

## INVITATION TO TENDER

### Ref: GYSBI\_ITT 102/102022: PROVISION FOR DEVELOPMENT OF GIE PLOT 8, PLOT 9 AND PLOT 10

#### PART 2 TECHNICAL SUBMISSION

##### SECTION 1. Scope of Work

###### 1.1 General description of Work

Except as otherwise expressly provided herein, Contractor shall supply all adequate and competent labour, supervision, tools, equipment, consumable materials, services, testing devices and each and every item of expense necessary for the clearing, layout, excavations, handling, hauling, materials storage, placing, compacting, field erection, installation, construction, fabrication, evaluation, and quality assurance for the Development of GIE Plot 8, Plot 9 and Plot 10, hereinafter called the Work.

###### 1.2 Detailed Scopes of Work

Detailed Scopes of Work are provided in the following Appendices:

- **APPENDIX A: Scope of Work**
- **APPENDIX B: Drawing Package**
- **APPENDIX C: Technical Specifications**

###### 1.3 Performance Schedule and Sequence of Works

Contractor shall commence performance of the Work on the dated stated on the Start Date of the Purchase Order and shall complete Work not later than **one hundred and twenty (120) days** after issuance of Purchase Order (PO) for each Lot (Plot).

###### 1.3.1 General scheduling, reporting and coordination requirements.

Contractor shall submit the detailed Work program (schedule) accordance to Section 01010 of the Technical Specification for approval prior to award of contract.

###### 1.3.2 Specific scheduling and coordination requirements may include but not necessarily be limited to the following:

- Mobilization time for manpower and equipment
- Material deliveries to jobsite
- Setting out of works

- Excavation to subgrade level
- Placing and compaction of subbase and base layers
- Placing and compaction of surface layer
- Installation of concrete drains
- Fabricate and Installation of chain link fence.
- Other as necessary

Site availability will be seven days a week on 24 hr. basis.

#### **1.4 Materials, Equipment and Services provided by Company**

Company will provide or cause to be provided to Contractor, without cost to Contractor, the following items for or in connection with performance of the Work:

##### **1.4.1 Survey**

Survey Monuments and Survey Control monuments and/or benchmarks for setting out the Work are established on site and described in the drawings. Contractor is responsible to verify/confirm all Survey Monuments and/or Survey Control Monuments and/or Benchmarks.

##### **1.4.2 Permits**

All permits required for performance of the Work at the jobsite will be arranged by Company on first basis.

All Work permits, thereafter, will be managed carefully with the Contractor's representative and GYSBI Operations.

##### **1.4.3 Equipment**

No equipment will be Company provided for this project.

##### **1.4.4 Material**

No materials will be provided by the Company for the project.

All materials necessary to complete this project will be provided by the Contractor. Contractor to submit for approval all necessary documents, such as technical specifications and shop drawings, for permanent material prior to procurement of material.

#### **1.5 Construction Facilities and Utilities**

##### **1.5.1 Provided by Company**

Company will supply or cause to be supplied the following temporary construction facilities and utilities to Contractor, without cost to Contractor, for or in connection with performance of the Work:

- Medical Services

Limited medical services on a "Good Samaritan" basis. Initial first aid shall be provided by Contractor. However, GYSBI has an onsite Medic 24/7 that the

Contractor can utilize for emergencies.

#### 1.5.2 Provided by Contractor

Except as expressly set forth in Section 1.5.1 of this Article 1.5, the supply, installation, provision, maintenance, repair, and final removal of all temporary facilities and utilities, necessary for full and complete performance of the Work, is the sole responsibility of the Contractor.

The type of facilities, move-in and move-out dates, and locations on the work Site shall be subject to and in accordance with the review and approval of Company.

#### 1.5.3 Materials, Equipment and Offices

Apart from the items specifically described herein as being Company provided, Contractor shall supply all other materials and equipment required for performance of the work.

Points to note:

- The cost and logistics to deliver all equipment and materials to the worksite is the responsibility of the Contractor.
- There will be no Changing and Break Facilities, Tools, Equipment and Consumable Stores, and Covered Storage required to support the works.
- There may be an opportunity for one construction office for Contractor's supervisory to operate and subject to review and approval by the Company.

#### 1.5.4 Construction Power

No temporary power for temporary facilities or construction will be provided to Contractor by Company. The contractor is responsible for generating their own power in order to perform and complete the tasks.

#### 1.5.5 Communication Facilities

Contractor shall provide and operate all means of communication, including but not limited to telephones, facsimiles, and radios which shall be approved by Company/Owner.

#### 1.5.6 Compressed Air and Gases

Contractor shall supply all compressed air and gases necessary for the performance of the Work. Compressed air for general work shall be to industry standards.

All gases to be utilized in the cutting of steel and welding of and steel shall meet the applicable specifications as identified in this Scope of Work and shall be in compliance with international welding specifications and standards. The gases specified for a specific welding procedure shall be supplied with all certifications to the specification.

All compressed air and gases shall be maintained in a secure and safe condition. Caps are to be installed on all bottles when not in use and especially when being transported. Transporting of bottles shall be done in secure industry standard carrying racks. Defective bottles and valves shall be removed from work areas immediately. All bottles and containers shall be clearly marked with the contents of the bottles. All bottles shall be stored to industry standards, keeping oxidizers and fuels separated as specified in the

## Safety Manual.

- 1.5.7 Material Handling and Rigging  
Contractor shall provide and operate all cranes and other necessary equipment for handling, hauling, unloading and receiving materials, tools and equipment.
- 1.5.8 Weather Protection of the Work and any methods required to allow continuation of the Work during periods of inclement weather, as outlined in the BOQ and Technical Specification.
- 1.5.9 Temporary lighting.  
Provision and operation to allow the Work to be performed in a safe manner regardless of ambient lighting conditions.
- 1.5.10 All Personnel Protective Equipment  
Contractor to provide all necessary PPE as required to perform the work per US OSHA standards.
- 1.5.11 Permits for Temporary Facilities.  
Contractor is solely responsible for obtaining all permits, licenses and government approvals for his temporary facilities that are located outside the Project boundaries. It is the Contractor's sole responsibility to ensure that these facilities are provided, operated, maintained, and disposed of in accordance with all laws and regulations.

## 1.6 Meetings and Reporting

Contractor shall promptly submit the schedules and reports set forth below.

- 1.6.1. Weekly Progress Meetings  
At the weekly progress meeting, Contractor shall submit a written report showing scheduled progress versus actual progress giving details of Work completed in relation to the approved schedule, together with a one (1) week "look ahead" which provides details of how the Work will be completed.

Contractor's Project Manager **AND** Site Management team shall attend a weekly **Site** coordination meeting.

The person or persons designated by Contractor to attend the meetings shall have all the required authority to make decisions and commit Contractor to solutions agreed upon during any meetings.

- 1.6.2 Other Meetings  
Contractor participation in certain additional activities shall also be required. These activities shall include, but not be limited to:
- Indoctrination, orientation and GYSBI safety training of all Contractor's employees designated for the project prior to commencing work at the jobsite. (This includes the entire labour force and all new hires). This duration of this activity is approximately 2 days.
  - Daily tool-box safety meetings organized and conducted by Contractor and attended by all of Contractor's craft employees. Contractor shall be responsible

for arranging and conducting these meetings with its craft employees. The meetings will last approximately 1/2 hour.

## 1.7 Data Requirements

1.7.1 Contractor shall submit the following data to Company as part of the Scope of Work:

- Quality Control Program for review prior to commencement of Work.
- All necessary Q.C. documentation as work is completed.
- A Bill of Materials
- All open excavation and materials filling plan for review prior to commencement of the works
- As-Built Drawings Two (2) copies of test reports and test certificates for review.
- Two (2) copies of all Non-Destructive Testing (NDTs)
- At completion of Work, a complete report of all tests.
- Any other Documentation and or data requested by Company.

1.7.2 Contractor's performance of their obligations hereunder shall not be deemed complete until Company is in receipt, on proper forms, of all Technical Data, As-Built Drawings, and other documents to be submitted to Company as part of Contractor's Scope of Work.  
**Failure of Contractor to comply with the above data requirements will entitle Company to withhold any progress payment, or final payment, pending Company's receipt of all the above data without prejudice to any other remedy of Company.**

1.7.3 Contractor shall submit all engineering data, samples, and shop drawings (herein called "data") to Company for review. Company requires ten (10) working days for review of data submitted by Contractor. Each submittal of Contractor's data shall be signed by Contractor and accompanied by a letter of transmittal containing the date of submittal, Contract Number, and all pertinent information required for identifying and checking submittals.

1.7.4 Contractor shall provide to Company reproducible drawings revised by Contractor to show "as-built" information. Contractor's revisions shall show details of those locations where the Work performed by Contractor was at variance with the details shown on the drawings (either provided by Company or provided by Contractor and reviewed by Company). Contractor's submittal to Company of such "As-Built" drawings shall be made on a continuous basis as the Work proceeds, but in all cases prior to the date of Notice of Acceptance. For the purposes of Contractor's inclusion of "As-Built" information, Company will provide Contractor with an electronic version of Company provided drawings.

1.7.5 Company reserves the right to review certified material test reports for all materials of construction at any time during field erection. Contractor shall maintain these documents readily available for such review and shall submit all documents to Company on the completion of the Work.

1.7.6 Contractor shall maintain at the jobsite up-to-date copies of all drawings, specifications, and other documents and supplementary data, complete with latest revisions thereto. In addition, Contractor shall maintain a continuous record of all field changes, and at the conclusion of the Work, shall incorporate all such changes on the "As Built" drawings and other engineering data and shall submit the required number of copies thereof to Company.

- 1.7.7 Contractor is required to keep As-Built drawings up to date on a daily basis and provide Company and/or Owner at all times access to these drawings during the Project.
- 1.7.8 Contractor shall show the Company Contract Number and identifying item numbers, if applicable, on all data submitted pursuant to this Article.
- 1.7.9 Where samples are required, they shall be submitted by and at the expense of Contractor. Such submittal shall be made not less than thirty (30) calendar days prior to the time that the materials represented by such samples are needed for incorporation into any Work. Samples shall be subject to review and materials represented by such samples shall not be manufactured, delivered to the site or incorporated into any Work without such review.
- 1.7.10 Each sample shall bear a label showing Contractor's name, project name, name of the item, manufacturer's name, brand name, model number, supplier's name and reference to the appropriate drawing, technical specification section and paragraph number, all as applicable.  
Samples which have been reviewed may, at Company's option be returned to Contractor for incorporation into the Work.

## **1.8 Quality Control**

Contractor shall be responsible for the performance of all inspection and testing activities as specified, Quality Assurance and Control. Contractor shall submit the Quality Program and Inspection Procedures required within seven (7) calendar days of award of this contract.

## **1.9 Clean up and Close Out**

Prior to demobilization, the Contractor is expected to submit a **Job Completion Report**.

Contractor shall perform a complete Work Site clean-up, clearance, dismantling and removal of any Contractor's property, including all temporary facilities and reinstatement of the temporary facility area given to Contractor to its original condition.

**Failure of Contractor to comply with the above "Clean Up & Close Out" will entitle Company to withhold any progress payment, or final payment, pending Company's approval of said Clean Up & Close Out without prejudice to any other remedy of Company.**

At conclusion of the works, Contractor's representative, Client's representative, and executive sponsors from both parties will review the completed works.

## **1.10 Executive Sponsor**

Contractor shall nominate an Executive Sponsor for the Contract. The role of the Contract Executive Sponsor is to be the Senior Management contact who will become involved and take a proactive approach to the successful execution of the Work, including accountability for safety and health performance. The Executive Sponsor will be aware of progress of the Work through the major milestones and will hold at least one meeting each month on the status of the Work.

The Executive Sponsor will contact Company's Executive Sponsor on any potential problems in Contractor's organization, or in Company's organization that may negatively impact safety, health and/or the progress of the Work. Contractor's Executive Sponsor will be available to meet with Company's Executive Sponsor contact or other Project Management representation at the work site to review status of the Work.

## SECTION 2. Quality, Health, Security, Safety & Environmental (QHSSE) Compliance

- 2.1 GYSBI requires the Awarded Tenderer to place the highest importance and priority on Quality, Health, Security, Occupational Safety and Environment (QHSSE) during performance of the work.
- 2.2 The Contractor shall be responsible for QHSSE management and comply with National and Local Regulations and Standards, as well as GYSBI's standards on QHSSE
- 2.3 The Contractor will be responsible for taking reasonable measures to ensure its personnel provide and maintain a safe, healthy, and environmentally responsible working environment.
- 2.4 Contractor is to provide all its personnel with Personal Protective Equipment (PPE), appropriate for the job based on the area of work. The minimum PPE requirements are listed below:
  - 2.4.1 *Safety helmets.*
  - 2.4.2 *Safety eyewear (dark lens for day, clear lens for night).*
  - 2.4.3 *Safety vests with reflective stripes.*
  - 2.4.4 *Lace-up type safety footwear with toe protection.*
  - 2.4.5 *Gloves, when necessary; and*
  - 2.4.6 *Dust masks*
  - 2.4.7 *Life preservers jackets where applicable*
  - 2.4.8 *Fall arresters where applicable*
- 2.5 Contractor should submit a **Safety Plan** as part of their tender submission.
- 2.6 The Contractors representative shall be notified by the client's representative immediately any accident occurs whether on Site or off Site in which the Contractor is directly involved which results in any injury to any person whether directly concerned with the Site or whether a third party. Such initial notification may be verbal and shall be followed by a written comprehensive report within 24 hours of the accident.
- 2.7 Additionally, the Contractor must have as part of their human resources a dedicated suitable, competent and qualified individual **APPROVED by Company** to manage the day-to-day safety operations of the site.
- 2.8 The Contractor is expected to perform all task in accordance to well set out safety practices and rules and this must be demonstrated in the method statements submitted as part of this tender submission.
- 2.9 Where the contractor needs to relocate Company's material to their site, there are to engage the QHSSE for a permit and JSA to complete the mobilization and unloading.
- 2.10 The Contractor to consider all the attached GYSBI QHSSE documents detailed below, and price accordingly:

1. QH-PO-001 QHSSE Policy
2. QH-PO-002 Smoking Policy
3. QH-PO-003 COVID 19 Guidelines
4. QH-PO-004 Cellular and Wireless Devices in the Workplace Policy
5. QH-PO-005 Hazardous Substances Staging Policy
6. QH-PO-006 Fitness to Work Policy
7. QH-PO-007 Drug, Alcohol and Contraband Policy
8. QH-PR-001 Investigation - Reporting Procedure
9. QH-PR-002 Permit to Work (PTW) Procedure
10. QH-PR-003 Simultaneous Operations Procedure
11. QH-PR-004-A/B Simultaneous Operations Procedure-SIMOPS Matrix-Forms A and B
12. QH-PR-005 Working at Height Procedure
13. QH-PR-006 Management of Change Procedure
14. QH-PR-007 QHSSE Communication Procedure
15. QH-PR-008 Shore Base Entry and Exit Procedure
16. QH-PR-009 Risk Assessment Procedure
17. QH-PR-010 QHSSE Reporting Procedure
18. QH-PR-011 Monitoring Tool Flowchart
19. QH-PR-012 Permit to Work (PTW) Audit flowchart
20. QH-PR-013 Medical Response Flowchart
21. QH-PR-014 Audit Procedure
22. QH-PR-015 Contractor Site Assessment Procedure
23. QH-PR-016 Site Induction Procedure
24. QH-PR-017 Confined Space Entry Procedure
25. QH-PR-018 QHSSE Document Retention Procedure
26. QH-PR-019 PPE Procedure
27. QH-PR-020 Dropped Object Prevention Scheme Procedure
28. QH-PR-021 Waste Management Procedure
29. QH-PR-022 Employee Health Assessment Procedure
30. QH-PR-023 Bomb Threat Procedure
31. QH-PR-024 Annex Entry Exit Procedure
32. QH-PR-025 Drone Management Procedure
33. QH-PL-003 Environment Management Plan
34. QH-PL-004 GYSBI Port Facility Security Plan
35. QH-PL-006 HSE Management Plan
36. QH-PL-005 Traffic Management Plan

## SECTION 3. Required Information

### 3.1 TECHNICAL SUBMISSION – SCOPE OF WORK

Tenderer must submit all documents requested in the detailed Scope of Work Appendices, including but not limited to:

- *Project Plan/Work Programme*
- *Method Statements*
- *Organisational Charts of proposed team identifying activities and organisational structures for all phases of the Scope of Work.*
- *Confirmation of Material & Equipment resources available to complete Scope of Work.*
- *Environmental Management Plan*

### 3.2 TECHNICAL SUBMISSION - QUALITY, HEALTH, SECURITY, SAFETY & ENVIRONMENTAL (QHSSE) COMPLIANCE

Tenderers should submit a **Safety Plan** for the Scopes of Work detailed in Section 1.

Tenderers should also submit a previous Safety Plan for review and any quality control procedures they have used in past projects.

### 3.3 COMMERCIAL SUBMISSION

Tenderers should bid on a **Unit Price** basis for the entire Work Package.

Tenderers must submit a **Unit Price** that covers the requirements of satisfying:

- 3.2.1 *Section 1 – Scope of Work (including appendices A, B & C)*
- 3.2.2 *Section 2 - Security, Safety, Health & Environmental (QHSSE) Compliance*
- 3.2.3 *Appendix D – Standard GYSBI Master Service Agreement (MSA)*

A suggested Pricing Schedule is included as an Excel Template as Part 3 COMMERCIAL SUBMISSION and should be completed and submitted as an excel spreadsheet.

GYSBI would like to see tenderers breakdown of pricing for the work itemised in the suggested Pricing Schedule (PART 3 COMMERCIAL SUBMISSION) including any potential priced discounts in their commercial submission

Contractor should take onus to ensure their work is costed accordingly to achieve the goal of the demolition work described in this document. If the Contractor presents any "estimation" figures, they do so at their own risk.

### 3.4 Previous Experience relating to Section 1. Scope of Work.

Tenderers to submit schedule of previous contracts demonstrating evidence of experience with projects of a similar level, with examples of references/past project history/performance track record.

### 3.5 Confirmation of acceptance of GYSBI Master Services Agreement Terms & Conditions.

3.6 Signing of **Form of Tender** and initialling of all other pages.

All queries to be emailed to **tenders@gysbi.com**

### **Appendices.**

Appendix A. Scope of Work

Appendix B. Drawing Package

Appendix C. Technical Specification

Appendix D. General & Specific Conditions of Contract

Appendix E. QHSSE Document Pack 2021

Appendix F. Evaluation Criteria

# GUYANA SHORE BASE INC

## PROVISION FOR DEVELOPMENT OF GIE PLOT 8, PLOT 9 AND PLOT 10

### SCOPE OF WORK

GYSBI\_ITT102\_102022

## 1.0 DESCRIPTION OF WORKS – GENERAL

### 1.1 Project Description

The Contractor to provide Company (GYSBI) with all materials, equipment, tools, and manpower for the development of GIE plot 8 (10 acres), plot 9 (10 acres) and plot 10 (7.66 acres) with white sand sub-base, loam base and crusher run surface, also included 36" wide concrete drains and chain link perimeter fence.

Works to be carried out under the Contract shall consist of items described in the Tender Document and Bill of Quantities that was provided with the Tender Document.

The works to be performed shall also include all the following but not limited to, all general preparation works for the development of the plots, construction of the concrete drains and fabrication and installation of the chain link fencing and any other work that may be related and necessary for the satisfactory construction, completion, and maintenance of the works to satisfy the objectives of the drawings.

The scope of works will include compliance by the Contractor with all General Conditions of Contract even if they are not specifically mentioned in the various clauses of these Specifications. This should include all materials, equipment and related items needed during construction. It will also include the provision of safety equipment for workers and adequate sanitary arrangements.

## 2.0 SPECIFICATIONS, DRAWINGS, ATTACHMENTS AND EXHIBITS

All works shall be performed in accordance with the following described specifications, drawings, and other documents, which by this reference are made a part thereof.

Appendix	Document
A	Scope of Works
B	Drawings
C	Technical Specification
D	General & Specific Conditions according to FIDIC
E	QHSSE Document Pack 2021

Drawings No.	Drawing Name	Drawing Date
	GIE Plot 8-10	26/10/2022
	Typical Plot Cross Section	26/10/2022
FD-A-02	Fence Details	17/06/2021

### 3.0 DESCRIPTION OF WORKS – SPECIFIC

The Work described in Section 1.0 and 2.0 of this document shall include, but not be limited to, the following:

3.1 **Preliminary** – The Contractor shall provide the necessary insurances, bonds, Environmental management plan, temporary work, and site accommodation for the duration of the contract.

3.2 **Site and Setting Out** - Throughout the period of the works the contractor shall be responsible for the preservation of all benchmarks, survey monuments, setting out marks and such like. And shall also comply with all legal provisions regarding surveying and setting out works.

3.3 **Earth Works** - The work specified in Section 02030 of the Technical Specification and the drawing covers excavation of areas to the required elevation, haul, dispose of materials, place, and compact specified materials necessary to construct the project, particularly those areas required for the yard development and for construction of the new concrete drains.

3.4 **Sub-Base and Base** – The sub-base and base materials provided by the Contractor shall be consistent in grading and appearance and shall not vary significantly from the material qualities as outlined in the Technical Specification Section 03010, 03010 and 03040, BOQ and the drawings. The white sand (26 inches) and sand/clay (9 inches) layers are to be constructed in regular courses, the component courses shall be approximately equal in thickness and the compacted thickness of any layer laid, processed and compacted at one time shall not exceed 150 mm (6 inches). No such layer once completed shall be covered by the succeeding layer until it has been accepted by the Company.

3.5 **Crusher Run Surface** – Crusher run (6 inches thick) shall consist of suitably graded aggregate material that shall meet all the requirements Section 03040 of the Technical Specification. All aggregates shall be reasonably free of clay lumps, soft and friable particles, salt, alkali, organic matter, adherent coatings, and other substances not defined which might possess undesirable characteristics. Compacted thickness of any layer laid, processed and compacted at one time shall not exceed 150 mm (6 inches). No such layer once completed shall be covered by the succeeding layer until it has been accepted by the Company. The material shall achieve a CBR (ASTM D1883-07e2) of not less than 80% after soaking

for four days when compacted to a density of at least 95 % of the maximum density as determined by ASTM D-1557-12.

**3.6 Concrete Drains** – All work and materials for constructing concrete channels drains shall conform to the dimensional tolerances of Section 05020 of the Technical Specification. The Contractor shall excavate and prepare trenches and foundations for concrete drains and shall be responsible for all dewatering of the trenches during construction. Supports and/or bedding material shall be placed in accordance with Drawings or as required by the Employer's Representative. Bedding material for concrete channels drain is 6" white sand fill with 2" thick concrete blinding as indicated on the drawings. Concrete used for all structural work described in this Section shall be Grade 30 (A) as indicated in the BOQ or directed by the Employer's Representative and shall conform to the requirements of Section 08020- Concrete for structures and other uses. All reinforcing steel used shall be deformed bars and shall conform to the requirements and stipulations of Grade 40 deformed reinforcement rods.

**3.7 Chain Link Fencing** – The fence shall be a minimum of 84 inches tall to the top of the cross-linked fence. The fence post shall be permanently bolted to the concrete intermediate drain or cast in concrete. If cast in concrete, fence post shall have not less than 1-meter embedment. The fence posts shall be no more than 3 meters apart and the bottom of the fence shall be less than 150mm above the concrete drain along the entire length of the fence. The fence shall be topped with a double row of concertina wire (razor wire), which shall be angled out away from the plot. Concertina wire shall be permanently fixed at 4 points between posts so it cannot be moved as shown in the drawings and shall be straight and plumb with smooth grade changes.

**3.8** As part of the proposal, Contractor shall furnish a step-by-step procedure including survey plan, equipment, excavation, material placement and compaction, surfacing and cleanup with the objectives to have minimum impact to the environment.

**3.10 A Pre-job conference/Kick off meeting** at the site will be required prior to mobilization. The conference will be between the Company HSE Representative, Company Engineering Representative, Company Operations Representative, and Contractor to review the site conditions, responsibilities, and requirements of the Work. At that time, the Contractor shall present a copy of his execution plan of the Work and shall discuss in detail the procedures and the sequence of construction including page-turn review of design drawing.

**3.11 Utilities** - Contractor to establish location and extent of service lines in area of Work and notify Company of findings before commencing Work and take all precautions to ensure that there are no unknown services.

- Where unknown services are encountered, immediately advise Company and confirm findings in writing.
- Where work involves breaking into or connecting to existing services, carry out work at times as directed by Company.
- Record locations, including elevations, of maintained, rerouted and abandoned service(s)

**3.12 Contractor's Scope Interfaces/Simultaneous Operations (SIMOPS)**

In order for Contractor to perform the Work, it will be necessary for Contractor to interface with others during the Work. Contractor shall be responsible for interface planning and implementation with Company and other contractors. Contractor shall be responsible for defining the interface requirements and ensuring the necessary data or physical interface is performed in accordance with other contractor's schedules

**3.13 Contractor's Resources**

The number and staffing of crews shall be agreed with and is subject to adjustment as required by Company for the performance of a task.

**3.14 Waste Management Services** - Toilets, construction waste containers and services for hauling, removal and disposal of construction waste is the responsibility of the Contractor.

# Construction of Lot 1 - Plot 8

## PART 3 COMMERCIAL SUBMISSION

Ref: GYSBI\_ITT102\_102022

### SUMMARY BILL

BILL NO	DESCRIPTION	TOTAL
1	<b>GENERAL</b>	
	<b>Existing Condition</b> - Vegetation	
	<b>Work Required</b> - Inclusive of complete construction storage yard areas which consists grubbing vegetation, excavation of organic soil, placement and compaction of minimum 660mm (26") white sand, 229mm (9") Loam and 150mm (6") Crusher run surfaces..	
	<b>Finished Surface</b> - 150mm (6") crusher run	
	<b>Estimated Area</b> - 40469 m <sup>2</sup> (48400.5 yd <sup>2</sup> )	
2	<b>SITE &amp; EARTHWORKS</b>	
3	<b>WHITE SAND SUB BASE</b>	
	<b>SUB-TOTAL</b>	
	<b>TOTAL</b>	

## Construction of Lot 1 - Plot 8

**BILL 1                      GENERAL**

The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs of the Works in accordance with the Technical Specifications. The provision of the Primary Technical Specifications Reference is only for guidance and does not preclude satisfaction or any other related clauses. NA means Not Applicable.

NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 01010 - General Requirements</b>						
1.1	NA	<b>Performance Security Bond from a recognised banking institution.</b>	<b>SUM</b>			
1.2	NA	<b>Advance Payment Guarantee from a recognised banking institution.</b>	<b>SUM</b>			
1.3	NA	<b>Insurance of the Works and Equipment</b>	<b>SUM</b>			
1.4	NA	<b>Third Party Insurance</b>	<b>SUM</b>			
1.5	NA	<b>Setting Out of the Works.</b> Provides for an Sworn Land Surveyor to monitor and control every aspect of the yard construction. Includes the cost of complying with the requirements of this Clause {Section 01010, Clause 1-9}.	<b>SUM</b>			
1.6	0101013	<b>Provision of Site Office .</b> Provide appropriate office facilities for the Project Manager and staff for the duration of the Contract . {Section 01010 Clause 1-31}	<b>SUM</b>			
1.7	NA	<b>Protection of Works and Existing Utilities .</b> The sum shall include all cost for dealing with water whether existing drainage system, water courses underground springs precipitation, existing utilities (telephone, light pole, water mains) etc. {Section 01010 Clause 1-17 to 1-19}	<b>SUM</b>			
1.8	010105	<b>Mobilisation and Demobilisation.</b> Payment for mobilization shall be 60% of this Sum with the remaining 40% being paid at the completion of Demobilization. {Section 01010 Clause 1-11}	<b>SUM</b>			
<b>Section 01020 - Contractor's Programme</b>						
1.9	010201	<b>Contractor's Programme.</b> Failure to comply with written instructions to submit a programme, revised programme or any other of the other items mentioned in Section 01020 of the Technical Specifications will result in a deduction at a rate of GY\$ 100,000 per week. {Section 01020}	<b>SUM</b>			
<b>Section 01030 - Safety &amp; Traffic Control</b>						
1.10	010301	<b>Safety &amp; Traffic Control.</b> This Sum shall include the cost of all personnel, equipment and appurtenances for complying with the Specifications with respect to safety, industrial health and traffic control. {Section 01030}	<b>SUM</b>			
<b>Section 01050 - Environmental Management</b>						
1.11	010501	<b>Environmental and Traffic Management Plan.</b> This Sum shall include the cost of all personnel, equipment and appurtenances for complying with the Specifications with respect to parpare management plans, implement plans, monitor and control plans for the duration of the contract . {Section 01050}	<b>SUM</b>			
<b>TOTAL for BILL # 1</b>						

## Construction of Lot 1 - Plot 8

**BILL 2                      SITE & EARTHWORKS**

The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs of the Works in accordance with the Technical Specifications. The provision of the Primary Technical Specifications Reference is only for guidance and does not preclude satisfaction or any other related clauses. NA means Not Applicable.

NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 02010 - Site Clearance</b>						
2.1	020102	<b>Clearing and Grubbing of Vegetation</b> {Section 02010, Clause 1-2, Sub-Clause 3}, and disposal of materials to a approve location / dump site.	m <sup>2</sup>	40469		
<b>Section 02030 - Earthworks</b>						
2.2	020301	<b>Excavation of Organic Soil/soft mud Materials and Level and Compact sub grade.</b> Excavation of depth 1m and the removal of all materials necessary, the surface of the exposed area shall be compacted by rolling with an appropriate roller for the full width of the excavated zone for the construction of the storage yard as indicated on the drawings. {Section 02030, Clause 1-2, Sub-Clause 1}	m <sup>3</sup>	40470		
<b>TOTAL for BILL # 2</b>						

## Construction of Lot 1 - Plot 8

**BILL 3                      SUB-BASE & BASE**

The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs of the Works in accordance with the Technical Specifications. The provision of the Primary Technical Specifications Reference is only for guidance and does not preclude satisfaction or any other related clauses. NA means Not Applicable.

NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 03010 - White Sand Sub-Base</b>						
3.1	010401	<b>Quality Control - Insitu Density Test (Nuclear).</b> Rate inclusive of cost for conducting the tests at the Ministry of Public Infrastructure Laboratory and for the cost or arrangement of transportation for collecting samples, storage of samples, testing equipment to and from site.	<b>Sum</b>			
3.2	030101	<b>Minimum 660mm (26") thk Sub-base.</b> Tested and approved white sand sub-base shall be brought up in even courses not exceeding 150mm thick. Layers shall be compacted to a density of at least 95% of the maximum density as determined by ASTM D- 1557 method A. {Section 03010, Clause 1-1 to 1-6}	m <sup>3</sup>	<b>26710</b>		
<b>TOTAL BILL #3</b>						

# Construction of Lot 1 - Plot 8

# Construction of Lot 2 - Plot 9

## PART 3 COMMERCIAL SUBMISSION

Ref: GYSBI\_ITT102\_102022

### SUMMARY BILL

BILL NO	DESCRIPTION	TOTAL
1	<b>GENERAL</b>	
	<b>Existing Condition</b> - Vegetation	
	<b>Work Required</b> - Inclusive of complete construction storage yard areas which consists grubbing vegetation, excavation of organic soil, placement and compaction of minimum 660mm (26") white sand, 229mm (9") Loam and 150mm (6") Crusher run surfaces..	
	<b>Finished Surface</b> - 150mm (6") crusher run	
	<b>Estimated Area</b> - 40469 m <sup>2</sup> (48400.5 yd <sup>2</sup> )	
2	<b>SITE &amp; EARTHWORKS</b>	
3	<b>WHITE SAND SUB BASE</b>	
	<b>SUB-TOTAL</b>	
	<b>TOTAL</b>	

## Construction of Lot 1 - Plot 8

**BILL 1 GENERAL**

The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs

NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 01010 - General Requirements</b>						
1.1	NA	<b>Performance Security Bond from a recognised banking institution.</b>	<b>SUM</b>			
1.2	NA	<b>Advance Payment Guarantee from a recognised banking institution.</b>	<b>SUM</b>			
1.3	NA	<b>Insurance of the Works and Equipment</b>	<b>SUM</b>			
1.4	NA	<b>Third Party Insurance</b>	<b>SUM</b>			
1.5	NA	<b>Setting Out of the Works.</b> Provides for an Sworn Land Surveyor to monitor and control every aspect of the yard construction. Includes the cost of complying with the requirements of this Clause {Section 01010, Clause 1-9}.	<b>SUM</b>			
1.6	0101013	<b>Provision of Site Office .</b> Provide appropriate office facilities for the Project Manager and staff for the duration of the Contract . {Section 01010 Clause 1-31}	<b>SUM</b>			
1.7	NA	<b>Protection of Works and Existing Utilities .</b> The sum shall include all cost for dealing with water whether existing drainage system, water courses underground springs precipitation, existing utilities (telephone, light pole, water mains) etc. {Section 01010 Clause 1-17 to 1-19}	<b>SUM</b>			
1.8	010105	<b>Mobilisation and Demobilisation.</b> Payment for mobilization shall be 60% of this Sum with the remaining 40% being paid at the completion of Demobilization. {Section 01010 Clause 1-11}	<b>SUM</b>			
<b>Section 01020 - Contractor's Programme</b>						
1.9	010201	<b>Contractor's Programme.</b> Failure to comply with written instructions to submit a programme, revised programme or any other of the other items mentioned in Section 01020 of the Technical Specifications will result in a deduction at a rate of GY\$ 100,000 per week. {Section 01020}	<b>SUM</b>			
<b>Section 01030 - Safety &amp; Traffic Control</b>						
1.10	010301	<b>Safety &amp; Traffic Control.</b> This Sum shall include the cost of all personnel, equipment and appurtenances for complying with the Specifications with respect to safety, industrial health and traffic control. {Section 01030}	<b>SUM</b>			
<b>Section 01050 - Environmental Management</b>						
1.11	010501	<b>Environmental and Traffic Management Plan.</b> This Sum shall include the cost of all personnel, equipment and appurtenances for complying with the Specifications with respect to parpare management plans, implement plans, monitor and control plans for the duration of the contract . {Section 01050}	<b>SUM</b>			
<b>TOTAL for BILL # 1</b>						

## Construction of Lot 1 - Plot 8

**BILL 2                      SITE & EARTHWORKS**

*The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs*

NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 02010 - Site Clearance</b>						
2.1	020102	<b>Clearing and Grubbing of Vegetation</b> {Section 02010, Clause 1-2, Sub-Clause 3}, and disposal of materials to a approve location / dump site.	m <sup>2</sup>	40469		
<b>Section 02030 - Earthworks</b>						
2.2	020301	<b>Excavation of Organic Soil/soft mud Materials and Level and Compact sub grade.</b> Excavation of depth 1m and the removal of all materials necessary, the surface of the exposed area shall be compacted by rolling with an appropriate roller for the full width of the excavated zone for the construction of the storage yard as indicated on the drawings. {Section 02030, Clause 1-2, Sub-Clause 1}	m <sup>3</sup>	40469		
<b>TOTAL for BILL # 2</b>						

## Construction of Lot 1 - Plot 8

**BILL 3 SUB-BASE & BASE**

The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs

NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 03010 - White Sand Sub-Base</b>						
3.1	010401	<b>Quality Control - Insitu Density Test (Nuclear).</b> Rate inclusive of cost for conducting the tests at the Ministry of Public Infrastructure Laboratory and for the cost or arrangement of transportation for collecting samples, storage of samples, testing equipment to and from site.	<b>Sum</b>			
3.2	030101	<b>Minimum 660mm (26") thk Sub-base.</b> Tested and approved white sand sub-base shall be brought up in even courses not exceeding 150mm (6") thick. Layers shall be compacted to a density of at least 95% of the maximum density as determined by ASTM D- 1557 method A. {Section 03010, Clause 1-1 to 1-6}	<b>m<sup>3</sup></b>	<b>26710</b>		
<b>TOTAL BILL #3</b>						

# Construction of Lot 1 - Plot 8

## Construction of Lot 3 - Plot 10

### PART 3 COMMERCIAL SUBMISSION

Ref: GYSBI\_ITT102\_102022

**SUMMARY BILL**

BILL NO	DESCRIPTION	TOTAL
1	<b>GENERAL</b>	
	<b>Existing Condition</b> - Vegetation	
	<b>Work Required</b> - Inclusive of complete construction storage yard areas which consists grubbing vegetation, excavation of organic soil, placement and compaction of minimum 660mm (26") white sand, 229mm (9") Loam and 150mm (6") Crusher run surfaces..	
	<b>Finished Surface</b> - 150mm (6") crusher run	
	<b>Estimated Area</b> - 31030 m <sup>2</sup> (37112 yd <sup>2</sup> )	
2	<b>SITE &amp; EARTHWORKS</b>	
3	<b>WHITE SAND SUB BASE</b>	
	<b>SUB-TOTAL</b>	
	<b>TOTAL</b>	

## Construction of Lot 1 - Plot 8

**BILL 1                      GENERAL**

The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs

NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 01010 - General Requirements</b>						
1.1	NA	<b>Performance Security Bond from a recognised banking institution.</b>	SUM			
1.2	NA	<b>Advance Payment Guarantee from a recognised banking institution.</b>	SUM			
1.3	NA	<b>Insurance of the Works and Equipment</b>	SUM			
1.4	NA	<b>Third Party Insurance</b>	SUM			
1.5	NA	<b>Setting Out of the Works.</b> Provides for an Sworn Land Surveyor to monitor and control every aspect of the yard construction. Includes the cost of complying with the requirements of this Clause {Section 01010, Clause 1-9}.	SUM			
1.6	0101013	<b>Provision of Site Office .</b> Provide appropriate office facilities for the Project Manager and staff for the duration of the Contract . {Section 01010 Clause 1-31}	SUM			
1.7	NA	<b>Protection of Works and Existing Utilities .</b> The sum shall include all cost for dealing with water whether existing drainage system, water courses underground springs precipitation, existing utilities (telephone, light pole, water mains) etc. {Section 01010 Clause 1-17 to 1-19}	SUM			
1.8	010105	<b>Mobilisation and Demobilisation.</b> Payment for mobilization shall be 60% of this Sum with the remaining 40% being paid at the completion of Demobilization. {Section 01010 Clause 1-11}	SUM			
<b>Section 01020 - Contractor's Programme</b>						
1.9	010201	<b>Contractor's Programme.</b> Failure to comply with written instructions to submit a programme, revised programme or any other of the other items mentioned in Section 01020 of the Technical Specifications will result in a deduction at a rate of GY\$ 100,000 per week. {Section 01020}	SUM			
<b>Section 01030 - Safety &amp; Traffic Control</b>						
1.10	010301	<b>Safety &amp; Traffic Control.</b> This Sum shall include the cost of all personnel, equipment and appurtenances for complying with the Specifications with respect to safety, industrial health and traffic control. {Section 01030}	SUM			
<b>Section 01050 - Environmental Management</b>						
1.11	010501	<b>Environmental and Traffic Management Plan.</b> This Sum shall include the cost of all personnel, equipment and appurtenances for complying with the Specifications with respect to parpare management plans, implement plans, monitor and control plans for the duration of the contract . {Section 01050}	SUM			
<b>TOTAL for BILL # 1</b>						

## Construction of Lot 1 - Plot 8

### BILL 2 SITE & EARTHWORKS

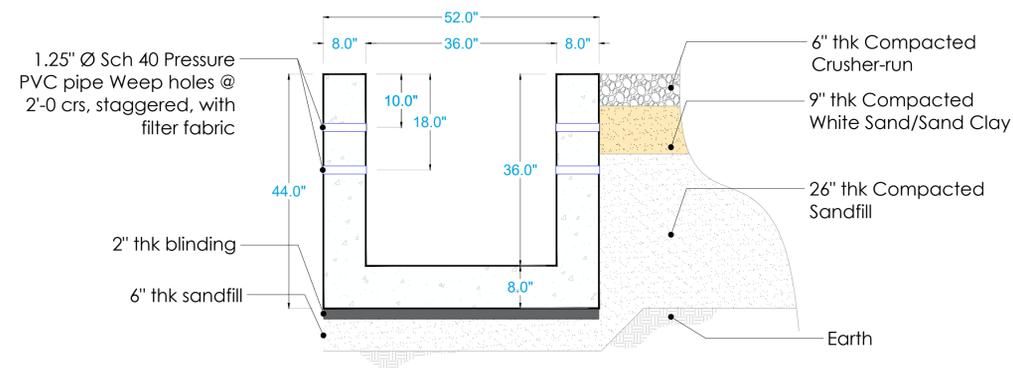
The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs

NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 02010 - Site Clearance</b>						
2.1	020102	<b>Clearing and Grubbing of Vegetation</b> {Section 02010, Clause 1-2, Sub-Clause 3}, and disposal of materials to a approve location / dump site.	m <sup>2</sup>	31030		
<b>Section 02030 - Earthworks</b>						
2.2	020301	<b>Excavation of Organic Soil/soft mud Materials and Level and Compact sub grade.</b> Excavation of depth 1m and the removal of all materials necessary, the surface of the exposed area shall be compacted by rolling with an appropriate roller for the full width of the excavated zone for the construction of the storage yard as indicated on the drawings. {Section 02030, Clause 1-2, Sub-Clause 1}	m <sup>3</sup>	31030		
					<b>TOTAL for BILL # 2</b>	

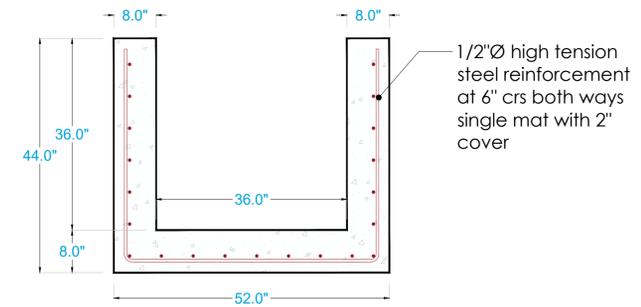
### BILL 3 SUB-BASE & BASE

The Rates and/or Total are to entered into each cell with a 'double line' border. These entries shall be **full** compensation for all operations and sequences of operations which may be required to comply with the needs

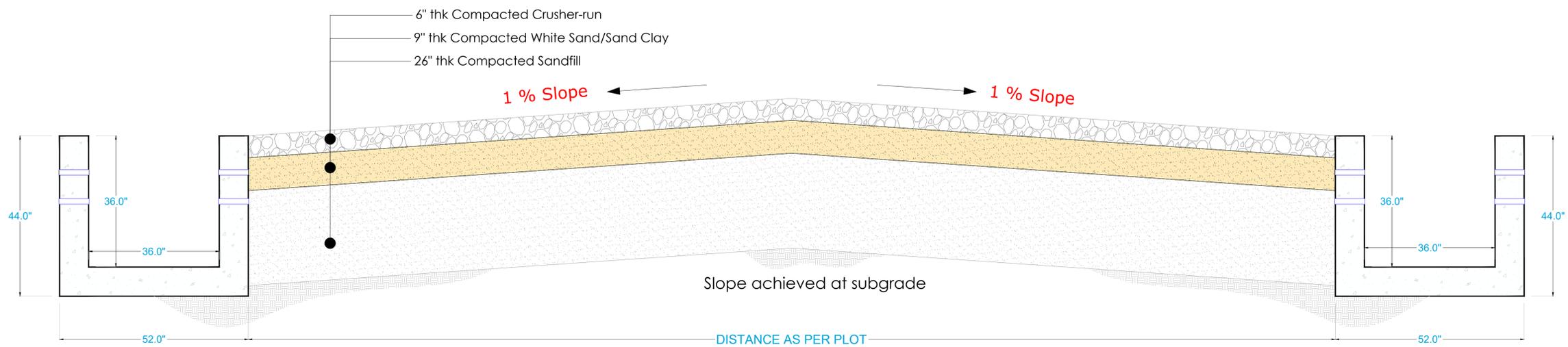
NO.	BILL ITEM IN SPECS.	DESCRIPTION {Primary Technical Specifications Reference}	UNIT	QTY	RATE	TOTAL
<b>Section 03010 - White Sand Sub-Base</b>						
3.1	010401	<b>Quality Control - Insitu Density Test (Nuclear).</b> Rate inclusive of cost for conducting the tests at the Ministry of Public Infrastructure Laboratory and for the cost or arrangement of transportation for collecting samples, storage of samples, testing equipment to and from site.	Sum			
3.2	030101	<b>Minimum 660mm (26") thk Sub-base.</b> Tested and approved white sand sub-base shall be brought up in even courses not exceeding 150mm (6") thick. Layers shall be compacted to a density of at least 95% of the maximum density as determined by ASTM D- 1557 method A. {Section 03010, Clause 1-1 to 1-6}	m <sup>3</sup>	20480		
					<b>TOTAL BILL # 3</b>	



**1** DETAIL A - TYPICAL DRAIN SECTION  
Scale: 3/4" = 1'-0"



**2** DETAIL B - DRAIN REINFORCEMENT  
Scale: 3/4" = 1'-0"



**3** TYPICAL PLOT CROSS SECTION  
Scale: Scale: 3/4" = 1'-0"

ALL DIMENSIONS ARE IN INCHES UNLESS OTHERWISE STATED.

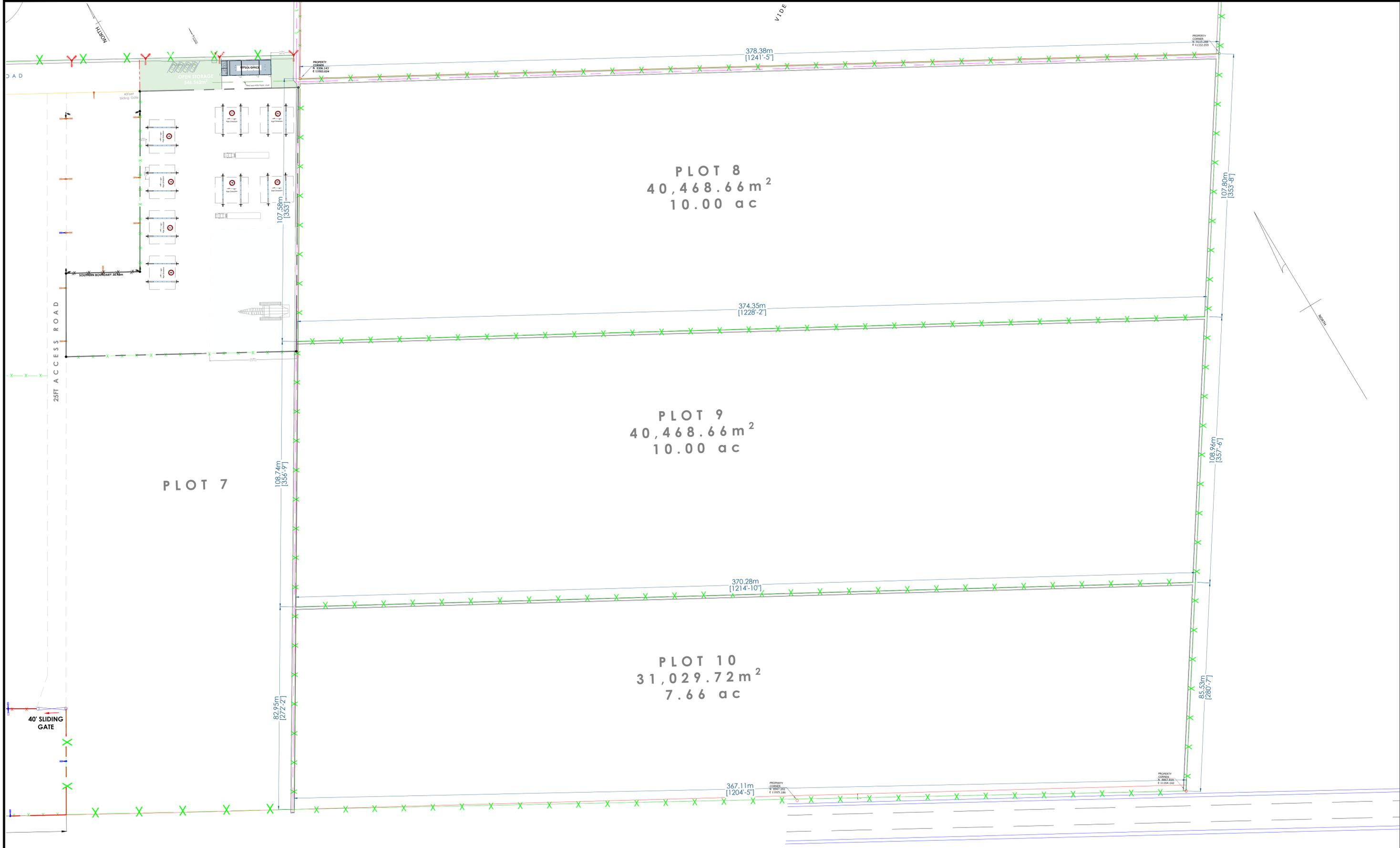


No:	REVISION	DATE:	CLIENT:

Project Title:	GYSBI INDUSTRIAL ESTATE
Project Location:	GYSBI INDUSTRIAL ESTATE
Drawing Title:	<b>TYPICAL PLOT CROSS SECTION</b>

Scale:	Scaled to fit	Date:	26.10.2022
Surveyed by:	*****		
Drawing by:	A. Flatts		
Checked by:	S. Kishun		
Approved by:	B. Murli	Appr. Date:	27.10.2022

Drawing #:	
Page No:	<b>1 of 1</b>



No:	REVISION	DATE:	CLIENT:

Project Title: GYSBI INDUSTRIAL ESTATE

Project Location: South East of GIE, South of Veira(Technip FMC)

Drawing Title: **GIE PLOT 8-10**

Scale: Scaled to fit	Date: 26.10.2022
Surveyed by: *****	Drawing #:
Drawing by: A. Flatts	Page No: 1 of 1
Checked by: S. Kishun	
Approved by: B. Murli	Appr. Date: 26.10.2022

# **GUYANA SHORE BASE INC.**

## **DEVELOPMENT OF GIE PLOT 8, PLOT 9 AND PLOT 10**

**GYSBI\_ITT102\_10/2022**

## **TECHNICAL SPECIFICATION OF WORKS**

**OCTOBER 2022.**

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# **WORKS REQUIREMENTS**

## *Scope of Works*

---

### **1 DESCRIPTION OF THE WORKS**

The Works constituting the Contract comprise upgrading section of GYSBI Industrial Estate (Annex) Road as defined in the Invitation to Bid:

## **2 LOCATION AND EXTENT OF SITE**

The Location of the site is at Mc Doom, the access road to Gafoors Complex, GYSBI Industrial Estate (Annex) etc. and the extent of site for the project is 620m from the East Bank Demerara Public Road.

**GYSBI's STANDARD  
TECHNICAL  
SPECIFICATIONS FOR  
TRANSPORTATION  
MATERIALS AND METHODS  
OF SAMPLING AND TESTING,  
1<sup>st</sup> EDITION, HIGHWAYS**

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## ***SECTION 01010 - GENERAL REQUIREMENTS***

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## ***1-1 INTRODUCTION***

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This Contract will be administered in accordance with the Laws of the Co-operative Republic of Guyana and these Specifications as detailed hereunder. References made in the Specifications may differ slightly in wording from those in the Conditions of Contract. In any such case, the provisions of the Conditions of Contract shall prevail. Any ambiguity resulting in a conflict of meaning should be referred to the Employer's Representative for clarification.

The Specifications shall apply to all road, culvert and bridge works that are required to be completed under Contract as directed by the Project Manager. All works shall be carried out to the satisfaction of the Project Manager and conform to all details in the drawings or otherwise indicated by the Project Manager. All materials, processing of materials and features of construction that may be needed will conform to the requirements set in the following sections. It is understood that if a section is only described in general terms then all general practice should be of the highest possible standards and all instructions from the Project Manager followed.

### ***1-1-1 Scope of Work***

Work to be carried out under the Contract shall consist of items described in the Tender Document and Bill of Quantities that was provided with the Tender Document.

The works to be performed shall also include all the following but not limited to, all general preparation works for the construction of roads, bridges, culverts, canal crossings, drainage and any other work that may be related and necessary for the satisfactory construction, completion, and maintenance of the works to satisfy the objectives of the drawings and orders that are issued by the Project Manager from time to time.

The scope of works will include compliance by the Contractor with all General Conditions of Contract even if they are not specifically mentioned in the various clauses of these Specifications. This should include all materials, equipment and related items needed during construction. It will also include the provision of safety equipment for workers and adequate sanitary arrangements.

The Contractor shall guarantee that all actions are taken to ensure quality assured construction in both the planning and execution of works. Quality assurance should cover all stages of work including selection of materials, construction methods and deployment of personnel.

The Contractor shall provide a method of execution of the works and a program schedule. These should describe the requirements and procedures for the preparation and submission of the Contractor's preliminary program and the subsequent detailed programme and narrative statement as well as requirements pertaining to the updating and revision thereof See section 01020 Contractors Program for details.

### ***1-2-1 Contract Drawings***

The Contract Drawings provided for tender shall be used as a true visual representation of the Works. From these drawings the Contractor should be able to visualise the nature and type of work contemplated and to make sure the rate and prices quoted in the Bill of Quantities have taken into consideration both the qualitative and quantitative variations.

The tendered rates should include prices for all work necessary included preparation and supply of all working drawings, plans and images that the Contractor is required to supply according to the Contract.

Copies of the drawings, for which actual work is to proceed, shall be provided by the Project Manager to the Contractor and will include all drawing layers that were prepared during the design phase of the project.

#### **1-3-1 Public Utilities**

Drawings showing the affected utility services included in the Contract Documents shall be verified by the Contractor for accuracy of the information prior to the beginning of any work. These drawings were prepared by the individual utility provider and the positions of utilities on the drawings are assumed to be correct.

No clearance shall be carried out by the contractor unless ordered by the Project Manager.

Any services affected by Works must be temporarily supported by the Contractor who must take reasonable measures to protect these services and property during the progress of the Works

#### **1-2 LOCATION AND EXTENT OF SITE**

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The Site of the Works shall be defined as the area containing the various road reserves, spoil areas, access roads and diversions, Contractor's storage areas, Camp sites and Field offices established specifically for the Contract with the approval of the Employer's Representative.

#### **1-3 SPECIFICATIONS**

---

The Specifications shall consist of the following:

##### **1-4-1 Standard Specifications.**

The Standard Specifications shall be the Guyana Standard Technical Specifications for Transportation Materials and Methods of Sampling and Testing 1<sup>st</sup> Edition, Highways – Revision 5

##### **1-5-1 Supplemental Specifications**

The Supplemental Specifications modify the Standard Specifications referred to above. The Supplemental Specifications do not delete any of the sections or sub-sections in the Standard Specifications but generally extend or modify them to allow for contract specific requirements.

##### **Definition**

The Specifications shall be the Standard Specifications and Supplemental Specifications as defined above. Whenever there is a conflict between the Standard Specifications and the Supplemental Specifications, the provisions of the Supplemental Specifications shall prevail.

***Equivalency of Standards and Codes***

Wherever reference is made in the Specification to specific standards and codes to be met by the materials, plant, and other supplies to be furnished, and work performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly stated in the Contract. Where such standards and codes are national, or relate to a particular country or region, other authoritative standards that ensure substantial equivalence to the standards and codes specified will be accepted subject to the Project Manager’s prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Project Manager at least 28 days prior to the date when the Contractor desires the Project Manager’s approval. In the event the Project Manager determines that such proposed deviations do not ensure substantially equal performance, the Contractor shall comply with the standards specified in the documents.

***Ambiguities or Discrepancies***

In general, if any ambiguity or discrepancy is found between the Specifications and the Conditions of Contract, the provisions of the Conditions of Contract shall prevail. In this situation the Contractor shall request the Project Manager to issue any necessary clarification or instruction.

***International Specifications***

Certain specifications issued by recognized international agencies are referred to in the Supplemental Specifications in these Contract Documents. These are defined and included herein as the International Specifications and shall be the latest editions of any such documents that are available 28 days prior to the date established for submission of Tenders - unless otherwise noted on the Drawings.

In referring to International Specifications, the following abbreviations are used:

AASHTO	American Association of State Highway and Transportation Officials
AISI	American Iron and Steel Institute
ASTM	American Society for Testing and Materials
AWPA	American Wood Preservers Association
BS	British Standard
BSCP or CP	British Standard Code of Practice
CRSI	Concrete Reinforcing Steel Institute
CSA	Canadian Standards Association
EES	Edison Electric Institute
IEEE	Institute of Electrical and Electronic Project Managers
IES	Illuminating Project Managing Society
IESNA	Illuminating Project Managing Society of North America
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association

UNITS

In general, the Contract Documents and the Standard Specifications have been drafted using the international metric (SI) system of units. Where International Standards or other referenced materials are not written using metric, the equivalent Imperial units or values may be employed subject to the approval of the Employer’s Representative.

The following abbreviations are used in this Specification:

Unit	Abbreviation
Millimetre	mm
Metre	(linear, square, cubic) m, m <sup>2</sup> , m <sup>3</sup>
Number	each
Diameter	dia
Hours	hr
Litre	L
Mega Pascal	MPa
Newtons Per Square Millimetre	N/mm <sup>2</sup>
Tonne	t

**1-4 DEFINITIONS**

Unless inconsistent with the context, in these Specifications, the following terms, words or expressions shall have the meanings hereby assigned to them.

**1 Terms**

Asphalt

A mixture to predetermined proportions of aggregate, filler and bituminous binder material prepared off the road and usually placed by means of a paving machine.

Asphalt Surfacing

The layer or layers of asphalt constructed on top of the base, and, in some cases, the shoulders.

Base

A layer of material constructed on top of the sub-base, or in the absence thereof, the modified sub grade or sub grade A base may extend to outside the travelled way.

### Bridge

A structure including supports, erected over a depression or over an obstruction such as water, highway or railway or for elevated roadway, for carrying traffic or other moving loads and having a length (measured along the centre of the roadway) of more than 6 m between the inside faces of end supports. A multiple-span box culvert is considered a bridge where the length between the extreme ends of the openings exceeds 6m.

### Carriageway

The surface normally traversed by vehicles and which consists of one or a number of contiguous traffic lanes, including auxiliary lanes and shoulders.

### Catch-water Drain

A longitudinal drain or bank outside the road prism used for diverting water that would otherwise flow into the road prism.

### Culvert

Any structure not classified as a bridge that provides an opening under the roadway.

### Cut

Cut shall mean all excavations from the road prism, including side drains, excavations for junctions and parking lanes, and, where classified as cut, excavations for open drains.

### Embankment

A term used interchangeably with fill.

### Project Manager

The Project Manager, the Employer's Representative, or the Project Manager are names used interchangeably

### Fill

That portion of the road prism consisting of approved imported material which lies above the roadbed and is bounded by the side slopes, shown on the typical cross-sections on the Drawings running downwards and outwards beneath the earthen shoulder and on which the modified sub grade, subbase, base, shoulders are to be constructed. Material imported to replace unsuitable material in the roadbed shall also be classified as fill.

### Formation Level

A term used to identify the top of the embankment on to which the subbase is placed.

### Inlet and Outlet Drains

Channels leading into or discharging from culverts and bridges.

Lane

Part of a travelled way intended for a single stream of traffic in one direction, which has normally been demarcated as such by road markings.

Lot

A sizable portion of work or quantity of material which is assessed as a unit for the purpose of quality control and selected to represent material or work produced by essentially the same process and materials.

Purchaser

In AASHTO it means the GYSBI

Roadbed

The natural in situ material on which the fill, or in the absence of fill, any pavement layers, are to be constructed.

Road Prism

That portion of the road construction included between the original ground level and the outer boundaries of the slopes of fills and side drains. It shall not include the modified sub grade, sub-base, base, surfacing, shoulders, or roadbed.

Road Reserve

The entire area included by the boundaries of a road as proclaimed.

Roller Passes

Unless otherwise specified in the Specifications or the Project Specifications, an area will be taken to have received one roller pass when a roller has passed over such area once. Additional passes made only as a result of nominal overlapping so as to ensure full coverage shall not be taken into account.

Utilities

Cables, pipes or other structures to provide, inter alia, conduits for electricity, telephone and telegraph connections, water, sewage, etc.

Side Drain

An open longitudinal drain situated adjacent to and at the bottom of cut or fill slopes.

Shoulder

When referring to this as a surface: The area between the outside edge of the travelled way and the shoulder breakpoint.

When referring to this as a pavement layer: The upper pavement layer lying between the outside edge of the base and the earthen shoulder.

Shoulder Breakpoint

The line along which, the extended flat planes of the surface of the earthen shoulder and the outside slope of the fill and pavement intersect. This edge is normally rounded to a predetermined radius.

Spoil (Material)

Materials originating from construction operations which are not utilized for construction purposes.

Stabilization

The treatment of the materials used in the construction of the roadbed, fill or pavement layers by the addition of a cementitious binder such as lime or Portland cement or the mechanical modification of the material through the addition of a soil binder or a bituminous binder. Asphalt and concrete shall not be considered as materials that have been stabilised.

Sub-base

The layer of material on top of the fill and below the base and shoulders

Sub Grade

A term used interchangeable with roadbed level.

Sub-structure

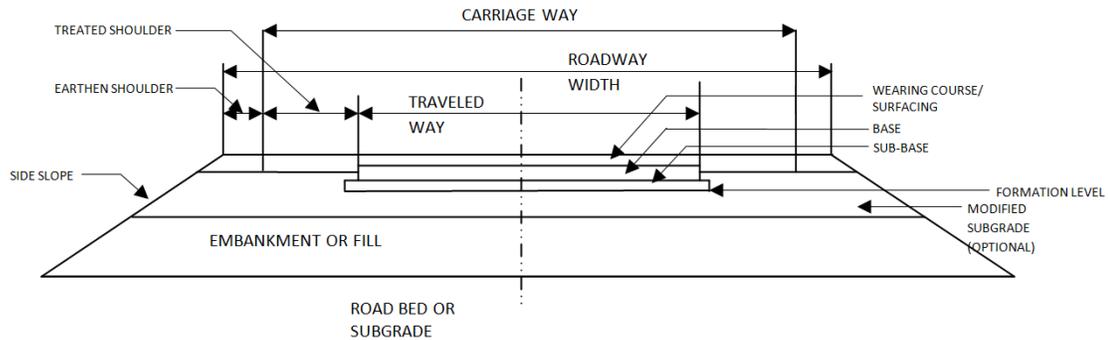
That part of a bridge structure below the bridge deck and deck supports including also pile caps, abutment back and wing-walls.

Superstructure

That part of a bridge structure above the substructure, including decking, anchorage and anchor bolts and parapets.

Travelled Way

That portion of the carriageway which includes the various traffic lanes and auxiliary lanes but excludes the shoulders.



**Verge**

The area between the outer edge of the road prism and the boundary of the road reserve.

**1-5 WORKMANSHIP AND QUALITY CONTROL**

The onus rests with the Contractor to produce work which conforms in quality and accuracy of detail to all the requirements of the Specification and Drawings, and the Contractor shall, at his own expense, institute a quality control system and provide experienced Project Managers, foreman, surveyors, material technicians, other technicians, and other technical staff, together with all transport, instruments and equipment, to ensure adequate supervision and positive control of the Works at all times.

**1-6 SUBMISSIONS TO THE EMPLOYER’S REPRESENTATIVE**

Whenever the Contractor is required to submit to the Employer’s Representative proposals, details, drawings, calculations, information, literature, materials, test reports and certificates, the Employer’s Representative will consider each submission and, if appropriate, will reply to the Contractor in accordance with the relevant provisions of the Conditions of the Contract. Each submission shall be made on dates to be agreed with the Employer’s Representative having regard to the approved program and the need to afford adequate time for the consideration of each submission.

Documents submitted, other than drawings and manufacturers’ literature shall be to an approved size. All documents shall be in English and any abbreviations shall be explained. Calculations and technical information shall be in units conforming to the metric system unless otherwise approved by the Employer’s Representative. All drawing notes shall be in English.

All drawings shall include the title of the Contract at the bottom of the drawing followed by the title of the drawing concerned. All drawings shall have the appropriate scales noted on them and be dated. All subsequent amendments to drawings shall be similarly noted and dated.

The approval of the Employer’s Representative of any submission shall not relieve the Contractor from his responsibilities under the Contract.

No separate payment shall be made for the cost of complying with meeting the requirements of this Clause and the Contractor is deemed to have covered the cost for this item in the bid price.

### **1-7 SETTING-OUT OF WORK AND PROTECTION OF BENCHMARKS**

Throughout the period of the works the contractor is responsible for the preservation of all benchmarks, survey monuments, setting out marks and suchlike. He shall also comply with all legal provisions regarding surveying and setting out works.

The Contractor shall, before any works commence, check the condition of all reference and level benchmarks and shall satisfy themselves that they have not been displaced and are true in regard to position and level, in relation to the Georgetown Datum. If benchmarks have been destroyed, displaced, or damaged before the site is handed over to the Contractor, the Contractor shall install new benchmarks, a newly installed benchmark shall not be used unless its true position and level have been re-established and the new values verified by the Employer's Representative.

Where a benchmark is likely to be displaced during construction operations, the Contractor shall establish suitable reference benchmarks at locations where they will not be displaced during construction. No benchmark shall be covered over, displaced or destroyed before accurate reference benchmarks have been established and details of the positions and levels of such benchmarks have been submitted to and approved by the Employer's Representative. The Contractor's reference benchmarks shall be of at least the same quality and durability as the existing benchmarks.

The Contractor shall submit to the Employer's Representative the method of setting-out he proposes to employ. To ensure beyond all doubt that the complex elements of the road, such as traffic junctions, structures and other important features are located truly and correctly. The Contractor shall check all setting-out by a second method. The Employer's Representative may at any time request the Contractor to submit proof that his setting out has been satisfactorily checked.

Accurate control of line and level shall be provided by the Contractor at all stages of construction. In respect of the road itself, control shall be at fifteen (15) metre intervals or such closer intervals as may be directed for horizontal and vertical curves.

The Contractor shall provide detailed drawings to the Employer's Representative which must include: Plans, longitudinal profiles, cross sections, drainage structures and encumbrances. The drawings shall clearly identify the components of the roadway; center line, travelled way, curb and/or drain details, shoulders, side slope details, fence lines, existing utilities, and water level elevations. Sample Plan and Profile and Cross Section Drawings are attached to this document for guidance.

In the case of drainage structures: bridges & culverts, hydraulic details must be highlighted in cross section and profile drawings inclusive of observed high-water mark, existing water elevation, slope of channel bed, invert levels, soffit levels, etc., and must be shown in relation to the surface of the travelled way. The longitudinal profile and cross sections shall extend for a distance of twenty (20) metres from extreme edges of both sides of the structure.

Submission of this requirement shall be made to the Employers Representative and shall include one (1) hard copy and one (1) soft copy; in dwg. and pdf format.

No separate payment shall be made for the cost of complying with the requirements of this Clause and the Contractor is deemed to have covered the cost for meeting these requirements in the Bid Price.

### **1-8 METHODS OF MEASUREMENTS**

Units of measurements

All work shall be measured in accordance with the SI system of metric units.

Bill of Quantities

The quantities set out in the Bill of Quantities are estimated quantities and are used for the comparison of bids and for awarding the Contract. It must be clearly understood that only the actual quantities of work done or materials supplied will be measured for payment, and that the scheduled quantities may be increased or decreased as provided for in the Conditions of Contract.

Measurement of completed

Work All distances along the centre line of the road as shown on the Drawings are horizontal distances, which will be used in calculating the quantities of fill and pavement layers for purposes of payment. All cross-sections shall be taken in a vertical plane.

No material shall be measured in the vehicle for payment purposes.

The quantity of bituminous and similar materials to be paid by volume shall be measured at the temperature of application and paid for in accordance with approved application rates.

The quantity of bitumen in mixes and stabilisers in cemented materials shall be paid by mass in accordance with approved mix design proportions.

Structures shall be measured to the neat lines shown on the Drawing and shall include any changes ordered in writing by the Project Manager and, for purposes of payment, the calculated volume of concrete structures shall include the volume of reinforcing steel, and minor ducts up to 150 mm in diameter.

### **1-9 METHODS OF PAYMENT**

Contract rates

In computing the final Contract amount, payment shall be based on the actual quantity of authorised work done in accordance with the specifications and drawings. The bid rates shall apply, subject to the provisions of the Conditions of Contract, irrespective of whether the actual quantities are more or less than the scheduled quantities.

Where no rate or price has been entered against a pay item in the Bill of Quantities by a bidder it shall be understood that he does not require any compensation for such work. Where, however, a pay item described in these Specifications or in the Special Specifications does not appear in the Bill of Quantities, the Contractor will receive reasonable compensation for such work if required, unless anything to the contrary has been determined elsewhere.

**Rates to be inclusive**

The Contractor shall accept the payment provided for in the Contract and represented by the rates bid by him in the Bill of Quantities, as payment in full for executing and completing the work as specified, for procuring, furnishing, placing and installing all materials, for procuring and providing labour, supervision, constructional plant, tools and equipment, for wastage, transport, loading and off-loading, handling, maintenance, temporary work, testing, quality control including process control, overheads, profit, risk and other obligations and for all other incidentals necessary for the completion of the work and maintenance during the period of maintenance. The Contractor shall note that the cost of all Works and materials for minor construction details at bridges, for example small quantities of caulking compound and joint filler (other than expansion joints), anchor-bar covers, etc, not shown in the Bill of Quantities, shall be included in the bid rates for concrete.

This CLAUSE shall apply in full to all pay items except where these requirements may be specifically amended in each case.

**The Meaning of certain phrases in payment clauses**

**Procuring and furnishing (material).**

Where any of the words “supply”, “procure”, “provide”, “provision of”, “furnish (material)”, are used in the description of a pay item, it shall mean the supply and delivery to the point of use of all materials of any kind required for the work covered by the particular pay item, including all tax, purchase costs, claims, damages, royalties and transport costs involved, but excluding overhaul. In the case of borrow materials, stone and sand, it shall also include all negotiations with the Owners concerned, excavating, producing, preparing, processing, testing, hauling and delivering the material to the point of use; the construction, repair, maintenance and making good after completion of all access roads, and all work required in opening, using and finishing off borrow pits unless covered by other pay items in the Bill of Quantities.

**Placing Material**

The phrase “placing material” shall mean the offloading, spreading, blending, processing, watering, mixing, shaping and compacting (where specified) of the material in the pavement layer, fills and bypasses, as well as the procuring, furnishing, applying and admixing of water, the breaking-down of oversize material, the removing of oversize material which cannot be broken down, correcting irregular or uneven surfaces or layers, the thickness of which is not to specification, finishing-off

to within the specified tolerances, the refilling of test holes and maintaining the completed work. In the case of asphalt course and bituminous seals, it shall also mean the heating and spraying of binder, the spreading of aggregate or asphalt mixtures, rolling, compacting, finishing-off to within the specified tolerances, and maintaining the completed work.

The phrase, “procuring, furnishing and placing” shall mean procuring and furnishing in addition to placing, all as defined herein.

#### Pay Items

The description under the pay items in the various sections of the Specifications, indicating the work for which allowance shall be made in the bid rates for such pay items, are for the guidance of the Contractor and do not necessarily repeat all the details of work and materials required by and described in the Specifications. These descriptions shall be read in conjunction with the relevant Specifications and Drawings, and the Contractor shall, when bidding, bear in mind that his rates shall be inclusive as specified in SUBCLAUSE (b) above.

#### Materials on the Site

Payment in terms of the relevant clause of the Conditions of Contract for materials on the site, which have not yet been incorporated in the works, will be calculated at 80% of their purchase price, or, in the case of crushed stone which has not been purchased but has been produced on the site, at 50% of the bid rate for such material.

The Project Manager may at his sole discretion allow payment under “materials on the site” in respect of articles such as precast beams manufactured and stored off site, subject to their having been completed, to proof of their ownership as being that of the Contractor, and to the articles being clearly marked with the Contractor’s name, the Contract number and other particulars in accordance with the Project Manager’s instructions.

#### Rate-only items

Against an item in the Bill of Quantities where no quantity is given but a rate only is required, the Contractor shall fill in a rate or amount which will constitute payment for work which may be done in terms of this item. Such rate only item is used where it is estimated that little or no work will be required under the item, or where the item is to be considered as an alternative for another item where a quantity is given, or for variations in rates of application or mix proportions in terms of.

Work under rate-only items will be paid for only if it has been executed in terms of a written instruction by the Project Manager.

#### Provisional Sums

The Bill of Quantities may contain Provisional Sums, so designated, which are entered as a preliminary allowance to cover the cost of work, materials, goods or services to be provided by the Contractor and which have not been fully specified or measured or to cover the cost of unforeseen items of work or contingent expenditure, for which no rates are applicable but for which the Contractor is to be paid according to the applicable provisions of the Contract.

Work done under such Provisional Sums shall only be executed upon a written order by the Project Manager which order shall also specify the method of payment. The expenditure in respect of a Provisional Sum for work ordered by the Project Manager shall be entirely at his discretion and any final expenditure in respect of a Provisional Sum may be more, less or equal to the amount provided in the Bill of Quantities.

Payment as specified in the order given by the Project Manager shall be either at contract rates, where such are applicable, or where none is applicable, the Contractor shall submit a separate quotation to the Project Manager.

Retention money

All payments are subject to deduction of Retention Money, as provided in the Conditions of Contract.

#### ***1-10***      **MATERIALS AND MANUFACTURED ARTICLES**

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The Contractor shall before placing any order for materials and manufactured articles for incorporation in the Works, submit to the Employer's Representative the names of the firms from whom it is proposed to obtain such materials and manufactured articles. Details shall include for each supplier, a description of the materials and articles to be supplied, their origin, the manufacturer's specification, quality, weight and strength data and any other relevant details. The Contractor shall deposit with the Employer's Representative, samples of such materials and articles when requested and where appropriate, manufacturer's certificates of recent tests carried out on by a Certifying body on similar articles.

#### ***1-11***      **MOBILISATION AND DEMOBILISATION**

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The contractor shall mobilize to site within 14 days of receiving the notice to proceed and demobilization should be completed within one month of the end of the Defects liability period. Payment for Mobilization and Demobilization will be made when in the opinion of the Project Manager's Representative mobilization has been completed.

Payment for mobilization shall be made at 60% of the rate set down in the priced Bill of Quantities, Bill 1, General Requirements, Item 010105, Mobilisation and Demobilisation. The remaining 40% will be paid at the completion of Demobilisation.

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**1-12 MAINTENANCE OF EXISTING ROADS AND STRUCTURES**

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**1 During Construction**

The Contractor shall maintain all existing roads, structures including approved detour facilities from the commencement of the works until the end of the contract and/or the date when sections are opened to public traffic. The roadway surfaces and structures (both existing and reconstructed) shall be maintained to the standards set down by the GYSBI or as directed by the Employer's Representative.

***Routine Maintenance during the defect's liability period***

The Defects Liability Period commences from the issue of the Certificate of Completion of the Works.

During the Defects Liability Period, in addition to rectifying defects, the Contractor shall carry out routine maintenance of the whole of the roads and structures comprising the Works until the end of the Defects Liability period or the issue of the Defects Correction Certificate, whichever is later.

The roadway surfaces and structures, together with the right of way and drainage structures (both existing and reconstructed) and street lighting shall be maintained to the standards set down by the GYSBI, or as may be directed by the Project Manager.

The costs of such rectification are deemed to be covered in the rates for executing the original work.

Each payment shall be liable to deductions in respect of any failure to maintain the works to the required such deductions, once made, shall be permanent and may not be reinstated in subsequent payments.

No payment will be made for the rectification of Defects. The costs of such rectification are deemed to be covered in the rates for executing the original work.

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**1-13 NOTICE OF OPERATIONS**

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No operation shall be carried out without full and complete notice having been given to the Employer's Representative by the Contractor. This must be sufficiently in advance of the planned time of the operation as to enable the Employer's Representative to make any necessary arrangements for inspection and checking. Each stage of the Works to be checked shall be as agreed with the Employer's Representative.

The Contractor shall give the Employer's Representative not less than 1 full working days' notice in writing of his intention to set out or give levels for any part of the Works in order that arrangements may be made for checking.

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**1-14 TEMPORARY WORKS**

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For all Temporary Works, the Contractor shall submit to the Employer's Representative drawings showing the general arrangement of Temporary Works (with diagrams and descriptions showing how it is proposed to execute them) and how they fit into the overall program for the Permanent Works.

The whole of the Temporary Works including the plant and appliances to be used will be the responsibility of the Contractor with regard to their construction, sufficiency, safety, maintenance and removal on completion of the Contract. Examination by the Employer's Representative of the Contractor's and/or his subcontractors' Temporary Works proposals or of any designs or drawings connected therewith shall not absolve the Contractor from any liability imposed upon him under the Contract.

No separate payment shall be made for the cost of complying with the requirements of this Clause and the Contractor is deemed to have covered the cost for meeting these requirements in the Bid price.

#### **1-15 INFORMATION FURNISHED BY THE EMPLOYER**

Certain information contained in these Contract documents or provided separately is being offered in good faith but, in the circumstances pertaining to the type of information furnished, no guarantee can be given that all the information is necessarily correct or representative of the in-situ conditions.

This applies more specifically to all soil tests, soil mapping, drilling results, geophysical surveys, geological reports, borrow-pit information, material surveys and reports, and similar information, the accuracy of which is necessarily subject to the limitations of testing, sampling, the natural variation of material or formations being investigated and the measure of certainty with which conclusions can be drawn from any investigations made.

The Employer will not accept any liability for the correctness or otherwise of the information furnished or for any resulting damage, whether direct or consequential, should it appear, during the course of the Contract, that the information supplied is either incorrect or not representative. Any reliance placed by the Contractor on this information shall be at his own risk.

The Employer's Representative reserves the right to adjust foundation levels and other levels for construction below ground level in the light of information that becomes available as general excavation proceeds at the Site.

The Contractor's attention is drawn to the obligation with regard to the inspection and examination of the Site as detailed in the Conditions of Contract.

#### **1-16 GENERAL CONSTRUCTION REQUIREMENTS**

The following general requirements shall apply:

1. When night work is authorized by the Employer's Representative, the Contractor shall provide adequate temporary lighting and shall provide and install any additional lighting which the Employer's Representative may require in order to gain access to supervise the Works and carry out any testing and examination of materials.

2. Materials brought to the site (including any to be made available or supplied by the Employer) shall be used solely for the execution of the Works.
3. The Contractor shall ensure that access is provided to all public and private properties adjacent to the Site for the duration of the Contract.
4. The Contractor shall take all reasonable precautions in connection with:
  - a) Any drains and watercourses to prevent silting, flooding, erosion of beds and banks and pollution of the water so as to affect adversely the quality or appearance thereof or cause injury or death to human, animal or plant life.
  - b) Underground water resources (including percolating water) to prevent any interference with the supply to or removal from, such sources and to prevent pollution so as to affect adversely the quality thereof.
5. The Contractor shall provide, maintain and remove on completion of the Works, settling ponds and other facilities constructed to minimize pollution due to the Contractor's operations. This shall include but not limited to, quarrying, aggregate extraction and washing, concrete mixing, grouting operations, bitumen and storage and application.
6. The Contractor shall provide, maintain and remove on completion of the Works, adequate fencing around parts of the Site including appropriate security measures on access roads. This, without reducing obligations for maintaining free access by the Employer, the Employer's Representative and/or other contractors or other persons entitled to such access.
7. The Contractor shall be responsible for becoming acquainted with and observing, all current State Ordinances, By-Laws or Regulations including those relating to training levies and similar taxes, health and safety regulations and taxation of employees.

#### **1-17 PROTECTION FROM WATER**

The Contractor shall be responsible for dealing with water, whether from existing drainage systems, water courses, underground springs, precipitation or any other source or cause. In discharging and diverting water, measures must be in place for the avoidance of flooding or damage to other works or services, erosion and/or pollution.

The Contractor shall keep the whole of the Works free from water and shall provide all dams, cofferdams, pumping, piling, shoring, temporary drains, sumps, etc., necessary for this purpose. Where possible, Works shall be programmed so that the necessity of temporarily draining the original ground is partially or totally obviated by working in dry periods.

The Contractor shall include all costs associated with taking the necessary precautions to prevent damage due to erosion and siltation during construction. Precautions will include temporary drainage berms, scour checks, riprap etc. Spoil material or stockpiled material shall be dumped so as not to interfere with streams, watercourses, or any of the natural drainage systems.

On cessation of the Works each day, the surface of each completed layer shall be trimmed so that ponding and concentration of surface run-off does not occur.

Any damage to the Works or to adjacent properties resulting from the Contractor's failure to take necessary precautions shall be made good at the Contractor's expense.

No separate payment shall be made for the cost of complying with the requirements of this Clause and the Contractor is deemed to have covered the cost for meeting these requirements in the Bid Price unless the item of work is specifically stated in the Bills of Quantities.

#### **1-18 PRESERVATION AND MAINTENANCE OF FENCES AND GATES**

The Contractor shall be responsible for ensuring the safety of all persons and property on the Site and for ensuring that livestock cannot stray as a result of the work. When existing fences and gates have to be removed or altered for the proper execution of the works, the Contractor shall erect temporary fencing and gates and if required, provide watchmen to ensure that livestock cannot stray. This is unless the owner or tenant has been made responsible for such removal or alternation as part of a negotiated compensation agreement.

No separate payment shall be made for the cost of complying with the requirements of this Clause and the Contractor is deemed to have covered the cost for meeting these requirements in the Bid Price.

#### **1-19 PROTECTION OF EXISTING UTILITIES**

The Contractor shall acquaint himself with the position of all existing services such as sewers, surface water drains, cables for electricity and telephone, telephone and lighting poles, water mains etc. before commencing any excavation or other work likely to affect those existing services.

The Contractor shall be held responsible for any damage to existing works or services and shall indemnify the Employer against any claims in this respect (including consequential damages). The Contractor shall be responsible for the reinstatement of any services so affected.

In all cases where such works or services are exposed, they shall be properly shored, supported or otherwise protected. Special care must be exercised in excavating, backfilling and compacting materials near mains, cables, etc. and to leave exposed water meters, stopcock boxes and similar items. The Contractor's attention is drawn to statutory regulations in force in Guyana (including those imposed by GWI, GPL and GT&T) that indicate safe working clearances from cables carrying different voltages for operations to be carried out near overhead power lines.

Notwithstanding the foregoing requirements and without reducing the Contractor's responsibility, the Contractor shall inform the Employer's Representative immediately if any existing works or services are exposed, located or damaged. All works to be carried out to rectify any damage caused to utility services shall be done to the satisfaction of the owner Agency and at the Contractor's expense.

All costs which may be incurred by the Contractor as a result of programming and coordinating work to enable any alterations to the services to be carried out and the cost of any safety precautions

which shall be deemed necessary due to the proximity of the Works to the power lines shall be at the Contractor's expense.

#### **1-20 MAINTAINING THIRD PARTY ACCESS**

Whilst carrying out the Works the Contractor shall be responsible for and take all necessary steps not to interfere with the access to or use or occupation of public or private roads and footpaths or accesses or rights of way to adjoining properties and businesses. In particular, the Contractor is to ensure that all accesses shown on the plans remain open at all times during the contract period. Any damage occasioned to accesses or Third Party property due to the negligent act or failure to take necessary precautions by the Contractor shall be at the cost to the Contractor.

No separate payment shall be made for the cost of complying with the requirements of this Clause and the Contractor is deemed to have covered the cost for meeting these requirements in the Bid price.

#### **1-21 DIVERSION OF UTILITIES**

The Contractor shall be responsible for arranging, in liaison with the appropriate Authority as soon as the requirement is known for the moving of or alterations to services for either the Temporary or Permanent Works. These may include power and telephone lines, water mains, sewers and surface water drains. The arrangements for any relocation or alteration shall be subject to the approval of the owner Agency and Employer's Representative. The Contractor shall allow adequate time in the program for the notification and execution of the utility works as agreed with the appropriate Authority.

Where authorized work is to be carried out by the Agency's own labour force, the Contractor shall coordinate and facilitate the works.

In the event that water supply is cut when moving or altering a water main, then the Contractor shall be required to provide drinking water to any residents effected by such work.

Payment for permanent relocation of utilities will be made at the rates entered as a provisional sum in the Bills of Quantities and will be paid directly to the Utility Companies by the Client.

#### **1-22 LIAISON WITH GOVERNMENT AND POLICE OFFICIALS**

The Contractor shall consult with officials of the Police and Government in the area regarding their requirements for the control of traffic and other matters. This may lead to the rendering of assistance and provision of facilities that may be required by such officials for the execution of their duties in relation to the Works.

No separate payment shall be made for the cost of complying with the requirements of this Clause and the Contractor is deemed to have covered the cost for meeting these requirements in the Bid price.

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**1-23 PROVISION OF LAND**

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The GYSBI shall make available free of charge to the Contractor, public land on which the Works are to be executed or carried out and/or as indicated on the Drawings and the Specifications. Such land shall include existing road reserve and public land required for detours, as well as stockpile and spoil areas, if such areas are available.

Land or property in private ownership that the Contractor may require for laboratories, offices, houses, storage yards etc. will be the responsibility of the Contractor to locate and no payment or reimbursement for the requisition/provision of such land will be made by the Employer.

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**1-24 WATER SUPPLY**

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The Contractor shall provide a clean, sufficient and continuous supply of fresh water both for the construction of the Works and for all houses, offices, laboratories and workshops. The Contractor will be fully responsible for making arrangements (including pipelines and meters necessary for connecting to local mains) and the provision of pumps, storage tanks or water conveyances where necessary and for the payment of all fees and water charges and for the satisfactory removal of such arrangements and provisions on completion of Work.

The water shall be clear of suspended solids and free from any matter in quantities considered by the Employer's Representative to be deleterious to the work. Water supplied to all the offices, laboratories and houses shall be wholesome and potable to the satisfaction of the Medical Officer in the area.

No separate payment shall be made for the cost of complying with the requirements of this Clause and the Contractor is deemed to have covered the cost for meeting these requirements in the Bid price.

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**1-25 ADVERSE WEATHER**

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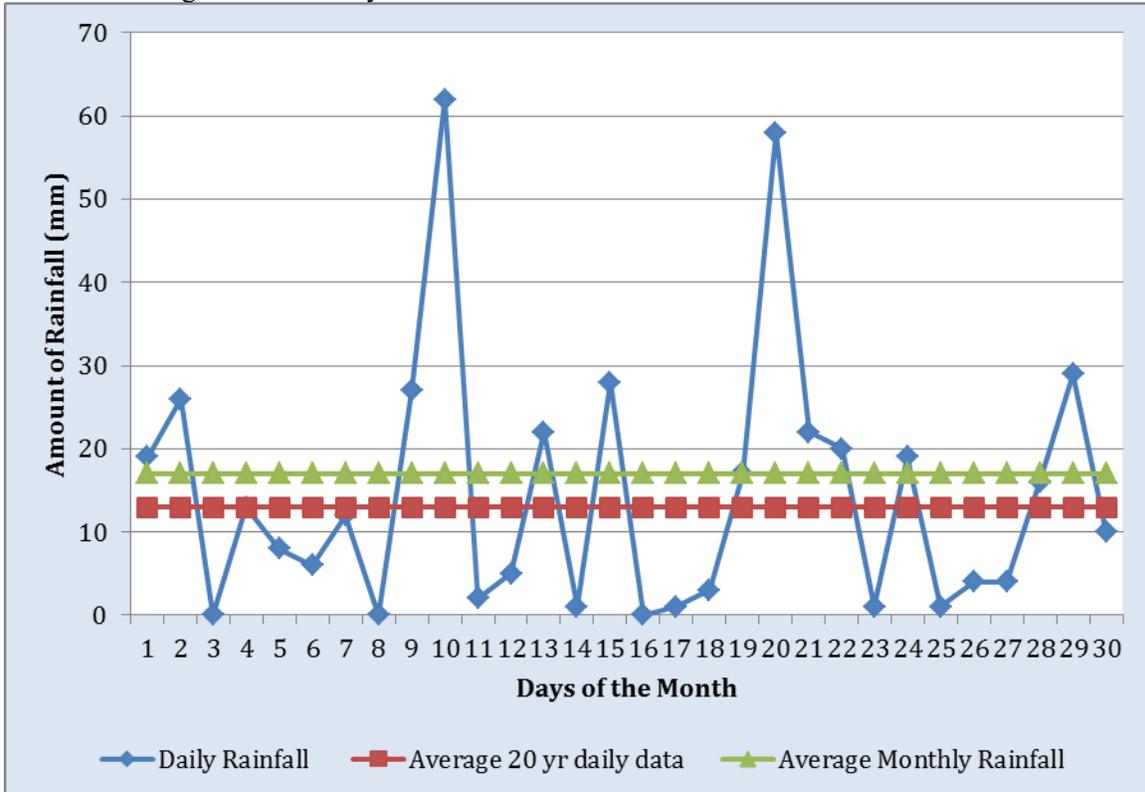
An extension of time can be granted for excessive rainfall providing the below mentioned conditions are met.

**A—Average Monthly Rainfall (Daily Average for a particular month)** : This average shall be computed by dividing the daily cumulative rainfall for the month in question by the number of days in that month. The contractor shall setup a rain gauge in areas approximately to the construction site and record the daily rainfall in order to compute A. Alternatively, rainfall data can be collected from nearest weather station.

**B—Average 20 year daily data:** This average represents the monthly average over the last 20 years. Firstly, the monthly average rainfall for each month in question over the last 20 years is computed and the 20 years average is calculated by dividing the summation of the Average monthly over the last 20 years by 20. Historical Rainfall Data shall be derived by using readings from the nearest

weather station. If data is not available from area within the area, readings taken in the Botanical Gardens Georgetown will be acceptable.

If (A) is greater than (B) an extension of time will be granted for each day that a daily rainfall during the month in question is greater than (B). On the contrary, if B is greater than A no extension of time will be granted for delays for rainfall.



**1-26 TRANSPORT OF WORKERS**

The Contractor shall include in the Bid Price all costs associated with the transport of staff and workers to and from the various parts of the Works. This shall be deemed to include any costs that may be incurred in securing, recruiting and deploying members of the labour force for the Works and of all related subsistence charges.

**1-27 TAKING OVER SECTIONS OR PARTS OF THE WORK**

The minimum part of the project for which a "Taking-Over Certificate" will be issued per the Conditions of Contract shall be individual sections as defined by the Contractor in the Bid.

In relation to the above, a "Taking-Over Certificate" will not be issued for any section of road, bridge or major culvert unless it can conveniently be opened to the public without the necessity to construct additional detour roads. All works within the section must be complete with the exception of the following which may be completed during the Defect Liability Period.

1. Surfacing of side accesses.
2. Reinstatement of borrows pits and quarries.
3. Erosion control measures.
4. Reinstatement of diversions.

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**1-28 NOTICES, SIGNBOARDS AND ADVERTISEMENTS**

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The Contractor shall not erect any signs, notices or advertisements on or along the Works or the site of the Works without the written approval of the Employer's Representative.

The Contractor shall provide, erect and maintain a minimum of two signboards, one at the beginning of the project and another at its end. On projects longer than 5Km, one signboard shall be erected at the beginning of the project, one on both sides of the road at its midpoint, and one at the end. Signboards shall be of sound, weatherproof construction, painted by an approved firm of sign-writers with the layout, wording and colors as agreed with the Employer's Representative. The minimum dimensions of the boards shall be 1.8 m x 3.3 m. The wording to be placed on the signboards will be provided at the start of the Contract.

These signboards shall be erected at sites to be selected by the Employer's Representative within one month of the date of commencement of the Contract. The Contractor shall remove the signboards only at the end of the Defects Liability Period.

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**1-29 PROGRESS PHOTOGRAPHS**

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The Employer's Representative shall take digital photographs showing the progress of the Works every month. The Contractor shall supply prints of each digital photograph from which the Employer's Representative will select the required number of photographs for the Monthly Report. The Contractor shall subsequently produce 2 sets of official 'progress photographs'.

Each set shall comprise up to 48 colour prints (size 200 mm x 150 mm) which shall be handed over to the Employer's Representative for presentation to the Employer. Each photograph shall be numbered and the date on which it was taken printed on the back. A statement shall be submitted by the Employer's Representative giving the location, and a brief description of the subject. The Contractor shall supply one album with each set of photographs.

Payment for Progress Photographs will be made per monthly set of two complete albums of Photographs at the rate set down in the priced Bill of Quantities, Bill 1, General Requirements, Item 0101012, Progress Photographs.

Failure to comply with written instructions to submit a monthly set of photographs shall result in a deduction for every month the photographs are not submitted. The deduction will be made from the next payment certificate. See SCC Part B Sub Clause 4.21

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**1-30 REMOVAL OF CAMPS**

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If instructed, upon completion of the Contract and after receiving approval in writing from the Employer's Representative, the Contractor shall take down and remove all structures forming part of the works and shall arrange for the disconnection of the water supply, removal of all temporary service drains and culverts and shall backfill trenches and latrine pits, soak ways and other sewage disposal excavations. This is with the exception of items and services which are required to revert to the ownership of the Employer. The Contractor shall restore the Site, as far as practicable, to its original state and leave it in a neat and tidy condition.

No separate payment shall be made for the cost of complying with the requirements of this Clause and the Contractor is deemed to have covered the cost for meeting these requirements in the Bid price.

### **1-31 SITE OFFICE FOR PROJECT MANAGER**

The Contractor **may** be required to provide appropriate office facilities for the exclusive use of the Project Manager and his staff for the duration of the Contract. Such offices shall comprise a building having a minimum total floor area of 50 sq.m. and shall be configured to provide, as a minimum, two rooms having dimensions of at least 3m.x5m. toilet facilities, kitchen facilities min 3mx4m, and a store room min 2m.x3m.

Externally there will be covered parking for at least two vehicles connected to the offices by a covered walkway.

Building, parking area and walkway will be raised to ensure floor area is at least 300mm above highest flood water levels.

Offices will be air-conditioned

Building and parking area will have easy drivable access by car to the paved road network.

Offices will be equipped with drainage/sewerage facilities in conformity with the requirements of this Specification and shall receive piped potable water and mains electricity.

Premises for offices may be either purpose built or rented. In either case they must be clean and freshly decorated inside and out, weatherproof and generally meet the approval of the Project Managers Representative.

The Contractor will maintain and clean the offices throughout the period of the works.

Payment for the Site Office for the Project Manager will be made at the rate set down in the priced Bill of Quantities, Bill 1, General Requirements, Item 0101013, Site Office for Project Manager.

**SECTION 01020 – CONTRACTOR’S PROGRAMME**

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## 1-1 DESCRIPTION

The Contractor shall provide a programme and a method statement for the execution of the Works. This Specification section describes the requirements and procedures for the preparation and submission of the Contractor's preliminary program and the subsequent detailed programme and narrative statement as well as requirements pertaining to the updating and revision thereof.

## 1-2 GENERAL

The Contractor's programme shall be used by the Contractor to plan and execute the Works. The programme will also be used by the Employer's Representative to monitor progress and be the basis for any assessment of extensions of time and the effect of delay on the progress of the Works.

The Programme shall be produced by the Contractor in the following phases:

- Initial Programme. An initial programme for the first three months of work.
- Accepted Programme. A programme (incorporating the Initial Programme) for the totality of the Works, which shall be submitted to the Employer's Representative for his information. If the Employer's Representative does not agree with it because it does not comply with the Contract, this programme shall be revised and resubmitted.
- Updated Programme. The Accepted Programme shall be updated with actual progress and saved on at least a monthly basis for record purposes. The Contractor may submit for acceptance by the Employer's representative other revisions to the Accepted or Updated programmes.

All programmes submitted by the Contractor must reflect the key dates shown in the contract documents and shown in the sample Programme attached to those documents.

Acceptance by the Employer's Representative of any phase of the Contractor's programme does not make the programme a contract document, or mandate that the Works shall be constructed strictly in accordance with the programme. The Contractor at all times remains responsible for the construction of the Works.

If at any time there is a claim, dispute or difference between the Contractor and Client over any matter concerning the Contractor's programme, then immediate steps should be taken by either party to have the dispute settled in accordance with the Dispute Adjudication Board.

## 1-3 SUBMISSION OF PROGRAMME

### *1-3-1 Timing*

Within seven days of receiving the Notice to Proceed, the Contractor shall submit to the Employer's Representative for its information an Initial Programme prepared using a project management software showing the order in which the Contractor proposes to carry out the

works anticipated in the first three months following the award of the Contract. The Initial Programme shall have regard to the contract completion dates and any other milestones, and/or restraints set out in the Contract.

Within fourteen eight days of receiving the Notice to Proceed, the Contractor shall submit to the Employer's Representative for its review and acceptance a programme for the whole Contract (incorporating the Initial Programme) showing the order of procedure in which the Contractor proposes to carry out the Works. This programme becomes the Accepted

Programme upon acceptance by the Employer's Representative. The Accepted Programme shall have regard to the contract completion dates and any other milestones, and/or restraints set out in the Contract. Thereafter, if the actual progress does not conform to the Accepted Programme, the Employer's Representative is entitled to require the Contractor to submit to the Employer's Representative for acceptance a revised programme showing the order of procedure and periods necessary to ensure completion of the Works by the contract completion dates.

#### **1-4 METHOD STATEMENT**

At the same time as the Contractor submits the programme, the Contractor shall submit to the Employer's Representative for its acceptance a general description of the arrangements and methods of construction and Temporary Works designs the Contractor proposes to adopt for the carrying out of the Works ('the Method Statement'). The Statement should be fully cross-referenced to the activities in the programme.

The Contractor shall submit to the Employer's Representative sufficient information as may be considered reasonably necessary by the Employer's Representative to interpret, evaluate, and give acceptance to the Method Statement.

The Contractor shall, whenever required by the Employer's Representative, furnish for its information further and more detailed particulars of the Contractor's Method Statement.

Should the Contractor wish to change a Method Statement or should the Employer's Representative subsequently consider it necessary to change a Method Statement to which acceptance has previously been given, then the Contractor shall submit a revised Method Statement to the Employer's Representative for its acceptance.

Acceptance by the Employer's Representative of the Contractor's Method Statement does not make the Method Statement a contract document, or mandate that the Works shall be constructed strictly in accordance with the Method Statement. The Contractor at all times remains responsible for the construction of the Works.

#### **1-5 FORMAT**

The Contractor shall supply the Employer's Representative with an electronic copy of each programme, together with a printout bar chart or tabular report in a pre-agreed format. All programmes shall be prepared and submitted using the specified or agreed project planning

software. The software shall be capable of producing programmes and information that complies with the requirements of this clause and shall be in a format that can be read by commercially available proprietary planning software. The Employer's Representative and the Contractor should use the same project planning software.

## 1-6 ACCEPTANCE

Within 10 working days of the Contractor submitting a programme complete with all the information required by this clause to the Employer's Representative for acceptance, the Employer's Representative will accept the programme or give its reasons for not accepting the programme. If such reasons are given, the Contractor shall take account of the reasons and resubmit the programme within a period of 10 working days. If the Employer's Representative does not accept or reject the programme within 10 working days, the Employer's Representative shall be deemed to have accepted the programme as submitted.

By agreement, the Contractor and the Employer's Representative may dispense with printouts of the various forms of the Contractor's programme, but under no circumstances may they dispense with the submission of the required electronic copies.

## 1-7 PREPARATION OF PROGRAMMES

### *1-8-1 The Initial Programme*

The Initial Programme shall show the first three months' work in the same level of detail as is required for the Accepted Programme set out in section 1-8 below, but only insofar as it applies to the first three months of the Contract Period.

The Initial Programme shall also be presented as a programme in bar chart form showing the detailed activities in the period covered by the network diagram, together with the major activities and milestones in the remainder of the period of the Contract. The Initial Programme shall be presented as or be accompanied by the schedules referred to in section 1-9 below.

### *1-8-2 The Accepted Programme*

The programme submitted by the Contractor in accordance with section 1-3 above becomes the Accepted Programme upon acceptance by the Employer's Representative. The Accepted Programme shall form the Contractor's basic strategy for the completion of the Works by the contract completion date.

The Accepted Programme shall be prepared in sufficient detail to ensure the adequate planning, execution, and monitoring of the work. Activities should generally range in duration up to 28 calendar days (single trade activities with uniform rate of progress might be excepted) and the number of activities with duration of less than seven calendar days should be kept to a minimum to make progress monitoring on larger projects more manageable.

The Accepted Programme shall take into account all time risk allowances, including time for the weather conditions (rain, wind). The Contractor **MUST** provide a summation of the

assumed number of adverse weather days per month to the Employer's Representative with the programme. For guidance see Division 1, General, Clause 1-23 Adverse weather.

The Employer's Representative is entitled to withhold its acceptance of a programme showing the work completed earlier than the contract completion date if that programme is reasonably considered by the Employer's Representative to be not achievable.

## **1-8 PROGRAMME DETAIL**

### ***1-8-3 Detail Required***

The programme to be accepted may either be at the direction of the Employer's Representative in a linked bar chart format or precedence network format prepared using techniques acceptable to the Employer's Representative and shall show as far as reasonably practicable:

- The activities in all work packages including those by the principal sub-contractors and suppliers, statutory undertakers, those contractors and suppliers directly employed by the Employer and others.
- The earliest and latest start and finish dates for every activity in each work package. Activities shall include all scope activities and any activities or time duration expected in addition to scope activities.
- Access dates for each phase or sections
- The earliest and latest start and finish dates for each phase or section.
- Milestone and Key Dates.
- Holiday periods.
- Dates by which design work or drawings to be produced by the Contractor or sub-contractors or suppliers will be submitted to the Employer's Representative for acceptance and dates by which acceptance of such design work or drawings will be required by the Contractor, allowing time for submittals, re-submittals and reviews.
- Dates by which samples to be produced by the Contractor will be submitted for approval by the Employer's Representative and dates by which approval of such samples will be required by the Contractor, allowing time for submittals, re-submittals, and reviews.
- Procurement periods and delivery dates for the major items of goods, plant and materials.

- Dates by which work will be ready for testing by the Employer’s Representative/Employer.
- Details and dates of any information required from the Employer.
- The work contained in defined Provisional Sums.
- Activities representing the likely work content of undefined Provisional Sums, complete with logic links but with durations set to zero (unless specified otherwise).
- Commissioning periods.
- Provisions for float, time risk allowances, quality control procedures, health and safety requirements

## 1-9 SCHEDULES

The Accepted Programme shall also be presented as schedules showing an analysis of the network including:

A schedule of all activities tabulated in order of earliest starting date and showing for each activity:

- Activity number and brief description;
- Preceding and succeeding activity numbers;
- Duration;
- Earliest and latest starting and finishing dates;
- Total and Free float.

A schedule of leads and lags with (if requested by the Employer’s Representative) reasons for them. Excessive leads and lags, negative lags or open/hanging activities, use of fixed dates and any other programming activities that can have the effect of creating false criticality or inhibiting the programme from reacting dynamically to change should be avoided.

A schedule of all activities lying on the paths containing the least float, namely the critical activities.

A schedule identifying the days of working per week, shifts per working day and holidays. Where multiple calendars are used, this information shall be provided for each of the calendars, accompanied by a schedule indicating the calendar applicable to each activity.

A schedule giving details of the Contractor’s resource requirements in terms of manpower, gang sizes, tradesmen, work rates, items of plant or equipment and materials and quantities of work

allowed for in sufficient detail to explain the Contractor's activity durations. Activities that may be the Contractor's activity durations. Activities that may be expedited by use of overtime, additional shifts or any other means shall be identified and explained.

A schedule of all submittals and material procurement activities, including time for submittals, re-submittals and reviews and time for fabrication and delivery of manufactured products. The interdependence of procurement and construction activities shall be included in the schedule.

A schedule giving the monetary value of each activity for cash flow purposes. The sum of the monetary values shall total the Contract amount. The schedule shall also give the payment items applicable to the activity monetary values.

### **CASH FLOW ESTIMATE**

Within forty-two days of receiving the Notice to Proceed, the Contractor shall submit to the Employer's Representative for its information a detailed cash flow estimate, in quarterly periods, of all payments to which the Contractor considers it will be entitled to under the Contract. The Contractor shall subsequently submit such revised cash flow estimates at quarterly intervals based on the Updated Programme, if required by the Employer's Representative.

### **REVISING AND UPDATING THE PROGRAMMES**

#### ***1-11-1 The Accepted Programme***

The Accepted Programme (or, if the Accepted Programme has already been updated, the Updated Programme) the corresponding Method Statement and the cash flow estimate shall be further revised by the Contractor within 10 working days if there is a grant by the Employer's Representative of an extension of time, a variation or whenever circumstances arise that in the opinion of the Employer's Representative affect the progress of the Works. Each revision to the programme shall be submitted to the Employer's Representative for its review and acceptance. Once a revised programme is accepted by the Employer's Representative, it replaces the previously Accepted or Updated Programme.

Each revised programme submitted for acceptance shall be presented as or be accompanied by the schedules referred to in section 1-9, together with any amendments to the Method Statement.

#### ***1-11-2 The Updated Programme***

The Accepted Programme shall be updated for actual progress at least once every month and the updates shall be archived as separate electronic files for record purposes. The updates shall be to all scope activities and any additional activities carried out or time duration experienced in addition to the scope activities. Actual progress shall be recorded by means of actual start and actual finish dates for activities, together with percentage completion and/or remaining duration of currently incomplete activities. Any periods of suspension of an activity should be noted in the Updated Programme. Each Updated Programme shall be submitted to the

Employer's Representative for its acceptance as a record. It is possible (if the Works have been delayed) that these Updated Programmes will show completion later than the contract completion dates. In this event the Employer's Representative's acceptance of such programmes will not constitute acceptance of the delay(s).

The Updated Programmes will be used by the Employer's Representative to monitor the Contractor's performance against the Accepted Programme, forecast work to be performed in the subsequent period and to assess any extensions of time at the time the cause of delay occurs. In order to provide effective monitoring of performance, the Contractor shall also provide to the Employer's Representative the progress reports as described in the General Conditions of Contract and the cash flow estimates described in section 1-10 above. The Updated Programmes may be prepared on a rolling basis showing the first three months of work in detail, with the remainder of the programmes showing the major activities and milestones only.

## RECORDS

The Contractor shall maintain and submit when requested current records of activities, including the work of sub-contractors and suppliers. The records shall be in a form as agreed between the parties and can include but not limited to:

- Identification of contractor/sub-contractor working and their area of responsibility;
- operating plant/equipment;
- work performed to date giving the location, description and by whom, and reference to the contract programme;
- Test results and references to specification requirements. List deficiencies identified, together with the corrective action;
- material received with statement as to its acceptability and storage;
- information or drawings reviewed with reference to the contract specifications, by whom, and action taken;
- job safety evaluations;
- progress photographs;
- a list of instructions given and received and any conflicts in plans and/or specifications;
- weather conditions encountered;
- the number of persons working on-site by trade and activity;
- information required from and by the Employer's Representative;
- Any delays encountered.

The parties should agree the intervals at which each of these types of records should be delivered to the Employer's Representative. A report if requested, shall be prepared for each day of work performed and shall be numbered sequentially. These daily reports shall be delivered to the Employer's Representative at the end of the working week to which they relate. The report shall be signed and dated by the Employer's Representative.

Any deficiency in the work shall be identified. As deficiencies are corrected, such corrections shall be acknowledged on the daily report.

The Employer's Representative shall notify the Contractor of any non-compliance with the reporting requirements. All the deficiencies cited and verbal instructions given to the Contractor by the Employer's Representative shall be entered on the daily report.

A monthly report shall be delivered by the Contractor to the Employer's Representative within 5 days of the end of each agreed monthly period. The monthly report shall be on a form as agreed between the parties and shall include current records of activities including the work of sub-contractors and suppliers. The report shall include but not limited to:

- Summary of the work performed;
- summary of the works performed as referenced on the agreed programme;
- Estimated value of work done during the month;
- Summary of the list of deficiencies;
- Summary of any delays encountered;
- Weather conditions during the month;
- Progress photographs;

**MEASUREMENT AND PAYMENT**

Payment for the Contractor's Programme shall be made at the rate set down in the priced Bill of Quantities, Bill 1 General Requirements Item 010201 Contractor's Programme.

Failure to comply with written instructions to submit a programme, revised programme or any of the other items mentioned in Section 01020 will result in a deduction for every week the programme, revised programme or other item is not submitted. The deduction will be made from the next payment certificate.

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## ***SECTION 01030 – SAFETY TRAFFIC MANAGEMENT AND CONTROL***

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**1-1 DESCRIPTION**

Throughout the execution of the Works, the Contractor shall, as a priority in all his operations, ensure the safety of the public and of all persons directly or indirectly associated with the Works.

The requirements noted in this Specification supplement the requirements of the Conditions of Contract.

**COMPLIANCE WITH LEGISLATION**

The Contractor shall comply with all safety and industrial health legislation including without limitation, all applicable Rules and Regulations of the GYSBI and any other authorities having jurisdiction.

The Contractor shall comply with all current laws and regulations, national or local related to, but not limited to, the protection of the public and of public traffic, and the safety of the workforce.

**SAFETY OF THE PUBLIC**

The Contractor shall be responsible for the safety of the public passing through the site. All excavations, plant or items of potential danger to the public must be barricaded and sign-posted to the satisfaction of the Project Manager and the Contractor must provide sufficient watchpersons to ensure the safety of the public at all times. All existing pedestrian routes shall be maintained in a safe condition unless an alternative route is provided to the satisfaction of the Project Manager. When a bridge is being rehabilitated the contractor must provide temporary bridge crossings for pedestrians. Temporary slopes above or below the road must be of an angle and design to ensure stability and safety, allowing for the materials involved.

**SAFETY ON SITE**

Throughout the course of the Works the Contractor shall be responsible for the safety of all persons present on the site of the Works.

The Contractor shall ensure, so far as is reasonably practicable and to the satisfaction of the Project Manager, the health, safety and welfare at work of his employees including those of his sub-contractors and of all other persons on the Site. His responsibilities shall include:

1. the provision and maintenance of Constructional Plant and systems of work that are lighted, safe and without risks to health;
2. the execution of suitable arrangements for ensuring safety and absence of risks to health in connection with the use, handling, storage, transport and disposal of articles and substances;
3. the provision of protective clothing and equipment including helmet, safety vest and boots, first aid stations with such personnel and equipment as are necessary and such

information, instruction, training and supervision as are necessary to ensure the health and safety at work of all persons employed on the Works all in accordance with the applicable Laws;

4. designation as Safety Officer of one of his senior staff who shall have specific knowledge of safety regulations, and experience of safety precautions on similar works and who shall advise on all matters affecting the safety of workmen and on measures to be taken to promote such safety;
5. the provision and maintenance of access to all places on the Site in a condition that is safe and without risk of injury;
6. the provision of adequate waterborne sanitation, refuse collection and disposal, complying with all applicable Laws and Bye-laws and to the satisfaction of the Project Manager, for all houses, offices, workshops, and laboratories erected on the site or sites;
7. the provision of an adequate number of suitable latrines and other sanitary arrangements at sites where work is in progress and the execution of appropriate measures in consultation with the appropriate Public Health Authority to control within the Site, mosquitoes, flies and pests including the application of suitable chemical to breeding areas;
8. Reporting details of any accident to the Project Manager and to the Police if appropriate as soon as possible after its occurrence.

#### **SITE SAFETY MEETINGS**

At least once per week during the execution of the Works, upon a date indicated by the Project Manager, a site safety meeting will be held. It will be attended by the Project Manager's Representative, the Contractor's Site Representative, the Contractor's designated Safety as well as Environmental Officer and such other members of their staffs as the Project Manager's Representative may require attend

Proceedings of the meeting will be minuted and any actions required to be taken will be carefully recorded and marked in the minutes for action by specific parties

The meeting will review:

1. Actions taken in accordance with the minutes of the previous months site safety meeting
2. Events since the previous site safety meeting having any bearing on safety
3. Events anticipated during the coming month having any bearing on safety

It is the purpose of the site safety meeting to identify and address all issues relating to site safety and to ensure that such issues and the measures which are required to deal with them remain at the forefront of the attention of the site staff.

## NOTIFICATION OF ACCIDENTS

The Contractor shall notify the Project Manager immediately when any accidents occur (whether on-site or off-site) in which the Contractor, his personnel or Construction plant or those of his Sub-contractors are directly or indirectly involved and which result in any injuries to people. Such notification may be verbal initially but shall be followed by a comprehensive, written report within 24 hours of the occurrence of the incident.

## ROAD SAFETY AND TRAFFIC CONTROL

The Contractor shall not undertake any operations on or adjacent to the public road without having first notified the Project Manager and received approval for those operations. In seeking approval he shall state clearly the details of all signage and traffic control measures he proposes to utilize and the dates and times during which he will operate on or adjacent to the public road. Throughout his operations he will ensure that the public road remains open and available for use in good condition and that delays to traffic are minimized.

### *1-7-1 General Requirements*

The Contractor shall keep existing roads open to traffic during construction operations but may bypass traffic over a detour of equal standard when approved by the Project Manager. The Contractor will be responsible for the cost of all diversions.

The Contractor shall keep roads and sidewalks affected by his operations free from soil and material spillage and ensure that construction areas can accommodate traffic safely at all times. The Contractor shall erect and maintain signs, barricades, and other traffic control devices as may be required to guide traffic inside and outside work areas and as indicated by the Manual on Uniform Traffic Control Devices, Part 6 – Temporary Traffic Control or as directed by the Project Manager. The Contractor, without additional compensation, shall replace traffic control devices that become lost, stolen, destroyed or deemed unacceptable while their use is required.

During non-working hours and following completion of a particular construction operation, all warning signs, except those necessary for public safety, shall be removed. Retro-reflective and painted surfaces on signs, barricades, and other devices shall be kept clean, in a good state of repair and retain their retro-reflective ability at all times. Sizes, colours, messages and locations shall all be to the approval of the Project Manager.

The Contractor shall take care at all times to ensure the convenience and safety of residents along and adjacent to the road and any public highway affected by the Works. Access to property adjacent to any work site shall be maintained at all times.

The Contractor shall be responsible for investigating and establishing the requirements for traffic control and safety. This includes becoming familiar with existing traffic conditions, the importance of maintaining traffic safety and minimizing traffic delay by co-operating with pertinent traffic control agencies.

### ***1-7-2 Traffic Control Measures***

To facilitate traffic movement and safety within and near work sites, the Contractor shall supply, erect and maintain traffic signs, lights, barricades, cones and other material as necessary or required by the Project Manager.

For the proper control of traffic as needed or when/where directed by the Project Manager, the Contractor shall furnish and station competent flag persons whose sole duties shall consist of directing the movement of traffic through or around the works.

In order to minimize disruption to traffic, the Contractor may enclose parts of the Site in a temporary fence as necessary to provide a visual barrier between works areas and adjacent traffic.

Traffic control devices shall be in accordance with North American standards, specifically those defined in the current edition of the Manual of Uniform Traffic Control Devices (MUNTCDD), Part 6 – Temporary Traffic Control and the following specific requirements:

1. Sign Panels shall be orange with black legend unless otherwise specified.
2. Posts shall be of untreated softwood or other materials acceptable to the Project Manager.
3. Signs shall be capable of remaining in position during normal traffic and wind conditions.
4. Barricades and temporary fences shall be constructed of wood, metal or plastic and be painted on the side facing traffic.
5. Cones shall be a minimum of 75 cm in height with a broadened base and capable of withstanding impact without damage to the cones or vehicles. All cones shall be orange/white in colour, highly visible, and capable of remaining in position during normal traffic and wind conditions.
6. Warning lights (electrical, colour, flashing, double-sided) shall be as approved by the Project Manager.
7. Traffic control devices shall be operated only when needed.

### ***1-7-3 Number of Traffic Lanes***

The Contractor is required to maintain a surface of equal standard to that of the original road at all times in terms of width, curvature, gradient and riding quality and to arrange working operations to achieve this. The Project Manager may approve an adequately signposted temporary road detour when the Contractor can show that this would not cause undue delay to traffic flows. With such approval, the Project Manager may specify the times when the reduced capacity road may be used. If additional delay does occur, the Project Manager may withdraw

the approval and in such cases, the Contractor will be required to re-establish the original road standard within 48 hrs.

If reconstruction is necessary on a part of the road and a detour is not feasible the Contractor may request that that part of the road be closed to Vehicular Traffic providing that all vehicles have access to at least one lane of the exiting road. The contractor in his request will submit a detailed work programme for the particular section under consideration and will also seek the approval of the NDC. Should approval be granted the contractor will give affected residents a minimum of 48 hrs notice prior to the closure of a section of the road. The Contractor will complete the section to the wearing course i.e. DBST/ Surface dressing or Asphaltic concrete during this period of time so as to minimise discomfort to road users.

#### ***1-7-4 Temporary Road Works***

Before constructing any temporary road works, the Contractor shall make all necessary arrangements, including payment if required, with the public authorities or landowners concerned for the use of the land and shall obtain the approval of the Project Manager. All temporary road works shall be constructed to the satisfaction of the Project Manager but the Contractor shall be responsible for any damage done to or caused by the use of any such temporary road works.

The Contractor shall submit for approval by the Project Manager, drawings giving full details of such items as the proposed alignment, signing, lighting, profile, riding quality and duration of the temporary road and the proposed maintenance arrangements.

The Contractor shall make all arrangements necessary to permit the passage along the road of construction plant, materials and personnel belonging to any other contractors engaged in the construction works. The Contractor shall furnish, maintain and remove upon completion, all temporary road works and shall clean up and restore the land to the satisfaction of the Project Manager.

### **MAINTAINING ROADWAYS DURING THE CONSTRUCTION WORK**

The Contractor shall perform roadway maintenance as follows:

1. Construct and remove diversion roads and bridges as required by the Contract or as instructed by the Project Manager;
2. Maintain intersections with trails, roads, streets, businesses, parking lots, residences, garages, farms, and other features;
3. Maintain a dust-free road such that visibility and air quality are not affected and a hazardous condition is not created;
4. Maintain all temporary or permanent road drainage systems to ensure the road does not flood or leave standing water on the carriageway;

5. Remove accumulations of soil and other material from the roadway;
6. Maintain the roadway, as well as all roads leading to the Contractor's equipment/plant/materials yards, detours, and diversions in a safe and acceptable condition. If corrective action is requested and the corrective action is not taken immediately, the condition may be corrected and the cost of the corrective action deducted from monies due the Contractor;
7. Be responsible for dealing with any vehicular accidents or incidents within the Site or related to his construction works, under the supervision of the Project Manager and/or in co-operation with official authorities in an emergency situation, as required. The Contractor shall also be responsible for the removal and clearance of vehicles and debris from the road in order to allow the free flow of traffic.

#### **MAINTAINING ROADWAYS DURING NON-WORK PERIODS**

The Contractor shall maintain roadways and traffic control for public traffic during all periods when work is not in progress.

#### **LIMITATIONS ON CONSTRUCTION OPERATIONS**

When the roadway is open to public traffic, restrict operations as follows:

1. Operate equipment in the direction of traffic, where practical.
2. For shoulder drop-offs in excess of 50 millimetres, provide 'Low Shoulder' warning signs. For shoulder drop-offs in excess of 100 millimetres, provide a 1:3 fillet with "Low Shoulder's warning signs". Complete the construction of shoulders adjacent to traffic lanes to the same elevation within 14 days.
3. Provide minimum lane widths of 3.0 metres. Use barricades, drums, or other acceptable devices to delineate traffic lanes through areas where the edge of pavement or intended path has been obliterated by construction operations.
4. Locate staging areas at least 10 metres from the travelled way or behind acceptable traffic barriers. Obtain approval of the location and access to staging areas. Store unused traffic control devices at staging areas.
5. Park equipment at least 10 metres from the travelled way or behind acceptable traffic barriers.
6. Provide parking areas for employees' personal vehicles in approved areas.
7. Provide two-way radio communications between flaggers and also between flaggers and pilot cars unless flaggers are able to see each other and communicate. Make radio equipment available to the Project Manager as necessary.

8. Where switching traffic to a completed lane, provide adequate personnel and equipment to set or relocate traffic control devices.
9. Limit construction-caused delays to public traffic to a maximum of 30 minutes per passage through the project.
10. Maintain existing guardrails, barriers, and bridge railings until removal is necessary for construction. Use a temporary barrier or appropriate channelling devices while the guardrails and bridge rails are absent. Install permanent barriers, guardrails, and bridge rails as soon as possible to minimize risk to the public.

### **NIGHT TIME OPERATIONS**

The Contractor shall perform construction operations during the hours of daylight (½ hour after sunrise to ½ hour before sunset).

Where night operations are permitted, the Contractor shall submit a night lighting system for approval of the Project Manager which shall include the light types, locations and the manner in which the lights will be moved. The Contractor shall submit the proposed system at least 14 days before use and use an independent source other than vehicle headlights.

The Contractor shall:

1. Submit details of the proposed type of lighting system to the Project Manager for approval.
2. Provide and install the approved system to illuminate the entire work area.
3. Position the lights so they do not shine directly at motorists travelling from any direction.
4. If the operation is moving, move the lighting with the operation.
5. Provide lighting at each flagger location.
6. Equip all vehicles with an exterior flashing yellow dome light.

### **TRAFFIC AND SAFETY SUPERVISOR**

The Contractor shall:

1. Provide a traffic and safety supervisor.
2. Not designate the superintendent as the traffic safety supervisor.
3. Provide the traffic safety supervisor's name, address and 24 hour telephone number(s) at the Preconstruction Meeting.

4. At all times during the contract, including periods of suspensions and work stoppages, perform all of the following:
  - Coordinate traffic control operations, including those of subcontractors and suppliers.
  - Ensure the condition, position, and applicability of traffic control devices in use.
  - Immediately correct traffic control deficiencies.
  - Coordinate traffic control maintenance operations with the Project Manager.
  - Ensure unused traffic control devices are properly handled and stored.
  - Conduct weekly traffic safety meetings for construction workers and invite the Project Manager’s Representative to these weekly meetings.
  - Provide a weekly certification that inspections and reviews were conducted and that the traffic control devices meet contract requirements. Include the number and types of devices in use. Report with the weekly certification, all changes or corrective actions taken to ensure the safe passage of public traffic through the project.

#### **TRAFFIC OVER COMPLETED PAVEMENT LAYERS**

The Contractor's traffic including that for hauling materials over structures or pavement layers of an uncompleted road shall, in so far as is possible, and in addition to other restrictions specified elsewhere, be limited to a minimum by planning of the sequence of operation and the use of construction roads and diversions.

The Contractor's traffic over structures or the completed road will be restricted to the maximum axle load permitted in terms of statutory provisions. Any damage to structures or completed layers caused by the Contractor's traffic shall be repaired at his own cost.

#### **HAUL ROADS**

The Contractor shall submit to the Project Manager for approval full details of any haul construction roads he proposes to build. Such details shall be submitted well in advance in order to afford the Project Manager sufficient time to investigate their implications. Haul roads may not be built without the Project Manager’s prior approval, and shall be kept to a minimum, particularly in areas where their impact on the environment may be serious.

#### **ASSISTANCE TO THE PROJECT MANAGER**

The Contractor shall provide full co-operation and assistance in all safety, environmental control aspects to be carried out by the Project Manager or Employer.

#### **MEASUREMENT AND PAYMENT**

Payment for Safety, Traffic Management and Traffic Control shall be made at the rate set down in the priced Bill of Quantities, Bill 1, General Requirements, Item 010301, Safety, and Bill Item 7, Item 010301 Traffic Management and Control

The cost of complying with the Specification in respect of all requirements related to the Contractor's safety, industrial health and traffic control organization and program shall be deemed to be included within the rates for the works and within the Item for Safety, Traffic Management and Control in Division 1 of the Bill of Quantities. This item shall include the cost of the provision of all necessary equipment, appurtenances and personnel for compliance with the requirements of the Contract Documents and this Specification in respect of Safety and Traffic Control.

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## **SECTION 01035 – TEMPORARY DIVERSIONS FOR TRAFFIC**

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**1-1 DESCRIPTION**

This Section covers the construction and maintenance of the necessary diversions and detours, barricades and signs and everything necessary for the safe and easy passage of all public traffic during the construction and maintenance periods, as well as the obliteration of diversions as they become redundant.

**GENERAL REQUIREMENTS*****1 Handing over the Site***

The Site will be handed over to the Contractor in the lengths and sequence specified in the Contract. Where no other provision is made in the Contract, the Contractor will be given possession of the Site in sections in accordance with the approved Program, sufficiently ahead of road construction works to enable diversions to be constructed in good time and to the Project Manager's satisfaction.

***Providing diversions***

Except where the existing road is to remain in use for through traffic, the Contractor shall provide, construct or put in order such diversions as may be provided for deviating traffic from such sections of the road as are handed over to him.

***Passage of public traffic***

The Contractor shall be responsible for the safe and easy passage of public traffic past or over sections of roads of which he has occupation. The Contractor shall at all times in all his operations and in using his construction equipment take the necessary care to protect the public and to facilitate the flow of traffic.

Further, the passage of public traffic on sections of a road may be allowed prior to the completion certificate where this is clearly in the interest of the public and the traffic can be accommodated on the road surface in a safe manner without damage to structures or pavement layers and without undue disruption of the Contractor's work. The Contractor shall be responsible for the control of public traffic over such sections, including temporary traffic control facilities. Traffic control devices shall be in accordance with North American standards, specifically those defined in the current edition of the Manual of Uniform Traffic Control Devices (MUTCD), Part 6 – Temporary Traffic Control

***Minimum vertical clearance***

The minimum vertical clearance over any section of a diversion shall be 5 m.

***Property and survey beacons***

Where possible, diversions shall be constructed so as not to damage or displace property boundaries or trigonometric/permanent survey markers. In exceptional cases where this is not possible, the Contractor shall notify the Project Manager in good time so that he may arrange to have them suitably referenced before they are displaced.

***Access to properties***

The Contractor shall also provide and grant access to persons whose properties fall within or adjoin the area over which he is working, and in this respect the Contractor's attention is drawn to the Conditions of Contract.

***Approval of diversions***

The need for details concerning all diversions shall be approved by the Project Manager before the construction of such diversions commences, and the Contractor shall satisfy himself before bidding that he can make arrangements in respect of any diversions as may be necessary for the safe and convenient passage of traffic.

***Temporary Works***

The diversions provided by the Contractor shall include the construction of temporary gates, grid gate, fences, drainage works and other incidentals considered by the Project Manager to be necessary.

***Public services***

The Contractor, in cooperation with the Project Manager, shall make arrangements for all public services such as power lines, telephone lines, water mains, etc, to be moved where required for the construction of diversions and he shall be solely responsible for the safety of such services. No payment will be made for any additional expenses caused by delays in moving such services. Where the moving of services is not required, the Contractor shall clearly indicate where such services cross the diversion so that these points will be clearly visible to the operating staff.

**TEMPORARY TRAFFIC CONTROL FACILITIES*****1 Programme for control of traffic.***

Following the award of the Contract, the Contractor shall submit to the Project Manager a detailed Traffic Control Plan. Such Plan shall be approved by the Project Manager before the Contractor commences work, and shall show amongst other things the method of protection of the public and give details of the hours of operation, location, types and numbers of traffic safety devices, barricades, warning signs, flagmen and the like. The Traffic Control Plan shall

be in accordance with and complementary to the approved Programme submitted under Section 01020 above.

In the preparation of this Traffic Control Plan, the Contractor should take into consideration the following:

1. The Contractor shall conduct his operation in such a manner that no greater length or amount of work is undertaken than he can carry out efficiently having due regards to the rights and convenience of the public.
2. If the Contractor proposes a road closure he shall provide an alternative routing of the traffic, which must be approved by the Project Manager.
3. No revisions shall be made to the approved Traffic Control Plan without the prior written permission of the Project Manager, and the Contractor shall allow 14 days for the Project Manager to review any request for a revision of the Traffic Control Plan.
4. The Traffic Control Plan shall conform in all respects with the requirements of the Specification.

### ***Traffic control devices***

Traffic control devices involve, but are not restricted to, the use of flagmen, traffic lights, portable STOP and GO signs or STOP and SLOW signs, and all temporary traffic management signs, whichever may be the most suitable methods under prevailing circumstances. The traffic control devices and all temporary traffic control signs should conform to standard international signage complying with North American standards, specifically those defined in the current edition of the Manual of Uniform Traffic Control Devices (MUTCD), Part 6 – Temporary Traffic Control.

The type of construction, spacing and placement of traffic control facilities shall be in accordance with the prescriptions and recommendation of the standard international signage to the agreement of the Project Manager. The Contractor shall present suitable proposals for the approval of the Project Manager. The various traffic control facilities which may be required are the following, or as directed by the Project Manager:

1. Road signs and barricades

Road signs shall comply with the requirements of Section 07010.

2. Channelization devices and barricades

Channelization devices shall include cones, delineators and drums. Barricades include barrier lattices, movable barricades or other types approved by the Project Manager.

Steel drums shall be cut, painted in black and white stripes and provided with reflective tape strips. Drums shall be kept in position with ballast of sand or soil. Stones shall not be used for this purpose. Drums shall be maintained in a clean and serviceable condition.

3. Barriers

Barriers for preventing vehicles from leaving the permitted lanes may consist of guardrails on both sides of steel drums for separating two opposite traffic streams, movable concrete barriers (New Jersey type), or ordinary guardrails which comply with the provision of Section 06030.

4. Warning devices and traffic lights

Warning devices consist of amber flicker lights. Traffic lights shall be operated automatically, by radio or manually in a proper manner by adequately trained staff.

5. Road markings

Road markings, as specified in Section 07020, may be required on sealed surfaces and will include road marking studs wherever necessary. The road markings shall be made in accordance with the provisions of Section 07020. Any painted road markings which no longer apply shall be removed or over painted with black road paint. Road marking studs shall be removed completely.

***Passage and control of traffic***

It is an intention of the Contract that public traffic should be able to pass along the road to be reconstructed/rehabilitated including bridges at all times during construction and in all weather. For this purpose, the Contractor will be required to order his work etc. in such a way as to assure that a single lane at least 3.25m wide is available for public traffic at all times and he shall provide sufficient pilot cars and drivers, competent flagmen and the like to control and regulate the flow of traffic under one-way traffic operations.

The frequency and duration of delays to traffic while passing through, over or across the Works, shall be kept to a minimum. They shall, in no case exceed half an hour and should normally be less than 20 minutes. Any method of working which requires road closures in excess of 30 minutes shall be the subject of 48 hours prior notice to an agreement of the Project Manager, who may refuse to allow such closure in default of due notice.

The Contractor shall take particular care when passing traffic through his Works that all excavations and other hazards are properly protected with barriers and are illuminated at night.

## CONSTRUCTION OF DIVERSIONS

### *1 General*

Where it is not preferable to pass traffic through the Works, the Contractor will, upon previous approval of the Project Manager, be allowed to construct and maintain diversions provided that such diversions are passable to traffic at all times.

The length of the diversions shall be of the shortest practical length having regard to gradient and obstruction and shall be sited as agreed between the Project Manager and the Contractor.

Where required in the Specification or by the Project Manager, temporary diversions shall be provided with bituminous surfacing in accordance with the requirements of Division 04, Pavement or as may be prescribed by the Project Manager.

### *Widths, Gradient, Camber*

For the diversion of an existing road, the carriageway width of the temporary road shall be the width of the existing carriageway or 6.0m whichever is the less. If wider diversions are required, such widths shall be specified in the Specification or on the Drawings.

For the diversion of a minor public road or a private road, the width of the temporary carriageway shall be the same as the existing carriageway, or such lesser width as agreed by the Project Manager.

Where in the opinion of the Project Manager, it is impracticable to provide a two-lane diversion, a single lane carriageway not less than 3.0 m wide with traffic control and passing places shall be provided.

The verges of the diversion shall be cleared and maintained clear for a width of at least 1.5 m beyond the edge of the carriageway or such lesser width as the Project Manager may agree.

The temporary traffic diversions shall have a minimum horizontal radius of 30 meters and a maximum gradient of 8 percent unless otherwise agreed to by the Project Manager in exceptional cases. Any acute intersection of gradient shall be properly graded to a smooth vertical curve, to the satisfaction of the Project Manager.

## TEMPORARY DRAINAGE WORKS

### *1 General*

Temporary ditches and culverts of adequate size and strength shall be provided alongside and under the temporary road to the satisfaction of the Project Manager.

The Contractor shall construct the necessary temporary drainage works such as side drains, catch water drains, miter drains, culverts, etc. to deal adequately with surface run-off. The temporary culverts of adequate type and size shall be installed on existing drainage channels wherever required by the Project Manager. Any suitable prefabricated culverts salvaged from

an existing road or an abandoned diversion may be re- used if in a good condition and approved by the Project Manager.

### ***Temporary bridges***

Where it is necessary to construct a diversion to permit construction of a new bridge the Contractor shall provide and maintain a temporary bridge over the waterway. The minimum clear width of a temporary bridge shall be 3.5 m and the strength shall be adequate for normal road vehicles. The bridge design and specification shall be approved by the Project Manager before construction is commenced.

## **EARTHWORKS AND EXISTING ROADS USED AS DIVERSIONS**

The Contractor shall shape and grade the diversions and shall make full use of all material that can be obtained from alongside the diversion, from side cuts or from the immediate vicinity. If an adequate quantity of material cannot be obtained in this manner, he shall import material from other sources. The Contractor shall also perform the necessary clearing and grubbing, including the removal of all trees and stumps. Where the sub grade is not sufficiently dense in its natural state, it shall be given three roller passes compaction as specified in Division 02, Site and Earthworks, prior to the construction of the earthworks.

All material shall be watered, mixed and compacted with suitable compaction equipment to give sufficient density to the material so that it will be capable of carrying traffic without undue wear or distress. The adequacy of this compaction shall be a density not less than 95% of the maximum density as determined by ASTM D1557-12

## **PAVED SURFACING OF DIVERSION ROUTES**

The diversions shall be provided with a bituminous wearing course and shall be of a suitable road construction approved by the Project Manager.

The Contractor shall construct a paved surface capable of carrying high volumes of all vehicle groups which shall be traveling at a reduced speed of 30km/hr without causing undue wear and tear.

## **ASSISTANCE TO THE PUBLIC**

The Contractor shall be responsible for safely maintaining and directing traffic through or around any part of the Works included in the Contract, with the maximum practical convenience, for the full twenty four hours of each day.

The Contractor shall render to the public all possible assistance when they are passing over roads maintained by him and over minor, private or temporary roads or bridges when used as diversion or when passing through the Works.

Whenever the Contractor's operations create a condition hazardous to traffic or to the public, he shall provide, erect and maintain such fences, barricades, lights, signs and other services, as are necessary to prevent accidents or damage or injury to the public.

The Contractor shall also train and provide such guards and flagmen as are necessary to give adequate warning to traffic or to the public of any dangerous conditions that might be encountered and shall provide prompt assistance to any vehicle experiencing difficulty in passing over the Works under construction, or through any diversions or roads maintained by the Contractor, if necessary by providing a towing vehicle, labour and tow rope to assist such vehicles.

Should the Contractor appear to be neglectful or negligent in providing warning and protective measures, as above provided, the Project Manager may direct attention to the existence of hazard, and the necessary warning and protective measures shall be provided and installed at the Contractor's expense. Should the Project Manager point out the inadequacy of warning and protective measures, such action on the part of the Project Manager shall not relieve the Contractor from responsibility for public safety or relieve him of his obligation to provide and pay for these devices.

#### **USE OF MINOR PRIVATE ROADS AS DIVERSION**

Where agreed by the Project Manager that the Contractor may use a minor or private road as a diversion, the Contractor shall be entirely responsible for negotiation with and obtaining the prior consent of the authorities and owners, and shall pay for any additional maintenance costs or shall if necessary, himself maintain the minor road for the period it is used as a diversion, and reinstate the road afterwards to the satisfaction of the authority or owner, and shall compensate the authority or owner for any damage arising out of the use of the road as a diversion.

The standard of such minor or private road when used as a diversion shall be constructed at the same standards as a temporary road and if necessary the Contractor shall, at his own expense improve the road to bring it to this standard before it is used as a diversion, and shall maintain it to that standard while it is used as diversion.

The length of the diversion shall not be excessive and shall be kept as short as practicable. Any part of the diversion shall generally not exceed twice the un-deviated length of the corresponding part of the original road, while the total route distance via all diversions shall not exceed that via the original road by more than 25%.

#### **RIDING QUALITY & MAINTENANCE OF DIVERSIONS**

The surface of all diversions shall be maintained smooth, free from ruts and potholes and loose material and shall be graded as required.

Where existing roads are to be used as diversions, the Contractor shall after consultation with the Owner or Authority having control of such road, carry out any improvements, repairs, alterations or additions to such roads as may be required to bring them to a condition suitable for traffic and to the satisfaction of the Project Manager.

All diversions and existing roads used as diversion shall be maintained by the Contractor in a safe trafficable condition. The roads and diversions shall be maintained to provide a smooth riding surface at all times. All potholes shall be repaired immediately.

The Contractor shall also ensure all diversions are maintained free of debris and excessive dust by conducting regular road cleaning and the application of water or other appropriate suppressants deemed acceptable by the Project Manager. All drainage works shall be maintained in a good working order.

Diversions shall be maintained to a standard that generally allows for increased volumes of traffic created by imposing a restricted speed of 30 km/h for all vehicular groups.

### **SIGNS, BARRIERS & TEMPORARY FENCING, GATES & GRID GATES**

The Contractor shall be responsible for the provision, erection, maintenance and removal of all temporary signs and barriers necessary for safety and convenience, to pass traffic not only upon the existing road to be constructed or realigned and such temporary roads or bridges as he may construct, but also on all minor and private roads off the site of the Works which are used as diversions.

Temporary “Diversion Ahead” signs shall be erected before any road junction and a “Diverted Traffic” sign shall be erected at the junction of the diversion route and other minor roads where there is any possibility of the diverted traffic mistaking the route of the diversion, and there shall be mounted on the same posts, a sign bearing the inscription “Diversion Ahead” or “Diversion”.

In addition, any hazard such as a narrow bridge, sharp bend, etc. occurring on the diversion shall be marked by the Contractor with the appropriate sign, if the existing sign is inadequate or none existent. All sharp bends and all places where the shoulder is higher than 2.0 m above the natural ground shall be marked with painted posts.

Where ordered by the Project Manager or specified on the Drawings or in the Specification, the Contractor shall make his own arrangements for providing either new fencing and gates or moving and subsequently reinstating existing fencing and gates in accordance with the provisions of Section 607 of the AASHTO Guide Specifications for Highways Construction 2008.

### **TRAFFIC WHERE THE ROAD IS CONSTRUCTED IN HALF WIDTHS**

Whereby for reasons of difficult terrain or for any other reason, the construction of diversions is not feasible, the Contractor shall obtain the written approval of the Project Manager, to construct the road in half widths to allow traffic to use that half of the road not under construction. The length of the half width construction shall be kept to a minimum, with provision of traffic control to allow the traffic travelling in opposite directions to pass at frequent intervals.

The length of half width construction, where the other roadway lane is open to one-way traffic only, shall be restricted to 1 km in length. Traffic control for short sections of maximum 250 m in length

of one way traffic may be controlled by qualified flagmen and portable STOP and GO signs. Traffic lights shall be used for longer sections unless otherwise agreed to by the Project Manager.

The Contractor shall arrange his work so as to allow traffic to have free one way access to at least half the width of the roadway at all times during the Construction period. He shall maintain that half of the road, which is being used for traffic for the time being, free from corrugations, to the satisfaction of the Project Manager

Should the road be not in a safe trafficable condition for two way traffic over the entire width at the end of each day's work the Contractor shall provide adequate flagmen, signs, traffic lights, barricades, light and the necessary staff at his own cost to ensure a free flow of traffic alternatively in each direction through the entire period when the roadway is open to one way traffic only.

#### **THE USE OF DIVERSIONS BY THE CONTRACTOR**

Where the Contractor constructs haul or construction roads for accommodating construction traffic, he shall construct and maintain them at his own cost and in accordance with details previously agreed with the Project Manager, in writing. Such roads shall be obliterated and their surfaces properly reinstated when no longer required, all at the Contractor's own cost.

The Contractor shall have the right to use public roads, including diversions open to public traffic, but where his own traffic causes excessive damage or wear to such roads or constitutes a condition hazardous to public traffic, the Project Manager shall have the right to regulate his traffic over such diversions and require the Contractor to provide at his own cost, such maintenance as in the Project Manager's opinion will be necessary.

#### **OBLITERATION OF DIVERSIONS**

When traffic is routed permanently onto the new road following the completion of construction, the diversions which are no longer required and, unless otherwise instructed by the Project Manager, such sections of obsolete roads and road marking as instructed by the Project Manager shall be obliterated in accordance with Section 202 of the AASHTO Guide Specifications for Highways Construction 2008.

#### **MEASUREMENT AND PAYMENT**

The cost of complying with the Specification in respect of all requirements related to all temporary traffic diversions shall include the cost of the provision of all necessary equipment, appurtenances and personnel for compliance with the requirements of the Contract Documents and this Specification in respect of Temporary Diversions for Traffic.

Payment for Temporary Diversions for Traffic shall be made at the rate set down in the priced Bill of Quantities, Bill 1, General Requirements, Item 010351, Temporary Diversions

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## ***SECTION 01040 – QUALITY CONTROL***

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## 1-1 DESCRIPTION

This Section describes the requirements to establish, implement and maintain a Project Quality Plan for the Contract.

The Contractor is responsible for quality control of all construction, materials, manufacturing and installations comprising the Works. The Contractor shall establish and maintain an effective quality control organization and system. The System shall be adequate to cover all operations and shall be keyed to the approved Method statements.

The system shall consist of plans, procedures and the staffing needed to produce an end product that complies with the overall Contract requirements. The program shall cover all operations including on-site and off-site production or fabrication, material sampling, testing, inspection and management control to ensure that work conforms to the Contract Documents.

### CONTRACTOR'S PROJECT QUALITY PLAN (PQP)

#### *1 General*

The Contractor shall furnish for review, comment and approval by the Employer's Representative, within 21 days of receipt of the Notice of Award a detailed Project Quality Plan (PQP). The PQP is the means by which the Contractor assures himself and the Employer that the services and work supplied comply with the specific requirements of the Contract. Construction will be allowed to begin only after acceptance of the PQP or of an interim plan applicable to a particular section of work.

Work to be done outside of the defined items included in any such interim plan will not be permitted to begin until receiving the Employer's Representative's concurrence of a PQP amendment or a further interim plan containing the additional features of work contemplated.

#### *Content*

The PQP shall include as a minimum, the following to cover all construction operations, both on-site and off-site and work by Subcontractors, fabricators, suppliers etc.

- A description of the quality control organization including a chart showing lines of authority and numbers of appointed QC staff that will carry out the inspections for the Works. The staff shall include a Construction Quality Control Manager who shall report to an executive of the Contractor's organization.
- The name, qualifications (in resume format), duties, responsibilities and authorities of each person assigned to the Quality Control Organization.
- A copy of the letter of appointment of Construction Quality Control Manager (signed by an authorized official of the firm) that describes the responsibilities and delegates sufficient authority to adequately perform the functions of the

QC Manager. This shall include the authority to stop work that is not in compliance with the Contract Documents and to direct the removal of any nonconforming work done by the Contractor.

- The QC Manager shall issue letters of direction to any other Quality Control representatives outlining their respective duties, authorities and responsibilities. Copies of these letters will also be furnished to the Employer's Representative.
- Procedures for scheduling, reviewing, certifying, and managing submittals, including those of Subcontractors, off-site fabricators, suppliers etc.
- Control, verification and acceptance testing procedures for each specific test to include the test name, specification paragraph requiring test, feature of work to be tested, test frequency and person responsible for the test. Also, identification of the laboratory or testing service that will perform the test.
- Procedures for inspection of the works including approvals for acceptance of work, acceptance testing and documentation.
- Procedures for tracking construction deficiencies from identification through acceptable corrective action. These procedures will enable verification that deficiencies have been corrected.
- Reporting procedures, including proposed reporting formats and samples of proposed quality control records, testing forms and reporting forms.

#### ***Approval by the Employer's Representative***

The Employer's Representative's shall approve the Contractor's QCP prior to the start of construction. Approval is conditional and will be predicated on satisfactory performance during the construction effort. The Employer's Representative reserves the right to require the Contractor to make changes to the QC plan, organization and operations thereof including substitution of personnel as necessary in order to obtain the necessary quality. The Employer's Representative may also instruct the Contractor to carry out an internal or independent audit.

#### ***Notification of Changes***

After acceptance of the QCP, the Contractor shall notify the Employer's Representative in writing a minimum of 7 calendar days prior to any proposed change. Changes are subject to the approval of the Employer's Representative.

#### **QCP COORDINATION MEETING**

Before start of construction and prior to approval by the Employer's Representative of the Quality Control Plan, the Contractor and the QC Manager shall meet with the Employer's Representative

to discuss the quality control system. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the QC operations, control activities, testing, administration of the system for both on-site and off-site work and the interrelationship of the Contractor's management with the Employer's Representative's QA requirements. Minutes of the meeting shall be prepared and signed by the Contractor's QC Manager, the Contractor's Project Manager and the Employer's Representative. The minutes shall become a part of the Contract file.

There may be occasions when subsequent conferences will be called by either party to reconfirm mutual understandings and/or address deficiencies in the QC system that may require corrective action by the Contractor.

## **CONTRACTORS QUALITY CONTROL ORGANIZATION**

### ***Quality Control (QC) Manager***

The Contractor shall identify an individual within the organization who shall be responsible for overall management of QC operations and have the authority to act in all QC matters on behalf of the Contractor. The QC Manager shall be a qualified Project Manager with a minimum of 10 years of design and/or construction experience on work similar in type. The QC Manager shall be assigned no other duties. The QC Manager shall be on the site at all times during construction and will be employed by the Contractor.

An alternate to the QC Manager will be identified in the plan to serve in the event of the QC Manager's absence. The period of absence may not exceed 2 weeks at any one time and not more than 30 work days during a calendar year. The requirements for the alternate will be the same as for the designated QC Manager.

The QC Manager shall report directly to an executive of the Contractor's organization and have equivalent authority and status as the Contractor's Project Manager. He shall have the responsibility and authority to override the Contractor's Project Manager on all aspects relating to the quality and Quality Control of the Works including the responsibility and authority to stop work which is not in compliance with the Contract and to direct the removal of non-conforming work placed or installed by the Contractor and/or his Sub-Contractors and/or agent(s).

### ***QC Staff***

The only responsibility that any member of the Contractor's Quality Control team can have in the Contract is Quality Control. It is intended that there be a separation of the QC from the production efforts. If the Employer's Representative determines that the QC Manager or any of his support personnel do not meet the QCP stipulations of the Contract, or if they are engaging in the production work associated with the Contract, the Employer's Representative may in writing, require the Contractor to remove such personnel from the Site.

The staff must be of sufficient size to ensure adequate QC coverage of all work phases, work shifts and work crews involved in the construction. All QC staff must be fully qualified by experience and technical training to perform their assigned responsibilities. The QCP will

clearly state the duties and responsibilities of each staff member as well as their experience, training and technical education.

### ***Organizational Changes***

The Contractor shall obtain the Employer's Representative's approval before replacing any member of the QC staff. Requests for approval shall include the sanction of the Quality Control Manager as well as the names, qualifications, duties, and responsibilities of each proposed replacement.

## **QC DOCUMENTATION**

The QC Manager's office shall maintain current records of quality control operations, activities and tests performed, including the work of Subcontractors and suppliers. These records shall be on a daily report form acceptable to the Employer's Representative and shall include factual evidence that required quality control activities and/or tests have been performed, including but not limited to the following:

- Work performed each day, giving location, description and by whom, type and number of control activities and tests involved.
- Results of control activities or tests.
- Deficiencies noted along with proposed remedial action or corrective action.
- Control activities performed with results and references to Specifications and/or other contractual requirements.

## **QC TESTS AND TESTING**

### ***1 General***

Certain requirements and limit values are laid down in the Specifications in regard to the properties of materials and workmanship to be supplied. Tests shall be conducted and measurements taken for controlling the relevant properties of the workmanship and materials supplied, and the results of such tests and measurements shall be assessed on the basis of the prescribed criteria for compliance with the specified requirements.

Wherever possible, acceptance criteria shall be determined by way of statistical principles described in this Section. Wherever impracticable and where no statistical judgment criteria have been prescribed, the specified requirements and limit values shall be fully complied with.

Despite acceptance of those properties judged by these statistical methods, the materials or work submitted will be rejected when other properties (which are not controlled by statistical methods) fail to comply with the requirements of the Specifications, or where there are other causes for rejection such as obviously defective workmanship or excessively variable

properties, visible signs of poor workmanship, and similar considerations which constitute sufficient grounds for rejecting the work without any further testing.

The Project Manager shall be entitled to assess separately any specified portion of a lot if, in his opinion, it exhibits significant deviations as compared with the remainder of the lot.

In order not to change the Contractor's or the Employer's risks, the statistical judgment plans shall be strictly adhered to in all cases where they are used, and decisions based on these plans shall not be altered. It shall be a various statistical judgment plans be accepted and that the validity of the decisions made on the basis of these judgment plans cannot be disputed on the grounds of statistical theory or a specified or implied producer's risk, or on the grounds of unjust enrichment.

### ***Standards***

All tests shall be conducted in accordance with the standard methods specified in the following, in order of precedence unless otherwise stated in the text:

- The Specifications of the American Association of State Highway and Transportation Officials (abbreviated as AASHTO).
- The Specifications of the American Society for Testing and Materials (abbreviated as ASTM).
- British Standards Institute Specifications (abbreviated as BS).

In addition to the above standard methods of testing, standard specifications or test methods of other bodies may also be referred to in these Specifications, or test methods may be described where no acceptable standard methods exist.

### ***Testing Procedures***

The Contractor shall perform tests specified or required to verify that control measures are adequate to provide a product that conforms to Contract and Specification requirements. Testing includes operation and/or acceptance tests as necessary. The Contractor shall procure the services of an approved Independent Testing Laboratory at the project site and a list of tests to be performed shall be furnished as a part of the QCP. The list shall give the test name, frequency, specification paragraph containing the test requirements, the personnel and laboratory responsible for each type of test and an estimate of the number of tests required.

The Contractor shall perform the following activities and record and provide the following data for approval by the Quality Control Manager and the Employer's Representative:

- Verify that testing procedures comply with Contract requirements.
- Verify that facilities and testing equipment are available and comply with testing standards.
- Check that test instrument calibration data meets certified standards.
- Verify that recording forms and the test identification control number system, including all of the test documentation requirements, have been prepared.

Results of all tests taken, both passing and failing tests, will be recorded on the Quality Control report for the date taken. Specification paragraph references, test locations and the sequential control number identifying the individual test must be given. Actual test reports may be submitted later, if allowed by the Employer's Representative, with a reference to the test number and date taken.

All information relating to tests performed by an off-site or commercial test facility will be provided directly to the Employer's Representative.

Failure to submit timely test reports, as stated, may result in removal of related work performed and/or disapproval of the test facility.

### ***Independent Testing Laboratory***

The terms "testing laboratory", "laboratory", "Contractor's laboratory" or "independent laboratory" are interchangeable and are defined as an independent entity engaged by the Contractor to perform inspections and tests of the work done at the project site or elsewhere and to report the test results.

The Contractor shall procure and provide the services of a testing laboratory. The Contractor's proposed testing laboratory shall be noted in the Quality Control Plan, as well as necessary information and data to evaluate the laboratory's qualifications and proposed personnel to be assigned to the Works. The laboratory shall maintain and operate facilities on site for the duration of the construction activities of the Works to accomplish all on-site testing.

The laboratory shall be fully stocked with all necessary equipment, two original copies (one copy to be retained by the employer) of all specified test standards and procedures and trained personnel to properly conduct all on-site testing in accordance with specified and appropriate materials testing procedures. It shall meet appropriate criteria detailed in ASTM E329-20, ASTM C1077-17, ASTM D3666-16, ASTM D3740-19, and ASTM E543-15. The laboratory shall be established sufficiently in advance of the start of works to ensure all contract requirements are met.

In the Contractor's QCP, all planned 'on-site' testing by the laboratory shall be noted as well as any testing the Contractor proposes to be accomplished 'off-site' by the laboratory or other laboratories.

A complete listing of the proposed on-site testing equipment and available off-site testing equipment of the appointed laboratory (clearly referenced to the Specification Clauses and other Contract Documents) shall be noted in the Contractor's QCP.

The on-site laboratory facilities will be a part of the Construction QC operation and will work independently but under the jurisdiction of the Quality Control Manager.

### ***Capability of Testing Laboratories***

The Employer's Representative reserves the right to check laboratory equipment in the proposed laboratory for compliance with the standards set forth in the Contract Documents and Specifications and to check the laboratory's technicians testing procedures and techniques.

### ***Use of Laboratory Facilities***

The Employer's Representative shall at all times have full access to the Contractor's laboratory and laboratory records.

The Project Manager shall have full access to the Works for the purpose of taking additional samples. The Contractor shall render any assistance necessary for taking the samples and shall be responsible for reinstatement of pavement layers or other structures at the positions where the samples have been taken.

### ***Approval***

Where the Contractor is required in the Specification to submit samples of materials or mixtures to the Project Manager for approval prior to their being used in the Works, the use of these materials or mixtures without the Project Manager's written approval shall constitute default on the part of the Contractor, who shall be liable for the consequence of such default. All samples shall be submitted in sufficient time for proper testing by the independent testing laboratory.

The Project Manager's approval of any materials or mixtures shall in no way relieve the contractor of his obligation to provide materials, mixtures and workmanship which comply with the Specifications.

Any material that appears inconsistent with similar approved material being produced shall be sampled and tested and shall be subject to a new approval process, unless such material is voluntarily removed or replaced or corrected.

## **SAMPLING**

### ***1 General***

A material sampling schedule noting time and frequency of testing and sampling of all materials shall be fully detailed in the Contractor's approved QCP.

### ***Sampling Procedure***

#### **Definitions**

For the purposes of this Section the following words and symbols shall have the following meanings:

- Lot - A lot is a sizeable portion of work or quantity of material which is assessed as a unit for the purposes of quality control, and selected to represent material or work produced by essentially the same process and from essentially the same materials.

- Random sample - A random sample is a group of "n" test measurements at "n" separate test positions or on "n" sample portions obtained from the lot in an unbiased manner. Random sampling shall mean stratified random sampling, unless inconsistent with the context.
- Sample mean ( $\bar{x}$ ) -  $\bar{x}$  is the arithmetic mean of a set of "n" test results constituting the sample.
- Sample standard deviation ( $S_n$ ) - The sample standard deviation  $S_n$  is defined by:

$$S_n = \sqrt{\frac{\sum x^2 - n\bar{x}^2}{n - 1}}$$

Where  $\bar{x}$  is the sample mean

$x$  is the value of an individual sample portion, i.e. an individual test result or measurement.

$n$  is the sample size, i.e. the number of individual test results or measurements.

- Specification limit ( $L_s$ ) - This is the limit value of the property of any product outside which not more than a specified percentage ( $\phi$ ) of the population of values representing an acceptable product property is allowed to lie. The specification limit may be a single lower limit  $L_s$ , or a single upper limit  $L's$ , or a double limit consisting of a lower limit  $L_s$  and an upper limit  $L's$ .
- Acceptance limit for sample mean ( $L_a$ ) - This is the limit value of a product property within which the sample mean shall lie for a product to be acceptable or a lower-limit specification, this acceptance limit is denoted by  $L_a$ . For an upper-limit specification, this acceptance limit is denoted by  $L'a$ . For a double-limit specification, the lower and upper limits are denoted by  $L_a$  and  $L'a$ .
- Acceptance limits for individual test values ( $L_e$ ) - These are the limit values of a product property within which the sample values representing a product shall lie for the product to be acceptable. The limit values will depend on the sample sizes "n" and may be a lower limit  $L_e$ , an upper limit  $L'e$ , or double limits  $L_e$  and  $L'e$ .

- Outliers - Where, in a sample, one or more test results differ significantly from the other values obtained, this difference could be ascribed to an assignable cause, in which case such test result shall be regarded as an outlier and disregarded when assessing the lot.

#### Lot size for road-construction layers

The lot size shall normally be a section compacted in one process where essentially the same materials and construction equipment have been used. Where production is on a continuous basis, a lot shall normally mean the product of one day's work and shall not exceed the product of two full days' work. However, a lot of any smaller size may be ordered by the Project Manager where:

- The properties under investigation exhibit abnormal local variation within the normal lot size;
- An area is obviously of a different quality than the rest;
- The rate of production is very high.

#### Lot size for Concrete

The lot size shall be determined by the Project Manager, with due regard being had to the size and the type of structure in which the concrete is placed, the specific portion of the structure, and the total quantity of concrete placed in a day. The lot sizes in concrete structures could therefore vary considerably, and, particularly in the case of small structures, it could be necessary to combine samples of the same grade of concrete from different structures, provided that the concrete has been obtained from the same concrete plant and has been cast in the same period.

#### Lot size for other materials

In other cases, the Project Manager will determine lot sizes in accordance with circumstances pertaining to each case.

#### Random sampling

When any lot is tested, whether a normally sized lot or an isolated section which clearly exhibits an abnormal variation of the properties under consideration, all samples shall be taken in a stratified random pattern.

#### Sample sizes

For purposes of acceptance control, the Project Manager will, in advance, determine sample size "n". The larger the sample, the more reliable the result will be, and no sample sizes may be smaller than those given in the procedures section described below.

#### Outliers

Test results shall be scanned for possible outliers. Where there is reason to believe that a test result may be erroneous, it shall, if possible, be re-examined by further testing, and, if there is reasonable evidence to suggest that the test result is erroneous, it shall be regarded as an outlier, rejected, and replaced with a fresh test result.

#### Resubmission

Where a lot has been accepted conditionally or has been rejected, the Project Manager may agree to its resubmission for approval if:

- It has been reworked and the Project Manager is satisfied that a proper attempt was made to improve the properties which were unacceptable;
- Or,
- Where, in his opinion there are valid technical reasons therefore.

In both cases a fresh sample shall be taken, and a fresh (second) set of test values determined. The first and second sets of test values shall then be compared with each other to determine whether their properties differ significantly.

Where in the opinion of the Project Manager a significant difference does occur, the submission of the lot shall be regarded as a first submission and assessed as such, and only the second set of test values shall then be used for this purpose.

Where in the opinion of the Project Manager no significant difference occurs, the submission of the lot shall be regarded and assessed as a resubmission. Where a lot is resubmitted, it shall be assessed on the same basis as a first submission, except that the original and the second set of sample results shall be combined for purposes of assessment.

#### Procedures for Surface levels of fills and pavement layers

The statistical judgment procedures described below will apply to the corresponding product properties for purposes of acceptance control.

At least 50, but preferably more, level measurements shall be taken according to a stratified random pattern of each lot of completed layer work, and the specified levels shall then be determined. Outliers shall be identified and examined.

The lot will be considered to comply with the requirements in respect of surface levels if, before any repair work is undertaken, at least 90% of the level measurements show a deviation from the specified levels which is smaller than the  $H_{90}$  tolerance specified in the relative sections in regard to each layer.

Isolated spots, where the surface levels deviate by more than the appropriate  $H_{\max}$  tolerance of the specified levels shall be repaired to bring the deviation to within the  $H_{90}$  tolerance.

#### Procedure for Layer thicknesses of pavement layers

The statistical judgment procedures described below will apply to the corresponding product properties for purposes of acceptance control.

At least 30, but preferably more, layer thicknesses shall be determined in accordance with a stratified random pattern for each lot of completed layer work. Layer thicknesses may be determined by means of level measurements taken before and after construction of the layer in exactly the same position, but may be augmented by thicknesses measurements taken by means of holes made in the layer.

In the case of asphalt layers, the Project Manager may require thickness determinations to be made only by means of measurements on drilled cores, in which case the minimum number of cores per lot shall be 20 instead of 30.

Outliers shall be identified, disregarded, and, if possible, replaced. The lot will be considered to comply with the requirements for layer thicknesses if:

- At least 90% of all the thickness measurements taken before any thickness repairs are made are equal to or greater than the specified thickness, minus the  $D_{90}$  tolerance specified in the appropriate section; and
- The mean layer thickness of the lot is not less than the specified thickness, minus the  $D_{mean}$  tolerance.

Isolated spots where the actual thickness is less than the specified thickness less the  $D_{max}$  tolerance shall be repaired so as to fall within the  $D_{90}$  tolerance.

Procedure for Relative compaction of pavement layers

At least four relative density determinations shall be taken in the case of selected layers and at least six in the case of all other pavement layers in accordance with a random pattern. After outliers have been examined and replaced, compliance with the specified density requirements shall be determined as in Table 1.

**Table 1 – Acceptance limits in respect of compaction**

Layer	Prescribed Density	Unit of Measurement	Minimum average density for the following sample sizes						Minimum value for any single test for the following sample sizes					
			4	5	6	7	8	9	4	5	6	7	8	9
Select ed layer	95%	Mod. AASHTO density	95.1	95.4	95.6	95.7	95.9	96.0	91.4	91.2	91.0	90.9	90.8	90.7
Sub base	98%	Mod. AASHTO density	98.1	98.4	98.6	98.7	98.9	99.0	94.4	94.2	94.0	93.9	93.8	93.7
	100%	Mod. AASHTO density	100.1	100.4	100.6	100.7	100.9	101.0	96.4	96.2	96.0	95.9	95.8	95.7

Emulsion Treated Base	100%	Mod. AASHTO density	100.1	100.4	100.6	100.7	100.9	101.0	96.4	96.2	96.0	95.9	95.8	95.7
Crushed stone base	102%	Mod. AASHTO density	102.1	102.4	102.6	102.7	102.9	103.0	98.4	98.2	98.0	97.9	97.8	97.7

The sample mean  $\bar{x}_n$  shall be at least equal to or higher than the acceptance limit ( $L_a$ ) for the sample mean as given in Table 1, and no single test value shall be lower than the acceptance limit ( $L_e$ ) for single values.

***Submission of materials for construction use and mix design***

Table 2 provides guidelines in respect of submitting the materials in regard to the time and quantity of material required for testing, approval and the mix design. As the time stated in this Table does not make any allowance for possible rejection and the resubmission of alternative materials, the Contractor shall submit any doubtful materials at an early stage or together with alternative materials in order to minimize any delays in final approval.

**Table 2 – Schedule showing quantities and times for submitting the materials for approval and mix designs**

Material Submitted	Proposed Use	Submission for quality approval only		Submission for quality approval and mix design	
		Minimum time to be allowed for testing and approval	Minimum quantity to be submitted	Minimum time to be allowed for testing, approval and mix design	Minimum quantity to be submitted
Crushed stone	Coarse Aggregate for concrete	2 weeks	50 kg of each size of stone	8 weeks for structures	150 kg of each size of stone for each class of concrete
	Bituminous seals	2 weeks	50 kg of each size of stone	2 weeks	50 kg of each size of stone
	Asphalt mixes	2 weeks	50 kg of each size of stone	8 weeks	100kg of each size of stone
	Crushed stone base or sub base	3 weeks	50 kg	8 weeks (stabilisation)	200kg
Sand	Fine aggregate for concrete	2 weeks	50 kg of each size of aggregate	10 weeks	150kg of each type proposed for use for each class of concrete
	Asphalt mixes	2 weeks	15 kg of each size of aggregate	8 weeks	150 kg of each type proposed for use
	Slurry or sand seal	2 weeks	10 kg of each type proposed for use	6 weeks	50 kg of each type proposed for use
Gravel	Sub base or Base	4 weeks	200 kg of each size of aggregate	8 weeks (stabilisation)	200kg
Other materials	As specified	As prescribed by the Employer's Representative			

### ***Approval***

Where the Contractor is required in the Specification to submit samples of materials or mixtures to the Project Manager for approval prior to their being used in the Works, the use of these materials or mixtures without the Project Manager's written approval shall constitute default on the part of the Contractor, who shall be liable for the consequence of such default. All samples shall be submitted in sufficient time for proper testing.

The Project Manager's approval of any materials or mixtures shall in no way relieve the Contractor of his obligation to provide materials, mixtures and workmanship which comply with the Specifications.

Any material that appears defective or inconsistent with similar material being produced shall be sampled, unless such material is voluntarily removed and replaced or corrected.

### **TRANSMITTAL OF TEST REPORTS**

Written reports of tests and data furnished by the Contractor for the Employer's Representative's review of materials proposed to be used in the Works shall be submitted as specified and detailed in the Contractor's approved QCP.

The testing laboratory shall furnish 3 copies of a written report of each test performed by laboratory personnel in the field or laboratory. 2 copies of each test report shall be distributed to the Employer's Representative and 1 copy to the Contractor within 3 days of each test is completed. Laboratory submittal procedures and requirements shall be detailed in the Contractor's approved QCP.

### **INSPECTIONS AND TESTING**

Inspection testing is divided into 2 categories:

- On-site inspections and testing;
- Off-site inspections and testing.

#### ***1 On-Site Inspections and Testing***

On-site or job inspection shall be carried out on or in the vicinity of the Site and which when performed properly by the on-site laboratory (and/or any other on-site testing facilities that are approved by the Project Manager) result in complete compliance with the Contract Documents of all in-place work.

#### ***Off-Site Inspections and Testing***

The Contract may include off-site testing and inspection for the equipment and materials identified in the Specifications. Off-site testing and inspection shall be conducted in the presence of the Employer's Representative.

The Contractor shall give appropriate written notice to the Employer's Representative not less than 14 days before off-site inspection services are required and shall provide for the producer, manufacturer, or fabricator to furnish safe access and proper facilities and to co-operate with the inspecting personnel in the performance of their duties. The Contractor shall pay any expenses incurred by the Employer's Representative.

#### **CERTIFIED LABORATORY TESTS**

Tests by certified laboratories may be made by approved testing agencies on materials and equipment to be incorporated into the Works. Certified tests on materials to be incorporated into structures will be acceptable provided that they are performed by the manufacturer or by approved agencies or laboratories and show that the materials conform to the Specifications.

#### **MANUFACTURER'S CERTIFICATION**

Manufacturer certification may be furnished by the Contractor on items of materials and equipment to be provided - only when this method will assure, to the satisfaction of the Employer's Representative, full compliance with the provisions of the Contract. Pre-printed certifications will not be acceptable. All certification shall be originals.

The original of all manufacturers or independent laboratory certifications shall name the appropriate item of equipment and material, specifications, standards or other document specified as controlling the quality of that item and shall have attached thereto certified copies of test reports upon which the certifications are based. Certifications shall be traceable to each represented production batch by acceptable batch numbers, labels, etc.

#### **FINAL INSPECTION**

Prior to substantial completion of all or part of the Works and before inspection by the Employer's Representative, the QC Manager shall conduct an inspection of the work and develop a list of any items which do not conform to the plans and specifications. Such a list of deficiencies shall be included in the QC documentation and shall include the estimated date by which the deficiencies will be corrected. The QC Manager or staff shall make a final inspection to ascertain that all deficiencies have been corrected and so notify the Employer's Representative.

#### **1-13 NOTIFICATION OF NON-COMPLIANCE**

The QC manager will notify the Employer's Representative and the Contractor's Representative of any detected non-compliance with the foregoing requirements.

The Contractor's Representative shall, after receipt of such notice, immediately take corrective action. If the Contractor fails or refuses to comply promptly, the Employer's Representative may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to such 'stop orders' shall be made the subject of claim for extension of time or for additional costs or damages by the Contractor.

**MEASUREMENT AND PAYMENT**

The Contractor is wholly responsible for all tests required to ensure to his satisfaction that the materials he supplies and the work he executes is in compliance with the Specification. The Contractor is entirely responsible for all the costs of such testing.

The independent testing laboratory is for the benefit of the Project Manager to enable him to confirm that the Works are, in fact, compliant with the Specification and tests carried out by the independent testing laboratory on the instructions of the Project Manager will be paid for from the Provisional Sum for Independent Tests, provided that they do demonstrate compliance, If tests carried out by the independent laboratory fail or otherwise demonstrate non-compliance with the Specification then the cost of such tests, or groups or sets of tests as appropriate, shall be borne by the Contractor.

The Project Manager's liability to pay for testing and associated works is limited to the amounts due to the independent testing laboratory for the carrying out of tests as requested. The associated costs of sampling, transport of samples, provision of assistance and suchlike shall be the responsibility of the Contractor alone.

Payment shall be made in each invoice at the rate of 7% (seven percent) of the sum quoted in the BOQ until 84% (eighty four percent) of the sum has been disbursed. No further payment will be made until the Final Invoice which will include the remaining 16% (sixteen percent) or whatever greater amount remains.

The contractor is reminded of the following stipulations given in Section 01060 Service Quality Level Criteria

- Payment Reductions for non-compliance with SQLC on the general aspects of roads: For any road or road section, the Employer may reduce the Interim Payment Certificate by the percentage of non-compliance determined on the basis of this section of the Technical Specifications. The payment will therefore be the Interim Payment Certificate amount multiplied by the coefficient of compliance.
- Payment Reductions for non-compliance with SQLC on road roughness: In case of non-compliance, the payment reductions are equivalent to the amount needed by the Employer to have the works carried out which are necessary to establish the conditions of compliance which the Contractor should have complied with according to the Contract. The amount of the reduction is to be deducted by the Employer from the Interim Payment Certificate due to the Contractor.

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## ***SECTION 01050 – ENVIRONMENTAL MANAGEMENT***

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**1-1 DESCRIPTION**

GYSBI is committed to protecting the environment by conducting its day-to-day activities in an environmentally responsible manner and preventing or minimising any adverse environmental effects associated with construction of the highway. The Contractor is required to comply with all relevant regulations, policies and procedures regarding the environment as laid down in this section.

**ENVIRONMENTAL PERMIT & MANAGEMENT PLAN**

The Environmental Permit (EP) and Environmental Management Plan (EMP) form part of the Contract Documentation. All construction operations must meet the requirements of the EMP and the Contractor must fulfil all obligations under the EMP.

Where there is a conflict between the provisions of the EMP and other provisions of the contract the matter must immediately be brought to the Employer's Representative's attention in writing, and, unless otherwise directed by the Employer's Representative in writing, the provision of the EMP shall prevail.

**GENERAL REQUIREMENTS**

The general requirements and stipulations of the Environmental Management Plan (EMP) are indicated below. Commitments required under the terms of the Permit issued by the EPA of Guyana are included appropriately.

***1 Prior to Construction***

The Contractor shall nominate and appoint a qualified Environmental Manager who shall assume responsibility for implementation of the EMP during and post-construction. The Environmental Manager should hold no other position on the project.

***During Construction*****Plans and Activities**

The Contractor shall at the outset of construction, prepare a waste management strategy (WMS) providing a plan of action for the reuse, recycling and disposal of all types of waste materials generated during construction. This shall cover the 'post-construction' period when demolition of construction related yards, and other facilities may be required.

The objective of the strategy shall be to minimize disposal through the maximization of reuse and recycling opportunities. Together with the Employer, it is expected the construction team shall identify materials that could be made available to local governments and residents (e.g., topsoil, waste road surface materials, waste oils, etc.) for possible re-use.

The Contractor shall also prepare an Emergency Response Plan (ERP) that shall encompass the objectives and direction provided by the requirements for the management of spills management as described in the EMP. This shall also include procedures for notification and reporting of incidents and the establishment of an environmental emergency response team

(made up of the Contractor's Environmental Manager, the Employer's Representative's Environmental Inspector and the Employer's Environmental Project Manager.

Regular inspections of construction sites and equipment/materials staging areas shall be conducted by the Employer's Environmental Inspector and Inspection reports prepared on a weekly, monthly and quarterly basis.

The Employer shall maintain routine liaison with the Contractor, Environmental Inspector and the Guyana EPA as construction proceeds to ensure compliance with the EMP.

#### Mitigation Measures and General Environmental Protection Needs

The EMP indicates that the following types of mitigation measures are required:

- Construction shall be limited to daylight hours unless otherwise approved under extreme conditions.
- All construction sites shall be watered twice daily to reduce dust nuisance.
- Vegetation removal shall be limited to within 3m of the edge of the shoulder.
- All vehicles shall be regularly maintained and be equipped with appropriate mufflers and silencers to control air and noise emissions.
- The trunks of all trees to remain shall be protected with fencing/barriers.
- Trees shall be pruned within 48 hours of any accidental damage to roots and/or limbs resulting from construction.
- Waste stockpiles shall have a perimeter berm and must be located no closer than 10m from a watercourse or drain. They must be removed within 14 days of initial placement.
- Excavated topsoil shall be stripped and segregated for future re-use and stockpiled at an approved off-site area;
- Limited work only shall be allowed within a watercourse or drain.
- No vehicles, stockpiles or wastes shall be allowed within a watercourse or drain.
- Dewatering at a rate greater than 250 L/min must be directed through a geotechnical filter cloth bag or an equivalent method of filtration/settling and shall outlet no closer than 10m from a watercourse or drain. Fences / barriers (which do not restrict access to authorized personnel) shall be provided around the construction site to protect the safety of the public and work force.
- All materials management personnel shall be provided with periodic training in the proper handling of fuels, lubricants, chemicals and any other hazardous materials used during construction. This must include procedures for spill reporting, emergency response and spill clean-up procedures. Mock spill response exercises shall be conducted at the start of construction and every 6 months thereafter, for the duration of construction.

- All fuels, chemicals and other hazardous materials used during the construction phase shall be stored in approved containers in designated storage areas and shall be handled in accordance with the applicable specifications.
- Construction sites shall be properly illuminated and maintained in a safe condition and without risks to health.
- Material/equipment staging areas shall be constructed to provide a bermed area with an impermeable pad to protect against fuel transfer spills and the storage of hazardous materials.
- Oil changes on the right-of-way are prohibited.
- All damage arising from construction is the responsibility of the Contractor.

### ***Post-Construction***

#### Plans and Activities:

- Inspection of all work sites by the Employer’s Environmental Inspector at the completion of construction to ensure that the areas have been rehabilitated in compliance with the EMP
- Inspection of each equipment / materials storage areas shall be conducted by the Employer’s Environmental Inspector to ensure all facilities are restored in compliance with the EMP.
- An inspection report shall be prepared following each construction site and staging area inspection by the Employer’s Environmental Inspector.
- The Contractor shall conduct soils and if necessary groundwater quality testing at areas used for fuel storage, waste oil storage, bitumen storage/production or oil changes, which show signs of contamination (e.g., staining), and if necessary the preparation and implementation of a remediation plan.
- The Employer’s Environmental Inspector shall maintain routine contact with the Guyana EPA to ensure ‘post-construction’ compliance with the EMP.

#### Mitigation Measures and General Environmental Protection Needs

- Upon completion of construction, the Contractor shall take down and remove all temporary structures forming part of the sites and/or equipment/materials storage areas. He shall arrange for the disconnection of water supplies, removal of all associated drains and culverts, backfill trenches and latrine pits or soak away and other sewage disposal excavations – other than items and services required reverting to the ownership of the Employer.
- The Contractor shall restore the Site and staging areas as far as practicable, to their original condition and leave them in neat and tidy condition.

- Waste materials generated during demolition and clean-up shall be disposed of in compliance with the overall waste management strategy ensuring that opportunities for re-use and re-cycling are maximized.

**MEASUREMENT AND PAYMENT**

Payment for Environmental Management shall be made at the rate set down in the priced Bill of Quantities, Bill 1, General Requirements, Item 010501, Environmental Management.

Payment shall be made in each invoice at the rate of 7% (seven percent) of the sum quoted in the BOQ until 84% (eighty four percent) of the sum has been disbursed. No further payment will be made until the Final Invoice which will include the remaining 16% (sixteen percent) or whatever greater amount remains.

Payment of the Final invoice containing this balance of the sum due for Environmental Management will be contingent upon the whole site having been satisfactorily cleaned and made good to the standards of this Specification and in accordance with all requirements of the Environmental Management Plan and the Environmental Permit.

## **SECTION 01055 – SOCIAL MANAGEMENT**

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## 1-1 DESCRIPTION

The GYSBI is committed to have social and environmental safeguards built into the process for every phase of the project in order to minimize and mitigate any adverse social effects associated with construction works.

Fundamental to this new and improved standard is the authentic participation of stakeholders from inception – at design stage, through to post construction with the visible uptake of stakeholders' knowledge, practical experience and priorities into the project plans, options and decisions – as far as feasible.

The Contractor is therefore required to strictly adhere to and comply with all relevant national laws, policies and regulations, and is encouraged to abide with the procedures concerning social impacts as laid down in this section

## MANAGEMENT PLAN

In accordance with Division 01 – General, Section 01020 Contractor's Programme - A Project Schedule must be developed by the Contractor for the construction and post construction phase of the project.

This Project schedule should be developed with the participation of the Multi-Stakeholder Committee (MSC), the residents and business owners, small cottage industries and bottom house producers within the Area of Direct Influence (ADI) of the road works during construction; as well as the relevant local and national Government authorities, (MPW/WSG, NDCs and RDC) Utilities agencies.

Input of key user groups such as truckers, minibus drivers, taxi drivers, School Head & Staff, Health Clinic staff, Parent Teachers Associations etc. is also recommended.

## GENERAL SCOPE OF THE PROJECT SCHEDULE

### ***1-3-1 Social Responsibility:***

During the construction phase it is expected that all road works and related day to day activities will be conducted in a socially responsible manner by the contractors and all other related entities engaged in the operations. Social responsibilities include respectful behaviours and attitudes to the residents, business entities and personnel, staff and students of schools and the school buildings and compounds, health workers and health centres, churches, temples and mosques and their respective congregations, sports facilities, cultural and youth activities.

### ***1-3-2 Key Elements:***

In accordance with Division 01 – General, Section 01030 Safety and Traffic control, The Project Schedule should address, *inter alia*: access to residences and businesses; access roads/ entrances to settlements; locations for buses to stop; provisions for parking/ temporary parking

arrangements; provisions for the safe use of the road by pedestrians, especially children; one lane continuously open for flow of traffic in the construction zone; and a public sensitization program so that all major groups of stakeholders and the general public are aware of the parameters and condition of the road during construction, timings, congestion and systems in place to minimize bottlenecks etc. so as to know what to expect.

## **COMMUNICATING THE PROJECT SCHEDULE**

The Project Schedule should be adequately communicated to stakeholders with due notification about construction i.e. when work would commence or cease in order that stakeholders can prepare in advance. The plan should be made public and the standard of performance for contractors should also be made public so that the public can monitor the Contractor's progress and adherence to traffic management, public health and safety issues.

The following are the key elements required when framing the Project Schedule:

### ***1-4-1 Mechanism for Transparent Recruitment/Local Employment for local persons during construction***

- A transparent local recruitment mechanism is to be set up. Advertisement for local employment must be publicly posted and circulated widely within the communities.
- This is so as to avoid charges of closed door selection and cronyism and to build healthy relations with stakeholders from the inception.

### ***1-4-2 Construction Site Office***

- A clearly marked/sign-posted site office is to be set up and its location communicated to the RDC, NDCs and to the Multi-Stakeholder Committee (MSC). The Construction Site Office will serve as the designated contact point for information and interface with stakeholders.

### ***1-4-3 Grievance Management Mechanism***

- A Grievance Management Mechanism has been developed and should be implemented by the Contractor accordingly in order to log and respond to grievances, to manage conflicts and to prevent conflicts (as far as possible) and to take remedial action as required.

### ***1-4-4 Traffic Management during Construction***

- A comprehensive traffic management system is required as a central plank of the Project Schedule. This must lay out practical measures and where needed (police manned) alternative routes, detours lane use etc. to allow for the easing of traffic congestion. A sensibly phased approach with one lane open at all times for flow of traffic and to avoid / minimize bottlenecks and accidents caused during construction.

**1-4-5 Minimizing Congestion & Blockages of Entrances- as far as possible**

- In order to minimize negative impacts on the daily routines of residents, the entrances to driveways of residents' dwellings and of business places, churches, schools, health centers, community centers etc. need to be kept as clear as possible. Especially important is to take into consideration the vulnerability of school children as major road users and their need to get to school and return home safely and on time.
- Building materials and excavated soil etc. are likewise not to be placed in front of the entrance to homes in order to avoid blocked access (including vehicular access) to yards.

**1-4-6 Impacts on Businesses**

**Minimize losses to businesses** by facilitating - as far as possible - shops, vendors and other commercial enterprises to conduct business with minimal disruption during construction. Ensure that access by patrons to shops, services and business places is adequate in terms of both pedestrians and those requiring parking.

**1-4-7 Livelihood impacts**

Efforts will be made to minimize socio-economic and environmental impacts such as loss of income to some of the most vulnerable such as those residents (mostly women) engaged in cottage industries e.g. making condiments and vending on roadside to children and other customers/ passers-by. Obstructions and levels of dust are natural consequences of road construction and these will be explained as necessary to secure the understanding & cooperation of stakeholders especially those in the Area of Direct Influence (ADI) of the road works during construction.

**1-4-8 Socio-economic strain on households and parents, particularly women and children**

The negative effects of road construction / rehabilitation on households and families especially children and women need to be taken into account and efforts made to alleviate such negative effects as far as possible. Some of these effects include loss of sleep, fatigue, reduced performance at school and work due to constricted and congested travel and additional time to do so; school children and workers having to leave earlier and returning home later than usual. This also relates to the additional burdens and restrictions on parents working outside of the home and their family responsibilities because of extra time spent travelling to and from work and arriving home late and tired. Sleep deprivation and resulting stress are likely to take a toll on many parents, particularly women who are primary care providers in the home.

**1-4-9 Adverse health and household costs from dust and noise**

Residents living on and near the roads under construction are likely to endure prolonged periods of dust. Children suffer respiratory illnesses. In addition, regular house-holding duties like hanging out their laundry to dry are inconvenienced. Experiences of tension and stress are likely to be generated from exposure to the construction noise, the internal heat generated from having to

lock up their houses from the dust, and noise from the back up of traffic, including tooting horns, music, and the loud engines of cement mixers, other construction equipment, trucks etc.

#### ***1-4-10 Hotline***

There should be a hotline to which every resident has equal access and/or a formal structure/mechanism through which their concerns can be addressed

### **TIMING OF CONSTRUCTION**

Construction should be restricted to hours as stated below in Clause 6.5 of the Particular Conditions of Contract:

*“Normal and Overtime working hours will be in accordance with the Laws of Guyana. However, the contractor will have to work 50% of the project duration on a two shift basis evening or off-peak hours.”*

The EPA regulations do not allow for late-night work on roads in residential areas.

**The times for road works during construction phase need to be negotiated with stakeholders and local authorities; and clearly communicated – before construction commences.**

### **MONITORING DURING CONSTRUCTION**

**The following is a check-list of matters to be closely monitored during construction.**

- Non-response on local employment inquiries for hiring of labor during construction;
- Effects of the construction labor force on the neighboring villages, including local services and infrastructure;
- Queues or long traffic delays at road works;
- Risks to community health, safety & security;
- Damage to property not foreseen or discussed with stakeholders in the Construction Plan;
- Accessing entrances to residents’ driveways, business and commercial entities, housing schemes, schools, churches and health centers;
- Inappropriate conduct of construction workers towards stakeholders, particularly women & girls, school children and minors;
- Prolonged or unplanned loss of utility service (water, electricity etc.)

- Difference in final designs of the road as shown to stakeholders and what contractors are actually doing on the ground with respect to the overall design specs Project Schedule, Traffic Management Plan, Communications Plan, Environmental Management Plan and any other relevant plans.

## **MONITORING PRIOR TO CONSTRUCTION**

### **Key Stakeholder Entities/Personnel Stipulations for Social Component of the Construction Plan**

#### ***1-7-1 Social Specialist/ Community Liaison Officer***

The Contractor shall nominate and appoint a qualified Manager to serve as the Social Specialist / Community Liaison Officer to assume responsibility for the implementation of the Social component of the Construction Management Plan. This person should be qualified in Social Development /Stakeholder Relations and will work in tandem with the Social and Environmental Officers of the Client who will have general oversight and responsibility for ensuring that the Project Schedule is being duly implemented by the Contractor.

#### ***1-7-2 Multi-Stakeholder Committee***

The Multi-Stakeholder Committee (MSC) will have been established during the Design/ Pre-Construction Phase of the Project. The MSC will have a key role during the Construction phase and serve as an important mechanism for representation and communications between the Contractor’s Social Specialist/Community Liaison Officer and the residents and other stakeholders in the Area of Direct Influence (ADI) of the road works.

The MSC has an important monitoring mandate during Construction serving as the community “watch dog” to ensure that stakeholders’ interests are met in terms of the approved Designs and the mechanisms for on-going stakeholder engagement in the process. Specifically, the MSC will also be responsible for reporting any breach in contractual obligations such as digression from specifications for materials and design plans etc. as well as any breach in social responsibility and conduct etc. on the part of the Contractor’s team.

The MSC will also make representation on behalf of any stakeholders and will assist in resolving conflicts in compliance with the Grievance Management Mechanism.

## **INFORMATION AND COMMUNICATION PROTOCOL**

A general protocol for information-sharing & communications for transparency and accountability during construction will be jointly developed and implemented. It will include MSC accessibility to project site and project office etc. for monitoring purposes. The MSC will also have direct access to the Client

#### ***1-8-1 Avenues for Stakeholders Communications, Engagements with Contractor.***

The project stakeholder communications mechanism provides four opportunities through which stakeholders can directly register a complaint:

- The Project Telephone Hotlines
- The Monthly meeting held by the Contractor
- The four-monthly Open Forums held by the MSC
- Direct visits to the Contractor’s Site office

***1-8-2 Contractor’s Pre-Construction Meeting with Stakeholders***

The Contractor will meet with the regional and local authorities (RDC/NDCs) with the MSC and with residents and other key stakeholders at a special pre-construction session in which full disclosure of the specifications and plans of the road contract will be shared and questions answered and clarifications provided to stakeholders.

***1-8-3 Stakeholder Workshop***

A workshop session with the Contractor, the Client, the MSC, NDC & RDC will be convened and facilitated so that all parties are:

- Informed of the Construction Plan and its Social Management component;
- Informed of the salient details of the approved road design and its specifications;
- Apprised of their roles and responsibilities as stakeholders;
- Sensitized/familiarized with the Grievance Management mechanism;

**RESPONSIBILITIES OF THE SOCIAL SPECIALIST/COMMUNITY LIAISON OFFICER**

The Social Specialist/ Community Liaison Officer will serve as the official focal point & contact person for stakeholders wishing to make comments, queries, or a complaint.

***1-9-1 The Social Specialist/Community Liaison Officer will be responsible for:***

- Operating the Project Hotline;
- Attending monthly Contractor’s Open Houses;
- Participating in the MSC’s quarterly Open Forums and will have
- Logging any Complaints / Grievances from Stakeholders in a Grievance Log Book.

***1-9-2 Grievance Management Mechanism***

The procedures for logging Grievances are set out in detail in the Grievance Management Mechanism. This has been submitted separately to GYSBI and will be used in the orientation/familiarization Workshop session referred to below.

***1-9-3 Training Workshop(s)***

Staff of Contractors including the Social Specialist/Community Liaison Officer and the Environmental Management Officer, RDC & NDC members, MSC members, and staff of the GYSBI should be adequately trained and/or made adequately aware that they should refer a stakeholder to the Hotline or Site Office. All staff of the Contractors should receive training to direct the stakeholder to the hotline.

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## ***SECTION 02010 – SITE CLEARANCE and DEMOLITION***

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## **1-1 INTRODUCTION**

This section of the Work shall consist of removal of existing buildings, foundations and related structures, including driveways, fences, septic tanks, graves and suchlike, clearing and grubbing across the full area of the site, removal and stockpiling of top soil and removing and disposing of all debris from drainage channels and suchlike, removal of all substantial vegetation comprising trees, bushes within the designated limits inside the Right-of-Way (RoW).

The Section does not apply to any objects intended to remain in place or to be removed in accordance with other Sections except insofar as requirements for protection refer.

### **GENERAL REQUIREMENTS**

#### ***1-2-1      General***

The Employer's Representative will identify and establish the limits of the work and designate trees, shrubs, plants and other vegetation that are to remain in place. The Contractor shall protect and preserve all items not intended for removal.

#### ***1-2-2      Clearing of Debris***

All existing man-made and natural debris, abandoned vehicles and wreckage is to be removed from the Site and disposed of to the approval of the Employer's Representative prior to starting temporary or permanent works in any area.

Unless otherwise directed, all debris (agricultural implements, vehicles, containers, pipes, building materials etc.) within the RoW and any Contractor's work areas (camps, quarries, haul roads etc.) are to be collected and disposed of at a site to be approved by the Employer's Representative.

The Contractor shall be required to clear other loose debris of any kind that may exist on roadway surfaces and shoulders or within drainage channels, in readiness for the rehabilitation works. Any toxic waste or other hazardous materials encountered must be disposed of in accordance with the requirements of the Environmental Management Plan and the EPA of Guyana.

Similarly, the Contractor shall clear debris of any kind that may have accumulated within major cross culverts and on bridge decks.

Payment for Clearing of Debris will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site and Earthworks, Item 020101, Clearing of Debris.

#### ***1-2-3      General Clearance - Cleaning and Grubbing of Vegetation***

This work shall include the removal from the work areas of all encroaching vegetation, trees, shrubs, grass and other undergrowth as designated by the Employer's Representative. Clearance of vegetation from shoulders shall be limited in general to a maximum dimension

equal to the proposed limit of construction plus 2.0 m, beyond this point, existing vegetation on the side slopes of embankments and ditches shall be undisturbed.

Tree stumps and root systems may remain at the discretion of the Employer's Representative or otherwise be removed. Undisturbed and sound stumps and non-perishable solid objects located more than 1m below sub-grade and on the slopes of ditches and embankments beyond the proposed shoulder width may remain in place. When authorized, stumps and non-perishable solid objects that do not extend more than 10 cm above the ground line or low water level may remain if they are located outside the construction limits.

Payment for Cleaning and Grubbing of Vegetation will be made at the rate set down in the priced Bill of Quantities, Bill 2, Demolition and Site Clearance, Item 020102, General Clearance.

#### ***1-2-4 Cleaning of Culverts***

This work shall include the removal of sand, silt and other deposits from the existing culvert systems as directed by the Employer's Representative. Material shall be disposed of off-site in accordance with the general requirements of these Specifications and in the case of toxic or hazardous materials, in conformance with the Environmental Management Plan.

The Contractor shall clean and clear the inside of pipe and box culverts that are to remain in service in order to restore their original line and bed levels. The Contractor shall ensure that all side ditches and all points of intake from and discharge to, associated pipes and culverts are cleaned of any spoil, mud, slurry or other materials likely to impede the free flow of water.

Payment for Clearing of Culverts will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020103, Clearing of Culverts.

#### ***1-2-5 Cutting of Topsoil (stripping)***

In areas of excavation for road or shoulder works or under roadway embankments or where otherwise designated by the Employer's Representative, the Contractor shall remove existing topsoil. The material shall be stockpiled for future re-use or disposed of as directed.

Removal of topsoil over any designated area shall be executed to the depth directed by the Employer's Representative and the topsoil shall be stockpiled and kept separate from other excavated material. In general, stockpiled topsoil shall include only that part of the removed material that is sufficiently fertile to encourage or sustain the growth of vegetation. For estimating purposes, this has been assumed to be 150 mm but may vary throughout the site.

In general, the whole of the topsoil so excavated is to be used for future dressing of the slopes of verges, embankments or other areas directed by the Project Manager or as indicated on the drawings, the work of topsoil stripping will be deemed to include provision of storage areas and the hauling of topsoil to stockpile. The Contractor shall be responsible for locating and providing the sites for stockpiles, maintaining these sites for the duration of the Works and reinstating them to approved standards when they are no longer required.

Payment for Cutting of Topsoil Stripping will be made at the rate set down in the priced Bill of Quantities, Bill 3, Earthworks, Item 020104, Cuttings-Cutting topsoil.

**PROTECTION OF ITEMS DESIGNATED TO REMAIN**

In areas designated by the Employer’s Representative, the Contractor will be responsible for the protection of existing shrubs, trees and grassed surfaces. Upon completion of the Works these areas will be returned to the Employer in the same condition as before and any damage due directly or indirectly to the Contractor's operations shall be made good at no additional cost to the Employer.

Trees intended to remain within the roadway area shall be trimmed, protected and left standing. Branches of trees extending over the area occupied by the roadway shall be trimmed as directed, to give a clear height of 5m above the roadway.

All existing walkways, paths, fences, walls, hedges, trees, shrubs, lawns and other features which the Employer’s Representative instructs shall not be removed or otherwise dealt with, shall be protected from damage. Any damage that occurs due to the Contractor’s failure to take adequate precautions shall be repaired at the Contractor’s expense.

Private property items that are to remain in place (buildings, fences, sewers, drains, water or gas service pipes, conduits, poles, walls, posts, ditch crossings etc.) shall be carefully protected from damage and displacement.

Payment for Protection of Items Designated to Remain will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020105, Items Designated to Remain.

**DISPOSAL OF CLEARED MATERIAL**

***1 Ownership of Materials***

Except as may be otherwise called for in the Contract Documents, all materials removed by the Contractor shall remain the property of the Employer unless instructions are issued for disposal by the Contractor at no cost to the Employer.

Usable timber shall be neatly stored in an approved accessible place within or near the right-of-way as directed and shall be trimmed and stacked in accordance with the requirements of the appropriate Agency.

All other timber that is not salvageable and all brush, stumps, roots, logs, and other refuse from the clearing and grubbing operation shall be disposed of at locations to be provided by the Contractor in compliance with the EMP.

***Burning of Debris***

Where burning of such materials is permitted, all such burning shall be subject to applicable laws, ordinances and regulations and shall be done at locations where trees and shrubs adjacent to the cleared area will not be damaged.

Where burning is prohibited by law, ordinance, or regulation, the Contractor shall dispose of the materials within areas provided by him and approved by the Employer's Representative.

#### ***Disposal in Areas Adjacent to Project***

Materials may be disposed of on private property, provided the Project Manager is furnished with a written statement from the owner of the property giving permission for the disposal of the materials there. All disposal areas for materials resulting from clearing and grubbing, both on private property and on property owned by the Contractor, shall be in areas out of sight of the project and at least 100m from the nearest roadway RoW boundary. If the materials are to be buried, the 100m dimension may be waived. This provision does not in any way remove the Contractor's responsibility to dispose of materials in accordance with the ESMP.

#### ***Leveling of Terrain***

Within the areas between the limits of construction and the outer limits of clearing and grubbing, all holes and other depressions shall be filled and all mounds and ridges cut down. The areas shall be brought to sufficiently uniform contour that the subsequent mowing and cutting operations will not be hindered by irregularity of terrain. This work shall be done regardless of whether the irregularities were the result of the Contractor's operations or existed originally. Permanent ponds or other permanent water areas, as so designated by the Employer's Representative, will not be required to be filled.

No separate payment shall be made for the cost of burning debris, providing disposal areas adjacent to the Project area, levelling terrain, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

### **MEASUREMENT AND PAYMENT**

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities Bill 2 Site Clearance and Demolition, Item 020101 Clearing Debris, Item 020102 Clearing and Grubbing of Vegetation, Item 020103 Cleaning of Culverts, Item 020104 Cutting of Top Soil and Item 020105 Protection Items Designated to Remain, using the units of measurement specified.

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## ***SECTION 02020 – DEMOLITION AND REMOVALS***

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## 1-1 INTRODUCTION

Demolition and removal of existing features by the Contractor shall be carried out within the RoW at roadway and structure rehabilitation areas as directed by the Employer's Representative and as shown on the Drawings.

The Employer's Representative may instruct that materials recovered from demolition work shall remain the property of the Employer unless specifically provided otherwise in the Contract Documents.

All designated saleable material shall be removed, without unnecessary damage, in sections or pieces that may be readily transported and shall be stored by the Contractor at specified places as directed by the Employer's Representative.

Cavities left by the removal of drainage structures etc. shall be back-filled with acceptable material to the level of the surrounding ground if no replacement is intended. If replacement is intended the cavities should be adequately protected until reconstruction work at the particular site commences.

Demolition and removal of existing structures includes salvage of materials removed, preservation and storage within the RoW or at any other locations as may be designated by the Employer's Representative.

Where indicated on the plans or directed by the Project Manager the Contractor shall demolish and remove houses or other buildings.

Prior to commencing demolition the Contractor shall ensure that water, electricity and telephone connections have been severed and secured in accordance with the requirements of the relevant public authorities and in such a manner that all disconnections are outside the limits of the Works.

Demolition shall be complete down to existing ground level.

Where indicated on the plans or directed by the Project Manager the Contractor shall demolish and remove foundations and any other appurtenances relating to demolished houses or buildings at or below ground level. This demolition will include the complete removal of all concrete, stone, timber, iron other manmade constructions at or below ground level and will include the removal of any driveways and septic tanks, cess pits and the like.

Any holes or voids extending below ground level as a result of demolitions shall immediately be filled with compacted soil or sand to the level of the surrounding ground. Under no circumstances may such excavations be left open and in particular they must be kept dry and not be allowed to collect water.

The contractor shall remove all debris and organic matter resulting from demolitions from the site and dispose of the same in accordance with the requirements of these Specifications and the EMP.

**DEMOLITION OF CONCRETE ABOVE GROUND - REMOVAL OF CONCRETE DRIVEWAYS, SIDEWALKS & BUS SHELTERS**

Existing concrete features designated for removal including base materials, shall be broken into pieces the size of which shall not exceed 300 mm in any dimension. Payment for this work will be paid at the rate quoted in the Bill of Quantities. Stockpiling at designated locations on the site for possible re-use by the Employer or otherwise disposed of will be done at no cost to the Employer. Removal of existing curbs shall be undertaken in a manner so as to avoid damage to abutting surfaces and items designated to remain.

Where parts of existing concrete features are to be retained in place, saw cutting or other approved means shall be used to separate them from the sections to be removed.

Payment for Removal of Concrete Driveways and Sidewalks will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020201, Removal of Concrete Driveways and Sidewalks. Payment for removal of Concrete Curbs will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020208, Removal of Concrete Curbs. Payment for removal of Bus Shelters will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020209, Removal of Bus Shelters.

**REMOVAL OF TRAFFIC SIGNS, TRAFFIC SIGNALS AND STREET LIGHTS**

Where directed, traffic signs, traffic signals and street lights including posts and sign board frames, etc. shall be carefully dismantled, removed and stored as directed by the Employer's Representative at no additional cost to the Employer.

Concrete foundations shall be broken into pieces, removed and stockpiled at designated locations or for disposal as may be directed by the Employer's Representative at no extra cost to the Employer.

Payment for Removal of Traffic Signs, Traffic Signals, Street Lights and Foundations, including Storage of Signs and Street Lights will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020202, Removal of Traffic Signs, Sign Board frames, etc.; Item 020203 Removal of Street Lights, Item 020204 Removal of Traffic Signals and Foundations.

**DEMOLITION OF STRUCTURES BELOW GROUND - REMOVAL OF DRAINAGE STRUCTURES**

Bridges, culverts, retaining walls and other existing drainage structures shall not be removed until satisfactory arrangements have been made to accommodate traffic. The Contractor's attention is drawn to the need to maintain or make provision for existing waterways at all times during construction of a bridge or culvert.

Where existing bridges and box culverts are to be removed or demolished to facilitate new construction, only that part sufficient to enable construction of the new structure, shall be removed or demolished. The wing walls of existing structures which require removal for the construction of a new structure shall be demolished to the level specified on the Contract Drawings to retain fill. Particular care shall be taken not to disturb or demolish existing toe piling/scour protection at outlets and such piling shall be carefully maintained and incorporated into the new outlet structure.

Elements or parts to be removed shall be agreed with the Employer's Representative prior to their removal. Steel and timber bridges, when specified by the Employer's Representative to be salvaged, shall be carefully dismantled without damage. Steel members shall be match-marked, unless the Employer's Representative waives such requirements. All salvaged material shall be stored as and where directed.

All culvert sections removed, which are not designated for stockpiling or relaying, shall become the property of the Contractor and be removed from the Site and disposed of in a manner and location approved by the Employer's Representative.

Generally, concrete shall be removed by manually or mechanically operated pavement breakers, by concrete saws or by chipping hammers unless otherwise directed by the Employer's Representative. Piles and Sheet piles should be cut 0.5m below the mud line. Works are to be carried out to the Employer's Representatives' satisfaction.

All demolition waste, subject to the requirements of the relevant Specification sections, and after removal of reinforcement where applicable, shall be re-used either for riprap or fill material or other approved use. Unless waived in writing by the Employer's Representative, demolition waste removed that is suitable for re-use but not needed on this Contract, shall be stockpiled at designated locations for future use by the Employer. Payment for the work specified in this section of the Specification shall be made under the relevant items in the Bill of Quantities.

Payment for Removal of Drainage Structures will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020205, Removal of Drainage Structures and Item 020206, Removal of Existing Retaining Walls include for revetments and other retaining structures.

#### **PARTIAL REMOVAL OF BRIDGES**

Where only a section of an existing drainage structure (bridge or culvert) is to be demolished, the Contractor shall execute this work in such a way as to avoid damage to the section designated to remain which shall include any toe piling or scour protection of a similar nature not specifically scheduled for replacement. All details of the Contractor's proposed method of demolition shall be submitted in advance to the Employer's Representative for approval. All drainage structures under replacement bridges shall be removed to the mean water level occurring over the previous 5 year period. Piles and Sheet piles should be cut 0.5m below the mud line. Works are to be carried out to the Employer's Representatives' satisfaction.

Generally, concrete shall be removed by manually or mechanically operated pavement breakers, by concrete saws or by chipping hammers. Explosives shall be not used. Where concrete is to be removed to neat lines such removal shall be done by use of concrete saws capable of providing a reasonably uniform face. If the equipment used will not provide a uniform cut without surface spalling, the outlines of the work shall first be scored appropriately.

Payment for Partial Removal of Bridges will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020207, Partial Removal of Bridges.

#### **CONCRETE CURBS**

Curbs shall be removed manually or using mechanically operated concrete breakers. When curbs are to be removed to neat lines concrete saws should be used to provide a reasonable uniform face.

Payment for Removal of curbs will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020208, Removal of Concrete Curbs.

#### **DISPOSAL OF MATERIALS**

Except as described above, all waste materials shall be disposed of by the Contractor in areas provided by him and approved by the Employer's Representative. Any material designated to remain the property of the Employer should be either stacked in neat piles within the RoW or loaded and transported to designated storage areas. This will be done at no additional cost to the Employer. The Contractor is encouraged to liaise with the Neighboring District Council in establishing a use any disposed material and storage areas.

No separate payment shall be made for the cost of, Disposal of Materials and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

#### **MEASUREMENT AND PAYMENT**

The work under this Section shall be deemed to include any precautions or special working methods necessary to avoid danger to abutting material and structures designated to remain. The Contractor shall rectify any such damage caused. All work shall be as directed by the Employer's Representative including the removal and disposal of all demolition materials.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities measured under the items quoted under Bill 2. Site Clearance and Demolition, Item 020201 Demolition of structures above ground, Item 020202, Removal of Traffic Signs, Sign Board frames, etc.; Item 020203 Removal of Street Lights, Item 020204 Removal of Traffic Signals and Foundations, Item 020205 Demolition of structure below ground, Item 020206, Removal of Existing Retaining Walls, Item 020207 Partial Removal of Bridges; Item 020208 Demolition of structures above ground- Concrete Curbs and Item 020209 Removal of Bus Shelters using the units of measurement specified. ***Not Applicable***



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## **SECTION 02030 – EARTHWORKS**

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**1-1 DESCRIPTION**

The work specified in this Section covers excavation, haul, dispose of, place and compact specified materials necessary to construct the project particularly those areas required for roadway and shoulder construction and for new drainage ditches. Also, for the construction of fill areas using material from approved borrow areas and for the preparation of sub-grades.

Clear, grub, and remove topsoil before beginning excavation, grading and embankment operations. Salvage top soil as specified in Section 02010 (Site Clearance) Provide a uniform and smooth finish to excavated surfaces. Obtain the Project Manager's approval before wasting excavation material. Excavate and perform operations without disturbing material outside staked constructions limits.

Dispose of surplus or unsuitable excavated material at the direction of the Project Manager. Obtain written agreements with property owners and government authorities for disposal locations outside the right-of-way limits. Use suitable surplus material to flatten slopes within the right-of-way. Do not place excess or unsuitable material in wetlands.

Grade obliterated roadways to restore the original ground contour. Form natural, rounded slopes. Remove and dispose of pavement and base courses as specified in Sections 02010 (Site Clearance) and 02020. (Demolitions and Removals)

Included in the excavation under this Section are materials that are encountered within the required limits of the excavation (except as may be specified to be removed under the work of clearing and grubbing and stripping of topsoil or under other items related to the removal of such materials).

Excavation and backfill associated with pothole or patch repair, the cleaning of drainage ditches and culverts, work specifically billed as structural excavation, structural backfill and embankment of White Sand or Reef Sand fill shall not be included in this work description.

If the operations expose artifacts of historical or archaeological significance, the excavation shall be temporarily discontinued and the event brought to the attention of the Project Manager in writing.

The excavation shall be resumed only when directed by the Project Manager.

All excavation is to be kept dry and the contractor shall take all necessary measures to maintain excavation free from water during construction. The method of keeping excavations clear of water, dewatering and disposal of water, shall be subject to approval of the Project Manager. The Contractor shall ensure that sufficient standby plant is on site at all times to avoid any interruption in continuity of dewatering. Where required by the Project Manager, the sumps from which pumps operate shall be constructed outside the area of the embankment limits.

## CLASSIFICATIONS

The excavation specified under this Section will be classified as General, Unsuitable Material and Ditch Excavation.

### *1-2-1 General Excavation*

General excavation shall include roadway excavation and borrow excavation as defined below.

#### Excavation or Roadway Excavation

Excavation shall consist of excavation within the construction limits of the roadway and stockpiling the excavated material for future use, or satisfactorily dispose of the material if it deemed to be unsuitable. Where excavation beneath a roadway area is required to a specific level (Grade level) and the Contractor excavates below this level, such over-excavation shall be made good using material approved by the Project Manager at the Contractor's expense.

When widening an existing road, extreme care and all necessary precautions shall be taken by the Contractor to ensure the integrity/stability of the existing road is maintained at all times during the construction period. In order to maintain the integrity of the existing road, excavation shall be only permitted in a 50 metre length at a time, immediately after which backfilling and compaction will be done in accordance with the requirements of the specifications before another 50 metre section can be excavated. Allowance shall be given for propping.

Excavation will be calculated from levels measured after demolition of existing pavement to the level of the grade line. Payment for Roadway Excavation will be made at the rate set down in the priced Bill of Quantities, Bill 3, Earthworks, - Excavation for cuttings- from commencing surface or excavation for cuttings from excavated surface.

#### Borrow Excavation (Applicable to interior projects mostly)

Borrow excavation shall consist of excavation, transport and placement in embankment of material from authorized borrow sources. It shall include only material that is suitable for construction of embankments or of other works covered by the contract and, where so specified, shall be in accordance with the requirements of the Drawings and these Specifications. The Contractor will make arrangements and pay all costs involved in procuring borrows.

Payment for Borrow Excavation will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site Clearance and Demolition, Item 020302, Borrow Excavation.

### *1-2-2 Unsuitable Materials*

#### Sub-Excavation Areas

Where unsuitable material is removed by sub-excavation of unsuitable material below the grade level, the surface of the exposed area shall be compacted by rolling with an appropriate roller for the full width of the sub-excavated zone (pavement areas and/or shoulders). Such rolling shall be done before any backfill is begun and shall be continued until the required support strength is achieved. This requirement shall not apply where the surfaces are below the normal

water table. The procedure and equipment required for this operation shall be varied at the discretion of the Project Manager.

Where silt, soft clay or other deleterious material is found within the limits of the roadway and is deemed to be unsuitable, the Contractor shall sub-excavate such material to the cross-sections shown on the Drawings or as otherwise indicated by the Employer’s Representative and backfill the void with suitable material.

Material removed shall be disposed of in approved spoil areas or, if judged suitable for re-use for the flattening of side slopes, shall be stockpiled or transported and placed free of charge as directed.

Sub excavation consists of excavation of material below grade elevation shown on the plans. Payment for Sub Excavation will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site and Earthworks, Item 020303, Sub Excavation.

**1-2-3 Ditch Excavation**

This work covers excavation and disposal of excavated material from new ditches, earthen channels and concrete channels where indicated on the drawings or otherwise directed by the Project Manager. The cleaning of existing watercourses is not included herein.

Tolerances for new ditches are as stated below, provided the cross sectional area of channels, bed width, and bank top level shall be not less than those shown on the Drawings or ordered by the Project Manager.

<b>Description</b>	<b>Tolerance</b>
Bed level	+/- 50mm
Side slope (from position shown on drawing)	+/- 20mm
Bank top level	Not less than specified
Centre Line of Channels	+/- 250mm from original CL

All surfaces shall be finished off neatly and evenly.

New ditches shall be constructed in accordance with the general procedures set out for excavation. The affected area will be cleared and grubbed, topsoil will be stripped and set aside and the remaining excavated material will be classified for use in the Works as noted in paragraph 2 above.

Payment for Ditch Excavation will be made at the rate set down in the priced Bill of Quantities, Bill 2, Site and Earthworks, Item 020304, Ditch Excavation.

**DISPOSAL OF SURPLUS AND UNSUITABLE MATERIAL**

**1-3-1 Ownership of Excavated Materials**

Any surplus materials shall remain the property of the Employer and shall be disposed of outside the RoW to the satisfaction of, and in locations instructed by, the Project Manager and in accordance with local laws including the provisions of the EMP. The costs of such disposal

shall be borne entirely by the Contractor who shall make allowance for them in his excavation rates.

In urban or other areas where temporary storage of suitable materials within the RoW may be impracticable, the Contractor shall stockpile the materials in areas provided by him until such materials are needed in the job or become surplus. With the written approval of the Project Manager, the Contractor may dispose of apparent excess material on the understanding that any portion of the disposed material that may subsequently be required to meet flattening requirements will be replaced with similar material at no cost to the Employer.

If material is to be stocked temporarily, no extra compensation will be allowed for any re-handling involved.

#### ***1-3-2 Disposal / Spoil Areas***

Unless otherwise permitted, the Contractor shall dispose of surplus excavated materials outside the RoW in approved spoil areas. The Contractor shall furnish the disposal areas without additional compensation and shall identify them and the proposed method of disposal for the approval by the Project Manager. This shall be at least 30 days before the opening of the disposal areas.

Areas provided by the Contractor for disposal of removed materials shall be out of sight of the project and at least 100m from the nearest public roadway and RoW boundary. The 100m limitation will not apply, however, if the material is properly deposited, compacted, landscaped and planted in accordance with a scheme approved by the Project Manager.

No separate payment shall be made for the cost of, Disposal of Surplus or Unsuitable Materials and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

### **BORROW (APPLICABLE TO INTERIOR PROJECTS MOSTLY)**

#### ***1-4-1 Authorization for Borrow***

In no case shall material be borrowed until so agreed by the Project Manager and then only from the approved borrow pits and in accordance with the requirements of the EMP. No borrow pits shall be opened until the Project Manager has approved their location and the restoration method to be used. Borrow pits shall be set back from the road reserve by at least 100 metres.

No borrow material shall be obtained from any substitute areas until the Contractor has made written request for permission to use such areas and the Project Manager has approved in writing, the use of the particular areas. Upon such written approval by the Project Manager, the substitute areas shall be considered as additional 'designated' borrow areas.

Except in the case of existing commercially operated sources, the Contractor shall supply the Employer with evidence that necessary permits, rights or waivers (including those from the Environmental Protection Agency) for the use of such areas have been secured.

Upon completion of excavation all exposed areas, including haul roads, shall be neatly shaped and dressed so as not to present an objectionable appearance. The cost of grassing or other

permanent erosion control measures as may be directed by the Project Manager shall be included in the cost of the works.

A waiver of the 100m setback requirement will be considered only in rare and unusual circumstances where a definite public benefit will result. Each such request to encroach on the 100m setback must be accompanied by the Contractor's proposed plan of landscaping and restoring the disturbed area so as to blend with the surrounding terrain. The cost of all landscaping and restoration work required due to encroachment upon the 100m setback will be at the expense of the Contractor.

#### ***1-4-2 Preparation of Borrow Areas***

Before winning material from borrow areas is commenced the area to be excavated shall have the topsoil stripped to a depth of 200mm, or such other depth as may be directed by the Project Manager, having regard to the effective depth of vegetation and organic matter and to the use to which the borrow material is to be put. The stripped topsoil shall be set aside and reserved for the final reinstatement of the borrow area.

#### ***1-4-3 Drainage of Borrow Areas***

Ditches for the adequate drainage of borrow pits shall be installed and the materials generated by the excavation of such ditches shall be classified as topsoil (and retained at the site for restoration purposes) or as borrow. Suitable materials designated for use as borrow shall be hauled and place in fill areas as directed by the Project Manager.

Where borrow pits are located in areas of flat terrain and where the Project Manager agrees that drainage is impractical, borrow pits shall be fenced on all sides to ensure that adequate protection is provided for members of the public and for animals.

#### ***1-4-4 Haul Routes for Borrow Pits***

The Contractor shall provide and maintain at his own expense all temporary or permanent roads used for hauling the borrow material. Where such haul roads are used by others, the Contractor shall not permit such roads to deteriorate in condition due to his operations.

The Contractor shall make his own arrangements for the use of all non-public haul routes crossing private property. Any expense for the use of such haul routes shall be the responsibility of the Contractor.

#### ***1-4-5 Reinstatement of Borrow Pits***

When extraction operations for the purposes of the Works at any borrow pit opened by the Contractor for the purposes of the Works have concluded, the pit shall be closed and reinstated. If the pit is a free draining pit then it shall be carefully shaped and graded to a form agreed with the Project Manager and in such a manner that no slopes shall exceed the normal gradient of slopes in the surrounding terrain. Upon conclusion of re-grading the whole of the affected area shall be covered with a uniform layer of topsoil using the material set aside when the pit was opened. The topsoil layer shall be seeded, grassed or otherwise vegetated in a manner

acceptable to the Project Manager and calculated to ensure that the whole area is adequately vegetated within 6 months of completion of reinstatement.

After the conclusion of reinstatement no area of any borrow pit shall be left in such a condition that it can hold standing water.

No separate payment shall be made for the cost of, Preparation, Drainage, Reinstatement, Construction of Haul Roads, or any other activity associated with the operation of Borrow areas. The Cost for complying with the requirements in this Clause is deemed to have been included by the contractor in the Bid Price.

## **MATERIALS FOR EMBANKMENT**

### ***1-5-1 General Requirements***

The words “fill” and “embankment” are used inter-changeably in these Specifications.

Material used for construction of fills or embankments shall not contain stumps, roots, brush, vegetable matter, rubbish or other material that cannot be compacted into a suitable and enduring structure. Material designated as unsuitable shall be removed and disposed of. Fill material must be approved by the Project Manager.

Granular material shall comply with ASTM D1241-15. Construction of fill or embankment shall be in accordance with Drawings or as directed by the Project Manager. Unless approved by the Project Manager the fill material shall not contain particles of size larger than 150mm.

### ***1-5-2 Specially Selected Fill***

Where specially selected fill is shown on the drawings or is ordered by the Project Manager, the material used shall be such as to give a stable construction with low permeability and shall be to the Project Manager’s approval.

### ***1-5-3 Moisture Content***

Materials shall be compacted at their optimum moisture content such that the specified density can be attained. If necessary, to attain the moisture content, water shall be added to the material or the moisture content lowered by working the material and/or by forming windrows and allowing it to dry as may be required.

### ***1-5-4 Density Requirements***

Each layer of the material used in the formation of embankments shall be compacted to a density with section 01040 – Quality control - table 1. Each layer shall be uniformly compacted using equipment that will achieve the required density and as compaction operations proceed the moisture content of each layer shall be increased or decreased to meet the specified density. Each layer shall be shaped and worked as necessary to assure uniform density throughout the embankment.

The density of each layer is to be tested by ASTM D 6938-10 the Nuclear Density Gauge. In the event of discrepancy between test results using the Nuclear Density gauge and Drive cylinder test in accordance with ASTM D2937-17e2 shall be performed, the Drive cylinder results shall be taken as the true value.

#### ***1-5-5 Sub-grade Preparation***

The existing embankment, where slopes are steeper than 6:1, shall be benched to receive the new construction. Bench continuously in loose lifts of less than 300 mm. Ensure benches can accommodate placing and compacting equipment. Begin all horizontal cuts at the intersection of the ground line and the vertical side of the previous bench. Step existing slopes to keep the embankment from wedging against structures.

Remove all organic matter from the existing ground surface (roadbed). Compact the roadbed with a walk behind roller or plate compactor to the satisfaction of the Project Manager's Representative.

### **CONSTRUCTION OF EMBANKMENTS**

#### ***1-6-1 Embankment Construction***

##### Existing embankment reconstruction

Scarify existing roadways containing granular material within 1 m of the sub grade to a depth of 150 mm. Compact to a density of at least 95% of the maximum density as determined by ASTM D1557-12 Method A. Each layer shall be uniformly compacted using equipment that will achieve the specified embankment density.

##### Embankment Adjacent to Structures

Compact the embankment without applying excessive pressures against the structure. Place fill adjacent to the end bent of a bridge only to the bottom of the back wall until the superstructure is in place. Bring up embankment equally on both sides of a concrete wall or box-type structure.

##### Roadway Embankment

Place and spread roadway embankment in uniform horizontal lifts of less than 250 mm loose measurement. The material shall meet the requirements of AASHTO M 57-80. Compact the embankment to a density of at least 95% of the maximum density as determined by ASTM D1557-12 Method A. Each layer shall be uniformly compacted using equipment that will achieve the specified density before placing the next lift. This procedure shall be repeated until the embankment is completed. The contractor may request from the Project Manager's Representative to place thicker layers providing he can demonstrate that compaction to the required density can be achieved. Maintain proper moisture content to achieve the required density and stability.

### Embankment over Wet or Unstable Foundations

Compact the first layer of fills over swampy or otherwise unstable ground in lifts sufficient to support equipment. Compact the fill uniformly across the area to produce a compacted embankment that does not rut under loaded hauling equipment.

Shape roadbed for its full width to required grade and cross section. Compact the roadbed by light rolling to allow placement of fill material without rutting or displacing the roadbed.

Ensure the finished roadbed surface is smooth and conforms to prescribed elevations before constructing the embankment. Limit the maximum variation from the roadbed to the prescribed elevation to 10 mm.

Correct all finished sections damaged during construction operations at no cost to the Employer. Where areas of widening are of insufficient width to permit the use of standard compaction equipment, the required compaction effort shall be provided by sidewalk rollers or trench compaction equipment that meets the approval of the Employer's Representative.

It shall be the Contractor's responsibility to maintain the required density until the sub-base and/or base layers above are placed on the sub grade.

### ***1-6-2 Maintenance and Protection of Work***

While construction is in progress, adequate drainage for the roadbed shall be maintained at all times. The Contractor shall maintain all earthwork construction throughout the duration of the Contract and shall take all reasonable precautions to prevent loss of material from the roadway due to the action of wind or water.

He shall repair at his expense, except as otherwise provided herein any slides washouts, settlement, subsidence, or other mishap which may occur prior to final acceptance of the work.

All channels excavated as a part of the Work shall be maintained against natural shoaling or other encroachments to the lines, grades and cross sections shown in the plans, until final acceptance of the project.

The Contractor's proposals for protecting the Works constructed under the Contract from damage by flooding or otherwise in the course of his work on the construction of associated structures, shall be submitted to the Project Manager for approval. Such submission and approval shall not in any way absolve the Contractor from responsibility for any damage which may be incurred subsequently.

### ***1-6-3 Final Shaping:***

As a final grading operation, the surface of embankment shall be shaped to conform to the lines, grades and cross sections shown on the Drawings or as directed, within the tolerances specified below. Hand dressing will not be required except as necessary in confined areas where equipment operation is restricted. Where the upper surface of embankment (formation level) is to form the underside of the sub base, it shall be shaped accurately to conform to the

required shape and levels shown in the drawings. Finished levels of the complete embankment course shall not exceed the design level and shall not be more than 30mm below design level.

If instructed by the Project Manager, level testing shall be carried out in accordance with “Procedures for Surface Levels of fills and pavements layers” Clause 1-7 Sampling, in QUALITY CONTROL Section 01040. The grid will not conform to any system of points or levels used by the Contractor for setting out the surface originally. In addition further check levels will be taken at any point or area which appears to be too high or low.

#### ***1-6-4 Operations Adjacent to Pavement***

When shoulder dressing is underway adjacent to a pavement lane being utilized to maintain traffic, extreme care shall be exercised to avoid interference with the safe movement of traffic.

### **MEASUREMENT AND PAYMENT**

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 3, Earthworks Item 020301 Excavation, Item 020302 Borrow Excavation, and Item 020304 Ditch Excavation the units of measurement specified.

The rates and prices quoted shall include the cost of all operations and sequences of operations which may be required to comply with the needs of the Works, including, but not limited to, provision and stockpiling of material, filling by increments, trimming of embankments and cuttings, disposing of all surplus material and formation and compaction of material and permanent works.

Dewatering may be required to embankment construction beside canals. The Contractor shall include for the cost of all cofferdams, temporary works, pumping and sequence of operations within his rates for excavations to embankments. The rates shall also include for multiple pumping operations in the event that the canal becomes refilled after being dewatered due to rainfall or any other reason.

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## **SECTION 02033 – GRANULAR FILL -WHITE SAND**

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## 1-1 DESCRIPTION

This section details the specifications for white sand fill to be incorporated in the Works.

### MATERIAL

#### *1 General*

The material used shall conform to the following:

For white sand not more than 15% shall pass the No. 200 sieve; In addition, the white sand shall be non-plastic.

Before any material is brought on to the site it shall first have been tested to determine the maximum index density by the Independent laboratory and approved by the Project Manager.

#### *Source of Materials*

##### Contractor's Option

The Contractor will furnish the areas or select the sources from which the sand material may be obtained. Material furnished by the Contractor must meet all the requirements of these specifications, and any hauling or other costs shall be absorbed by the Contractor and included in his rate for the work.

##### Variability of Material

The material provided by the Contractor shall be consistent in grading and appearance and shall not vary significantly from the material qualities of the samples originally approved. Source(s) of material shall not be changed without the approval of the Project Manager.

### PLACING MATERIALS

Sand layers are to be constructed in regular courses, the component courses shall be approximately equal in thickness and the compacted thickness of any layer laid, processed and compacted at one time shall not exceed 150 mm. No such layer, once completed shall be covered by the succeeding layer until it has been accepted by the Project Manager. The contractor may request to place thicker layers providing he can demonstrate to the Project Manager's Representative that full depth compaction can be achieved

### COMPACTION

The material shall be within  $\pm 2\%$  of the optimum moisture content as determined during approval, before being compacted. Wetting or drying will be required when the material does not have the proper moisture content to ensure the required density. If the material is deficient in moisture, water shall be added and uniformly mixed-in by disking the course to its full depth. If the material contains an excess of moisture, it shall be repeatedly disked and turned until it has dried to the required moisture content. Wetting or drying operations shall involve manipulation of the entire

width and depth of the layer as a unit. As soon as proper conditions of moisture are attained the layer shall be compacted to a density with section 01040 – Quality control - table 1. Each layer shall be uniformly compacted using equipment that will achieve the required density and as compaction operations proceed each layer shall be shaped and worked as necessary to assure uniform density throughout the embankment.

Prior to placing material for any course, the density tests shall have been made on the underlying course and the Project Manager shall have determined that the specified compaction requirements have been met. In the compaction of the upper course the operations of wetting, diskings, etc., shall not be such as to disturb the density in the lower course. The density shall be determined separately for each layer.

### **TESTING**

The density of each layer is to be tested by ASTM D 6938-10 the Nuclear Density Gauge. In the event of discrepancy between test results using the Nuclear Density gauge and Drive cylinder test in accordance with ASTM D2937-17e2 shall be performed, the Drive cylinder results shall be taken as the true value.

The stiffness of the final layer to determine the in situ California Bearing Ratio must be performed in accordance with ASTM D6758-18

If requested by the Project Manager, density and stiffness testing shall be carried out in accordance with “Procedures for relative compaction in pavement layers” Clause 1-7 Sampling, in QUALITY CONTROL Section 01040. The grid will not conform to any system of points or levels used by the Contractor for setting out the surface originally. In addition further check levels will be taken at any point or area which appears to be too high or low.

White sand fill shall be brought up in even courses not exceeding 150mm in compacted thickness. The final course shall be checked for compliance with the level required for the formation level, or underside of the Sub base. The top surface of white sand embankment shall not exceed the design level and shall not be more than 30mm below design level.

In addition, no more than fifty percent (50%) of the testing will be apportioned as random tests at the Project Manager’s discretion. The Contractor is required to carry out any field or laboratory testing as described by the Specifications at any given time within the project duration at the Ministry of Public Infrastructure Laboratory. The Contractor will also bare the cost or responsibility of arranging transportation for collecting samples, storage of samples and testing equipment to and from site.

### **FINAL SHAPING**

In the event there is a settlement period included in the contract the lines and levels shown for Initial Construction levels of white sand embankment in the documents and drawings make provision for settlement expected to occur during the settlement period after placing. Initially the

Contractor will be required to provide compacted white sand embankment in accordance with these requirements and protected at the sides with clay blanket.

Following the settlement period and prior to commencing the work of sub base or base construction, the whole of the embankment works will be checked for level and shape and the Project Manager will finalise the required finished levels. If additional material is required to be placed it will be paid for as white sand embankment. If there is surplus material to be removed the Contractor shall remove the material from site and it shall become his property.

Clay blanket material required shall be supplied and paid for under the Bill item for Clay Blanket.

#### **MEASUREMENT AND PAYMENT**

Measurement of the work of White Sand embankment shall be based on the requirements of the Drawings and the surveys and shall be the cubic metres of compacted material required based on the nominal required Initial Construction levels of the embankment, the nominal levels of the roadbed and the theoretical edge profile and extent shown on the drawings. Payment for any additional white sand required after settlement shall be measured and paid for on the same basis using sections and measurements taken jointly immediately before the placement of such additional white sand.

Payment for white sand fill shall be made at the relevant rate quoted in the Bill of Quantities, Bill 2, Earthworks Item 020331 White Sand Fill. Measurement will be in cubic metres and shall be full and complete payment for the work and shall include winning and transport of the material, stockpiling, placing, compacting, final shaping, disposal of any surplus material and all other works involved in supplying the completed embankment.

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## ***SECTION 02035 – SELECT SUB-GRADE***

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## 1-1 DESCRIPTION

The work specified in this Section consists of the construction of a Modified Sub-grade or capping, layer composed of a blend of Loam and White Sand and constructed on a prepared roadbed in accordance with these Specifications and in conformity with the lines, grades, notes and typical cross sections shown on the Drawings.

## MATERIALS

The material used shall conform to the following requirements:

- CBR bearing capacity to be not less than 15% when tested in accordance with ASTM D1883-16 after soaking for four days.
- Plasticity Index shall not exceed 12 and the Liquid Limit not exceeding 45% when tested in accordance with ASTM D4318-17-e1

Before any Modified Sub-grade material is used, it shall first have been tested by the Independent laboratory and approved by the Employer's Representative.

### 1-2-1 Sources

The Contractor shall identify the area(s) from which the sand materials will be obtained.

Material to be provided must meet all the requirements of these Specifications and all haul or other costs shall be included by the Contractor.

The material shall be removed from approved sources in accordance with the particular requirements of the Environmental Management Plan and of the Employer's Representative.

## PLACEMENT

### 1-3-1 Layer thickness

When the specified compacted thickness of the Modified Sub-grade is greater than 150 mm, the layer shall be constructed in two or more courses. Otherwise the Modified Sub-grade may be constructed in a single course.

Component courses of this layer shall be approximately equal in thickness and the compacted thickness of any layer laid, processed and compacted at one time shall not exceed 150 mm.

### 1-3-2 Compaction

The material shall be brought to within  $\pm 2\%$  of its optimum moisture content and to the proper loose consistency, in a method approved by the Employer's Representative, before being compacted.

Wetting or drying may be required when the material does not have the proper moisture content to reach the required density. If the material is deficient in moisture, water shall be added and

uniformly mixed-in by disking the course to its full depth. If the material contains an excess of moisture, it shall be dried before being compacted. Wetting or drying operations shall involve manipulation of the entire width and depth of the placed layer.

As soon as proper conditions of moisture are attained each course shall be compacted to a density not less than 95% of the maximum density as determined by ASTM D1557-12.

Prior to the placing of material for subsequent layers, density tests shall be made on the lower course so that the Employer's Representative can be satisfied that the specified compaction requirements have been met. For the compaction of an upper layer, the operations of moisture content adjustment shall not be such as to disturb the density of the lower course. The in-place densities shall be determined separately for each layer.

### **1-3-3 Tolerances**

#### Level

The level tolerances referred to in Section 01040, Quality Control and Testing shall be as follows:

1.  $H_{90} = 25\text{mm}$
2.  $H_{\text{max}} = 33\text{mm}$

#### Layer Thickness

The thickness tolerances referred to in Section 01040, Quality Control and Testing shall be as follows:

1.  $D_{90} = 30\text{mm}$
2.  $D_{\text{max}} = 40\text{mm}$
3.  $D_{\text{average}} = 10\text{mm}$

### **1-3-4 Density Control**

The density of each layer is to be tested by ASTM D 6938-10 the Nuclear Density Gauge. In the event of discrepancy between test results using the Nuclear Density gauge and Drive cylinder test in accordance with ASTM D2937-17e2 shall be performed, the Drive cylinder results shall be taken as the true value.

## **MEASUREMENT AND PAYMENT**

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities measured under the items quoted under Division 2. Site and Earthworks, Section 02035: Select Sub-grade using the units of measurement specified.

Payment for the work specified in this section of the Specification shall be made under the relevant rate quoted in the Bill of Quantities, Bill 2, Site and Earthworks, Item 020351 Select Sub Grade. Measurements will be in cubic meters and shall be full and complete payment for the work and shall include all testing, stockpiling, placing, compacting, forming modified sub grade, final

shaping, disposal of any surplus material and all other works involved in completing modified Sub Grade.

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## ***SECTION 02040 – EXCAVATION & BACKFILL***

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## 1-1 DESCRIPTION

The work specified in this Section consists of excavation for bridge foundations, box culverts, retaining walls, headwalls, tie or anchor rods and similar structures. It shall also include:

- Construction and removal of cofferdams, sheeting, bracing, etc.
- Pumping or otherwise de-watering of foundation excavations.
- Disposing of surplus material and final cleaning, as may be necessary for the proper execution of the work.
- Backfilling with approved materials.

### CLASSIFICATION OF EXCAVATION

All material excavated shall be classified as follows:

#### Hard material

Hard Material is material which can be excavated by the use of a mechanical breaker fitted with a rock point in good condition and operated correctly.

#### Soft Material

Soft material is all material other than hard material including that which is suitable and unsuitable for reuse.

### EXCAVATION OF FOUNDATIONS FOR STRUCTURES

#### *1-3-1 General*

The excavation of foundations for all structures shall be kept to the limits of structural excavation as shown on the plans. The sides of the excavation shall be properly timbered or sheet piled, shored and strutted as necessary to prevent subsidence or slipping of the surrounding soil.

The excavation of trenches for precast concrete box culvert shall be kept to the dimensions specified in the Contract Drawings or ordered by the Employer's Representative. The Contractor shall make such provisions as required to insure adequate drainage of the trench to protect the bedding during construction operations.

All excavated surfaces in hard material other than rock on which foundations for structures are to be placed shall be compacted to 95% MDD (ASTM D1557-12) immediately before foundations are constructed.

Excavated surfaces in soft material shall be further excavated to achieve a minimum thickness of 50mm compacted white sand and 50mm of Grade 7 (E) concrete. Where ground conditions

are such that a satisfactory foundation cannot be achieved, the Contractor shall, if instructed by the Employer's Representative, remove the unsuitable material either until a suitable material is encountered or to the depth and width instructed by the Employer's Representative. Placement of white sand bedding material shall precede the installation of precast concrete box culvert. This shall include necessary levelling of the native trench bottom or the top of foundation materials as well as placement and grading of required white sand bedding material to a uniform grade so that the entire length of culvert will be supported on a uniform slightly sloping bedding.

The Contractor shall backfill the resultant excavation with approved material to a dry density of 95% MDD (ASTM D1557-12). Approved material may include rock-fill and/or selected backfill material from sources approved by the Employer's Representative.

The Employer's Representative's approval of any excavation shall be obtained prior to beginning any construction thereon.

### **1-3-2 Dewatering**

All excavations are to be kept dry and the Contractor shall take all necessary measures to maintain excavation free from water.

The Contractor shall keep each excavation clear of water during construction and in case of structures being constructed in saline or acidic groundwater, for such periods as may be necessary to avoid the submergence of concrete within 14 days of being placed.

The method of keeping excavation clear of water, dewatering and disposal of water, shall be subject to the approval of the Employer's Representative. The Contractor shall ensure that sufficient standby Plant is on site at all times to avoid any interruption in continuity in the dewatering.

Where required by the Employer's Representative, the sumps from which pumps operate shall be constructed outside the area of the foundation base. Excessive pumping from the excavation - that is liable to cause settlement, disturbance or washing out of fines from the adjacent ground - will not be permitted.

Where, in the opinion of the Employer's Representative, the foundation has become soft and additional excavation is required due solely to the Contractor's method of working, the resulting sand backfill of approximately 150mm to level the bottom of the excavation shall be at the Contractor's expense.

### **1-3-3 Cofferdams**

#### General

The Contractor shall furnish, construct and maintain all necessary cofferdams, cribs, channels, flumes and other diversions and protection works and shall furnish, install, maintain and operate all necessary pumping and other equipment for the exclusion or removal of water from various parts of the Works. Culverts shall be protected by a minimum of 1000mm cover to prevent damage before permitting heavy construction equipment to pass over them during construction.

Shop Drawings and calculations for cofferdams and other proposed temporary installation shall be submitted to the Employer's Representative before commencement of the work. The Contractor shall avoid any measures in the proposed installations that will cause flooding or endanger the safety of persons or property upstream or downstream of the site.

All such structures shall be removed on completion of the works unless otherwise instructed by the Employer's Representative.

#### Construction Methods

Wherever practicable, all foundations shall be constructed by open excavation and the excavations shored, braced, or protected by cofferdams, in accordance with approved methods.

Cofferdams or cribs for foundation construction shall generally be carried well below the bottom of the footings and shall be safely braced and as watertight as practicable.

There shall be sufficient clearance in the cofferdam interiors to permit construction of forms and the inspection of exteriors and for pumping equipment.

Cofferdams or cribs which are tilted or moved laterally during the process of sinking shall be righted or enlarged in order to provide the necessary clearance.

#### Protection of Concrete

Cofferdams shall be so constructed as to protect green concrete against damage from a sudden rise of the water and to prevent damage by erosion.

No timber or bracing shall be left in cofferdams or cribs in such a way as to extend into the substructure masonry except where permitted in writing by the Employer's Representative.

#### Placing in the Dry

For placing footings in the dry, the Employer's Representative may require cofferdam sheeting to be driven to an elevation below the elevation of the bottom of the footings and require sufficient pumping equipment to de-water and maintain the cofferdam in a comparatively dry condition.

#### Working Drawings

For substructure work, the Contractor shall submit, drawings showing the proposed method of cofferdam construction and other details left to his choice or not fully shown on the Contract Drawings.

The type and clearance of cofferdams insofar as such details affect the character of the finished work, will be subject to the approval of the Employer's Representative but other details of design will be left to the Contractor, who shall be responsible for the successful construction of the work.

#### Removal

Unless otherwise provided, cofferdams or cribs, with all sheeting and bracing, shall be removed by the Contractor after completion of the substructure. The removal shall be effected in a manner which does not disturb or mar the finished masonry.

**1-3-4 Foundations and abutments cast against in-situ material**

Where shown on the Drawings or instructed by the Employer's Representative that a foundation and/or abutment shall be cast against the in-situ material, the excavation shall be neatly excavated to the shape required. Should any over-excavation occur, the space between the foundation and / or abutment and the in-situ material should be back-filled with Concrete Grade 15(D) or with the same grade of concrete as the foundation and/or abutment. Where concrete of the foundation and/or abutment is to be cast against an over-excavated face, then that face shall be neatly trimmed to a minimum over-excavation of 100mm from the foundation and/or abutment face. All such backfill shall be at the Contractor's expense.

All additional concrete for filling to over excavated faces shall be at the expense of the Contractor.

**1-3-5 Surplus excavated and backfilling materials**

Surplus excavated material shall be taken to an approved spoil areas or may be used in adjacent earthworks if suitable.

The Employer's Representative's approval must be obtained to the Contractor's proposed material for back filling and filling behind and around a structure.

**BACKFILL OF EXCAVATIONS FOR STRUCTURES****1-4-1 General**

No filling around a structure or backfill in trench or excavation shall commence; neither shall a structure be loaded, without the approval of the Employer's Representative.

The sequence of filling and backfilling behind and around a structure and the maximum difference in height at any time between fill levels shall be agreed to by the Employer's Representative.

**1-4-2 Material**

All material used for backfill shall be White Sand as specified in Section 02033 – White Sand Embankment, Clay for Culvert's Head and Wing Walls or otherwise directed by the Employer's Representative.

Density

Backfill shall be deposited in horizontal layers not 150 mm in depth and shall be compacted to a density with section 01040 – Quality control - table 1 for the material type.

Box Culverts

For precast reinforced concrete box culvert, bedding and backfill material shall conform to the Contract Drawings and Figure 27.5E from the AASHTO Standard Specifications for Highway Bridges, Part II with the following exceptions. Bedding material will be White Sand.

The fill material for precast concrete box culvert shall be placed and compacted with care and shall be brought up evenly and simultaneously on both sides of the culvert in 150mm layers.

Timbering and sheeting left for the purpose of supporting the excavation shall be eased up 150mm at a time in step with the backfill layer. Where instructed by the Employer's Representative, timbering or sheeting shall be left in place.

#### **EXCAVATIONS FOR RIVER TRAINING**

Excavation carried out in the diversion, enlargement, deepening or straightening of streams and rivers or in the formation of new watercourses shall be performed as shown on the Drawings or as instructed by the Employer's Representative, and may include site clearance, trimming of slopes, grading of beds and disposal of the excavated materials.

Where watercourses have to be diverted, the original channels shall be cleared of all vegetation growth and soft deposits, and carefully filled in with approved materials, deposited and compacted as instructed by the Employer's Representative.

#### **MEASUREMENT AND PAYMENT**

The work under this Section shall be deemed to include any precautions or special working methods necessary to avoid danger to abutting material designated to remain. The Contractor shall rectify any such damage caused. All work shall be as directed by the Employer's Representative including the removal and disposal of all demolition materials.

Payment for the work specified in this section of the Specification shall be made under the relevant rate quoted in the Bill of Quantities, Bill 2, Earthworks, Item 020401 Structural Excavation and Backfill to the lines shown on the drawings. Measurements will be in cubic meters and shall be full and complete payment for the work and shall include excavation, disposal of excess excavated material, building and removal of cofferdams, dewatering, winning and transportation of backfill material including clay, stockpiling, placing, compacting, forming the working platform, final shaping, disposal of any surplus material and all other works involved in completing Structural Excavation and Backfill.



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## ***SECTION 02060 – FILL TO EMBANKMENT***

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## 1-1 DESCRIPTION

The work specified in this Section consists of placing of a layer of selected clay material, the outer layers of which shall be favorable to plant growth, over areas of the project which are to be seeded, seeded and mulched or sodded and/or which are to be protected from the effects of erosion. This shall be accomplished by use of a clay blanket using material which has either been stockpiled during site clearance works and general earthworks, or which shall be imported from other sources of the Contractor's finding and at the Contractor's expense.

## MATERIALS

The Project Manager shall approve the material to be used. In general it is anticipated that material for clay blanket will be obtained from the site of the works with material for the inner, or buried, areas of the blanket being provided from the areas of lower excavation and the outer, vegetated layers being provided from material arising from the stripping of topsoil.

The inner section of the clay blanket shall be formed from well compacted heavy, impervious clay material. The upper and outer 200mm of the clay blanket shall be formed from selected materials suitable for supporting grass and other vegetation and which have previously been vegetated. Materials shall come, as far as possible from material arising from the excavated embankment and from stripping of vegetated areas of the works during the operations of topsoil stripping and stockpiling. Material in the outer blanket shall be suitable for plant growth and free from appreciable quantities of hard clods, stiff clay, hardpan, gravel, brush, large roots, refuse or other deleterious materials and shall be of reasonably uniform quality.

The outer material may also be obtained from clearance operations or ditch excavation within the road right of way.

In the event that materials arising from the area of the works are insufficient or unsuitable, the Contractor shall identify alternative sources and obtain the approval of the Project Manager to their use prior to commencing excavation.

## APPLICATION

### *1-3-1 Preparation of Areas*

Prior to placing the material, the surface of the earthwork shall have been constructed to the lines, shapes and elevations indicated in the drawings.

### *1-3-2 Inner Layer*

Material shall be spread to the width indicated on the drawings in layers not exceeding 200mm. Material shall be packed firmly in placed with tampers or other methods approved by the Project Manager.

**1-3-3 Outer Layer**

Material for the outer layer shall be placed over the completed inner layer to a minimum thickness of 200mm measured normal to the surface being covered. Material shall be packed firmly in place with tampers or other methods approved by the Project Manager. Mechanical compaction and density testing will not be required for this layer but the layer, on completion, shall be firm and well bedded and properly shaped in accordance with drawings and to the approval of the Project Manager.

**MEASUREMENT AND PAYMENT**

Payment for fill to embankment will be per square metre of material placed based on the nominal dimensions required by the drawings. No additional volume will be measured for payment for over-filling or for flattening of side slopes or batters unless such work is specifically instructed by the Project Manager as a variation from the drawings. Measurement will be made in two phases; an initial measurement of the embankment followed by a second measurement after the clay blanket is placed. Volumes of clay blanket placed will be calculated based on these measurements. Sections where thicknesses are less than 10% of design thicknesses must be corrected prior to payment.

Payment for fill to embankment specified in this section of the Specification shall be made under the relevant item in the Bill of Quantities, Bill 2 Earthworks, Item 020601, Fill to embankment using the units of measurement specified.

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***SECTION 02070- ROADSIDE IMPROVEMENT MATERIALS***

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**1-1 TOPSOIL**

Topsoil shall be provided in accordance with Section 02060.

**SEED**

Meet the following seed formula(s):

Grass seed shall be obtained from an approved supplier.

Seed mix for all highway verges and central reservations shall be:

- 80% Paspalum notatum (Bahia Grass)
- 20% Cynodon dactylon (Bermuda Grass)

Sowing shall be carried out by evenly distributing the seed at a rate of not less than 25 g/m<sup>2</sup>.

Deliver in labeled and sealed containers to the job. Seeds are subject to testing by the Ministry of Agriculture.

Inoculate legume seed with approved cultures according to the manufacturer's instructions.

**MEASUREMENT AND PAYMENT**

Payment for Roadside Improvement (Grass Seeding) will be per sq meter of area planted based on the nominal dimensions required by the drawings. No additional quantity will be measured for payment for over-broadcasting unless such work is specifically instructed by the Project Manager as a variation from the drawings.

Payment for Roadside Improvement (Grass Seeding) specified in this section of the Specification shall be made under the relevant item in the Bill of Quantities, Bill 2, Site and Earthworks, Item 020701, Roadside Improvement (Grass Seeding) using the units of measurement specified.



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## ***SECTION 03010 – WHITE SAND SUB-BASE***

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**1-1 DESCRIPTION**

This section details the specifications for white sand sub base to be incorporated in the Works.

**MATERIAL**

*1-2-1 General*

The material shall meet ASTM D1241-15 and conform to grading E or F. (See **Table 1** Below). It shall achieve a CBR (ASTM D 1883-16) of not less than 11% after soaking for four days when compacted to a density of at least 95 % of the maximum density as determined by ASTM D1557-12 Method A. In addition the material shall be non-plastic.

Before any material is brought on to the site it shall first have been tested by the Independent laboratory and approved by the Project Manager.

**Table 1**

	Gradation E	Gradation F
2-in. (50-mm)	100	100
1-in. (25.0-mm)	100	100
3/8-in. (9.5-mm)	.....	.....
No. 4 (4.75-mm)	55 to 100	70 to 100
No. 10 (2.00-mm)	40 to 100	55 to 100
No. 40 (425-µm)	20 to 50	30 to 70
No. 200 (75-µm)	6 to 15	8 to 15

*1-2-2 Source of Materials*

Contractor's Option

The Contractor will furnish the areas or select the sources from which the sand material may be obtained. Material furnished by the Contractor must meet all the requirements of these specifications, and any hauling or other costs shall be absorbed by the Contractor and included in his rate for the work.

Variability of Material

The material provided by the Contractor shall be consistent in grading and appearance and shall not vary significantly from the material qualities of the samples originally approved. Source(s) of material shall not be changed without the approval of the Project Manager.

## PLACING MATERIALS

White sand sub base shall be brought up in even courses not exceeding 150mm thick. No such layer, once completed shall be covered by the succeeding layer until it has been accepted by the Project Manager. The final course shall be checked for compliance with the level required for the lower base course or underside of the base. The top surface of white sand sub base shall not exceed the design level and shall not be more than 30mm below design level.

## COMPACTION

The material shall +/-2% of the optimum moisture content before being compacted. Wetting or drying will be required when the material does not have the proper moisture content to ensure the required density. If the material is deficient in moisture, water shall be added and uniformly mixed-in by diskings the course to its full depth. If the material contains an excess of moisture, it shall be repeatedly disked and turned until it has dried to the required moisture content. Wetting or drying operations shall involve manipulation of the entire width and depth of the layer as a unit. As soon as proper conditions of moisture are attained the layer shall be compacted to a with section 01040 – Quality control - table 1.

Each layer shall be uniformly compacted using equipment that will achieve the required density and as compaction operations proceed each layer shall be shaped and worked as necessary to assure uniform density throughout the sub base.

Prior to the placing material for all courses, density tests shall have been made on the underlying course and the Project Manager shall have determined that the specified compaction requirements have been met. In the compaction of the upper course the operations of wetting, diskings, etc., shall not be such as to disturb the density in the lower course. The density shall be determined separately for each layer.

## TESTING

Each layer of the material used in the formation of White sand Sub Base shall be compacted to a density of at least 95% of the maximum density as determined by ASTM D1557-12 Method A. Each layer shall be uniformly compacted using equipment that will achieve the required density and as compaction operations proceed the moisture content of each layer shall be increased or decreased to meet the specified density. Each layer shall be shaped and worked as necessary to assure uniform density throughout the embankment.

The density of each layer is to be tested by ASTM Standards D-6938-10 the Nuclear Density Gauge. In the event of discrepancy between test results using the Nuclear Density gauge and Drive cylinder test in accordance with ASTM D2937-17e2 shall be performed, the Drive cylinder results shall be taken as the true value.

Density testing shall be carried out in accordance with “Procedures for relative compaction in pavement layers” Clause 1-7 Sampling, in QUALITY CONTROL Section 01040. The grid will not conform to any system of points or levels used by the Contractor for setting out the surface originally. In addition further check levels will be taken at any point or area which appears to be too high or low.

In addition, no more than fifty percent (50%) of the testing will be apportioned as random tests at the Project Manager’s discretion. The Contractor is required to carry out any field or laboratory testing as described by the Specifications at any given time within the project duration at the Ministry of Public Infrastructure Laboratory. The Contractor will also bare the cost or responsibility of arranging transportation for collecting samples, storage of samples and testing equipment to and from site.

#### **FINAL SHAPING**

Prior to commencing the work of Base Course construction, the whole of the White Sand Sub Base works will be checked for level and shape and the Project Manager will finalize the required finished levels. If additional material is required to be placed it will be paid for as white sand sub base. If there is surplus material to be removed the Contractor shall remove the material from site at his own expense.

Level testing shall be carried out in accordance with “Procedures for Surface Levels of fills and pavements layers” Clause 1-7 Sampling, in QUALITY CONTROL Section 01040. The grid will not conform to any system of points or levels used by the Contractor for setting out the surface originally. In addition further check levels will be taken at any point or area which appears to be too high or low.

#### **MEASUREMENT AND PAYMENT**

Item: White Sand Sub Base

Unit: Cubic meter

Measurement of the work of White Sand Sub Base shall be based on the requirements of the Drawings and the surveys and shall be the cubic meters of compacted material based on the required construction levels of the white sand sub base. Payment for White Sand Sub Base shall be measured and paid for using sections and measurements taken jointly immediately before the placement of a Sub Base or Base Course layer and all incidentals necessary to complete the work. It shall also include all hauling of material.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 4, Pavement works Sub-Base and Base Item 030101 White Sand Sub-Base using the units of measurement specified.

The rates and prices quoted shall include the cost of all operations and sequences of operations which may be required to comply with the needs of the Works, including, but not limited to, all testing, all clearing and grubbing of materials pits, all stripping of overburden from the pits, if required, and all incidentals necessary to complete the work, provision and stockpiling of material, hauling, filling by increments, dewatering, pumping, trimming of embankments and cuttings, disposing of all surplus material and formation and compaction of material and permanent works, and all incidentals necessary to complete the work.

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## ***SECTION 03020 – WHITE SAND/SAND CLAY LOWER BASE COURSE***

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**1-1 DESCRIPTION**

The work specified herewith consists of the construction of a lower base composed of a mixture of suitable sand clay and white sand. The materials shall be free from roots and other deleterious matter. The White Sand/Sand Clay Lower Base should also be used as bedding beneath sidewalks.

**MATERIAL**

The Contractor shall provide an aggregate lower base course that meets the requirements of ASTM D 1241-07 as modified by the gradation table below. This gradation table may be changed in order to meet the CBR requirements stated below.

**1 Gradation Requirements**

ASTM No.	Sieve	Limits of Percentage Passing Weight by
8		100
16		97-100
30		65-81
50		38-70
100		24-54
200		16-42

The sand clay/white sand mix shall achieve a CBR of not less than 30% when compacted to a minimum of 95% of the maximum density in accordance with ASTM D-1557-12, Method A, and tested in accordance with ASTM D1883-16 after soaking for four days. In addition the Plasticity Index of the material shall not exceed 6, and the liquid limit must not be greater than 25%.

***Source of Material***

Contractor's Option

The Contractor will furnish the areas or select the sources from which the sand clay and white sand material may be obtained. Material furnished by the Contractor must meet all the requirements of these specifications, and any hauling or other costs shall be absorbed by the Contractor and included in his rate for the work.

Variability of Material

The material provided by the Contractor shall be consistent in grading and appearance and shall not vary significantly from the material qualities of the samples originally approved. Source(s) of material shall not be changed without the approval of the Project Manager.

Where water is required to ensure the aggregate meets the density requirements, the water shall meet ASTM 1602-04. Water shall be tested to ASTM C1603. Potable-quality water requires no testing.

## BLENDING OF MATERIALS

The sand clay/ white sand shall be mixed by one of the following methods to ensure homogeneous blending and to provide optimum moisture content for compaction:

### *1 Stationary Plant Method*

Mix white Sand and Sand Clay into a pugmill while adding water during the mixing operation as necessary to provide optimum moisture content. Place the material onto the roadbed immediately after mixing.

### *Travel Plant Method*

Use a mechanical spreader or windrow-sizing device to place the White Sand and Sand Clay. Add and thoroughly mix water with the White Sand and Sand Clay using a travelling mix plant.

### *Road Mix Method*

Place and mix the White Sand and Sand Clay on the roadway using a rotovator or similar equipment. The rotovator shall be mechanically efficient and so controlled that it will process the materials to the full depth on each pass. Water shall be added uniformly in increments during the processing as required to obtain the optimum moisture content as designated. Mixing may be accomplished in one or more passes but in any event shall be continued until the resulting mixture is entirely uniform.

## LAYER THICKNESS

Place lower base material in uniform lifts of equal thickness. Ensure lifts are at least 75 mm in depth. Limit maximum lift thickness to 150 mm compacted.

In the compaction of the upper course the operation of wetting, spreading, etc., shall not be such as to disturb the density in the lower course. The density shall be determined separately for each layer.

## COMPACTION

The material shall be brought to within +/-2% of the optimum moisture content and the proper loose consistency, in a method approved by the Project Manager, before being compacted. Wetting or drying will be required when the material does not have the proper moisture content to insure the require density. If the material is deficient in moisture, water shall be added and uniformly mixed-in to its full depth. If the material contains an excess of moisture, it shall be cause to dry before being compacted. Wetting or drying operations shall involve manipulation of the entire width and depth of the lower base as a unit. As soon as proper conditions of moisture are attained the layer shall be compacted to a density in accordance with section 01040 – Quality control - table 1.

When a Nuclear Density Gauge is used, the in place density of each layer shall be determined as specified by the ASTM Standards D6938-10. The Project Manager will determine in-place density by the Sand Cone method D156-07.

**TESTING SURFACE**

The stiffness of the final layer to determine the in situ California Bearing Ratio must be performed in accordance with ASTM 6758-18

The finished surface of the lower base shall be checked with a template cut to the required crown and with a 5meter straightedge laid parallel to the centre line of the road. All irregularities greater than 10mm shall be corrected by scarifying, and removing or adding lower base material as may be required, after which the entire area shall be re-compacted to meet the specified density requirements.

**THICKNESS OF LOWER BASE**

A 5mm under-tolerance in the thickness of the lower base will be allowed. All areas where the thickness of the completed lower base is less than the thickness after such tolerance shall be corrected by scarifying, adding lower base material and re-compacting.

**JOINTS BETWEEN NEW AND EXISTING WORK**

The forming of construction joints between previously treated work and newly treated work shall be carried out so as to produce a uniformly compacted and homogeneous zone free from ridges or other irregularities. When forming transverse joints, at least 2 meters length of the previously laid work shall be scarified and blended into the new works.

**TESTING**

In addition, no more than fifty percent (50%) of the testing will be apportioned as random tests at the Project Manager's discretion. The Contractor is required to carry out any field or laboratory testing as described by the Specifications at any given time within the project duration at the Ministry of Public Infrastructure Laboratory. The Contractor will also bare the cost or responsibility of arranging transportation for collecting samples, storage of samples and testing equipment to and from site.

**MEASUREMENT AND PAYMENT**

Item: Sand Clay/ White Sand

Unit: Cubic meter

Measurement of the work of Sand Clay/White Sand Lower Base Course shall be based on the requirements of the Drawings and the surveys and shall be the cubic meters of compacted material required based on the required construction levels of the Sand Clay/White Sand Lower Base. Payment for Sand Clay/White Sand Lower Base shall be measured and paid for using sections and measurements taken jointly immediately before the placement of a Base Course layer.

The quantity of blended material shall be paid for at the contract unit price per cubic meter. Such price and payment shall be full compensation for all the work specified in this Section, and shall include the cost of all testing, all materials, multiple handling, stockpiling, blending, placing, dewatering, pumping, compaction and trimming at optimum moisture content, all clearing and grubbing of materials pits, all stripping of overburden from the pits, if required, and all incidentals necessary to complete the work. It shall also include all hauling of material.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 3, Sub-Base and Base Item 030201 White Sand/ Sand Clay Lower Base Course and Item 030202 White Sand/ Sand Clay Lower Base Course for sidewalks using the units of measurement specified.

**SECTION 03021 – CEMENT TREATED WHITE SAND/SAND CLAY LOWER BASE COURSE**

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## 1-1 DESCRIPTION

The work specified herewith consists of the construction of a lower base composed of a mixture of cement and suitable sand clay and white sand. The materials shall be free from roots and other deleterious matter.

### MATERIAL

The Contractor shall provide an aggregate mix that meets the requirements of ASTM D1241-07 as modified by the gradation table below. This gradation table may be changed in order to meet the CBR requirements stated below.

#### 1 Gradation Requirements

ASTM Sieve	Limits of Percentage Passing by Weight
4	100
8	100-80
16	80-50
30	60-30
50	45-20
100	35-16
200	25-10

The sand clay/white sand mix shall achieve a CBR of not less than 30%(ASTM D 1883\_07e2) after soaking for four days when compacted to a minimum of 98% of the maximum density in accordance with ASTM D-1557-12, Method A, In addition the Plasticity Index of the material shall not exceed 6, and the liquid limit must not be greater than 25%.

Add Portland cement as a percentage of the dry unit weight of the mix until the sand clay/white sand/cement mix shall achieves a CBR of not less than 80%(ASTM D 1883\_07e2) after soaking for four days when compacted to a minimum of 95% of the maximum density in accordance with ASTM D-1557-12, Method A.

For mixed-in-place construction, the Project Manager will establish a rate of application of cement based on a trial section. The Contractor shall prepare trial sections at no extra cost.

### PROCESSING OF SOIL-CEMENT MIXTURE

#### 1 General

Mix the sand clay, sand, cement, and water either by mixed-in-place or central-plant-mix methods. Do not allow the percentage of moisture in the soil-sand-sand clay at the time of cement application to exceed the quantity that will permit a uniform and intimate mixture of soil and cement during mixing operations. At the completion of moist-mixing, pulverize the soil so that 100% passes a No. 4 sieve. Continue the operations specified in 1.4 (Central Plant Mixing Method), 1.5 (Construction Joints), 1.6 (Shaping and Finishing), and 1.7, (Compacting) and complete them within a period of four hours starting from WHEN the mixing commences.

## MIXING

### *1 Mixed-in-Place Method*

Where feasible, process the entire width of the base in a single operation. Uniformly spread the design quantity of cement on the soil at the required rate of application, by means of an approved method. Replace spread cement that becomes displaced before starting mixing. The Project Manager will check the uniformity of spread rate by (a) weight of cement spread/square meters covered for a short trial section that is between 30 and 90 m in length or (b) use of a square meter cloth/box.

After applying the cement, begin mixing within 60 minutes. Initially mix the soil and cement until the cement has sufficiently blended with the soil to prevent formation of cement balls when applying additional water; then add water if necessary, and re-mix the mixture. Do not perform windrow mixing.

The Contractor may process the full depth in one course, provided the Contractor obtains a satisfactory distribution of cement and water and the specified density. If not, construct courses of such thickness to obtain satisfactory results. Make provisions to achieve adequate bonding between courses.

Immediately after mixing of the soil and cement, add any additional water that is necessary. If the moisture content exceeds that specified, manipulate the soil-cement mixture by re-mixing or blaring as required to reduce the moisture content to within the specified range. Avoid excessive concentrations of water. Continue mixing during and after applying water until obtaining a uniform and intimate mixture of soil, cement, and water.

As an alternative to the above described procedure, the Contractor may use an approved machine that will blend the cement and the soil and then add and mix-in any additional water that is necessary.

### *Central-Plant-Mixed Method*

Mix the soil, cement, and water in a pugmill of either the batch or continuous-flow type. Equip the plant with feeding and metering devices which will accurately proportion the soil, cement, and water in the quantities specified. Mix soil and cement sufficiently to prevent cement balls from forming when adding additional water. Continue mixing until obtaining a uniform and intimate mixture of soil, cement, and water.

Haul the mixture to the roadway in trucks equipped with protective covers. Place the mixture on the moistened subgrade in a uniform layer with suitable equipment. Do not allow more than 60 minutes to elapse between placing of soil-cement in adjacent passes of the spreader at any location, except at construction joints. Ensure that the layer of soil-cement is uniform in thickness and surface contour and in such quantity that the completed base will conform to the required grade and cross-section. Do not perform windrow mixing.

## CONSTRUCTION JOINTS

Prior to joining any previously constructed section of base, form a vertical construction joint by cutting back into the completed work to form a true vertical face of acceptable soil-cement to the full depth of the base course. Moisten the vertical face, if directed, prior to placing new material against it.

**SHAPING AND FINISHING**

Prior to final compaction, shape the surface of the soil-cement to the required lines, grades, and cross-section. In all cases where adding soil-cement mixture to any portion of the surface, lightly scarify the surface with a spring tooth harrow, spike drag, or other approved device to uniformly loosen the surface prior to adding material and prior to the initial set of the soil-cement mixture. Compact the resulting surface to the specified density. Continue rolling until all rutting ceases and until the base conforms to the density requirements.

Ensure that the surface material is moist but not ponded, and maintained at not less than 2 % below its specified optimum moisture content, during finishing operations. Perform surface compaction and finishing in such a manner as to produce a smooth dense surface, free of compaction planes, construction cracks, ridges, and loose material. In certain cases, the Project Manager may determine that minor tire marks are acceptable.

If the time limits specified in 1.3 (General) are exceeded, leave the base undisturbed for a period of seven days, after which, the Project Manager will examine it to determine its suitability. If the Project Manager determines that it is suitable, the Client will fully compensate the Contractor, providing the base meets all other requirements specified herein. If found unsuitable, remove and replace the base without additional compensation. The Contractor may remove and replace the deficient base rather than wait seven days.

**COMPACTION**

Begin compaction of the soil-cement mixture immediately after mixing and placing. Do not allow more than 30 minutes to elapse between the last pass of moist-mixing or spreading and the start of compaction of the soil-cement mixture at a particular location.

The Project Manager will determine the optimum moisture content and the maximum density in the field by the methods prescribed in ASTM D558-11 on representative samples of the soil-cement mixture obtained immediately after the initial mixing. The Project Manager will determine the density for each day's run or change of material.

Uniformly compact the loose materials to meet the density requirements specified in 1.11(Density) during compaction operations, the Contractor may reshape the material to obtain required grade and cross-section.

**PROTECTION AGAINST DRYING**

While finishing and correcting the surface, keep the surface of the base continuously moist by sprinkling it as necessary. Subsequently, keep the surface moist for seven days by regular sprinkling or by applying emulsified asphalt at the rate of 0.9 to 1.1 L per square meter. The Project Manager will direct the actual rate of application that will provide complete coverage without excessive runoff. While applying the bituminous material, ensure that the soil-cement surface is dense, free of all loose and extraneous material, and contains sufficient moisture to prevent excessive penetration of the bituminous materials.

If it is necessary to allow construction equipment or other traffic to use the completed base before the bituminous material has cured sufficiently to prevent pickup or displacement, sand the bituminous material, using approximately 5 kg of clean sand per square meter. Do not use cover material containing organic acids or other compounds detrimental to the soil-cement base. Maintain the curing material during the seven day protection period.

### **OPENING TO TRAFFIC**

Do not allow traffic on the base subsequent to completion of the finishing operations specified in 1.6 for a minimum period of 72 hours. As an exception to this requirement, allow equipment necessary for correction of surface irregularities, application of water, and application of curing materials on the base, provided that the tire contact pressures of such equipment do not exceed 45 psi [300 kPa]. Under special conditions (i.e. low speed limit, low traffic volume, urban conditions), the Project Manager may waive the 72-hour period.

### **MAINTENANCE**

Maintain the base to a true and satisfactory surface until the base course or wearing surface is constructed. If the Project Manager requires any repairing or patching, extend the repair or patch to the full depth of the base, and make them in a manner that will ensure restoration of a uniform base course in accordance with the requirements of these Specifications. Do not repair the base by adding a thin layer of soil-cement or concrete to the completed work. The Contractor may make full depth repairs to small or minor areas, such as at manholes, inlets, or the like, with concrete.

For patching of deficient areas less than 10 m<sup>2</sup> and less than 25mm in depth, correct the areas using Asphaltic Concrete or Sand Asphalt. For patching of deficient areas less than 10 m<sup>2</sup> and greater than 25 mm in depth, remove the areas to full depth, and replace them using Asphalt Base Course or soil-cement.

### **ACCEPTANCE REQUIREMENTS**

#### ***1 Density***

As soon as possible after completing compaction, the Project Manager will perform field density testing to ensure that the required density is 100% of the maximum density as determined by methods prescribed in ASTM D 558-11

For density determination, a LOT is defined as 2,000 m<sup>2</sup> of base. The Project Manager may include any small section of base at the end of a day's operation in the preceding LOT. No LOT shall include more than 3,000 m<sup>2</sup> or consider it as a separate LOT.

The Project Manager will perform six density tests at locations randomly selected within each LOT and will ensure that a LOT value is the average of the five density tests performed within the LOT.

If a LOT value is less than 96% of the maximum density, payment will be reduced for the LOT in accordance with the requirements of 1.13.

If an individual test value within a LOT is less than 94% of the maximum density, the Project Manager will determine the extent of this deficiency by performing density tests using a 1.5 m grid pattern until a test value of 96% or greater is located in all directions. Remove the

delineated area of base, and replace it with base meeting all requirements of this Section, at no expense to the Owner.

As an exception to the foregoing, if three or more of the original six individual test values within a LOT are less than 94% of the maximum density, the Project Manager will reject the entire LOT, and the Contractor shall remove all base within the LOT and replace it with base meeting all requirements of this Section, at no expense to the Client.

**Surface Finish**

After compacting and finishing, and not later than the beginning of the next calendar day after constructing of any section of base, measure the surface with a template cut to the required cross-section and with a 4.572 m straightedge laid parallel to the center line of the road. Correct all irregularities greater than 6 mm to the satisfaction of the Project Manager with a blade adjusted to the lightest cut which will ensure a surface that does not contain depressions greater than 6 mm under the template or the straightedge. The Project Manager may approve other suitable methods for measurement. In the testing of the surface, do not take the measurements in small holes caused by the blades pulling out individual rocks. Waste the material removed.

**Thickness**

After completing the base, including hard planning if necessary, dig or drill 75 mm minimum diameter test holes. The Project Manager will determine the thickness from measurements made in these test holes.

For thickness evaluation, a LOT is defined as 1,000 m<sup>2</sup> of base. The Project Manager may include any small section of base at the end of a day’s operation or small irregular areas as part of the preceding LOT. The Project Manager will consider an area such as an intersection, crossover, ramp, etc., as a separate LOT. The Project Manager may include small irregular areas as part of another LOT. No LOT shall include more than 3,000 m<sup>2</sup> of base. The Project Manager will perform five thickness measurements at locations randomly selected within each LOT.

The Project Manager will determine construction tolerances for thickness as follow:

	<b>Deviation From Plan Thickness</b>
Central-Plant-Mixed Processing	25 mm
Mixed-in-Place Processing	25 mm

When any thickness measurement is outside the construction tolerance, the Project Manager will take additional thickness measurements at 10 foot [3 m] intervals parallel to the centerline in each direction from the measurement which is outside the construction tolerance until a measurement in each direction is within the construction tolerance.

The Project Manager will evaluate an area of base found to have a thickness outside the construction tolerance and, if he determines that the service life of the base will be significantly reduced, he will require the Contractor to remove and replace it with acceptable base of the thickness shown in the plans, at no expense to the Client. The Client will pay for areas of deficient thickness that are within the construction tolerance in accordance with 1-13, Basis of Payment.

**TESTING**

In addition, no more than fifty percent (50%) of the testing will be apportioned as random tests at the Project Manager’s discretion. The Contractor is required to carry out any field or laboratory testing as described by the Specifications at any given time within the project duration at the Ministry of Public Infrastructure Laboratory. The Contractor will also bare the cost or responsibility of arranging transportation for collecting samples, storage of samples and testing equipment to and from site.

**METHOD OF MEASUREMENT**

The quantity to be paid for will be plan quantity; cubic meters, completed and accepted. The Contractor shall provide the Project Manager with written documentation so he can perform calculations to confirm that the design quantity of cement for the project was incorporated into the project.

**BASIS OF PAYMENT**

Price and payment will be for all work specified in this Section, including preparing the soil; preliminary grading; furnishing and adding cement; furnishing and adding water; mixing of soil, cement, and water; compacting the mixture; finishing the surface; furnishing and applying curing material; protecting the completed base from traffic; maintaining the completed base; and removing and replacing base which is deficient in thickness as provided in 1.11 (Thickness)

No separate payment will be made for cement or for bituminous material applied as a curing seal. The completed base will be accepted on a LOT to LOT basis. LOTS that have a density less than 100%, or a thickness less than the plan thickness in excess of 0.5 inch [10 mm], will be paid for at reduced rates in accordance with the following schedules.

<b>Density</b>	
<b>Percent of Maximum Density, LOT Average</b>	<b>Percent Payment</b>
97.0 and above	90
95.0 to 97.0	80
94.0 to 95.0	50, or remove and replace at the option of the Project Manager

<b>Thickness</b>	
(Applicable only when processing is by the central-plant-mixed method)	
Deficiency From Plan Thickness LOT Average*	Percent Payment
0.00 – 0.50 inch [0.00 – 13 mm]	100
0.51 – 0.75 inch [13.1 – 19]	90
0.76 – 1.00 inch [19.1 – 25 mm]	80
*When processing is by the central-plant-mixed method, the average of the five thickness measurements will be determined. In calculating the average, thickness measurements which exceed the plan thickness by more than 0.5 inch [10 mm] will be considered to be the plan thickness plus 0.5 inch [10 mm] and measurements which are deficient from the plan thickness by more than 1 inch [25 mm] will not be included in the average. Exploratory measurements for determining the extent of an area in which the thickness is outside the construction tolerance will not be included in the average.	

When the LOT average thickness of soil-cement base is deficient by more than 1 inch [25 mm] and the judgement of the Project Manager is that the area of such deficiency should not be removed and replaced, payment for the area retained will be at 50%.

When multiple deficiencies occur, the applicable percent payment schedule will be applied to the LOT of base that is identified with each deficiency. The penalty for each deficiency will be applied separately to the unit price.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 3, Sub-Base and Base Item 030211 Cement Treated White Sand/Sand Clay Lower Base Course using the units of measurement specified.

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***SECTION 03025 – RECLAIMED UNSTABILIZED  
LOWER BASE COURSE***

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**1-1 DESCRIPTION**

This specification covers the requirements for full-depth reclamation of reclaimed asphalt pavement and underlying granular base; if required, adding and blending corrective aggregate; as well as shaping and compacting the reclaimed unstabilized mix.

**MATERIALS**

**1 Reclaimed material**

Reclaimed asphalt pavement (RAP) and underlying granular base

Grading Requirements

The gradation of the reclaimed sub base shall satisfy the following limits:

**Table 1: Grading Requirements for Unstabilized Reclaimed Lower Base**

ASTM Sieves No	Percentage Passing by Mass
#1 1/2 in	98 - 100
#1 1/4 in	95 - 100
# 4	35 - 65
#30	15 - 40
#200	7 - 15

**Blending Requirements**

No more than 25% of the blended material can consist of RAP

**EQUIPMENT**

**1 Reclamation Equipment**

Reclamation shall be accomplished by means of a self-propelled, travelling rotary reclaimer or equivalent machine capable of cutting through existing bituminous concrete pavement to depths of up to 200mm in a single or multiple passes. The machine shall be equipped with an adjustable grading blade leaving its path generally smooth for proof rolling initial compaction. Equipment such as road planers or cold milling machines designed to mill or shred the existing bituminous concrete, rather than to crush or fracture it, may be allowed provided that it provides an adequately crushed mix.

**Mixing Equipment**

The selected materials shall be thoroughly mixed to provide a uniformly blended homogenous material with no visible signs of separation. The method of mixing shall be selected by the Contractor and shall be subject to full scale field trials in the presence of the Project Manager to demonstrate that the method is satisfactory. It is envisaged that satisfactory mixing will require initial blending to required proportions using hoppers and belt feeder, spreading on the site and treatment with rotovator or pulvimixer to achieve uniform mixing. Once the method and sequence of operations for blending placing and mixing of material has been approved it shall not be changed without the authority of the Project Manager.

## PLACEMENT

### *1 Layer thickness*

When the specified compacted thickness of a Lower Base layer is greater than 150 mm, the layer shall be constructed in two or more courses. Otherwise the layer may be constructed in a single course.

Component courses of a layer shall be approximately equal in thickness and the compacted thickness of any course laid, processed and compacted at one time shall not exceed 150 mm.

### *Compaction*

The material shall be brought to within  $\pm 2\%$  of its optimum moisture content in a method approved by the Project Manager, before being compacted and must have a loose consistency.

Wetting or drying may be required when the material does not have the proper moisture content to reach the required density. If the material is deficient in moisture, water shall be added and uniformly mixed-in by disking the course to its full depth. If the material contains an excess of moisture, it shall be dried before being compacted. Wetting or drying operations shall involve manipulation of the entire width and depth of the placed layer.

As soon as proper conditions of moisture are attained each course shall be compacted to a density with section 01040 – QUALITY CONTROL - table 1.

Prior to the placing material for subsequent layers, density tests shall be made on the lower course so that the Project Manager can be satisfied that the specified compaction requirements have been met. For the compaction of an upper layer, the operations of moisture content adjustment shall not be such as to disturb the density of the lower course. The in-place densities shall be determined separately for each layer.

### *Tolerances*

- Level

The level tolerances referred to in Section 01040, Quality Control and Testing shall be as follows:

- $H_{90} = 15\text{mm}$
- $H_{\text{max}} = 20\text{mm}$

- Layer thickness

The thickness tolerances referred to in Section 01040, Quality Control and Testing shall be as follows:

- $D_{90} = 21\text{mm}$
- $D_{\text{max}} = 27\text{mm}$
- $D_{\text{average}} = 5\text{mm}$

### *Density Control*

The Density of the layer is to be tested by the Sand Cone method – ASTM D1556-07 When approved by the Project Manager the Contractor may supplement the sand cone method with the use of a Nuclear Density Gauge, in which case the in place density of each layer shall be determined as specified by the ASTM Standards D-6938-10

### ***Testing***

Density testing shall be carried out in accordance with “Procedures for relative compaction in pavement layers” Clause 1-7 Sampling, in QUALITY CONTROL Section 01040. The grid will not conform to any system of points or levels used by the Contractor for setting out the surface originally. In addition further check levels will be taken at any point or area which appears to be too high or low.

Level testing shall be carried out in accordance with “Procedures for Surface Levels of fills and pavements layers” Clause 1-7 Sampling, in QUALITY CONTROL Section 01040. The grid will not conform to any system of points or levels used by the Contractor for setting out the surface originally. In addition further check levels will be taken at any point or area which appears to be too high or low.

### ***Deficiencies***

Where an area submitted for testing fails to meet the specified level or density requirements the area shall be scarified, moisture content adjusted if necessary, re-compacted and retested. In the event of repeated failure to meet density requirements the Contractor shall remove the offending material and replace with new material. The Contractor will be responsible for all payments related to the group of tests which included the failed test(s).

## **MEASUREMENT AND PAYMENT**

Payment for the work of Unstabilized Lower Base shall be at the rate entered in the Bill of Quantities for the Item of Supply, Reclaiming, Mixing, Placing and Compacting Unstabilized Lower base and shall be per cubic meter of compacted material required to be placed based on the nominal required levels of the course(s), the nominal levels of the underlying layer and the theoretical edge profile and extent shown on the drawings.

The quantity of Unstabilized Lower Base material shall be paid for at the contract unit price per cubic meter. Such price and payment shall be full compensation for all the work specified in this Section, and shall include the cost of all testing, all materials, reclaiming, stockpiling, multiple handling, blending, placing, compaction and trimming at optimum moisture content, and all incidentals necessary to complete the work. It shall also include all hauling of material.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 3, Sub-Base and Base Item 030251 Unstabilized Lower Base using the units of measurement specified.

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## ***SECTION 03040 – AGGREGATE BASE***

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**1-1 DESCRIPTION**

This Section covers the application of Aggregate Base material for placement in areas of new construction or of major repairs and shall consist of suitably graded aggregate material that shall meet all the requirements of the following Specifications.

**MATERIALS**

Material intended for use in the work shall be a crushed rock or natural gravel base material and shall be free from vegetation, foreign matter and other deleterious material. It shall not contain lumps or aggregate of a nature or sufficient quantity that a smooth surface cannot be obtained.

**1 Gradation**

The material shall meet one of the following gradation requirements when tested in accordance with ASTM C136-05

Crushed Rock Base

ASTM sieve No	% by mass of total aggregate passing test sieve	
	Type 37.5	Type 20.0
2 in	100	-
1 1/2 in	95 – 100	100
3/4 in	60 – 80	70 – 85
3/8 in	40 – 60	50 – 65
4	25 – 40	35 – 55
8	15 – 30	25 – 40
40	7 – 19	12 – 24
200	5 - 12	5 – 12

Crushed Natural Gravel Base

ASTM sieve No	% by mass of total aggregate passing test sieve	
	Type 37.5	Type 20.0
2 in	100	-
1 1/2 in	80 - 100	100
3/4 in	60 – 80	80 - 100
3/8 in	45 – 65	55 - 80
4	30 - 50	40 - 60
8	20 - 40	30 - 50
40	10 - 25	12 – 27
200	5 - 12	5 – 15

***Deleterious Substances***

All aggregates shall be reasonably free of clay lumps, soft and friable particles, salt, alkali, organic matter, adherent coatings, and other substances not defined which might possess undesirable characteristics. The weight of deleterious substances shall not exceed the following percentages:

1. Coal and lignite ASTM C123/C123M-12 ≤1.0%
2. Soft and friable particles ASTM C142M-10 ≤2.0%
3. Clay lumps ASTM C142M-10 ≤2.0%
4. Cinders and clinkers ≤0.5%
5. Free shell ≤1.0%
6. Organic Matter (Wet) ≤0.3%

**Physical Properties**

Aggregates shall meet the physical property requirements listed in Table 1.

Table 2- Coarse Aggregate Properties

Property	Test	Limits
Particle Shape	Flakiness Index) ASTM D-3398-00	<45%
Strength	Aggregate Crushing Value (ACV) BS 812-110	<25
	Los Angeles Abrasion (LAA) ASTM C-131-06 AND C-535-12	<30
Abrasion	Aggregate Abrasion Value (AAV) BS 812-113,	<15
Polishing	Polished Stone Value (BS EN 1097-8:2000)	>50
Durability	Soundness - Sodium Test ASTM C88-05	<12%
	Soundness - Magnesium Test ASTM C-88-05	<18%
Water Absorption	Water Absorption ASTM C-127-12	<2%
Bitumen Affinity	Immersion Tray Test (Shell Bitumen Handbook, D. Whiteoak)	Index of retained stability >75%

**California Bearing Ratio Requirement**

The material shall achieve a CBR (ASTM D1883-07e2) of not less than 80% after soaking for four days when compacted to a density of at least 95 % of the maximum density as determined by ASTM D-1557-12.

**PLACEMENT**

When the specified compacted thickness of the base is greater than 150 mm the base shall be constructed in two or more courses. Otherwise the base may be constructed in a single layer. Component courses of the layer shall be approximately equal in thickness and the compacted thickness of any layer laid, processed and compacted at one time shall not exceed 150 mm.

### ***1 Compaction***

The material shall have approximately the optimum moisture content before being compacted. Wetting or drying will be required when the material does not have the proper moisture content to ensure the required density. If the material is deficient in moisture, water shall be added and uniformly mixed-in by diskings the course to its full depth. If the material contains an excess of moisture, it shall be repeatedly disked and turned until it has dried to the required moisture content. Wetting or drying operations shall involve manipulation of the entire width and depth of the layer as a unit. As soon as proper conditions of moisture are attained the layer shall be compacted to a density with section 01040 – QUALITY CONTROL - table 1.

### ***Tolerances***

- Level

The level tolerances referred to in Section 01040, Quality Control and Testing shall be as follows:

- $H_{90} = 15\text{mm}$
- $H_{\text{max}} = 20\text{mm}$

- Layer thickness

The thickness tolerances referred to in Section 01040, Quality Control and Testing shall be as follows:

- $D_{90} = 21\text{mm}$
- $D_{\text{max}} = 27\text{mm}$
- $D_{\text{average}} = 5\text{mm}$

Level testing shall be carried out in accordance with “Procedures for Surface Levels of fills and pavements layers” Clause 1-7 Sampling, in QUALITY CONTROL Section 01040. The grid will not conform to any system of points or levels used by the Contractor for setting out the surface originally. In addition further check levels will be taken at any point or area which appears to be too high or low.

### ***Density Control***

The Density of the layer is to be tested by the Sand Cone method ASTM D1556-07. When approved by the Employer’s Representative the Contractor may supplement the sand cone method with the use of a Nuclear Density Gauge. The in place density of each layer shall be determined as specified by the ASTM Standard D6938-10

Density testing shall be carried out in accordance with “Procedures for relative compaction in pavement layers” Clause 1-7 Sampling, in QUALITY CONTROL Section 01040. The grid will

not conform to any system of points or levels used by the Contractor for setting out the surface originally. In addition further check levels will be taken at any point or area which appears to be too high or low.

## TESTING

The stiffness of the final layer to determine the in situ California Bearing Ratio must be performed in accordance with ASTM 6758-18

In addition, no more than fifty percent (50%) of the testing will be apportioned as random tests at the Project Manager's discretion. The Contractor is required to carry out any field or laboratory testing as described by the Specifications at any given time within the project duration at the Ministry of Public Infrastructure Laboratory. The Contractor will also bare the cost or responsibility of arranging transportation for collecting samples, storage of samples and testing equipment to and from site.

## MEASUREMENT AND PAYMENT

Item: Aggregate Base

Unit: Cubic meter

Measurement of the work of Aggregate Base shall be based on the requirements of the Drawings and the surveys and shall be the cubic meters of compacted material required based on the nominal levels of the roadbed and the theoretical edge profile and extent shown on the drawings.

Payment for Aggregate Base shall be made at the relevant rate quoted in the bill of quantities per cubic meter and shall be full and complete payment for the work and shall include the cost of all operations and sequences of operations which may be required, including testing, to comply with the needs of the Works, including, but not limited to winning and transport of the material, stockpiling, hauling, filling by increments, compacting, forming base, final shaping, disposing of all surplus material and all incidentals necessary to complete the work.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 4, Pavement Works Item 030401 Crushed Aggregate Base using the units of measurement specified.

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## **SECTION 03050 – TREATMENT OF SURFACE DEFECTS**

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**1-1 DESCRIPTION**

The Work shall consist of the repair and treatment of existing road surfaces prior to the application of a seal or asphalt surfacing. It comprises deep and shallow (surface) patching; repairing edge breaks and cracks sealing all as directed by the Employer’s Representative.

This part of the work is intended to take place in advance of the major construction or rehabilitation works in order to restore the existing roadway surfaces to a serviceable condition for use by the public.

The roadway and shoulder surfaces shall be maintained in such condition throughout the Contract period. Routine maintenance activities to be undertaken during the period following takeover by the Employer are covered in Division 01010, General Requirements.

**MATERIALS**

Materials shall comply with the requirements Specified below:

***1 Slurry***

Composition

The slurry shall consist of a mix of slurry aggregate, the grade to be approved by the Employer’s Representative, a 60% stable-grade emulsion, filler and water in the proportions as directed. The following proportions shall apply for bidding purposes only and may be adjusted later to suit site conditions:

- Slurry aggregate (saturated volume) 100 kg
- Stable-grade emulsion 20 kg
- Cement 1-1.5 kg
- Water (as directed by the Employer’s Representative) ± 15 kg

Mixing

A mixer of a type approved by the Employer’s Representative shall be provided in good working order and capable of producing a uniform slurry of the constituent materials. It may either be a batch mixer or a continuous type mixer. Material which, in the opinion of the Employer’s Representative, is not properly mixed or in which the emulsion shows signs of having broken during mixing shall not be applied.

***Herbicide***

Herbicide shall be a non-selective, environmentally compatible herbicide approved by the Employer’s Representative.

**PLANT AND EQUIPMENT**

All equipment shall be suitable for the specified use and working areas and shall be capable of obtaining the specified results.

**1-3-1 Milling**

The equipment shall be of a design which will be suitable for milling the existing surfacing in order to remove any irregularities and to leave an even surface without tearing the underlying material. An approved milling machine may be used.

Before milling may start, the Contractor shall demonstrate to the Employer's Representative that the machine is capable of executing the work in accordance with the Project Specifications.

Payment for Milling specified in this section of the Specification shall be made under the relevant item in the Bill of Quantities, Bill 4, Pavement Works, Item 030501 Milling using the units of measurement specified.

**1-3-2 Repairing Edge Breaks**

Only approved cutting or sawing equipment may be used for cutting or sawing asphalt layers. The equipment shall be capable of cutting asphalt layers to depths of 200 mm in one operation without fragmenting the material and in straight lines within the required tolerances.

The following items of plant and equipment shall also be available:

- A vibratory roller having a mass of about 15 tons with an adjustable amplitude and frequency of vibration.
- A mobile compressor capable of producing at least 3 m<sup>3</sup>/minute compressed air at 750 kPa.
- Appropriate paving breakers.
- Manually operated pneumatic compactors as required.
- Appropriate concrete mixers.

**1-3-3 Crack Sealing**

Over and above the equipment normally used for surface treatments, the following additional equipment shall be available for crack sealing:

- Special spraying equipment with 2 mm nozzle openings and with spare nozzles.
- Special heating equipment where appropriate for cleaning cracks and custom built applicators for applying sealants to cracks.

**REPAIR OF SURFACE DEFECTS**

The Baseline data which defines the condition of the road shall be the data given in photographic records and schematic surface drawings.

The following treatments shall be carried out in areas designated by the Project Manager's Representative.

**1-4-1 Crack Sealing**

This work shall be carried out where existing asphalt surfaces exhibit sufficient cracking that treatment with bituminous slurry is directed by the Employer's Representative.

Cracks shall be blown clean with compressed air and all foreign and loose material shall be removed.

A supply of an approved, environmentally compatible herbicide diluted in accordance with the Manufacturer's requirements shall be applied. The solution shall be sprayed into cracks on the designated areas by means of backpack type sprayers and allowed to dry. Care shall be taken to spray only undesirable plants and spray drift shall not be allowed to affect adjacent vegetation or fall into water courses.

The surface on either side of the crack shall be sprayed with an approved rejuvenator for a width of 300 mm on either side of the crack and allowed to soften the existing surface. The crack shall then be filled with slurry which shall be worked in with rubber squeegees. Any excess slurry shall be removed.

Once the emulsion has set, the area can be rolled with a pedestrian vibratory roller until a smooth finish is obtained.

Payment for Crack Sealing specified in this section of the Specification shall be made under the relevant item in the Bill of Quantities, Bill 3, Pavement Works, Item 030502, Crack Sealing using the units of measurement specified.

#### ***1-4-2 Patching***

The Employer's Representative will demarcate any failed areas to be repaired, and shall instruct the Contractor on the depth of patching work to be done – shallow or deep.

The Contractor shall give adequate notice of his intention to commence repair work on any specific section of the road so that the Employer's Representative will have sufficient time to demarcate the areas to be treated.

The Contractor shall be responsible for traffic safety and control during the demarcation work and the subsequent repairs.

Unless otherwise instructed by the Employer's Representative, the patching shall have a neat rectangular shape. The existing material shall be excavated and removed to the full specified depth. Asphalt layers and surfacing shall be sawn to a vertical face with approved sawing equipment.

#### **Asphalt Surface Patches Type 1– Shallow**

The Employer's Representative will designate the areas of the roadway to receive a shallow patch treatment.

This work shall comprise saw cutting and excavation of the asphalt surface layer(s) to a rectangular shape, the application of a Tack Coat to the exposed layer beneath and placement of an asphalt patch using Sand Asphalt material to the level of the surrounding intact surface. All excess materials shall be disposed of.

Payment for Asphalt Surface Patches, Type 1 shall be made under the relevant item in the Bill of Quantities, Bill 2, Site and Earthworks, Item 020503, Asphalt Surface Patches- Type1, using the units of measurement specified.

### Asphalt Surface Patches for Paved and Surface Dressed Highways Type 2 – Deep

The Employer's Representative will designate the areas of the roadway to receive the deep patching treatment.

This work shall comprise saw cutting of asphalt surface layer(s) to a rectangular shape, then excavation of all pavement layers as well as removal of sub grade to firm ground as directed by the Project Manager's Representative. Excavation for deep patches must be a minimum of 600mm below the level of the surrounding intact surface for heavily trafficked asphalt surfaced roads and 400 mm for lightly trafficked DBST roads.

Excavation for patching shall be cut with side slopes of approximately 90° to the horizontal. Excavated material from each pavement layer shall be placed in separate stockpiles for re-use or spoiled in an approved manner in accordance with the Employer's Representative's instructions.

Stockpiled material shall not be spoiled next to the road. All excess materials shall be disposed of in an acceptable way.

Excavations shall be backfilled with sub-base and base material meeting the requirements of sub base and base material given in Section 03010 – White Sand Sub Base and Section 03040 – Aggregate Base and compacted and finished to the required levels. The requirements for material quality, density and finish specified in other appropriate Sections shall remain applicable and untested material from the sides of the road shall not be used.

Unless otherwise specified, the sub-base and base shall be backfilled in accordance with the following requirements:

- When the specified compacted thickness of the sub-base or base material is greater than 150 mm, the layer shall be constructed in two or more lifts, otherwise the sub base or base may be constructed in a single layer. Component courses of the layer shall be approximately equal in thickness and the compacted thickness of any layer laid, processed and compacted at one time shall not exceed 150 mm.

#### **1-4-3 Compaction**

The material shall be brought to its optimum moisture content and the proper loose consistency, in a method approved by the Employer's Representative before being compacted.

Wetting or drying may be required when the material does not have the proper moisture content to reach the required density. If the material is deficient in moisture, water shall be added and uniformly mixed-in by disking the material to its full depth. If the material contains an excess of moisture, it shall be dried before being compacted. Wetting or drying operations shall involve manipulation of the entire width and depth of the placed layer.

As soon as proper conditions of moisture are attained each course shall be compacted to a density not less than 95% as determined by ASTM D1557-12

Prior to the placing of material for subsequent layers, density tests shall be made on the lower course so that the Employer's Representative can be satisfied that the specified compaction requirements have been met. For the compaction of an upper layer, the operations of moisture content adjustment shall not be such as to disturb the density of the lower course. The density shall be determined separately for each layer.

The deep patched area shall have a base thickness of 200mm and be finished with an application of a Prime Coat and Sand Asphalt material to a minimum depth of 75 mm to the level of the surrounding intact surface. All excess materials shall be disposed of.

Unless otherwise instructed in writing by the Employer's Representative, the excavation, backfilling and all patching work, complete as specified, for any patch shall be carried out and completed on the same day.

Payment for Asphalt Surface Patches, Type 2 shall be made under the relevant item in the Bill of Quantities, Bill 3, Pavement Works, Item 030504, Asphalt Surface Patches- Type2, using the units of measurement specified.

#### ***1-4-4        Repairing Edge Breaks***

This treatment is intended for use where trimming and/or repair of the edges of the surfaces to receive an asphalt overlay is required. The work shall include restoration of the edges to the true lines of the original road or to such other edge line as may be designated.

Where the edges of the surfacing have broken away significantly, the existing edges shall be cut back to the full thickness of the asphalt layer until a sound face can be obtained. Loose material shall be removed and disposed of.

The exposed surface shall be compacted with suitably sized vibratory rollers to ensure a sound surface and a Prime Coat applied.

Where directed, a Tack Coat shall be applied to the exposed sound asphalt face and the repair completed with Sand Asphalt and compacted by means of a suitable vibratory roller or compactor.

Payment for Repairing Edge Breaks specified in this section of the Specification shall be made under the relevant item in the Bill of Quantities, Bill 4, Pavement Works, Item 030505, Repairing Edge Breaks using the units of measurement specified.

#### ***1-4-5        Vertical Cut in Asphalt Concrete Surface and Cement Base***

This item is intended for use when trimming the edge of the shoulders is required to allow for pavement widening

The existing edge will be cut to full depth asphalt and cement stabilized base leaving a neat vertical surface after excavation for widening.

Payment for Vertical Cut in Asphalt Concrete Surface and Cement Base shall be made under the relevant item in the Bill of Quantities, Bill 4. Pavement Works, Item 030506 Vertical Cut in Asphalt Concrete and Cement Base using the units of measurement specified.

### **OPENING TO TRAFFIC**

The road shall be kept open to traffic for such period as the Employer's Representative may direct before further surface treatment work is carried out.

### **MEASUREMENT AND PAYMENT**

The work under this Section shall be deemed to include any precautions or special working methods necessary to planning, crack sealing, shallow and deep patching, repair edge breaks, vertical cutting as well as disposal of excavated material. All work shall be as directed by the Employer's Representative including traffic management, saw cutting, excavation, removal and disposal of all demolition materials, replacing sub base and base materials, compacting, prime and tack coating, providing sand asphalt etc. and any other material required for completion of the works.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 4, Pavement Works Item 030501 Planning, Item 030502 Crack Sealing, Item 030503 Asphalt Surface Patches Type 1, Item 030504 Asphalt Surface Patches Type 2, Item 030505 Repairing Edge Breaks, and Item 030506, Vertical Cut in Asphalt Concrete Surface and Cement Stabilized Base, using the units of measurement specified

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***SECTION 04010 – PRIME COAT***

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## 1-1 DESCRIPTION

This Section shall cover the application of bituminous Prime Coat to previously prepared non-asphaltic pavement layers where directed.

All such work shall be accomplished in accordance with these Specifications and in conformity with the lines, dimensions and notes shown on the Drawings or as directed by the Employer's Representative.

## MATERIALS

### *1 Prime*

The material shall meet the requirements of ASTM D2028/D2028M-10 or ASTM D2027/D2027M-10 otherwise approved by the Employer's Representative and shall be:

**Cut-back Asphalt, RC-250, RC-70 or MC-70**

### *Aggregate*

The aggregate applied to primed surfaces shall consist of crushed rock or river sand, with 100% passing the 6.7 mm sieve and not more than 10% passing the 2.00 mm sieve.

The aggregate shall be clean, hard and free from excessive dust and contain no clay, loam or other deleterious matter.

## EQUIPMENT

The following equipment shall be available and in good working order:

### *1 Distributor*

The distributor used for distributing the bituminous binders shall:

- Be in sound working condition and shall be calibrated against common methods for determining film thickness.
- Have a spray-bar where the outside nozzle at each end of the spray bar shall have an area of opening 25% min. and 75% max in excess of the other nozzles. All other nozzles shall have uniform openings.
- Have a spray bar where the distance between the centres of openings of the outside nozzles of the spray-bar are equal to the width of the application required - with an allowable variation of 50 mm. When the prime application covers less than the full width, the normal opening of the end nozzle at the junction line may remain the same as those of the interior nozzles.
- Not have any fuel or binder leaks;
- Have a straight and clean spray-bar, with spray heads of the same type which open simultaneously and not leak when closed;

- Have spray-heads all at the same angle to the spray-bar and adjusted to the correct level so as to obtain the required spray overlap;
- Have fans clearing one another;
- Have undamaged and clean sieves;
- Shall be equipped with pneumatic tires having a sufficient width of rubber in contact with the road surface to avoid breaking the bond or forming a rut in the surface;
- Be under the direct control of an operator approved by the Employer's Representative and with a certificate of competence.
- Be equipped with hand lance equipment for spraying corners and other areas which cannot be reached by the spray bar;

### ***Water Sprinkler***

The water sprinkler shall have efficient spray equipment capable of spraying a uniform film of water over the whole area to be primed.

### ***Rotary Broom***

The rotary broom shall be self-propelled or supplied together with a suitable pneumatic-tired towing vehicle.

### ***Miscellaneous Equipment***

Other equipment shall include hand brooms, reinforced paper for joints, string, nails and all other ancillary equipment required to carry out the operation efficiently and neatly.

### ***Transport Tanks***

All transport tanks delivering bituminous materials for use on the project shall be equipped with an approved spigot-type sampling device.

### ***Storage Tanks***

All prime materials stored in a heated condition shall be stored in a container with a properly functioning circulation system and having a securely fitting lid. The maximum storage temperature shall be as recommended by the prime material manufacturer.

Where measurement of bituminous material is to be made from a storage tank, the tank shall be calibrated by a Specialist approved by the Employer's Representative prior to its use.

### ***Calibration***

All distributors, transport tanks and storage tanks used on the work shall be calibrated by a Specialist approved by the Employer's Representative and no distributor or tank shall be used until it has been satisfactorily calibrated.

Calibrations made for distributors, transport tanks, and storage tanks by a reliable and recognized firm engaged in calibrating tanks may be accepted. The calibrations made or

approved by the Employer's Representative shall be used to determine the quantity for each distributor, transport, and storage tank.

## APPLICATION

### *1 Weather and other Limitations*

No prime shall be applied under the following adverse conditions:

1. During misty or wet conditions;
2. When rain is imminent;
3. When wind is blowing sufficiently hard to cause uneven spraying;
4. When the surface of the layer is visibly soaked;
5. After sundown;

When at any position the moisture content of the base layer is more than 90% of the optimum moisture content as determined by the Employer's Representative.

The Employer's Representative's decision on whether or not to apply the prime coat under specific conditions shall be final.

### *Preparation*

No longer than 24 hr before spraying, the layer to be primed shall be swept and cleaned of all loose or deleterious material by means of rotary and/or hand brooms. Sweeping shall be done carefully so as not to cause any damage to the layer.

Before any priming material is sprayed the layer to be primed shall be checked for compliance with the surface and other requirements specified. Any sections not complying with the specified requirements shall be corrected.

A light spray of water, sufficient to dampen the surface, may be uniformly applied to the layer immediately before the application of the prime. If the water is over applied the layer shall be allowed to dry until a uniform damp surface is obtained. The material in the layer shall not exceed 90% of the optimum moisture.

### *Application*

It is recommended that the temperature of the prime material shall be between 38°C and 65°C. The actual temperature will depend on the recommended application temperature for the specific prime material being used. The actual temperature shall be that which will ensure uniform distribution and will be designated by the Employer's Representative. Comment:

The rate of application will be dependent on the character of the surface but shall be sufficient to coat the surface thoroughly and uniformly with no excess material. The rate of application shall be within the range:

**0.9 – 2.3 l/m<sup>2</sup>**

The actual rate of application shall be as directed by the Employer's Representative after trial applications to short sections if necessary.

Wherever feasible, the prime shall be applied in one or more lanes evenly over the full width of the road and allowed to penetrate and cure until traffic can pass over the surface without the wheels picking up the prime. All traffic shall be kept off the surface until this condition is obtained.

The total width of the primed surface shall be as shown on the Drawings or as prescribed by the Employer's Representative and the edges of the primed surface shall be parallel to the centerline of the road.

Where it is not feasible for traffic to use diversions, the prime shall be applied and allowed to penetrate for as long as is practicable before a blinding layer of aggregate is applied at a rate of 0.0035 m<sup>3</sup>/m<sup>2</sup> approx.

Care shall be exercised in this operation to avoid the aggregate being applied too soon after spraying the prime. Where practicable 2-4 hr shall elapse as directed by the Employer's Representative. Any "caking" of aggregate which may take place and cause problems during the surfacing process and all loose aggregate shall be removed before the final surfacing is commenced.

If the prime is applied in more than one strip, allowance shall be made for overlapping of strips by 100 mm.

#### ***Protection of Adjacent Work***

When the prime is applied adjacent to curb or any other concrete surfaces, such concrete surfaces (except where they are to be covered with a bituminous wearing course) shall be covered with heavy paper or otherwise protected as approved by the Employer's Representative during application. Any bituminous material deposited on such concrete surfaces shall be removed immediately.

The Contractor shall, at his own cost, replace all soiled items which cannot be properly cleaned. Painting the soiled surfaces will not be accepted as a suitable remedial measure.

#### ***Maintenance and Opening to Traffic***

Where aggregate has been applied to the primed surface, the Contractor shall maintain the layer and the primed surface during the period when the surface is opened to traffic and shall repair all damage caused to the primed surface as directed by the Employer's Representative.

#### ***Tolerances***

The actual spray rates measured at spraying temperature shall not deviate from the required spray rate as specified or ordered by the Employer's Representative by more than 0.06 l/m<sup>2</sup>. The edges of the primed surface shall be true to line with a maximum deviation of 25 mm from the specified edge line.

#### ***Testing***

The Contractor shall give the Employer's Representative at least 24 hr notice of the intention to spray prime material so that the actual spray rates can be prescribed and/or verified by the

Employer's Representative. Unless otherwise agreed in advance, the Contractor shall only spray when the Employer's Representative is present and the section to be sprayed has been approved in writing.

**MEASUREMENT AND PAYMENT**

Payment for prime coat shall be based on the area to be prime coated as defined in the drawings or as approved by the Project Manager. No payment shall be made for any additional material required neither for testing or calibration, nor for any excess material placed in excess of the approved rate or outside the required areas.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities Bill 4 Pavement Works, Item 040101, and Prime Coat using the units of measurement specified.

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## **SECTION 04011 – TACK COAT**

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**1-1 DESCRIPTION**

This Section covers the application of bituminous tack coat on previously prepared asphaltic impervious bases, prepared base courses, concrete bridge decks and on existing pavement surfaces where directed.

All such work shall be accomplished in accordance with these Specifications and in conformity with the lines, dimensions and notes shown on the Drawings or as directed by the Employer's Representative.

**MATERIALS**

The tack coat material shall meet the requirements of ASTM D2397-12 or ASTM D977-12b as otherwise approved by the Employer's Representative and shall be:

**Emulsified Bitumen, Grades RS-2, SS-1 or SS-IH****EQUIPMENT**

The equipment to be used for this section conforms to the specifications laid out in Section 1-3 of the preceding Section 04010 Prime Coat.

***1-3-1 Calibration***

All distributors, transport tanks and storage tanks used on the work shall be calibrated by a Specialist approved by the Employer's Representative and no distributor or tank shall be used until it has been satisfactorily calibrated.

Calibrations made for distributors, transport tanks, and storage tanks by a reliable and recognized firm engaged in calibrating tanks may be accepted. The calibrations made or approved by the Employer's Representative shall be used to determine the quantity for each distributor, transport, and storage tank.

**APPLICATION*****1-4-1 Weather and other Limitations***

No tack shall be applied under the following adverse conditions:

1. During misty or wet conditions;
2. When rain is imminent;
3. When wind is blowing sufficiently hard to cause uneven spraying;
4. When the surface of the layer is visibly wet, i.e. more than damp;
5. After sundown.

The Employer's Representative's decision on whether or not to apply the tack coat under specific conditions shall be final.

**1-4-2 Preparation**

No longer than 24 hr before spraying, the layer to be tacked shall be swept and cleaned of all loose or deleterious material by means of rotary and/or hand brooms.

**1-4-3 Application**

The recommended temperature of the tack material shall be between 38°C and 65°C. The actual temperature shall be that which will insure uniform distribution and will be designated by the Employer's Representative.

The rate of application will be dependent on the character of the surface but shall be sufficient to coat the surface thoroughly and uniformly with no excess material. The rate of application shall be within the range:

**0.3 – 0.6 l/m<sup>2</sup>**

The actual rate of application shall be as directed by the Employer's Representative after trial applications to short sections if necessary.

Wherever feasible, the tack shall be applied in one or more lanes evenly over the full width of the road and allowed to cure.

The total width of the tacked surface shall be as shown on the Drawings or as prescribed by the Employer's Representative, and the edges of the tacked surface shall be parallel to the centerline of the road. If the tack is applied in more than one strip, allowance shall be made for overlapping of strips by 100 mm.

Before applying the surface the tack coat shall then be allowed to dry. No traffic shall be allowed on the tacked surface.

**1-4-4 Protection of Adjacent Work**

When the tack coat is applied adjacent to curb and gutter, valley gutter or any other concrete surfaces, such concrete surfaces (except where they are to be covered with a bituminous wearing course) shall be covered with heavy paper, or otherwise protected as approved by the Employer's Representative during application. Any bituminous material deposited on such concrete surfaces shall be removed immediately.

The Contractor shall, at his own cost, replace all soiled items which cannot be properly cleaned. Painting the soiled surfaces will not be accepted as a suitable remedial measure.

**1-4-5 Tolerances**

The actual spray rates measured at spraying temperature shall not deviate from the required spray rate as specified or ordered by the Employer's Representative by more than 0.06 l/m<sup>2</sup>. The edges of the tacked surface shall be true to line with a maximum deviation of 25 mm from the specified edge line.

**1-4-6 Testing**

The Contractor shall give the Employer's Representative at least 24 hr notice of his intention to spray tack material so that the actual spray rates can be prescribed and/or verified by the

Employer's Representative. Unless otherwise agreed in advance the Contractor shall only spray when the Employer's Representative or his representative is present and the section to be sprayed has been approved in writing.

**MEASUREMENT AND PAYMENT**

Payment for tack coat shall be based on the area to be tack coated as defined in the drawings or as approved by the Project Manager. No payment shall be made for any additional material required neither for testing or calibration, nor for any excess material placed in excess of the approved rate or outside the required areas.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities Bill 4 Pavement Works, Item 040111, Tack Coat, using the units of measurement specified.

## **SECTION 04030 – ASPHALT CONCRETE AND SAND ASPHALT**

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**1-1 DESCRIPTION**

This Section specifies the materials, composition and job-mix formulae for Continuously Graded Asphalt Concrete and Hot Mix Sand Asphalt for use in road, parking lane, shoulder and sidewalk surfaces.

**ASPHALT CONCRETE****1-2-1 Materials**

The materials used shall conform to the following requirements:

Asphalt Cement (Bituminous Binders)**Bitumen Binder Viscosity Grade AC-20**

Each delivery of bituminous material shall be accompanied by a copy of recently (not more than 4 weeks) certified results of test on the material being delivered and a statement as to the type and amount of material contained in each carrier and the identification of the storage tanks from which the material is being delivered.

If AC-20 is not readily available, then an alternative may be used with the written approval of the Employer's Representative.

This statement shall be presented to the Employer's Representative or his representative upon delivery.

The asphalt cement or the alternative shall conform to the requirements of ASTM D 3381/D3381M-12 Table 2 for Grade AC-20 and a maximum penetration of 60 at 25°C (77°F) shall be required.

Aggregate

The aggregate shall be clean and shall contain no deleterious substances. Coarse or fine aggregate containing more than 0.5% of phosphate shall not be used.

All aggregate shall comply with the recommendations in:

1. ASTM D1073-11 – Standard Specification for Fine Aggregate for Bituminous Paving Mixes, and;
2. ASTM D692/D692-09 – Standard Specification for Coarse Aggregate for Bituminous Paving Mixes.
3. ASTM C136-06 – Standard Specification for Coarse aggregate gradation;
4. ASTM C136-06 – Standard Specification for Fine aggregate gradation.

The aggregate shall comply with the recommendations specified in and **Table 2**.

**Table 3- Coarse Aggregate Properties**

Property	Test	Limits
Particle Shape	Flakiness Index) BS 812-Part 105.1-89	<45%
Strength	Aggregate Crushing Value (ACV) (BS812-110, Part 3)	<25
	Los Angeles Abrasión (LAA) ASTM C-131-06 AND C-535-12	<30
Abrasion	Aggregate Abrasion Value (AAV) (BS812, Part 3)	<15
Polishing	Polished Stone Value (BS812-113, Part 3)	>50
Durability	Soundness - Sodium Test ASTM C88-05	<12%
	Soundness - Magnesium Test ASTM C-88-05	<18%
Water Absorption	Water Absorption ASTM C-127-12	<2%
Bitumen Affinity	Immersion Tray Test (Shell Bitumen Handbook, D. Whiteoak)	Index of retained stability >75%

**Table 4- Fine Aggregate Properties**

Property	Test	Limits
Cleanliness	Sand Equivalent ASTM C 2419=09	>35%
	Plasticity Index ASTM D-4318-10	<4
Durability	Soundness - Sodium Test ASTM C-88-05	<15%
	Soundness - Magnesium Test) ASTM C-88-05	<20%

Mineral Filler

In laboratory tests, and for the purpose of proportioning the paving mixes, all material passing a 2.0 mm sieve and retained on a 0.075 mm sieve shall be considered as fine aggregate. Material passing the 0.075 mm sieve shall be considered as mineral filler.

The mineral filler shall comply with the recommendations in:

1. ASTM D546-17 – Standard Test Method for Sieve Analysis of Mineral Filler for Road and Paving Materials.
2. ASTM D242/242M-19 Standard Specification Of Mineral Filler for Bituminous paving mixtures

**1-2-2 Mix Composition**

The aggregate shall be so graded, and the constituents combined in such proportions as to produce a mix conforming to the general composition limits as shown in **Table 3** below for combined aggregates.

The gradation may be adjusted by the Employer’s Representative on the basis of mix design tests to obtain optimum flow and stability complying with the limits shown in **Table 4 and**

**Table 6.**

**Table 5- Grading Limits for Combined Aggregates**

Sieve Size ASTM E11-09e1	Total Aggregate Passing by Weight (%)	
	WC1	WC2
3/4	100	
1/2	80 – 100	100
3/8	54 – 72	62 – 80
4	42 – 58	44 – 60
8	34 – 48	36 – 40
16	26 – 38	28 – 40
30	18 – 28	20 – 30
100	12 – 20	12 – 20
200	6 -12	6 – 12

**Table 6- Marshall Test Criteria and Mix Proportions**

Criteria	WC1	WC2
Bitumen Content (% by mass of total mix)	5.0 – 7.0	5.5 – 7.4
Minimum Stability (kN at 60 degrees)	6.0	
Minimum Flow (mm)	2	
VMA (minimum)	14	15

Criteria	WC1	WC2
Air Voids (%)	3.0 – 5.0	

The asphalt concrete shall retain 75% of the specified Marshall stability when tested, after 48 hours of soaking according to immersion compression test. Lime and/or Ordinary Portland cement should be added to the mix when the mix does not meet the minimum specified retained strength according to the immersion compression test.

The maximum flow value during production shall not exceed the accepted value of the Job mix formula by more than 25%.

The ratio of % by weight of total aggregate passing #200 sieve to the effective asphalt content expressed as a % by weight of total mix shall be in the range of 0.6 - 1.2.

Where hand placing and finishing of Asphalt Concrete is permitted for small and irregular areas, such as in intersection areas, acceleration and deceleration lanes, the portion of the coarse aggregate retained on a #4 sieve may be omitted from the mix and the % by weight of the coarse aggregate passing a #4 sieve and retained on a #10 sieve shall be within the range specified for the total coarse aggregate in the mix.

Screenings

Any screenings used in the combination of aggregates shall contain no more than 15% of material passing a #200 sieve. When two screenings are blended to produce the screening component of the aggregate, one of such screening product may contain up to 18% of material passing a #200 sieve, as long as the combination of the two does not contain over 15% of material passing a #200 sieve.

Screenings may be washed to meet these requirements.

**1-2-3 Formula for Job Mix**

Mix Design

The Contractor shall submit mix designs and representative samples of all component materials to the Employer’s Representative at least 30 days before the scheduled start of production.

No asphalt construction shall be started on the project until the Employer’s Representative has approved the job-mix formulae.

Modifications to Master Ranges

The general composition limits prescribed above are ‘master ranges’ of tolerance to govern mixes made from any materials meeting the Specifications. They are the maxima and minima in all cases and mixes utilizing materials which fall outside these ranges or yield mixes with properties outside these ranges will not be permitted.

Compliance with Job Mix Formula

The tolerances from the approved Job Mix Formula applicable to production mixes are given in Para 1-12-1 Construction Tolerances, below.

#### Materials Requiring Adjustment of Bituminous Material Content

Materials found to have characteristics requiring a content of bituminous material less than is indicated in the formula prescribed above shall be rejected, or shall be adjusted to provide a blend that will produce a balanced mix under the terms of the formula.

Where materials otherwise meeting specifications are found (because of highly absorptive or other special characteristics) to produce an acceptable balanced mix only if the bituminous material content is increased over the amount specified, the materials may be accepted provided that the design mix is adjusted to require the use of such an increased amount of bituminous material.

#### Laboratory-Compacted Density

Laboratory-compacted mix shall have a density of not less than 95% (nor more than 98%) of the calculated theoretical density of a void-less mix composed of the same materials and proportions.

#### Sampling of the Site Mix

Samples of the mix in use will be taken as many times daily as necessary and it shall be maintained uniformly throughout the project within the specified tolerances.

#### Change in Sources of Supply or Nature of Materials

If an additional or alternative source of supply for materials is approved, or if a change in the nature of the materials from an approved source causes a variation in the mix properties, the Contractor will re-design the job-mix formula and seek approval as per the requirements for the original design mix.

### **SAND ASPHALT**

#### ***1-3-1 Materials***

The materials used shall conform to the following requirements:

##### Asphalt Cement (Bituminous Binders)

##### **Bitumen Binder Viscosity Grade AC-20**

The bitumen binder for use in hot mix sand asphalt mixes shall comply with the requirements of Asphalt Concrete above.

##### Sand

The sand for use in hot mix sand asphalt mixes may comprise local reef sand or white Sand obtained from a borrow source or a commercial supplier and blended to the correct proportions.

The sand shall be free from clay, organic and other deleterious material and shall comply with the properties in Table 5 below.

**Table 5-Properties of Sand for Sand Bitumen Mixes**

Property	Test	Limits
Cleanliness	Sand Equivalent ASTM D-2419-14	>30%
	Plasticity Index ASTM D-4318-17e1	Non Plastic
Durability	Soundness - Sodium Test ASTM C-88-18	<15%
	Soundness - Magnesium Test ASTM C-88-18	<20%

Mineral Filler:

Mineral filler shall consist of finely ground particles of limestone, hydrated lime, Ordinary Portland Cement or other non-plastic matter as approved by the Employer’s Representative. It shall be thoroughly dry and free from lumps. At least 75% (by weight) shall pass a #200 sieve and 100% shall pass a # 40 sieve.

The gradation may be adjusted by the Employer’s Representative on the basis of mix design tests to obtain optimum flow and stability complying with the limits shown in **Table 6**.

**Table 6- Marshall Test Criteria and Mix Proportions**

Criteria	Limits
Bitumen Content (% by mass of total mix)	4.0-5.0
Minimum Stability (kN at 60°) (50 blows)	2.7
Minimum VMA	15
Flow (mm)	2 -4
Air Voids (%)	2.0 – 10.0

The Sand Asphalt shall retain 75% of the specified Marshall Stability when tested after 48 hours of soaking according to the immersion compression test.

Lime and/or ordinary Portland cement should be added to the mix when the mix does not meet the minimum specified retained strength according to the immersion compression test.

**1-3-2 Construction**

The temperature of the sand asphalt mix on arrival on site shall not exceed 170°C and during compaction shall not be lower than 110°C.

## COMPOSITION OF ASPHALT SURFACING MIXES

The rates of application and mix proportions of bituminous binder, aggregates and fillers which are given in the tables above are nominal rates and proportions and shall only be used for bidding purposes. The rates and proportions actually used shall be determined to suit the materials used and conditions prevailing during construction and any approved variation of a nominal mix in the bitumen content or active filler content shall not be the subject of an adjustment in payment.

Before production or delivery of the asphalt the Contractor shall submit samples of the materials he proposes to use in the mix, together with his proposed mix design as determined by an approved laboratory, to the Employer's Representative so that the Employer's Representative may test the materials and confirm the use of the proposed mix if he is satisfied that it meets the specified requirements. As soon as the materials become available the Contractor shall produce a working mix in the plant in accordance with the design mix. The working mix shall again be tested by him for compliance with the design requirements. Samples of the working mix shall also be made available to the Employer's Representative, who will authorize the use of the working mix proportions finally approved for use. The composition of the approved working mix shall be maintained within the tolerances given above.

## PLANT AND EQUIPMENT

### *1-5-1 General*

All plant shall be so designed and operated to produce a mix complying with the requirements of this Specification. The plant and equipment used shall be of adequate rated capacity, in good working order and subject to the approval of the Employer's Representative. Obsolete or worn-out plant will not be allowed on site. Prior to the start of the work the Contractor shall supply the Employer's Representative with copies of the manufacturer's handbooks and copies of check lists prepared in terms of ISO 9002 where applicable pertaining to the mixing, remixing and paving plants, containing details of the correct settings and adjustments of the plant.

Any alteration which has been or is being effected to any constructional plant, and which does not comply with the specifications of the manufacturer, shall be brought to the notice of the Employer's Representative.

### *1-5-2 Mixing Plant*

Asphalt shall be mixed by means of an approved type mixer of proven suitability for producing a mix complying with all the requirements of the Specifications. Mixing plants having a capacity of less than 50 tons per hour shall not be used.

The mixing plant may be either automatically or manually controlled but in the latter case, two control operators shall be provided.

The heating system of the tanks storing the binder shall be so designed that the binder will not be degraded during heating. A circulating system for the binder shall be provided which shall

be of adequate size to ensure the proper and continuous circulation between storage tanks and mixer during the entire operating period.

Binder storage tanks shall be fitted with thermometers designed to provide a continuous record of the temperature of the binder in the tank. Copies of these records shall be supplied to the Employer's Representative on a daily basis.

Satisfactory means shall be provided to obtain the proper amount of binder in the mix within the tolerances specified, either by weighing or volumetric measurements. Suitable means shall be provided for maintaining the specified temperatures of the binder in the pipelines weigh buckets, spray bars and other containers or flow-lines.

In the case of a drum type mixer, the system shall control the cold feeding of each aggregate fraction and of the filler by mass, by means of a load cell or another device regulating the feed automatically, and by immediately correcting any variation in mass which results from moisture or from any other cause. The cold feed shall be regulated automatically in regard to the binder feed so as to maintain the required mix proportion.

Suitable dust collecting equipment shall be fitted to prevent pollution of the atmosphere in accordance with the provisions of any local Act governing pollution.

The fuel chosen and control of the burner shall be such as to ensure the complete combustion of the fuel in order to prevent pollution of the atmosphere and the aggregate.

#### ***1-5-3 Spreading Equipment- Paver***

The mix shall be laid by an approved type of self-propelled mechanical spreader and finisher capable of laying to the required widths, thicknesses, profile, camber or cross-fall, without causing segregation, dragging or other surface defects.

All pavers shall be fitted with automatic electronic screed controls to maintain the required levels, cambers and cross falls. Where skids are used they shall be at least 9 m long or as specified by the Employer's Representative. Where levelling beams on multiple skids or sliding beams are used they shall be at least 9 m long.

#### ***1-5-4 Rollers***

Compaction shall be done by means of approved flat steel wheel vibratory or pneumatic-tired rollers. The frequency as well as the amplitude of vibratory rollers shall be adjustable. Vibratory rollers shall be used only where there is no danger of damage being done to the asphalt, structures of bridge decks, or other layers. It will be indicated in the Project Specifications whether vibratory compaction equipment may be used on bridge decks and what the constraining parameters will be. The rollers shall be self-propelled and in good working condition, free from back lash, faulty steering mechanism and worn parts. Rollers shall be equipped with adjustable scrapers to keep the drums clean and with efficient means of keeping the wheels wet to prevent mixes from sticking to the rollers. No leakages of any nature may occur in the rollers. The mass and/or tire pressures shall be such so as to ensure proper compaction to comply with the specifications of surface finish and density.

#### ***1-5-5 Vehicles***

The asphalt shall be transported from the mixing plant to the spreader in trucks having tight, clean, smooth beds and sides which have been treated to prevent adhesion of the mix to the truck bodies. A thin film of soapy water or vegetable oil may be used to prevent adhesion but petroleum products shall not be used for this purpose. All vehicles used for transporting hot asphalt shall be fitted with canvas or other suitable approved covers to minimize temperature loss. Such covers shall be securely fixed over the hot asphalt from time of departure at the mixing plant until immediately prior to discharge of the asphalt into the paver.

## GENERAL REQUIREMENTS

### *1-6-1 Weather Conditions*

Asphalt may be mixed and placed only under favourable weather conditions, and shall not be mixed or placed when rain is imminent or during misty or wet conditions.

### *1-6-2 Moisture Content*

The mixing and placing of asphalt will not be allowed if the moisture content of the aggregate affects the uniformity of temperature or if free water is present on the working surface, or when the moisture content of the underlying layer, in the opinion of the Employer's Representative, is too high. No surfacing shall be placed unless the moisture content of the upper 50 mm of the base is less than 90% of the optimum moisture content as determined by the Employer's Representative.

No levelling course shall be placed immediately after a rainy spell on an existing partly cracked and/or highly permeable surfacing resulting in trapping of moisture in the pavement structure. A minimum delay of 24 hours or such extended period as ordered by the Employer's Representative shall apply.

### *1-6-3 Surface Requirements*

#### Correction of Base

The base (after the prime coat has been applied) shall be checked for smoothness and accuracy of grade, elevation and cross section. Any portion of the base not complying with the specified requirements shall be corrected with asphalt at the Contractor's own expense, until the specified requirements are met. The Employer's Representative may however, in his sole discretion, allow minor surface irregularities to remain, provided they can be taken up in the following asphalt layer without adversely affecting that layer.

Asphalt used for the correction of the base or sub-base, shall be the same mix as specified for the surfacing or as directed by the Employer's Representative, and the maximum size of aggregate used shall be dictated by the required thickness of the correction in each case.

Notwithstanding these provisions for the correction of the base, the Employer's Representative reserves the right to order the removal and reconstruction of the layer or of portions of the base and sub-base layers not complying with the specified requirements, instead of allowing the correction of substandard work with asphalt material.

#### Cleaning of the Surface

Immediately before applying the prime or tack coat before the application of the asphalt, the surface shall be swept and cleaned of all loose or deleterious material.

Where the prime or tack coat has been damaged, it shall be repaired by hand brushing or spraying priming material over the damaged portions.

The prime or tack coat shall be sufficiently dry before the asphalt may be applied. The Contractor’s programme shall allow for delays that are a function of the type of prime, rate of application, base porosity and moisture content, and climatic conditions.

Storage

Mixing shall not be allowed to take place more than four hours before paving begins unless provision has been made for storage. Storage of mixed material will only be permitted in approved hoppers, which are capable of maintaining the temperature of the mix uniform throughout.

In any case storage will not be permitted for a period longer than 12 hours after mixing, unless otherwise approved by the Employer’s Representative.

**PRODUCTION OF THE MIX**

*1-7-1 Mixing and Storage Temperatures*

Bituminous binders shall be stored at temperatures not exceeding those given in **Table 7** and the aggregate and bituminous binders shall be heated at the mixing plant to such temperatures that the mixed product shall have a temperature within the range given in **Table 7**.

**Table 7- Temperature Ranges for Bitumen Binders**

Material	Max Storage Temperature of Binder (°C)		Temperature Range of Mix (°C)	
	Over 24 hours	Under 24 hours	Continuously Graded Asphalt	Hot Mix Sand Asphalt
AC-20	135	175	135 - 160	145 - 170

*1-7-2 Batch Plants*

Heating the Aggregate

The aggregate shall be dried and heated so that, when delivered to the mixer, its temperature shall be between 0°C and 20°C lower than the maximum temperature indicated in **Table 7** for the mix. The moisture content of the mix shall not exceed 0.5%.

Batching

Each fraction of the aggregate and binder shall be measured separately and accurately in the proportions by mass in which they are to be mixed. If filler is used, it shall be measured

separately on a scale of suitable capacity and sensitivity. The error in the weighing apparatus used shall not exceed 2% for each batch.

### Mixing

The aggregate, filler and binder shall be mixed until a homogeneous mix is obtained in which all particles are uniformly coated. Care shall be taken to avoid excessively long mixing times which can cause hardening of the binder.

#### ***1-7-3 Drum-Type Mixer Plant***

The aggregate and filler shall be accurately proportioned and conveyed into the drum-mixing unit. The calibrated amount of binder shall be sprayed onto the aggregates at the correct position so that no hardening of the binder shall take place.

A homogeneous mix and uniform coating of binder must be achieved and the moisture content of the asphalt mix shall not exceed 0.5%. Once the final mix temperature has been agreed upon it may not be altered without the prior consent of the Employer's Representative. The moisture content of the asphalt mix shall be tested using a recognized method.

### **TRANSPORTING THE MIX**

The mix shall be transported from the mixing plant to the Works in trucks complying with the above requirements. Loads shall be covered by waterproof canvas or metal sheets. Deliveries shall be made so that spreading and rolling of all the mixes prepared for a day's run, can be completed during daylight, unless artificial lighting, as approved by the Employer's Representative, is provided.

Any asphalt which has become wet due to rain or any other cause will be rejected.

Hauling over freshly laid asphalt material is not permitted.

### **SPREADING**

#### ***1-9-1 General***

The mix shall be delivered to the paver in such a manner that the paver will never be forced to stop for lack of asphalt. The temperature of the mix shall be controlled by measuring in a random pattern in the truck immediately before emptying, and the average temperature found shall not be less than 10°C below the minimum temperature specified for mixing in **Table** . The adjustment of the screed tamping bars, feed screws, hopper feed, etc, shall be checked frequently to ensure uniform spreading of the mix. If segregation occurs, the spreading operations shall immediately be suspended until the cause is determined and corrected.

The addition and removal of material behind the paver shall normally not be allowed and the paver shall be capable of spreading the mix to the correct amounts that will provide the required

compacted thickness without resorting to spotting, picking-up or otherwise shifting or disturbing the mix.

Operators shall not be permitted to walk on un-compacted asphalt.

Paving shall, if possible, commence at the bottom of the grades and the lower edges of super elevated curves. Paving shall be done upgrade on grades steeper than 5%. Spreading shall be so arranged that longitudinal joints do not coincide with joints in lower layers of asphalt levelling course or surfacing.

The paver shall be equipped to provide automatic control of levels and cross section. In the case of asphalt levelling course construction, automatic control shall be run off guide-wires and in the case of surfacing and overlays skids or guide-wires shall be used.

On restricted areas, inaccessible to the paving equipment used, the mix may be placed by hand or other means to obtain the specified results. Paving shall be carried out in a manner which will avoid segregation and which will allow control of levels.

The mixer capacity and the operating speed of the paver are to be coordinated to ensure continuous laying and to avoid intermittent stopping of the paver. Paving shall cease when rain starts falling or when the surfaces to be paved are visibly wet.

#### **1-9-2 Overlays**

In the case of overlays, guide-wires will normally not be required when placing the mix unless specifically requested by the Employer's Representative. In all cases, including levelling courses, the paver shall be provided with skid beams with electronically controlled equipment which can ensure a constant cross fall and can even out local irregularities.

#### **1-9-3 Asphalt**

Asphalt shall be placed in restricted areas with the aid of smaller specially equipped pavers, hand tools, or other approved equipment. The space concerned shall be properly filled with asphalt, without leaving any gaps between the fresh asphalt and the existing pavement layers. All the provisions in regard to temperature, mix composition, uniformity, etc, shall remain applicable, but layer thickness and control shall be such that the requirements for compaction and surface tolerances can still be attained.

#### **1-9-4 Joints**

All joints between adjacent sections of the work shall be made by cutting back the layer against which the material is to be placed. All loose and incompletely compacted material shall be removed. A cutting wheel shall be used for cutting longitudinal joints.

Joints shall be either at right angles or parallel to the centre line, and joints in the final layer of the surfacing shall, where possible, correspond with the lane markings. Joints in lower layers shall be offset not less than 150 mm on either side of the edges of the traffic lanes.

Before a new layer is placed next to an existing layer, the cut edge of the existing layer shall be painted with a thin coat of bituminous emulsion of the same type used for the tack coat, if so directed by the Employer's Representative, or the paver must be fitted with a gas burner to heat the cut edge of the existing layer.

Joints shall be neat and shall have the same texture and density as the remainder of the asphalt course. All joints shall be marked out with chalk lines prior to cutting.

The outside edges of the completed asphalt course shall be trimmed along the shoulder, and parallel to the centre line, to give a finished width, as shown on the Drawings, within the tolerances specified.

Any fresh mix spread accidentally onto existing work at a joint shall be carefully removed by sweeping it back with stiff brooms onto the un-compacted work, so as to avoid the formation of irregularities at the joint. Whenever the paving operation is stopped due to lack of mix, the Contractor shall form a proper joint as specified above, if so directed by the Employer's Representative.

#### **1-9-5 Compaction**

The mix shall be rolled as soon as possible after it has been laid by vibratory, steel wheel and pneumatic-tired rollers in a sequence predetermined and approved during the laying of trial sections. Such rolling shall commence and be continued only for so long as it is effective and does not have any detrimental effect. The use of pneumatic-tired rollers for continuously-graded non-homogeneous modified binders shall be assessed in the trial section.

As many rollers shall be used as is necessary to provide the specified pavement density and the required surface texture. During rolling of surfacing only, the roller wheels shall be kept moist with only sufficient water to avoid picking up the material.

After longitudinal joints and edges have been compacted, rolling shall start longitudinally at the sides and gradually progress towards the centre of the pavement, except on super elevated curves, or where the area to be paved has a straight cross-fall, when rolling shall begin on the low side and progress to the higher side, uniformly lapping each preceding track, covering the entire surface. The initial breakdown rolling shall be done with 8-10 tonnes dead weight smooth-wheeled rollers the rollers shall move at a slow but uniform speed (not to exceed 5 km/h) with the drive roller nearest the paver, unless otherwise specified on account of steep gradients. The intermediate rolling shall be done with 8-10 tonnes dead weight or vibratory rollers or with pneumatic tyred rollers of 12 to 15 tonnes weight having nine wheels with a tyre pressure of at least 5.6kg/sqcm. The finish rolling shall be done with 6 to 8 tonnes smooth wheeled tandem rollers.

No movement of the asphalt layer shall occur under steel wheel rollers once the asphalt temperature has dropped to below 100°C. Three-wheeled steel rollers, with large diameter rear wheels are preferable to tandem rollers and may be used in conjunction with pneumatic tired rollers; provide pickup of the asphalt on the wheels does not occur.

For non-homogeneous binder mixes it is recommended that a commercial detergent at a concentration of 1 to 3,000, be added to the water used to wet the tires of pneumatic tired rollers, to limit pick up. The sequence of rollers used in compaction is at the discretion of the Contractor provided the completed pavement shall have a density as measured on recovered core equal to or greater than 95%, in the approved production mix, of the theoretical maximum density.

The Contractor shall utilize a calibrated nuclear gauge for process control during compaction operations. Notwithstanding this requirement, the acceptance control carried out for

compaction by the Employer's Representative shall still be based on cores taken from the compacted layer.

The nuclear device shall:

1. Be operated by a suitably trained technician;
2. Comply with all the safety regulations of the Regulatory Authority (Radiation Control);
3. Be certified to be suitably calibrated.
4. The portion of trial section having the desired surface texture shall be designated as a reference for what is required in the permanent work.
5. The following requirements shall apply to rolling and compacting generally:
6. The material shall not be excessively displaced in a longitudinal or transverse direction especially when changing gears, stopping or starting rollers.
7. No cracks or hair cracks shall be formed and the bond with the underlying layer shall not be broken.
8. The density shall be uniform over the whole area of the layer and extend over the full depth of the layer.
9. Rollers shall not be left standing on the asphalt layer before it has been fully compacted.
10. In restricted areas where the specified rollers cannot be used, compaction shall be carried out with hand-operated mechanical compaction equipment or approved smaller vibratory rollers. The prescribed density requirements remain applicable throughout, over the full layer thickness, irrespective of the method of compaction.

### **TRIAL SECTIONS**

Before the Contractor commences with the construction of any asphalt leveling course or surfacing, he shall demonstrate, by laying a trial section 300 m<sup>2</sup> in area, that the equipment and processes that he proposes to use, will enable him to construct the particular asphalt course in accordance with the specified requirements.

The Employer's Representative may require that up to three different binder contents be incorporated in one such trial section to verify the laboratory design phase.

The specified requirements shall include dynamic test results obtained from briquettes prepared from material obtained in a stratified randomly sampled manner at the manufacturing plant or behind the paver as directed by the Employer's Representative and/or cores extracted from the completed trial section and in locations determined in a stratified randomly sampled manner.

A maximum period of 10 days shall be allowed to verify dynamic test results unless otherwise specified by the Employer's Representative.

Only when such a trial section has been satisfactorily laid and finished, and complies with the specified requirements, will the Contractor be allowed to commence with construction of the permanent work.

If the Contractor should make any alterations in the methods, processes, equipment or materials used or if he is unable to comply consistently with the Specifications, the Employer's Representative may require that further trial sections be laid before allowing the Contractor to continue with the permanent work.

The intention of this Clause is to avoid any experimentation by the Contractor on the permanent work.

The trial sections shall be laid where indicated by the Employer's Representative. The Contractor shall prepare the surface on which to lay the trial section and shall also, if required, remove the trial section after completion and restore the surfaces on which it was constructed.

Should the Contractor fail to produce a satisfactory product for at least a continuous 100 m<sup>2</sup> he shall lay additional areas, at his own cost and no additional payment, until a satisfactory product is obtained for a continuous 200 m<sup>2</sup>.

#### **PROTECTION AND MAINTENANCE**

The Contractor shall protect the asphalt leveling course and asphalt surfacing from all damage until the work is finally accepted by the Employer and he shall maintain the surfacing work until the issue of the maintenance certificate. Any damage occurring to the completed surfacing except fair wear and tear on surfacing during the maintenance period, or any defects which may develop due to faulty workmanship shall be made good by the Contractor at his own expense and to the satisfaction of the Employer's Representative.

#### **TOLERANCES AND FINISH REQUIREMENTS**

##### *1-12-1 Construction Tolerances*

The completed sections of asphalt levelling course and surfacing shall comply with the requirements for grade, width, thickness, cross section and smoothness stated below:

##### Level and Grade

The level tolerances referred to in Section 01040 of the Specification shall be as follows:

1.  $H_{90} = \pm 15$  mm
2.  $H_{\max} = \pm 20$  mm

Deviation from the specified longitudinal grade due to deviations from the specified levels shall not exceed the values given in **Table 8** below.

#### **Table 8- Deviations from Specified Longitudinal Grade**

Length of section under review (m)	Maximum deviation (g) of specified slope (%)
2	0.354
5	0.224
10	0.158
20	0.112
30	0.091

Width

The average width of both asphalt levelling course and surfacing shall be at least equal to that shown on the Drawings and nowhere shall the outer edge of the layer be inside the lines shown on the Drawings by more than 15 mm.

Thickness

The thickness tolerances referred to in Section 01040 of the Specification shall be as follows:

1.  $D_{90}$  levelling course = 15 mm/surfacing = 5 mm
2.  $D_{max}$  levelling course = 20 mm/surfacing = 8 mm
3.  $D_{ave}$  levelling course = 5 mm/surfacing = 2 mm

Thickness shall be determined from carefully controlled levels taken before and after construction in exactly the same position and/or from cores drilled from the completed layer.

Cross Section

When tested with a 3 m straight-edge laid parallel to or at right angles to the road centre line the surface shall not deviate from the bottom of the straight-edge by more than 10 mm.

At any transverse section the difference in level between any two points shall not vary from their difference in level computed from the cross section shown on the Drawings by more than 10 mm.

Surface Regularity

When tested with a rolling straight-edge as described in Section 01040 of the Specification the number of surface irregularities shall not exceed those given below (applied to levelling course and surfacing).

1. The average number of 6 mm irregularities per 100 m shall not exceed 2 when taken over 600 m lengths of asphalt surfacing;
2. The number of 6 mm irregularities shall not exceed 3 when taken over 100 m sections;

3. The maximum value of any individual irregularity when measured with the rolling straight-edge or a 3 m straight-edge lay parallel or perpendicular to the road centre line shall not exceed 10 mm.

The rolling straight-edge shall be operated in at least two locations per traffic lane, once at 1metre from the outer edge of the lane and once at 3metres from the outer edge of the lane. The number of irregularities identified in the two runs thus required for any section of a single lane shall be added together for the purposes of compliance with (1) and (2) above.

#### Failure to meet Surface Tolerances

1. Failure to meet the basic minimum thickness requirement or to meet the minimum level requirement (not lower than the design level) is not acceptable and must be rectified, either by removal and replacement of the substandard layer or by the application of an additional layer. In the case of an additional layer the extent, thickness and material must be agreed by and will be at the discretion of, the Project Manager's representative but in no case will an additional layer of less than 20mm of sand asphalt or 35 mm of asphalt concrete be permitted. In the case of a 35mm layer of AC a new mix design utilizing aggregate with maximum size of 18mm will have to be provided, all in accordance with these Specifications. Where additional material is applied it must be for the full width of the road over a length of not less than 100metres and with additional ramp sections of at least 10metres length for Sand Asphalt and 20metres length for Asphaltic Concrete. Rectification by placing additional material may not be used on sections in such a way that the gap between sections is less than 300metres. In such cases additional material must be laid over the whole length.
2. Where the surface is too high but meets the requirements for Detail and Surface Regularity set out above it will be accepted except in areas where other considerations apply (e.g. Intersection with existing pavement) where the Project Manager may condemn the work and require it to be removed and replaced as necessary to meet those other considerations.
3. Where the surface meets thickness and minimum level requirements but fails to meet Detail or Surface Regularity requirements it will be accepted up to a certain point with a financial penalty. Where the level of defects exceeds the acceptable maximum the layer must be rectified as for failure to meet the thickness requirement as set out in (1) above.

Under no circumstances shall a section of surfacing be accepted where the deviation from the bottom of the 3metre straightedge exceeds 20mm. In such cases the surfacing over a length not less than 30metres of complete lane width shall be removed and replaced. In such cases the surface must be rectified and failure to meet the thickness requirement as set out in (1) above can be accepted with the financial penalty given below.

Where the finished surface fails to meet the requirements for Surface Regularity by the preceding paragraph the penalty shall be calculated as follows:

Determine the summation in millimetres of the peak values of all irregularities in excess of 5mm in every 100metre section of each affected lane. Subtract 30mm from this total and divide the resulting figure by 10; take that result as the percentage by which payment for the surfacing in the affected 100metres is to be reduced.

E.g. Total of all irregularity peaks in sample 100 metres length is 102mm.

Subtract 30 leaves 72mm.

Reduce the nominal payment for surfacing in those 100 metres of lane by 7.20%.

Allowable Mix Proportion Tolerances

After the job-mix formulae have been established, all operations, handling, preparation and mixing shall be controlled such that the mix shall meet the approved formula for the project.

This shall be within the allowable tolerances (which are the maxima for any materials and may be applied only within the limits of the general composition range) shown in **Table 9**.

**Table 9 Mix Proportions Tolerances for Asphalt Surfacing**

Sieve Size ASTM E11- 20	Tolerances (% by Weight)
3/4	+/-4%
1/2	+/-5%
4	+/-5%
8	+/-4%
16	+/-4%
30	+/-4%
50	+/-4%
100	+/-3%
200	++-1.5%
Bitumen	+/-0.4%

For the percentages shown in the design mix for the total material retained on the No.10 sieve and for the total material passing the No.10 sieve, a tolerance of 4% will be allowed from the percentage specified as the design mix.

Application of the above tolerances does not remove the Contractor’s responsibility for providing asphalt mixes which meet project requirements in terms of the specified criteria for Flow, Stability and Voids.

**TESTING**

**1-13-1 Sampling**

Sampling of asphalt mixes shall be carried out according to a recognized method as agreed by the Employer's Representative.

**1-13-2 Coring of asphalt layers**

The Contractor shall provide suitable coring machines capable of cutting 100 mm diameter cores from the completed asphalt layers.

All core holes shall be neatly repaired with asphalt and compacted to the specified density. The cores shall be filled with the same mix as used for the layer tested.

**MEASUREMENT AND PAYMENT**

Payment shall be made for the theoretical volume in Cubic meters of Asphaltic Concrete or Sand Asphalt, as the case may be, based on the required thicknesses and outlines shown on the drawings. Payment will include all testing required, providing all materials, mixing, placing, compacting and trial sections. No allowance will be made for any additional material required to make good low areas in the underlying Base Layer or neither for any excess material placed above the design finished levels nor for any additional material placed as corrective measures required by a failure to meet Specified standards.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities Bill 4 Pavement, Item 040301, Asphalt Concrete and Item 040302 Sand Asphalt, using the units of measurement specified.

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## 1-1 DESCRIPTION

This specification covers the materials, construction plant, construction and requirements for providing bituminous surface treatments or dressings to the road surface in locations shown on the Drawings or as directed by the Employer's Representative.

The surface treatments shall consist of the application of a bituminous coat applied to the road followed by spreading a layer of aggregate in the case of a Single Surface Dressing (SSD) and a repeat of this in the case of a Double Surface Dressing (DSD) to the areas shown on the Drawings.

## MATERIALS

### 1-2-1 Bituminous Binders

The binder will be a medium-cured cut-back MC 3000 or a penetration/cut-back mixture blended to the approval of the Project Manager.

#### Penetration Grade Bitumen

Road-Grade Bitumen ASTM D3381/D3381M-18

Cut-back Bitumen ASTM D2028/D2028M-15 and ASTM D2027/D2027M-19

#### Bitumen Emulsion

Anionic Emulsions ASTM D977-20

Cationic Emulsions ASTM D2397-20

The bitumen emulsions shall also be subject to viscosity requirements for spray-grade emulsions as follows:

1. Anionic spray-grade (60%) Emulsion  
Minimum 12 degrees Engler at 20-C
2. Cationic spray-grade (65% and 70%) emulsion  
Minimum 80 seconds Saybolt Furol at 50-C

### 1-2-2 Extender Oils

The extender oil shall be a petroleum-derived of high aromatic material and shall comply with the requirements of **Table 1**.

**Table 1- Extender Oils**

Property	Requirements
Flash point	180°C (min)
% by mass of saturated hydrocarbons	25% (max)
% by mass of aromatic-unsaturated hydrocarbons	50% (min)

**1-2-3 Diluents**

The diluents shall be a hydrocarbon distillate.

**1-2-4 Aggregate**

Aggregate shall be composed of clean, tough particles, free from lumps or balls of clay or other objectionable material.

Properties

The properties of the aggregate shall comply with the characteristics set out in **Table 2**

**Table 2- Properties Aggregates for Surface Dressings**

Particle Shape	Flakiness Index BS 812-Part 105.1-89	<45%
Strength	Aggregate Crushing Value (ACV)	<25
	Los Angeles Abrasion (LAA) ASTM C131-20 AND C535-20	<30
Abrasion	Aggregate Abrasion Value (AAV)	<15
Polishing	Polished Stone Value	>50
Durability	Soundness - Sodium Test ASTM C88-18	<12%
	Soundness - Magnesium Test ASTM C88-18	<18%
Water Absorption	Water Absorption ASTM C127-15	<2%
Bitumen Affinity	Bituminous mixtures. Test methods for hot mix asphalt. Determination of the affinity between aggregate and bitumen EN 12697-11	Index of retained stability >75%

Grading

The grading set out in **Table 3** for aggregates shall be used.

**Table 3**

ASTM Sieve #	Nominal Size of Aggregate ASTM Sieve #			
		5/8	3/8	#1/4
Percentage by Mass Passing				
#1 1/4		-	-	-
#3/4		100	-	-
#5/8		85 - 100	100	-
#3/8		0 - 40	85 - 100	100
#1/4		0 - 7	0 - 35	85 - 100
#4		-	0 - 10	-
#6		-	-	0 - 35
#8		0 - 2	0 - 2	0 - 10
#30				0 - 2
#200		0 - 1	0 - 1	0 - 1

**PLANT AND EQUIPMENT**

**1-3-1 General**

All plant and equipment used on the Works shall be of adequate rated capacity and in good working condition.

All plant and equipment that will be operated on the road during construction of the seal shall be free from any binder, fuel or oil leaks, and no refuelling or servicing of any equipment will be allowed to take place while such equipment is on the road.

**1-3-2 Distributor.**

The distributor used for distributing the bituminous binders shall:

1. Be in sound working condition and shall be calibrated using common methods for determining film thickness.
2. Have a spray-bar where the outside nozzle at each end of the spray bar shall have an area of opening not less than 25% or more than 75% in excess of the other nozzles. All other nozzles shall have uniform openings.

3. Have a spray bar where the distance between the centres of openings of the outside nozzles of the spray-bar are equal to the width of the application required within an allowable variation of 50 mm. When the prime application covers less than the full width, the normal opening of the end nozzle at the junction line may remain the same as those of the interior nozzles.
4. Not have any fuel or binder leaks;
5. Have a straight and clean spray-bar, all the spray heads of which shall be of the same type which open simultaneously and shall not leak when closed;
6. Have its spray-heads all spraying at the same angle to the spray-bar and adjusted to the correct level so as to obtain the required overlapping;
7. Have its fans not interfering with one another;
8. Have its sieve undamaged and clean;
9. Shall be equipped with pneumatic tires having a sufficient width of rubber in contact with the road surface to avoid breaking the bond or forming a rut in the surface;
10. Be under the direct control of an operator approved by the Employer's Representative on the grounds of a reference, in writing, or a certificate of competence signed by a representative of a Road Authority.
11. The Contractor shall provide proof by way of a test on the site that the binder distributor has sufficient reserve power to maintain the required constant speed up the steepest incline to which spray has to be applied, and to obtain a uniform distribution of the mix.
12. The optimal spray-bar level shall be determined during testing, and the spray-bar level shall be adjusted accordingly before each spray. The uneven application of binder will be unacceptable.

### **1-3-3 Chip Spreaders**

The chip spreaders shall be capable of spreading stone of the specified size uniformly over widths varying between 2.4 and 4 m and shall be capable of adjustment to permit variation of the rate of application within the specified tolerances, and uniform spreading in both the transverse and longitudinal directions.

Spreaders which are not self-propelled, shall be of a type that can be attached quickly to the rear of trucks, and operated while backed over the stone chippings being spread.

### **1-3-4 Rollers**

Sufficient operational rollers of each of the following types shall be available on the Works to maintain the required tempo of work:

#### **Pneumatic-Tired Rollers**

Rolling of the chips should preferably be carried out by pneumatic tired rollers of a self-propelled type equipped with smooth flat profile pneumatic tyres of uniform size and diameter. The mass of the roller shall be between 12 to 15 tonnes. Steel wheeled rollers tend to crush the chips and if their use cannot be avoided their weight shall be limited to 8 tonnes.

The rollers shall be equipped with suitable devices for keeping the wheels wet and clean during operation.

The wheels of the roller shall be so spaced that one pass of the roller will provide one complete coverage equal to the rolling width of the machine. The total operating mass and tyre pressure may be varied by the Employer's Representative at his discretion. Individual tire pressures shall not differ by more than .05 kg/sqcm from one another.

#### Steel-Wheeled Rollers

Steel-wheeled rollers shall be self-propelled three-wheel or tandem rollers of between 6 and 8 tonnes mass and shall be equipped with suitable devices for cleaning and moistening the wheels. The mass of the roller required shall be approved by the Employer's Representative. No steel-wheeled rollers shall be used without the consent of the Employer's Representative.

#### Additional Requirements

The type and number of rollers shall be subject to the approval of the Employer's Representative for each type of seal and the proposed programme.

No seal work shall continue if the required rollers are not on site or in an operational condition.

#### **1-3-5 Brooms**

##### Drag Broom

The drag broom shall be of a size, type and mass which will enable the chips to be distributed evenly over the surface without dislodging any chips from the binder.

##### Rotary Broom

An approved rotary broom, complete with towing vehicle fitted with smooth pneumatic tires, shall be available at all times on the Works.

#### **1-3-6 Pre-coating Plant**

The pre coating of chips may be done in any suitable plant capable of uniformly coating the chips.

#### **1-3-7 Miscellaneous Equipment**

Sufficient equipment for handling and hauling aggregate and binder shall be provided to ensure prompt and continuous placing and application of bituminous materials as specified. The Contractor shall have available all the necessary ancillary equipment and hand tools to carry out the work efficiently.

Suitable fire-fighting equipment for dealing with bitumen fires shall be available on site, together with suitable first aid equipment for dealing with bitumen burns.

The Employer's Representative shall be entitled to request reserve plant, should there be any doubt as to the efficiency or capability of the equipment provided.

**GENERAL LIMITATIONS AND REQUIREMENTS**

**1-4-1 Weather limitations**

The minimum road-surface temperatures at which spraying of the different types and grades of binder may be done is as follows:

Bitumen Binders

- 1. 150/200 Penetration-Grade Bitumen 21°C
- 2. 80/100 Penetration-Grade Bitumen 25°C
- 3. MC-800 Cut-back Bitumen 10°C
- 4. MC-3000 Cut-back Bitumen 10°C

Bitumen Emulsions

- 1. Bitumen emulsion 10°C

Whenever the temperature of the road surface falls below the aforesaid temperature for the binder in question, or, in the opinion of the Employer’s Representative, will probably fall below the required temperature before spraying the binder, no binder shall be sprayed.

No bituminous work shall be done during foggy or rainy weather, and, when a cold wind is blowing, the above temperatures shall be increased by 3°C to 6°C as directed by the Employer’s Representative.

When the breaking process accelerates to such an extent that it renders the product unworkable to attain the required end result, for instance when the surface temperature is in excess of 60°C, or as otherwise prescribed by the Employer’s Representative, no sealing shall be done.

When strong winds are blowing which are likely to interfere with the proper execution of the work, no sealing, especially spraying of binder, shall be done.

**1-4-2 Moisture Content**

No seal shall be placed unless the moisture content of the upper 50 mm of the base is less than 90% of the optimum moisture content as determined by the Employer’s Representative. No reseal shall be placed immediately after a rainy spell on an existing partly cracked and/or highly permeable surface resulting in the trapping of moisture in the pavement structure. A minimum delay of 24 hours or such extended period as ordered by the Employer’s Representative shall apply.

**1-4-3 Other Constraints**

The following curing periods shall apply to the various treatments listed, prior to applying a surface dressing unless otherwise specified in Project Specifications:

- 1. Texturing using fine slurries 6 weeks
- 2. Rapid setting slurry (rut filling, etc.) 12 weeks
- 3. Crack sealing 2 weeks

4. Repair of distressed patches                      6 weeks

Unless otherwise agreed by the Employer's Representative, and subject to the outcome of a trial section, the Contractor shall programme all spraying to cease each working day at 15:00 hours.

#### ***1-4-4 Preparation of Areas to be Surface Dressed***

##### General

The areas to be surface dressed shall be cleaned of all dust, dirt, dung, oil or any other foreign matter that may be deleterious to the seal.

##### Newly Constructed surface dressed

Where newly constructed base or shoulder areas are to be Surface dressed, the surfaces shall be checked for compliance with the surface tolerances and all other requirements specified. Any portions that do not meet these requirements shall first be either corrected or removed and reconstructed before they are surface dressed.

##### Existing Surfaces to be surface dressed

Existing roads that require surface dressing shall, if so specified or ordered by the Employer's Representative, be given a pre-treatment in accordance with one or more of the methods described in Section 02050 ( Treatment of Surface Defects) of these Specifications. Any failures shall be repaired as specified in these Specifications.

#### ***1-4-5 Demarcation of Working Area***

##### New Work

The Contractor shall demarcate the area of the primed base to be surface dressed by means of setting out wire lines down each edge of the specified seal width.

##### Reseal Work

Immediately before the tack coat or bituminous binder is sprayed, the centre line of the road shall be marked by a 3 mm thick sisal or hemp twine, secured by nails driven, at 15 m intervals on straights and 5 m intervals on curves, into the existing surface. This twine shall be left in position during all subsequent operations.

### **HEATING AND STORAGE OF BITUMINOUS BINDERS**

#### ***1-5-1 Bituminous Binders***

The temperature ranges between which bituminous binders are to be heated shall be given in **Table 4** Heating and spraying temperatures are given in **Table 5**.

**Table 4- Maximum Storage Temperatures**

Materials	Maximum Storage Temperature (°C)	
	Over 24 hours	Up to 24 hours
<b>Road Grade Bitumen</b>		
150/200 Pen Grade	115	165
80/100 Pen Grade	125	175
<b>Cut-Back Bitumen</b>		
RC-250	60	90
MC-800	75	125
MC-3000	100	155
<b>Bituminous Emulsions</b>		
60%	Air Temp.	60
65%	Air Temp.	60
70%	Air Temp.	60

**Table 5- Heating and Spraying Temperatures**

Materials	Heating and Spraying Temperatures (°C)		
	Min	Max	Recommend
<b>Road Grade Bitumen</b>			
150/200 Pen Grade	150	175	165
80/100 Pen Grade	165	190	175
<b>Cut-Back Bitumen</b>			
RC-250	90	115	100
MC-800	110	135	125
MC-3000	135	155	145
<b>Bituminous Emulsions</b>			
60%	Air	60	60
65%	Air	60	60

70%	Air	60	60
-----	-----	----	----

Binders stored in a heated condition shall be kept in a container with a securely fitting lid, the circulatory system of which is functioning properly. The container shall be provided with a built-in thermometer.

Binders which have been heated above the maximum temperatures indicated in this table shall not be used and shall be removed from the site. Every effort shall be made to maintain the binder temperature for spraying to within 5°C of the recommended temperature.

For single surface dressing the temperature limits for 150/200 penetration-grade bitumen, cut back with the indicated amounts of power paraffin in parts per 100 parts of bitumen by volume, shall be as set out in **Table 6** to prevent degradation of the bitumen.

**Table 6-Heating and Spraying Temperatures**

Quantity of power paraffin added (parts per 100 parts of bitumen by Volume)	Temperature Limits	
	Lower Limit (°C)	Upper Limit (°C)
0	150	175
2.5	146	163
5	138	154
7.5	132	149
12.5	121	138
15	115	135
17.5	107	127
22.5	100	118

**STOCKPILING AGGREGATE**

General

Sites for stockpiling aggregates shall be prepared in such a manner that no grass, mud, dirt or other deleterious material will be included when the aggregates are loaded for use.

Access roads to stockpile sites shall be prepared and maintained in such a way that no dirt is conveyed by vehicle wheels onto the areas to be surface dressed whilst aggregate is being transported to or from the stockpiles.

Stockpiles shall be so sited that they will not be exposed to excessive contamination with dust arising from traffic on the road or access roads. Aggregates contaminated to the extent that it contains more than the allowable percentage of material passing through the #30 sieve and #200 sieves shall not be used for sealing.

Precautions

Areas used for stockpiling pre coated aggregate shall be so sited that dust deposited on the chips is reduced to a minimum. Where necessary, temporary diversions and access roads in the immediate proximity shall be watered, sprayed with a suitable chemical dust suppressant, or sealed.

During the wet season when there is danger of the pre coating fluid being washed off the aggregate, the stockpiles shall be covered with tarpaulins or similar protective coverings.

During cooler periods the Employer's Representative may order that stockpiles be covered with tarpaulins to ensure that the aggregate temperature remains compatible with the limiting temperature applicable to the specified binder type.

## CONSTRUCTION PROCEDURE

### General

Adequate advance notice shall be given to the Employer's Representative before the Contractor proceeds with any seal work.

### Application of Tack Coat and Aggregate

A bituminous tack coat consisting of the type and grade of binder specified in these Specifications shall be sprayed on the properly cleaned and prepared base or existing surface over the full specified width of the surface dressing.

Where the binder in the distributor tank may not be able to feed the spray bar when spraying downhill, spraying shall be done with the binder distributor moving uphill. Should the Employer's Representative be of the opinion that the Contractor is unable to place the sealant over the full specified width in one pass; the Contractor shall execute spraying and place the chips in strips. The spraying of adjacent strips shall overlap by 100 mm. Chips may not be placed on the 100 mm overlap before the adjacent strip has been sprayed. The adjacent strip may not be sprayed before the preceding strip, excluding the 100 mm overlap, has been covered satisfactorily with chips in compliance with the Specifications. In so far as is practicable, the Contractor shall so place the strips that the joint between two adjacent chip applications shall fall on the centre line of the road.

Immediately after the binder has been sprayed, it shall be covered with clean, dry aggregate of the size specified in these Specifications under each of the appropriate Sections for each type of seal.

The actual rates of application of binder and aggregate to be used in the construction will be determined by the Employer's Representative, after he has tested the aggregates the Contractor proposes to use for the surface dressing and prior to any surface dressing being carried out.

The aggregate shall be applied uniformly by means of self propelled chip spreaders. The immediate application of the chips is of prime importance. The chip spreader shall be so operated that the tack coat shall be covered with aggregate before the wheels of the chip spreader or truck pass over the uncovered tack coat.

The quantity of bitumen sprayed in any single spray operation shall be governed by the quantity of aggregate, and the number of trucks available shall be sufficient to ensure the continuous application of stone behind the distributor. In addition the available roller capacity at normal operating speed shall also govern the extent of the tack coat and aggregate that may be applied.

### Initial Rolling of Aggregate

Immediately after spreading the aggregate has been completed, the surface shall be rolled with a 12 to 15 tonne pneumatic-tired roller for four covers except in the case of single seals initial rolling shall then be done with a steel-wheeled roller with a mass of 6 to 8 tonne working parallel to the centre line of the road from the shoulders towards the crown of the road, until every portion of the surface concerned has been covered by at least four passes of the roller, provided only a limited amount of crushing of aggregate takes place, If in the opinion of the Employer's Representative general crushing occurs under the rollers, such rolling shall be stopped regardless of the number of passes completed by the roller.

### Broom Drag and Final Rolling of Aggregate

After the bituminous binder has set-up sufficiently to prevent any aggregate from being dislodged, the surface shall be slowly dragged with a broom drag to ensure even distribution of the aggregate. If there are areas which are deficient in stone chips, additional material shall be added by hand so as to leave a single layer of chips lying shoulder to shoulder.

If there are areas with an excess of stone chips, such excess shall be removed by hand so as to leave a single layer of chips lying shoulder to shoulder. The importance of applying only a single layer of chips is stressed. Every care shall be taken to avoid an over-application of chips.

After broom dragging has been completed, the surface shall be rolled with a 12 to 15 tonne pneumatic-tired roller for four covers except in the case of single seals final rolling shall then be done with a steel-wheeled roller with a mass of 6 to 8 tonne working parallel to the centre line of the road from the shoulders towards the crown of the road, until every portion of the surface concerned has been covered by at least four passes of the roller, provided only a limited amount of crushing of aggregate takes place, If in the opinion of the Employer's Representative general crushing occurs under the rollers, such rolling shall be stopped regardless of the number of passes completed by the roller.

The surface shall be well knit and have a uniform appearance, free of roller-tyre marks; all aggregate contaminated by fuel, oil or grease shall be removed and replaced with clean aggregate.

### Joints between Binder Sprays

In order to prevent overlapping at junctions of separate binder applications the previous work along the joint shall be covered with twine-reinforced building paper for a sufficient distance back from the joint to ensure that the spray bar is operating at the required rate before the untreated surface is reached, and also to prevent additional binder application onto the previously treated section. The same method shall be used to ensure a neat joint at the end of the run.

### Protection of Kerbs, Channels, Etc.

Kerbs, channels, guttering, manholes, guard rails, bridge railings and any other structures which may be soiled by bituminous binders during spraying operations shall be protected when spraying.

The Contractor shall replace at his own cost any items that have been soiled and cannot be cleaned entirely. Painting soiled surfaces will not be accepted as a suitable remedy.

**RATES OF APPLICATION OF BINDER AND CHIPS**

**1-8-1** *The rates of application of binder for different sizes of chips shall be as follows:*

# 3/8 - # 5/8 chips	0.82 - 1.18 litre/sq. m
# 3/8 - 1/4" chips	0.82 - 0.41 litre/sq. m
#1/4"- No8	0.41 - 0.30 litre/sq m

The Average Least Dimension (ALD) shall be determined in the field after crushing the rock for chips and then determine the actual spray rates and chip spread rates.

The spread rates for different sizes of chips shall be as follows:-

#3/8” – #5/8” chips	90 –120 sq. m /cu m
# 8 - 1/4" chips	70–95 sq. m/cu m
1/4” to #8 chips	35 – 50 sq.m/cum

**1-8-2** *Trial sections*

The Contractor shall allow in his program for the construction of trial sections and carry out tests upon them as directed by the Project Manager. The Time of Completion of the Contract shall not be extended because of the time taken to carry out the tests and evaluate trial sections. The relevant works shall not commence until this trial has been approved by the Project Manager. No variation in spray or spread rates, size or sources of constituents shall be made after this trial without the agreement of the Project Manager.

**1-8-3** *Change of Rate of Application*

There will be no change in the rates/price or extra payments to the Contractor if the instructed materials application rates (binder spray, chipping, spreading etc) are outside the rates indicated in this document.

Tray tests shall be carried out at least once per day during surface dressing operations to check spray and spread rates calculated from spray truck drippings and chip-spreader coverage, and more frequently when a number of short lengths are being surface dressed. Spray truck drippings shall be taken for each length sprayed and chip-spreader coverage shall be checked each day chipping operations are in progress.

**1-8-4** *Crushing, Screening, Washing and Stockpiling Chips*

The construction plant provided and the methods of operating it shall be such as will produce chips that meet the specified requirements. This may require washing the chips to meet the

cleanliness requirements. If required the stockpile area shall be surfaced with 4 inches thickness of gravel or other material, acceptable to the Project Manager. Any contaminated chips shall not be used in the Works. After use the stockpile area shall be cleared, top soiled and left neat and tidy.

**1-8-5 Net Bitumen or Net Quantity of Bitumen**

Whenever the terms "net bitumen" or "net quantity of bitumen" are used in these Specifications to specify the rate of application of the binder for conventional or homogeneous modified binder (hot and cold), they shall mean viscosity grade (penetration-grade) bitumen net cold.

All binders and aggregates used in the various types of seals shall be applied at the rates of application as approved by the Employer’s Representative after tests on the materials proposed for use.

The nominal rates of application are for bidding purposes only and will not necessarily be used in construction. The actual rates of application to be used on the site shall in all cases be as approved by the Employer’s Representative. No payment will be made for bituminous binder applied in excess of the nominal rate.

The appropriate conversion factors given in Table 7 or specified in the Project Specifications shall be used for calculating net bitumen (cold) from conventional and homogeneous modified binders at spraying temperature.

Table 7- Calculating Net Bitumen

<b>Binder</b>	<b>Conversion Factor</b>	<b>Average Temperature (°C)</b>	<b>Spray</b>
150/200 Pen Bitumen	1.10	165	
80/100 Pen Bitumen	1.11	180	
MC 800	1.33	114	
MC 3000	1.23	138	
Bitumen Emulsion (60% Bitumen Content)	1.67	53	
Bitumen Emulsion (65% Bitumen Content)	1.56	60	

**DUST CONTROL**

Any temporary diversions and construction roads shall be kept watered and damp, or sprayed with a suitable chemical dust suppressant during all sealing operations and all dust shall be removed from surfaces before any binder or aggregate is applied.

**OPENING TO TRAFFIC**

The Employer's Representative shall be responsible for determining when any surface dressed layer is to be opened to traffic.

The road shall not be opened to traffic until the binder has set sufficiently to retain the aggregate so that the chips will not be picked up by the wheels of passing traffic.

The Contractor shall not allow any construction equipment, which is likely to cause damage, over the completed seal. The Contractor shall display speed restriction signs in accordance with the instructions of the Employer's Representative.

## **DEFECTS**

When in the opinion of the Employer's Representative, any unacceptable loss of stone or bleeding of the road surface which occurred during the course of the Contract or during the maintenance period and can be attributed to the Contractor not observing any of the requirements of the Specifications, these defects shall be corrected at the Contractor's expense. This includes the supply of aggregate, bitumen, pre coating if necessary, stockpiling at selected sites and later removal of any excess material reserved for corrective work during the period of maintenance.

### ***1-11-1 Bleeding***

Bleeding shall be corrected by the method described below or as required by the Employer's Representative. All operations to correct bleeding shall be carried out only when the surface temperature is high enough to promote adherence of chips to excess bitumen. This work shall be carried out as soon as possible after bleeding occurs. Before opening any rectified work to traffic, all the loose aggregate shall be swept off the surface.

If the binder of the existing surface has an oxidised film or if the road has been used by traffic for some time, it shall be treated either by brushing in power paraffin to soften the surface of the binder, or soften the surface with gas burners. This work shall only be done on hot days.

If the surface is non-uniform, i.e. partly bleeding and partly coarse-textured, the surface shall be rectified by pre-treating the coarse areas with nominal sized 10 mm or 14 mm spread at the rate of 0.007 m<sup>3</sup>/m<sup>2</sup> or 0.010 m<sup>3</sup>/m<sup>2</sup> respectively. The aggregate shall be coated as described in this specification with an approved pre coating fluid at a rate of 100 to 125 l/m<sup>3</sup>.

The aggregate shall be rolled with a 12 to 15 tonne pneumatic-tired roller until the aggregate is firmly embedded. All loose aggregate not embedded shall be swept off the road before it is opened to traffic. When opening the road to traffic, the affected areas shall be demarcated with traffic cones and speed limit signs for the first two days, care being taken to remove all loose aggregate daily.

Areas where whip-off is excessive after the above treatment has been applied shall be retreated in accordance with the Employer's Representative's instructions.

It is essential to use a 12 to 15 tonne pneumatic-tired roller on all work. Rolling shall continue until the Employer's Representative is satisfied that all the aggregate has been properly embedded. No rolling shall be done in wet weather, or early morning when the surface is cold.

Notwithstanding the above methods of treatment, the Employer's Representative may order any seal which has not been properly constructed to be removed and replaced. The removal of the seal shall be done so as not to damage the existing base. All aggregate and binder shall be

removed either by grader or hand tools and any damage done to the surface shall be repaired to the satisfaction of the Employer's Representative.

#### *1-11-2 Loss of Stone*

Loss of stone shall be corrected in accordance with the requirements of the Employer's Representative, with the aid of a fog spray. The surface to be repaired shall be clean and dry, and a 30% anionic or cationic spray-grade emulsion shall be applied at a rate of 0.6 l/sq m or such other rate as may be approved by the Employer's Representative.

### **MAINTENANCE**

The Contractor shall maintain the bituminous surface until the work is finally accepted by the Employer. Any damage done to the surface or any defects which may develop before the issue of the completion certificate, fair wear and tear excepted, shall be corrected by the Contractor at his own expense and to the requirements of the Employer's Representative.

### **TOLERANCES**

The completed bituminous work shall comply with the following requirements regarding surface tolerances and finish.

#### *1-13-1 New Work*

##### Level and Grade

The requirements relating to the base on which the surface dressing is constructed shall apply.

##### Width

The edges of the surface dressing shall be true to line with a maximum deviation of 15 mm from the specified edge line.

##### Cross Section

The requirements relating to the base on which the surface dressing is constructed shall apply.

##### Surface Regularity

The requirements relating to the base on which the surface dressing is constructed shall apply.

##### General

Any areas which show signs of bleeding after the section has been opened to traffic shall be corrected as specified in section 1-11. Corrective work shall be carried out in such a manner as to blend in colour, texture and finish with adjacent work.

The completed surface dressing shall be free from corrugations or any other wave effect where depressions are preceded and followed by humps or ridges no matter how small the distance between the top of the hump to the bottom of the preceding or following depression.

### *1-13-2 Resealing Work on Existing Surfaces*

#### General

Any areas which show signs of bleeding after the section has been opened to traffic shall be corrected as specified in section 1-11. Corrective work shall be carried out in such a manner as to blend in colour, texture and finish with adjacent work.

The completed surface dressing shall be free from corrugations or any other wave effect where depressions are preceded and followed by humps or ridges no matter how small the distance between the top of the hump to the bottom of the preceding or following depression

The completed surface dressing shall be of uniform texture without gaps or patches and shall be free from any loose aggregate or bitumen spillage.

#### Width

The edges of the completed surface dressing shall be continuously true to line with a maximum allowable deviation from the specified edge line of 15 mm.

#### Cross Section

The requirements relating to the base on which the surface dressing is constructed shall apply.

#### Surface Regularity

The requirements relating to the base on which the surface dressing is constructed shall apply

### *1-13-3 The Rate of Application*

The maximum permissible variation from the rates of application of bituminous binders or aggregates, as approved by the Employer's Representative, shall be plus or minus 5% of the rate of application required for the aggregate, and plus or minus 0.06 l/m<sup>2</sup> net cold bitumen for conventional binders.

## **MEASUREMENT AND PAYMENT**

Payment shall be made for the area in square metres of Single or Double Surface Dressing, as the case may be, based on the required area shown on the drawings. No allowance will be made for any additional material required to make good areas that require correction due to bleeding, loss of aggregate or for any additional material placed as corrective measures required by failure to meet Specified Standards.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities Bill 4 Pavement, Item 040501, Single Surface Dressing or Item 040502 Double Surface Dressing, using the units of measurement specified.

## ***SECTION 04060 – SAND SEAL COAT***

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## 1-1 DESCRIPTION

Provide and construct sand seal coat composed of bituminous material applied in one application and covered with sand cover material applied in a single application. Construct this work on sub-base or other surfaces as specified or where directed.

### PROPORTIONING

Use the approximate proportions for the sand seal coat as follows:

- |                        |  |
|------------------------|--|
| 1. Bituminous Material | 0.7 to 1.1 L/m <sup>2</sup>                  |
| 2. Cover Material      | 0.003 to 0.007m <sup>3</sup> /m <sup>2</sup> |

The Project Manager will designate the actual spread for each material.

### MATERIALS

#### *1-3-1 Bituminous Material:*

Meet the following requirements:

1. Asphalt Cement: Viscosity Grade AC-5 to meet requirements of ASTM D3381/D3381M-18
2. Emulsified Asphalt Grade RS-2 to meet requirements of ASTM D977-20

Use asphalt cement or emulsified asphalt at Contractors' option.

#### *1-3-2 Cover Material*

Use clean and non-plastic sand composed of hard durable grains and free from loam, roots, clay balls, and other deleterious substances. The Contractor may use local sand if it meets the above requirements. Obtain the Project Manager's approval for the sand.

### WEATHER LIMITATIONS

Do not apply bituminous material when weather conditions or surface conditions are otherwise unfavorable.

### CONSTRUCTION METHODS

#### *1-5-1 Application of Bituminous Material*

After the surface to be treated has been cleaned to the satisfaction of the Project Manager, the bituminous material shall be sprayed uniformly over the surface by means of a pressure distributor. When a surface constructed under this Section is on a paved shoulder, the Contractor shall use a string line or other approved method, to produce a uniform line along the edge of the applied bituminous material, adjacent to the traffic lanes. The distributor used

for applying the bituminous material shall maintain a pressure of at least 14,000, but not more than 53,000, kg per sq. m.

For asphalt cement, Viscosity Grade AC-5, the application temperature shall be between 150° and 175° C; for emulsified asphalt, between 40° and 75° C; and for cut-back asphalt, between 80° and 135° C.

#### ***1-5-2 Uniformity of Distribution***

Special precautions shall be observed to assure that an even and uniform distribution of bituminous material will be obtained, and the distributor shall be so adjusted and operated as to maintain uniform, even distribution of the type of material being applied. Excessive deposits of bituminous material upon the road surface, caused by stopping or starting the distributor, leakage, or otherwise, shall be immediately corrected.

#### ***1-5-3 Limitations***

The area to be covered by any one application of bituminous material shall be not greater than can be covered with the aggregate without interruption due to limitations of hauling and spreading equipment or other causes.

For double application surface treatments, the second application of bituminous and cover materials shall be applied with the curing requirements specified in Section 04050, Surface Dressing, Clause 1-4 General Limitations and Requirements, Sub Clause 3 Other Constraints.

#### ***1-5-4 Application of Cover Material***

Apply sand uniformly at the rate designated by the Project Manager. If the Project Manager considers it necessary for the proper distribution of the spread, lightly drag the sand with a drag broom. Roll the entire area of the sand with at least ten passes of a traffic roller.

### **MEASUREMENT AND PAYMENT**

Payment for Sand Seal Coat shall be based on the area to be Sand Seal Coated as defined in the drawings or as approved by the Project Manager. No payment shall be made for any additional material required neither for testing or calibration, nor for any excess material placed in excess of the approved rate or outside the required areas.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities Bill 4 Pavement, Item 040601, Sand Seal Coat, using the units of measurement specified.

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## ***SECTION 04070 – SLURRY SEAL***

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**1-1 DESCRIPTION**

Prepare a mixture of asphaltic emulsion, water and aggregate and spread the mixture on a surface or pavement as shown in the plans, as specified or as directed by the Project Manager.

When used as a wearing surface, the slurry seal should not be applied to small areas. Sealing should be full lane width not less than 0.3 Km long and gaps between sealed surfaces should not be less than 0.5Km unless permitted by the Project Manager. When the distance is less than 0.3 Km, seal between the surface areas.

The material shall be mixed in a travelling mixing plant and automatically transferred into a spreader box attached to the plant, which spreads the mixture to the desired thickness. The thickness may be in the range of 3 mm to more than 6 mm.

**MATERIALS**

**1-2-1 Asphaltic Emulsion**

Asphaltic emulsion shall be a quick-setting type conforming to the requirements of CSS1h or SS1h grade ASTM Designation D3381/3381M18 and ASTM D977-20 respectively.

**1-2-2 Water**

Water shall be of such quality that the asphalt will not separate from the emulsion before the slurry seal is in place in the work.

**1-2-3 Aggregate**

Aggregate shall consist of rock dust and plaster sand or other sands of similar nature, except that any aggregate or combination of aggregates used in the mixture shall contain not less than 50 percent of the product obtained by crushing rock. The material shall be free from vegetable matter and other deleterious substances.

The percentage composition by weight of the aggregate shall conform to one of the following gradations:

Gradation of Aggregates for Slurry Seal

ASTM Sieve Sizes	Percentage Passing		
	Type I	Type II	Type III
3/8"	-	100	100
No. 4	100	90 - 100	70 - 90
No. 8	90 - 100	65 - 90	45 - 70
No. 16	60 - 90	40 - 70	28 - 50
No. 30	40 - 65	25 - 50	19 - 34

No. 200	10 - 20	5 - 15	5 - 15
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The aggregate shall also confirm to the following quality requirements:

Sand Equivalent	45 Min.
Film Stripping (test performed on the material passing the No. 8 sieve and retained on the No. 16 sieve)	25% Max.
Durability Index	60 Min.

**PROPORTIONING**

Asphaltic emulsion shall be added at a rate of 11 to 25 percent by weight of the dry aggregate.

The exact rate will be determined by the Project Manager.

If necessary for workability, a retarding agent, that will not adversely affect the seal, may be used.

Water, and retarder if used, shall be added to ensure proper workability and (a) permit uncontrolled traffic on the slurry seal no more than 3 hours after placement without the occurrence of bleeding, raveling, separation or other distress and (b) prevent development of bleeding, raveling, separation or other distress within 7 days after placing the slurry seal.

If more than one kind of aggregate is used, the correct amount of each kind of aggregate to produce the required grading shall be proportioned separately in a manner that will result in a uniform and homogeneous blend.

Uniform distribution of asphalt will be determined by extraction tests. The bitumen ratio (Kg of asphalt per 100 Kg of dry aggregates) shall not vary more than 5 percent above or below the amount designated by the Project Manager. This requirement shall apply to samples taken from any location or operation designated by the Project Manager.

**MIXING**

The slurry seal shall be mixed in continuous pug mill mixers.

Continuous type pug mill mixers shall be equipped to proportion emulsion, water, and aggregate by volume. The emulsion shall be introduced into the mixer by a positive displacement pump. Water shall be introduced into the mixer through an indicating meter by centrifugal-type pumps. A means of weighing the delivery of emulsion and water to the mixer shall be provided in order that the accuracy of the pumps can be checked at intervals determined by the Project Manager.

Aggregate feeders shall be connected directly to the drive on the emulsion pump. The drive shaft of the aggregate feeder shall be equipped with a revolution counter reading to 1/10 of a revolution.

The delivery rate of aggregate and emulsion per revolution of the aggregate feeder shall be calibrated at different gate settings for each truck used on the project.

**SPREADING EQUIPMENT**

The slurry mixture shall be uniformly spread by means of a controlled spreader box conforming to the following requirements:

The spreader shall be capable of spreading a traffic lane width and shall have strips of flexible rubber belting or similar material on each side of the spreader box and in contact with the pavement to prevent loss of slurry from the box and shall have baffles, or other suitable means, to ensure uniform application on super elevated sections and shoulder slopes.

The rear flexible strike-off blade shall make close contact with the pavement and shall be capable of being adjusted to the various crown shapes so as to apply a uniform seal coat.

Slurry mixture, to be spread in areas inaccessible to the controlled spreader box, may be spread by other approved methods.

**PLACING**

Slurry seal shall not be placed during unsuitable weather.

Before placing the slurry seal, the pavement surface shall be cleaned by sweeping, flushing or other means necessary to remove all loose particles of paving, all dirt and all other extraneous material.

Unless otherwise specified in the special provisions, slurry seal shall be spread at a rate within the following ranges in Kg of dry aggregate per square metre. The exact rate will be determined by the Project Manager. The spread rate shall be within 10 percent of the rate determined by the Project Manager.

Type of Aggregate	Ranges
I	4- 6
II	5- 7.5
III	7.5- 12.5

Hand tools shall be available in order to remove spills. Ridges or bumps in the finished surface will not be permitted.

The mixture shall be uniform and homogeneous after spreading on the road and shall not show separation of the emulsion and aggregate after setting.

Adequate means shall be provided to protect the slurry seal from damage by traffic until such time that the mixture has cured sufficiently so that the slurry seal will not adhere to and be picked up by the tires of vehicles.

**MEASUREMENT AND PAYMENT**

Payment for Slurry Seal shall be based on the area to be Slurry Seal as defined in the drawings or as approved by the Project Manager. No payment shall be made for any additional material required neither for testing or calibration, nor for any excess material placed in excess of the approved rate or outside the required areas.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities, Bill 4, Pavement, Item 040701, Slurry Seal, using the units of measurement specified.

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**SECTION 05020 – CONCRETE DRAINAGE CHANNELS**

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**1-1 DESCRIPTION**

The work under this Section shall consist of

**1-1-1 Construction of concrete drainage channels**

Construction of concrete drainage channels (“U” drains) of the types shown on the drawings.

**1-1-2 Reinforced Concrete Drain Covers Reinforcement**

Paid under Steel Reinforcement Item 080203

**1-1-3 Trash Gates**

Install trash grates. Reinforcement paid under Steel Reinforcement Item 080203

**1-1-4 Weep holes.**

Paid under Item 050801 Weep holes to Structures

These works shall be in accordance with these Specifications and at locations noted on the Drawings or as otherwise directed by the Employer’s Representative.

The work shall include the provision of rebates for covers, drain covers, trash grates as well as joints and any connections required to receive pipe connections from catch basins, land drains and other features that may be encountered or are shown on the Drawings and as may be required by the Employer’s Representative.

**SCHEDULING OF WORK**

The Contractor shall not begin channel work until the Employer’s Representative issues the written approval defining the works. The Contractor shall schedule culvert construction concurrently with this work to ensure adequate drainage of the Works.

Temporary provisions shall be in place and operational before the start of adjacent embankment works unless otherwise directed by the Employer’s Representative.

Silt control devices shall also be in place in accordance with the requirements of the Environmental Management Plan.

No sub-grade preparation or pavement overlay work (either in the road or the shoulder areas) shall commence until the drainage system is fully operational.

**1 Rectifying Unsatisfactory Work**

All work and materials for constructing concrete culverts and channels shall conform to the dimensional tolerances and to the various provisions for rectifying unsatisfactory workmanship that are given in the relevant Specifications.

### ***Maintaining Accepted Work***

Notwithstanding the Contractor's obligation to rectify unsatisfactory or failed work, the Contractor shall also be responsible for routine maintenance of all completed and accepted channels and drains throughout the Contract Period, and the Defects Liability Period.

## **MATERIALS**

### ***1 Bedding***

Bedding material for concrete channels (including sand bedding if required and/or indicated on the Drawings) shall conform to the requirements given below.

- **Class A-** Granular bedding material compacted and shaped to receive the pipes with even distribution of support in accordance with Section 03010 Sub-Base material.
- **Class B-** Lean concrete or concrete bedding shall be Grade 7 (E) in accordance with the requirements of Section 08020- Concrete for structures and other uses.

### ***Concrete***

Concrete used for all structural work described in this Section shall be Grade 30 (A) as indicated on the Drawings or directed by the Employer's Representative and shall conform to the requirements of Section 08020- Concrete for structures and other uses.

### ***Reinforcing Steel***

All reinforcing steel used shall be deformed bars and shall conform to the requirements and stipulations of Grade 40 deformed reinforcement rods. Payment for reinforcement steel used in drain construction and trash grates will be made under Steel Reinforcement Item 080204

### ***Contraction Joints***

The Contractor shall form contraction joints by using dummy joints (either formed or sawed) or by using sheet metal templates. If using sheet metal templates ensure that they are of the dimensions and are set to the lines shown on the drawings. Hold templates firmly while placing the concrete and leave templates in place until the concrete has set sufficiently to hold its shape. Remove them while the forms are still in place.

Joints shall be sawn for machine placed items, unless the Employer's Representative approves an alternative method. Saw the joints as soon as the concrete has hardened to the degree that excessive ravelling will not occur and before uncontrolled shrinkage cracking begins.

Space contraction joints at intervals of not more than 3.0m except where closure requires a lesser interval. Do not allow any section between joints to be less than 1.2 m in length.

### ***Expansion Joints***

Construct expansion joints using 13 mm thick pre-formed jointing board. They shall be formed at the locations indicated on the Drawings or at intervals of approximately 15 m or at the end of each day's work.

***Pre-formed Expansion Joint Filler***

Unless otherwise approved by the Employer's Representative, pre-formed joint filler if required shall be in accordance with ASTM D- 1751-18.

***Backfill***

Backfill material used in the works shall generally be suitable, native materials. If the Employer's Representative directs that a porous, granular material be used as part or all of the backfill, it shall meet the requirements of Section 03010 White Sand Sub Base. If the Project Manager directs the use of porous backfill material it shall conform to 03010– Sub-base Material.

***Water Stops***

If water stops are required, they shall be pre-fabricated with a uniform cross section that is free from porosity and other defects. Water stops must be made from durable waterproof material.

Water stops shall be fabricated from a homogeneous, elastomeric, plastic compound of basic PVC or other approved material. Reclaimed materials shall not be used.

The Contractor shall provide certification from the supplier showing test values for the following properties:

1. Tensile strength, ASTM D638-14 - 9.65 MPa
2. Elongation at breaking, ASTM D638-14 - 250% min
3. Hardness (shore), ASTM D2240-15-1e - 60 –75
4. Resistance to alkali, ASTM D 543-20 - Max. % change –0.10 to +0.25
5. Max. Change in hardness +/-5 shore
6. Min. Decrease in tensile strength - 15%
7. Water Absorption, ASTM D570 -98 - 0.50% max.

**INSTALLATION**

Materials shall be handled in such a manner as to insure delivery to the point of installation in sound undamaged condition.

The Contractor shall excavate and prepare trenches and foundations for concrete channels and shall be responsible for all dewatering of the trenches during construction. Supports and/or bedding material shall be placed in accordance with Drawings or as required by the Employer's Representative.

**SURFACE REQUIREMENTS**

Test the section of gutter with a 3 m straightedge laid parallel to the centerline of the roadway while the concrete is still plastic. Perform straight-edging along both sides of the top of the gutter or along

other lines on the gutter cross-section, as directed by the Employer's Representative. Immediately correct irregularities in excess of 6 mm.

#### **MEASUREMENT AND PAYMENT**

Payment for Concrete Drainage Channels will be per linear meter of drains constructed based on the nominal dimensions required by the drawings. No additional length will be measured for payment for over casting unless such work is specifically instructed by the Project Manager as a variation from the drawings. Payment for Reinforced Drain Covers and Trash grates will be paid based on the numbers installed.

No separate payment shall be made for the cost of, Excavation, Placing and Compacting Bedding, Formwork, Installing Expansion and Contraction Joints, Pre-formed joint filler, Water Stops, Disposal of Excavated Materials, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5, Minor Drainage, Item 050201, Concrete Drainage Channels, Item 050202, Reinforced Concrete Drain Covers and Item 050203, Trash Gates using the units of measurement specified.

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***SECTION 05030 – CLEANING & SHAPING EXISTING  
OPEN DRAINS***

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**1-1 DESCRIPTION**

This Section covers the requirements and procedures for cleaning and shaping existing open drains, ditches, side drains and irrigation canals in excess of the general maintenance requirements of the Contract.

**OPEN DRAINS**

In addition to the general maintenance requirements and when ordered by the Employer's Representative existing open drains, ditches or side drains shall be cleared by removing all vegetation, debris and sediment. Where necessary the floor and sides of open drains, ditches and side drains shall be trimmed to the profiles as agreed with the Employer's Representative.

Unless otherwise described in the Bill of Quantities three sizes of drain shall be used for the measurement of this item:

1. Type 1 Drains < 1 meter deep and less than 1.5 meters top width.
2. Type 2 Drains > 1 meter and < 2 meters deep and less than three meters top width.
3. Type 3 Drains > 2 meters deep and greater than three meters top width.

Depth shall be measured from the surrounding natural ground to the invert level of the drain specified to be achieved during cleaning.

The depth of irrigation canals shall be measured from the top of the side dam to the invert level.

All material resulting from the cleaning and shaping of open drains, ditches and side drains shall be disposed of as agreed by the Employer's Representative or in the case of toxic or hazardous materials, in conformance with the Environmental Management Plan. The Contractor shall at all times protect existing drainage structures from damage.

**MEASUREMENT AND PAYMENT**

Payment for Cleaning and Shaping existing open Drains will be per square meter of drains cleaned based on the nominal dimensions required by the drawings. No additional area will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of, Excavation, Cleaning and Shaping, Disposal of Excavated Materials, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 2 Demolition and Site Clearance Item 050301 Cleaning and Shaping Existing Open Drains Type 1, 050302 Cleaning and Shaping Existing Open Drains Type 2, 050303 Cleaning and Shaping Existing Open Drains Type 3, using the units of measurement specified.



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## ***SECTION 05040 – RIPRAP SLOPE PROTECTION***

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**1-1 DESCRIPTION**

This Section covers the requirements and procedures for furnishing and placing riprap for canal or river bank protection, side slope protection and general erosion control.

All work constructed on prepared beds shall be in accordance with this Section and conform to the lines, grades, and dimensions shown on the drawings or otherwise directed by the Employer's Representative.

The Section covers both hand laid and machine laid installation of riprap.

**DIMENSIONAL TOLERANCES**

The surface of each face stone shall not vary from the average profile of the surrounding riprap by more than 100 mm for hand laid riprap and 250 mm for machine laid protection. The average surface profile for river bank slopes formed by placed riprap shall not vary from the specified or approved channel invert profile by more than 150 mm. The minimum thickness of any riprap protection layer shall be 300 mm.

**SUBMISSIONS**

The Contractor shall submit to the Employer's Representative two samples of at least 50 kg before using any stone material. The Employer's Representative will retain one of these samples for reference throughout the Contract Period. The Contractor shall only use stone for the works that the Employer's Representative has approved.

**WORK SCHEDULING**

Where riprap is to be installed on slopes, the Contractor shall first form the slopes to the appropriate rough grades and shall shape the work to the final lines only, immediately before placing the riprap.

**RECTIFYING UNSATISFACTORY WORK**

The Contractor shall rectify at his own expense all riprap which does not meet the tolerances given in this Specification section or as directed by the Employer's Representative.

The Contractor shall be responsible for the stability and integrity of all finished work and shall replace at his own expense any damaged or displaced portions due, in the opinion of the Employer's Representative, to the Contractor's neglect.

**MAINTAINING ACCEPTED WORK**

The Contractor shall be responsible for the routine maintenance of all completed and accepted riprap throughout the Contract Period, and the Defects liability Period.

**MATERIALS**

**1 Rock**

Rock for hand and machine laid riprap shall consist of angular fieldstone or roughhewn quarry stone as nearly rectangular in section as is practical. The stone shall be sound, tough, durable, dense, resistant to the action of air and water and suitable in all respects for the purpose intended. It shall have a specific gravity of 2.4 or more. As indicated on the drawings or required by the Project Manager, riprap shall be in accordance with the following:

Class 1

Class 1 Riprap erosion protection shall be hand placed stones placed on a prepared earth or gravel bed. It shall consist of primary stone and choke stone fragments.

1. The primary stone shall be at least 100 mm thick and shall weigh not less than 10 kg or more than 25 kg with at least 50% weighing more than 15 kg.
2. The choke stone fragments shall be stone pieces that are properly sized to satisfactorily wedge between the primary stone.

Class 2

Class 2 Riprap shall be machine laid stones placed on a prepared earth or gravel bed.

Class 2 Riprap shall consist of stones weighing at least 25 kg but not more than 70kg with 50% of stones weighing more than 45 kg and with a sufficient quantity of smaller stones uniformly distributed throughout.

Class 3

Class 3 Riprap shall be machine laid stones placed on a prepared earth or gravel bed and shall consist of stones of the following sizes:

1. Nominal size 1 m<sup>3</sup>;
2. Minimum size 0.75 m<sup>3</sup> and maximum size of 1.25 m<sup>3</sup>;
3. At least 50% of stones shall be of size 1.0 m<sup>3</sup>.

***Filter Aggregate***

Filter aggregate shall be hard durable particles or crushed stone fragments or natural gravel, meeting the following gradation requirements:

Size	Percent passing
5/16	100
No. 4	20-50
No. 200	0-10



**EXECUTION OF THE WORK**

***1 Preparation of Foundations***

The Contractor shall prepare slope surfaces to receive riprap protection in accordance with the general provisions of Section 02030 - Earthworks.

***Preparation***

The Contractor shall clean the stones of all defects that may impair their bond.

***Placement***

The Contractor shall place any required aggregate bedding on the prepared formation and shall construct this bedding progressively by laying the rock in such a manner that the stones are always in secure contact.

The Contractor shall place the rocks firmly against each other to provide the required layer thickness measured perpendicular to the slope and shall then place additional stone to fill all spaces completely. The work shall progress from the bottom of the slopes towards the top.

The Contractor shall trim and finish adjacent slopes and shoulders to ensure a tight and smooth interface with the riprap. The interfaces shall allow unobstructed drainage and prevent scour at the edges of the work.

**MEASUREMENT AND PAYMENT**

Payment for Rip Rap Slope Protection Class 1 Class 2 and Class 3 will be per square meter of Rip Rap Slope Protection placed based on the nominal dimensions required by the drawings. No additional area will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of providing the rock and filter aggregate, Preparing the Foundation, Placement and any other work required to comply with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5 Item 050401 Rip Rap Slope Protection Class 1, Item 050402 Rip Rap Slope Protection Class 2, and Item 050403 Rip Rap Slope Protection Class 3 using the units of measurement specified.

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## ***SECTION 05050 – GABIONS***

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**1-1 DESCRIPTION**

Gabions may be utilized in lieu of Rip-Rap for the control of erosion adjacent to the structures.

**SUBMISSIONS**

The Contractor shall submit to the Employer's Representative a gabion basket of the type to be used in the works. In addition, a sample of at least 50 kg of the stone material is to be used for submissions. The Employer's Representative will retain these samples for reference throughout the Contract Period. The Contractor shall only use gabion baskets and stone for the works that the Employer's Representative has approved.

**WORK SCHEDULING**

Where gabions are to be installed on slopes, the Contractor shall first form the slopes to the appropriate rough grades and shall shape the work to the final lines only, immediately before placing the gabions.

**RECTIFYING UNSATISFACTORY WORK**

The Contractor shall rectify at his own expense all gabions which do not meet the tolerances given in this Specification section or as directed by the Employer's Representative.

The Contractor shall be responsible for the stability and integrity of all finished work and shall replace at his own expense any damaged or displaced portions due, in the opinion of the Employer's Representative, to the Contractor's neglect.

**MAINTAINING ACCEPTED WORK**

The Contractor shall be responsible for the routine maintenance of all completed and accepted gabions throughout the Contract and the Defects Liability Period.

**MATERIALS**

Gabions shall be of a size and type suitable for placement around wing-walls and abutments in and in adjacent watercourses to the extent indicated on the plans or otherwise directed by the Project Manager. Gabions and mattresses shall be obtained from a manufacturer specializing in their manufacture. The Contractor may use other proprietary protective mats in lieu of gabion mattresses, subject to the approval of the Project Manager.

Gabions shall consist of triple twisted wire mesh netting with hexagonal mesh 75mm by 100mm securely tied to a wire frame to form cages. The mesh shall be formed from 9 SWG (Standard wire gauge) wires and the frame from 5 SWG wires. Mattresses shall be formed using similar cages with frames of 12 SWG wire and a mesh size of 50mm by 55mm formed from 15 SWG wire. All wire shall be in accordance with ASTM A641/A641M-09 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

Stone for gabions shall be sound and durable, free from flaws and from soft, weathered or decomposed parts. The stone shall pass a 200mm ring and be retained on a 100mm ring except for a small quantity of material, which may be used for filling voids. A sufficient quantity of large flat-sided stone shall be available for placing against the wire mesh.

#### **EXECUTION OF THE WORK**

Gabions and mattresses shall be stretched to their full size - laid as indicated on the drawings or otherwise described in these specifications - and fixed together by continuous wire lacing along each abutting edge. They shall then be carefully packed by hand with stone in such a way that the sides do not bulge from the weight of the stone. The layer of stone against the mesh shall be carefully placed with the flattest side of each stone against the mesh. The top layer of the stone shall be one inch above the top frame so that the lid can be stretched tightly before wiring to the frame.

#### **MEASUREMENT AND PAYMENT**

Payment for Gabion Slope Protection will be per cubic meter of Gabion Slope Protection placed based on the nominal dimensions required by the drawings. No additional volume will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of providing the rock and gabion baskets, Preparing the Foundation, Filling the Baskets, Placement and any other work required to comply with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5 Item 050501 Gabion Slope Protection, using the units of measurement specified.

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## ***SECTION 05060 – ANTI-CRACK GEOTEXTILE***

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## 1-1 GENERAL

Where indicated in the Drawings or directed by the Employer's Representative, the Contractor shall provide Anti-Crack Geotextile, which shall be placed on the existing asphalt surface to receive asphalt overlay and on the surface of sealed cement-treated base course in both full width construction or in widened sections.

### SUBMISSIONS

The Contractor shall submit details, with a certificate stating name of the manufacturer, product name, style number, chemical composition of the filament or yarns and other pertinent information, and samples of the proposed material to the Employer's Representative for review and approval.

Geotextile labeling, shipment, and storage shall follow ASTM D4873-17. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

Each Anti-Crack Geotextile roll shall be wrapped with a material that will protect the Geotextile from damage due to shipment, water, sunlight and contaminants. The protective wrapping shall be maintained during periods of shipment and storage. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from damaging the physical property values of the Geotextile.

### WORK SCHEDULING

When geotextile is to be placed on asphalt surface, the Contractor shall inform the Employer's Representative two working days in advance of the impending works.

### RECTIFYING UNSATISFACTORY WORK

The Contractor shall rectify at his own expense all geotextile which do not meet the tolerances given in this Specification section or as directed by the Employer's Representative.

The Contractor shall be responsible for the integrity of all finished work and shall replace at his own expense any damaged or displaced geotextile portions due, in the opinion of the Employer's Representative, to the Contractor's neglect.

### MAINTAINING ACCEPTED WORK

The Contractor shall be responsible for the routine maintenance of all completed and accepted geotextile throughout the Contract and the Defects Liability Period.

### MATERIALS

#### *1 Geotextile*

The anti-crack geotextile shall conform to AASHTO M 288-06. The geotextile can be a woven or non-woven geotextile.

The grade of the geotextile shall weigh not less than 140g/m<sup>2</sup> and have a minimum thickness of 0.5mm.

The geotextile shall resist pressure of 70.5kN/m<sup>2</sup>.

The Geotextile property requirements are listed as follows:

Geotextile Requirement	Geotextile Class			
	Test Method	Unit	Class 2	
			MD	CD
Grab Tensile Strength	ASTM D4632-15	Lbs(N)	101 (449)	101 (449)
Grab Tensile Elongation	ASTM D4632-15	%	50	50
Grab Tensile Asphalt Saturated	ASTM D4632-15 (modified)	Lbs(N)	220 (979)	220 (979)
Grab Tensile Elongation Asphalt Saturated	ASTM D4632-15 (modified)	%	40 -70	
Asphalt Retention	ASTM D6140-00	Gal/yd <sup>2</sup> (l/m <sup>2</sup> )	.27(1.2)	
Change in area Asphalt Saturated	TX DOT3099	%	± 15	
Melting Point	ASTM D276-12	F°(C°)	325 (163)	
Mass per Unit Area	ASTM D5261-10-(2018)	oz/yd <sup>2</sup> (g/m <sup>2</sup> )	4.1 (140)	
UV Resistance (at 500 hrs)	ASTM D4355-14(2018)	% strength ret	70	

Geotextiles shall be subject to sampling and testing to verify conformance with this specification. Sampling and testing shall be in accordance with the following list of ASTM Standards.

<b>ASTM D276-12</b>	Test Methods for Identification of Fibres in Textiles
<b>ASTM D3786M-18</b>	Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
<b>ASTM D4354-12(2020)</b>	Standard Practice for Sampling of Geosynthetics for Testing
<b>ASTM D4355-14(2018)</b>	Test Method for Deterioration of Geotextiles for Exposure to Ultraviolet Light and Water (Xenon – Arc Type Apparatus)
<b>ASTM D4491-20e1</b>	Test Method for Water Permeability of Geotextiles by Permittivity
<b>ASTM D4533-15</b>	Test Method for Trapezoid Tearing Strength of Geotextiles
<b>ASTM D4595-17</b>	Test Method For Tensile Properties of Geotextiles by the Wide Width Strip Method
<b>ASTM D4632-15a</b>	Test Methods for Breaking Load and Elongation of Geotextiles (Grad Method)
<b>ASTM D4751-20a</b>	Test Method for Determining Apparent Opening Size for a Geotextile

<b>ASTM D4759-11(2018)</b>	Standard Practice for Determining the Specification Conformance of Geosynthetics
<b>ASTM D4833-07(2020)</b>	Test Method for Index puncture Resistance of Geotextiles, Geomembranes, and Related Products
<b>ASTM D4884-14a</b>	Standard Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles
<b>ASTM D5261-10(2018)</b>	Test Method for Measuring Mass Per Unit Area of Geotextiles
<b>ASTM D 6140-00(2014)</b>	Standard Test Method to Determine Asphalt Retention of Paving Fabrics Used in Asphalt Paving for Full-Width Applications

**EXECUTION OF THE WORKS**

The Geotextile shall be placed against a carefully prepared asphalt surface or cement treated base course, free from mounds, debris or projections that might damage the geotextile. Geotextile shall be laid loosely, not stretched with any wrinkles or folds. Damaged material shall be repaired or replaced by a piece of geotextile that is large enough to cover the damaged area and to meet the overlap requirement. Geotextile shall be overlapped by a minimum of 450mm at all joints, seams and edges.

**MEASUREMENT AND PAYMENT**

Payment for Geotextiles placed on Asphalt Surfaces will be per square meter of Geotextile placed based on the nominal dimensions required by the drawings. No additional area will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of providing the geotextile, placing the Geotextile on the asphalt surface, overlap of geotextile, preparing the foundation, placement and any other work required to comply with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5 Item 050601 Anti-Crack Geotextile, using the units of measurement specified.

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## ***SECTION 05061 – GEOTEXTILES TO STRUCTURES***

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**1-1 GENERAL**

Where indicated in the Drawings or directed by the Employer's Representative, the Contractor shall provide filter fabric (Geotextile), which shall be wrapped around Precast Concrete Box culverts, behind Precast Concrete Sheet Piles as well as retaining walls and abutments to retain backfilling material and prevent backfill materials being washed out from around or behind the structure.

**SUBMISSIONS**

The Contractor shall submit details, with a certificate stating name of the manufacturer, product name, style number, chemical composition of the filament or yarns and other pertinent information, and samples of the proposed material to the Employer's Representative for review and approval.

Geotextile labeling, shipment, and storage shall follow ASTM D4873-17. Product labels shall clearly show the manufacturer or supplier name, style name, and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate.

Each Geotextile roll shall be wrapped with a material that will protect the Geotextile from damage due to shipment, water, sunlight and contaminants. The protective wrapping shall be maintained during periods of shipment and storage. During storage, geotextile rolls shall be elevated off the ground and adequately covered to protect them from damaging the physical property values of the Geotextile.

**WORK SCHEDULING**

When geotextile is to be installed on structures, the Contractor shall inform the Employer's Representative two working days in advance of the impending works.

**RECTIFYING UNSATISFACTORY WORK**

The Contractor shall rectify at his own expense all geotextile which do not meet the tolerances given in this Specification section or as directed by the Employer's Representative.

The Contractor shall be responsible for the integrity of all finished work and shall replace at his own expense any damaged or displaced geotextile portions due, in the opinion of the Employer's Representative, to the Contractor's neglect.

**MAINTAINING ACCEPTED WORK**

The Contractor shall be responsible for the routine maintenance of all completed and accepted geotextile throughout the Contract and the Defects Liability Period.

**MATERIALS**

**1 Filter Fabric (Geotextile)**

The plastic filter fabric shall conform to AASHTO M 288-06. The filter fabric can be a woven or non-woven fabric consisting of at least 95% long-chain polymeric filaments or yarns such as polypropylene, polyethylene, polyester, polyamides or polyvinyl dine chloride formed into a stable network such that the filaments or yarns retain their position relative to each other, including selvages. The base plastic shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration by ultra-violet light (for exposed conditions) heat, and potentially damaging chemicals in the local environment.

The grade of the fabric shall weigh not less than 140g/m<sup>2</sup> and have a minimum thickness of 0.5mm. The Class of fabric shall be Class 1 with backfilling material compacted to more than dry density of 95% MDD (ASTM D698-12e2). For less severe or harsh installation conditions, Class 2 Geotextile can be used. The Contractor shall submit the installation conditions for fabric for the approval of the Employer’s Representative prior to manufacturing the Geotextile.

The fabric shall resist pressure of 70.5kN/m<sup>2</sup> and a tensile stress caused by this pressure with maximum of a 25mm joint between precast concrete box culvert units.

The Geotextile (fabric) property requirements are listed as follows:

Geotextile Requirement	Geotextile Class			
	Test Method	Unit	Class 2	
			MD	CD
Grab Tensile Strength	ASTM D4632-15	Lbs(N)	160 (712)	160 (712)
Grab Tensile Elongation	ASTM D4632-15	%	50	50
Trapezoidal Tear Strength	ASTM D4533-15	Lbs(N)	80 (267)	60 (267)
CBR Puncture Strength	ASTM D6241-14	Lbs(N)	410 (1825)	
Permittivity	ASTM D4491 -20-1e	Sec <sup>-1</sup>	1.5	
Apparent Opening Size (AOS)	ASTM D4751-20a	US Sieve	70 (0.212)	
UV Resistance (at 500 hrs)	ASTM D4355-14(2018)	% strength ret	70	
Flow Rate	ASTM D4491-20-1e	Gal/min/ft <sup>2</sup>	110 (4481)	

Geotextiles shall be subject to sampling and testing to verify conformance with this specification. Sampling and testing shall be in accordance with the following list of ASTM Standards.

<b>ASTM D 276-12</b>	Test Methods for Identification of Fibres in Textiles
<b>ASTM D 3786/D3786M-18</b>	Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
<b>ASTM D4354-12(2020)</b>	Standard Practice for Sampling of Geosynthetics for Testing
<b>ASTM D4355-14(2018)</b>	Test Method for Deterioration of Geotextiles for Exposure to Ultraviolet Light and Water (Xenon – Arc Type Apparatus)
<b>ASTM D4491-20-1e</b>	Test Method for Water Permeability of Geotextiles by Permittivity
<b>ASTM D4533-15</b>	Test Method for Trapezoid Tearing Strength of Geotextiles
<b>ASTM D4595-17</b>	Test Method For Tensile Properties of Geotextiles by the Wide Width Strip Method
<b>ASTM D4632-15a</b>	Test Methods for Breaking Load and Elongation of Geotextiles (Grad Method)
<b>ASTM D4751-20a</b>	Test Method for Determining Apparent Opening Size for a Geotextile
<b>ASTM D4759-11(2018)</b>	Standard Practice for Determining the Specification Conformance of Geosynthetics
<b>ASTM D4833-07(2020)</b>	Test Method for Index puncture Resistance of Geotextiles, Geomembrances, and Related Products
<b>ASTM D4884-13</b>	Standard Test Method for Strength of Sewn or Thermally Bonded Seams of Geotextiles
<b>ASTM D5261-10(2018)</b>	Test Method for Measuring Mass Per Unit Area of Geotextiles

<b>ASTM D6140-00(2014)</b>	Standard Test Method to Determine Asphalt Retention of Paving Fabrics Used in Asphalt Paving for Full-Width Applications
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**EXECUTION OF THE WORKS**

Plastic filter fabric shall be placed on or against a carefully prepared bed or surface, free from mounds, debris or projections that might damage the fabric. Fabric shall be laid loosely, not stretched with any wrinkles or folds. Damaged material shall be repaired or replaced by a piece of geotextile that is large enough to cover the damaged area and to meet the overlap requirement. Fabric shall be overlapped by a minimum of 450mm at all joints, seams and edges.

The permeable material shall be placed in horizontal layers and thoroughly consolidated along with and by the same methods specified in Clauses 1-0 to 4-0 inclusive of the Specification for Structural Excavation and Backfill.

**MEASUREMENT AND PAYMENT**

Payment for Geotextiles to Structures will be per square meter of Geotextile placed based on the nominal dimensions required by the drawings. No additional area will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of providing the geotextile, wrapping the geotextile to structures, overlap of geotextile, preparing the foundation, placement and any other work required to comply with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5 Item 050611 Geotextile to Structures, using the units of measurement specified.

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***SECTION 05062 – REINFORCING FILTER FABRIC***

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**1-1 DESCRIPTION**

The works specified in this Section consists of the placement of geotextile fabric material in accordance with these Specifications and in conformity with the details shown on the Drawings of the typical design sections of the embankment.

**MATERIALS**

Geotextile fabric material shall be of an approved and ISO 9001 certified proprietary type or of any other equivalent and reputable standard. The material shall be composed of a woven fabric of continuous strands of 100% polypropylene, having a minimum mass per unit area of 750g/m<sup>2</sup> and conforming significantly to the requirements established below. The base plastic shall contain stabilizers and/or inhibitors to make the filaments resistant to deterioration by prolonged exposure to ultra-violet light and heat. Additionally it must be entirely non-biodegradable, resistant to soil chemicals and bacteria, unaffected by acids and alkalis, and any presence of moisture in the soil.

The geotextile fabric shall be of a minimum sheet width of 5m with the following minimum property requirements;

<b>PROPERTY</b>	<b>Units</b>	<b>Type 300</b>
<b>MECHANICAL PROPERTIES</b>		
<b>Length Direction</b>		
Nominal tensile strength	KN/m	300
Elongation at Nominal Strength	%	15
Tensile Strength at 10% Elongation	KN/m	230
Tensile Strength at 5% Elongation	KN/m	110
Tensile Strength at 2% Elongation	KN/m	30
<b>Transverse (Cross) Direction</b>		
Nominal tensile strength	KN/m	40
Elongation at Nominal Strength	%	11
<b>Static Puncture</b>		
Push through force	KN	10
Push through displacement	Mm	40
<b>DURABILITY</b>		
<b>Ultra Violet resistance</b>		
Xenon Test	U.T.S	>90%
Classification	Class	C
Thermo-oxidation resistance	Class	A
<b>HYDRAULIC PROPERTIES</b>		
Water Flow at Δh=100mm	litre/m <sup>2</sup> s	15
Water head at v=10mm/s	Mm	40
Permittivity	1/s	0.25
Water Permeability	m/s	0.005

The abovementioned mechanical properties refer to length and transverse directions relative to the roll of the fabric (Plate .1); moreover the properties specified are the minimum requirements. In addition to the mechanical properties listed above the approved geotextile shall have a consistently rough surface suitable by promoting friction between the fabric and the adjacent soil.

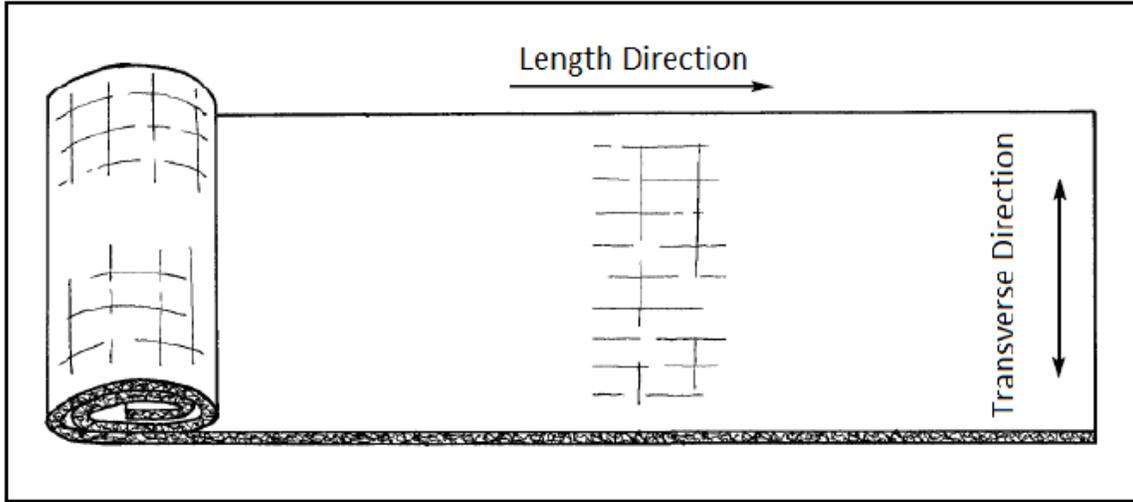


Plate 1 – Typical Geotextile Roll

The geotextile fabric shall be subject to sampling and testing to verify conformance with the aforementioned specifications. Sampling and testing shall be in accordance with the following list of ASTM Standards or with alternative European or other standards approved by the Project Manager.

<b>ASTM D276</b>	Test Methods for Identification of Fibers in Textiles
<b>ASTM D3786</b>	Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
<b>ASTM D4354</b>	Standard Practice for Sampling of Geosynthetics for Testing
<b>ASTM D4355</b>	Test Method for Deterioration of Geotextiles for Exposure to Ultraviolet Light and Water (Xenon-Arc Type Apparatus)
<b>ASTM D4533</b>	Test Method for Trapezoid Tearing strength of Geotextile
<b>ASTM D4595</b>	Test Method for Tensile Properties of Geotextile by the Wide Width Strip Method.
<b>ASTM D4632</b>	Test Methods for Breaking Load and Elongation of Geotextiles (Grad Method)
<b>ASTM D4759</b>	Standard Practice for Determining the Specification Conformance of Geosynthetics.
<b>ASTM D4833</b>	Test Method for Index Puncture Resistance of Geotextiles, Geomembranes and Related Products.
<b>ASTM D5261</b>	Test Method for Measuring Mass Per Unit Area of Geotextiles.

The Contractor shall submit details, with a certificate stating the manufacturer’s name, product name, style number, chemical composition of the filament or yarn mechanical/hydraulic properties and other pertinent information, and samples of the proposed material to the Project Manager for review and approval. The Contractor shall provide the Project Manager with certified copies of the manufacturer’s independent test results relating to the properties of the fabric as detailed in this specification. Geotextile labeling, shipment and storage shall follow ASTM D4873-17. Product

labels shall clearly show the manufacturer or supplier name, style name and roll number. Each shipping document shall include a notation certifying that the material is in accordance with the manufacturer's certificate. Each geotextile roll shall be shipped wrapped with a material that will protect the geotextile from damage due to water, contaminants and sunlight. The protective wrapping shall be maintained during periods of shipment and storage. During storage, the geotextile rolls shall be elevated off the ground and adequately covered to protect them from damaging the physical property values of the geotextile. The Project Manager may reject geotextile fabric if it has defects, tears, punctures, shows deterioration, or damage incurred during manufacture, transportation or storage.

## INSTALLATION

The procedure for installation of geotextile fabric reinforcement shall be agreed beforehand between the Contractor and the Project Manager. The initial laying operations shall be carefully monitored by both parties and any changes or adjustments to the procedure agreed and demonstrated. A satisfactory, agreed procedure having been approved, shall not be changed except by consent of the Project Manager who shall be consulted immediately if the contractor feels any change is required.

The agreed procedure shall be such as to ensure that:

- Fabric is laid as soon as possible after completion of wick drains
- Fabric is laid on a smooth surface without undue irregularities, inclusive of all sharp and protruding objects
- Fabric is laid correctly with the right overlaps and anchorage lengths
- Fabric is laid without wrinkles or folds
- Fabric should be laid in longitudinal strips perpendicular to the alignment to the road
- Backfilling takes place as soon as possible after fabric is laid
- Anchorage takes place as soon as possible after backfilling commences at the correct height of fill
- Clay blanket is laid to protect exposed areas of fabric as soon as possible after the anchor layers are backfilled

As soon as practicable following the installation of a completed section of embankment drainage and wick drains, the Contractor shall install the geotextile membrane for the embankment base reinforcement.

The geotextile fabric shall be precut to the correct lengths to allow for the required edge wrap and anchorage length as shown on the drawings. Precut lengths may be either folded or rolled and stacked ready for installation along the edge of the embankment site. Such precut lengths shall not be left on site, unplaced for more than 24 hours. As soon as the current road section becomes available for fabric laying the fabric panel shall be stretched out transversely across the line of the road in their correct positions with the anchorage lengths neatly folded at each side of the road bed. The edge of the panel shall overlap the next panel by a minimum of 300mm (12in), but no greater than 500mm (20 in) as depicted in Plate 2. The run of the fabric shall be perpendicular to the road alignment and no joints between fabric lengths will be permitted; each complete panel shall be a single piece of fabric, as depicted in Plate 3. After laying out, all fabric shall be smooth and free from wrinkles.

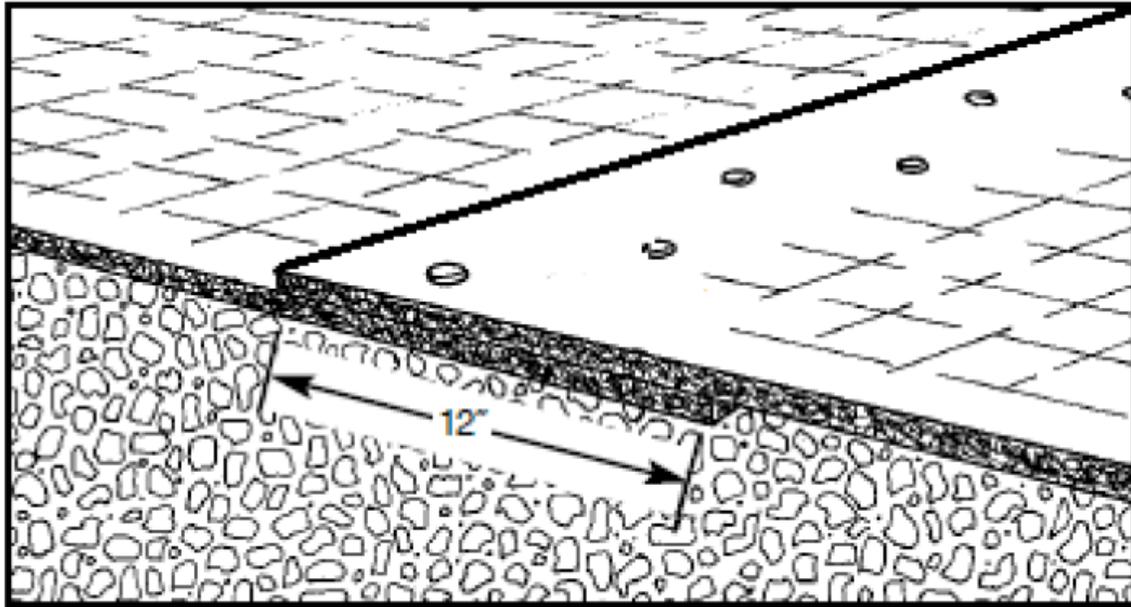


Plate 2 – Overlap at edge of Panels

When the laying out of a section is complete the Contractor shall request the Project Manager to inspect and approve the layout. Immediately on receipt of such approval backfilling shall commence.

Backfilling shall commence from the end of the section working from the previously completed and partially backfilled section and no vehicles or equipment of any sort shall be permitted to ride on the bare fabric. The first layer of the backfill shall be 300mm loose depth. Material shall be tipped only on previously placed material and carefully spread forward to cover the fabric. Levels shall be carefully controlled at all times to ensure that there is an absolute minimum of 150mm cover to fabric where vehicles or equipment are passing or working. Subsequent to compaction and approval of the first layer, a second layer of backfill shall be placed and compacted. Where the anchorage level is above the original ground level care shall be taken to ensure that the correct width of embankment is placed. The edges of the fill shall be trimmed where necessary to provide the correct width and the anchorage lengths shall be brought up and pulled tightly into position on top of the layer.

As soon as practical after completion of the embankment construction to the required height the protective clay blanket shall be placed to cover any exposed areas of fabric and to protect the sand fill from erosion.

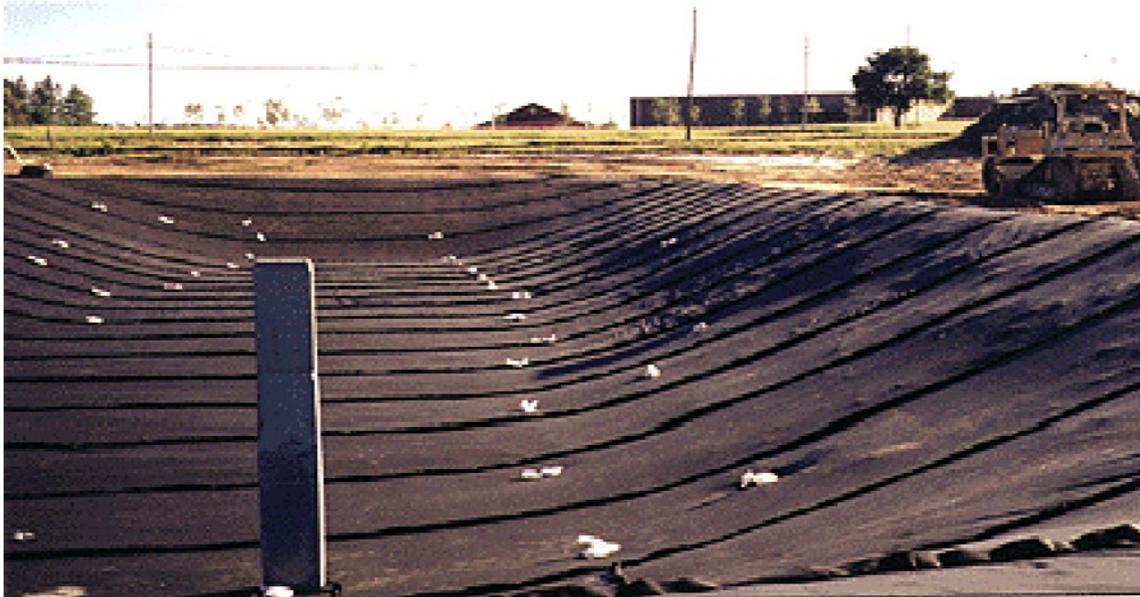


Plate 3 – Typical Installation of Geotextile Fabric

#### MEASUREMENT AND PAYMENT

Geotextile reinforcing fabric material shall be measured by the square metre for the net area of each type of material required to be installed, complete and in place. Measurement will include the required side risers and anchorage lengths but will not include overlaps. Payment for geotextile fabric will be made at the rate entered in the Bill of Quantities against each of the tingle items for provision of the specified type of material, which price shall be full compensation for the cost of furnishing the full area of material, installing the material, any adjustment to the method of installation in order to provide the required end result in accordance with the plan and specifications, and shall also include the cost of furnishing all tools, materials, labor, equipment and all other things of whatsoever nature necessary to complete the required work including all access to the site. No payment will be made for unacceptable material, for relaying of improperly installed material, for overlaps, for wastage of material or for any delays or expenses incurred through changes necessitated by improper or unacceptable material or equipment.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5 Item 050621 Reinforcing Filter Fabric, using the units of measurement specified.

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**SECTION 05070 – WATERPROOFING TO STRUCTURES**

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**1-1 DESCRIPTION**

Waterproofing shall be applied to structural concrete surfaces in contact with fill material or cut soil surfaces wherever detailed on the Drawings or instructed by the Employer's Representative in writing.

**WORK SCHEDULING**

When waterproofing is to be installed on structures, the Contractor shall inform the Employer's Representative two working days in advance of the impending works.

**RECTIFYING UNSATISFACTORY WORK**

The Contractor shall rectify at his own expense all waterproofing which does not meet this Specification section or as directed by the Employer's Representative.

The Contractor shall be responsible for the integrity of all finished work and shall replace at his own expense any damaged waterproofing, due, in the opinion of the Employer's Representative, to the Contractor's neglect.

**MAINTAINING ACCEPTED WORK**

The Contractor shall be responsible for the routine maintenance of all completed and accepted waterproofing throughout the Contract and Defects Liability Period.

**MATERIALS**

Waterproofing materials shall consist of either bitumen emulsion or cutback bitumen or bitumen/rubber latex emulsion.

Bitumen emulsion shall be grades RS-2, SS-1 or SS-IH and comply with the requirements of ASTM D2397-20 or ASTM D977-20. Two coats shall be applied, the first coat at a minimum rate of 0.45L/m<sup>2</sup> (0.1 gallons per square yard). The first coat shall be allowed to dry before the second coat is applied.

**EXECUTION OF THE WORKS**

Prior to application the surface shall be clean and completely free from damp, moisture, dust, membrane curing compounds, projecting tying wire, nails and the like.

Two coats of bitumen shall be applied at the application rates given in clause **1-5 MATERIALS**. The first coat shall be allowed to dry before the second is applied.

Bitumen/rubber latex emulsion shall contain a minimum of 10% rubber. Two coats shall be applied, the application rates being as described for bitumen emulsion. The second coat shall be applied when the first coat is touching dry. Bitumen/rubber latex emulsion shall not be applied during wet

weather and should rain occur and cause damage before the rubber has dried the membrane shall be repaired or replaced as approved by the Employer's Representative at the Contractor's expense.

Where concrete is cast against existing ground the waterproofing membrane shall be single layer polythene sheet meeting the requirements of Geotextiles to Structures, Section 05060

#### **MEASUREMENT AND PAYMENT**

Payment for Waterproofing to Structures will be per square meter of waterproofing placed based on the nominal dimensions required by the drawings. No additional area will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of providing and laying polythene sheet or providing bitumen, applying the bitumen to the concrete or structure, excavation, preparing the foundation, and any other work required in order to comply with the requirements in this clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5 Item 050701 Waterproofing to Structures, using the units of measurement specified.

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## ***SECTION 05080 – WEEPHOLES TO STRUCTURES***

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**1-1 DESCRIPTION**

Where shown on the Drawings or directed by the Employer's Representative the Contractor shall cast weep holes into concrete walls abutments, sides of drains etc. as shown on the drawings or stated in the Specifications.

Weep holes are not required in abutment cap beams. Weep holes are required in all pre-cast, pre-stressed concrete sheet piles for wing walls and facing walls at abutments.

**WORK SCHEDULING**

When Weep holes are to be installed in structures, the Contractor shall inform the Employer's Representative two working days in advance of the impending works.

**MATERIALS**

The Contractor shall provide and place PVC pressure pipe Schedule 120 of the diameter shown on the Contract Drawings to form Weep holes, which shall be firmly held in position during the placing of the concrete and shall be cut flush with the face of the concrete. A 500mm x 500mm square of approved fabric as specified in Clause 1-6 of the Specification for Section 05061 Geotextiles to Structures shall be placed, central on the Weep holes between the concrete wall and the backfill material.

**MEASUREMENT AND PAYMENT**

Payment for Weepholes to Structures will be per Weepholes placed based on the requirements in the drawings. No additional Weepholes will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of providing the Pipe, Installing and securing same, providing the Geotextile and any other work required to comply with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5 Item 050801 Weepholes to Structures, using the units of measurement specified.

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## ***SECTION 06010– CONCRETE KERB***

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**1-1 DESCRIPTION**

Construct ordinary Portland cement concrete curb in the locations shown on the drawings or as otherwise directed by the Employer's Representative. Cement and concrete products are to conform to the general requirements of Section 08020 – Concrete for structures and other uses as well as the following:

**MATERIALS*****1 Concrete***

Use Grade 30 (A) concrete meeting the requirements of Section 08020. Concrete for structures and other uses

***Reinforcement***

All reinforcing steel used shall be deformed bars and shall conform to the requirements and stipulations of Grade 40 deformed reinforcement rods and meet the requirements of Section 08020. Concrete for structures and other uses

***Joint Materials***

Meet the requirements specified on the Drawings.

***Form Materials***

Construct forms of either wood or metal. Provide forms that are straight, free from warp or bends and of sufficient strength when staked, to resist the pressure of the concrete without deviation from line and grade. For any curb to be constructed on a radius, use flexible form materials.

**CONSTRUCTION*****1 Machine Placement***

The Contractor may place these items by machine methods with the approval of the Employer's Representative provided that the method consistently produces an acceptable finished product-true to line, grade and cross section.

***Excavation***

Except where curb is to be installed on top of an asphalt surface, excavate to the required depth and compact the foundation material upon which the curb is to be placed to not less than 95% of maximum density or as per ASTM D698-12e2 and as shown on the Drawings.

***Placing Concrete***

Place the concrete in the forms and tamp and spade it to prevent honeycombing until the top of the structure can be floated smooth and the edges rounded to the radius shown in the plans.

### ***Contraction Joints***

Except for machine placed items, the Contractor may form joints by using dummy joints (either formed or sawed) or by using sheet metal templates. If using sheet metal templates ensure that they are of the dimensions and are set to the lines shown on the drawings. Hold templates firmly while placing the concrete and leave templates in place until the concrete has set sufficiently to hold its shape. Remove them while the forms are still in place.

Joints shall be sawn for machine placed items, unless the Employer's Representative approves an alternative method. Saw the joints as soon as the concrete has hardened to the degree that excessive ravelling will not occur and before uncontrolled shrinkage cracking begins.

Space contraction joints at intervals of not more than 3.0 m except where closure requires a lesser interval. Do not allow any section between joints to be less than 1.2 m in length.

### ***Expansion Joints***

Construct expansion joints using 13 mm thick pre-formed jointing board at all inlets, radius points and at other locations indicated on the Drawings. Locate them at intervals of 15m between other expansion joints or ends of a run.

### ***Other***

Construct drainage slots and openings for dowel bars to the size and spacing shown on the Drawings. Install steel dowel pins of the diameter and length indicated or as directed by the Employer's Representative.

## **FINISHING**

### ***1 Repair of Minor Defects***

Remove the forms within 24 hours after placing the concrete and then fill minor defects with mortar composed of one part Portland cement and two parts fine aggregate. The Employer's Representative will not allow rendering to the face of the curb. Remove and replace any rejected curb, curb and gutter, or valley gutter without additional compensation.

### ***Final Finish***

Finish all exposed surfaces while the concrete is still green. In general, the Employer's Representative will only require a brush finish.

For any surface areas, however, which are too rough or where other surface defects make additional finishing necessary, the Employer's Representative may require the Contractor to rub the curb to a smooth surface with a soft brick or wood block using water liberally. Also, if necessary to provide a suitable surface, the Employer's Representative may require the Contractor to rub further using thin grout or mortar.

## **CURING**

### ***1 General***

Continuously cure the concrete for a period of at least 7 days Commence curing after completely finishing and as soon as the concrete has hardened sufficiently to permit application

of the curing material without marring the surface. Immediately replace any curing material removed or damaged during the 7 day period.

After removing the forms, cure the surfaces exposed by placing a berm of moist earth against them or by any of the methods described below, for the remainder of the 72 hr. curing period.

#### ***Wet Burlap Method***

Place burlap, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 150 mm. Hold the burlap securely in place such that it will be in continuous contact with the concrete at all times, and do not allow any earth between the burlap surfaces at laps or between the burlap and the concrete.

Saturate the burlap with water before placing it, and keep it thoroughly wet throughout the curing period.

#### ***Membrane Curing Compound Method:***

Apply clear membrane curing compound or white pigmented curing compound as directed by using a hand sprayer. Apply a single coat continuous film at a uniform coverage of at least 0.2 L/m<sup>2</sup>).

Immediately recoat any cracks, checks or other defects appearing in the coating. Thoroughly agitate the curing compound in the drum prior to application and during application as necessary to prevent settlement of the pigment.

#### ***Polyethylene Sheeting Method***

Place polyethylene sheeting, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 150 mm, Hold the sheeting securely in place and in continuous contact with the concrete at all times.

#### ***Backfilling and Compaction***

After the concrete has set sufficiently, but not later than 3 days after pouring, refill the spaces in to the front and back of the curb to the required elevation with suitable material. Place and thoroughly compact the material in layers not thicker than 150 mm.

#### ***Surface Requirements***

Test the section of curb with a 3 m straightedge laid parallel to the centreline of the roadway and while the concrete is still plastic. Perform straight-edging along the top of the curb and in the case of curb with gutter along the edge of the gutter adjacent to the pavement or along other lines on the gutter cross-section, as directed by the Employer's Representative. Immediately correct irregularities in excess of 6 mm.

### **MEASUREMENT AND PAYMENT**

Payment for Concrete Curb will be per linear metre of curb constructed based on the nominal dimensions required by the drawings. No additional length will be measured for payment for

over casting unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of, Excavation, Placing and Compacting Bedding, Formwork, Steel Reinforcement, Installing Expansion and Contracting Joints, Disposal of Excavated Materials, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities Bill 6, Incidental Road Works. Item 060101: Concrete Curb Type 1 and Item 060102; Concrete Curb Type 2 using linear meter as the unit of measurement.

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## ***SECTION 06015 – CEMENT CONCRETE SIDEWALKS***

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## 1-1 Descriptions

This Work consists of constructing cement concrete sidewalks in accordance with details shown in the drawings and these Specifications and in conformity to lines and grades also shown in the drawings or as established by the Project Manager.

### Materials

Materials shall meet the requirements of the following sections:

- Concrete for Structural Uses.
- Aggregates
- Pre-formed Expansion Joint Filler
- Concrete Curing Materials and Admixtures

The Contractor shall seek Approval of Material process and other materials. The detectable warning surface shall have the truncated dome shape shown in the Plans. The minimum 2-foot-wide detectable warning surface area shall be yellow and shall match Federal Standard 595, color number 33538.

### Construction Requirements

The concrete in the sidewalks and curb ramps shall be air entrained concrete Class 3000.

#### *1-3-1 Excavation*

Excavation shall be made to the required depth and to a width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown in the Plans. All soft and yielding material shall be removed and replaced with acceptable material.

#### *1-3-2 Forms*

Forms shall be of wood or metal and shall extend for the full depth of the concrete. All forms shall be straight, free from warp, and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. After the forms have been set to line and grade, the foundation shall be brought to the grade required and thoroughly wetted approximately 12 hours before placing the concrete.

#### *1-3-3 Placing and Finishing Concrete*

The concrete shall be placed in the forms and struck off with an approved straightedge. As soon as the surface can be worked, it shall be toweled smooth with a steel trowel.

After toweling and before installing the contraction joints or perimeter edging, the walking surfaces of the sidewalk and curb ramps shall be brushed in a transverse direction with a stiff bristled broom as shown in the Plans.

Expansion and contraction joints shall be constructed as shown in the Plans. When the sidewalk abuts a cement concrete curb or curb and gutter, the expansion joints in the sidewalk shall have the same spacing as the curb. The expansion joint shall be filled to full cross-section of the sidewalk with 3/8 inch pre-molded joint filler.

Curb ramps shall be of the type specified in the Plans and shall include the detectable warning surface.

#### ***1-3-4 Curing***

Concrete sidewalks shall be cured for at least 72 hours. Curing shall be by means of moist burlap or quilted blankets or other approved methods. During the curing period, all traffic, both pedestrian and vehicular, shall be excluded. Vehicular traffic shall be excluded for such additional time as the Project Manager may specify.

#### ***1-3-5 Detectable Warning Surface***

The detectable warning surface shall be located as shown in the Plans. Placement of the detectable warning surface shall be in accordance with the manufacturer's recommendation for placement in fresh concrete, before the concrete has reached initial set, or on a hardened cement concrete surface or asphalt pavement surface.

Vertical edges of the detectable warning surface shall be flush with the adjoining surface to the extent possible (not more than 1/4 inch above the surface of the pavement) after installation.

Embossing or stamping the wet concrete to achieve the truncated dome pattern or using a mold into which a catalyst-hardened material is applied shall not be allowed.

### **Measurement & Payment**

Cement concrete sidewalks will be measured by the square meter of finished surface and will not include the surface area of the curb ramps.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities Bill 6 Incidental Road Works, Item 060151, Cement Concrete Sidewalks, using the units of measurement specified.

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## ***SECTION 06020 – CONCRETE DRIVEWAYS***

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## 1-1 DESCRIPTION

This Section describes the requirements and procedures for the construction of reinforced concrete driveways and property access roads using in-situ concrete, on a prepared bed in accordance with lines, levels, grades, dimensions and types shown on the Drawings. Where shown on the Drawings, the work shall also include the construction of base layer.

## MATERIALS

### *1 Base Material*

If a sub base layer is required by the drawings, or otherwise required by the Employer's Representative, the material shall be in accordance with the requirements and provisions of Section 03010 White Sand Sub Base.

### *Concrete*

Concrete shall be of the Grade 30 (A) as shown on the Drawings and shall be in accordance provisions and requirements of Section 08020 Concrete for structures and other uses.

### *Reinforcing Steel*

All reinforcing steel used shall be deformed bars and shall conform to the requirements and stipulations of Grade 40 deformed reinforcement rods and meet the requirements of Section 08020 Concrete for structures and other uses.

### *Pre-formed Expansion Joint Filler*

Unless otherwise approved by the Employer's Representative, pre-formed joint filler if required shall be in accordance with ASTM D1751-18.

## CONSTRUCTION METHODS

### *1 General*

Excavation shall be made to the required depth, and the foundation shall be shaped to conform to the section shown on the drawings and compacted to a firm, even surface. All soft and unsuitable material shall be removed and replaced with suitable material. All work shall be correct to line, grade and level to within 10 mm.

### *Cast in Place Concrete*

Forms shall be made of metal or of straight and sound lumber at least 25 mm in thickness. They shall be free of warp and of sufficient strength to resist springing out of shape under pressure of the concrete. Forms shall be staked securely in position at the correct line and elevation. Concreting shall be in accordance with the requirements of Section 08020 Concrete for structures and other uses.

Pre-formed expansion joint filler, if required by Drawings, shall be of the dimensions shown. They shall be set in the positions shown on the drawings before the placing of concrete is started.

Concrete areas between expansion joints shall be divided into blocks by transverse cuts, extending to at least 30% of the depth of the slab, where called for on the Drawings or directed by the Employer's Representative.

The edges of the surfaces and the transverse cuts shall be shaped with a suitable tool so formed as to round the edges to a 10 mm radius. Unless otherwise required or directed by the Employer's Representative cast in place sidewalks shall receive a Type U1 broom textured surface finish.

## CURING

### *1 General*

Continuously cure the concrete for a period of at least 7 days in accordance with requirement given in section 08020 Concrete for Structures and other uses. During the curing period, protect the work from all pedestrian and vehicular traffic. Commence curing after completely finishing and as soon as the concrete has hardened sufficiently to permit application of the curing material without marring the surface. Immediately replace any curing material removed or damaged during the 7 day period.

After removing the forms, cure the surfaces exposed by placing a berm of moist earth or sand against them or by any of the methods described below, for the remainder of the 7 day curing period.

#### *Wet Burlap Method*

Place burlap, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 150 mm. Fix the burlap securely in place such that it will be in continuous contact with the concrete at all times, and do not allow any earth between the burlap surfaces at laps or between the burlap and the concrete.

Saturate the burlap with water before placing it, and keep it thoroughly wet throughout the curing period.

#### *Polyethylene Sheeting Method*

Place polyethylene sheeting, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 150 mm. fix the sheeting securely in place and in continuous contact with the concrete at all times.

#### *Backfilling and Compaction*

After the concrete has set sufficiently but not later than 3 days after pouring, refill the spaces to the sides of the slab to the required elevation with suitable native material. Place and thoroughly compact the material in layers not thicker than 150 mm.

#### *Surface Requirements*

Test the section of curb with a 3 m straightedge laid parallel to the centre-line of the roadway and while the concrete is still plastic perform straight-edging along lines both parallel and

perpendicular to the centre-line of the pavement or along other lines as directed by the Employer's Representative. Immediately correct irregularities in excess of 6 mm.

### **Partial Removal of Concrete Driveways**

#### **1 General**

When the carriageway is widened to include extra or wider lanes or shoulders, it will be necessary to partially remove driveways to accommodate the widened carriageway. Care must be taken during construction to provide temporary access to the property and minimum inconvenience to residents.

When there is a difference in elevation between the edge of the new carriageway and the driveway it will be necessary to cut back the driveway in order to provide an asphalt concrete wedge to transition between the carriageway and driveway. This wedge should be long enough to provide a smooth transition between the driveway and carriageway. If the original driveway included a dam to direct runoff away from the driveway a replacement dam must be provided.

All construction must be neat and durable and to the satisfaction of property owner Payment for partial removal of the driveway will be withheld until the property owner is satisfied with the alteration.

### **MEASUREMENT AND PAYMENT**

Payment for Concrete Driveways will be per cubic metre of driveway constructed based on the nominal dimensions required by the drawings. No additional volume will be measured for payment for over casting unless such work is specifically instructed by the Project Manager as a variation from the drawings.

Payment for partial removal and reconstruction of driveways will be made based on a rate and paid for the number of driveways partially removed and reconstructed

No separate payment shall be made for the cost of, Excavation, Placing and Compacting, Bedding, Formwork, Installing Expansion and Contracting Joints, pre-formed expansion joint filler, Disposal of Excavated Materials, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities Bill 6, Incidental Road Works; Item 060201: Concrete Driveways; using sq.m as the unit of measurement. Item 060202 partial removal and reconstruction of driveways based on a unit rate.

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## ***SECTION 06030 – STEEL BEAM GUARDRAIL***

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## 1-1 DESCRIPTION

The Works specified in this section consist of the supply and installation of protective guard railing to mitigate risks to occupiers of vehicles from potential dangers adjacent to the carriageway. These guard rails are deformable metal barriers, on posts.

The Work also comprises the supply and installation of steel beam ('thrie beam' and W-beam) guardrail to areas where approaching traffic must be protected from bridge parapet ends. The work includes the supply and erection of both straight and curved beam elements on supporting posts, the addition of an additional horizontal rail element at the bridge attachment end, anchorage of both rails elements to the adjacent bridge parapets. The components to be used are those listed in the US AASHTO-ARTBA-AGC Document, "A Guide to Standardized Highway Barrier Rail Hardware".

The remote end of the rail treatment shall have appropriate beam-end safety treatments as required and approved by the Employer's Representative.

The locations where the installations are to be applied are shown on the Drawings and the required anchorage arrangements are shown in the structural details.

## MATERIALS

### *1 Rails*

Guardrails shall be made from steel of thickness no less than 12 gauge which shall not elongate more than 12% as determined by a 5 cm long specimen under tensile test.

They shall have an ultimate tensile strength of no less than 5,600 kg/cm<sup>2</sup> and a beam strength including joints, of 680 kg at a deflection of 5 cm (when tested on a clear span of 365 cm with a load applied through an 8 cm wide flat surface at the centre).

Joints shall be capable of withstanding a side pull of 2,200 kg.

Guardrails shall be galvanized in accordance with ASTM A123/A123M-17. All galvanizing shall be done after fabrication.

### *Hardware*

Offset brackets shall be as shown on the Drawings and approved by the Employer's Representative. Splices and end of connections shall be of the type and design as shown on the Drawings, and shall be of such strength as to develop the full design strength of the rail elements.

Unless otherwise specified, all fittings, bolts, washers and other accessories shall be galvanized in accordance with the requirements of ASTM A153/A153M-16a galvanizing shall be done after fabrication.

### *Posts*

Steel posts shall be of the section and length as shown on the Drawings. They shall be of a copper bearing steel and shall conform to the requirements of AASHTO M 183 for the grade specified.

Posts shall be galvanized in accordance with requirements of ASTM A123/A123M-17. All galvanizing shall be done after fabrication.

### ***Terminal End Treatments***

Rail ends shall have an approved terminal attachment. The Contractor shall supply a Manufacturer's detail ("shop drawing") indicating the proposed type. This shall be submitted in advance of placement of the order.

## **INSTALLATION**

### ***1 Posts***

Posts shall be set vertically in the position shown on the Drawings and, where embedded in a concrete foundation block shall remain undisturbed for 7 days minimum.

The space around the posts shall be backfilled to the finished elevation using approved material in layers not exceeding 200 mm. Each layer shall be moistened and thoroughly compacted.

### ***Rail Elements***

Where required to be installed on a radius, rails shall be pre-bent prior to their attachment to the posts.

Rail elements shall be erected in a manner resulting in a smooth continuous installation. All bolts, except adjustment bolts, shall be drawn tight. Bolts shall be of sufficient length to extend beyond the nuts at least 5 mm but not more than 15 mm.

Where galvanized surfaces have been abraded so that the base material is exposed, the threaded portions of all fittings and fasteners and cut ends of bolts shall be protected with a zinc based repair coating.

### ***Galvanizing Repairs***

In the event that minor damage to the galvanized coating of the guardrail or mounting hardware occurs, the Employer's Representative may allow field repairs to be made instead of removal and replacement. Repairs shall involve three applications of a zinc-based, anti-corrosive paint as approved by the Employer's Representative. The Contractor shall provide full details and information (including the manufacturer's application and surface preparation requirements) for the approval of the Employer's Representative.

Repair coating applications shall not proceed until such information and data has been approved by the Employer's Representative.

## **MEASUREMENT AND PAYMENT**

Payment for Steel Beam Guardrail will be linear meter of guardrail constructed based on the nominal dimensions required by the drawings. No additional length will be measured for payment for over installing unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of, Excavation, Placing Concrete foundation for posts, Backfilling around posts, Purchasing and Installing metal posts at 7m centres, Purchasing and Installing guard rail, Hardware including offset brackets, Bolts and Washers to attach guard rail to posts, Disposal of Excavated Materials, and for complying with the

requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities Bill 6, Incidental Road Works Item 060301: Steel Beam Guardrail, using linear meter as the unit of measurement. Item 060302: End Terminal Sections with flare, using the number installed as the unit of measurement.

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## ***SECTION 06040 – BUS SHELTER***

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## 1-1 DESCRIPTION

Construct Bus Shelters in accordance with the drawings as shown on the plans or as otherwise directed by the Employer's Representative. Bus Shelters should measure 2.5m length x 2.5m width x 3m height or as directed by the Project Manager. Concrete for Bus Shelters should conform to the general requirements of Section 08020 – Concrete for structures and other uses as well as the following:

### MATERIALS

#### *1 Concrete*

Use Grade 30 (A) concrete meeting the requirements of Section 08020- Concrete for structures and other uses.

#### *Reinforcement*

All reinforcing steel used shall be deformed bars and shall conform to the requirements and stipulations of Grade 30 deformed reinforcement rods and meet the requirements of Section 08020 – Concrete for structures and other uses.

#### *Timber*

All timber used shall be cured and conform to the requirements of Section 09080 – Timber.

#### *Paint*

All painting material used shall conform to the requirements of Section 09020- Paint.

#### *Form Materials*

Construct forms of either wood or metal. Provide forms that are straight, free from warp or bends and of sufficient strength when staked, to resist the pressure of the concrete without deviation from line and grade. Formworks shall meet the requirements of Section 08020 – Concrete for structures and other use: 1-16: Formwork for concrete.

#### *Hollow Concrete Blocks*

Hollow concrete blocks shall be used of standard sizes and strengths and shall conform to the requirements of ASTM C90-16a or as directed by the Employer's Representative.

#### *Zinc*

Zinc sheets and all roofing materials with their arrangements shall be in accordance with the plans and bill of quantities or as directed by the Employer's Representative.

### CONSTRUCTION

#### *1 Site Preparation*

Site preparations for the construction of the structures shall be done in the most appropriate manner by the Contractor in accordance with Section 02010 – Site Clearance.

### ***Formworks***

Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal. After the forms have been set to line and grade, the foundation shall be brought to the grade required and thoroughly wetted approximately 12 hours before placing the concrete.

### ***Mechanically Produced Concrete***

The Contractor should produce concrete mechanically and with the approval of the Employer's Representative provided that the method consistently produces an acceptable finished product true to line, grade and cross sections.

### ***Excavation***

Excavation shall be made to the required depth and to a width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm even surface conforming to the section shown in the Plans. All soft and yielding material shall be removed and replaced with acceptable material.

Compact the foundation material upon which the Bus Shelter is to be placed to not less than 95% of maximum density or as per ASTM D698-12e2 and as shown on the Drawings.

General Earthworks shall be done in accordance with the requirements of Section 02030 – Earth Works.

### ***Placing Concrete***

Place the concrete in the forms and vibrate to prevent honeycombing until the top of the slabs can be floated smooth and the edges defined as shown in the plans.

## **FINISHING**

### ***1 Repair of Minor Defects***

Remove the forms within 24 hours after placing the concrete and then fill minor defects with mortar composed of one part Portland Cement and two parts fine aggregate. Remove and replace any rejected concrete, steel, timber or any other material without additional compensation.

### ***Final Finish***

Finish all exposed surfaces while the concrete is still green. Generally, the Employer's Representative will require a floated finish on concrete surfaces.

However, for any surface areas, which are too rough or where other surface defects make additional finishing necessary, the Employer's Representative may require the Contractor to redo the surface to the Employer's Representative satisfaction. Also, if necessary to provide a suitable finish for concrete surfaces, the Employer's Representative may require the Contractor to rub further using thin mortar.

All paintings shall be done as directed by the Employer's Representative.

## CURING

### *1 General*

Continuously cure the concrete for a period of at least 7 days Commence curing after completely finishing and as soon as the concrete has hardened sufficiently to permit application of the curing compound without marring the surface. Immediately replace any curing compound removed or damaged during the 7 day period.

After removing the forms, cure the surfaces exposed by any of the methods described below, for the remainder of the 72 hr. curing period.

#### *Wet Burlap Method*

Place burlap, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 150 mm. Hold the burlap securely in place such that it will be in continuous contact with the concrete at all times, and do not allow any earth between the burlap surfaces at laps or between the burlap and the concrete.

Saturate the burlap with water before placing it, and keep it thoroughly wet throughout the curing period.

#### *Membrane Curing Compound Method:*

Apply clear membrane curing compound or white pigmented curing compound as directed by using a hand sprayer. Apply a single coat continuous film at a uniform coverage of at least 0.2 L/m<sup>2</sup>).

Immediately recoat any cracks, checks or other defects appearing in the coating. Thoroughly agitate the curing compound in the drum prior to application and during application as necessary to prevent settlement of the pigment.

#### *Polyethylene Sheeting Method*

Place polyethylene sheeting, over the entire exposed surface of the concrete, with sufficient extension beyond each side to ensure complete coverage. Overlap adjacent strips a minimum of 150 mm, Hold the sheeting securely in place and in continuous contact with the concrete at all times.

#### *Backfilling and Compaction*

After the concrete has set and cured sufficiently, refill the spaces around the foundation to the required elevation with suitable material. Place and thoroughly compact the material in layers not thicker than 150 mm.

## MEASUREMENT AND PAYMENT

Payment for Bus Shelters will be per No and constructed based on the nominal dimensions required by the drawings. .

No separate payment shall be made for the cost of, Excavation, Placing and Compacting Bedding, Formwork, Steel Reinforcement, Disposal of Excavated Materials, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities Bill 6, Incidental Road Works. Item 060401: Bus Shelter.

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## ***SECTION 06050 – RAISED CROSSWALKS***

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## 1-1 DESCRIPTION

The Works specified in this section consist of constructing raised crosswalks which will be at an elevated level to that of the roadway. The intent of installing raised crosswalks is to encourage vehicles to slow as they approach the pedestrian crossing.

These structures are compacted asphalt humps, built on top of the actual pavement and placed at critical areas where pedestrian crossings are located such as schools and health centers. At each pedestrian crossing, one crosswalk will be installed across each lane ten (10) meters before that crossing. The work includes the supply of all materials and the construction of these crosswalks.

The locations where the raised crosswalks are to be installed are shown on the Drawings.

## MATERIALS

### *1 Prime Coat*

The material shall meet the requirements of ASTM D2028/D2028M-15 or ASTM D2027/D2027M-19 otherwise approved by the Employer's Representative and shall be:

Cut-back Asphalt, RC-250, RC-70 or MC-70

In accordance with *SECTION 04010 – PRIME COAT*.

### *Asphalt Concrete*

The asphalt concrete used to construct the raised crosswalk will confirm to DIVISION 04-Pavement Section, Section 04030 – Asphalt Concrete and Sand Asphalt.

### *Painting/Striping*

The paint used for markings on the raised crosswalks will confirm to DIVISION 09– Incidental Structural Works Section 09020 – Paint.

## INSTALLATION

Raised crosswalks will be installed ten (10) meters prior to pedestrian crossings at key locations such as schools, health centers, Police Stations, etc.

The asphalt surface on which the raised crosswalk is to be constructed must be thoroughly cleaned preferably with a mechanical broom prior to applying prime coat to the area.

The raised crosswalk itself will be constructed by hand with asphalt concrete and shaped in accordance with the plans shown in the drawings.

Compaction can be achieved either by rolling with a walk behind one ton roller or by using a plate compactor.

Pavement marking stripes in accordance with The Manual of Uniform Traffic Control Devices (MUNTCDD) will be applied to the surface of the raised crosswalks by brush or roller.

Prior to opening the road to vehicular traffic care should be taken to ensure the road marking paint is completely dry with no residual stickiness.

**MEASUREMENT AND PAYMENT**

Payment for the installation of raised crosswalks will be by the number installed based on the nominal dimensions required by the drawings. No additional payment will be made for varying lengths of crosswalks unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of, cleaning, placing asphalt concrete, painting pavement markings, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this Section of the Specification shall be made under the relevant items in the Bill of Quantities Bill 6, Incidental Road Works, Item 060501: Raised Crosswalks, using the number as the unit of measurement.

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## ***SECTION 07010 – TRAFFIC SIGNS***

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## 1-1 DESCRIPTION

The work under this Section consists of fabricating sign plates and installation of traffic signs and their supporting post(s) at the locations shown on the Drawings or as otherwise directed by the Employer's Representative.

### SIGN DETAILS

All materials used for this work shall conform to the materials Specifications below and to the dimensions shown on the Drawings.

#### *1 Classification*

Signs to be installed are classified as follows:

1. Regulatory
2. Warning
3. Guide
4. Directional / Information

#### *Shapes and Colours*

Sign plates and colours shall be in accordance with North American standards, specifically those defined in the current edition of the Manual of Uniform Traffic Control Devices (MUTCD).

#### *Sign Dimensions*

Dimensions shall conform to standard MUTCD requirements for applications on 'Conventional' highways and are generally shown on Drawings and in the sign patterns. Any increases above those standard sizes shall only be as directed by the Employer's Representative for those specific locations where greater legibility or emphasis is needed.

For enlarged signs, standard shapes and colours shall be used and width/height proportions shall be retained insofar as is practicable.

#### *Messages and Lettering*

Wording shall be as brief as possible and the lettering large enough to provide the necessary legibility at the appropriate sight distance for the design speed of the roadway. Abbreviations should be kept to a minimum and should include only those recognized and understood in the country (e.g. Ave.). The Employer's Representative shall approve all abbreviations proposed before sign manufacture commences.

Lettering shall generally be upper case except that destination names may be in 'title' case.

## REFLECTIVE SHEETING

### *1 Grade*

Diamond Grade VIP reflective (Series 3990 or equal) sheeting shall be used for sign surfaces of Regulatory, Warning and School signs. Hi-intensity grade retro-reflective (Series 3870) sheeting may be used for Directional and Information signs as is specified herein.

Hi-intensity sheeting shall also be used for signs used to control traffic during construction. The Diamond Grade sheeting shall be in the form of wide angled, prismatic lens reflective sheeting designed for the production of durable traffic control signs intended for exposed vertical surfaces. The sheeting shall comply with the following specifications:

Colour	Product Code
White	3990 or equal
Yellow	3991 or equal
Red	3992 or equal
Blue	3995 or equal
Green	3997 or equal

**Photometric**

Daytime Colour (x, y, Y)

The chromaticity coordinates and total luminance factor of the retro-reflective sheeting shall conform to **Table A** below.

Colour Test

Conformance to colour requirements shall be determined by instrumental method in accordance with ASTM E1164-12(2017)e1 on sheeting applied to aluminium test panels. The values shall be determined on a Hunter Lab Labscan 6000 0/45 spectro-colorimeter with option CMR 559 or equivalent. Computations shall be done in accordance with E-308 for the 2° observer.

Coefficients of Retro-reflection (RA)

The values in **Table B** are minimum coefficients of retro-reflection expressed in candelas /lux/m<sup>2</sup> (cd/lux/m<sup>2</sup>).

Test for Coefficients of Retro-reflection

Conformance to ‘coefficient of retro-reflection’ requirements shall be determined by an instrument method in accordance with ASTM E-810-03 “Test Method for Coefficient of Retro-reflection Retro-reflective Sheeting” and per ASTM E-810-03. The values of 0° and 90° rotation are averaged to determine the RA in **Table B**.

**Table A- Colour Specification Limits\* and Reference Standards**

Colour	X	y	x	y	x	y	x	y	Daytime Luminance	
									Limit (Y %)	
									Min	Max
White	0.305	0.305	0.355	0.355	0.335	0.375	0.285	0.325	40	-

Yellow	0.487	0.423	0.545	0.454	0.465	0.534	0.427	0.483	24	45
Red	0.69	0.31	0.595	0.315	0.569	0.341	0.655	0.345	3	15
Blue	0.078	0.171	0.15	0.22	0.21	0.16	0.137	0.038	1	10
Green	0.03	0.398	0.166	0.364	0.286	0.446	0.201	0.794	3	9

\* The four pairs of chromaticity coordinates determine the acceptable colour in terms of the CIE 1931 standard colorimetric system measured with standard illumination Source D65.

**Table B - Minimum Coefficient of Retro-reflection, RA for new sheeting (cd/lux/m<sup>2</sup>)**

<b>4° Entrance Angle<sup>2</sup></b>			
Observation Angle <sup>1</sup>			
	0.2°	0.5°	1.0°
White	380	275	80
Yellow	300	220	60
Red	98	70	20
Green	45	32	9
Blue	22	17	4.5
<b>30° Entrance Angle<sup>2</sup></b>			
Observation Angle <sup>1</sup>			
	0.2°	0.5°	1.0°
White	225	135	45
Yellow	180	100	35
Red	65	32	11
Green	28	16	6
Blue	14	8	3
<b>40° Entrance Angle<sup>2</sup></b>			
Observation Angle <sup>1</sup>			
	0.2°	0.5°	1.0°
White	90	35	10
Yellow	70	27	8.8
Red	26	10	3
Green	9.8	3.5	1.6
Blue	4.5	1.5	0.8

<sup>1</sup>Observation (Divergence) Angle is the angle between the illumination axis and the observation axis.

<sup>2</sup>Entrance (Incidence) Angle is the angle between the illumination axis and the retro-reflector axis. The retro-reflector axis is the axis perpendicular to the retro-reflective surface.

**Screen Printed Colours and Overlay Films**

For screen printed transparent colour areas on white sheeting, the coefficients of retro-reflection shall not be less than 70% the value for the corresponding colour in **Table B**.

Orientation

Where letters and numbers are placed on the same sign, they shall be placed with identical orientation in accordance with the recommendations of the Manufacturer.

### *Adhesive*

Sheeting shall be applied with a pressure-sensitive adhesive recommended for room temperature application. Room temperature application is defined as 65°F (18°C) or higher.

### *Test Methods of Adhesive and Film*

#### Standard Test Panels

Unless otherwise specified herein, sheeting shall be applied to test panels in accordance with ASTM D4956-19, section 7.2 and test conditions shall conform to ASTM D4956 -19 section 7.1.

#### Properties

Standard Conditioning - all mounted and un-mounted test specimens shall be conditioned for 24 hours at 73°F + 2°F (23°C + 1°C) and 50% + 4% R.H. before testing.

#### Adhesive

The retro-reflection sheeting shall comply with the liner removal and adhesion requirements contained in ASTM D4956-19 sections 7.10 and 7.5 respectively.

#### Impact Resistance

Test Method - Apply sheeting to a standard panel 3" x 6" (7.6x15.2cm) and condition. Subject sheeting to a 50 inch pounds (5.7Nm) impact in accordance with ASTM D-2794-93. Requirement - No separation from panel or cracking outside immediate impact area.

#### Shrinkage

The retro-reflective sheeting shall comply with the shrinkage requirements contained in ASTM D4956-19 at Sections 7.10 and 7.5 respectively.

#### Flexibility

Test Method - Following conditioning of 25mm x 150mm samples, remove liner and dust adhesive with talc. At standard conditions, bend in 1 second around 3.2mm mandrel with adhesive side facing mandrel. No cracking, peeling or de-lamination shall occur.

#### Gloss

Test Method- Test in accordance with ASTM D523-14(2018) using an 85° gloss meter. Requirement- Rating not less than 40.

## **FABRICATION**

### *1 Application*

Sheeting Series 3990 or equal incorporates a pressure-sensitive adhesive and shall be applied to the sign substrate at room temperature (65°F/18°C) or higher in accordance with the Manufacturer's recommendations and by one of the following methods:

1. Mechanical squeeze roll applicator - IF 1.4 or equal
2. Hand squeeze roll applicator - IF 1.6 or equal

### ***Hand Application***

Hand application is recommended for legend and copy only. Application of sheeting for complete signs or backgrounds shall be done with a roll laminator - either mechanical or hand.

### ***Splices***

Sheeting shall be butt spliced when more than one piece of sheeting is used on one piece of substrate. The pieces shall not touch each other at the splice and a gap of up to 1.5 mm is acceptable.

### ***Double Faced Signs***

Sheeting on the first side shall be protected from damage from the steel bottom roll of squeeze roll applicators with FR-2 or equivalent sponge rubber and SCW 568 or equal.

### ***Substrates***

For traffic sign use, product application is limited to properly prepared aluminium with the exception that extrusions are to be trimmed rather than wrapped, and flat panel signs are to be carefully trimmed so that sheeting from adjacent panels does not touch on the assembled signs. Users are urged to carefully evaluate all other substrates for adhesion and sign durability. Diamond Grade VIP sheeting is designed primarily for application to flat substrates. Any use that requires a radius of curvature of less than 125mm should also be supported by rivets or bolts. Plastic substrates are not recommended where cold shock performance is essential.

### ***Screen Processing***

VIP (Visual Impact Performance) sheeting may be screen processed into traffic signs before or after mounting on a sign substrate, using Process Colours Series 880 (see Product Bulletin 880). Series 880 process colours can be screen processed at 60-100°F (16-38°C) at relative humidity of 20-50%. A PE 157 or equivalent screen mesh with a fill pass is recommended. Use of other process colours series is not recommended.

Care should be taken to avoid flexing VIP sheeting before and especially after screening to eliminate the possibility of cracking from improper handling techniques.

### ***Cutting and Matching***

The sheeting may be hand cut or die cut one sheet at a time, and band sawed or guillotined in stacks. VIP sheeting can be hand cut from either side with a razor blade or other sharp hand tool. Like all reflective sheeting, when two or more pieces are used side by side on a sign, they must be matched to assure uniform day colour and night appearance. Cutting equipment such as guillotines and metal shears which have pressure plates on the sheeting when cutting, may damage the optics. Padding the pressure plate and easing it down onto the sheets being cut will

significantly reduce damage. Maximum stack height for cutting VIP sheeting is 50 sheets. Edge sealing VIP sheeting is generally not required.

Following extended exposure, airborne dust particles may become trapped within the row of cut cells along the sheeting edge. This should have no adverse effect on sign performance. If the user chooses to edge seal, Series 880I or equivalent toner should be used.

### ***Health and Safety Information***

Read all health hazard and precautionary and first aid statements found in the Material Safety Data Sheet and/or product label of chemicals prior to handling or use.

### ***General Performance Considerations***

The durability of Diamond Grade VIP and Hi - Intensity Reflective Sheeting will depend upon substrate selection and preparation, compliance with recommended application procedures, geographic area, exposure conditions and maintenance must be ensured.

### ***Cleaning***

Signs that require cleaning should be flushed with water then washed with a detergent solution and bristle brush or sponge. Avoid pressure that may damage the sign face. Flush with water following washing and do not use solvents to clean signs.

### ***Storage and Packaging***

Sheeting should be stored in a cool, dry area, preferably at 65-75°F (18-24°C) and 30-50% relative humidity and should be applied within one year of purchase. Rolls should be stored horizontally in the shipping carton. Partially used rolls should be returned to the shipping carton or suspended horizontally from a rod or pipe through the core. Unprocessed sheets should be stored flat. Finished signs and applied blanks should be stored on edge.

Screen processed signs must be protected with SCW 568 or equivalent slip sheet paper. Place the glossy side of the slip sheeting against the sign face and pad the face with closed cell packaging foam. Double faced signs must have the glossy side of the slipsheet against each face of the sign. Un-mounted screened faces must be stored flat and interleaved with SCW 568 or equivalent slip sheet, glossy side against the sign face. Packages of finished sign faces must include sufficient nylon washers for mounting. Avoid banding, crating, or stacking signs. Package for shipment in accordance with commercially accepted standards to prevent movement and chafing. Store sign packages indoors on edges. Panels or finished signs must remain dry during shipment and storage. If packaged signs become wet, unpack immediately and allow signs to dry.

## **INSTALLATION**

Nylon washers are recommended between the heads of all twist fasteners (such as screw heads, bolts, or nuts) and the sheeting in order to protect the sheeting from the twisting action of the bolt heads.

### ***1 Standard Location***

Signs should be individually erected on separate posts or mountings except where one sign supplements another or where route or directional signs must be grouped.

Signs should be located to optimize night time visibility and minimize the effects of mud spatter and in conformance with safety factors related to fixed obstacles near the roadway. Signs should be located so that they do not obscure each other or are hidden from the view by other roadside objects.

### ***Height***

Signs shall be mounted at a height of at least 1.8m from the bottom of the sign to the nearest edge of pavement level. In business, commercial and residential areas or where there are other obstructions to view, the clearance to the bottom of the sign shall be at least 2.0m.

The height to the bottom of a secondary sign mounted below another sign may be 0.3 m less than the appropriate height specified above. In the particular case of W1-8, Chevron, signs the height to the bottom of the signs shall be not greater than 1.2 m.

### ***Lateral Clearance***

Signs should have a maximum practical lateral clearance from the edge of the travelled way for the safety of road users who may leave the roadway and strike the sign supports. Signs should not be closer than 1.0m from the outside edge of the shoulder or if none, 3.5m from the edge of the travelled way.

### ***Erection***

Signs should be mounted approximately at right angles to the direction of, and facing, the traffic that they are intended to serve.

Where mirror reflection from the sign face is encountered to such degree as to reduce legibility, the signs should be turned slightly away from the road.

On curved alignment the angle of placement should be determined by the direction of the approaching traffic rather than by the roadway edge at the point where the sign is located.

### ***Posts and Mounting***

Sign posts and their foundations mountings shall be so constructed as to support the signs in a proper and permanent position and to resist swaying in the wind or displacement by vandalism. See drawings.

In areas where ground mounted sign supports cannot be sufficiently offset from the pavement edge, supports should be of a suitable breakaway or yielding design. Concrete bases for sign supports should be flush with the ground level.

## **RESPONSIBILITY FOR NOTIFICATION**

Notify the Employer's Representative prior to the erection of signs. At the time of notification, indicate the locations and type of signs. Provide a test report to the Employer's Representative certifying that the sign materials meet all the specified requirements. Test results either from the manufacturer or an independent lab must be submitted

## **MEASUREMENT AND PAYMENT**

Measurement of the work of Installing Traffic Signs shall include the cost of the signs, providing posts, accessories and concrete foundations based on the requirements of the Drawings. Payment for Installing Traffic Signs shall be measured and paid for by the unit installed.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities, Bill 5. Road Furniture, Section 07010: Traffic Signs and using the units of measurement specified. This includes Item 070101 Stop R1-1, Item 070102 Speed Limit R2-1 80 km/h, Item 070103 Speed Limit R2-1 50km/h, Item 070104 Speed Limit 30Km/h ahead. S4-5a, Item 070105, No Parking Bus Stop,R7-7; Item 070106, Curve to left or right W1-2, Item 070107, Chevron W1-8,Item 070108, Pedestrian,W11-2, Item 070109, Ahead W16-9p, Item 0701010, Pedestrian Crossing, W11a-2, Item 0701011, Downward Diagonal W16-7, Item 0701012, Four Way Intersection W2-1, Item 0701013, Intersection to Right W2-2, Item 0701014, Intersection to Left W2-2, Item 0701015, Signal ahead W3-3, Item 0701016, Bike route W11-1; Item 070117, School Zone S1-1, Item 0701018, School S4-3; 8:30 Am to 5:30 Pm, Item 0701019, School, S4-1, Item 0701020 Hospital D9-2, Item 0701021, Police D9-14, Item 0701022 Yield R1-2, Item 0701023 No Right Turn R3-1, Item 0701024 No Left Turn R3-2, Item 0701025 No U-Turn R3-4, Item 0701026 Left of Median R4-8, Item 0701027 Do Not Enter R5-1, Item 0701028 Wrong Way R5-1a, Item 0701029 One Way R6-1, Item 0701030 One WayR6-2

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## ***SECTION 07011 – REFERENCE MARKERS***

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## 1-1 DESCRIPTION

This Section covers the provision of maintenance marker/kilometer reference sign and posts at the roadside. These to be provided and installed in accordance with this Section at the locations and in conformity with the sizes, dimensions and designs shown on the Drawings or as required by the Employer's Representative.

### MATERIALS

All materials used for this work shall conform to the materials Specifications below and to the dimensions shown on the Drawings. The grade and fabrication details shall be as for traffic signs as shown in Section 07010.

1. Shapes and Colours  
Sign plates and colours thereof shall be in accordance with North American standards, specifically those defined in the current edition of the Manual of Uniform Traffic Control Devices (MUTCD)
2. Sign Dimensions  
Dimensions shall conform to standard MUTCD requirements for applications on 'Conventional' highways and are generally shown on Drawings and in the sign patterns.

### INSTALLATION

#### *1 Location.*

Marker posts shall be set vertically in the position shown on the Drawings. Generally, they shall be placed at least 1.0m from the back of the shoulder. In cases where this is impractical, the Employer's Representative may direct that the post be installed closer to the RoW boundary.

#### *Construction.*

Posts shall be set vertically in the position shown on the Drawings and, where embedded in a concrete foundation block shall remain undisturbed for 7 days minimum.

The space around the posts shall be backfilled to the finished elevation using approved material in layers not exceeding 200 mm. Each layer shall be moistened and thoroughly compacted.

### MEASUREMENT AND PAYMENT

Measurement of the work of Installing Reference Markers shall include the cost of the markers, providing posts, accessories and concrete foundations based on the requirements of the Drawings. Payment for Installing Reference Markers shall be measured and paid for by the unit installed.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities measured under the items quoted in the Bill of Quantities Bill 5, Road Furniture 07011 Reference Markers, Item 070111 Km Marker D10-1, Item 070112 Km Marker D10-2

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## ***SECTION 07020 – ROAD MARKINGS***

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## 1-1 DESCRIPTION

This Section covers the application of centerline and lane edge markings including symbols (e.g. cross walks) and messaging (e.g. in school zones) on the pavement surface, for the guidance of traffic.

Any such material required to be applied to inform road users of temporary detours or diversions are not covered under this Section but are considered to be included by the Contractor as part of Section 01030 - Safety and Traffic Control.

## MATERIALS

### 1 *Thermoplastic Pavement Markings*

This material shall be a mixture of resins and other materials providing an essentially non-volatile thermoplastic compound especially developed for traffic markings.

#### A. Ingredient Materials.

##### 1. Binder

The binder shall consist of a mixture of synthetic resins, at least one of which is solid at room temperature. The solid resin shall be a hydrocarbon or alkyd resin. The total binder content of the thermoplastic compound shall be well distributed throughout the compound. The binder shall be free from all foreign objects or ingredients that would cause bleeding, staining, or discoloration. The binder shall be 18 percent minimum by weight of the thermoplastic compound. The binder shall be characterized by an IR Spectra. Future Shipments of binder will be checked by an IR Spectra to verify that the binder has not been changed.

##### 2. Pigment

The pigment used for the white thermoplastic compound shall be a high-grade pure (minimum 93 percent) titanium dioxide (TiO<sub>2</sub>). The white pigment content shall not be less than ten percent by weight and shall be uniformly distributed throughout the thermoplastic compound. The pigments used for the yellow thermoplastic compound shall be nontoxic, heat resistant, and colour-fast yellows, gold, and oranges, which shall produce a compound meeting the requirements of the current Federal Highway Colour Tolerance Chart, PR Colour No. 1. The medium chrome yellow pigment content shall be not less than four percent by weight and shall be uniformly distributed throughout the thermoplastic compound.

##### 3. Filler

The filler shall be a maximum of 42 percent by weight of the thermoplastic compound. The filler to be incorporated with the resins as a binder shall be a white calcium carbonate, silica, or an approved substitute. Any filler which is insoluble in 6N hydrochloric acid shall be of such particle size as to pass a No. 100 (150 µm) sieve.

4. Glass Beads

The glass beads used for reflectorizing pavement marking lines shall be uncoated and is intended for use as drop-on beads with solvent-based pavement marking paints and as intermix beads with thermoplastic pavement marking materials. The glass beads shall be 30 to 40 percent by weight of the thermoplastic compound.

B. Properties

The glass beads furnished under this specification shall consist essentially of transparent, water-white glass particles of a spherical shape. They shall be manufactured from a glass of a composition designed to be highly resistant to traffic wear and to the effects of weathering. The glass beads shall be according to the following.

1. Sieve Analysis

The glass beads shall meet the following sieve requirements.

ASTM U.S. Standard Sieve No.	Sieve Sizes	Total Percent By Weight (Mass) Passing
20	850 µm	100
30	600 µm	75 – 100
50	300 µm	15 – 40
100	150 µm	0 – 5
200	75 µm	0 - 1

2. Imperfections

The surface of the glass beads shall be free of pits and scratches. The glass beads shall be spherical in shape and shall contain no more than 20 percent by weight of irregular shapes when tested by the standard method using a vibrating inclined glass plate as adopted by the Department.

3. Index of Refraction

The index of refraction of the glass beads shall not be less than 1.50 when tested by the immersion method at 77°F (25°C).

4. Silica Content

The glass beads shall contain not less than 70 percent silica (SiO<sub>2</sub>).

5. Chemical Stability

Glass beads which show tendency toward decomposition, including surface etching, when exposed to paint or thermoplastic constituents shall be rejected. The glass beads shall be tested according to Federal Specification TT-B-1325D, Section 4.3.9 (water resistance) and evaluated for compliance with Section 3.2.9, with the following exceptions. The size of sample to be tested shall be 25 grams and the reflux time shall be five hours.

#### 6. Flowing Properties

The glass beads shall flow uniformly through dispensing equipment in atmospheric humidity up to 94 percent.

- a) The beads shall be free of silicones, waxes, oils, or other coatings and pass the following test.

One hundred grams of glass beads, spread evenly and thinly in a suitable container, shall be conditioned at 77 °F (25 °C) for four hours over a solution of sulphuric acid (Sp. Gr. 1.10) in a closed desecrator. After four hours, the glass beads shall flow readily through a clean glass analytical funnel, 60 degree, 3 in. (75 mm) diameter and 6 in. (150 mm) stem. Inside diameter of the stem shall be a nominal 1/4 in. (6.33 mm).

- b) Packaging

The glass beads shall be packaged in approved moisture proof bags consisting of at least five ply paper constructions unless otherwise specified. Each bag shall contain 50 lb (22.7 kg) net, and shall be legibly marked with the manufacturer, DOT specification and type, lot number, and the month and year the glass beads were packaged. The letters and numbers used in the stencils shall be a minimum of 1/2 in. (12.7 mm) in height.

#### C. Thermoplastic Compound.

##### 1. Characteristic Requirements.

- a) In the plastic state, the material shall not give off fumes that are toxic or otherwise injurious to persons or property. The manufacturer shall provide material safety data sheets for the product.
- b) The temperature versus viscosity characteristic of the plastic material shall remain constant and the material shall not deteriorate in any manner during reheating processes.
- c) There shall be no obvious change in colour of the material as a result of repeated heating or from batch to batch. The maximum elapsed time after application after which normal traffic will leave no impression or imprint on the new stripe shall be two minutes at 50 °F (10 °C) or five minutes at 90 °F (32 °C) pavement temperature. After application and proper drying, the material shall show no appreciable deformation or discoloration, shall remain free from tack, and shall not lift from the pavement under normal traffic conditions within a road temperature range of -20 to 150 °F (-29 to 66 °C). The stripe shall maintain its original colour, dimensions and placement. Cold ductility of the material shall be such as to permit normal dimensional distortion as a result of traffic impact within the temperature range specified.

- d) The material shall provide a stripe that has a uniform colour and thickness throughout its cross section and has the density and character to provide a sharp edge of the line.
- e) Daylight Reflectance and Colour. The thermoplastic compound after heating for four hours  $\pm$  five minutes at  $425 \pm 3$  °F ( $218.3 \pm 2$  °C) and cooled at 77 °F (25 °C) shall meet the following requirements for daylight reflectance and colour, when tested, using a colour spectrophotometer with 45 degree circumferential/zero degree geometry, illuminate C, and two degree observer angle. The colour instrument shall measure the visible spectrum from 380 to 720 nm with a wavelength measurement interval and spectral band pass of 10 nm.
- White: Daylight Reflectance- 75 percent min.  
Yellow: Daylight Reflectance- 45 percent min.  
Shall match Federal Highway Colour Tolerance Chart, PR Colour No. 1
- f) Specific Gravity. After heating the thermoplastic for four hours  $\pm$  five minutes at  $425 \pm 3$  °F ( $218.3 \pm 2$  °C), the specific gravity of the thermoplastic material shall be from 1.8 to 2.4 when determined according to ASTM D153-84(2020), Method A, using kerosene as the immersion liquid.
- g) Water Absorption of Plastics. The material shall have not more than 0.5 percent by weight of retained water when tested by (2018), “Water Absorption of Plastics,” Procedure (a).
- h) Softening Point. After heating the thermoplastic material for four hours  $\pm$  five minutes at  $425 \pm 3$  °F ( $218.3 \pm 2$  °C) and testing in accordance with ASTM E28-18, the material shall have a softening point between 200 to 240 °F (93.3 to 115.6 °C) as measured by the ring and ball method.
- i) Tensile Bond Strength. After heating the thermoplastic material for four hours  $\pm$  five minutes at  $425 \pm 3$  °F ( $218.3 \pm 2$  °C), the tensile bond strength shall exceed 180psi when tested in accordance with ASTM D4806-20. The material shall be applied to an unprimed, sandblasted Portland cement concrete block at a thickness of 0.0625-inch and at a temperature of  $375 \pm 3$  °F. The test shall be conducted at room temperature.
- j) Impact Resistance After heating the marking compound for 4 hours  $\pm$  5 minutes at  $218 \pm 2$  °C ( $425 \pm 3$  °F) the impact resistance shall be a minimum of 50-inch pounds minimum when tested in accordance with ASTM D2794-93(2019). No cracks or bond loss shall occur when a 0.0625-inch thick film drawdown is made at  $375 \pm 3$  °F on an unprimed sandblasted Portland cement concrete block. The sample is tested with a male indenter 5/8-inch and no female die, at room temperature.

Identification of each package of material shall be stenciled with the manufacturer's name, the type of material and specification number, the month and year the material was packaged and lot number. The letters and numbers used in the stencils shall be a minimum of 1/2-inch in height

- k) Packaging. The thermoplastic material shall be packaged in suitable containers which will not adhere to the product during shipment and storage. The container of thermoplastic material shall weigh approximately 50 lb. (22.7 kg), and shall be delivered on pallets, 40 containers per pallet. The lot size shall be approximately 44,000 lb. (20,000 kg) unless the total order is less than that amount.

Each container of material shall be stenciled with the manufacturer's name, the type of material (alkyd or hydrocarbon), and colour of material (white or yellow).

- l) Storage Life. The material shall maintain a granular free-flow condition in dry storage for a minimum of one year, providing the temperature does not exceed 104 °F (40 °C). The thermoplastic must also melt uniformly with no evidence of skins or un-melted particles and meet all requirements of this specification for one year after delivery. Any material not meeting the above requirements shall be disposed of by the contractor and immediately replaced with acceptable material entirely at his expense, including handling and transportation charges.

## EQUIPMENT

The Contractor shall use a type and design of applicator that produce the required uniformity of application of the markings - both in terms of coating thickness and alignment. All equipment shall be specifically designed for the intended purpose.

The travelling unit shall be capable of moving at a uniform, pre-determined rate of speed, in order to produce a uniform coating.

The equipment shall be either a Thermoplastic Truck-Mounted unit or a Thermoplastic Hand-Operated unit.

Misalignment, defective surfaces, etc. shall be corrected by sand blasting or by any other type of mechanical device that in the opinion of the Employer's Representative, will effectively remove the deficient paint without damage to the pavement surface.

## DETAILS

Markings on roads other than freeways may be placed with either truck-mounted or hand-operated equipment.

Before applying the pavement marking material, the pavement shall be clean, dry, and free of debris or any other material that would reduce the adhesion of the markings on the pavement.

Pavement marking words and symbols shall conform closely to the dimensions and spacing specified in the MUTCD and the plans. Deviations from the required dimensions and spacing or other departures from reasonable standards of professionalism will be cause for rejection by the Project Manager.

### **1 Thermoplastic**

Prior to applying the thermoplastic pavement markings, any existing pavement markings shall be removed. The area removed shall be no wider than the width of the existing pavement markings.

The Contractor shall notify the Project Manager 72 hours prior to the placement of the thermoplastic markings. At the time of this notification, the Contractor shall indicate the manufacturer and lot numbers of thermoplastic and glass beads he/she intends to use.

The compound shall be installed in a molten state at a minimum temperature of 400 °F (205 °C) and maximum temperature of 475 °F (245 °C). Scorching or discoloration of material will be cause for rejection by the Project Manager. The machinery shall be constructed so all mixing and conveying parts, up to and including the shaping-die, maintains the material in a molten state.

The binder sealer material shall be applied as recommended by the manufacturer of the thermoplastic and in sufficient quantities to entirely cover the surface on which the thermoplastic is to be laid.

The thermoplastic material shall be applied at a thickness of not less than 100 mils (2.50 mm) but no greater than 110 mils (2.75 mm). Finished lines shall be within 1/4 in. (6 mm) of the width specified in the plans.

Thermoplastic markings shall be placed with drop on glass beads uniformly applied to assure adequate night time reflectivity. It shall be the Contractor's responsibility to use a compatible combination of thermoplastic material and beads to preclude the surface beads from sinking deeply into the thermoplastic.

The thickness of the markings will be measured above the pavement surface at random points as selected by the Project Manager, to determine conformance.

- a) If the measurements show less than 100 mils (2.50 mm), the Project Manager will "chip" the edges of the markings at random points and measure the thickness of the chips to determine if the overall thickness of the markings is at least 100 mils (2.50 mm). When either the overall thickness or the thickness above the pavement surface is substantially in conformance with the thickness requirements, payment will be made at 100 percent of the contract unit prices involved.
- b) (b) If the thickness at a given location is less than 100 mils (2.50 mm), additional measurements will be taken on each side of the location by the Project Manager to determine the extent of the deficient portion of the marking. If the average thickness of the deficient portion is less than 100 mils (2.50 mm) but more than 60 mils (1.50 mm), an adjusted unit price of 50 percent of the contract unit price involved will be used in computing payment for the area which is deficient.
- c) If the measurements show the average thickness to be less than 60 mils (1.50 mm), the Contractor shall remove the surface of the deficient portions of the markings sufficiently to reduce the average thickness to approximately 50 mils (1.25 mm)

or less. The Contractor shall then apply additional thermoplastic material and beads to bring the thickness of the markings to at least 100 mils (2.50 mm) and the reflectivity to the minimum required values.

### ***Alignment***

Tack points shall be established at appropriate intervals for use in aligning the markings. If it is found to be necessary in order to achieve the required accuracy, a string line will be set from such points.

On tangents and on curves up to 1 deg. the alignment of the marking shall not deviate from the string line by more than 25mm. On curves exceeding 1 deg. the maximum permissible deviation will be 50 mm. In addition, the outer edge of the lane edge markings shall fall uniformly at not <2mm nor >100 mm from the edge of the shoulder shall have no noticeable breaks or deviations in alignment or width.

### ***Dimensions***

No marking shall be less than the specified width nor exceed the specified width by more than 12.5 mm. The length of the painted segments for broken lines and the gap between segments may each vary by plus or minus 250 mm except that over-tolerance and under-tolerance lengths shall approximately compensate.

### ***Correction Rates***

Any corrections of variations in the width or in the alignment of the markings shall not be made abruptly. If a correction becomes necessary, the markings shall be returned to the design width over a length of at least 3m for each 12mm of width correction needed.

If re-alignment is required, it shall be accomplished by a shift back to the string line position at a rate of at least 7m for each 25 mm of correction. Beyond these tolerances, the markings shall be reapplied.

### ***Time of Application***

Marking shall be done only during daylight hours and as far as practicable, shall be terminated in time to permit sufficient drying by sunset.

### ***Weather Limitations***

No markings shall be applied when any moisture is present on the surface to be marked, nor when winds are sufficient to cause spray dust.

### ***Preparation of Surfaces***

The surface to be marked shall be cleaned by compressed air or other effective means, immediately prior to the start of the application process and shall be clean and dry.

Any vegetation or loose soil shall be removed from the pavement before marking operations are begun.

## PROTECTION

### *1 New Markings*

Newly applied markings including edge markings shall be protected until the product is sufficiently dry to permit vehicles to cross it without damage from the tyres. When necessary, a pilot car shall be used to protect the painting operations from traffic interference.

### *Warning Signs*

Warning signs shall be set up before the beginning of each operation and extra signs shall be kept ahead of the painting equipment. Warning signs shall be placed only when operations are in progress and shall be relocated as often as is necessary.

The Contractor shall erect adequate warning signs, provide a sufficient number of flagmen, and take all necessary precautions for the protection of the wet application and the safety of the public. Cones, rubber "Z" guards or similar protective devices shall be placed along the new marking to prevent traffic from crossing. Any such devices used shall be of a type that will not cause damage to vehicular traffic in the event that these objects are accidentally passed over.

All protective devices shall be removed not later than sunset to allow free movement of traffic at night.

### *Number of Traffic Lanes*

The Contractor may be allowed, subject to the Employer's Representative approval, to restrict traffic to one-way operation for short periods of time provided that adequate means of traffic control are affected and traffic is not unreasonably delayed.

### *Crossings and Intersections*

Adequate accommodations for intersecting and crossing traffic shall be provided and maintained and, except where specific permission is given, no road or street crossing the project shall be blocked or unduly restricted.

### *Repair of Damaged Areas*

Any section of the markings damaged by passing traffic or from any other cause shall be repainted at the Contractor's expense.

### *Corrective Measures*

All painted markings which fail to meet the specifications, including the permissible tolerances and the appearance requirements, or are marred or damaged by traffic or from other causes, shall be corrected at the Contractor's expense. All drip and spattered paint shall be removed to the satisfaction of the Employer's Representative. Whenever it is necessary to remove paint it shall be done by means, as approved by the Employer's Representative, which will not damage the underlying surface of the pavement. When necessary to correct a deviation which exceeds the permissible tolerance in alignment, that portion of the marking affected shall be removed and repainted in accordance with these Specifications.

### ***Acceptance of the Work***

When the work under this Section has been completed to the satisfaction of the Employer's Representative, including any corrections or repairs ordered, preliminary acceptance of the work will be made.

### ***Maintenance.***

All works under the Contract are to be the subject of a routine maintenance protocol. This will be in force until the completion of the defects liability period.

## **RESPONSIBILITY FOR NOTIFICATION**

The Employer's Representative shall be notified at least 14 days in advance of the application of markings. At the time of notification, the Contractor shall confirm the name of the supplier and the Lot numbers of products to be applied.

## **APPLICATION**

### ***1 Standards***

The Federal Highway Administration's Manual on Uniform Traffic Control Devices (MUTCD) is the adopted design standard for signs and markings.

It sets forth the basic principles and prescribes minimum standards to be followed in the design, application, installation, maintenance of all traffic control devices and all warning devices and barrier which are necessary to protect the public and workers from hazards within the project limits. The standards established in the aforementioned manual constitute the minimum requirements for normal conditions, and additional traffic control devices, warning devices, barrier or other safety devices will be required where unusual, complex or particularly hazardous conditions exist.

### ***Types and Locations***

Line markings shall be placed in accordance with the Drawings and the following general requirements:

Yellow markings on two-lane or four lane, two-way roadways shall be one of the following:

1. Two-direction passing zone markings consisting of a normal broken yellow line where crossing the centerline markings for passing with care is permitted for traffic traveling in either direction;
2. One-direction no-passing zone markings consisting of a normal broken yellow line and a normal solid yellow line 100mm apart where crossing the centerline markings for passing with care is permitted for the traffic traveling adjacent to the broken line, but is prohibited for traffic traveling adjacent to the solid line;
3. Two-direction no-passing zone markings consisting of two normal solid yellow lines 100mm apart where crossing the centerline markings for passing is prohibited for traffic traveling in either direction.

4. The centerline markings on undivided two-way roadways with four or more traffic lanes always available shall be the two-direction no-passing zone markings consisting of two normal solid yellow lines.
5. Centerline markings shall be placed on all paved urban or rural roads with widths of 5.5 m or greater. Project Managering judgment should be used in determining whether to place centerline markings on traveled ways that are less than 4.9 m (16 ft) wide because of the potential for traffic encroaching on the pavement edges, traffic being affected by parked vehicles, and traffic encroaching into the opposing traffic lane.
6. Lines shall be 150 mm wide on highways with an ADT greater than 3000 and 100 mm wide on highways with an ADT of less than 3000.
7. Broken lines shall consist of a 3m line and a 9m gap  
Dotted lines used as an extension of a broken line shall consist of a .6m line and a .6m to 1.8m gap

The location of the ends of the passing prohibition zones shall be confirmed in the field by the Employer's Representative.

White markings on two-lane or four lane, two-way roadways shall be one of the following

8. Lane line pavement markings delineating the separation of traffic lanes that have the same direction.
9. Where crossing the lane line markings with care is permitted, the lane line markings shall consist of a normal broken white line.
10. Where crossing the lane line markings is discouraged, the lane line markings shall consist of a normal solid white line.
11. Edge line pavement markings shall delineate the right and left edges of a roadway.
12. Edge line markings shall not be continued through intersections; however, dotted edge line extensions may be placed through intersections.
13. Edge line markings shall be placed on all paved urban or rural roads regardless of their widths
14. Parking lane markings consisting of a solid line
15. Lines shall be 150 mm wide on highways with an ADT greater than 3000 and 100 mm wide on highways with an ADT of less than 3000.
16. Broken lines shall consist of a 3m line and a 9m gap  
Dotted lines hall consist of a .6m line and a .6m to 1.8m gap

Pedestrian Crossings (white):

1. Main Highway (4.0 m wide) – 600 mm width, lines 600 mm apart.
2. Paved side streets (4.0 m wide) – 600 mm width, lines 600 mm apart.

Stop Lines (white):

1. On Main Highway – 600 mm width
2. On all paved side roads / streets – 400 mm width

**MEASUREMENT AND PAYMENT**

Measurement of the work of Road Markings shall include the cost of all materials, plant and labor, based on the requirements of the Drawings. Payment for Road Markings shall be measured and paid for by the meter for solid lines and for dashes in dashed lines. For pedestrian cross walk markings, arrows, stop lines, cycle lane markings, school markings etc. Payment will be by the unit.

Payment for the work specified in this section of the Specification shall be made under the relevant items in the Bill of Quantities measured under the items quoted under Division 7 Road Furniture, Section 07020: Road Markings and using the units of measurement specified. Note Section 1-4 Details, Sub section thermoplastic, Para (b) for deductions.

This includes Item 070201: Centre line (yellow) solid single 150 mm line; Item 070202 (yellow) solid single 100 mm line; Item 070203: (yellow) solid single 100mm – cycle lane; Item 070204: (yellow) solid double x 150 mm lines (100mm apart); Item 070205: (yellow) solid double x 100 mm lines (100 mm apart) ; Item 070206: Broken single (Yellow 3m dash - 9m gap) 150 mm line; Item 070207: Broken single (Yellow 3m dash - 9m gap) 100mm line; Item 070208: Solid single 150 mm line and single broken 150mm line (100mm apart): Item 070209: Solid single 100 mm line and single broken 100mm line (100mm apart): Item 070210: Lane Edge (white) solid single, 150 mm line; Item 070211: Lane Edge (white) solid single, 100 mm line; Item 070212: Broken lane edge line white (1m dash - 1m gap) single 150mm line; Item 070213: Broken center line white (3m dash – 9m gap) single 150 mm line; Item 070214: Stop line; Item 070215 Pedestrian Cross Walk; Item 070216 Arrow; Item 070217: Chevron Marking; Item 070218: Cycle Lane Marking; Item 070219: Cycle; Item 070220: School, Item 070221: Only and Item 070222: Stop.

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## ***SECTION 07030 – RAISED PAVEMENT MARKERS***

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## 1-1 DESCRIPTION

This Section covers the supply and placement of raised Retro-Reflective Pavement Markers (RPM) to the finished pavement surface in centre line and lane edge locations as shown on the Drawings. This is intended to provide positive guidance under night conditions to supplement other horizontal and other signage to be installed.

### MATERIALS

#### *1 General*

Read all health hazards, precautionary, and first aid statements found in the Material Safety Data Sheet (MSDS) and/or product label of chemicals prior to handling or use.

Also refer to the MSDS for information about volatile organic compound (VOC) content of chemical products. Consult local regulations and authorities for possible restrictions on product VOC content and/or VOC emission.

#### *Adhesives*

Adhesives may be of the bitumen, epoxy or fast-setting epoxy types depending upon the recommendations of the Manufactures.

Use only approved RPM materials and bituminous adhesives in accordance with the recommendations of the Manufacturer. An appropriate data sheet (“shop drawing”) shall be obtained from the Manufacturer and submitted to the Employer’s Representative at least 14 days in advance of order placement.

The Employer’s Representative will take random samples of the RPM shipment in accordance with standard procedures.

#### *Type*

Type A, Class “B” markers shall be used unless otherwise shown on the Drawings.

### INSTALLATION

#### *1 Notification*

Notify the Employer’s Representative prior to the placement of RPMs. At the time of notification, indicate the manufacturer and the Lot numbers of the RPM batch and the bituminous adhesive that is intended for use. Verify that the approved Lot numbers appear on the material packages and provide a test report to the Employer’s Representative certifying that the materials meet all the specified requirements.

#### *Equipment*

Use equipment having either thermostatically controlled double boiler type units utilizing heat transfer oil or thermostatically controlled electric heating pots to install hot applied bituminous adhesive.

Apply RPMs to the bonding surface using bituminous adhesives only. Demonstrate effectiveness and durability of the bonding system to the satisfaction of the Employer’s

Representative before starting installation. Correct RPMs not applied in accordance with these requirements at no extra cost.

### ***Surface Preparation***

Prior to application of adhesive, clean the portion of the bonding surface, of all material which would adversely affect the adherence of the RPM.

Apply the adhesive to the bonding surface (not the marker) so that 100% of the bonding area of the marker will be covered, in accordance with adhesive Manufacturer's recommendations. Apply sufficient adhesive to ensure that when the marker is pressed downward into the adhesive, adhesive will be forced out around the entire perimeter of the marker.

Immediately remove excess adhesive from the bonding surface and exposed surfaces of the RPMs. Soft rags moistened with mineral spirits or kerosene may be used to remove adhesive from exposed faces of the RPMs. Do not use any other solvent. If any adhesive, pavement marking material or other foreign matter adheres to the reflective face of the marker, replace the marker at no extra cost.

### ***Installation***

Place RPM's in accordance with the following general specifications:

1. Do not apply markers on longitudinal or transverse seams or joints in the pavement.
2. Do not apply markers on existing pavement markings such as paint, thermoplastic, or preformed tapes.
3. Do not apply markers during rainfall or immediately after rainfall. Follow the adhesive manufacturer's instructions.
4. Do not allow traffic to cross over markers immediately after insulation. Provide adequate protection until adhesive is sufficiently set to prevent tracking or movement of the markers. Refer to the adhesive manufacturer's instructions.
5. Do not use epoxy adhesives that contain solvents as they will tend to dissolve bituminous road surface.
6. Follow the recommendations of the adhesive manufacturer for application temperature and ambient weather requirements.

### ***Locations***

RPM's shall be placed in accordance with the Drawings and the following general requirements:

#### Centreline locations (yellow markers) at:

1. 24 m spacing where 3m line and 9m gap broken centre lines occur.
2. 12 m spacing where solid centre lines occur.
3. 9 m spacing where twin solid lines occur in sharp curves.
4. 6m spacing in school crossing zones;
5. None when ADT is less than 3000

Lane Edge locations (white markers) at:

1. 24 m spacing except;
2. 12 m spacing through sharp curves (outside edge only);
3. None across major intersection throats.

***Acceptance***

Ensure that all final RPMs are in place prior to opening the road to traffic.

If more than 2% of the RPMs fail in adhesion or alignment within the first 45 days under traffic, replace all failed markers at no extra expense. If more than 5% of the markers fail in adhesion and or alignment during the initial 45 day period, the Employer's Representative will extend the replacement period for an additional 45 days from the date that all replacement markers have been installed. If, at the end of the additional 45 day period, more than 2% of all markers (initial installation and 45 day replacements combined) fail in adhesion or alignment, replace all failed markers at no extra charge.

**MEASUREMENT AND PAYMENT**

Measurement of the work of Installing Raised Pavement Markers shall include the cost of the markers, providing epoxy, positioning the markers, drilling holes in the pavement if necessary, providing all labor, tools accessories etc. based on the requirements of the Drawings. Payment for Installing Reference Markers shall be measured and paid for by the unit installed.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities measured under the items quoted under the relevant items in the Bill of Quantities Bill 5, Road Furniture, Section 07030 Raised Pavement Markers, Item 070301 White or yellow on center line; Item 070302 Yellow on edge line;

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## **SECTION 07040 – TRAFFIC SIGNALS**

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**1-1 DESCRIPTION**

Traffic Signals works shall consist of the supply, configuration, testing and installation of traffic signals controllers, UPS, signal heads, detector units, cabling and all associated equipment as shown on the traffic signals junction drawings.

The locations of signal equipment shown on the plans are approximate and the exact locations shall be established by the Project Manager in the field.

All systems shall be complete and in operational condition, and tested to the satisfaction of the Project Manager as stipulated in the contract prior to acceptance.

**REGULATIONS AND CODE**

All electrical equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA), the Underwriters' Laboratories Inc. (UL), the Electrical Testing Laboratories (ETL), the National Electrical Testing Association Inc. (NETA), or the Electrical Industries Association (EIA), where applicable. In addition to the provisions of the plans, these specifications and the special provisions, all materials and workmanship shall conform to the requirements in the National Electrical Code, hereinafter referred to as the NEC; and any local ordinances which may apply.

Wherever reference is made to any standard, the reference shall be specified and be the order of standard that is in effect on the day the Notice to Contractors for the work is dated.

**MAINTAINING EXISTING AND TEMPORARY ELECTRICAL SYSTEMS**

New signal equipment shall be fully installed and operational prior to the shut-down and removal of existing equipment. Any complete signal shut-down operations shall be limited to the hours as directed by the Project Manager's representative.

**FOUNDATIONS**

Concrete foundations for traffic signal posts and cabinets shall be in accordance with the manufacturer's specification and shall be approved by the Project Manager before commencement of works.

Portland cement concrete shall conform to Section 08020 "Concrete for Structures and other Uses" Class 30 (A).

Concrete foundations shall rest on firm ground.

Except when located on structures, foundations for posts, standards and pedestals shall be placed "in the solid" and monolithic except for the top 50mm, which shall be placed after the post or pedestal is in proper position.

Forms shall be true to line and grade. Tops of foundations for posts shall be finished to curb or sidewalk grade or as directed by the Project Manager. Conduit ends and anchor bolts shall be placed in proper position and to proper height, and shall be held in place by means of a template until the concrete sets.

Anchor bars, studs and nuts and headed anchor bolts for foundations shall conform to ASTM Designation: ASTM A615/A615M-20

### **STEEL PEDESTALS AND POSTS**

All poles and mast arms shall be of steel construction.

Hand holes for signal mast arms shall be located 90° anti-clockwise from the outreach.

Where poles are supplied with hand holes, these shall be placed on the downstream side of the pole in relation to traffic, or as shown on the plans.

All poles shall be mounted vertically and shall have adequate stability before signal heads are fitted to them. All signal heads and integral regulatory signs shall have a minimum vertical clearance of 2.3m from the footway surface. The controller shall be located to allow normal maintenance to take place without encroachment on to the carriageway by equipment or personnel and without causing undue obstruction to pedestrians.

All items of street furniture shall be treated with an appropriate protective finish which shall be intact at the time of delivery and completion of the works. Great care shall be taken to ensure that damage does not occur to the street furniture during the execution of the works.

Grounding and bonding shall be provided for all signal poles situated adjacent to pedestrian guard railing or other metal items.

### **CONDUIT**

All conduits shall be Schedule 80 polyvinyl chloride conduit unless otherwise specified. End bells shall be installed on all PVC conduits ends. Ground bushings shall be installed for all metallic conduits.

Contractor shall not use 90-degree elbows. Only large radius 45-degree elbows shall be allowed.

Interconnected cable conduit terminations into pull boxes shall be gradually swept to the elevation where conduit enters through the side of a pull box. These conduit sweeps shall have a minimum 3-foot radius at 45-degrees.

All conduits shall have a pull tape and a bare #8 AWG (minimum) copper wire for grounding and tracing conduits.

All conduits placed in utility joint trenches shall be inspected and approved by the Government Chief Electrical Inspector prior to backfilling. The Contractor shall coordinate all such inspections with the Government Chief Electrical Inspector.

All conduits shall be sealed with Duct-Seal after wires are installed to prevent moisture and vermin from entering the conduits.

Conduits shall be installed either parallel to or perpendicular to the curb, unless otherwise approved by the Project Manager prior to placement. Conduit at an oblique angle to the curb will not be permitted.

Pull boxes shall be located behind the curb or at locations shown on the plans.

At locations where conduit is required to be installed under the existing roadway pavement, conduit shall be installed by the “Trenching in Pavement Method” or the “Directional Boring Method”, as determined by the Contractor and approved by the Project Manager.

### **PULL BOXES**

The identification “TRAFFIC SIGNAL” shall be engraved, welded or cast on the top face of all covers for pull boxes containing traffic signal circuits.

Pull boxes shall be No. 5 or larger unless otherwise indicated on the plans. Pull boxes for signal interconnect shall be No. 6 or larger unless otherwise indicated on the plans.

Excess conduit for all conduit ends shall be cut back to provide stub ends of 1-inch minimum to 2-inch maximum.

Bottom of pull boxes shall be grouted over a clean crushed rock sump (450 mm minimum). All pull boxes shall have a 2-inch drain hole in the centre bottom and grouted with smooth surfaces sloped toward the drain hole.

### **CONDUCTORS AND WIRING**

Wire sizes, other than conductors used in loop detection lead-in cables shall be based on American Wire Gauge (AWG) standards except that conductor cable diameters shall be not less than 98 percent of the specified AWG diameter. Conductor cable used in detector lead-in shall conform to the requirements in ASTM B286- 07(2017)

Splices in the cable run shall only be permitted with the agreement of the Project Manager. Cable splices shall be insulated by “Method B” or, at the Contractor’s option; splices of conductors shall be insulated with heat-shrink tubing of the appropriate size after thoroughly painting the spliced conductors with an electrical insulating coating.

Identification stripe color shall be permanently impregnated on the conductor insulating jacket.

No. 10 or smaller traffic signal conductors shall be solid copper with either:

1. Type USE insulation with a minimum thickness of 1 mm (40 mils), or
2. Type THW insulation with a minimum thickness of 1 mm (40 mils).

#### ***1 Signal Interconnect Cable***

Signal interconnect cable shall contain a minimum of 12-pair 12 AWG stranded copper wire unless otherwise noted on the plans.

There shall be a minimum of 3 spare conductors provided in all conduits, over and above the number of conductors sufficient to perform the functional operation of the signals.

### ***Identification Labelling***

Identification shall be by T&B Ty-Rap Cable Ties No.TY553Morsimilar.The identification shall be fastened to the conductors / cables in such a manner that they will not move along the conductors / cables. The flags on the Ty-Rap shall be marked with a permanent marking pen (Black), or approved equal. All phase conductors shall be labelled by phase designation in the pull boxes nearest their termination, and in the controller cabinet. Detector cables shall be labelled by channel designation in the pull boxes nearest their termination, and in the controller cabinet. Detector cables shall be also labelled by phase designation in the controller cabinet nearest their termination at the detector amplifiers.

### **BONDING AND GROUNDING**

All metallic electrical equipment including, but not limited to, poles, metal conduit, service pedestals, controller cabinets, anchor bolts, foundation reinforcement, and metallic cable sheaths shall be tied to ground electrical potential and shall be interconnected by means of copper conductors and clamps to form a single, grounded and electrically bonded system. Grounding of the electrical system shall be accomplished by means of approved 16mm x 2.5M copper-clad steel or 19mm x 2.5M galvanized steel ground rods installed in all cabinet foundations and in all pull boxes that contain conduits with equipment ground conductors as shown on the project plans. Ground rods shall extend above the finished cabinet foundation or grouted pull box bottom sufficiently to attach a ground clamp and #8 AWG bare copper equipment ground conductor.

### **SERVICE**

Continuous welding of exterior seams in service equipment enclosures is not required.

Type III service equipment enclosures shall be the aluminum type.

Each service shall be provided with 1 main circuit breaker which shall disconnect ungrounded service entrance conductors. The “Main” circuit breaker shall have a maximum interrupting rating of RMS 10,000 Amps at 120/240 V AC 60 Hz: HARC Type 40 degree C.

The Contractor shall make all arrangements for, and shall pay all fees required for inspection and connection of service by the serving utility. Full compensation for arranging for and paying for connection of electrical service by the serving utility shall be considered as included in the contract price paid for signals, and no additional compensation will be allowed therefore.

### **CONTROLLER ASSEMBLY**

The controller(s) shall be supplied with two copies of the facilities manual/Project Managers handbook and software for each controller type supplied and for any item of ancillary equipment. The documentation shall include a full list of operator commands and their functions and details of the functions of all switches accessible to the traffic signal Project Manager.

The controller assemblies shall be Type 90 controller assemblies and shall conform to the requirements in the NEMA TS Standards for Traffic Control Systems. The controller cabinet foundation shall be a minimum of 300mm above the finished grade.

Cabinet construction, all component equipment, and test shall meet NEMA TS2 specifications or equivalent.

The controller shall be wired and system ready with all necessary connectors, isolators, flash relays, etc. as needed for a complete and functional TS2 cabinet to operate the entire appurtenance as shown on the relevant plan.

#### **NUMBERING ELECTRICAL EQUIPMENT**

The placement of numbers on electrical equipment shall be done by the Contractor in agreement with the Client. The numbers should be embossed on a metal plate and riveted to the electrical equipment.

#### **TRAFFIC SIGNAL FACES AND FITTINGS**

Traffic signal faces shall be of the adjustable type, and shall conform to the requirements in Institute of Traffic Project Managers (ITE) Publication: ST-008B, "Vehicle Traffic Control Signal Heads".

Back plates and visors shall be furnished and installed on all signal faces. Screws shall be placed in all back plate mounting screw holes in vehicle signal heads. Louvers shall not be used unless otherwise specified.

Color of the traffic signal housing doors, visors, and back plates shall be black. Color of signal housing shall be black.

All RED, AMBER and GREEN signal lamps for traffic signal units shall be furnished and installed by the Contractor. All signal faces shall be High Intensity Light Emitting Diode (LED) signal modules.

The LED signal modules shall have prominent and permanent directional marking(s) that have an "up arrow," for correct indexing and orientation within the signal housing. The manufacturer's name, trademark, serial number and other necessary identification shall be permanently marked on the backside of the LED signal modules. A label shall be placed on the LED signal module certifying to this specification. The LED signal module shall be a single, self-contained device, not requiring on-site assembly for installation into the existing traffic signal housing.

#### **PEDESTRIAN SIGNALS**

All lamps for pedestrian signal units shall be furnished and installed by the Contractor. All "WALKING MAN" symbols shall be Green LED signal modules, and all "STANDING MAN" symbols shall be Red LED signal modules.

The pedestrian signal mountings shall have an upper and lower mounting bracket attached to the pedestrian signal housing in the same manner as that on the traffic signal units.

#### **PEDESTRIAN PUSH BUTTONS**

Pedestrian push buttons should be parallel to the crosswalk, within 0.5m of the crosswalk extended, and within 1m of the edge of curb, shoulder, or pavement. The push button box shall be located so that the centre of the push button is 1.0m above the walkway.

The push button shall be raised from or flush with the housing and shall be a minimum of two (2) inches in diameter in the smallest dimension.

The push button housing shall be fitted with an indication that shall be illuminated when a pedestrian demand has been registered, and shall be extinguished as soon as the pedestrian green man is illuminated.

The switching unit shall have a stainless steel, aluminum, or structural plastic operator and shall be mounted within the housing with a stainless steel, non-corrosive, tamperproof fastening device.

#### **ABOVE GROUND VEHICLE DETECTION SYSTEM**

Above ground vehicle detection units shall be used as the normal method of detecting vehicle demands at the traffic signals junction. The method of detection can be Radar, Infra-Red or Video detection.

The vehicle detector units shall be mounted on the traffic signal pole nearest to the stop line and above the traffic signal face.

Only vehicles approaching the signals shall be detected, and vehicles traveling away from the signals shall be ignored. It shall be possible to aim or set the detector so that vehicles beyond a certain distance from the stop line are not detected. Once vehicles enter the detection zone they shall be continuously detected until exiting the detection zone, which will normally be immediately before the stop line.

#### **INDUCTIVE LOOP DETECTORS**

Inductive loop detectors shall be installed instead of above ground detection in circumstances where greater differentiation between vehicles is required.

The minimum dimensions for slot cutting in asphalt road surfaces shall be 10mm wide by sufficient depth to allow 65mm cover of the cables, for the actual loop perimeter and for the cut back to the edge of the carriageway. On concrete road surfaces, the depth specified may be reduced by 30mm.

Where the loop cable turns in the slot at an angle of less than 110°, the apex of the corner shall be crosscut.

All slots shall be dry and free from debris before the loop cable is laid and the slot backfilled with hot poured bitumen.

#### **ELECTRICAL SUPPLY**

The contractor shall be responsible for arranging an electrical supply for the controller.

The power for the traffic signal controller shall be provided via an Uninterruptible Power Supply (UPS) located in a separate cabinet next to the traffic signal controller. The UPS shall be capable of maintaining the operation of the traffic signals for a period of eighteen hours.

### **FUNCTIONAL TESTING**

The contractor shall fully demonstrate the operation of the traffic signals and all associated equipment to the satisfaction of the Project Manager before the signals are switched on.

The controller operation shall be tested against the specific controller timing sheets and a Certificate of Acceptance completed and signed by the Project Manager or his representative.

An Earth Loop Impedance test shall be carried out by the contractor, using appropriate test equipment, at the controller and each traffic signal pole on the site. A Certificate of Signal Installation Electrical Test Results shall be completed prior to the site acceptance.

The contractor shall measure the series resistance and the insulation resistance of each inductive loop detector, and the results shall be provided in a completed Certificate of Inductive Loop Detector Test Results.

### **MEASUREMENT AND PAYMENT**

Payment for the work specified in this section of the Specification shall be at the rates entered in the Bill of Quantities under the various traffic signals items for the provision/installation of traffic signals include all costs of whatsoever nature related to the provision and installation of posts, signals, feeder pillars switching equipment, cables, ducts, foundations etc. and no other payment of any kind will be made for this work.

Measurement of the work of Installing Traffic Signals shall include the cost of the signals providing posts, accessories and concrete foundations based on the requirements of the Drawings. Payment for Installing Traffic Signals shall be measured and paid for under the relevant items of the Bill of Quantities under the items quoted under Division 7 Signs, Markings, Signals and Lighting, Section 07040: Traffic Signals and using the units of measurement specified. This includes Item 070401 Cable ducts-1 No x 100mm diameter; Item 070402 Cable ducts- 2 No x 100mm diameter; Item 070403 Cable Ducts 4No x 100mm Diameter; Item 070404 Duct chamber/Draw pit; Item 070405 Traffic signal controller; Item 070406 Uninterruptible power supply (UPS unit); Item 070407 Traffic signal head (RAG); Item 070408 Pedestrian signal head; Item 070409 Pedestrian demand unit; Item 0704010 Vehicle above ground detector; Item 0704011; Induction loop detector; Item 0704012 Steel traffic signal pole 4m high, planted in concrete foundation not exceeding 0.25 m<sup>3</sup>; Item 0704013 Cantilever overhead signal pole, planted in concrete foundation not exceeding 4m<sup>3</sup>; Item 0704014 Signal Cable; Item 0704015 Installation and Testing; Item 0704016 Cable ducts. 4No x 100mm diameter and Item 0704017 Duct chamber/draw pit.

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## ***SECTION 07050 – STREET LIGHTING (Metal Poles)***

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## 1-1 DESCRIPTION

The Work comprises the supply and installation of lighting poles, transformers, luminaries, electrical distribution system, panel boards and service connections to Guyana Power & Light's (GPL) supply points. Underground works including trenching, ducting, pull boxes, road reinstatement, etc. are also included.

GPL will supply all necessary overhead line extensions, transformers and fuse gear up to their supply points the cost of which shall be included in BOQ Item 0705023 Provision for GPL Input;

### SCOPE OF WORKS

The works shall include the following:

1. Liaison with the utility company (e.g. GPL) and the payment of any capital contributions and service deposits required.
2. Connection of lighting circuits to panel boards and the panel boards to GPL's supply points (i.e. point of interface).
3. Installation of luminaries and brackets on both new and previously used poles.

Also, the supply and installation of:

1. Panel boards
2. Underground and surface ducts with pull ropes
3. Underground cables
4. Trenching, backfilling and reinstatement of paved and non-paved surfaces
5. Light poles with concrete bases and luminaries
6. Grounding
7. Testing and commissioning of the entire electrical system.
8. Payment of all GPL co-ordination, testing and inspection fees.

### GENERAL PROVISIONS

#### *1 Codes and Standards*

Install the Works in compliance with the National Electrical Code (latest edition), Occupational Health and Safety Standards and the requirements of the Electricity and Telephone utility and other Government Agencies' requirements, except where specified otherwise.

***Government Agencies - Permits and Fees***

Submit to Electrical Inspectorate, Factory Inspectorate, etc. all necessary shop drawings and Manufactures' specifications for examination and approval prior to commencement of the Work- and pay all related fees.

***Drawings***

The Contract Drawings shall not be considered to be shop drawings. The Contract Drawings show the location in principle for the various services. The detailed position shall be determined and coordinated by the Contractor and shown on a set of "Shop Drawings".

Existing equipment details or site features that may affect the Works shall be added to the "Shop Drawings".

***Shop Drawings***

The Contractor shall, prior to manufacture and installation, prepare "Shop Drawings" for the electrical work. These shall be marked "For Examination" and presented to the Employer's Representative for approval.

If drawings are returned with no comments, the Contractor shall issue one original and two prints of each drawing to the Employer's Representative for stamping "For Construction". These approved "Shop Drawings" form part of the "Working Drawings".

If drawings are returned with comments, the Contractor shall amend the drawings and re-submit for examination. The procedure for re-submittal shall be the same as for the initial submission. Each re-submitted drawing must be treated as a revision.

Irrespective of whether or not the drawings have been examined by the Employer's Representative, responsibility for errors shall remain with the Contractor and no additional costs whatsoever will be payable as a result of any error.

The Contractor shall correct any discrepancies, errors or omissions in the Shop Drawings and other particulars supplied by him, whether or not such drawings and particulars have been examined by the Employer's Representative.

The following drawings shall form the Shop drawings:

1. Detail or Manufacturer's drawings required prior to, or found necessary during, the manufacture or progress of the works.
2. Details of all fabricated steelwork, brackets, supports and all other items of a similar nature.
3. Plans, sections and elevations showing all required work, including size and position of bases, plinths, holding down bolts, trenches, etc.

***As-Built Drawings***

The Contractor shall keep a spare set of Working Drawings on site in order that all conduit runs, positions of points, etc. can be checked by the Employer's Representative.

The Contractor shall modify these "As-Built" drawings to allow for site tolerances, discrepancies and changes in layout where the principle and intent of the design of the services

are not affected. Where the principle and intent of the design are affected, notice of the conflict shall be given to the Employer's Representative.

The Employer's Representative shall have the right at all reasonable times to inspect the Contractor's drawings for any portion of the works.

The Contractor shall submit marked-up Working Drawings and other information to reflect the progressive, 'as-built' status of the Work at regular intervals, or as required by the Employer's Representative.

The Contractor is responsible for all errors, omissions and deviations on the marked-up drawings intended to show the actual 'as-built' status of the works.

### ***Product Data and Samples***

Where appropriate, Manufacturers' standard catalogue sheets, drawings or other descriptive data may be submitted in lieu of samples.

The above will be accepted if they conform to the following:

1. All inapplicable information is deleted there from.
2. Any additional information needed is attached.

The Contractor's responsibility for errors, omissions and deviations in submissions from the overall requirements of the Contract Documents shall not be relieved by review and/or acceptance by the Employer's Representative's.

Until the Employer's Representative gives written acceptance of specified deviations, work involving relevant products shall not proceed.

### ***Building Work***

Building work is considered normal for that trade is included in this Contract and shall mean:

1. Provision of brackets, rag-bolts or other form of service suspension items.
2. Excavation for bases of poles etc.
3. Formation of concrete bases for poles etc.
4. Construction of pull boxes, cable ducting etc.
5. Excavation and restoration of trenches for all buried services.

Openings in concrete pole bases and pull boxes etc. shall be incorporated into the design and the Contractor shall check that cables, ducts and other services can be installed in the openings provided.

Holes shall not be cut in pre-cast, pre-stressed concrete under any circumstances.

Any holes in steelwork that are approved must be drilled. Burning holes by means of welding equipment shall not be permitted unless by the Employer's Representative's special written approval.

### ***Operating and Maintenance Instructions***

The Contractor shall include for editing, printing, binding and producing 3 copies of an Operation and Maintenance Manual meeting the approval of the Employer's Representative.

Prior to printing, a draft copy shall be submitted for the Project Manager's approval, one month prior to the Contract completion. The Project Manager reserves the right to modify the draft copy prior to printing without incurring additional cost to the tender price.

The Manuals shall be completed in sufficient detail to enable the Employer's Representative (or other Agency's staff) to maintain, dismantle, reassemble and adjust all parts of the works.

Completed Manuals shall be of a standard equal to this Specification with durable binders and properly printed covers. The Manuals shall have a comprehensive index and be compiled in sections for each system of the installation. Payment for the Operating and Maintenance Instructions to be included in Item 0705025 Miscellaneous and Contingencies.

#### ***Certificates from Government Agencies***

Furnish certificates of acceptance from the relevant Government Agencies on completion of Works.

#### ***Environmental Conditions***

Equipment located outdoors shall generally be considered to be located in a tropical area subject to severe weather conditions. In addition, hazardous area or other special conditions will be specified in such cases. Equipment shall be capable of operating in specified conditions without damage.

#### ***Finishes***

Finish all equipment in accordance with the following provisions.

#### ***Equipment Identification***

Identify electrical equipment with nameplates and appropriate labels.

#### ***Wiring Identification***

Identify wiring with permanent identifying markings, either by number or coloured plastic tape on both ends of phase conductors and other circuit wiring. Maintain phase sequence and colour coding throughout.

#### ***Conduit and Cable Identification***

Colour code conduits and metallic sheathed cable according to Specifications.

#### ***Wire Terminations***

These shall be suitable for copper conductors.

#### ***Manufacturer's Labels***

These shall be visible and legible after the equipment is installed.

### **TESTING**

#### ***1 Protection***

Protect exposed live equipment during construction for personnel safety.

Shield and mark all live parts "LIVE 240 VOLTS" or with appropriate voltage, in English.

### ***Inspection and Testing during Manufacture***

Where required, obtain permission for the Employer's Representative to inspect and test on the manufacturer's premises any plant to be supplied under the Contract. In the case of tests on the premises of the Contractor or Sub-Contractor, provide such assistance, apparatus, etc., as may be reasonably demanded to conduct such tests efficiently.

Where applicable, furnish to the Employer's Representative duly certified copies of tests during manufacture.

Such inspections and tests, if made, shall not release the Contractor from any obligation under the Contract.

### ***Defects***

Correct as soon as possible, any defects arising from design, materials or workmanship that may develop at any time up to the expiry of the Defects Liability Period.

If required, search for the cause of any defect or fault under the direction of the Employer's Representative.

### ***Tests on Completion***

Before the Works are taken over by the Employer, the contractor shall conduct and pay for all tests specified including testing of:

1. Grounding systems.
2. Equipment insulation.
3. Polarity.
4. Phase sequence.
5. Protective devices.
6. Lighting
7. Loading

Give to the Employer's Representative in writing 14 calendar days' notice of the date on which tests on completion will commence.

Carry out tests in the presence of the Employer's Representative. Provide instruments, meters, equipment and personnel as may be required to conduct tests during and at the conclusion of the work. Submit test results.

Repeat within a reasonable time, the appropriate tests of any portion of the works which fails to pass the tests and bear all reasonable expenses to which the Employer may be put to for the repetition of the tests.

Carry out the tests in the following sequence:

1. Visual inspection
2. Continuity of branch circuit conductors

3. Continuity of protective (grounding) conductors, including main and supplementary equipotential bonding
4. Earth electrode resistance
5. Insulation resistance:
6. Use 500V megger for equipment up to 350V rating
7. use 1,000V meggerfor equipment of 350-660V rating
8. Insulation of site-built and factory-built assemblies
9. Protection by electrical operation
10. Polarity
11. Earth fault impedance
12. Earth leakage protective devices
13. Phase sequence
14. Prospective short circuit current to terminal and intermediate equipment
15. Load balance.

Submit, upon completion of the work, a report listing all phase and neutral currents on each circuit operating under normal load. State the hour and date on which each load was measured and the voltage at the time of testing.

## **OTHER REQUIREMENTS**

### ***1 Operations and Temporary Services***

Power or service cannot be interrupted without the Employer's Representative's written approval.

Any power interruption necessary for change-over must be reported to the Employer's Representative at least 48 hr. ahead of time.

### ***Warning Signs***

Provide warning signs as specified or to meet requirements of the local authority and Employer's Representative.

### ***Utility Connections***

Obtain connections from the utility Agency (GPL) when all other work has been completed, tested and accepted.

### ***Training of Employer's Staff***

The Contractor shall instruct the Employer's staff in the operation and maintenance of all aspects of the plant. Instruction shall be carried out by qualified personnel.

## **LOW VOLTAGE WIRES AND CABLES**

The scope of work includes the supply and installation of all wires and cables, together with connectors and other accessories necessary to complete the circuitry indicated by the Working Drawings and schedules.

### ***1 Underground and Surface Cables***

1. PVC Wire & Cable (non-armoured) – BS 6004-2012, BS EN 500525-1:2011, BS EN 500525-2-31
2. PVC Wire & Cable (armoured) - BS 6346 – 1989
3. XLPE Cable (non-armoured and armoured) – BS 5467:1997+A3:2008

Cables shall be stranded copper, 70°C, PVC insulated or 90°C, XLPE insulated, 600/1,000 volt grade, with steel wire armour and PVC sheath where specified.

Comment: Does not make sense to me

Multi-core insulated conductors shall be acceptable. Type AC and MC armoured and metal-clad cables are acceptable.

Pole wiring from hand hole to luminary shall be 1 x 4 mm<sup>2</sup> PVC insulated cable (12 AWG).

### ***Aerial Cables***

Insulated triplex conductor with bare messenger

Cables shall be stranded, compressed aluminium, 75°C polyethylene insulated or 90°C vulcanized interlinked polyethylene (VIP), 600 volt grade with bare neutral messenger.

### ***Material Schedule***

Provide wires and cables listed in schedules or shown on the Drawings.

### ***Execution***

Install cables, prepare ends and terminate. Sizes of wires and cables are indicated on the drawings and schedules.

Install armoured cables as indicated on the Drawings or in an approved manner as agreed with the Employer's Representative.

Use an extra conductor core in each circuit for equipment grounding. In the case of armoured cables, the armour shall not be relied upon for equipment grounding. Where an extra core or a grounding conductor is provided, this will also serve as an additional grounding conductor.

Carry out all wiring in the 'loop in' system. No jointing is permitted. All main feeder circuits shall run their entire length in continuous pieces without joints or splices.

Contractor shall make use of approved wiring methods using raceways, wire ways and approved methods of support.

Wiring "clipped to surface" will not be accepted without the approval of the Employer's Representative.

**BASIC DESIGN CRITERIA*****1 General***

Provide and install the entire lighting and electrical system along the road and the supply points for GPL connection including the transformer, the transformer pole and all appurtenances. Do all testing and make the system operational to the satisfaction of the local utility (GPL) as well as the client.

Unless otherwise specified in the plans or the specifications, the light poles and bracket arms shall be in accordance with the requirements of the AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals, and with the specific requirements contained in this Section.

***Design Calculations***

Should the Contractor wish to propose an alternative pole design, he shall submit for approval, design calculations of the light poles (including bracket arms) and anchor bolts if an alternate design is proposed.

***Lighting Fixtures***

Provide lighting fixtures in accordance with Section 07050, Clause 1-14 Light Poles.

***Installation***

Install lighting units in accordance with manufacturer's written instructions to ensure that units fulfil requirements.

Use belt slings or rope (not chain or cable) to raise and set finished poles to protect finishes.

Set pole plumb. Support adequately during anchoring to foundations.

***Field Quality Control***

Test lighting system upon completion of installation.

Correct mal-functioning units; remove and replace with new units where necessary and retest.

At the time of substantial completion, replace lamps which are noticeably dimmed after Contractor's use and testing, as judged by the Employer's Representative.

***Grounding***

Provide effective equipment grounding and bonding to NEC standards.

**INSTALLATION OF CABLES*****1 Products***

Provide PVC ducts of the sizes and quantities as indicated on the drawings and schedules.

***Trenching and Backfilling*****A. General**

Excavate along routes for ducts and cables as shown on the drawings. In locations that are presently surfaced (asphalt or concrete) mark and saw the surfaces to a neat vertical face prior to excavation.

Do not commence backfilling until the area of work to be backfilled has been inspected and approved by the Employer's Representative. Areas to be backfilled shall be free from debris.

Place and compact fill materials in continuous horizontal layers not exceeding 300 mm loose depth. The first layer which shall be 150mm thick shall surround the ducts 75 mm all around and shall consist of white sand with no stone or aggregate greater than 6 mm diameter. This layer shall be tamped and compacted to the satisfaction of the Employer's Representative.

#### B. Verges

In locations outside of roadway or shoulder areas, subsequent layers shall be native backfill with no stone or aggregate greater than 50 mm diameter. These shall be thoroughly tamped and compacted to at least the density of the adjacent undisturbed soils, and to the satisfaction of the Employer's Representative. If necessary, to obtain the desired compaction, the native backfill shall be moistened or aerated as required. Compaction of 95% (ASTM D1557-12) shall be achieved wherever installation is below pavement areas and tested to the Employer's Representative's requirements.

#### C. Surfaced Areas

In locations that are already or will be surfaced (asphalt or concrete) as part of the Works, the subsequent layers shall be compacted base material and the finish either asphalt or concrete as required to match the surrounding area. All surfaces shall be restored to a neat and safe condition. Compaction of 95% (ASTM D1557-12) shall be achieved wherever installation is below pavement areas and tested to the Employer's Representative's requirements.

#### ***Cable Installation in Ducts***

Install cables in ducts indicated but do not pull spliced cables inside ducts. Install multiple cables in duct simultaneously. Use approved lubricants of type compatible with cable jack to reduce pulling tension.

Before pulling cable into ducts and until cables are properly terminated, seal ends of cables with moisture seal tape. After installation of cables, seal duct ends with duct sealing compound.

#### ***Testing***

Perform tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:

1. Circuits are continuous and free from short circuits and grounds;
2. Circuits are free from unspecified grounds;
3. Insulation resistance to ground of circuits is not less than 50 mega ohms.

Provide the Employer’s Representative with a list of test results showing location of which each test was made, circuit-tested and result of each test.

## GROUNDING

### *1 Scope*

The scope of the work includes grounding of the following:

1. Panel boards
2. All non-current carrying equipment enclosures.
3. Lighting poles
4. Luminaries

The extent of the work shall be as indicated on the Drawings.

### *Products*

#### Standards

Unless otherwise indicated, grounding shall conform to NEC 250: 2010. (National Electrical Code)

#### Copper Conductors

Bare (or with a green jacket), stranded, tinned, soft annealed, sized per drawings.

#### Rod Electrodes

Solid copper 19 mm diameter by 3 metres long can be installed within the low coastal plain of Guyana. In other geographic areas different rod electrodes will be specified.

#### Field Welding

Use “Cadweld” joints for all below-ground connections. Obtain Employer’s Representative's approval for other types of joints.

#### Bolted Connectors

Use bolted connectors for grounding connections to equipment provided with lugs.

### *Execution*

Install accessories to manufacturers' instructions. Protect any exposed grounding conductors from damage by enclosing in metallic duct.

#### Inspection

Do not proceed with work until conditions are satisfactory. Do not cover up work until it has been inspected and approved by the Employer's Representative.

#### Testing

Carry out ground resistance test on completion. Where tests show resistance to ground is over 25 ohms take steps to reduce by driving additional electrodes and/or chemical treatment of soil; re-test to check compliance.

### **RACEWAYS**

#### ***1 Type***

Raceways in this section shall be Rigid PVC Conduit.

#### ***Submittals***

Before commencement of work, prepare samples of material to be used for the Employer's Representative's approval.

#### ***Materials***

Provide conduit, tubing and fittings of types, grades and sizes for each service indicated. Where types and grades are not indicated, provide proper selection determined by Contractor to fulfil wiring requirements, and complying with applicable portions of NEC Regulations or other approved code for wire ways.

#### PVC Conduit and Tubing

Provide high-impact, Schedule 40 PVC conduit for all below ground and surface work.

Match with conduit/tubing type material.

#### ***Execution***

Co-ordinate with other work as necessary. Level and square raceway and install at proper elevations. Complete raceway installation before installing corresponding cable/wires.

Wherever possible, install horizontal raceway runs above water piping. Ensure that all raceways are free of obstruction and leave spare pull rope in conduit/tubing for future pulling-in of wires and cables.

In exposed areas, install all raceways embedded in concrete or block work unless physical constraints dictate otherwise.

The Employer's Representative's permission must be obtained for all surface wiring or surface installation of raceways.

### **ELECTRICAL BOXES AND FITTINGS**

#### ***1 Type***

Materials shall be metallic or PVC to suit. Types of material in this section include:

1. outlet boxes
2. junction boxes
3. pull boxes
4. bushings
5. locknuts
6. knockout closures

***Submittals***

Submit samples of all materials for Employer's Representative's approval.

***Materials*****Weatherproof Outlet Boxes**

Provide cast metal or PVC weatherproof boxes. Boxes shall have gasketed covers and corrosion-resistant fasteners.

**Junction and Pull Boxes**

Provide boxes suitable for each location and installation. Equip with stainless steel nuts, bolts, screws and washers or approved equal corrosion resistant material.

**Bushings, Lockouts and Knockout Closures**

Provide corrosion-resistant material of types and sizes to suit each use and installation.

***Execution***

Co-ordinate the installation of boxes and fittings with other work. Provide knockout closures to cap unused knockout holes where blanks have been removed. Install boxes and conduit bodies such as to ensure ready accessibility of electrical wiring.

In exposed areas, install boxes and fittings in such a way that covers finish flush with finished surfaces. The Employer's Representative's permission must be obtained for all surface mounted boxes and fittings.

**PANEL BOARDS*****1 Type***

Operating environment to be considered "tropical" with 34°C average ambient temperature and 95% relative humidity.

***Submittals***

Within 1 month of order being placed submit manufacturers' specifications on all products listed in this Specification.

***Materials***

### Enclosures

Provide galvanized sheet steel cabinet type enclosures, minimum 14 gauge thickness, NEMA (National Electrical Manufacturers Association) Type 4 for protection against windblown dust, rain, splashing water and hose directed water.

Design for surface mounting with ample wiring gutters on top, sides and bottom for all wires and connections. Provide sufficient number of adequately sized knock-outs for termination glands.

Provide enclosures fabricated by same manufacturer as panel boards, and which mate properly with panel boards to be enclosed. Provide “tropicalized”, anti-corrosive treatment and baked grey enamel finish. Equip any cabinet doors with locks.

Provide with interior circuit-directory frame and card with clear plastic covering.

### Panel boards

Construct with solid copper busbars, securely mounted and braced. Provide solderless lugs on the main bars, approved for copper conductors.

Provide a bare un-insulated grounding bar, bolted to enclosure, with suitable lugs for feeders requiring grounding connections.

Provide a moulded case main and branch circuit breaker for each circuit. Provide all circuit breakers from: General Electric, Square D, Siemens or equivalent.

### ***Circuit Breaker***

Provide moulded case circuit breaker, tropicalized for 95% relative humidity at 40°C ambient temperature.

All breakers shall provide overcurrent and short circuit protection.

### ***Execution***

#### Installation

Make good any damage to panel finishes arising during handling and installation. Install panel boards on poles via suitable brackets, and ensure assembly is robust and durable.

Provide panel schedule identifying the circuits associated with each breaker. Submit copy of panel schedule to the Employer’s Representative.

#### Testing

Arrange for testing and acceptance of the panel boards in the manner approved by the relevant Authority. Submit a copy of the Acceptance Certificate to the Employer’s Representative.

## **TRANSFORMERS**

### ***1 Type***

Outdoor, oil filled, 13.8 KV- 120v/240V, 1 phase, 60 Hz transformers.

#### Site Conditions

Tropical Average ambient temperature 34°C and 95% Relative humidity.

#### Manufacturers

Manufacturers shall include, but not be limited to the following:

1. Cutler Hammer
2. General Electric
3. Square D
4. Siemens

#### Standards

Factory tests shall be to the following or approved equal standards:

1. ANSI (American National Standards Institute) C57.12.90-1973
2. CSA C22.2 No. 47-1977
3. BS IEC 60076-8-1997

#### ***Submittals***

Within 1 month of the order being placed, submit 2 copies of the following to the Employer's Representative:

1. Detailed dimensioned drawings of complete transformer.
2. Installation, operation and maintenance instructions.
3. Cross sectional drawings showing core, windings and internal connections.
4. Test certificates for:
  - A. Ratio Test
  - B. Polarity Test
  - C. No load core loss
  - D. Full Load core loss
  - E. Impedance
  - F. Temperature Rise
  - G. Dielectric withstand
  - H. Noise Level in db.

#### Maintenance Materials

Provide a list of one set of spares as recommended by Manufacturer with delivery of the unit.

#### ***Materials***

Materials shall be to the following or equal approved standards:

1. Transformer to: BS IEC 60076-8-1997
2. Oil to: BS 148-2009 or BS En 60296:2012

#### General

Transformer shall be capable of delivering the rated kVA continuously with temperature rises as stipulated in BS IEC 60076-8-1997 under 'ON' conditions.

Transformer shall be capable of sustaining overloads as defined in BS IEC 60076-7:2005 loading guide for oil-immersed power transformers.

#### Ratings

- |                              |   |
|------------------------------|---|
| 1. kVA:                      | As per drawings                           |
| 2. System highest voltage:   | 7,960 volts.                              |
| 3. System grounding:         | HV and LV systems solidly grounded.       |
| 4. Insulation Level:         | 95kVBIL Primary and 30 kV BIL Secondary   |
| 5. Windings:                 | Primary – 12.8 kv 120/240V                |
| 6. Impedance:                | 2.7%                                      |
| 7. Surface temperature rise: | 65°C maximum.                             |
| 8. HV taps:                  | Provide 5 No. 2½% above and below normal. |

#### Neutral and LV Terminals

Provide terminals and lugs suitable for receiving PVC SWA cables as per drawings.

#### HV Terminals

Open bushing HV terminal connections capable of receiving up to 50 sq. mm XLPE cable.

#### Fittings

Provide the following fittings:

1. Nameplate showing kVA, voltage, taps, insulation levels, temperature, impedance, weight and connection diagram.
2. Grounding terminals for grounding of tank and other metal work with removable lug suitable for 95mm<sup>2</sup> copper cable.
3. Pressure relief device.
4. Provide any other accessories which are the Manufacturer's standard for the transformer.

#### ***Execution***

##### Installation

Make good any damage to arising during handling and installation. Install transformers on poles using suitable brackets and ensure assembly is robust and durable.

##### Testing

Carry out routine tests, type tests and supplementary tests as per BS IEC 60076-8-1997. If transformer offered is identical to one previously type tested, submit specified type test certificates related to the transformer design.

### Shipping

All equipment subject to damage during shipping must be suitably protected. No hay, straw, rags, bags or sacks shall be used for packing and all cases must be non-returnable.

## **LIGHT POLES**

### ***1 Material***

Use galvanized Steel light poles. Unless otherwise shown, galvanized steel light poles shall be 1 piece, continuous-tapered, round or octagonal poles and shall be manufactured from one length of steel sheet, formed in continuous tapered tube, with one continuous arc-welded vertical seam. They shall be galvanized in accordance with ASTM A 123/A 123M-17.

### ***Wall Thickness of Steel Poles***

Lighting poles shall be galvanized steel poles. The minimum wall thickness for galvanized steel poles shall not be less than 3 mm.

### ***Length***

The poles shall not be less than 9.0 m in length and sufficiently high to provide the luminary mounting height shown in the plans or directed by the Project Manager.

### ***Bases***

Anchor base poles shall have a wiring hand hole with a weatherproof metal cover near the base, with a grounding lug located inside the pole near the hand hole.

### ***Bracket Arms***

Bracket arms shall be as shown on the drawing, and shall have the luminary end formed to accommodate a 50 mm pipe slip fitter. Bracket arms shall be attached to the poles, with machine bolts and pole adapters, unless approved otherwise. Light poles located in the median will carry double luminaries.

### ***Luminaries, Ballasts, etc.***

#### ***TYPE 1 – LED Lighting Fixtures***

Where 0.75 cd/m<sup>2</sup> or 540 -620 lumien or over is required, it should be 71-97 watts,110-250volts, 50/60hz, luminaire efficiency of up to 100 lm/w, working temperature of -20 to 60°C with a safety protection glass of I or II. A lifetime of no less than 100,000 hrs and a colour temperature of 4000

The design must be a complete electronic control activity of the LED lights with the ability to regulate current from 1-100% v

The product should be approved under acceptable international standards ISO 9001, 14001 OR 50001 and environmentally friendly. It is required to be light weight capable

of adopting short or long arm /bracket at 15° and have capability of adjusting its focus/ light beams to achieve cutting edge light performance

### ***TYPE 2 – Incandescent Lighting Fixtures***

Luminaries shall consist of a precision-cast aluminium housing and reflector holder, a refractor-holder latch on the street side, and a hinge with a safety catch on the house side of the luminary also a slip fitter suitable for attaching to a 50 mm mounting bracket, with a gasket between the reflector and the refractor and the socket entry, an adjustable bracket capable of producing the specified IES type light distributions, and a heat-resistant, high-transmission flat glass refractor meeting IES (Illuminating Project Managering Society) IES RP-8-00(R2005). Luminaries shall have a 250 Watt, 240 volt, 60Hz – Type 3 Cobra head high-pressure sodium vapour lamp, ANSI (American National standards Institute) designation S50VA-250 and a socket receptacle and approved photocell.

Luminary shall be provided with precision die-cast aluminium housing with electro coated grey paint finish, heat resistant glass refractor with charcoal filtered optics and photo-electric receptacle.

Luminaries shall be constructed for protection against harmful dust deposits and water jets to NEMA IP55 standards. The optical component shall be sealed against dust and moisture and must carry a 15 year guarantee.

Provide luminaries with photometric, specifications or model numbers from manufacturers as follows:

General Electric M-400A POWR/DOOR luminaire with reflector 35-451001, Catalogue No. MDCA-25-S-3-A-1-1-F-MC2-2-2, or approved equivalent. (UL approved and ISO standard)

250 Watt CWA type ballast and optical assembly that will provide an ANSI/, IES type II-M-C distribution, for 240 Volt operations as indicated in the plans.

The ballast shall be an auto regulating, constant wattage type. Power factor shall be 90% or better, with regulation within  $\pm 2\%$  variation in lamp watts and a line voltage variation of  $\pm 10\%$ .

The top housing shall contain an integral slip fitter, adjustable for 42 to 60 mm pipe.

### ***Conductors***

The conductors shall be colour-coded and, unless otherwise shown in the plans, the conductors shall be as called for below.

Service conductors shall be stranded copper, single-conductor cable, Type RWU or equivalent for underground installation and shall not be smaller than No. 6 AWG.

Direct-burial cable shall meet the same classification requirements as the service conductors except it shall be approved for direct burial.

Pole and bracket cable shall be a stranded cable, Type RHW or THW, and shall not be smaller than No. 10 AWG.

Bonding ground conductor shall be bare (or have a green jacket) and shall be No. 6 AWG or larger.

### ***Conduit***

### General

Conduit shall, in general, be rigid steel or polyvinyl-chloride as shown on the plans. At all road crossings the P.V.C Conduits shall be embedded in concrete. The concrete encasement shall extend from connecting point one side of the road to the connecting point on the other side or as directed.

### Polyvinyl-Chloride

Polyvinyl-chloride conduit shall be high-impact, Schedule 40, and each 3 m length shall carry the Underwriter's seal of approval.

### Electrical Grounds

The electrical ground rods shall be made of corrosion-resistant clad steel or other material as may be permitted by the plans or approved by the Project Manager.

### Protection of Light Poles

Each metal pole shall be appropriately and adequately protected by "tire wrapping" with heavy paper, or by some other effective means, so that no chipping, gouging, or other significant surface damage will be incurred during transit or installation. The poles, when installed, shall be clean and uniformly free from dark streaks and discoloration.

### Concrete Foundations for Light Poles

The concrete foundations for the light poles shall be of Class 30(A) concrete unless otherwise shown in the plans. The foundation design shall meet the manufacturer recommendations but shall not be inferior to the requirements established by the plans.

## ***Wooden Service Poles***

### General

Wooden service poles shall meet the requirements of The Guyana Grading Rules GR 08 "Round transmission poles" and GPL requirements shall be at least 13 m in length. The poles shall be Select grade unless otherwise specified on the plans or in the specifications or as required by GPL.

### Standards

Poles shall comply with Guyana grading rules for hardwood timber (Ref No GR 08 Round transmission poles). All poles shall be natural round timber poles cut from sound living trees of the species *Eperua falcate* (Wallaba).

All poles shall be completely debarked, sapwood removed and shall not show any sign of heart rot. They shall have uniform taper and be reasonably round and straight. The tip of the pole shall be roofed or pointed, while the butt shall be square to the length.

Each pole shall be free from short or reverse bends so that a straight line from centre of the butt to centre of the tip shall be at no point less than one-tenth of the diameter of the pole from the near side at point of consideration. Each pole shall be generally free of defects which significantly affect the strength such as knots and knot-clusters of width greater than one third of the diameter of the section where they occur, rotten and hollow knots, rotten heart, splits and shakes in tip or butt, insect attack and plugged holes.

### Mounting Height

Mounting height of all equipment and lines shall meet the requirements of the latest edition of the U.S National Safety Code, the local ordinances, and the specifications of the connecting utility.

### ***Testing and Performance Criteria***

The system shall pass the following performance criteria in accordance with NEC 110.2:  
(National Electrical Code)

#### Dielectric Test

No breakdown shall occur with a test potential of 1,960 volts applied between the primary conductors (tied together) and the protective ground for a period of one minute.

#### Leakage Current Test

Leakage current shall be measured on the mated connectors between the primary conductors and the protective ground conductor. When tested at the rated operating voltage, the leakage current shall not exceed 0.5 mA. The mated connectors shall then be wrapped in aluminium foil and the leakage current measured between the primary conductors and the foil wrap. When tested at the rated operating voltage, the leakage current shall not exceed 0.5 mA.

#### Flame Retardant Test

Flammability tests shall be conducted on the cable, the moulded body of the connectors, and the moulded protective caps. These materials shall be subjected to five flame applications, on for 15 seconds and off for 15 seconds. The materials shall self-extinguish within one minute upon removal of the flame and not burn through.

#### Internal Temperature Test

The internal temperature rise of the contact area of the mated connectors shall not exceed a temperature rise of 12°C referenced to 23°C ambient temperature when operated at the maximum current rating.

#### External Temperature Test

The external temperature rise of the mated connectors and cable shall not be greater than 12°C referenced to 23°C ambient temperature when operated at the maximum current rating.

#### Fault Test

The mated connectors shall be fault tested by applying a test current of 1,000 amperes, 60 HZ, for a minimum of 3 cycles (50 ms). The mated connectors shall then satisfactorily pass the dielectric test.

#### Drop Test

The connectors shall not break, crack or suffer other damage when subjected to eight consecutive drop tests from 1 m above the concrete floor with the connectors having been rotated 45 degrees between each drop.

### Crushing Test

No breakage or deformation shall result when the mated and unmated connectors are subjected to a crushing force of 2.2 kN for one minute. Following the crush test, the dielectric test shall be satisfactorily passed.

### Impact Resistance Test

No breakage or deformation shall result when the connectors are subjected to an impact caused by dropping a cylindrical 4.5 kg weight having a flat face 50 mm in diameter from a height of 450 mm. No loosening shall result when each connector is subjected to a 5,000 cycle flex test at the cable/bond area back and forth in a plane through an angle of 180 degrees. Following the flex test the dielectric test shall be satisfactorily passed.

### No Load Endurance Test

No excessive wear shall result when the male and female connectors and protective cap and female connector were subjected to 2,000 cycles of complete insertion and withdrawal.

### Rain Test

The mated and capped connectors shall be subjected to a continuous water spray (simulating worst case outdoor rain down-pour) for at least one hour at a rate of at least 450 mm per hour at an operating pressure of 34 kPa. The dielectric and leakage current tests shall be satisfactorily passed. The connectors shall be unmated and caps removed. Inspection shall indicate that water had been successfully prevented from reaching the contact areas of the connectors.

### Watertight (Immersion) Tests

The mated and capped connectors shall be immersed in water for one hour in which the highest point of the test samples is at least 1 m below the water level. Immediately following the immersion, a satisfactory dielectric and leakage current tests shall be performed. The connectors shall be unmated and caps removed. Inspection shall indicate that water had been successfully prevented from reaching the contact areas of the connectors.

### Exposure to Deteriorating Liquids

The cable and connectors shall be dried at 100°C for one hour. The samples shall then be immersed in ASTM Reference Oil No. 1 and ASTM Reference Fuel C liquids for one hour. The samples shall show no evidence of bubbling, cracking or corrosion. Within one hour after being removed from the fluids, the test samples shall satisfactorily pass the flammability test.

## **SUBMISSION AND DESIGN REQUIREMENTS**

### ***1 Photometric Requirements***

Photometric tests results shall be provided for the luminaries supplied, and shall include the following data:

1. Isolux readings and mounting height correction factors;
2. Utilization chart or graph;
3. Lumen distribution curves indicating peak intensity;

4. Luminous intensity Table to IES formats, I-tables;
5. Luminaries efficiency values
6. Luminous output above and below nadir;
7. Lamp Lumen output and wattage.

### ***Shop Drawings***

The shop drawings shall contain, at a minimum, the following information:

1. All mechanical details, including dimensions, layout and mounting arrangements for components
2. All electrical details, including wiring diagrams and component ratings
3. All photometric information regarding the luminary, including but not limited to lamp position and photometric data sheets.

Each shop drawing shall be stamped by the Project Manager, certifying that the shop drawings comply with the requirements of the contract.

The Contractor shall submit shop drawings to the Contract Administrator.

### ***Materials***

#### General

A permanent label shall be provided and attached to the interior of the luminary indicating the manufacturer's name or trademark, catalogue number, date of manufacture and the ANSI/IES (American National Standards Institute/Illuminating Project Managers society) photometric classification and distribution type, the suitable supply voltage and frequency, the lamp type, the lamp wattage and the nominal operating voltage of the lamp so that it is clearly visible during maintenance operations.

A label including a wiring diagram shall be attached to each ballast showing the ballast schematic wiring diagram and shall be visible during maintenance operations.

For asymmetrical luminaries with adjustable optical systems, an externally embossed identification mark shall be located in line with the horizontal axis of the lamp.

### **CONCRETE FOR THE CONSTRUCTION OF CONCRETE POLE BASE**

Cement, aggregate, water, mixing, reinforcement, curing etc used for the construction of concrete pole bases shall meet all the requirements given in Section 08020, Concrete for Structures and other Uses, for Class 30(A) concrete.

### **MEASUREMENT AND PAYMENT**

Payment for the work specified in this section of the Specification shall be at the rates entered in the Bill of Quantities under the various street lighting items for provision/installation of lighting columns include all costs of whatsoever nature related to the provision and installation of posts, lamp holders, lamps, feeder pillars, switching equipment, cables, ducts, foundations etc and no other payment of any kind will be made for this work.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities measured under the items quoted under Division 7. Signs, Markings, Signals and Lighting, Section 07050: Street Lighting (Metal Poles) using the units of measurement specified. This includes Item 070501 Greenheart Timber piles, 8m Driven in place; Item 070502 Reinforced concrete pole bases including excavation backfill reinforcement and formwork; Item 070503 Excavate and Backfill Cable Trench for 40mm PVC Conduit; Item 070504 Sand Cushion and Sand Fill around 40mm PVC Conduit; Item 070505 Excavate and Backfill Cable Trench for concrete duct bank from transformer pole to light pole line; Item 070506 40mm PVC Conduit for Distribution Cables; Item 070507 2-100mm PVC Conduit in concrete duct bank from transformer pole to light pole line; Item 070508 40mm long radius bends in light pole foundations; Item 070509 75mm PVC Conduit in light pole foundations; Item 0705010 Remove and reconstruct road pavement at conduit crossings; Item 0705011 Concrete in Duct Banks; Item 0705012, #2 AWG Cable; Item 0705013 #4 AWG Cable; Item 0705014 #6 AWG Ground Cable; Item 0705015 #12 AWG Low Voltage Riser Wires; Item 0705016 #12 AWG Stranded Copper Ground Wire to luminary; Item 0705017 Lamp poles with single bracket; Item 0705018 Luminaries and Lamp 250W with photocell; Item 0705028 LED Type Luminary; Item 0705019 25 KVA Transformers approved by Guyana Power and Light Co.; Item 0705020 25 Wallaba Transformer Stands Poles, Steps, Guywires, Anchor Blocks, Cross Arm Bolts, Rural Cutouts, Ground Wire and Tarring of Bottom; Item 0705021 Fuses for Pole Circuit; Item 0705022 Ground Rods 3m 15mm dia.; Item 0705023 Provision for GPL Input; Item 0705024, Lightning Arrestors, Item 0705025; Survey in connection with the works; Item 0705026; Allow for location with utilities in relation to the works, and Item 0705027; Miscellaneous and Contingencies.

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## ***SECTION 07051 – STREET LIGHTING (Wallaba Poles)***

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## 1-1 DESCRIPTION

The Work comprises the supply and installation of lighting poles, transformers, luminaries, electrical distribution system, panel boards and service connections to Guyana Power & Light's (GPL) supply points. Works could also include dismantling storing and re-erecting light poles.

GPL will supply all necessary overhead line extensions, transformers and fuse gear up to their supply points.

## SCOPE OF WORKS

The works shall include the following:

1. Liaison with the utility company (e.g. GPL) and the payment of any capital contributions and service deposits required.
2. Connection of lighting circuits to panel boards and the panel boards to GPL's supply points (i.e. point of interface).
3. Installation of luminaries and brackets on both new and previously used poles.

Also, the supply and installation of:

1. Panel boards
2. Light poles and luminaries
3. Grounding
4. Testing and commissioning of the entire electrical system.
5. Payment of all GPL co-ordination, testing and inspection fees.

## GENERAL PROVISIONS

### *1 Codes and Standards*

Install the Works in compliance with the National Electrical Code (latest edition), Occupational Health and Safety Standards and the requirements of the Electricity and Telephone utility and other Government Agencies' requirements, except where specified otherwise.

### *Government Agencies - Permits and Fees*

Submit to Electrical Inspectorate, Factory Inspectorate, etc. all necessary shop drawings and Manufactures' specifications for examination and approval prior to commencement of the Work, and pay all related fees.

### *Drawings*

The Contract Drawings shall not be considered to be shop drawings. The Contract Drawings show the location in principle for the various services. The detailed position shall be determined and coordinated by the Contractor and shown on a set of "Shop Drawings" taking into consideration that the maximum distance between poles is not to exceed 35m.

Existing equipment details or site features that may affect the Works shall be added to the "Shop Drawings".

### ***Shop Drawings***

The Contractor shall, prior to manufacture and installation, prepare “Shop Drawings” for the electrical work. These shall be marked "For Examination" and presented to the Employer’s Representative for approval.

If drawings are returned with no comments, the Contractor shall issue one original and two prints of each drawing to the Employer’s Representative for stamping "For Construction". These approved "Shop Drawings" form part of the "Working Drawings".

If drawings are returned with comments, the Contractor shall amend the drawings and re-submit for examination. The procedure for re-submittal shall be the same as for the initial submission. Each re-submitted drawing must be treated as a revision.

Irrespective of whether or not the drawings have been examined by the Employer’s Representative, responsibility for errors shall remain with the Contractor and no additional costs whatsoever will be payable as a result of any error.

The Contractor shall correct any discrepancies, errors or omissions in the Shop Drawings and other particulars supplied by him, whether or not such drawings and particulars have been examined by the Employer’s Representative.

The following drawings shall form the Shop drawings:

1. Detail or Manufacturer's drawings required prior to, or found necessary during, the manufacture or progress of the works.
2. Details of all fabricated steelwork, brackets, supports and all other items of a similar nature.
3. Plans, sections and elevations showing all required work, including length of poles (13.5m), position of poles, depth in ground (2.3m), tarring poles, dressing, pole protecting, etc.

### ***As-Built Drawings***

The Contractor shall keep a spare set of Working Drawings on site in order that all conduit runs, positions of points, etc. can be checked by the Employer’s Representative.

The Contractor shall modify these “As-Built” drawings to allow for site tolerances, discrepancies and changes in layout where the principle and intent of the design of the services are not affected. Where the principle and intent of the design are affected, notice of the conflict shall be given to the Employer’s Representative.

The Employer’s Representative shall have the right at all reasonable times to inspect the Contractor's drawings for any portion of the works.

The Contractor shall submit marked-up Working Drawings and other information to reflect the progressive, ‘as-built’ status of the Work at regular intervals, or as required by the Employer’s Representative.

The Contractor is responsible for all errors, omissions and deviations on the marked-up drawings intended to show the actual ‘as-built’ status of the works.

***Product Data and Samples***

Where appropriate, Manufacturers' standard catalogue sheets, drawings or other descriptive data may be submitted in lieu of samples.

The above will be accepted if they conform to the following:

1. All inapplicable information is deleted there from.
2. Any additional information needed is attached.

The Contractor's responsibility for errors, omissions and deviations in submissions from the overall requirements of the Contract Documents shall not be relieved by review and/or acceptance by the Employer's Representative's.

Until the Employer's Representative gives written acceptance of specified deviations, work involving relevant products shall not proceed.

***Building Work***

Building work is considered normal for that trade is included in this Contract and shall mean:

1. Provision of brackets, rag-bolts or other form of service suspension items.
2. Tarring base of poles.
3. Excavation for bases of poles (2.3m)etc.
4. Installation of pole steps.

***Operating and Maintenance Instructions***

The Contractor shall include for editing, printing, binding and producing 3 copies of an Operation and Maintenance Manual meeting the approval of the Employer's Representative. Payment for the Operations and Maintenance instructions to be included in Item 0705015 Miscellaneous items.

Prior to printing, a draft copy shall be submitted for the Project Manager's approval, one month prior to the Contract completion. The Project Manager reserves the right to modify the draft copy prior to printing without incurring additional cost to the tender price.

The Manuals shall be completed in sufficient detail to enable the Employer's Representative (or other Agency's staff) to maintain, dismantle, reassemble and adjust all parts of the works.

Completed Manuals shall be of a standard equal to this Specification with durable binders and properly printed covers. The Manuals shall have a comprehensive index and be compiled in sections for each system of the installation.

***Certificates from Government Agencies***

Furnish certificates of acceptance from the relevant Government Agencies on completion of Works.

***Environmental Conditions***

Equipment located outdoors shall generally be considered to be located in a tropical area subject to severe weather conditions. In addition, hazardous area or other special conditions will be specified in such cases. Equipment shall be capable of operating in specified conditions without damage.

### ***Finishes***

Finish all equipment in accordance with standard practice.

### ***Equipment Identification***

Identify electrical equipment with nameplates and appropriate labels.

### ***Wiring Identification***

Identify wiring with permanent identifying markings, either by number or coloured plastic tape on both ends of phase conductors and other circuit wiring. Maintain phase sequence and colour coding throughout.

### ***Wire Terminations***

These shall be suitable for both aluminium and copper conductors.

### ***Manufacturer's Labels***

These shall be visible and legible after the equipment is installed.

## **TESTING**

### ***1 Protection***

Protect exposed live equipment during construction for personnel safety.

Shield and mark all live parts "LIVE 240 VOLTS" or with appropriate voltage, in English.

### ***Inspection and Testing during Manufacture***

Where required, obtain permission for the Employer's Representative to inspect and test on the manufacturer's premises any plant to be supplied under the Contract. In the case of tests on the premises of the Contractor or Sub-Contractor, provide such assistance, apparatus, etc., as may be reasonably demanded to conduct such tests efficiently.

Where applicable, furnish to the Employer's Representative duly certified copies of tests during manufacture.

Such inspections and tests, if made, shall not release the Contractor from any obligation under the Contract.

### ***Defects***

Correct as soon as possible, any defects arising from design, materials or workmanship that may develop at any time up to the expiry of the Defects Liability Period.

If required, search for the cause of any defect or fault under the direction of the Employer's Representative.

### *Tests on Completion*

Before the Works are taken over by the Employer, the contractor shall conduct and pay for all tests specified including testing of:

1. Grounding systems.
2. Equipment insulation.
3. Polarity.
4. Phase sequence.
5. Protective devices.
6. Lighting
7. Loading

Give to the Employer's Representative in writing 14 calendar days' notice of the date on which tests on completion will commence.

Carry out tests in the presence of the Employer's Representative. Provide instruments, meters, equipment and personnel as may be required to conduct tests during and at the conclusion of the work. Submit test results.

Repeat within a reasonable time, the appropriate tests of any portion of the works which fails to pass the tests and bear all reasonable expenses to which the Employer may be put to for the repetition of the tests.

Carry out the tests in the following sequence:

1. Visual inspection
2. Continuity of branch circuit conductors
3. Continuity of protective (grounding) conductors, including main and supplementary equipotential bonding
4. Earth electrode resistance
5. Insulation resistance:
  - a) Use 500V megger for equipment up to 350V rating
  - b) use 1,000V megger for equipment of 350-660V rating
6. Insulation of site-built and factory-built assemblies
7. Protection by electrical operation
8. Polarity
9. Earth fault impedance
10. Earth leakage protective devices
11. Phase sequence
12. Prospective short circuit current to terminal and intermediate equipment

13. Load balance.

Submit, upon completion of the work, a report listing all phase and neutral currents on each circuit operating under normal load. State the hour and date on which each load was measured and the voltage at the time of testing.

## **OTHER REQUIREMENTS**

### ***1 Operations and Temporary Services***

Power or service cannot be interrupted without the Employer's Representative's written approval.

Any power interruption necessary for change-over must be reported to the Employer's Representative at least 48 hr. ahead of time.

### ***Warning Signs***

Provide warning signs as specified or to meet requirements of the local authority and Employer's Representative.

### ***Utility Connections***

Obtain connections from the utility Agency (GPL) when all other work has been completed, tested and accepted.

### ***Training of Employer's Staff***

The Contractor shall instruct the Employer's staff in the operation and maintenance of all aspects of the plant. Instruction shall be carried out by qualified personnel.

## **LOW VOLTAGE WIRES AND CABLES**

The scope of work includes the supply and installation of all wires and cables, together with connectors and other accessories necessary to complete the circuitry indicated by the Working Drawings and schedules.

### ***1 Feeder Cables***

Feeder Cables shall be standard copper 70°C, PVC insulated 12 AWG

### ***Aerial or distribution Cables***

Insulated triplex conductor with bare messenger

Cables shall be stranded, compressed aluminium, 75°C polyethylene insulated or 90°C vulcanized interlinked polyethylene (VIP), 600 volt grade with bare neutral messenger.

### ***Material Schedule***

Provide wires and cables listed in schedules or shown on the Drawings.

### ***Execution***

Install cables, prepare ends and terminate. Sizes of wires and cables are indicated on the drawings and schedules.

Install armoured cables as indicated on the Drawings or in an approved manner as agreed with the Employer's Representative.

Carry out all wiring in the 'loop in' system. No jointing is permitted. All main feeder circuits shall run their entire length in continuous pieces without joints or splices.

Contractor shall make use of approved wiring methods using raceways, wire ways and approved methods of support.

## **BASIC DESIGN CRITERIA**

### ***1 General***

Provide and install the entire lighting and electrical system along the road and the supply points for GPL connection including the transformer, the transformer pole and all appurtenances. Do all testing and make the system operational to the satisfaction of the local utility (GPL) as well as the client.

### ***Design Calculations***

Should the Contractor wish to propose an alternative pole design, he shall submit for approval, design calculations of the light poles (including bracket arms) and anchor bolts if an alternate design is proposed.

### ***Lighting Fixtures***

Provide lighting fixtures in accordance with Section 07051, Clause 1-14 Light Poles.

### ***Installation***

Install lighting units in accordance with manufacturer's written instructions to ensure that units fulfil requirements.

Use belt slings or rope (not chain or cable) to raise and set finished poles.

Set pole plumb. Support adequately during anchoring to installation.

### ***Field Quality Control***

Test lighting system upon completion of installation.

Correct mal-functioning units; remove and replace with new units where necessary and retest.

At the time of substantial completion, replace lamps which are noticeably dimmed after Contractor's use and testing, as judged by the Employer's Representative.

### ***Grounding***

Provide effective equipment grounding and bonding to NEC standards.

## **INSTALLATION OF CABLES**

### ***1 Products***

Provide PVC ducts of the sizes and quantities as indicated on the drawings and schedules.

### ***Excavation and Backfilling***

#### **A. General**

Excavate for poles as shown on the drawings and backfill. In locations that are presently surfaced (asphalt or concrete) mark and saw the surfaces to a neat vertical face prior to excavation.

Do not commence backfilling until the area of work to be backfilled has been inspected and approved by the Employer's Representative. Areas to be backfilled shall be free from debris.

Place and tamp fill materials in continuous horizontal layers not exceeding 300 mm loose depth. The first layer which shall be 150mm thick shall surround the poles and shall consist of white sand with no stone or aggregate greater than 6 mm diameter. This layer shall be tamped and compacted to the satisfaction of the Employer's Representative.

#### **B. Verges**

In locations outside of roadway or shoulder areas, subsequent layers shall be native backfill with no stone or aggregate greater than 50 mm diameter. These shall be thoroughly tamped and compacted to at least the density of the adjacent undisturbed soils, and to the satisfaction of the Employer's Representative. If necessary, to obtain the desired compaction, the native backfill shall be moistened or aerated as required. Compaction of 95% (ASTM D1557-12) shall be achieved wherever installation is below pavement areas and tested to the Employer's Representative's requirements.

#### **C. Surfaced Areas**

In locations that are already or will be surfaced (asphalt or concrete) as part of the Works, the subsequent layers shall be compacted base material and the finish either asphalt or concrete as required to match the surrounding area. All surfaces shall be restored to a neat and safe condition. Compaction of 95% (ASTM D1557-12) shall be achieved wherever installation is below pavement areas and tested to the Employer's Representative's requirements.

### ***Testing***

Perform tests using qualified personnel only. Provide necessary instruments and equipment to demonstrate that:

1. Circuits are continuous and free from short circuits and grounds;
2. Circuits are free from unspecified grounds;
3. Insulation resistance to ground of circuits is not less than 50 mega ohms.

Provide the Employer's Representative with a list of test results showing location of which each test was made, circuit-tested and result of each test.

## GROUNDING

### *1 Scope*

The scope of the work includes grounding of the following:

1. Panel boards
2. All non-current carrying equipment enclosures.
3. Lighting poles
4. Luminaries
5. The extent of the work shall be as indicated on the Drawings.

### *Products*

#### Standards

Unless otherwise indicated, grounding shall conform to NEC 250: 2010.

#### Copper Conductors

Bare (or with a green jacket), stranded, tinned, soft annealed, sized per drawings.

#### Rod Electrodes

Solid copper 19 mm diameter by 3 metres long can be installed within the low coastal plain of Guyana. In other geographic areas different rod electrodes will be specified.

#### Bolted Connectors

Use bolted connectors for grounding connections to equipment provided with lugs.

### *Execution*

Install accessories to manufacturers' instructions. Protect any exposed grounding conductors from damage by enclosing in metallic duct.

#### Inspection

Do not proceed with work until conditions are satisfactory. Do not cover up work until it has been inspected and approved by the Employer's Representative.

#### Testing

Carry out ground resistance test on completion. Where tests show resistance to ground is over 25 ohms take steps to reduce by driving additional electrodes and/or chemical treatment of soil; re-test to check compliance.

## **ELECTRICAL BOXES AND FITTINGS**

### ***1 Submittals***

Submit samples of all materials for Employer’s Representative's approval.

### ***Materials***

#### Weatherproof Outlet Boxes

Provide cast metal or PVC weatherproof boxes. Boxes shall have gasketed covers and corrosion-resistant fasteners.

#### Bushings, Lockouts and Knockout Closures

Provide corrosion-resistant material of types and sizes to suit each use and installation.

### ***Execution***

Co-ordinate the installation of boxes and fittings with other work. Provide knockout closures to cap unused knockout holes where blanks have been removed. Install boxes and conduit bodies such as to ensure ready accessibility of electrical wiring.

In exposed areas, install boxes and fittings in such a way that covers finish flush with finished surfaces. The Employer’s Representative's permission must be obtained for all surface mounted boxes and fittings.

## **TRANSFORMERS**

### ***1 Type***

Outdoor, oil filled, 13.8 KV- 120v/240V, 1 phase, 60 Hz transformers.

#### Site Conditions

Tropical Average Ambient 34°C and 95% R.H.

#### Manufacturers

Manufacturers shall include, but not be limited to the following:

1. Cutler Hammer
2. General Electric
3. Square D
4. Siemens

#### Standards

Factory tests shall be to the following or approved equal standards:

1. ANSI C57.12.90-1973
2. CSA C22.2 No. 47-1977
3. BS IEC 60076-8-1997

### ***Submittals***

Within 1 month of the order being placed, submit 2 copies of the following to the Employer's Representative:

1. Detailed dimensioned drawings of complete transformer.
2. Installation, operation and maintenance instructions.
3. Cross sectional drawings showing core, windings and internal connections.
4. Test certificates for:
  - A. Ratio Test
  - B. Polarity Test
  - C. No load core loss
  - D. Full Load core loss
  - E. Impedance
  - F. Temperature Rise
  - G. Dielectric withstand
  - H. Noise Level in db.

### **Maintenance Materials**

Provide a list of one set of spares as recommended by Manufacturer with delivery of the unit.

### ***Materials***

Materials shall be to the following or equal approved standards:

1. Transformer to: BS IEC 60076-8-1997
2. Oil to: BS 148-2009 or BS EN 60296:12

### **General**

Transformer shall be capable of delivering the rated kVA continuously with temperature rises as stipulated in BS IEC 60076-8-1997 under 'ON' conditions.

Transformer shall be capable of sustaining overloads as defined in BS IEC 60076-7:2005 Loading guide for oil-immersed power transformers.

### **Ratings**

1. kVA: As per drawings
2. System highest voltage: 7,960 volts.
3. System grounding: HV and LV systems solidly grounded.

4. Insulation Level: 95kVBIL Primary and 30 kV BIL Secondary
5. Windings: Primary – 12.8 kv 120/240V
6. Impedance: 2.7%
7. Surface temperature rise: 65°C maximum.
8. HV taps: Provide 5 No. 2½% above and below normal.

#### Neutral and LV Terminals

Provide terminals and lugs suitable for receiving PVC SWA cables as per drawings.

#### HV Terminals

Open bushing HV terminal connections capable of receiving up to 50 sq. mm XLPE cable.

#### Fittings

Provide the following fittings:

1. Nameplate showing kVA, voltage, taps, insulation levels, temperature, impedance, weight and connection diagram.
2. Grounding terminals for grounding of tank and other metal work with removable lug suitable for 95mm<sup>2</sup> copper cable.
3. Pressure relief device.
4. Provide any other accessories which are the Manufacturer's standard for the transformer.

#### ***Execution***

##### Installation

Make good any damage arising during handling and installation. Install transformers on poles using suitable brackets and ensure assembly is robust and durable.

##### Testing

Carry out routine tests, type tests and supplementary tests as per BS IEC 60076-8-1997. If transformer offered is identical to one type previously tested, submit specified type test certificates related to the transformer design.

##### Shipping

All equipment subject to damage during shipping must be suitably protected. No hay, straw, rags, bags or sacks shall be used for packing and all cases must be non-returnable.

### **LIGHT POLES**

#### ***1 Material***

Wooden light poles shall meet the requirements of Clause 1-12 Sub Clause 5. Wooden Service poles

#### ***Length***

The poles shall not be less than 13.5 m in length and sufficiently high to provide the luminary mounting height shown in the plans or directed by the Project Manager.

***Luminaries, Ballasts, etc.***

***TYPE 1- LED Lighting Fixtures***

Where 0.75 cd/m<sup>2</sup> or 540 -620 lumien or over is required, it should be 71-97 watts,110-250volts, 50/60hz, luminaire efficiency of up to 100 lm/w, working temperature of -20 to 60°c with a safety protection glass of I or II. A lifetime of no less than 100,000 hrs and a colour temperature of 4000

The design must be a complete electronic control activity of the LED lights with the ability to regulate current from 1-100% v

The product should be approved under acceptable international standards ISO 9001, 14001 OR 50001 and environmentally friendly. It is required to be light weight capable of adopting short or long arm /bracket at 15° and have capability of adjusting its focus/ light beams to achieve cutting edge light performance

***TYPE 2 – Incandescent Lighting Fixtures***

Luminaries shall consist of a precision-cast aluminium housing and reflector holder, a refractor-holder latch on the street side, and a hinge with a safety catch on the house side of the luminary also a slip fitter suitable for attaching to a 50 mm mounting bracket, with a gasket between the reflector and the refractor and the socket entry, an adjustable bracket capable of producing the specified IES type light distributions, and a heat-resistant, high-transmission flat glass refractor meeting IES RP-8-00(R 2005) Luminaries shall have a 250 Watt, 240 volt, 60Hz – Type 3 Cobra head high-pressure sodium vapour lamp, ANSI designation S50VA-250 and a socket receptacle and approved photocell

Luminary shall be provided with precision die-cast aluminium housing with electro coated grey paint finish, heat resistant glass refractor with charcoal filtered optics and photo-electric receptacle.

Luminaries shall be constructed for protection against harmful dust deposits and water jets to IP55. The optical component shall be sealed against dust and moisture and must carry a 15 year guarantee.

Provide luminaries with photometric, specifications or model numbers from manufacturers as follows:

General Electric M-400A POWR/DOOR luminaire with reflector 35-451001, Catalogue No. MDCA-25-S-3-A-1-1-F-MC2-2-2, or approved equivalent. (UL approved and ISO standard)

250 Watt CWA type ballast and optical assembly that will provide an ANSI/ IES type II-M-C distribution, for 240 Volt operation as indicated in the plans.

The ballast shall be an auto regulating, constant wattage type. Power factor shall be 90% or better, with regulation within ±2% variation in lamp watts and a line voltage variation of ± 10%.

The top housing shall contain an integral slip fitter, adjustable for 42 to 60 mm pipe.

### ***Conductors***

The conductors shall be colour-coded and, unless otherwise shown in the plans, the conductors shall be as called for below.

Service conductors shall be stranded copper, single-conductor cable, Type RWU or equivalent for underground installation and shall not be smaller than No. 6 AWG.

Direct-burial cable shall meet the same classification requirements as the service conductors except it shall be approved for direct burial.

Pole and bracket cable shall be a stranded cable, Type RHW or THW, and shall not be smaller than No. 10 AWG.

Bonding ground conductor shall be bare (or have a green jacket) and shall be No. 6 AWG or larger.

### ***Wooden Service Poles***

#### General

Wooden service poles shall meet the requirements of The Guyana Grading Rules GR 08 “Round transmission poles” and GPL requirements shall be at least 13.5 m in length. The poles shall be Select grade unless otherwise specified on the plans or in the specifications or as required by GPL.

#### Standards

Poles shall comply with Guyana grading rules for hardwood timber (Ref No GR 08 Round transmission poles). All poles shall be natural round timber poles cut from sound living trees of the species *Eperua falcate* (Wallaba).

All poles shall be completely debarked, sapwood removed and shall not show any sign of heart rot. They shall have uniform taper and be reasonably round and straight. The tip of the pole shall be roofed or pointed, while the butt shall be square to the length.

Each pole shall be free from short or reverse bends so that a straight line from centre of the butt to centre of the tip shall be at no point less than one-tenth of the diameter of the pole from the near side at point of consideration. Each pole shall be generally free of defects which significantly affect the strength such as knots and knot-clusters of width greater than one third of the diameter of the section where they occur, rotten and hollow knots, rotten heart, splits and shakes in tip or butt, insect attack and plugged holes.

#### Mounting Height

Mounting height of all equipment and lines shall meet the requirements of the latest edition of the U.S National Safety Code, the local ordinances, and the specifications of the connecting utility.

### ***Concrete Foundations for Light Poles***

The concrete foundations for the light poles shall be of Class 30(A) concrete unless otherwise shown in the plans.

### ***Testing and Performance Criteria***

The system shall pass the following performance criteria in accordance with NEC 110-2:

#### **Dielectric Test**

No breakdown shall occur with a test potential of 1,960 volts applied between the primary conductors (tied together) and the protective ground for a period of one minute.

#### **Leakage Current Test**

Leakage current shall be measured on the mated connectors between the primary conductors and the protective ground conductor. When tested at the rated operating voltage, the leakage current shall not exceed 0.5 mA. The mated connectors shall then be wrapped in aluminium foil and the leakage current measured between the primary conductors and the foil wrap. When tested at the rated operating voltage, the leakage current shall not exceed 0.5 mA.

#### **Flame Retardant Test**

Flammability tests shall be conducted on the cable, the moulded body of the connectors, and the moulded protective caps. These materials shall be subjected to five flame applications on for 15 seconds and off for 15 seconds. The materials shall self-extinguish within one minute upon removal of the flame and not burn through.

#### **Fault Test**

The mated connectors shall be fault tested by applying a test current of 1,000 amperes, 60 HZ, for a minimum of 3 cycles (50 ms). The mated connectors shall then satisfactorily pass the dielectric test.

#### **Drop Test**

The connectors shall not break, crack or suffer other damage when subjected to eight consecutive drop tests from 1 m above the concrete floor with the connectors having been rotated 45 degrees between each drop.

#### **Crushing Test**

No breakage or deformation shall result when the mated and unmated connectors are subjected to a crushing force of 2.2 kN for one minute. Following the crush test, the dielectric test shall be satisfactorily passed.

#### **Impact Resistance Test**

No breakage or deformation shall result when the connectors are subjected to an impact caused by dropping a cylindrical 4.5 kg weight having a flat face 50 mm in diameter from a height of 450 mm. or loosening shall result when each connector is subjected to a 5,000 cycle flex test at the cable/bond area back and forth in a plane through an angle of 180 degrees. Following the flex test the dielectric test shall be satisfactorily passed.

#### **No Load Endurance Test**

No excessive wear shall result when the male and female connectors and protective cap and female connector were subjected to 2,000 cycles of complete insertion and withdrawal.

#### Rain Test

The mated and capped connectors shall be subjected to a continuous water spray (simulating worst case outdoor rain down-pour) for at least one hour at a rate of at least 450 mm per hour at an operating pressure of 34 kPa. The dielectric and leakage current tests shall be satisfactorily passed. The connectors shall be unmated and caps removed. Inspection shall indicate that water had been successfully prevented from reaching the contact areas of the connectors.

#### Watertight (Immersion) Tests

The mated and capped connectors shall be immersed in water for one hour in which the highest point of the test samples is at least 1 m below the water level. Immediately following the immersion, a satisfactory dielectric and leakage current tests shall be performed. The connectors shall be unmated and caps removed. Inspection shall indicate that water had been successfully prevented from reaching the contact areas of the connectors.

#### Exposure to Deteriorating Liquids

The cable and connectors shall be dried at 100°C for one hour. The samples shall then be immersed in ASTM Reference Oil No. 1 and ASTM Reference Fuel C liquids for one hour. The samples shall show no evidence of bubbling, cracking or corrosion. Within one hour after being removed from the fluids, the test samples shall satisfactorily pass the flammability test.

### **SUBMISSION AND DESIGN REQUIREMENTS**

#### ***1 Photometric Requirements***

Photometric tests results shall be provided for the luminaries supplied, and shall include the following data:

1. Isolux readings and mounting height correction factors;
2. Utilization chart or graph;
3. Lumen distribution curves indicating peak intensity;
4. Luminous intensity Table to IES formats, I-tables;
5. Luminaire efficiency values
6. Luminous output above and below nadir;
7. Lamp Lumen output and wattage.

#### ***Shop Drawings***

The shop drawings shall contain, at a minimum, the following information:

1. All mechanical details, including dimensions, layout and mounting arrangements for components
2. All electrical details, including wiring diagrams and component ratings

3. All photometric information regarding the luminary, including but not limited to lamp position and photometric data sheets.

Each shop drawing shall be stamped by the Project Manager, certifying that the shop drawings comply with the requirements of the contract.

The Contractor shall submit shop drawings to the Contract Administrator.

### *Materials*

#### General

A permanent label shall be provided and attached to the interior of the luminary indicating the manufacturer's name or trademark, catalogue number, date of manufacture and the ANSI/IES photometric classification and distribution type, the suitable supply voltage and frequency, the lamp type, the lamp wattage and the nominal operating voltage of the lamp so that it is clearly visible during maintenance operations.

A label including a wiring diagram shall be attached to each ballast showing the ballast schematic wiring diagram and shall be visible during maintenance operations.

For asymmetrical luminaries with adjustable optical systems, an externally embossed identification mark shall be located in line with the horizontal axis of the lamp.

### **MEASUREMENT AND PAYMENT**

Payment for the work specified in this section of the Specification shall be at the rates entered in the Bill of Quantities under the various street lighting items for provision/installation of lighting columns include all costs of whatsoever nature related to the provision and installation of posts, lamp holders, lamps, feeder pillars, switching equipment, cables, ducts, excavation, backfilling, tarring , etc and no other payment of any kind will be made for this work.

Dismantling storage and re-erection of light poles includes re-use of all serviceable items listed below. Replacement of items that cannot be refurbished will be paid at the bill rate for that item.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities measured under the items quoted under Division 7. Signs, Markings, Signals and Lighting, Section 07051: Street Lighting (Wallaba Poles) using the units of measurement specified. This includes Item 070511 Wallaba timber poles 13.5m long embedded to 2.3m depth, Item 070512 Single spool clevis, Item 070513 Distribution Triplex wire (90A) service, Item 070514 Luminaires and lamp 250 W with photocell, Item 0705120 LED Type Luminary, Item 070515 Galvanized bracket, Item 070516 14 AWG Standard Copper ground wire(2.5 mm sq), Item 070517 60 A piercing Connecters, Item 070518 Spool insulator, Item 070519 Pole steps, Item 0705110 Construction of transformer stand, pole steps, guy wire, anchor blocks, cross arms, cutouts, ground wire and tarring, Item 0705111 25 KVA Pole mount transformer (13.8 KV – 120/240 V) 60 Hz, Item 070512 Ground rods 3m 15 mm Dia, Item 0705113 Drop down Fuses for pole circuit, Item 0705114 18"x 5/8 machine bolts, Item 0705115 Lighting Arrestor, Item 0705116 Guy-set, Item 0705117 Miscellaneous and Contingencies, Item 0705118 Provision for GPL inputs, Item 0705119 Dismantling storage and re-erection of light poles.

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***SECTION 08010 – PRE-CAST PRE-STRESSED  
CONCRETE PILING***

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## 1-1 DESCRIPTION

This Section covers the supply and installation of pre-cast, pre-stressed concrete piles of two types – square section bearing piles, and rectangular section sheet piles for wing walls and facing walls needed for the retention of abutment backfill materials.

The Work includes also, testing of designated pile installations and splicing and/or build-up of bearing piles to the length(s) required to meet load bearing requirements at each site.

### PART A - GENERAL PROVISIONS

#### *1 Equipment and Workmanship*

##### Submissions

Before any piling work is commenced, the Contractor shall submit to the Employer's Representative full details of the pile driving equipment and the method of carrying out the work intended for use throughout the project.

Such information shall include a full description of the piling frame, hammer, helmet and packing and the method of handling and pitching of piles and supporting them during driving. It shall also describe the proposed driving procedure (to give penetration to the required level) and 'set' for the working load on the pile together with the method of calculating it.

Any revisions to these proposals, which, in the light of ensuing experience appear to be desirable, shall also be submitted for the approval of the Employer's Representative.

##### Piling Frame

The piling frame shall be of sturdy construction supported on an adjustable base; securely guyed and with ample toggle connections to leaders so that the pile is firmly held at all times. No swinging type leads will be allowed. The type and weight of hammer shall be to the approval of the Employer's Representative.

In general, a heavy hammer with a short drop should be used in preference to a light hammer with a longer drop. All plant shall be maintained in a satisfactory condition and any items suffering wastage or damage shall be promptly replaced or repaired.

##### Approval

No piling work shall be carried out without the approval in writing of the Employer's Representative of the equipment and method of working and any revisions to these as described above. The Contractor shall submit all his proposals at least six weeks before the date on which he intends to use the plant on Site.

The Contractor shall submit the proposed driving criteria for each of hammer – pile - cushion combination to the Employer's Representative for review at least 2 weeks prior to the commencement of pile driving operations.

##### *Handling of Piles*

The Contractor shall exercise the greatest care in the lifting and handling of piles, and no concrete pile shall be lifted otherwise than by slinging from the lifting points. The lifting point shall be as directed or approved by the Employer's Representative.

### ***Pitching and Driving***

#### Utilities

Hand excavation shall be undertaken to locate services in areas where prior investigation has indicated these might exist. All necessary liaisons shall take place with the owners/managers of such services or adjacent structures at the Contractor's cost. If during piling damage is caused to mains, services or other adjacent structures, the Contractor shall be liable for the consequences and for the cost of repair.

#### Driving

The Employer's Representative shall be notified 24 hours before the commencement of pile driving.

Piles shall be pitched accurately in the positions and driven to the lines shown on the Drawings. Piles deflected from the proper lines shall, where ordered by the Employer's Representative, be withdrawn and re-pitched until the proper line is obtained. No forcible method of correction of the position or line of any pile will be permitted.

Any holes from which piles are withdrawn shall be packed with approved non-plastic material before re-driving. Open voids left by the removal of a pile shall be filled to the previous ground level with non-plastic materials and all costs shall be borne by the Contractor.

Driving piles shall include all costs involved in the actual driving and cutting off of piles, mobilization of all equipment needed for the handling and driving of piles after the piles have been delivered to the piling works site, and compliance with the requirements of these Specifications.

#### Tolerances

Pile heads shall be within 75mm of the locations indicated and not be more than 2% of length out of alignment.

Cut-off elevation of tops of piles shall be within 25mm of the levels intended.

#### Leaders

Where piles have to be driven below the level of the bottom of the leaders, extension leaders shall be fitted. The use of a follower or other device will not be permitted except with the written approval of the Employer's Representative.

#### Jetting

The use of water jetting may be proposed by the Contractor but will not necessarily be approved. If jetting is allowed or ordered by the Employer's Representative, it shall be carried out in all respects with rigorous control and not to the detriment of the surrounding ground or any part of the Works and to the entire satisfaction of the Employer's Representative.

Pre-boring, jetting and other methods used for facilitating pile-driving procedures when either required or permitted will not be measured and shall be considered to be included in the unit price paid for the piles driven.

#### Protection

During driving, the heads of piles shall be held securely and protected by a helmet of an approved type. All piles cracked or otherwise damaged during handling or driving shall be repaired or replaced, as directed by the Employer's Representative and without additional charge. The Employer's Representative shall be the sole judge of the acceptability of a damaged pile.

Concrete piles shall be protected from impact and tension loads with appropriate cushion material placed on top of the pile head.

#### Pile Groups

Individual piles in a pile cluster shall be driven in such a way as to minimize the generation of increased driving resistance by compaction and displacement of soil.

All piles shall be driven to levels determined by the Employer's Representative as driving of the group of piles proceeds and, in addition, all bearing piles shall have achieved sets which indicate that they are capable of carrying with a suitable factor of safety at least the working load indicated on the Drawings, in the Specifications, or Bill of Quantities. Should the approved set be achieved before the approved penetration and vice versa, driving shall be continued until both requirements are met. The Contractor's rates shall be deemed to include for complying in all respects with the requirements specified herein. Piles, which have risen as a result of the driving of adjacent piles, shall be re-driven to the original depth or set, unless otherwise directed by the Employer's Representative.

#### Driving Records

A detailed record of driving of all piles shall be furnished by the Contractor and given to the Employer's Representative daily. The Contractor shall give every assistance to the Employer's Representative necessary to enable checking of measurements during the progress of the work.

#### ***Pilot Piles***

If required by the Employer's Representative, the Contractor shall construct pilot piles to the lengths indicated on the Drawings, in the Bill of Quantities, or directed by the Employer's Representative. These pilot piles shall be driven in the positions selected by the Employer's Representative who shall be notified in advance of the Contractor's intention of driving such piles.

The Contractor shall furnish the Employer's Representative daily with a detailed record of the driving of pilot piles throughout the full depth of driving and after attaining the approved 'set' driving shall be continued until the Employer's Representative directs that it shall cease. Driving beyond the point at which the approved set is obtained will be called for to demonstrate that driving resistance continues to increase.

The results of the driving of such pilot piles will be used by the Employer's Representative to determine the lengths of the remaining piles at the location or in the area.

#### ***Pile Tests***

Where the Employer's Representative directs, dynamic pile testing using a Pile Driving Analyzer shall be performed at the sites.

Dynamic testing will require the attachment of two strain transducers and two accelerometers by the Contractor at a minimum distance from the pile head of 2 x pile head diameter. After the gauges are attached and ready for testing, driving shall then commence and/or continue until termination of driving. Interruption of driving may be required during the testing as directed by the Employer's Representative. Testing will be performed during driving and/or re-striking of the piles. The number of tests shall be directed by the Employer's Representative.

When carrying out dynamic testing, the Contractor shall co-operate and assist the Employer's Representative as may be required. Elevated devices, which will allow the full mobility of personnel to the pile top for attachment of gauges, shall be supplied by the Contractor to the Employer's Representative at no additional cost.

The Contractor shall submit for the Employer's Representative's approval, a full description of the method he proposes to use for carrying out the tests.

Testing of piles shall include the cost of supplying, installing, and performing test monitoring of piles as designated or as otherwise approved by the Employer's Representative. This shall include all necessary skilled and unskilled labour, plant and equipment, instrumentation, logs, reports and records in accordance with the Specifications.

### ***Lay Out***

The main setting out for piles is to be completed prior to commencement of piling.

Secondary or individual pile setting out is to be completed and agreed not less than 8 hr prior to commencing work on the piles concerned. All main setting out points, lines, stations and the like are to be maintained safe and undisturbed.

### ***Acceptance of Piles***

If a pile appears to be unsatisfactory, the Employer's Representative may require that driving cease. Further driving may however be ordered in the light of information obtained from driving of subsequent piles. Piles will be accepted by the Employer's Representative only when each group is completed.

## **PART B - PILE DETAILS**

### ***1 Concrete***

Concrete shall be Grade 45(P) with minimum 28-day cube strengths of 45 MPa. Ordinary Portland cement shall normally be used, Sulphate resisting cements will be used only if approved or ordered by the Employer's Representative in writing.

### ***Reinforcement***

Reinforcement shall consist of mild steel and high tensile steel bars and binding links bent and fixed as shown on the Drawings. Main reinforcing bars shall be supplied in one complete length.

Should this prove impractical, separate lengths shall be effectively spliced by a method approved by the Employer's Representative.

***Manufacture***

The manufacture, handling and delivery of pre-cast, pre-stressed concrete piles shall be in accordance with the Specification for Pre-cast, Pre-stressed Concrete Components and as shown on the Drawings and/or approved Shop Drawings.

***Ready-Made Piles***

Subject to obtaining the approval of the Employer's Representative, in writing, the Contractor may use ready-made piles.

In such cases he shall supply the Employer's Representative with the names of the makers together with full details of the piles, which he proposes to use and which shall be manufactured in accordance with these Specifications.

It will be necessary for the Contractor to satisfy the Employer's Representative that the ready-made piles comply with the Specification and he shall be deemed to have allowed in his rates all costs for so doing.

***Delivery, Handling and Pitching***

Care shall be exercised in the delivery, handling and pitching so as not to damage the piles. All methods shall be subject to the approval of the Employer's Representative.

***Extensions***

Where it becomes necessary to lengthen a pile a reinforced section shall be added in accordance with the Drawings.

The pile shall be extended by concreting in properly formed and supported moulds to the length required. Care shall be taken to form the joint between the old and new concrete in accordance with the Specification for Concrete and other structures.

Jointing and lengthening shall be properly aligned and to ensure integrity of the extended pile across the joint. After piles have been lengthened driving shall not resume until the approval of the Employer's Representative has been given.

***Sheet Piles*****Types**

Pre-cast, Pre-stressed Concrete (PPC) sheet piles for wing-walls and facing walls at abutments shall be manufactured in accordance with details shown on the plans.

PPC sheet piles shall be installed to the lines and elevations shown on the project plans. The Contractor may elect to provide and install longer PPC sheet piles with a minimum thickness coping in lieu of shorter PPC sheet piles with a varying, thicker coping. In the case of bridges the coping shall be no higher than the elevation of the approach slab at the abutment.

**Installation**

Positive methods (such as whalers and blocks) shall be used for temporarily aligning and bracing the sheet piles prior to installation and to control their alignment during setting down to level.

Care shall be taken adjacent to existing foundations, drainage work or adjacent property so as not to inflict damage or disturbance. When installing PPC sheet piles next to existing portions of structures that are to remain in-place, the toes of any footings or other parts shall be probed and, if necessary, exposed to facilitate proper placing of the new sheet piles. Parts of existing footings shall not be cut or removed without the approval of the Employer's Representative.

Partial, local excavation and jetting may be used to facilitate installation of the PPC sheet piles. However, the PPC sheet piles shall be driven down for the last one-third of their intended penetration. PPC sheet piles shall be installed to the full length and depth given on the plans. PPC Sheet piles shall not be cut-off unless directed by the Employer's Representative.

All and any material excavated or removed below the original bed (mud) line by excavation or jetting shall be replaced by an approved material of equal or better quality than that removed, all placed and compacted in a manner approved by the Employer's Representative.

The work shall include all costs associated with the manufacture, transport, handling, delivery and installation of the sheet piles in accordance with the plans. It shall also include the provision of waterproofing, filter fabric, drainage layer back-fill and the construction of all cast-in-place reinforced concrete copings to the tops of the sheet piles. The latter shall also include the cost of furnishing all materials in accordance with the plans and specifications.

All costs for temporary construction work, excavation, backfill with approved materials shall be deemed to be included.

#### Planning

The Contractor shall provide to the Employer's Representative an installation plan for setting, aligning and driving, back filling and finishing the construction of the PPC sheet pile wing walls and facing walls. The installation plan shall also include recording and checking procedures for the manufacture, transport, installation and finishing work associated with the PPC sheet piles.

Installation shall not be undertaken until the plan has been accepted and approved by the Employer's Representative.

#### **MEASUREMENT AND PAYMENT**

Payment for Bearing Piles Sheet Piles and Pilot Piles, Steel Reinforcement, Pitching and Driving and Dynamic Pile Testing will be made as defined in the drawings or as approved by the Project Manager. No payment shall be made for any additional material required for steel or concrete testing or calibration, nor for any excess material cast in excess of the approved quantities unless such work is specifically instructed by the Project Manager as a variation from the drawings. No separate payment shall be made for the cost of, Cement, Formwork, Delivery, Handling, Layout, Disposal of cut off sections or rejected piles, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities, Bill 8, Bridges and Box Culverts Item 080101, Supply Square Section Bearing Piles, Item 080102 Supply Rectangular Section Sheet Piles, Item 080103, Supply

Pilot Piles, Item 080104, All Steel Reinforcement, Item 080105, Pitching and Driving Square, Rectangular or Pilot piles, Item 080106, Dynamic Pile Testing, using the units of measurement specified.

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## ***SECTION 08020 – CONCRETE FOR STRUCTURES AND OTHER USES***

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## DESCRIPTION

This section covers the materials, design of mixes, mixing, transport, placing, consolidation and curing of concrete required in the Works. It also covers formwork and reinforcement for concrete.

## DEFINITIONS

Structural concrete is any class of concrete used in reinforced, pre-stressed (pre- or post tensioned) or unreinforced concrete construction, which is subject to stress.

Non-structural concrete is composed of materials complying with the specification but for which no strength requirements are specified and which is used only for filling voids, blinding foundations and similar purposes where it is not subjected to significant stress.

A formed surface is a concrete face cast against formwork.

An unformed surface is a horizontal or nearly horizontal surface produced by hand or mechanical screeds, trowels or floats to the required level and finish.

A pour refers to the operation of placing concrete into a mould, casting bed, casting cell, bay or formwork, etc., and also to the volume to be filled. Pours in vertical succession are referred to as lifts.

## MATERIALS FOR CONCRETE

### *1 General*

The Contractor shall submit to the Employer's Representative, full details of all materials he proposes to use for making concrete. These details shall include, but shall not necessarily be limited to, type of material, complying standard or specification (AASHTO, ASTM, or BS), source of origin, (plant, quarry, or other) etc., all in accordance with the requirements of this specification. Materials incorporated in the concrete shall be certified from the source and shall conform to the requirements of this specification.

No concrete shall be placed in the structure until the Employer's Representative has approved the materials of which it is composed. Approved materials shall not thereafter be altered or substituted by other materials without the written consent of the Employer's Representative.

### *Cement*

Types permitted and basic material specifications

The cement shall be ordinary or rapid hardening Portland cement and shall conform to the requirements of the following:

Either: **BS EN 197-1:2011 Specification for Portland cement**

Or: **AASHTO M 85 Type I, II or III**

Acceptance of cement shall be based upon manufacturer's certified mill analysis of test results meeting the requirements of the above specifications for the particular type of cement. If requested by the Project Manager the below requirements shall apply.

Each consignment of cement intended for use in the project shall be accompanied by a manufacturer's test certificate showing that the cement has been tested and analyzed. The certificate shall show the date and results of such tests and analyses in order to confirm that the cement complies with to the specification for the type of cement.

A certificate of test results shall be provided to the Employer's Representative for each consignment. Where such a certificate is not available, or as required by the Employer's Representative, the Contractor shall arrange for each consignment of cement to be tested and analyzed in accordance with the specification for that type of cement, all at no additional expense.

When requested by the Employer's Representative, in addition to any tests required elsewhere in this specification, the Contractor shall arrange for corresponding samples of cement to be taken at the manufacturer's plant and subsequently tested by an independent testing agency, all at no additional expense.

No cement shall be used, and it shall be stored separately, until the results of such tests and analyses are known and have been approved in writing by the Employer's Representative.

The Contractor shall keep full records of all data relevant to the manufacture, delivery, testing and use of all cement used in the Works and shall provide the Employer's Representative with two copies thereof.

#### Mixing of different cements

Different brands of cement, cement of the same brand from different mills, or different types of cement, shall not be mixed during any continuous concrete pour.

#### Alkali Content

Only Portland Cements containing less than 0.6% alkali, calculated as Na<sub>2</sub>O (percent Na<sub>2</sub>O plus 0.658% K<sub>2</sub>O) shall be used in combination with any source of alkali reactive coarse or fine aggregate.

#### Protection against Chemical action

In cases where concrete is to be deposited against ground known or suspected to contain sulphate salts or other deleterious chemical agents, sulphate resisting Portland cement may be used instead of ordinary Portland cement. The sulphate resisting Portland cement shall be from an approved manufacture and in accordance with BS4027:1996.

The degree of exposure which shall be assumed as a minimum sulphate (SO<sub>4</sub>) content shall be 1000mg/l SO<sub>4</sub> in the ground water, and shall be confirmed by the Contractor in accordance with BS 6068-2.39:1991, or ISO 9280:1990 IDT 'Water quality. Physical, chemical and biochemical methods. Method for the determination of sulphate using barium chloride and gravimetry.

#### Packaging, Handling and Storing Cement

Cement shall be free flowing and free of lumps. It shall be supplied in the manufacturer's sealed, unbroken bags or in bulk. Bagged cement shall be transported in vehicles provided with effective means of protecting bags from the weather. Bulk cement shall be transported in vehicles or containers equipped for the purpose.

Cement in bags shall be stored in a suitable, weatherproof building and kept dry and well ventilated at all times. The store shall be at a convenient location where the concrete is made.

Bags of cement in storage shall be kept on a raised floor or platform above the level of the surrounding ground. Each delivery of cement in bags shall be stacked together in one place. The bags shall be closely stacked so as to reduce air circulation, but shall not be stacked against an outside wall. If pallets are used, they shall be constructed so that bags are not damaged during handling and stacking. No stack of cement bags shall exceed a height of 3 metres. Different types of cement in bags shall be clearly distinguished by visible markings and shall be stored in separate stacks.

Cement from broken bags or older than 90 days shall not be used and will be rejected.

Cement in bags shall be used in the order in which it is delivered.

Bulk Cement shall be stored in weatherproof silos, conveniently located for the production of concrete. Each silo shall bear a clear indication of the type of cement contained in it. Different types of cement shall not be mixed in the same silo.

The Contractor shall provide sufficient storage capacity to ensure that his anticipated program of work is not interrupted due to lack of cement.

Cement which has become hardened, which is partially set or has become lumpy or caked, or fails to comply with these specifications, shall not be used. The entire contents of the bag of cement or the container of bulk cement shall be rejected. Cement salvaged from discarded, broken bags or partially used bags, shall not be used. All cement thus rejected shall be removed from the Works and shall be disposed of by the Contractor in a manner acceptable to the Employer's Representative, all at no additional expense. All cement delivered to site older than ninety - (90) days will be rejected.

### ***Aggregates***

#### **General**

All natural aggregates (fine, coarse and all in) for all grades of concrete and mortar shall comply in all respects with BS EN 12620:2002, or ASTM C33-18, and the Contractor shall test all samples in accordance with the series of tests described in BS EN 12390. Each sample shall consist of not less than 50kg (110 pounds) and shall be tested as often as the Employer's Representative may require ensuring that they are continuously up to these standards.

All aggregates shall be hard, strong, durable, clean and free from organic matter and deleterious coatings such as clay. They shall contain no harmful material in such quantities as to affect adversely the strength or durability of the concrete, or attack the reinforcement, as ascertained by tests on concrete cubes hereafter described and by other tests as described in BS EN 12620:2002.

The Sources of all Aggregates shall be approved by the Employer's Representative

All aggregates whether fine or coarse if considered unsuitable by the Employer's Representative shall be removed immediately from the Site by the Contractor and at the Contractor's expense.

#### **Testing**

As soon as possible after receiving the Employer's Representative's authority to commence the Works (and before commencing any concreting) the Contractor shall have delivered upon the site sample loads of aggregates representative of those proposed for the Works, and shall forward samples prepared in accordance with the series of tests described in BS EN 12390. Each sample shall consist of not less than 50kg (110 pounds) of fine aggregate and 100kg (220

pounds) weight of coarse aggregate and shall be tested in accordance with the Specification. No aggregate shall be used in the Works until the results of these tests shall have been submitted to the Employer's Representative and his approval in writing obtained.

#### Washing

Washing of aggregates may only be carried out using clean fresh water obtained from an approved source.

The Contractor is to provide adequate storage facilities and arrange to obtain this water at times chosen so as to cause the minimum of inconvenience to other consumers.

#### Storage of Aggregates

The Contractor shall provide proper means of storing aggregates at each point where concrete is made and in such a manner that there is no possibility of the various aggregates mixing one with the other. Effective precautions shall be taken to prevent the aggregates segregating in the storage heaps and from being contaminated by the ground and other foreign matter.

Storage heaps shall be capable of draining freely. Wet aggregates shall not be used until, in the Employer's Representative's opinion they have completely drained. Where aggregates are damp, the Contractor must measure the moisture content of the aggregates and adjust the amounts of aggregates and added water in each batch of concrete mixed to allow for the water contained in the aggregates. If necessary to meet the requirement of this Clause, the Contractor shall protect the heaps of aggregate from inclement weather.

#### ***Fine Aggregates***

##### General

Fine aggregates shall be clean hard and durable and shall be natural sand, crushed gravel sand and crushed rock sand complying with BS EN 12620:2002. All material shall pass through a 3/8 ASTM sieve and the grading shall be in accordance with Zones 1, 2 or 3 of Table 1. In order to achieve an acceptable grading, it may be necessary to blend materials from more than one source. Fine aggregate for mortar only shall comply with BS EN 13139:2002.

The fine aggregate shall not contain iron pyrites or iron oxides. It shall not contain mica, shale, coal or other laminar, soft or porous materials or organic matter unless the Contractor can show by comparative tests, on finished concrete as set out in the series of tests described in BS EN 12390, that the presence of such materials does not adversely affect the properties of the concrete.

##### Fine Dust

Content passing a # 200 sieve shall not exceed 3 per cent for natural or crushed gravel sand or 15 per cent for crushed rock sand.

#### ***Coarse Aggregates***

General

Coarse aggregates shall consist of crushed rock, gravel, or crushed gravel, free from coating or clays or other deleterious material. It shall not contain harmful materials such as iron pyrites, coal mica, laminated material or any materials in sufficient quantity to adversely affect the strength and durability of the concrete. If necessary, coarse aggregate shall be washed to remove the deleterious material. In addition to the above, the coarse aggregate material shall have a flakiness index not exceeding 30%. The individual pieces shall be roughly cubical or spherical in shape and have neither glassy nor powdery surfaces.

“Ten per cent Fines” Value

The “Ten per cent fines” value when determined in accordance with BS 812 Part 111:1990 shall not be less than 5000kg (5 tons).

The Grading

The grading of the coarse aggregate particles is required to satisfy the percentages given in Table 1 with a content not exceeding 1% passing the # 6 sieve size. The percentage passing through the # 200 shall be determined by methods described in BS 812 Section 103.1:1985.

Alternatively the latest requirements of BS EN 12620:2002 for both coarse and fine grading may be adopted if agreed with by the Employer’s Representative.

Additional Requirements

Aggregate Crushing Value (ACV) (BS 812 Part 110:1990) Not more than 35%.

Los Angeles Abrasion (LAA) (ASTM C-131): Not more than 45%.

NOTE: Total chloride and sulphate content

The total chloride content, (ASTM C1218-20 or C1152-20) expressed as chloride ion, arising from all ingredients in a mix including cement, water and admixtures shall not exceed the following limits, expressed as a percentage of the weights of cement in the mix:

For reinforced concrete: 0.3 per cent in 95 per cent of all tests results provided no result is more than 0.5 per cent.

The total sulphate content, (BS EN 1744-1:2009+A1:2012) expressed as SO<sub>3</sub> of all the ingredients in a mix including cement, water and admixture shall not exceed 0.4 per cent by weight of the aggregate or 4.0 per cent of the weight of cement in the mix, whichever is the lesser.

The Contractor shall ensure that the source rock for the coarse aggregate is properly selected and sufficiently processed to produce coarse aggregate that consistently complies with the Specifications.

**Water**

All water used for mixing of concrete shall comply with all requirements for potable water used in Guyana.

**Table 1 - Grading of Coarse and Fine Aggregates**

	Percentage by weight passing
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ASTM sieve size	Fine Aggregate			Coarse Aggregate		
	Grading Zone 1	Grading Zone 2	Grading Zone 3	Grading 40–5mm	Grading 20–5mm	Grading 14–5mm
3 in				100		
1 ½ in				100		
1 ½ in				95-100	100	
¾ in				35-70	95-100	100
5/8 in				-	-	100
3/8 in	100	100	100	10-40	30-60	90-100
#4	90-100	90-100	90-100	0-5	0-10	0-10
#8	60-95	75-100	85-100			
#16	30-70	55-90	75-100			
#30	15-34	35-59	60-100			
#50	5-20	8-30	12-40			
#100	0-10	0-10	0-10			
#200	0-3	0-3	0-3	0-1	0-1	0-1

#### PROPORTION OF CONCRETE MIXES

At the commencement of the Works the Contractor shall indicate the type of compaction equipment, which he intends to use in the various parts of the Works and obtain the approval of the Employer's Representative thereto. The contractor shall produce mixes for concretes of grades as required, each design fulfilling the following requirements:

1. The cement, the aggregates and the water shall all comply with the appropriate Clauses of this Specification.
2. The cement content shall be not less than that shown in **Table 2** of this Specification.
3. The water content for each mix shall be such as to give the required workability (compaction factor). Where different methods of compaction are to be employed for the same grade of concrete, involving different compacting factors, then a separate design mix shall be prepared for each case, to satisfy the requirements of the appropriate clause of this Specification.
4. The resistance to chemical attack and durability of the concrete shall be considered in accordance with the guidance given in Building Research Establishment Special Digest 1; Concrete in Aggressive Ground, or a similar approved document.
5. Concrete strength shall be in accordance with **Table 2**

**Table 2 – 150mm Concrete Cube Strengths (BS EN 12350-1:2012)**

Grade (Class)	Minimum Cementitious Content	Maximum Water Cementitious Ratio	Design Strength at 28 Days		Min Cube Strength at 7 Days	
	Kg/m <sup>3</sup>	kg/kg	N/mm <sup>2</sup>	PSI	N/mm <sup>2</sup>	PSI
7 (E)	145	0.50	7.0	1000	4.0	600
15 (D)	160	0.48	15.0	2200	10.0	1450
20 (C)	160	0.48	20.0	2900	13.5	2000
25 (B)	175	0.45	25.0	3600	16.5	2400
30 (A)	190	0.44	30.0	4350	20.0	2900
40 (S)	250	0.40	40.0	5800	28.0	4050
45 (P)	250	0.40	45.0	6525	31.0	4500

### TRIAL MIXES

The Contractor shall prepare, in the presence of the Employer's Representative, a trial mix of each design grade of concrete. The actual proportions will be determined on the basis of trial mixes made by the Contractor and carried out with the materials to be used in the Works. Each batch shall be not less than half a cubic meter in bulk before mixing and shall be mixed as specified in Clause 1-6 of this Specification in a mechanical mixer of the type approved for use in the Works. Three separate batches of concrete shall be prepared for each trial mix.

The compacting factor and slump of each batch shall be determined immediately after mixing as directed in BS EN 12350-4:2009 and shall not exceed the maximum value required in the mix design. Each trial mix shall be handled and compacted by the methods, which the Contractor proposes to use for that mix in the Works, and the mixes shall show no tendency of inadequate compaction by the methods proposed. 150mm compression test cubes shall be made from each batch of the trial mix. The cubes shall be made, cured, stored, and tested in accordance with the requirements of BS EN 12350-1:2012. Three cubes shall be tested 7 days after manufacture and three more 28 days after manufacture. The strength requirements of the cubes at each age shall be considered to be satisfied if none of the strengths of the groups of three cubes tested at each age falls below the appropriate design strength or if the average strength of the three cubes is not less than the design strength and the difference between the greatest and least strengths is not more than 20 per cent of that average. Failing this, the Contractor shall re-design the mix and make such further trials mixes and test such further cubes as the Employer's Representative may direct until the requirements of this Specification are satisfied.

The design mixes which fulfill the requirements of this Specification for a particular grade of concrete shall be called the approved mixes for that grade of concrete and the Contractor shall only use the approved mixes where that grade of concrete is specified, and shall not depart there from without the written permission of the Employer's Representative. If a change is intended in the materials or in the proportions of the materials to be used, the Employer's Representative will require further trial mixes and further cube tests to be made before any permission is given.

The Contractor shall allow ample time in his program for designing and making trial mixes and for the preparation and testing of compression test cubes obtained there from. Should any design mix fail to satisfy the requirements of this Specification and should the Employer's Representative

consider that it is essential to commence the production of that grade of concrete before the results of the cube tests of a further design mix are available, he will consult with the Contractor and decide on an interim mix for use until such time as the results of the cube tests have become known, any extra cost involved being borne by the Contractor.

The Employer's Representative will approve each concrete mix if the trial mixes meet the specification mentioned above.

The Contractor shall be deemed to have satisfied himself that the materials on which he has quoted will produce a concrete which, with the specified nominal proportions and subsequent adjustments as indicated by the trial mixes, will develop the cube strengths specified and at the same time have the desired workability in the work itself.

## **MIXING OF CONCRETE**

### ***1 General***

Concrete shall be mixed in approved mechanical mixers of the weigh-batch type, and fitted with an approved weight-measuring device. No hand mixing will be permitted. Mixing shall continue until there is a thorough distribution of the materials, and the mass is of uniform colour and consistency. The period of mixing, judged from the time that all materials including the water are in the mixer, shall be not less than 2 minutes with a rotation of the mixer drum at least 10 revolutions per minute, or as ordered by the Employer's Representative. Hand mixing using volume boxes may be approved with written approval from the Project Manager's Representative

The entire contents of the drum shall be discharged before materials for the next batch are fed in. Should there, for any reason, be a stoppage of greater than 30 minutes duration, the drum of the mixer shall be thoroughly washed out with clean fresh water before mixing is resumed.

### ***Re-mixing Concrete***

No partly set concrete shall be placed in the Works. Concrete which has commenced initial set shall not be re-mixed either with nor without additional water and in no case shall such concrete be used in the Works.

## **QUALITY CONTROL OF CONCRETE**

### ***1 Employer's Representative Control and Approval of Materials, etc***

Before their use in the Works, the Contractor shall show to the satisfaction of the Employer's Representative that all materials and methods of storage and mixing to be employed in the production of concrete conform in every way with the requirements of this Specification. Such deliveries of materials to the Site as the Employer's Representative may designate shall be tested and analyzed to ensure that they comply and the tests shall be carried out sufficiently in advance of their intended use in the Works to allow the results to be studied and the materials approved, modified or rejected by the Employer's Representative as the case may be. The Contractor shall remove all rejected materials from the Site without delay and at his own cost. Permission to use any material shall not be construed as an approval of its source, nor any acceptance as continued acceptance.

### ***Compacting Factor***

Workability of concrete shall be measured by the compacting factor. The Contractor shall provide a compacting factor apparatus conveniently accessible to each concrete mixer and shall measure the compacting factor by the method described in BS EN 12350-4:2009 at frequent intervals or as frequently as the Employer's Representative may direct. Whenever the compacting factor varies from that of the approved mix the quantity of water added to the mix shall be immediately adjusted to counteract the variation. The successive values of the compacting factor and the quantity of water added shall be recorded on a suitable quality control chart, which shall be kept near the mixer and submitted to the Employer's Representative for his inspection as he may direct.

In addition to the tests mentioned above, as frequently as the Employer's Representative may decide and at least once each day when concreting is in progress, the Contractor shall sample and test the aggregate due shortly for incorporation into the Works in Accordance with the relevant tests as per BS EN 12350.

#### Sieve Analysis of both Coarse and Fine Aggregate

The grading of all aggregates must be within the respective limits specified in Clauses 1-3. If this cannot be achieved, the Employer's Representative shall instruct the Contractor to make such modifications to the proportions of aggregate in the mix as will allow for such difference, and the Contractor shall immediately do so.

#### Determination of Clay, Fine Silt and Fine Dust in the Fine Aggregate BS 812 Clause 7.2.4

Should the amount of clay, fine silt and fine dust exceed the limits specified, then the Contractor shall refrain from using the aggregate until he satisfies the Employer's Representative of its suitability for making concrete of the quality required.

#### Determination of Organic Impurities

Should the colour produced by this test be as dark as the standard solution, the aggregate shall not be used until the further comparative tests as per AASHTO T21-05 (2009) specified in Section 10 have been carried out and given satisfactory results.

### ***Works Cube Strength***

#### Works Cube Manufacture Test

Work cubes, shall be made and cured in the manner described in BS EN 12350-1:2012 Where the concrete is vibrated the cubes shall be compacted by similar means in such a way that full compaction of the concrete with neither segregation nor excessive laitance is obtained.

#### Checking Works Cube Strength

At the commencement of concreting work, a sample of the concrete shall be taken on each of the first four days and work cubes shall be made. Six cubes shall be made from each sample taken, three for testing at 7 days, and three for testing at 28 days. The average strength of the three cubes tested at each age will be taken as the Works Cube Strength of the concrete. This cube strength shall be accepted in complying with the specified requirements for works cube strength if none of the compressive strength or if the average strength is not less than the specified Works Cube Strength and the difference between the greatest and least strengths is not more than 20% of that average.

If the 7 day strengths deduced from these tests from the first four days of concreting do not reach the required value, the mix shall be re-designed. After the first four days, the frequency of sampling and the number of samples to be taken will be as directed by the Employer's Representative but not less than 6 cubes for every 7.5 cu metres batched. If 7 days' results taken for early indication fail to satisfy the strength requirements the mix proportions and batching methods should be investigated immediately.

During daily concrete production six (6) cubes shall be taken at each site where concrete is cast. Three (3) cubes will be tested after seven (7) days and three (3) will be tested after twenty-eight (28) days.

### ***Independent Test Cubes***

The Contractor shall arrange for the Employer's Representative to be present during the sampling of the concrete and the manufacture, storing and curing of the cubes to ensure that there is complete agreement between himself and the Employer's Representative that the said cubes are entirely acceptable as test cubes. Should the Contractor fail to arrange for the Employer's Representative to be present when required, or decline to do so, the cubes so manufactured will not be accepted as test cubes.

Should the Contractor wish to make independent test cubes he may do so at his own expense, but the results will not be valid unless the cubes are manufactured in the presence of the Employer's Representative and tested by an approved agency, all in accordance with BS EN 12390-1:2012

The results of all the cube tests shall be shown on an approved form, giving the reference number of the cube, its size and weight, the grade of concrete from which it was made, the compaction factor, the date on which it was tested, the total load at which it failed, the stress in MPa. and the location of structure at which the sample concrete was taken. Two copies of each test certificate, containing all the information mentioned above, shall be forwarded to the Employer's Representative for his retention and a third copy retained in the Laboratory.

### ***Failure of Test Cubes for Strength Requirement***

Should test cubes crushed at 7 days or those crushed at 28 days, fail to satisfy the specified requirements, the Contractor shall stop all concrete work until, on the Employer's Representative's Instructions, until one or more of the following steps have been taken:

1. The Contractor shall alter the design of the mix to increase its average compressive strength.
2. The Contractor shall alter the methods of making the concrete and controlling its quality to reduce the variability of the concrete.
3. The Contractor shall cut out and replace all concrete placed in the Works on any day in which a cube was made and failed after 28 days if, in the opinion of the Employer's Representative, such concrete is likely to be incapable of fulfilling its purpose.

### ***Correlation of Test***

Tests on concrete materials and concrete shall be made as often as directed by the Employer's Representative and at instances such that the test results can be directly correlated to the works test cubes for a particular batch of concrete.

## **TESTING**

In addition, no more than fifty percent (50%) of the testing will be apportioned as random tests at the Project Manager's discretion. The Contractor is required to carry out any field or laboratory testing as described by the Specifications at any given time within the project duration at the Ministry of Public Infrastructure Laboratory. The Contractor will also bare the cost or responsibility of arranging transportation for collecting samples, storage of samples and testing equipment to and from site.

## **TRANSPORTATION OF CONCRETE**

Concrete shall be taken from the place of mixing to the place of deposition by methods which will prevent the drying-out and consolidation of the concrete, the segregation and loss of ingredients, and which are sufficiently rapid to ensure that the concrete does not commence to set before it is finally consolidated in position. During transportation the concrete shall be protected from any adverse effects of sun, wind, and rain. The concrete shall be deposited as near as possible to its final position in the Works, and no concrete shall be dropped freely or deposited by means of chutes through a depth exceeding 1.5m. All mixers, barrows, spades and other mixing and distribution equipment shall be thoroughly clean before commencing each period of use and shall be kept free of partly set concrete which shall not be used in the Works. No concrete shall be transported over or near to new work that has insufficiently hardened, in order to prevent harmful vibration of the new work and no planks or ways for skips, etc. shall be supported on either formwork or reinforcement for the same reason.

## **PLACING AND CONSOLIDATION OF CONCRETE**

No concrete shall be placed on any part of the Works until written permission to do so has been obtained from the Employer's Representative. Well in advance of the intention to place concrete, the Contractor shall forward to the Employer's Representative for his approval full information about the order in which he proposes to place concrete in the various parts of the Works, the height of each lift of concrete and details of the shuttering which it is proposed to employ, with relevant calculations and positions of all construction joints.

All construction joints shall be formed as specified in Clause 1-13 and there shall be no stoppage of placing concrete except at proper construction joints.

The Contractor will be required to furnish the Employer's Representative with satisfactory evidence that all preparations, precautions and provisions have been made to ensure that the concrete shall be placed and compacted in accordance with this Specification before the Employer's Representative will give his permission for concreting to proceed.

For members involving "vertical" placing of concrete (e.g. walls) each lift shall be deposited in layers extending for the full width between shuttering and of such depth that each layer can be easily and effectively incorporated with the layer below by the means of consolidation being employed.

The layers shall be placed horizontally, sloping beds not being permitted unless particularly so specified.

For members involving “horizontal” placing of concrete (e.g floor and roof slabs) the concrete shall be placed along the line of the starting point in such quantities as will allow the member to be cast to its full depth along the full width between side shuttering and then gradually brought towards the finishing point along its entire front, parallel to the starting line, the tampers for giving the required surface and compaction following as closely behind as practicable.

All members shall be concreted at such a rate as will eliminate any possibility of fresh batches of concrete being deposited immediately adjacent to batches which have commenced to set, and all members shall be poured in one continuous operation until completed, no interval being allowed to lapse while the work is in hand.

Care shall be taken to ensure that the process of placing concrete does not cause any harmful vibration to adjacent work that has insufficiently hardened.

Should any unforeseen occurrence result in a stoppage of concreting for such a time as might allow the concrete already place to begin to set before the next batches can be consolidated in place, the Contractor shall immediately insert, at his own cost, a proper end-shutter to form a proper tongue and groove construction joint, as specified in Clause 1-13. The joint shall be normal to the work at that point which will ensure that the section already cast is formed completely in accordance with this Specification. Any additional reinforcement required as a result of the joint shall be provided by the Contractor at his own expense.

Large, exposed (horizontal) concrete surfaces may require protection from the direct rays of the sun or other adverse weather effects. The Contractor shall take all reasonable precautions to protect the concrete surfaces in accordance with these specifications, or as approved by the Employer’s Representative. Failure to protect such surfaces may result in rejection of the work by the Employer’s Representative.

Consolidation of the concrete shall be affected by either hand or mechanical means and all consolidating tools must be approved by the Employer’s Representative before being used in the Works. The concrete shall be worked well up against whatever surface it adjoins and consolidated to such a degree that it reaches its maximum density as a homogenous mass, free from air and water holds, and penetrates to all corners of the moulds and shuttering and completely surrounds the reinforcement. Care shall be taken to ensure that neither hand tampers or mechanical vibrators come into contact with the formwork, reinforcement, or any embedded fittings and to prevent the operation of consolidation from transmitting any harmful vibrations or shocks to concrete which has not yet hardened sufficiently. Comment: Impossible

Compliance with the conditions of this Clause may require working longer hours than usual and the Contractor must allow for this in his program for concreting.

#### **CONCRETE PLACED UNDER WATER**

Concrete shall be placed under water only where particularly so specified and approved by the Employer’s Representative. The quantity of cement in any concrete placed under water shall be increased by at least 25% above the cement content of the appropriate approved mix. Concrete shall

be placed in still water only and every precaution shall be taken to prevent the cement and fine materials from being washed out of the concrete.

Concrete shall be placed either with a tremie or a bottom-opening box of a type approved by the Employer's Representative. Bottom opening boxes shall not be opened until they are resting on the work and the lower ends of tremie pipes shall always be kept below the surface of the wet concrete already deposited. No concrete shall be allowed to fall through water at any time. Concrete shall be placed evenly over the whole area closed by the shuttering and must not be raked over, only the minimum of screeding being allowed once the concrete has been placed.

#### **PLACEMENT OF SULPHATE RESISTING CONCRETE**

In such situations where the use of sulphate resisting Portland cement is required, particular care shall be taken to keep the ground water level below the level of the concrete being placed until that concrete has hardened and has been cured as specified in Clause 1-15.

#### **ATTENDANCE OF JOINER AND STEEL FIXER**

During all concreting operations, the Contractor shall ensure that a competent joiner and a competent steel fixer (in the case of reinforced work and work in which fittings are embedded) are in attendance on each concreting gang. It shall be their duty to ensure that the formwork is maintained in accordance with the Specification, temporary construction joints inserted as necessary, and reinforcement and fittings maintained in place as the work proceeds.

#### **CONSTRUCTION JOINTS**

##### ***1 General***

All construction joints in all classes of work shall be formed by inserting stopping-off boards normal to the work to form a tongue and groove joint as required and against which the concrete can be properly consolidated. They shall be formed in the position shown on the Drawings or as directed and approved by the Employer's Representative. There shall be no construction joints in pre-cast members nor in the reinforced concrete deck slabs of minor spans. In the case of T-beams the rib and slab shall be cast together in one continuous operation. In other work, construction joints shall be located at points where shear stresses or tensile concrete stresses are a minimum and at places where they will least affect the appearance and properties of the finished works. No construction joint may be inserted without the written approval of the Employer's Representative. Any proposed construction joint shall be provided by the Contractor at his own cost.

When work is resumed against a horizontal surface, which has hardened or recently set, the surface of the concrete shall be roughened by hacking and all laitance, loose and porous material and poorly consolidated concrete shall be removed from it. Where reinforcement or fittings project from the older concrete, these shall be carefully cleaned, the utmost care being taken not to break the bond, and freed from all adherent coatings of concrete and other matter likely to reduce the bond between the steel and the concrete about to be poured. The surface of the concrete (and steel if applicable) shall then be swept clean, brushed with a steel wire brush to remove all loose material, saturated with water, thoroughly cleaned and all surplus water removed.

Existing concrete surfaces shall be washed with clean potable water and allowed to dry to a damp condition prior to placing fresh concrete. Fresh concrete shall be thoroughly consolidated against all surfaces.

#### ***Joints to prevent bonding of adjacent surfaces***

Where it is specified on the Drawings that a joint is to be inserted to prevent bonding between two adjacent parts of the structure, the Contractor shall insert two layers of approved waterproof building paper between those parts of the structure in the positions specified. The paper shall be tailored to fit the surfaces accurately without any folding or wrinkling, and cut overlapping edges shall be covered with adhesive tape to prevent any turning or movement during concreting operations. Throughout the area of the joint there must be not less than two thicknesses of approved waterproof building paper.

Concreting operations shall be carried out carefully to ensure that no damage shall be done to the paper. Instead of waterproof building paper the Contractor can use bond breaker, which will be applied in two layers. The second layer can only be applied after the first layer has dried.

#### **REMEDIAL WORK TO DEFECTIVE SURFACES**

If, on stripping formwork the concrete surface is found to be defective in any way, the Contractor shall make no attempt to remedy such defects prior to the Employer's Representative's inspection and the receipt of any instructions, which the Employer's Representative may give.

Defective surfaces shall not be made good by plastering.

Areas of honeycombing, which the Employer's Representative agrees may be repaired, shall be cut back to sound concrete or to 75mm whichever is the greater distance. In the case of reinforced concrete the area shall be cut back to at least 25mm clear distance behind the reinforcement or to 75mm, whichever is the greater distance. The cavity shall have sides at right angles to the face of the concrete. After cleaning out with water and compressed air, a thin layer of cement grout shall be brushed on to the concrete before repairing with concrete of the same class as the main body but with aggregate smaller than 19mm nominal size. If repairs are made two weeks after the concrete has been cast the repaired concrete should be epoxy concrete. The amount of epoxy added to the concrete shall comply with the epoxy manufacturer's specification. A form shall be used against the cavity, provided with a lip to enable concrete to be placed. The form shall be filled to a point above the edge of the cavity.

After seven days the lip of concrete shall be broken off and the surface ground smooth.

Surface irregularities, which are outside the limits of acceptable tolerance, shall be ground down in the manner and to the extent instructed by the Employer's Representative.

Defects other than those mentioned above shall be dealt with as instructed by the Employer's Representative.

#### **CURING OF CONCRETE**

### **1 General**

During curing of concrete all precautions shall be taken to ensure a slow heat evolution and the absence of cracks. The temperature of the hot concrete surfaces shall not be subjected to sudden changes by spraying cold water and the concrete must be protected from sunshine and wind. Freshly placed concrete must be protected from rain.

#### ***Water Curing***

Importance is attached to the proper curing of the freshly placed concrete and the Contractor must ensure that it is effectively done. All newly placed concrete shall be protected from the effect of rain, drying winds and the sun by suitable screens of damp Hessian, etc., supported on frames until the concrete has hardened sufficiently to support them directly without marking. The ends of and sides of the screens shall be held down at the edges to prevent drafts from getting underneath. As soon as the concrete has hardened sufficiently to support the covering without marking, it shall be covered with clean sacks, hessian, or a 50mm thick layer of clean sand or other approved material which shall be kept continuously wet. When the shuttering is removed, the damp hessian or sacks shall be hung directly around the concrete member and kept continuously wet by spraying with clean fresh water.

Providing that the shuttering has been covered with approved mold oil which will prevent the timber from absorbing water from the concrete, the time that the concrete remains in formwork under the conditions herein specified shall count as part of the curing period. Curing of all concrete shall continue for at least 7 days, or as directed by the Employer's Representative or as otherwise specified. On no account must the surrounding sacks, hessian, sand, etc., be allowed to dry out during the curing period.

#### ***Resinous Curing***

As an alternative method of curing, the surface may be protected, where approved by the Employer's Representative, by treating with an approved resinous curing compound, mechanically sprayed on to the surface of the finished concrete at a rate approved by the Employer's Representative.

Unless otherwise directed by the Employer's Representative the compound shall be applied immediately after completion of laying and finishing of the concrete. Any groove over a joint shall be protected from the entry of curing liquid.

## **FORMWORK FOR CONCRETE**

### **1 Definitions**

Formwork means the surface against which concrete is placed to form a face, together with all the immediate supports to retain it in position while concrete is placed.

False work means the structural elements supporting both the formwork and the concrete until the concrete becomes self-supporting.

A formed face is one, which has been cast against formwork.

An exposed face is one, which will remain visible when casting has been completed.

#### ***Construction of formwork***

Formwork shall include all temporary or permanent forms required for forming the concrete, together with all temporary construction required for their support.

All formwork shall be so constructed that there shall be no loss of material from the concrete. After hardening, the concrete shall be in the position and of the shape, dimensions and surface finish described in the Contract.

Where internal metal ties are permitted, they or their removable parts shall be extracted without damage to the concrete and the remaining holes filled with mortar. No permanently embedded metal part shall have less than 38mm cover to the finished concrete surface.

### ***Formed surfaces - classes of finish***

The requirements extra to those given above to provide the class of finish required shall be:

- Class F1- Nil
- Class F2- The irregularities in the finish shall be no greater than those obtained from the use of wrought thickness square edged boards arranged in a uniform pattern. The finish is intended to be left as struck but imperfections such as fins and surface discoloration shall, if required, shall be made good by methods approved by the Employer's Representative.
- Class F3- The formwork shall be lined with a material approved by the Employer's Representative to provide a smooth finish of uniform texture and appearance. This material shall leave no stain on the concrete and shall be so joined and fixed as to impart no blemishes on removal. It shall be of the same type and obtained from only one source throughout any one structure. The Contractor shall make good any imperfections in the resulting finish as required by the Employer's Representative. Internal ties and embedded metal parts will be allowed only with the Employer's Representative's specific approval.

The Contractor shall ensure that permanently exposed concrete surfaces of Class F3 and F2 finish are protected from rust marks, spillage and stains of all kinds.

All exposed formed surfaces of abutments, wing-wall capping beams and pier caps shall receive a class F2 or F3 finish. Permanently buried surfaces of abutment and pier caps shall receive a class F1 finish. Exterior exposed cast in-situ vertical faces of bridge decks and traffic barriers shall receive a class F2 or F3 finish.

Vertical faces and the interior horizontal surfaces of in-situ concrete box culvert elements shall receive a class F2 or F3 finish. The exterior surfaces of in-situ concrete box culvert elements shall receive a class F1 finish.

All exposed edges and at all lift heights shall be chamfered.

### ***Preparation of formwork before concreting***

The inside surfaces of forms shall, except for permanent formwork, or unless otherwise agreed by the Employer's Representative, be coated with an approved material to prevent adhesion of the concrete. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not come into contact with the reinforcement or pre-stressing tendons and anchorages. Different release agents shall not be used on formwork for concrete, which will be visible on the finished Works.

Immediately before concreting, all forms shall be thoroughly cleaned out.

### ***Removal of formwork***

The Employer's Representative shall be informed in advance when the Contractor intends to strike any formwork. Attention is drawn to provisions against early loading.

The time at which the formwork is struck shall be the Contractor's responsibility, but the minimum periods between concreting and the removal of forms shall be as follows:

<b>Part of Structure</b>	<b>Ordinary Portland Cement</b>
Side of walls, beams, columns and piles	1 day
Soffit of slabs (props left in)	7 days
Props under slabs	14 days

The periods stated above are based on a constant concrete surface temperature of 16°C (61°F) and the use of Portland cement. They may be changed if other types of cement are used, subject to the Employer's Representative's agreement.

Formwork shall be constructed so that the side forms of members can be removed without disturbing the soffit forms and, if props are to be left in place when the soffit forms are removed, these props shall not be disturbed during the striking.

For pre-stressed units the side forms shall be eased as early as possible and the soffit forms shall permit deformation of the member when the pre-stress is applied.

All formwork shall be removed without damage to the concrete.

Where it is intended that formwork is to be re-used it shall be cleaned and made good to the satisfaction of the Employer's Representative.

### ***Unformed surfaces - classes of finish***

1. Class U1 - The concrete shall be uniformly levelled and screeded to produce a plain or ridged surface as described in the Contract. No further work shall be applied to the surface unless it is used as the first stage for a Class U2 or Class U3 finish.
2. Class U2 - After the concrete has hardened sufficiently, the concrete Class U2 surface shall be sufficiently floated by hand or machine to produce a uniform surface free from screed marks.
3. Class U3 - When the moisture film has disappeared and the concrete has hardened sufficiently to prevent laitance from being worked to the surface, a Class U3 surface shall be steel-towelled under firm pressure to produce a dense, smooth uniform surface free from trowel marks.

The top surfaces of abutments and pier caps shall receive a class U2 finish. Top surfaces of cast-in-place copings shall receive a class U3 finish.

### ***Remedial treatment of surfaces***

Any remedial treatment to surfaces shall be agreed with the Employer's Representative in accordance with Clause 1-14 following inspection after immediately removing the formwork. This shall be carried out without delay.

Any concrete, the surface of which has been treated before being inspected by the Employer's Representative, shall be liable to rejection.

## REINFORCEMENT FOR CONCRETE

### *1 General*

Reinforcement shall comply with the following Standards that cover plain and deformed bar reinforcement and steel fabric to be cast into concrete in any part of the Works but do not include pre-stressing tendons or any other embedded steel.

ASTM A615/A615M-20 Grade 40, Grade 60 or BS 4449:2005+A2:2009 for hot rolled steel bars for the reinforcement of concrete, BS 4482:2005 for cold reduced steel wire for the reinforcement of concrete, BS 4483:2005 for steel mesh fabric for the reinforcement of concrete. Stainless steel dowel bars and stainless steel reinforcing bars, where required and as shown on the plans, shall conform to BS 6744:2001+A2:2009 or ASTM A955/A955M-20c and shall be at least grade 413 MPa (60 ksi).

All reinforcement shall be from an approved manufacturer and, if required by the Employer's Representative, the Contractor shall submit a test certificate from the manufacturer.

All reinforcement for use in the Works shall be tested for compliance with the appropriate Standard in a laboratory acceptable to the Employer's Representative and two copies of each test certificate shall be supplied to the Employer's Representative.

The frequency of testing shall be as set out in the Standard.

In addition to the testing requirements described above, the Contractor may be required to carry out additional tests as instructed by the Employer's Representative.

Any reinforcement, which does not comply with the Specification, shall be removed from Site.

### *Storage of reinforcement*

All reinforcement shall be delivered to Site either in straight lengths or cut and bent. No reinforcement shall be accepted in long lengths, which have been transported bent over double.

Any reinforcement, which is likely to remain in storage for a long period, shall be protected from the weather so as to avoid corrosion and pitting. All reinforcement which has become corroded or pitted to an extent which, in the opinion of the Employer's Representative, will affect its properties shall either be removed from Site or may be tested for compliance with the appropriate Standard in accordance with this Clause at the Contractor's expense.

### *Bending reinforcement*

Unless otherwise shown on the Drawings, bending and cutting shall comply with BS 8666:2005.

The Contractor shall satisfy himself as to the accuracy of any bar bending schedules supplied and shall be responsible for cutting, bending, and fixing the reinforcement in accordance with the Drawings.

Bars shall be bent cold by the application of slow steady pressure. At temperature below 5<sup>0</sup>C the rate of bending shall be reduced if necessary to prevent fracturing the steel.

If instructed by the Project Manager's Representative after bending, bars shall be securely tied together in bundles or groups and legibly labelled as set out in BS 8666:2005.

Reinforcement shall be thoroughly cleaned and all dirt, scale, loose rust, oil and other contaminants removed before it is placed in the Works.

### ***Placing of reinforcement***

Reinforcement shall be placed and maintained in the position shown in the Contract. Unless otherwise permitted by the Employer's Representative, all intersecting bars shall be tied together and the ends of the tying wire shall be turned into the main body of the concrete.

No splices shall be made in the reinforcement except where described in the Contract or where approved by the Employer's Representative.

### ***Cover Blocks***

Cover blocks required for ensuring that the reinforcement is correctly positioned, shall be as small as possible consistent with their purpose, shape acceptable to the Employer's Representative, and designed so that they will not overturn when the concrete is placed. They shall be made of concrete with 8mm maximum aggregate size and the mix proportions shall comply with the Specification to produce the same strength as the adjacent concrete. Wire shall be cast in the block for the purpose of tying it to the reinforcement.

### ***Welding reinforcement***

Reinforcement in structures shall not be welded except where permitted in the contract. All welding procedures shall be subject to the prior approval of the Employer's Representative in writing.

## **MOVEMENT JOINTS AND SEALS**

The term "movement joint" includes all types of permanent joint or hinge throat which allow expansion, contraction, shrinkage or angular rotation to take place.

Movement joints shall be constructed all in accordance with the Contract Plans and Manufacturer's instructions.

The size of the gap shall be compatible with the mean structure temperature at the time of installation. This temperature shall be determined in accordance with arrangements agreed with the Project Manager. An approved preformed expansion joint filler shall be installed at approach slab to deck joints and all similar locations as required on the Contract Plans.

The position of all bolts cast into concrete and holes drilled in plates shall be accurately determined from templates.

### ***1 Prevention of damage***

During placing and hardening of concrete or mortar under expansion joint components, relative movement shall be prevented between them and the supports to which they are being fixed.

When one half of the joint is being set, the other half shall be completely free from longitudinal restraint. In particular where strong backs or templates are used to locate the two sides of a joint, they shall not be fixed simultaneously to both sides.

Screw threads shall be kept clean and free from rust. Ramps shall be provided and maintained to protect all expansion joints from vehicular loading. Vehicles shall cross the joints only by means of the ramps until the Project Manager permits their removal.

#### ***Sealing of deck joints and overlay***

The sealant shall be hot poured rubber bitumen sealant or polysulphide sealant as approved by the Project Manager. Both shall be used in accordance with the manufacturer's recommendations. Joints shall be clean and dry before sealing. There shall be no separate payment for the provision and installation of sealed deck joints and joints in the overlay at the ends of bridge decks or over intermediate piers (as indicated on the Contract Plans). All costs for this work shall be deemed to be included in the costs for all other structure and overlay items.

#### ***Approved pre-moulded compression strip seal joints***

(i.e., "Jeene" joints or other approved joints) shall be installed carefully to the lines and grades required on the plans. All installation shall be in strict accordance with the Manufacturer's recommendations and needs of the Contract Plans. Payment shall be made for the length, size and type of joint installed.

#### **Mild steel tie rods**

Reinforcement to structures shall include mild steel tie rods which will be installed carefully to line and grade as shown in the drawings. The rate shall include splicing couplings, bolts nuts and washers, 'fishtail' lock nuts, hessian wrap and painting the rod with a rust inhibitor.

#### **MEASUREMENT AND PAYMENT**

Payment for Blinding Concrete, Concrete for Structures and Other Uses, Steel Reinforcement, Fabric Reinforcement and Pre Molded Compression Strip Seal Joints will be made as defined in the drawings or as approved by the Project Manager. No payment shall be made for any additional material required for steel or concrete testing or calibration, nor for any excess material cast in excess of the approved quantities unless such work is specifically instructed by the Project Manager as a variation from the drawings. Payment for all testing is included in the rates.

Blinding concrete shall be measured by the cubic metre calculated as the product of the plan area of the foundation as shown on the Drawings and the instructed thickness. No deduction shall be made for openings provided that the area of each is less than 0.5 square metres. Blinding concrete over hard material shall be measured, as the volume used provided that a maximum thickness of 150mm allowed for over break is not exceeded.

The rate for blinding concrete shall include for all costs associated with the work in this Specification.

Concrete for Structures shall be measure by the cubic metre of each class calculated from the dimensions given on the Drawings or instructed by the Project Manager. No deduction shall be made in the measurement for:

1. Bolt holes, pockets, box outs and cast in components provided that the volume of each is less than 0.2 cubic meters.
2. Mortar beds, fillets, drips, rebates, recesses, grooves, chamfers and the like of 100mm total width or less.

The rate for concrete for Structures shall include for the cost:

1. Provision and transport of cement aggregates and water.
2. Mortar beds, fillets, drips, rebates, recesses, grooves, chamfers and the like of 100mm total width or less.
3. Admixtures and workability agents including submission of details unless specified.
4. Batching, mixing, transporting, placing, compacting and curing.
5. Class U1, U2 and U3 finish.
6. Laying to sloping surfaces not exceeding 15 degrees from the horizontal and to falls.
7. Formwork to blinding concrete.
8. Formwork class F1, F2 and F3
9. Placing and consolidating against excavated surfaces where required including any additional concrete to fill over break or working space.
10. Providing, shaping and installing all preformed joint filler material for expansion joints and the like.
11. Complying with the requirements of Clauses 1-1 to 1-17 inclusive

Reinforcement will be measured in kg of each type of reinforcement for all ranges of diameters. Plain steel and deformed bar reinforcement shall be measured by the kg and shall be the calculated weight of the steel required including splice lengths shown on the Drawings. No allowance shall be made in the measurement for rolling margin or cutting waste. The density of steel shall be taken as 7,861.3 kilos per cubic meter.

The rates for reinforcement shall include for the cost of providing, cutting to length, splice lengths additional to those shown on the Drawings, laps, bending, hooking, waste incurred by cutting, cleaning, spacer blocks, provision and fixing of chairs or other types of supports, welding, fixing the reinforcement in position including the provision of wire or other material for supporting and tying the reinforcement in place, bending reinforcement aside temporarily and straightening, placing and compacting concrete around reinforcement and for complying with the requirements of this Specification.

Steel fabric reinforcement shall be measured by the square meter and shall be the calculated area excluding any allowance for laps.

The rate for steel fabric reinforcement shall include the costs associated with complying with this Specification.

The rate for mild steel tie rods shall include the costs associated with complying with this Specification

Payment for Pre-Molded Compression Strip Seal Joints shall be made for the length measured in meters of joint installed for the size and type of joint shown on the Contract Plans. Payment shall include all costs associated with approval, manufacture, delivery, handling and installation all in accordance with the details on the plans, the Manufacturer’s recommendations and as approved by the Project Manager. Payment shall also cover the costs of all necessary labor, plant, materials, storage, preparation, installation, miscellaneous materials, finishing and clean-up.

Payment for the work specified in this section of the Specification shall be made at the rate set down in Priced Bill of Quantities, Bill 8 Bridges and Box Culverts, Item 080201, Blinding Concrete, Item 080202 Concrete for Structures and Other Uses, Item 080203, Steel Reinforcement, Item 080204 Fabric Reinforcement, Item 080205 Pre-Molded Compression Strip Seal Joints, 080206 Mild steel tie rod sand item 080207 High tensile steel reinforcement using the units of measurement specified.

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***SECTION 08030- PRESTRESSED CONCRETE***

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**1-1 DESCRIPTION**

Furnish, place and tension pre stressed steel for pre-stressing precast or cast-in-place concrete.

**MATERIALS**

Provide materials as specified in:

Portland Cement, Types I, II or III	
Reinforcing Steel	
Concrete	
Approved Anchorages, Couplers, Ducts and Grout	AASHTO guide Specifications for Design and Construction of Segmental Concrete Bridges, ASSHTO LRFD Bridge Design Specifications
Corrosion Inhibitor	Federal Specifications MIL-PRF-340G(1)

**CONSTRUCTION**

Select a system that provides the required magnitude and distribution of pre-stressing force and ultimate strength without exceeding allowable temporary stresses. Perform the pre-stressing by either pre tensioning or post-tensioning methods, or a combination of the two methods.

**1 Submittals.**

Submit for approval working drawings including complete details and substantiating calculations of the method, materials, and equipment proposed for use in the pre-stressing operations, any additions or rearrangement of reinforcing steel, and any revision in concrete dimensions.

Submit for approval a quality control program that verifies that the materials and workmanship incorporated into the precast prestressed concrete members meet the requirements.

Include on working drawings embedded items such as the pre-stressing ducts, vents, anchorage reinforcement and hardware, reinforcing steel, anchor bolts, earthquake restrainers, deck joint seal assemblies, drainage systems, utility conduits, and other related items. Ensure that there will be no conflict among the planned positions of embedded items and the concrete cover will be adequate.

***Placing Ducts, Steel, and Anchorage Hardware.***

Rigidly support ducts in the forms using ties, supplementary support bars, and hold-down ties to prevent displacement during concrete placement and to maintain proper alignment of the duct.

Couple joints between sections of duct with positive connections that do not result in angle changes at the joints and that will prevent the intrusion of cement paste.

Vent ducts for continuous structures at the high points of the duct profile, except where the curvature is small. Install drains at the low point in ducts. Remove the ends of vents and drains 2S mm below the surface of the concrete after grouting is completed. Fill the void with mortar.

Install pre-stressing steel accurately in the forms and hold in place by the stressing jack or temporary anchors and, when tendons are to be draped, by hold down devices.

Place and hold accurately in position during concrete placement all pre-stressing steel preassembled in ducts and installed prior to placing concrete. Set and hold anchorage devices or block out templates for anchorages with their axes parallel to the axis of the tendon, and anchor plates perpendicular to the tendon.

Use a corrosion inhibitor placed in the ducts or applied directly to the steel to protect pre-stressing steel installed in members or ducts, but not grouted within the time limit, against rust or other corrosion. Protect the pre-stressing steel until grouted or encased in concrete.

Seal the openings at the ends of the ducts to prevent entry of moisture after tendons are placed in ducts. If instructed by the Project Manager's representative do not install steel for post-tensioning until after steam curing is completed.

### ***Tensioning.***

Tension pre-stressing steel by hydraulic jacks to produce the forces shown on the approved working drawing with appropriate allowances for all losses. For post tensioned work, the losses must also include the anchor set loss appropriate for the anchorage system employed.

Limit the strand stress in pretension members before seating (jacking stress) to 80 percent of the minimum ultimate tensile strength of the pre-stressing steel ( $0.80 f_s$ ).

Limit the standard stress in post-tensioned members prior to seating (jacking stress), and the stress in the steel immediately after seating, to the values allowed in AASHTO LRFD Bridge Design Specifications.

Apply or transfer pre-stressing forces to the concrete after the concrete has attained the strength specified for initial stressing. Stress the post-tensioning tendons and release pre-tensioned tendons as specified.

If instructed by the Project Manager's representative provide a record of gauge pressures and tendon elongations for each tendon elongations of each for review.

If instructed by the Project Manager's representative determine the stress in tendons during tensioning by the gauge load cell readings and verify with the measured elongations using the modulus of elasticity, based on nominal area, as furnished by the manufacturer for the lot of steel being tensioned, or as determined by a bench test of strands used in the work.

If instructed by the Project Manager's representative use a dynamometer or other approved method to measure the initial force so that its amount can be used as a check against elongation computed and measured. Mark each strand prior to final stressing to allow measurement of elongation and to ensure anchor wedges set properly.

### ***Pre-tensioning.***

Stress strands by either single strand stressing or multiple strand stressing.

Bring strands to be stressed in a group (multiple strand stressing) to a uniform initial tension, prior to being given their full pre-tensioning, that is within the range specified and sufficient to eliminate slack and equalize the stresses in the tendons.

Use approved low-friction devices at all points of change in slope of tendon trajectory when tensioning draped pre-tensioned strands, regardless of the tensioning method used.

Tension draped strand from both ends of the bed if the load, as determined by elongation measurements, is more than 5 percent less than that indicated by the jack gauges. Ensure the computed load from the sum of elongation at both ends is within 5 percent of that indicated by the jack gauges.

Perform only one splice per strand when using single strand jacking. Splice all strands or splice no more than 10 percent of the strands when using multi-strand jacking. Splice strands with similar physical properties, from the same source, and with the same "twist" or "lay."

Locate splices outside of the pre-stressed units.

Cut pre-tensioned pre-stressing strands flush with the end of the member. Clean and paint the exposed ends of the strand and a 25mm strip of adjoining concrete.

#### ***Post-Tensioning.***

Stress all strands in each tendon simultaneously with a multi-strand jack, except for those in flat ducts with not more than four strands. Tension tendons in continuous post-tensioned members by jacking at each end of the tendon. Provide the pre-stressing steel with permanent protection and bond to the concrete by completely filling the void space between the duct and the tendon with grout.

#### ***Grouting.***

Flush ducts with concrete walls (cored ducts) to ensure that the concrete is thoroughly wetted. Remove water from ducts with oil free compressed air.

Add water to the mixer first, followed by Portland cement and admixture, or as required by the admixture manufacturer. Mix to obtain a uniform, thoroughly blended grout, without excessive temperature increase or loss of expansive properties of the admixture. Agitate grout continuously until it is pumped. Limit the water content to the minimum necessary for proper placement, and when Type I or II cement is used, to a water cement ratio of 0.45.

Open grout and high point vent openings when grouting starts. Allow grout to flow from the vent nearest the inlet pipe until residual flushing water or entrapped air has been removed. Cap or otherwise close the vent. Inject grout at any vent that has been, or is ready to be, capped if the grouting pressure exceeds the maximum recommended pumping pressure to maintain a one way flow of grout.

Pump grout through the duct and continuously waste at the outlet pipe until no visible slugs of water or air are ejected and the efflux time of the ejected grout, as measured by a flow cone test, if used, is not less than that of the injected grout. Close the outlet and build the pumping pressure to a minimum of 0.50 MPa before the inlet vent is closed.

Ensure the temperature of the concrete is 2<sup>0</sup>C or higher from the time of routing until job-cured 50-mm cubes of grout reach a minimum compressive strength of 5.5 MPa.

Ensure the temperature of the grout is below 32°C during mixing or pumping.

### **MEASUREMENT AND PAYMENT**

Payment for Pre-Stressed Pre cast members and Pre Stressed Cast in place concrete will be made by the amount placed as defined in the drawings or as approved by the Project Manager.

**Precast Members**

Payment will be made for the pre-stressing of precast concrete members in the contract price paid for the precast members.

**Cast In place concrete**

The contract price paid for pre-stressing cast-in-place concrete is full compensation for furnishing all labour, materials, tools, equipment, and incidentals, and for doing all work involved in furnishing, placing, and tensioning the pre-stressing steel in cast-in-place concrete structures, complete in place.

Full compensation for furnishing and placing additional concrete and deformed bar reinforcing steel required by the particular system used, ducts, anchoring devices, distribution plates or assemblies and incidental parts, and for furnishing samples for testing, for preparing working drawings, and for pressure grouting ducts is included in the contract lump sum price paid for pre-stressing cast-in-place concrete or in the contract price for furnishing precast members. No additional compensation will be paid for such items.

No payment shall be made for reinforcing steel or concrete, testing or calibration, or for any excess material cast in excess of the approved quantities unless such work is specifically instructed by the Project Manager as a variation from the drawings. No separate payment shall be made for the cost of, Cement, Reinforcement steel, Formwork, Delivery, Handling, Disposal of cut off sections or rejected concrete, and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities, Bill 8, Bridges and Box Culverts Item 080301, Pre cast Pre stressed members, Item 080302 Pre Stressed Cast in place concrete using the units of measurement specified.

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***SECTION 08040 – PRECAST CONCRETE  
CONSTRUCTION***

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**1-1 MANUFACTURE OFF SITE**

The Contractor shall give reasonable notice to the Project Manager in advance of the date of commencement of manufacture and casting of the member.

A copy of all 28 day cube test results relating to the work shall be made available.

For all precast members the straightness of the precast concrete shall be measured at 28 days after casting. Unless otherwise stated on the drawings the allowable dimensional variations shall not exceed the following:

Length	Variation for Stated Dimension
Up to 3 M	+/- 6mm
3 to 4.5 m	+/- 9mm
<i><u>Cross-section (each direction)</u></i>	
Up to 500mm	+/- 6mm
500 to 750	+/- 9mm
<i><u>Straightness or bow (deviation from intended line)</u></i>	
Up to 3 m	+/- 6mm
3 to 6 m	+/- 9mm

The above allowable dimensional variations should be taken into account when bending and fixing reinforcement

Where tests are to be carried out, no members shall be dispatched to site until the tests have been satisfactorily completed.

**MARKING OF PRECAST MEMBERS**

All members shall be indelibly marked to show the member mark as shown on the drawings, the place and date on which the concrete was cast and if symmetrical the face that will be uppermost when the member is in its correct position in the Works.

The markings shall be so located that they are not exposed to view when the member is in its permanent position.

**HANDLING, TRANSPORT & INSTALLATION**

Handling and lifting fixings shall be designed and provided by the Contractor. Any embedded anchorages and fixings shall have a minimum of 50mm cover to the finished face. Members shall be lifted or supported only at points specified by the Contractor and agreed with the Project Manager, and the members shall be handled and placed without impact.

Members shall be kept vertical during transportation to avoid any dynamic stresses developing, unless otherwise agreed by the Project Manager.

**INSTALLATION OF CULVERT**Box Alignment

It is critical that the first box sections be installed correctly as they will determine the line and grade of the following boxes. If these are not correct, future connections may be affected.

### Box Placement

Placement of boxes shall start at the outlet end of the line of box sections. The bell end shall point upstream and the spigot or tongue should point downstream. Unless otherwise approved by the Project Manager, loads from construction equipment transferred to a box section before, during, or after fill placement, either directly or through the fill, should not be greater than the loads assumed in the design (ASCE 26-97).

The units shall be adequately propped or held in position so that any structural connections can be made, and levelling devices or props shall only be released when the structural connection has achieved sufficient strength as previously agreed with the Project Manager.

Using excavating machinery for the purpose of pushing boxes into place should be avoided, since this could cause cracking, requiring on-site repairing. Also, dropping or dragging the section over gravel or rock is not advised. A proper foundation for construction equipment should be available in order to ensure that no damage is caused to the levelling course and the sidewalls of the excavation area.

### Jointing

The method of assemble of the units shall be agreed with the Project Manager and the precast units shall be placed to achieve the nominal gaps between units as shown on the drawings.

Jointing shall be installed to reduce the migration of soil fines and water between box sections and their surroundings. The precast box culvert sections shall be joined with preformed flexible joint sealants in accordance with ASTM C990-09(2019) or rubber gaskets compliant with ASTM C1619-20.

Box culverts shall be sealed between the joint with a bituminous mastic sealant by one of the following:

- Liquid butyl (bulk mastic) or non-shrink grout shall be added to the outside top slab and applied down the sidewall 12 in. (300 mm) as well as applied to the inside bottom slab and inside sidewalls;
- Butyl sealant 1 in. (25 mm) thick shall be placed on the inside bottom and halfway up the sides of the bell end (approximately 1/2 in. (13 mm) from edge) and placed on the outside top and halfway down the sides of the spigot end (approximately 1/2 in. (13 mm) from edge) shall be used to seal a soil tight joint. Placement of this joint material in a sunny location, just prior to use, will allow heat absorption and make it more workable.
- An extruded sealant which is placed between the joints. The extruded sealant can be applied in the same manner as the bituminous sealant, applied to the bell and spigot end of the sections being joined. In some areas, rubber gasket box joints may be available. Pre-made foam gaskets can also be used to seal joints. However these forms of sealant will have to be manually attached to the bottom of the spigot end of the box to prevent sagging. If the seal is insufficient then an added layer of adhesive joint wrap (butyl rubber laminated to polyethylene vapor retarder) can be used on the outside of the box to prevent infiltration. The external sealing band can also be non-woven geotextile and should be placed on the

sides and top of the box after installation. In certain situations all four sides can be wrapped. Geotextile material shall be slipped under the box before it is set then the sides and top can be sealed after the box is in place. It is desirable for the sealant to be one continuous strip, however if this is not practical, then the top strip should be one piece and extend down the sides of the box a distance of 12 in. (300 mm) and overlap with the strip extending from the bottom.

#### Connecting of Sections

Chains or winches shall be used in joining the boxes. Direct contact between installation machinery and the box sections shall be prohibited. Appropriate cushion material shall be used between the box section and the machine to prevent spalling. Before placing the box culvert in its final location, the grade shall be checked for correctness and the joint surface shall be cleared of all bedding material, so that the joint sealant is properly seated. A workman should be in a position to guide the crane operator as the box is being aligned.

The top slab of the box section shall be placed approximately two feet above the adjoining top slab of the previously placed box. The box should be lowered in such a way that the sides of the boxes are flush and the spigot end of the installed box slips in line with the bell end of the receiving section. Even though the box is in the right position the weight of the section should be maintained by the crane. Securing of the joints shall be done through the use of winches or come-a-longs. The winch or come along shall be secured at the far end of the installed section and over the outer end of the next section. Care shall be taken not to spall the surface. Winching shall be done uniformly. If the joint is not within the maximum allowable joint opening, the crane shall carefully lift the section slightly without breaking out the joint on top, while the winches are pulling the chains taut. The section shall be removed and the bedding re-screed. When the box is in the right position the crane shall gradually release the box so that the bedding material carries the entire weight of the box and then it can be disconnected. The chains are held securely until the crane is disconnected, and then they are released.

#### Completion

After the boxes have been joined together the lift holes should be plugged according to the manufacturer's recommendation or using an approved concrete grout.

#### Backfill

Backfill should be placed in uniform layers along the sides of the boxes and over the top of the box sections. These layers should be no greater than the maximum allowed to achieve the required density. Compaction and equipment loads should not exceed the pipe design strength.

#### **PROTECTION**

At all stages of construction the precast members and other concrete associated therewith shall be properly protected to prevent damage to permanently exposed concrete surfaces, especially corners, joint surfaces.

#### **MEASUREMENT AND PAYMENT**

Separate items shall be provided for each Type or Size of Precast Culvert Unit required in the works. Payment for the Precast Units will be by the linear metre of Precast Unit of the type specified required on the drawings and in the Contract and shall include for:

- The item for precast members shall in accordance with the Preambles for the Bills of quantities include for:- reinforcement as shown on the drawings,
- production, mixing and placing of concrete,
- formwork,
- curing and protection,
- individual chamfers, joints, splays, rebates, recesses, drips, groves, and the like,
- holes, ducts, sockets,
- matching members, and placing into position including all temporary positioning
- marking members for identification and delivery,
- embedded or cast in lifting devices and bearing plates including their removal to provide the minimum 50mm cover,
- Reinstatement of holes for lifting devices
- temporary bracing and stays to prevent displacement,
- bedding jointing, caulking and joint seals,
- infilling of joints between adjacent units and members,
- sealing between and under units,
- infilling to joints including surface finish and formwork.

Payment for the work specified in this section of the Specification shall be made at the rate set down in priced Bill of Quantities, Bill 8, Structures Item 080401, Precast units.

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## ***SECTION 08050 – WATER CONTROL EQUIPMENT - GATES***

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## 1-1 DESCRIPTION

Sliding gates shall consist of furnishing and installing sliding gates in culverts in accordance with the specifications and details shown on the contract drawings.

### GENERAL

1. Manually operated sliding gates shall be provided and installed on culverts and elsewhere as specified. Each gate shall consist of framing incorporating guide grooves and sealing faces, together with a sill member and gear supporting members, movable gate leaf with sealing faces and screw operated hoist, all as shown on the Drawings.
2. Type 1 gates shall be a maximum of 2.50 m span x 2.35 m deep to a minimum size of 1.80 m span by 0.90 m deep.
3. Type 2 gates shall be a maximum size of 1.50 m span x 0.80 m deep to a minimum size of 1.50 m span by 0.60 m deep.
4. The gates shall be designed to withstand and operate against a maximum head of water to the top of the gate on the upstream side with the downstream side dry. The gate shall be capable of being raised clear of the gate sill by an amount equal to the depth of the gate.
5. For the purpose of calculating the gate operating frictions, the following coefficients of friction shall be used:
6. 0.30 for machined steel against bronze.

### GATE FRAMING

1. The gate framing shall consist of steel guide grooves fabricated from folded plate with sill and gear supporting members connected to the grooves by bolts. The groove members shall extend upwards sufficiently to support and guide the gate throughout its travel. The grooves shall be fitted with adjusting and fixing devices to enable them to be accurately positioned and securely held within the recesses in the primary concrete work during concreting-in. The groove members shall be fitted with machined bronze faces upon which the gate shall slide and seal.
2. The sill members shall consist of a rolled steel angle or other suitable section having a machined upper surface upon which the lower sealing member of the gate shall bear when the gate is fully closed. The sill member shall be fitted with levelling screws to permit its accurate alignment and levelling within the recess formed in the concrete floor. The ends of the sill member shall be connected to the groove members at each end.
3. The gear supporting members shall be designed to support the operating gear and the loads resulting from gate operation and shall be connected to the groove members at each end.

### GATE

1. The gate shall be of welded steel construction consisting of a steel skin plate supported on the upstream side by horizontal stiffening members connected to vertical side

guiding and stiffening members contained within the side grooves. Arrangements shall be provided at the top of the gate for attachment of the gate to the operating spindles by non-ferrous hinge pins.

2. The skin plate shall be stiffened along its upper edge by means of a rolled steel angle or other suitable section and along its lower edge by a sealing bar.
3. The gate shall be fitted with machined steel sliding and seal faces to match those incorporated into the framing.

#### **OPERATING GEAR**

1. The operating gear for Gate Type 1 shall consist of a centrally mounted bevel gear unit arranged to drive twin bevel gearboxes containing operating nuts engaging with twin operating spindles connected to the gate near to its ends.
2. The gearing shall be self-sustaining and capable of positively holding the gate suspended in any position when the crank handle or hand wheel is released and shall be designed to be capable of operating the gate against the maximum water loading conditions specified.
3. The twin bevel gearboxes shall each contain a bronze operating nut engaging with a stainless steel operating screw attached to the gate. The operating nut shall be carried between ball thrust bearing above and below the nut. The gearing shall be machine cut and enclosed in suitable casing designed as far as possible to exclude wind-blown dust. The twin bevel boxes shall each be provided with tubular covers over the operating screws when they are in the fully raised position. The operating spindles shall have a minimum root diameter at the bottom of the thread of 50 mm.
4. The centrally mounted bevel gear unit shall be operated by a crank handle wheel provided with a locking device and padlock to prevent unauthorized operation. A gate position indicator graduated in centimeter intervals shall be incorporated into the gearing showing the level of the lower edge of the gate relative to the sill level and shall be positioned so that it is clearly visible from the central operating position.
5. The operating gear for Gate Type 2 shall generally comply with the Specification above. However the operating gear shall be capable of being operated from the abutment (from the side of the gate) and therefore twin worn gear boxes shall be provided to operate these gates.

#### **MEASUREMENT AND PAYMENT**

Payment for the works specified in this section of the specification shall be made at the rate set down in priced Bill of Quantities, Bill 8 Bridges and Box Culverts, Item 080501. It will include but not limited to supplying all material, fabricating gates in accordance with the contract drawings, installing gates and any other associated items of work.

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***SECTION 08060 – STEEL STRUCTURE***

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## 1-1 DESCRIPTION

Steel structure shall consist of furnishing, fabricating, and erecting steel structures and structural steel portions of other structures in accordance with the Specification and the details shown on the Contract Drawings.

### GENERAL

#### *1 Certification*

The structural steel fabricating plant shall be certified under the AISC Quality Certification Program, Category I. The fabrication of fracture critical members shall be Category III. For structural steel fabricating plants without the above listed certificates, the fabrication procedures adopted shall fully comply with AISC 'Code of Standard Practice for Steel Buildings and Bridges'. The Contractor shall provide an approved inspector to inspect the mill or foundry on a regular basis to the satisfaction of the Employer's Representative.

Details of design which are permitted to be selected by the Contractor shall conform to Division I of AASHTO Standard Specification for Highway Bridges.

#### *Notice of Beginning of Work*

If instructed by the Project Manager's representative the Contractor shall give the Employer's Representative 30 days' notice of the beginning of work at the mill or in the shop, so that inspection may be provided. The term 'mill' means any rolling mill or foundry where material for the work is to be manufactured. No material shall be manufactured, or work done in the shop, before the Employer's Representative has been so notified.

#### *Inspection*

If instructed by the Project Manager's representative structural steel will be inspected at the fabrication site. The Contractor shall furnish to the Employer's Representative a copy of all mill orders and certified mill test reports. Mill test reports shall show the chemical analysis and physical test results for each heat of steel used in the work.

If instructed by the Project Manager's representative and with the approval of the Employer's Representative, certificates of compliance shall be furnished in lieu of mill test reports for material that normally is not supplied with mill test reports, and for items such as fills, minor gusset plates and similar material when quantities are small and the material is taken from stock.

If instructed by the Project Manager's representative certified mill test reports for steels with specified impact values shall include, in addition to other test results, the results of Charpy V-notch impact tests. When fine grain practice is specified, the test report shall confirm that the material was so produced. Copies of mill orders shall be furnished at the time orders are placed with the manufacturer. Certified mill test reports and Certificate of Compliance shall be signed by the manufacturer and shall certify that the material is in conformance with the specifications to which it has been manufactured.

If instructed by the Project Manager's representative material to be used shall be made available to the Employer's Representative so that each piece can be examined. The Employer's Representative shall have free access at all times to any portion of the fabrication site where the material is stored or where work on the material is being performed.

### ***Inspector's Authority***

The Inspector shall have the authority to reject materials or workmanship which does not fulfil the requirements of the Specifications. In cases of dispute, the Contractor may appeal to the Employer's Representative, whose decision shall be final.

Inspection at the mill and shop is intended as a means of facilitating the work and avoiding errors, and it is expressly understood that it will not relieve the Contractor of any responsibility in regard to defective material or workmanship and the necessity for replacing the same.

The acceptance of any material or finished members by the Inspector shall not be a bar to their subsequent rejection, if found defective. Rejected materials and workmanship shall be replaced as soon as practical or corrected by the Contractor.

## **DRAWINGS**

### ***1 Working Drawings***

The Contractor shall expressly understand that the Employer's Representative's approval of the working drawings submitted by the Contractor covers the requirements for 'strength and detail', and that the Employer's Representative assumes no responsibility for errors in dimensions.

Working drawings must be approved by the Employer's Representative prior to performance of the work involved and such approval shall not relieve the Contractor of any responsibility under the contract for the successful completion of the work.

### ***Shop Drawings***

The Contractor shall submit copies of the detailed shop drawings to the Employer's Representative for approval. Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Employer's Representative and corrections by the Contractor without delaying the work.

Working drawings for steel structures, and replacement members shall give full detailed dimensions and sizes of component parts of the structure and details of all miscellaneous parts, such as panel pin, chord bolts, bearing, transom seating, etc.

Working drawings shall specifically identify each piece that is to be made of steel which is to be other than AASHTO M 270 (ASTM A709-18) Grade 36 steel.

### ***Erection Drawings***

The Contractor shall submit drawings illustrating fully his or her proposed method of erection. The erection of parts of Bailey/Acrow Bridges shall comply with the standard specification from a licensed Bailey/Acrow Bridge manufacturer. The drawings shall show details of all falsework bents, bracing, guys, dead-men, lifting devices, and attachments to the bridge members: sequence of erection, location of cranes and barges, crane capacities, location of lifting points on the bridge members, and weights of the members. The plan and drawings shall be completed in detail for all anticipated phases and conditions during erection. Calculations may be required to demonstrate that allowable stresses are not exceeded and that member capacities and final geometry will be corrected.

**MATERIALS**

**1 New Structural Steel**

Steel shall be furnished according to the specification. The grades of steel to be furnished shall be as shown on the plans or specified as follows.

The minimum qualities for Bailey bridge:

Item	Identify Marking	Minimum Steel Grade
Bailey type Panel	BB1	Grade 70W
Panel Pin	BB4	Grade 100
Bracing Frame	BB2	Grade 70W
Raker	BB3	Grade 70W
Transom	BB5	Grade 70W
Plain Stringer	BB7	Grade 36
Button Stringer	BB8	Grade 36
End Posts (Female)	BB62	Grade 70W
End Posts (Male)	BB63	Grade 70W
Chord Reinforcement	BB150	Grade 70W
Deck Plate	BP1	Grade 70W
Other Connections, i.e. Bolts	BB200	Grade 100

The minimum qualities for replacement steel member:

Item	Identify Marking	Minimum Steel Grade
Replacement Steel member for Bridge #66	RP1	Grade 36

For the above listed items shall have the following properties of steel in accordance with AASHTO M 270 (ASTM A709-18).

AASHTO/ASTM Designation Steel Grade	Grade 36	Grade 70W	Grade 100
Min Tensile Strength in kN/m <sup>2</sup> (ksi)	400kN/m <sup>2</sup> (58ksi)	620kN/m <sup>2</sup> (90ksi)	758kN/m <sup>2</sup> (110ksi)
Min Yield Strength in kN/m <sup>2</sup> (ksi)	248kN/m <sup>2</sup> (36ksi)	482kN/m <sup>2</sup> (70ksi)	690kN/m <sup>2</sup> (100ksi)

All steel for use in main load-carrying member components subject to tensile stresses shall conform to the applicable Charpy V-notch Impact Test requirements of AASHTO M270 (ASTM A709-18).

**Refurbished Structural Steel**

Existing steelwork requiring refurbishment shall be reinstated to its “as new” condition, with the steel properties as listed in the Section for new Structural Steel above. The cross sectional area of any refurbished steel elements must be equal to or be greater than the original section.

The Contractor shall propose to the Employer’s Representative a methodology for the refurbishment of the specified existing steelwork. If the refurbishment of the steelwork is

considered to be uneconomic by the Employer's Representative, the Contractor shall be given approval to replace it with new steelwork.

### ***High-Strength Fasteners***

High-strength bolts for structural steel joints shall conform to either AASHTO M 164 (ASTM A325-14) or AASHTO M 253 (ASTM A490-14a). When high-strength bolts are used with unpainted weathering grades of steel, the bolts shall be Type 3.

The supplier shall provide a lot number appearing on the shipping package and a certification noting when and where all testing was done, including rotational capacity tests, and zinc thickness when galvanized bolts and nuts are used.

Proof load tests (ASTM F606-19 Method 1) are required for the bolts. Wedge tests of full-sized bolts are required in accordance with section 8.3 of AASHTO M 164. Galvanized bolts shall be wedge tested after galvanizing. Proof load tests (AASHTO M 291) are required for the nuts. The proof load tests for nuts to be used with galvanized bolts shall be performed after galvanizing, overtapping, and lubricating.

Nuts for AASHTO M 164 (ASTM A325-14) bolts shall conform to AASHTO M 291 (ASTM A 563) Grade DH, DH3, C, C3 and D. Nuts for AASHTO M 253 (ASTM A490-14a) bolts shall conform to the requirements of AASHTO M 291 (ASTM A563-15) Grades DH, DH3.

1. Nuts to be galvanized (hot-dip or mechanically galvanized) shall be heat treated Grade DH or DH3.
2. Plain (un-galvanized) nuts shall have a minimum hardness of 89 HRB.
3. Nuts to be used with AASHTO M 164 (ASTM A325-14) Type 3 bolts shall be of Grade C3 or DH3. Nuts to be used with AASHTO M 253 (ASTM A490-14a) bolts shall be of Grade DH3.

All galvanized nuts shall be lubricated with a lubricant containing a visible dye. Black bolts must be oily to touch when delivered and installed.

Washers shall be hardened steel washers conforming to the requirements of AASHTO M293 (ASTM F436-19).

### ***Identifying Marks***

AASHTO M 164 (ASTM A325-14) for bolts and the specifications referenced therein for nuts require that bolts and nuts manufactured to the specification be identified by specific markings on the top of the bolt head and on one face of the nut. Head markings must identify the grade by the symbol 'A 325', the manufacturer and the type, if Type 2 or 3. Nut markings must identify the grade, the manufacturer and if Type 3, the type. Markings on direct tension indicators must identify the manufacturer and Type '325'. Other washer markings must identify the manufacturer and if Type 3, the type.

AASHTO M 253 (ASTM A490-14a) for bolts and the specifications referenced therein for nuts require that bolts and nuts manufactured to the specifications be identified by specific markings on the top of the bolt head and on one face of the nut. Head markings must identify the grade, the manufacturer and if Type 3, the type. Markings on direct tension indicators must identify the manufacturer and Type '490'. Other washer markings must identify the manufacturer and if Type 3, the type.

### ***Dimensions***

Bolt and nut dimensions shall conform to the requirements for Heavy Hexagon Structural Bolts and for Heavy Semi-Finished Hexagon Nuts given in ANSI Standard B18.2.1 and B 18.2.2, respectively.

### ***Welding and Welding Inspection***

Shop and field welding and welding inspection of structural steel shall be done in accordance with ANSI/AASHTO/AWS D1.5 Bridge Welding Code.

Approved Welding Procedure Specification (WPS) are required for all welding. WPS's shall be based upon Procedure Qualification Testing (PQT) in accordance with the Code. The cost of the WPS and PQT shall be incidental to the contract price for structural steel.

### ***Galvanized High-Strength Fastener***

When fasteners are galvanized, they shall be specified to be hot-dip galvanized in accordance with AASHTO M 232 (ASTM A153-16a) Class C or, mechanically galvanized in accordance with AASHTO M 298 (ASTM B695-04(2016)) Class 50. Bolts to be galvanized shall be either AASHTO M 164 (ASTM A325-14) Type 1 or Type 2 except that Type 2 bolts shall only be mechanically galvanized. Galvanized bolts shall be tension tested after galvanizing. Washers, nuts and bolts of any assembly shall be galvanized by the same process. The nuts should be overtapped to the minimum amount required for the fastener assembly, and shall be lubricate with a lubricant containing a visible dye so a visual check can be made for the lubricant at the time of field installation. AASHTO M 253 (ASTM A490-14a) bolts shall not be galvanized.

### ***Alternative Fasteners***

Other fasteners or fastener assemblies shall meet the materials, manufacturing, and the chemical composition requirement of AASHTO M 164 (ASTM A325-14) or AASHTO M 253 (ASTM A490-14e), and which meet the mechanical property requirements of the same specification in full-sized tests, and which have body diameter and bearing areas under the head and nut, or their equivalent, not less than those provided by a bolt and nut of the same nominal dimensions prescribed above, may be used subjected to the approval of the Employer's Representative.

Subject to the approval of the Employer's Representative, high-strength steel lock-pin and collar fasteners may be used as an alternate for high-strength bolts as shown on the plans. The steel locking collar shall be a standard product of an established manufacturer of lock-pin and collar fasteners, as approved by the Employer's Representative.

### ***Galvanizing***

When galvanizing is shown on the plans or specified in the special provisions, ferrous metal products, other than fasteners and hardware items shall be galvanized in accordance with the Specifications for Zinc (Hot Galvanized) Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shape Plates, Bars, and Strip, AASHTO M 111 (ASTM A123-17). Fasteners and hardware items shall be galvanized in accordance with the Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, AASHTO M 232 (ASTM A153-16a) except as noted in 2 above for high-strength fasteners.

## FABRICATION

### *1 Identification of Steels During Fabrication*

The Contractor's system of assembly-marking individual pieces and the insurance of cutting instructions to the shop shall be such as to maintain identity of the original piece. The Contractor may furnish from stock, material that can be identified by heat number and mill test report.

During fabrication up to the point of assembling members, each piece of steel other than Grade 36 steel shall show clearly and legibly its specification.

Any piece of steel, other than Grade 36 steel which prior to assembling into members, will be subject to fabricating operations such as blast cleaning, galvanizing, heating for forming, or painting which might obliterate marking, shall be marked for grade by steel die stamping or by a substantial tag firmly attached. Steel die stamps shall be low stress-type.

The Contractor shall furnish an affidavit certifying that throughout the fabrication operation, the identification of steel has been maintained in accordance with the Specification.

### *Storage of Materials*

Structural material, either plain or fabricated, shall be stored above the ground on platforms, skids, or other supports. It shall be kept free from dirt, grease, and other foreign matter, and shall be protected as far as practicable from corrosion.

### *Plates - Direction of Rolling*

Unless otherwise shown on the plans, steel plates for main members, splice plates for flanges, main tension members and bearing plates for Bailey Type Bridges shall be cut and fabricated so that the primary direction of rolling is parallel to the direction of the main tensile and/or compressive stresses.

### *Plate Cut Edges*

Sheared edges of plate more than 15.8mm (5/8") in thickness and carrying calculated stress shall be planed, milled, ground, or thermal cut to a depth of 6.3mm (1/4").

Oxygen cutting of structural steel shall conform to the requirements of the current ANSI/AASHTO/AWS D1.4 Bridge Welding Code.

### *Bent Plates*

#### Cold bending

Cold bending of fracture critical steels and fracture critical members is prohibited. Cold bending of other steels or members shall be done in accordance with the ANSI/AASHTO/AWS D1.5 Bridge Welding Code and the following **Table I** a manner such that no cracking occurs.

**Table 1– Minimum Cold-Bending Radii**

Thickness in mm (inches) (t)	Up to 19mm (3/4")	Over 19mm - 25mm (3/4"-1")	Over 25mm - 50mm (1"-2")	Over 50mm (2")
ASTM A709/ A709M-18 or AASHTO M 270 Grades				
36	1.5t	1.5t	1.5t	2.0t
50	1.5t	1.5t	2.0t	2.5t
50W	1.5t	1.5t	2.0t	2.5t
HPS70W	1.5t	1.5t	2.5t	3.0t
100	1.75t	2.25t	4.5t	5.5t
100W	1.75t	2.25t	4.5t	5.5t

For bent plates, the bend radius and the radius of the male die should be as liberal as the finished part will permit. The width across the shoulders of the female die should be at least 8 times the plate thickness for Grade 36 steel. Higher strength steels require larger die openings. The surface of the dies in the area of radius should be smooth.

Where the concave face of a bent plate must fit tightly against another surface, the male die should be sufficiently thick and have a proper radius to ensure that the bent plate has the required concave surface.

Since cracks in cold bending commonly originate from the outside edges, shear burrs and gas cut edges should be removed by grinding. Sharp corners on edges and on punched or gas cut holes should be removed by chamfering or grinding to a radius.

Unless otherwise approved, the minimum bend radii for cold forming (at room temperature), measured to the concave face of the plate shall comply with Table 1. If a smaller radius is required, heat may be needed to be a part of the bending procedure. Provide the hearing procedure for review by the Employer’s Representative. For grades not included in the Table 1, follow minimum bend radii recommendations of the plate producer.

If possible, bend lines should be orientated perpendicular to the direction of final rolling of the plate. If the bend line is parallel to the direction of final rolling, multiply the suggested minimum radii in Table 1 by 1.5.

Hot bending

If a radius shorter than the minimum specified for cold bending is essential, the plates shall be bent hot at a temperature not greater than 648°C (1,200°F), except for Grades 70W, 100 and 100W. If Grades 100 and 100W steel plates to be bent are heated to a temperature greater than 593°C (1,100°F), or Grade 70W plates to be bent are heated to a temperature greater than 565°C (1,050°F), they must be re-quenched and tempered in accordance with the producing mill’s practice and tested to verify restoration of specified properties, as directed by the Employer’s Representative.

Grade HPS70W steel to be bent shall not be heated to a temperature greater than 593°C (1,100°F). Re-tempering and tempering is not required for Grade HPS70W steel heated to this limit.

***Facing of Bearing Surfaces***

The surface finish of bearing and base plates and other bearing surfaces that are to come in contact with each other or with concrete shall meet the ANSI surface roughness requirements as defined in ANSI B46.1, Surface Roughness, Waviness and Lay, Part I:

Steel Slabs	ANSI 2,000
Heavy plates in contact in shoes to be welded	ANSI 1,000
Milled ends of compression members, milled or ground ends of stiffeners and fillers	ANSI 500
Bridge rollers and rockers	ANSI 250
Pins and pin holes	ANSI 125
Sliding bearings	ANSI 125

***Straightening Material***

Any distorted steel member shall only be straightening following approval by the Employer’s Representative. The method of straightening shall be done by methods that will not produce fracture or other injury to the metal. Distorted members shall be straightened by mechanical means or, if approved by the Employer’s Representative, by carefully planned procedures and supervised application of a limited amount of localized heat. Except that heat straightening of AASHTO M 270 (ASTM A709/A709M-18) Grade 70W, HPS70W, 100 and 100W steel members shall be done only under rigidly controlled procedures, each application subject to the approval of the Employer’s Representative. In no case shall the maximum temperature exceed values in the following table.

Grade 70W	565°C (1,050°F)
Grade HPS70W	593°C (1,100°F)
Grade 100 or 100W	593°C (1,100°F)

In all other steels, the temperature of the heated area shall not exceed 648°C (1,200°F) as controlled by temperature indicating crayons, liquids, or bimetal thermometers. Heating in excess of the limits shown shall be cause for rejection, unless the Employer’s Representative allows testing to verify material integrity.

Parts to be heat straightened shall be substantially free of stress and from external forces, except stresses resulting from mechanical means used in conjunction with the application of heat.

Evidence of fracture following straightening of a bend or buckle will be cause for rejection of the damaged piece.

***Bolt Holes***

General

All holes for bolts shall be either punched or drilled except as noted herein. Material forming parts of a member composed of not more than five thicknesses of metal may be punched 1.5mm (1/16”) larger than the nominal diameter of the bolts whenever the thickness of the material is

not greater than 19mm (3/4") for structural steel, 15.8mm (5/8") for high-strength steel or 12.7mm (1/2") for quenched and tempered alloy steel.

When material is thicker than 19mm (3/4") for structural steel, 15.8mm (5/8") for high-strength steel or 12.7mm (1/2") for quenched and tempered alloy steel, all holes shall either be subdrilled and reamed or drilled full size. When more than five thicknesses are joined, material shall be subdrilled and reamed or drilled full size while in assembly.

Holes not more than 0.8mm (1/32") larger in diameter than the true decimal equivalent of the nominal diameter that may result from a drill or reamer of the nominal diameter are considered acceptable. The width of slotted holes which are produced by flame cutting or a combination of drilling or punching and flame cutting shall generally be not more than 0.8mm (1/32") greater than the nominal width. The flame cut surface shall be ground smooth.

#### Accuracy before Reaming

All holes punched full size, sub-punched, or subdrilled shall be so accurately punched that after assembling (before any reaming is done) a cylindrical pin 3mm (1/8") smaller in diameter than the nominal size of the punched hole may be entered perpendicular to the face of the member, without drifting, in at least 75% of the contiguous holes in the same plane. If the requirement is not fulfilled, the badly punched pieces will be rejected. If any hole will not pass a pin 4.8mm (3/16") smaller in diameter than the nominal size of the punched hole, this will be cause for rejection.

#### Accuracy after Reaming

When holes are reamed or drilled, 85% of the holes in any contiguous ground shall, after reaming or drilling, show no offset greater than 0.8mm (1/32") between adjacent thicknesses of metal.

All steel templates shall have hardened steel bushings in holes accurately dimensioned from the centrelines of the connection as inscribed on the template. The centerlines shall be used in locating accurately the template from the milled or scribed ends of the members.

#### ***Pins and Rollers***

Pins and rollers shall be accurately turned to the dimensions shown on the drawings and shall be straight, smooth and free from flaws. Pins and rollers more than 228mm (9") in diameter shall be forged and annealed. Pins and rollers 228mm (9") or less in diameter may be either forged and annealed or cold-finished carbon-steel shafting.

Pin holes shall be bored true to the specified diameter, smooth and straight, at right angles with the axis of the member and parallel with each other unless otherwise required. The final surface shall be produced by a finishing cut.

The diameter of the pin hole shall not exceed that of the pin by more than 0.5mm (1/50") for pins 127mm (5") or less in diameter, or by 0.8mm (1/32") for larger pins.

The distance outside to outside of end holes in tension members and inside to inside of end holes in compression members shall not vary from that specified more than 0.8mm (1/32"). Boring of pin holes in built-up members shall be done after the member has been assembled.

#### ***Threads for Bolts and Pins***

Threads for all bolts and pins for structural steel construction shall conform to the United Standard Series UNC ANSI B1.1, Class 2A for external threads and Class 2B for internal threads, except that pin ends having a diameter of 35mm (1 3/8”) or more shall be threaded six threads every 25mm (six threads to the inch).

***Flatness of Deck Panels***

The maximum deviation from detailed flatness or curvature of a panel shall not exceed the greater of 5mm (3/16”).

***Full-Sized Tests***

The Contractor shall provide suitable facilities, material, supervision, and labour for making and recording the required full-sized tests of fabricated structural members.

***Marking and Shipping***

Each member shall be painted or marked with an erection mark for identification and an erection diagram showing these marks shall be furnished to the Employer’s Representative.

Components of Bailey Type Bridges should be marked with the standard Bailey Bridge Marking and they are listed as follows:

Bailey Type Panel	BB1
Panel Pin	BB4
Bracing Frame	BB2
Raker	BB3
Transom	BB5
Plain Stringer	BB7
Button Stringer	BB8
End Posts (Female)	BB62
End Posts (Male)	BB63
Chord Reinforcement	BB150
Deck Plate	BP1
Other Connections, i.e. Bolts	BB200

The Contractor shall furnish to the Employer’s Representative as many copies of material orders, shipping statements, and erection diagrams as the Employer’s Representative may direct. The weights of individual members shall be shown on the plan and statements. Members weighing more than 3 tons shall have the weights marked thereon. Structural members shall be loaded on trucks or cars in such a manner that they may be transported and unloaded at their destination without being excessively stressed, deformed or otherwise damaged.

Bolts, nuts and washers from each rotational-capacity lot shall be shipped in the same container. Pins, small parts and packages of bolts, washers, and nuts shall be shipped in boxes, crates, kegs, or barrels with the gross weight of any package not exceeding 136kg (300 pounds). A list and description of the contained materials shall be plainly marked on the outside of each shipping container.

**ASSEMBLY**

**1 Bolting**

Surfaces of metal in contact shall be cleaned before assembling. The parts of a member shall be assembled, well pinned, and firmly drawn together before drilling, reaming, or bolting is commenced. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the operation. The member shall be free from twists bends, and other deformation.

The drifting done during assembling shall be only such as to bring the parts into position and not sufficient to enlarge the holes or distort the metal.

**Welded Connections**

Surfaces and edges to be welded shall be smooth, uniform, clean and free of defects which would adversely affect the quality of the weld. Edge preparation shall be done in accordance with the current ANSI/AASHTO/AWS D1.5 Bridge Welding Code.

**Preassembly of Field Connections**

Field connections of main members of trusses, continuous beams, plate girder and rigid frames shall be preassembled prior to erection as necessary to verify the geometry of the completed structure or unit and to verify or prepare field splices. Attaining accurate geometry is the responsibility of the Contractor who shall propose an appropriate method of preassembly for approval by the Employer’s Representative. The method and details of preassembly shall be consistent with the erection procedure shown on the erection plans and camber diagrams prepared by the Contractor and approved by the Employer’s Representative. The Contractor shall take the responsibility of ensuring the erection plans to comply with the current Bailey/Acrow Bridge erection method.

Connecting parts preassembled in the shop to assure proper fit in the field shall be match-marked, and a diagram showing such marks shall be furnished to the Employer’s Representative.

**Connections Using High-Strength Bolts**

High strength bolts or fasteners conforming to AASHTO M 164 (ASTM A325-14) or AASHTO M 253 (ASTM A490-14e) shall be installed and as to develop the minimum required bolt tension specified in the Table below:

<b>Bolt Size in mm (inch)</b>	<b>AASHTO M 164 ASTM A 325 Tension in kN (lb)</b>	<b>AASHTO M 253 ASTM A 490 Tension in kN (lb)</b>
12.7mm (½")	53kN (12,000 lb)	67kN (15,000)
15.8mm (5/8")	85kN (19,000 lb)	107kN (24,000)
19mm (¾")	125kN (28,000)	156kN (35,000)
22.2mm (7/8")	174kN (39,000)	218kN (49,000)

25.4mm (1")	227kN (51,000)	285kN (64,000)
28.5mm (1-1/8")	249kN (56,000)	356kN (80,000)
31.7mm (1-1/4")	315kN (71,000)	454kN (102,000)
35mm (1-3/8")	378kN (85,000)	538kN (121,000)
38mm (1-1/2")	458kN (103,000)	658kN (148,000)

All material within the grip of the bolt shall be steel, there shall be no compressible material such as gaskets or insulation within the grip. Bolted steel parts shall fit solidly together after the bolts are snugged, and may be coated or uncoated. The slope of the surfaces of parts in contact with the bolt head or nut shall not exceed 1:20 with respect to a plane normal to the bolt axis.

At the time of assembly, all joint and the adjacent surfaces shall be free of scale, except tight mill scale, and shall be free of dirt or other foreign material. Burrs that would prevent solid seating of the connected parts in the snug condition shall be removed.

## INSTALLATION

### 1 General

Fastener components shall be assigned lot number prior to shipping, and components shall be assembled when installed. Such components shall be protected from dirt and moisture at the job site. Components shall not be cleaned of lubricant that is required to be present in as delivered condition. Assemblies for slip-critical connections which accumulate rust or dirt resulting from job site conditions shall be cleaned, relubricated and tested for rotational-capacity prior to installation. Plain bolts must be oily to touch when delivered and installed. Lubricant on exposed surfaces shall be removed prior to painting.

A bolt tension measuring device (a Skidmore-Wilhelm Calibrator or other acceptable bolt tension indicating device) shall be at all job sites where high-strength bolts are being installed and tensioned. The tension measuring device shall be used to perform the rotational-capacity test (shall be performed in accordance with the requirements of AASHTO M 164 ASTM A325-14) and to confirm the following:

1. The suitability to satisfy the requirements of the table below of the complete fastener assembly.
2. Calibration of the wrenches.
3. The understanding and proper use by the bolting crew of the installation method.

AASHTO M253 (ASTM A 490) fasteners and galvanized AASHTO M164 (ASTM A325-14) fasteners shall not be reused. Other AASHTO M 164 (ASTM A325-14) bolts may be reused if approved by the Employer's Representative. Touching up or re-tensioning previously tensioned bolts which may have been loosened by the tensioning of adjacent bolts shall not be considered as reuse provided the tensioning continues from the initial position, and does not required greater rotation, including the tolerance, than that required by the following table:

<b>Bolt Length Measured from Underside of Head to End of Bolt</b>	<b>Both Faces Normal to Bolt Axis</b>	<b>One Face Normal to Bolt Axis and Other Face Sloped Not More Than 1:20 Bevel Washer Not Used</b>	<b>Both Faces Sloped Not More Than 1:20 From Normal to Bolt Axis, Bevel Washers Not Used</b>
Up to and including 4 diameters	1/3 turn	1/2 turn	2/3 turn
Over 4 diameters but not exceeding 8 diameters	1/2 turn	2/3 turn	5/6 turn
Over 8 diameters but not exceeding 12 diameters	2/3 turn	5/6 turn	1 turn

Bolts shall be installed in all holes of the connection and the connection brought to a snug condition. Snug is defined as having all plies of the connection in firm contact.

Snugging shall progress systematically from the most rigid part of the connection to the free edges. The snugging sequence shall be repeated until the full connection is in a snug condition.

Comment: Is this to do with Bailey type bridges

**ERECTION**

**1 General**

The Contractor shall provide all tools, machinery and equipment necessary to erect the structure. Falsework and forms shall be approved by the Employer’s Representative.

**Handling and Storing Materials**

Material shall be kept clean and properly drained. Girders and beams shall be placed upright and shored. Long member shall be supported on skids placed near enough together to prevent injury from deflection. The Contractor shall be responsible for the loss of any material while in his or her care, or for any damage caused to it after being received by the Contractor.

**Erection Procedure**

The erection procedure shall conform to the erection drawings submitted in accordance with the requirements of this section of the Specification. Any modifications to or deviations from this erection procedure will require revised drawings and verification of stresses and geometry.

Any erection stresses, induced in the structure as a result of using a method of erection which differs from the plans, shall be accounted for by the Contractor. The Contractor, at his own

expense, shall prepare erection design calculations for such changed methods and submit them to the Employer's Representative. Additional material required to keep both the temporary and final stresses within the allowable limits used in design shall be provided at the Contractor's expense.

The Contractor will be responsible for providing temporary bracing or stiffening devices to accommodate handling stresses in individual members or segments of the structure during erection.

During erection, the Contractor will be responsible for supporting segments of the structure in a manner that will produce the proper alignment and camber in the completed structure. Cross frames and diagonal bracing shall be installed as necessary during the erection process provide stability and assure correct geometry. Temporary bracing, if necessary at any stage of erection, shall be provided by the Contractor.

All components of bridges shall be accurately assembled as shown on the plans or erection drawings, and any match-marks shall be followed. The material shall be carefully handled so that no parts will be bent, broken, or otherwise damaged.

Pilot and driving nuts shall be used in driving pins. They shall be furnished by the Contractor without charge.

### ***Misfits***

The correction of minor misfits involving minor amounts of reaming, cutting, grinding and chipping will be considered a legitimate part of the erection. However, any error in the shop fabrication or deformation resulting from handling and transporting will be caused for rejection.

The Contractor shall be responsible for all misfits, errors, and damage and shall make the necessary corrections and replacements.

## **MEASUREMENT AND PAYMENT**

Payment for the work specified in this section of the Specification shall be made on a lump sum basis as shown in the Priced Bill of Quantities, Bill 8, Bridges and Box Culverts, Item 080601, Steel Structure.

Costs for all items associated with producing working and shop drawings, materials, fabrication, assembly, installation, erection, painting and all other items needed to complete steel structures are deemed to have been included by the contractor in the Bid Price.

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***SECTION 08070 – PNEUMATICALLY PLACED  
CONCRETE***

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**1-1 DESCRIPTION**

This item shall govern furnishing and placing “Pneumatically Placed Concrete” for the repair of deteriorated or damaged concrete and for other works as shown on the plans.

**MATERIALS**

Unless otherwise specified in the plans, Grade 30 (A) shall be used for encasement and Grade 40 (S) concrete shall be used for repair.

All materials shall conform to the pertinent requirements of the following items:

*Item 08020, “Concrete for Structures and Other Uses”*

**PROPORTIONING AND MIXING**

The Contractor shall submit a mix design for approval by the Project Manager. The basic mix design shall conform to the following:

**Table 1-** Classes of Concrete

Grade (Class)	Design Strength at 28 Days		Min Cube Strength at 7 Days	
	N/mm <sup>2</sup>	PSI	N/mm <sup>2</sup>	PSI
25 (B)	25.0	3600	16.5	2400
30 (A)	30.0	4350	20.0	2900
40 (S)	40.0	5800	28.0	4050

Test panels will be required prior to the approval of the mix design. The concrete shall be applied to a plywood sheet and each test panel shall be a minimum size of 450 mm x 450 mm x 75 mm. The panels shall be shot with approximately the same air pressure, nozzle tip and position to be used during production of the work. The panels shall be cured in the same manner required for the work.

Three (3) cores, 50 mm diameter, will be taken from each test panel and tested in compression at 7 days. The average strength of the cores shall conform to the strengths shown in **Table 1** herein.

The Project Manager may require additional panels during progress of the work if there is any change in materials, equipment or nozzle operator.

Unless otherwise specified, mixing and application may be done by either the dry mix or wet mix process. The materials shall be thoroughly and uniformly mixed using a mixer designed for use with pneumatic application. It may be either a paddle or drum type mixer. Transit mix concrete may be used for the wet process.

All mixing and placing equipment shall be cleaned at regular intervals and be kept in acceptable working condition.

## CONSTRUCTION METHODS

### *1 Surface Preparation*

All surfaces on which pneumatically placed concrete is to be applied shall be cleaned thoroughly of all paint, rust, loose mill scale, grease or oil, deteriorated or loose concrete or any other foreign materials which are likely to prevent adequate bond. Concrete and reinforcing steel surfaces which will be in contact with pneumatically placed concrete shall be abrasion blasted clean and then the surface cleaned of loose material with filtered compressed air.

Where the pneumatically placed concrete is intended to replace concrete in the cover zone of an element then concrete shall be removed to a depth of 25mm beyond the reinforcement or to an equivalent depth to the approval of the Employer's Representative.

Concrete surfaces on which pneumatically placed concrete is to be applied shall be thoroughly moistened by wetting just prior to placement. Excess water shall be allowed to drain or shall be removed by filtered air blasting.

Where standing or running water is encountered it shall be removed before applying the concrete.

The periphery of repair areas shall be saw cut 25 mm deep and existing concrete removed as necessary to avoid feather edges.

Concrete adjacent to a crack shall be removed in such a manner as to leave the existing reinforcing steel throughout the area as intact as possible.

### *Reinforcement*

All reinforcement to be embedded in pneumatically placed concrete shall be clean and free from loose mill scale, rust oil or other coatings which might prevent adequate bond.

### *Placing Pneumatically Placed Concrete*

#### General

The existing concrete surface shall be in approximately a saturated surface dry condition when concrete is placed.

The mix shall be sufficiently wet to adhere properly and sufficiently dry so that it will not sag or fall from vertical or inclined surfaces or separate in horizontal work.

The Concrete may be applied in one coat; however if the concrete begins to sag, it shall be applied in two or more coats. In covering vertical surfaces, placing concrete shall begin at the bottom and be completed at the top.

Any sags or other defects shall be corrected to proper section by the Contractor at his expense and as directed by the Project Manager.

The nozzle shall be held at approximately two (2) to four (4) feet from the surface and positioned so that the concrete impact as nearly as possible at right angles to the surface. Any deposits of loose sand shall be removed prior to placing any initial or succeeding layers of pneumatically placed concrete. Should any deposit of loose sand be covered by pneumatically placed concrete, the concrete shall be removed and replaced with a new coat of pneumatically placed concrete after the receiving surface has been properly cleaned.

The original surface and the surface of each layer which is permitted to harden before applying succeeding layers shall be washed with water and filtered air blasted to remove loose material. Any material which rebounds and does not fall clear of the work or which collects on horizontal surfaces shall be blown off from time to time to avoid leaving sand pockets.

A steel edge screed shall be used to cut the fresh concrete to proper section followed by floating, as necessary and a final steel trowel finish.

The use of wet mix process will not be permitted for the repair of deteriorated or damaged concrete.

#### Dry Mix Process

The compressor or blower used to supply air shall be capable of delivering a sufficient volume of oil free air. Steady pressure must be maintained throughout the placing process.

The water pump shall be of sufficient size and capacity to deliver the water to a nozzle at pressure not less than 1.5 N/mm<sup>2</sup> in excess of the required air pressure.

### **MEASUREMENT AND PAYMENT**

Payment for Pneumatically Placed Concrete will be per square meter of surface constructed based on the nominal dimensions required by the drawings. No additional area will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of Cement, Aggregate, Placing and Finishing and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made at the rate set down in Priced Bill of Quantities, Bill 8, Bridges and Box Culverts, Item 080701, Pneumatically Placed Concrete.

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**SECTION 08080 –ELASTOMERIC BRIDGE BEARINGS**

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**1-1 DESCRIPTION**

This item covers elastomeric-bearing pads for use as bearings under structural members when so specified on the Plans. The dimensions and shapes of pads shall be as provided on the Plans.

**MATERIALS, FABRICATION AND TESTING**

**1-2-1 General**

Elastomeric bearings may be either of two types: (1) plain pads, composed of neoprene compound, or (2) composite pads, composed of layers of neoprene compound between which steel plates are bonded. In addition to the internal steel plates, the composite pads may have external steel load plates bonded to the upper or lower elastomeric layer or both.

Plain pads shall be used for all the flat slab bridges. Composite pads shall be used for AASHTO girder bridges.

The pads shall be furnished with the dimensions indicated in the plans and shall be composed of the specified elastomer type, grade, and shear modulus (or hardness) and adequate for the specified design load. The pads shall be tested at the appropriate level and shall satisfy any special requirements in the plans.

The elastomer portion of the elastomeric compound shall be 100% polychloroprene (neoprene). The elastomeric compound shall meet the requirements of ASTM D2000-18 for the specific requirements shown in Table 1. Unless otherwise specified in the plans, the elastomer shall be 50 Durometer and adequate for 1,300 lb/in<sup>2</sup> [9 MPa] Design Compression Stress.

**TABLE 1**

Serial Designations for Basic Requirements			Suffix Designations
Durometer 50	Durometer 60	Durometer 70	All Durometer
2BC525	3BC625	3BC725	A14, B14, C12, E034, F17, K21, Z (OZONE)
NOTE: The complete designation of test requirements consists of the basic designation plus the suffix designation.			
ASTM D1149-18			
	Durometer 50	Durometer 60	Durometer 70
100 pphm OZONE in air by volume, 20% strain, 100% ±2°F (38 ± 1°C), 100 hours, Mounting Procedure D518, Procedure A	No cracks	No cracks	No cracks
Adhesion (composite pads only) ASTM D429-14			
	Durometer 50	Durometer 60	Durometer 70
Bond made during vulcanization	40lb/in (7.0 N/mm)	40 lb/in (7.0N/mm)	40 lb/in (7.0 N/mm)

### 1-2-2 Fabrication

Bearing pads shall be cast under pressure and heat and shall be individually moulded to the size and shape called for in the plans. Pads shall be furnished in one piece, and the elastomer portions shall not be laminated in any manner.

Flash tolerance, finish, rubber-to-metal bonding, and appearance shall meet the requirements of the latest edition of the Rubber Handbook as published by the Rubber Manufacturers Association, Inc., RMA F3 and T.063 for moulded bearings and RMA F2 for extruded bearings.

Plain bearing pads may be moulded or extruded and vulcanized in large sheets and cut to size. Cutting shall not heat the materials and shall produce a smooth finish to ANSI 250.

The pads shall be prepared and packaged by the manufacturer and shall be shipped in unbroken identifiable packages. Each package shall list the number of pads, the type of pads, and the purchase order number. The required mill test reports shall accompany the packaged pads. No package of pads shall weigh more than 1,800 lbs [820 kg].

### 1-2-3 Specific Requirements for Composite Pads

The composite (neoprene and steel) pads shall be cast as a unit in a mould and bonded and vulcanized under heat and pressure. The moulds shall have standard shop practice mould finish. The internal steel laminates shall be grit-blasted and cleaned of all surfaces coating rust and mill scale before bonding, shall be free of sharp edges and burrs, and shall have a minimum edge cover of  $\frac{1}{4}$  inch [6.4 mm]. External load plates, if used, shall be protected from rusting by the manufacturer and preferably shall be hot-bonded to the bearing during vulcanization.

Composite pads shall consist of alternate laminations of neoprene and hot-rolled steel sheets moulded together as a unit. Unless otherwise shown in the plans, the pads shall meet the following requirements: The outer metal laminations shall be  $\frac{3}{16}$  inch [4.8 mm], and the inner laminations shall be 14-gauge [2.0 mm]. The outer laminations of neoprene shall be  $\frac{1}{4}$  inch [6.4 mm]; and the inner laminations shall be of equal thickness, the actual thickness depending upon the number of laminations. Unless otherwise shown in the plans, all components of the composite pad shall be moulded together into an integral unit; and all edges of the steel laminations shall be covered by a minimum of  $\frac{1}{4}$  inch [6.4 mm] of elastomer. Exposed laminations, apparent as a result of manufacturing techniques, shall be sealed flush on the finished bearing pad with a bonded vulcanized patch consisting of material equivalent to that used in the manufacture of the pad. The pad surface shall be free of cuts, blemishes, and moulding defects in excess of  $\frac{3}{4}$  inch [19 mm] in length and  $\frac{1}{8}$  inch [3.2 mm] in depth and shall be free of foreign matter. The top and bottom bearing surfaces shall each have an integral sealing rib approximately  $\frac{1}{8}$  inch [3.2 mm] in depth (in addition to the specified total thickness) and  $\frac{3}{16}$  inch [4.8 mm] in width around their peripheries, which shall be free of cuts, tears, and separations. Variations from specified dimensions for individual laminations shall not exceed those under "Dimensional Tolerances" herein. Steel reinforcement in composite pads shall conform to AASHTO M 251.

### 1-2-4 Dimensional Tolerances

Plain pads and composite pads shall be built to the design dimensions and these Specifications within the tolerances of **Table 2**:

**TABLE 2**

1. Overall Vertical Dimensions:	
Design Thickness 1 1/4 inch (31.8 mm) or less:	-0, +1/8 inch (-0, +3.2 mm)
Design Thickness over 1 1/4 inch (31.8 mm):	-0, +1/4 inch (-0, +6.4 mm)
2. Overall Horizontal Dimensions	
36 inches (900 mm) and less:	-0, +1/4 inch (-0, +6.4 mm)
Over 36 inches (900 mm):	-0, +1/2 inch (-0, +12.7 mm)
3. Thickness of Individual Layers of Elastomer (Composite Pads Only) at any point within the bearing:	±20% of design value but no more than ±1/8 inch (±3.2 mm)
4. Variations from a Plane Parallel to the Theoretical Surface (as determined by measurements at the edge of the bearings)	
Top:	slope relative to the bottom of no more than 0.005 radians
Sides:	1/4 inch (6.4 mm)
5. Position of Exposed Connection Members:	1/8 inch (3.2 mm)
6. Edge Cover of Embedded Laminates or Connection Members:	-0, +1/8 Inch (-0, +3.2 mm)
7. Size of Holes, Slots or Inserts:	+1/8 inch (+3.2 mm)
8. Position of Holes, Slots or Inserts:	+1/8 Inch (+3.2 mm)

**1-2-5 Testing for Physical Properties**

The pads shall meet the requirements for physical properties as specified under "Original Physical Properties" in Table 3 when tested in accordance with ASTM Designations shown. Test specimens shall be prepared in accordance with ASTM D3183-10(2019) The bearing pads will be acceptable on the basis of meeting the requirements for Durometer 50, 60 or 70, whichever is called for in the plans.

**1-2-6 Original Physical Properties**

**TABLE 3**

Durometer	50	60	70
Hardness (ASTM D-2240-15e1)	50 ±5 points	60 ±5 points	70 ±5 points
Tensile Strength* (ASTM D412-16), minimum	2,250 psi (15.5 MPa)	2,250 psi (15.5 MPa)	2,250 psi (15.5 MPa)
Elongation at Break*, minimum	400%	350%	300%
*Test results of these properties of test samples prepared from finished pads shall not be more than 10% below the specified value.			

**1-2-7 Change in Original Physical Properties**

The material, oven-aged 70 hours at 212°F [100°C] and tested in accordance with ASTM D 573-04 shall show the following:

- Hardness..... 0 to +15 points, change
- Tensile Strength..... -15% change, maximum
- Elongation at Break..... -40% change, maximum

**1-2-8 Extreme Temperature Characteristics**

Compression Set (ASTM D 395-18 Method B, 22 hours at 212°F [100°C])..... 35% maximum

**1-2-9 Oil Swell**

Volume change (ASTM D471-16a using ASTM Oil No. 3, 70 hours at 212°F [100°C])120% maximum

**1-2-10 Ozone Cracking Resistance**

Time within which no cracks develop (ASTM D1149-18) 100 pphm of ozone in air by volume at 20% strain and a temperature of 100±2°F [38 ± 1°C].....100 hours, minimum.

**1-2-11 Bond Between Neoprene and Steel (Composite Pads only)**

ASTM D429-14 Method B..... 40 lb/in [7.0 N/mm]

**1-2-12 Bearing Tests and Acceptance Criteria**

The acceptance criteria shall have two levels. Level I acceptance criteria shall be applied to all pads. Level II acceptance criteria shall be applied to more critical or unusual pads as required in the plans. Level II test shall also be used to resolve differences over the acceptance of pads to which only Level I tests shall have been applied.

**1-2-12-1 Level I**

Level I criteria require that the pad be manufactured according to this Specification and any additional requirements specified in the plans. The manufacturer shall proof load each composite pad with a compressive load 1.5 times the maximum design load. If bulging patterns imply laminate placement, which does not satisfy design criteria and manufacturing tolerances, or if bulging suggests poor laminate bond, the pad shall be rejected. The pad shall be acceptable if the number of surface cracks do not exceed 5; however, if there are more than three separate surface cracks which are greater than 0.08 inch [2 mm] wide and 0.08 inch [2 mm] deep or any one surface crack which is greater than 1.0 inch [25 mm] long and 0.08 inch [2 mm] deep, the pad shall be rejected. Cracks shall be measured under test loading conditions.

Unless otherwise specified in the plans, the maximum design load in pounds [Newton's] shall be 1,300 [9] times the pad area in square inches [square millimeters].

Level I criteria requires that the elastomer satisfies the minimum properties under this Specification except as otherwise specified in the plans. Tensile strength, elongation at break, Durometer hardness, bond strength, and ozone resistance shall be tested for each production LOT of pads. A LOT shall consist of a single type of

bearing, of the same design and material, submitted for inspection at the same time, as defined in ASTM D4014-03(2018). A new set of all tests shall be required whenever there is a change in the type or source of raw materials, elastomer formulation or production procedures.

*1-2-12-2 Level II*

Level II criteria require that all Level I conditions are satisfied, except that individual conditions may be waived by the Project Manager if Level II certification is used as an arbitration of disputes. Any failure at Level II shall constitute rejection of the entire LOT. As a minimum, shear modulus and compressive stiffness shall be determined in accordance with ASTM D 4014. The shear modulus may be determined by testing a piece of the finished pad as specified in ASTM D4014-03(2018). (if possible), or a comparable non-destructive test may be performed on the complete pad. A compressive stiffness test shall be performed on the complete pad. The shear modulus shall fall within 15% of the value specified in the plans or within the limits of **Table 4** if no value for shear stiffness is specified:

**TABLE 4**

Durometer Hardness	50	60	70
Shear Modulus at 73°F (23°C)	85-110 psi (0.59 to 0.76 MPa)	120-155 psi (0.83 to 1.07 MPa)	160-260 psi (1.10 to 1.79 MPa)
creep deflection at 25 years			
instantaneous deflection	25%	35%	45%

The compressive stiffness shall vary by no more than 10% from the median value of all pads, nor more than 20% from the design value, if specified. However, a compressive stiffness and a shear stiffness shall not both be specified for the same pad.

*1-2-12-3 Sampling*

For the properties of the rubber compound to be measured by test in Level I, one extra pad shall be produced per LOT, selected at random for the necessary destructive sampling. The rubber samples shall be cut from interior laminates of the pad. In the sampling, internal surfaces exposed by vertically sawing through the middle of the pads, shall be measured for Durometer hardness as a check on completeness of vulcanization. All readings for hardness shall fall within the range for the Durometer value specified.

For Level II non-destructive testing, two pads per LOT shall be provided. For LOTs exceeding 50 pads, at least one additional pad shall be tested for every 50 pads or part thereof.

**1-2-13 Submittals****1-2-13-1 Shop Drawings**

When plain or laminated neoprene pads are detailed in the plans and fabricated in accordance with the plans and Specification, submittal of shop drawings will not be required. The Contractor shall submit shop drawings to the Project Manager for approval prior to fabrication of neoprene pads that are not fabricated as detailed in the plans or have external steel load plates or other materials bonded to the upper or lower elastomeric layers.

**1-2-13-2 Notification of Production**

The Contractor shall also provide the Project Manager with written notification 30 days prior to the start of pad production. This notification shall include the project number, quantity and size of pads being produced, manufacturer's name, location, and the name of the representative who will coordinate production, inspection, sampling and testing with the Project Manager.

After completion of pad production, the Contractor shall allow the Project Manager 14 days after notification for selecting the pads to be tested. The time required for testing shall be determined by the testing lab selected by the Contractor. All tests shall be conducted by an independent laboratory approved by the Project Manager and under the direction of the Project Manager. The Project Manager reserves the right to perform additional Level I or check tests on no more than one pad per LOT, if deemed necessary. As a convenience and by agreement, the independent laboratory may use the manufacturer's test facilities providing that testing machines are shown to comply with AASHTO T 67-05.

**1-2-14 Costs for Testing**

The Contractor shall provide all pads, including pads that are needed for fulfilling testing requirements. All costs of testing and any extra pads needed for testing shall be borne by the Contractor and included in the bid price for the bearing pads.

**1-2-15 Acceptances and Rejection of Lots**

If a pad fails the requirements of the compressive proof load, the pad shall be rejected (other tests failures affect LOT acceptance). If a pad for a given LOT fails to meet other test requirements specified herein, all pads in that LOT shall be rejected. In this event, the Contractor may provide two additional pads from the rejected LOT for a repeat test at Level II. All costs associated with additional (repeat) tests shall be borne by the Contractor. Both pads must pass Level II Test for acceptance of the LOT.

**1-2-16 Mill Analysis Reports**

For both plain pads and composite pads, six certified copies of the manufacturer's complete mill analysis, including actual results of all tests specified in this Sub article, and properly identified by project number, shall be furnished to the Project Manager by the Contractor. The mill analysis reports shall be for material representative of that furnished.

The manufacturer shall certify that each pad satisfies the design specification. Each composite pad shall be permanently marked. The marking shall consist of the order number, LOT number, pad identification number, and elastomer type and hardness number. Where possible, unless otherwise specified in the plans, the marking shall be on a face, which is visible after erection of the structure.

**1-3 CONSTRUCTION****1-3-1 Handling and Delivery**

Bridge bearing pads and composite elastomeric bearings shall be handled with care to avoid damage during transportation.

**1-3-2 Storage**

The Contractor shall take measures to store and protect bearings from any damage prior to installations.

**1-3-3 Certification**

Refer to Section 2.

**MEASUREMENT AND PAYMENT****1-4-1 Method of Measurement**

Both plain elastomeric bearing pads and Composite steel laminated bearings shall be measured as each.

**1-4-2 Basis of Payment**

Payment shall be the full compensation for furnishing and installing each elastomeric bearing pad or composite steel laminated bearing pad based on the nominal dimensions required by the drawings and stated in the Bill Of Quantities. No additional area will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of Placing and Installing bearings and mortar and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made at the rate set down in Priced Bill of Quantities Bill 8 Bridges and Box Culverts, Item 080801: Elastomeric Bridge Bearing Pads.

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## ***SECTION 08090 – HDPE PIPE***

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**1-1 DESCRIPTION**

This item shall govern for furnishing and placing of HDPE pipe as used in the construction of Culverts shown on the Contract drawings.

**MATERIALS**

The polyethylene pipe and fittings shall conform to the requirements of AASHTO M294-11.

Bedding and Structural backfill shall meet the requirements of AASHTO M145-91(2008), and the requirements of Section 02040 of this Specification.

Sizes of pipes to be installed:

1. Type 1- 0.3 m Diameter
2. Type 2- 0.45 m Diameter
3. Type 3- 0.6 m Diameter
4. Type 4- 1.0 m Diameter
5. Type 5- 1.2 m Diameter

**JOINTS**

The joints shall be water tight, and shall incorporate a bell and spigot connection with rubber gasket and connection collars to ASTM F477-14.

**INSTALLATION**

The polyethylene pipe shall be installed in accordance with the manufacturer's instructions.

Foundation and bedding shall be carried out in accordance with the requirements of Section 02040 of this Specification.

A minimum depth of cover shall be maintained above the pipe before allowing vehicles to traverse the pipe trench. The minimum depth of cover shall be to the approval of the Employer's representative.

**MEASUREMENT AND PAYMENT**

Payment for HDPE Pipe will be per linear meter of drains constructed based on the nominal dimensions required by the drawings. No additional length will be measured for payment unless such work is specifically instructed by the Project Manager as a variation from the drawings.

No separate payment shall be made for the cost of Placing and Compacting Bedding, Formwork, HDPE Pipe, Installing Gaskets and Connection collars and for complying with the requirements in this Clause. Costs for these items are deemed to have been included by the contractor in the Bid Price.

Payment for the work specified in this section of the Specification shall be made at the rate set down in Priced Bill of Quantities Bill 8 Bridges and Box Culverts, Item 080901: HDPE Pipe, Type 1- 0.3 m Diameter; Item 080902: HDPE Pipe, Type 2- 0.45 m Diameter; Item 080903: HDPE Pipe, Type 3- 0.6 m Diameter; Item 080904: HDPE Pipe, Type 4- 1.0 m Diameter and Item 080905: HDPE Pipe, Type 5- 1.2 m Diameter.

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## ***SECTION 09010 – BARRIERS AND HANDRAILS***

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## 1-1 DESCRIPTION

The works specified in this Section consists of the construction of concrete traffic barriers and pedestrian handrail barriers on bridge decks and approach slabs. The work shall be constructed in accordance with these specifications and in conformity with the lines, grades, dimensions, details and notes shown in the plans. The work includes the furnishing and placing of mortar or concrete, anchor bolts, reinforcing steel dowels or other devices used to attach the railing to the structure.

### METAL BARRIERS

#### *1 General*

Shop drawings, catalogue data, information on handrails, fixing devices and installation procedures shall be submitted for review and approval of the Employer's Representative. Submittals shall be at least 30 days prior to any installation.

All materials not otherwise specified shall conform to the requirements of the applicable AASHTO Standard Specifications for Transportation Materials.

Unless otherwise permitted by the Employer's Representative, railing shall not be placed until the cantering or falsework for the span has been released, rendering the span self-supporting.

The line and grade of the railing shall be true to that shown on the plans and may include an allowance for camber in each span but shall not follow any unevenness in the superstructure. Unless otherwise specified or shown on the plans, railings on bridges, whether super-elevated or not, shall be vertical.

#### *Metal barriers*

Barriers shall be the standard W-beam and Thrie Beam in accordance with AASHTO-ARTBA-ACG Task Force 13 "A Guide to Standardized Highway Barrier Hardware", and may be of either galvanized steel or aluminum at the Contractor's option.

#### *Steel Railing*

Materials and fabrication of steel railings shall conform to the applicable requirements of Section 08060, except that formed sections may be fabricated from mild steel, and pipe sections shall be of standard steel pipe. Nuts and bolts not designated as high strength shall conform to the requirements of ASTM A307-12 and steel tubing shall conform to the requirements of ASTM A500/A500M-20, Grade B.

#### *Aluminum Railing*

For aluminum railings or portions of railings, cast aluminum post shall conform to the requirements of AASHTO M 193; and extruded components shall conform to the requirements of ASTM B221-14.

#### *Posts*

Unless the plans or special provisions designate a particular type of post to be used, the type of post used shall be at the Contractor's option. The posts shall be timber, steel or aluminum, and shall be the sizes and dimensions shown in the plans. The particular type selected shall be used

throughout the project, except where special steel posts are required in conjunction with normal timber posts.

#### Timber Posts

Timber posts shall conform to the requirements Section 09080. The posts shall be shaped and drilled prior to treatment and shall not vary more than plus or minus one inch from the specified length. All timber posts shall be dressed on all four sides.

#### Steel Posts

Steel posts shall conform to the requirements of ASTM A36/A36M-19 steel and shall be galvanized. Galvanizing shall be in accordance with the requirements of ASTM A123/A123M-17, with two ounces of zinc coating per square foot of surface area. The posts shall be drilled prior to galvanizing. The Manufacturer shall furnish certification showing physical and chemical properties of each heat, the amount of spelter coating and conformance to the specification.

Steel Handrails posts may be either a rolled section or a welded structural shape with nominal dimensions as shown in the Roadway Design Standards. Welded structural shapes shall meet the following requirements:

1. The design properties of the shape shall conform to or exceed the design properties for a W 6 x 8.5 shapes as contained in the American Institute of Steel Construction Manual, Thirteenth Edition.
2. Welding shall be done in accordance with the requirements of ASTM A769/A769M-17.
3. After posts are cut to length, a weld shall be placed to seal the spaces between the web plate and flange plates.
4. Galvanizing shall be done as specified above after all drilling and welding is completed.

#### Aluminum Posts

Aluminum posts shall be of aluminum alloy, and shall conform to the requirements of ASTM B221-14. The manufacturer shall furnish certification of the physical and chemical properties and conformance to the specification.

#### ***Anchor Blocks***

Anchor blocks shall be Class 25(B) (25N/mm<sup>2</sup>) concrete and shall be constructed and placed in accordance with the requirements shown in the plans or as directed by the Employer's Representative.

#### ***Offset Blocks***

Handrails and Barriers offset blocks shall be either timber, steel or aluminum, of the sizes called for in the plans and shall not vary more than plus or minus 6mm from the specified length. The steel or aluminum blocks may be cut from a section of post. Timber offset blocks may be cut from a length of greenheart, or purple heart timber which shall be dressed on all four sides and painted with three coats of epoxy paint.

***Welding***

All exposed welds shall be finished by grinding or filling to give a smooth surface. Welding of aluminum materials shall be done by an inert gas shield, electric arc welding process using no welding flux. Torch or flame cutting of aluminum will not be permitted.

***Installation***

The posts shall be set vertically to the depth shown in the plans, and shall be accurately lined and relined as necessary, until final acceptance. Where the posts are not set in concrete structures, the postholes shall be backfilled with suitable material, which shall be thoroughly tamped. As an alternative method, the Contractor may use a post-driving machine, meeting the approval of the Employer's Representative and capable of driving the posts without damaging them. The guardrail panels, supports, anchor, etc., shall be erected as shown in the plans.

Metal railings shall be carefully adjusted prior to fixing in place to ensure proper matching at abutting joints, correct alignment, and camber throughout their length. Holes for field connections shall be drilled with the railing in place on the structure at proper grade and alignment.

Where aluminum alloys come in contact with other metals or concrete, the contacting surfaces shall be thoroughly coated with dielectric aluminum-impregnated caulking compound, or a synthetic rubber gasket may be placed between the two surfaces.

***Finish***

Unless otherwise specified, anchor bolts, nuts and all steel portions of railing shall be galvanized and aluminum portions shall be unpainted. Galvanizing of rail element shall conform to the requirements of AASHTO M 111M/M111-11 (ASTM A123/A123M-12) and galvanizing of nuts and bolts shall conform to the requirements of AASHTO M 232M/M232-10 (ASTM A153/A153-09). Minor abrasions to galvanized surfaces shall be repaired with zinc rich paint. After erection, all sharp protrusions shall be removed and the railing cleaned of discoloring foreign materials.

When painting is specified, the type and coating shall conform to the requirements of Section 09020.

***CONCRETE TRAFFIC AND PEDESTRIAN BARRIERS***

Concrete barriers shall be constructed to the required lines, locations and details shown on the contract plans with cast-in-place concrete. All materials and construction shall conform to the requirement in Section 08020. Unless otherwise specified, concrete grade shall be Class 40(S) (40N/mm<sup>2</sup>). Forms for cast-in-place railing shall not be removed until adequate measures to protect and cure the concrete are in place and the concrete has sufficient strength to prevent surface or other damage caused by form removal. Finish for railings constructed with fixed forms shall be Class 2- Rubbed Finish. Finish for railings constructed with slip forms and for temporary railings shall be Class I – Ordinary Finish.

**MEASUREMENT AND PAYMENT**

Measurement of the work of Installing Un-tensioned Corrugated Beam Safety Barriers single sided to working with W2 and N2 containment level, any radius complete with posts and concrete foundations at 2M spacing and End Terminal Sections with flare for single sided corrugated beam safety barrier as well as Concrete Barriers shall be based on the requirements of the Drawings. Payment for Corrugated Beam Safety Barrier and Concrete Barrier shall be measured and paid for by the meter. Payment for End Terminal Sections shall be paid per unit installed.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 09, Incidental Structural Works Item 090101 Concrete Barriers using the units of measurement specified.

The rates and prices quoted shall include the cost of all operations and sequences of operations which may be required to comply with the needs of the Works, including, but not limited to, Purchase of Galvanized Metal Barriers, Galvanized Metal Posts, Anchor Blocks, Offset Blocks, Reflector Elements, Welding, Installation and Finish and all incidentals necessary to complete the work.

## ***SECTION 09020 – PAINT***

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## 1-1 DESCRIPTION

This section covers the protective treatment of structural steelwork according to the requirements of the various sections of these specifications where protective treatment is called for.

This work shall consist of the painting of surfaces shown on the plans or otherwise specified to be painted. The work includes, but is not limited to the preparation of surfaces to be painted, application and curing of the paint, protection of the work, protection of existing facilities, vehicles and the public from damage due to this work, and the furnishing of all labor, equipment, and materials needed to perform the work.

### PROTECTION OF PUBLIC AND PROPERTY

#### *1 General*

The Contractor shall comply with all applicable environmental protection and occupational health and safety standards, rules, regulations, and order. Failure to comply with these standards, rules, regulations, and orders will be sufficient cause for suspension.

The Contractor shall provide protective devices such as tarps, screens or covers as necessary to prevent damage to the work and to other property or persons from all cleaning and painting operations.

Paint or paint stains that result in an unsightly appearance on surfaces not designated to be painted shall be removed or obliterated by the Contractor at own expense.

#### *Protection of the Work*

All painted surfaces that are marred or damaged as a result of operations of the Contractor shall be repaired by the Contractor, at own expense, with materials and to a condition equal to that of the coating specified herein.

If traffic causes an objectionable amount of dust, the Contractor, when directed by the Employer's Representative, shall sprinkle the adjacent roadbed and shoulders with water or dust palliative for a sufficient distance on each side of the location where painting is being done.

Upon completion of all painting operations and of any other work that would cause dust, grease, or other foreign materials to be deposited on the painted surfaces, the painted surfaces shall be thoroughly cleaned. At the time of opening structures to public traffic, the painting shall be completed, and the surfaces shall be undamaged and clean.

### SURFACE PREPARATION

#### *1 General*

All exposed surfaces of structural steel, except galvanized or metalized surfaces, shall be cleaned and painted.

All surfaces of new structural steel shall be cleaned by the blast-cleaning method unless otherwise specified in the special provisions, or approved in writing by the Employer's Representative.

The methods used in the cleaning of metal surfaces shall conform to the following tables:

Details of Corrosion Protection Requirements– Maintenance Work on Main Steel

Pre-treatment	High pressure water cleaning to remove loose paint and contamination. Intact areas to be roughened. Damaged and corroded areas –de-rusted. Patch priming with surface tolerant aluminium epoxy primer, min. dft 75 microns
Primer	Surface tolerant aluminium epoxy primer, min. (Dry Film Thickness) dft 100 microns Weld seams, sharp edges, bolts and nuts are to be given extra stripe coats to ensure the minimum dft is achieved
Finishing coat	Surface tolerant polyurethane, min. dft 80 microns. Additional topcoat to be applied if required by the Employer’s Representative.
Minimum overall dft 200 microns.	

Details of corrosion protection requirements – steel barrier

Pre-treatment	In accordance with the relevant clauses of this standard
Primer	2 coats of zinc chromate primer to a minimum dft of 20 microns per coat
Finishing coat	2 coats of high gloss enamel, with minimum dft of 25 microns per coat Colour: black or yellow to match existing, to be agreed with the Employer’s Representative
Total dft of all paint shall not be less than 90 microns.	

***Blast Cleaning at Fabrication Works or on Site***

Abrasives used for blast cleaning shall be either, clean dry sand, mineral grit, steel shot, or steel grit, at the option of the Contractor, and shall have a suitable grading to produce satisfactory results. The use of other abrasives will not be permitted unless approved in writing by the Employer’s Representative.

Unwashed beach sand containing salt or excessive amounts of silt will not be allowed.

All dirt, mill scale, rust, paint, and other foreign material shall be removed from exposed steel surfaces in accordance with the requirements of the Steel Structures Painting Council Surface Preparation Specification No. 10, SSPC-SP10 – Near White Blast Cleaning. Blast cleaning shall leave all surfaces with a dense and uniform anchor pattern of not less than 25 microns (1 mil) nor more than 75 microns (3 mils), as measured with an approved surface profile comparator.

Blast cleaned surfaces shall be primed or treated the same day blast cleaning is done, unless otherwise authorised by the Employer’s Representative. If cleaned surfaces rust or are contaminated with foreign material before painting is accomplished, they shall be re-blast cleaned by the Contractor at own expense.

***Abrading in the Shops or on Site***

Any encrusted foreign matter or paint which may be difficult to remove by abrading alone shall, with the Employer's Representative's approval be dislodged by scraping, aided by hand or power wire-brushing. This work shall be completed before abrading the areas so affected.

Abrading shall be carried out using abrasive paper or other material. Abrading tools may be used to remove weld spatter. Subject to the Employer's Representative's approval, wet abrading may be employed for the preparation of finishes over sound undercoats.

All equipment including tools and abrasive sheets, shall be of a type, capacity and in condition, approved by the Employer's Representative.

A burnished appearance caused by polishing in of paint, rust or dirt will not be acceptable.

Areas of previously corroded steel or unsound metal coatings, except galvanising, which have been prepared by abrading down to bright steel or bright metal coating, and blast cleaned where appropriate, shall be protected by the primer and next two coats of paint before any cleaning down or preparation of adjacent surfaces.

***Wet Cleaning***

Wet cleaning shall be carried out by scrubbing with a stiff-bristled brush using water and a cleaning agent. Immediately after cleaning, the surfaces shall be thoroughly rinsed. Painting shall not be performed less than 24 hours after cleaning and rinsing.

***Dry Cleaning in the Shops or on Site***

Surfaces shall be cleaned by scrubbing with a dry stiff-bristled brush.

***Procedures for Treatment at Joints*****Joint Material and Parent Material in Joints**

The standard of initial blast cleaning of joint material and parent material in joints shall be at least equal to that for the parent material. Before a joint is made on site, contact surfaces shall be restored to clean steel, 2nd Quality or to sound metal coating.

**At Joints Made with HSFG Bolts**

In steelwork painted only overall:

The blast primer applied to the paint material shall be taken 10 mm to 15 mm inside the perimeter of the joints. The outer surfaces and edges of site joint material may, at the option of the Contractor, also be given a coat of the blast primer.

The thickness of a protective paint coat applied to the outer surfaces of joint material prior to assembly of any high strength friction grip (HSFG) bolted joint shall not exceed 20 microns dry film thickness (dft).

**At Welded Joints**

At shop and site joints in all steelwork, surfaces to be welded shall be restored to clean steel, 2nd Quality or to bright steel and shall be free of any protective or other coating immediately prior to welding.

Parent Material Shop Treatment Adjacent to Joints which are to be Assembled or Welded Later on Site

#### At HSFG Bolted Joints

The paint coats with the exception of the primer or first coat of paint shall be stepped back at 30 mm intervals commencing 10 mm from the perimeter of the joints.

#### Surfaces of Fasteners

Uncoated and temporarily coated fasteners shall be free from all but traces of oil and grease and blast cleaned to clean steel, 2nd Quality, Medium profile, before painting.

Bolted joints or built-up sections shall be free from any water which has penetrated the plies.

When drying out has been completed to the satisfaction of the Employer's Representative or when surfaces are dry after surface preparation, fine gaps around the perimeter of joints or along plies shall be sealed by successive application of undercoat paint. All wider gaps shall be sealed with a proprietary sealant compatible with the primer or undercoats and approved by the Employer's Representative.

#### Sealing of Gaps at Nibs of Load Indicating Fasteners or Washers

Unless otherwise agreed by the Employer's Representative these gaps shall be sealed by brush application of primer and successive undercoats, of the types used on adjacent areas.

#### Procedure for Treatment at Area of Mechanical Damage or Other Surface Defects

Score marks and indentations in the surface of a steel substrate or of a metal coating shall be treated by abrading or grinding to bright steel or bright metal coating, to produce a surface without sharp edges or abrupt change in contour. Damage to unprepared surfaces shall be treated before blast cleaning.

In the case of damage to paint coatings only, surface preparation shall be by abrading or other method agreed with the Employer's Representative. The paint coatings shall then be restored.

Single pack blast primers may be omitted when an oleo-resinous system is being restored over a steel substrate.

In all cases where paint coats are to be restored, the edges of paint coatings adjacent to the affected area shall be bevelled back into sound paint.

In the shops exposure and over-coating times shall not exceed those specified.

On site, unless otherwise agreed by the Employer's Representative, over-coating shall be started immediately after surface preparation of the affected area and continued as soon as each coat is dry enough for over-coating.

#### Procedures for Treatment of Local Failure in Protective Coating

In the shops, failed paint coatings shall be restored. Abrading down to sound paint only, is permissible.

On site, failed paint coatings shall be restored except that:

1. Abrading down to sound paint or to bright steel, or
2. Blast cleaning to clean steel, 2nd Quality,

Are permissible methods of surface preparation when restoring paint systems over a steel substrate.

In all cases of local failure, the extent of the failure and the required surface preparation, including extent of initial wet or dry cleaning down, shall be agreed with the Employer's Representative.

Restoration of protective coatings shall not be started until the standard of surface preparation, including the cleanliness of the surface, has been passed as satisfactory by the Employer's Representative.

#### ***Workmanship Standards for the Surface Preparation of Steel***

The surface profile to be achieved by blast cleaning shall be within the limits set by the Steel Structures Painting Council Surface Preparation Specification No.10., SSPC-SP10.

Blast cleaned surfaces shall be virtually free from sharp spikes of parent metal defined as 'rogue peaks' formed by the impact of abrasive particles and which project above the blast cleaning profile. Any 'rogue peaks' which in the opinion of the Employer's Representative would be detrimental to the protective system shall be removed.

'Hackles' and inclusions caused by the rolling process, visible after blast cleaning, which in the opinion of the Employer's Representative would be detrimental to the protective system, shall be removed. Affected surfaces shall be prepared by grinding or abrading to bright steel. Sharp edges shall be rounded.

Steel surfaces to be prepared by any of the methods described in the Contract shall be such that after surface preparation the surfaces are free from detrimental contamination.

Surface preparation by blast cleaning shall be to one or more of the following standards of visual cleanliness:

##### 'Clean steel' 1<sup>st</sup> Quality

Appearance: There shall be a blast cleaning pattern overall. The surface profile shall be free from mill scale, rust and foreign matter when viewed through an X10 illuminated magnifying glass of a type approved by the Employer's Representative.

##### 'Clean steel' 2nd Quality

Appearance: There shall be a blast cleaning pattern overall. The surface profile shall be free from mill scale, rust and foreign matter when viewed by normal vision.

##### 'Bare steel' (blast cleaned or abraded)

Appearance: The surface shall be free from all rust scale, loose rust and loose mill scale.

After surface preparation by blast cleaning to 1<sup>st</sup> or 2<sup>nd</sup> Quality the surface profile shall be virtually free from embedded abrasive particles when viewed through an x10 illuminated magnifying glass of a type approved by the Employer’s Representative. Surfaces assessed as unsatisfactory in this respect by the Employer’s Representative shall be blast cleaned again with fresh abrasive. Another abrasive complying with the Specification may be used if necessary.

‘Harmful Residues’ or ‘Detrimental Contamination’:

Surfaces shall be deemed to be free from 'harmful residues' or 'detrimental contamination' after surface preparation when, in the opinion of the Employer’s Representative, any such remaining matter will not reduce the required durability of the specified protective system.

‘Bright Steel’:

Surfaces free from defects or prepared to this standard by grinding or abrading shall have an overall bright appearance.

***Workmanship Standards for the Surface Preparation of Coated Steelwork***

Before over-coating, surfaces shall be free from:

1. Any visible gloss which may, in the opinion of the Employer’s Representative, prevent adequate adhesion of the next coat,
2. Any unsound paint,
3. Detrimental contamination.

**MATERIALS**

***1 Coating Systems and Paints***

The coating system and paints to be applied shall consist of the system as follows:

<b>Location</b>	<b>Min. total dft (microns)</b>	<b>Preparation</b>	<b>Primer</b>	<b>Undercoat</b>	<b>Finishing Coat</b>
Exterior main surfaces	290	Blast clean to clean steel, 1st Quality, medium profile	Epoxy blast primer (25 microns) 2-pack epoxy zinc phosphate primer (75 microns)	High solids 2-pack epoxy MIO (125 microns)	High solids 2-pack epoxy MIO (65 microns) site applied
Contact surfaces at HSFG joints	25	Blast clean to clean steel, 1st Quality, medium profile	Epoxy blast primer (25 microns)	N/A	N/A
Barriers	85	Pickling	Galvanised		

### ***Paint and Similar Protective Coatings***

The term paint shall be deemed to refer also to similar protective coatings including specialist coatings such as grease paints.

All paints shall be supplied in sealed containers of not more than 5 litres capacity and these shall be used in order of delivery. Each container shall be clearly marked on the side to show the name of the manufacturer, registered description of the material (including purpose, e.g. whether primer, undercoat or finish), colour, Item No, paint manufacturer's reference number, batch number and date of manufacture. Where date of manufacture is coded, the Contractor shall provide the Employer's Representative with the code key.

The Contractor shall ensure that the properties of the paints he has selected are suitable for the conditions in the shops and on site, including temperature and humidity, and that he is able to apply the paints satisfactorily to all parts of the structure in these conditions.

All paints forming any one protective system or overlapping systems shall be obtained from the same manufacturer and shall be to the approval of the Employer's Representative. The disposal of unused or empty paint containers shall be agreed with the Employer's Representative.

### **COLOUR**

If not otherwise shown or specified, the color of the top or finish coat of paint shall be as directed by the Employer's Representative.

### **TESTING OF PAINT**

#### ***1 Provision of Samples***

When required by the Employer's Representative the Contractor shall provide unopened 5 litre samples, known as 'A' samples, for quality assurance purposes, of each type of paint to be used for the Works. In addition the Contractor shall supply 500 ml samples, known as 'B' samples, for application control purposes.

#### **"A" Samples**

'A' samples are required in all cases where more than 50 litres of any one coat of paint is to be applied.

The first 'A' samples shall be taken from the first batch of each type of paint delivered to the fabricator's shop or to site and accepted by the Employer's Representative as being representative of paint to be used for the Works. First batches of paint of less than 10 tins shall be discarded as not being representative and shall not be used in the Permanent Works.

Additional 'A' samples of the paints subject to testing under this clause shall be provided by the Contractor depending on the weight of structural steelwork in the Permanent Works in accordance with the following:

1. 250 tonnes to 500 tonnes: one set of samples;
2. Over 500 tonnes: a further set of samples for each part of or whole 500 tonnes.

When instructed by the Employer's Representative, the Contractor shall also provide an 'A' sample:

1. Of any replacement batch of paint subject to testing under this clause;
2. Returned paint.
3. When the paint, in the opinion of the Employer's Representative, is showing unsatisfactory application characteristics.

Immediately after selection by the Employer's Representative, the 'A' samples shall be despatched by the Contractor to the testing authority in accordance with the Employer's Representative's instructions.

Paint shall be supplied in sufficient time to allow for sampling and testing before the start of application.

Unless permitted by the Employer's Representative, painting, except for procedure trials, shall not start until the Employer's Representative confirms that the first 'A' samples are satisfactory.

#### 'B' Samples

The Contractor shall take 'B' samples when instructed by the Employer's Representative, and only under his supervision. The samples shall be taken from painters' kettles or from nozzles of airless spray guns directly into clean, new 500 ml tins which shall be filled and then sealed and handed to the Employer's Representative. On return of the samples to the Contractor, the Contractor shall despatch them immediately to the testing authority in accordance with the Employer's Representative's instructions.

#### *Provision of 500 ml Tins, Packing and Transport of 'A' and 'B' Samples*

The Contractor shall provide 500 ml tins with lids and lid clips, for 'B' samples at the start of painting or before any procedure trials required. The quantity supplied shall be sufficient to avoid any delay in taking 'B' samples throughout the work.

The Contractor shall ensure that the lids of all tins of sample paint are securely clipped down when they are despatched for testing.

The Contractor shall be responsible for handling, packing as necessary, prompt despatch and transit of 'A' and 'B' samples.

### **EPOXY COATING**

In addition to the general requirements of this specification the following conditions shall apply wherever epoxy coating work is being carried out:

1. The work shall be illuminated to the satisfaction of the Employer's Representative.
2. Forced draught ventilation to the approval of the Employer's Representative shall be used wherever required for the needs of personnel or for drying out surfaces.
3. Operatives shall work in pairs.
4. The Contractor shall demonstrate all his methods, equipment and materials before any work commences. Sample areas of substrate shall be prepared and coated as required by the Employer's Representative and for his approval.
5. There shall be strict control of surface cleanliness between the primer and epoxy coating and between coats of the same. Vacuum removal of dust and sand shall be

- employed and contamination shall be removed as specified in appropriate preparation clauses herein. Where dirt or dust has become trapped in the painted surface it shall be removed with suitable abrasive paper. The surface being painted shall be free of visible moisture throughout these operations.
6. The paint shall be applied only to clean dry primed or previously coated surfaces. Any thick runs or collections of paint shall be removed before they harden.
  7. Not less than two coats shall be applied over the primer by airless spray; not less than 3 by brush.
  8. Each coat shall be distinctly different in color from the primer or previous coat. The color of the final coat shall be as required by the Employer's Representative.
  9. Each coat shall be seen to have completely covered the preceding coat without "misses" or pinholes or any areas visibly low in thickness. A high voltage pin-hole detector shall also be used to determine the integrity of the coats.
  10. The coat manufacturer shall stipulate primer and epoxy recoat intervals for all curing temperatures likely to be encountered and these shall be adopted with a maximum tolerance of +4 hours. Where this is exceeded, the surfaces to be recoated shall first be suitably abraded to remove gloss and give key.

#### Storage Requirements and Keeping Periods for Paints

On delivery to the shops or site, paint shall be unloaded directly into one or more secure paint stores. The Contractor shall implement any storage restrictions recommended by the paint manufacturer.

Unless otherwise agreed by the Employer's Representative, paint which has not been used within the shelf life recommended by the manufacturer or within 12 months of the date of manufacture, whichever is the less, shall be discarded and not used in Works.

Chemically or moisture cured paints shall not be used after the expiry of the pot life stipulated by the paint manufacturer. They shall be discarded on expiry of the pot life or at the end of each working day/night whichever is the less. All other paints in opened tins or open containers including painters' kettles shall be returned to store and kept in sealed containers with not more than 10% usage.

### **APPLICATION OF PAINTS**

#### ***1 General***

The Contractor shall notify the Employer's Representative, in writing, at least 1 week in advance of the date that cleaning and painting operations are to begin.

Painting shall be done in a neat and workmanlike manner. Unless otherwise specified, paint shall be applied by brush, spray, or roller, or any combination thereof peculiar to the paint being applied.

Each application of paint shall be thoroughly cured and any skips, holidays, thin areas, or other deficiencies corrected before the succeeding application. The surface of the paint being covered shall be free from moisture, dust, grease, or any other deleterious materials that would prevent the bond of the succeeding applications. In spot painting, old paint which lifts after

the first application shall be removed by scraping and the area repainted before the next application.

Paints specified are formulated ready for application and no thinning will be allowed unless otherwise provided in the applicable materials specification for the paint being used.

Brushes, when used, shall have sufficient body and length of bristle to spread the paint in a uniform film. Round, oval-shaped brushes or flat brushes not wider than 115mm (4.5") shall be used. Paint shall be evenly spread and thoroughly brushed out.

Rollers, when use, shall be of a type that do not leave a stippled texture in the paint film. Rollers shall be used only on flat, even surfaces to produce a paint film of even thickness with no skips, runs, sags, or thin areas.

Paint may be applied with airless or conventional spray equipment.

Suitable traps or separators acceptable to the Employer's Representative shall be furnished and installed in the airline to each spray pot to exclude oil and water from the air.

Any spray method which produces excessive paint build-up, runs, sags, or thin areas in the paint film, or skips will be considered unsatisfactory and the Employer's Representative may require modification of the spray method or prohibit its use and require brushing instead.

Mechanical mixers shall be used to mix paint. Prior to application, paint shall be mixed a sufficient length of time to thoroughly mix the pigment and vehicle together, and shall be kept thoroughly mixed during its application.

Structures shall be blast cleaned and painted with the total thickness of undercoats before erection. After erection and before applying subsequent paint, all areas where paint has been damaged or has deteriorated and all exposed unpainted surfaces shall be thoroughly cleaned and spot painted with the specified undercoats to the specified thickness.

Surfaces exposed to the atmosphere and which would be inaccessible for painting after erection shall be painted the full number of applications prior to erection.

#### ***Exposure Times for Prepared Steel Surfaces***

Clean steel prepared by dry blast cleaning or bright steel prepared by abrading or by grinding shall be primed within 4 hours.

Clean steel prepared by wet blast cleaning only, shall be primed within 4 hours of being dry enough for painting.

Clean steel prepared by combined wet/dry blast cleaning shall be primed within 4 hours of dry blast cleaning.

Steel or steelwork blast primed at the mills or in the shops shall be over-coated within 8 weeks. The primed surfaces shall only be exposed outside for a maximum of 2 weeks of the 8 week period. Prepared surfaces affected by detrimental contamination or corrosion which in the opinion of the Employer's Representative will reduce the required durability of the protective system shall be restored when directed by the Employer's Representative.

Shop prepared steel surfaces, unsealed metal spray coatings and undercoats, except final shop undercoat, shall not be exposed outside.

A first shop undercoat shall be over-coated within 72 hours. Unless otherwise agreed with the Employer's Representative, further shop coats shall be applied within 72-hour intervals per coat.

Unless otherwise described in the Contract two stripe coats using undercoat paint shall be applied to all welds and all fasteners including washers and to all external corners.

The application of sealant in gaps may be carried out either before or after application, as appropriate, of the first coat of paint to be applied to the completed joints or assembled plies.

Prepared steel surfaces which have been restored and paint coats which have been prepared after surface damage or deterioration shall be over-coated with the sealer primer or first undercoat as appropriate before the surfaces have been affected by moisture and in any case within 4 hours.

On site, steel surfaces, shall be primed within 4 hours and shall have the following coat applied within 72 hours unless otherwise agreed with the Employer's Representative. The next coat shall be applied within a further 72 hours unless otherwise agreed with the Employer's Representative.

### ***Weather Conditions***

Paint shall be applied only on thoroughly dry surfaces. Painting will not be permitted when the atmospheric temperature, paint, or the surface to be painted is at or below 4.5°C (40°F) or above 38°C (100°F), or when metal surfaces are less than -15°C (5°F) above the dew point, or when the humidity exceeds 85% at the site of the work, or when freshly painted surfaces may become damaged by rain, fog, or dust, or when it can be anticipated that the atmospheric temperature will drop below 4.5°C (40°F) during the drying period, except as provided herein for painting in enclosures. Metal surfaces which are hot enough to cause the paint to blister, to produce a porous paint film, or to cause the vehicle to separate from the pigment shall not be painted.

Subject to approval of the Employer's Representative, the Contractor may provide a suitable enclosure to permit painting during inclement weather. Provisions shall be made to artificially control atmospheric conditions inside the enclosure within limits suitable for painting throughout the painting operation. Surfaces painted under cover in damp or cold weather shall remain under cover until the paint dries or weather conditions permit open exposure. Full compensation for providing and maintaining such enclosures shall be considered as included in the prices paid for the various contract items of work involving painting and no additional compensation will be allowed therefore.

All blasting cleaning except that performed within closed buildings, and all painting shall be performed during daylight hours unless otherwise provided by the contract documents.

### ***Procedure Trials***

Unless otherwise described in the Contract the Contractor shall carry out shop and site procedure trials of the protective system when more than 50 litres of any coat of paint are to be applied.

The procedure trials shall be completed at least ten days before the start of application of the systems on the main steelwork. The trials shall be carried out with the labour and equipment to be used for the work.

The Contractor shall provide for the shop trials, samples of steel from 2 m<sup>2</sup> to 10 m<sup>2</sup> representing the main steelwork, as required by the Employer's Representative. The Contractor shall demonstrate his ability to carry out blast cleaning and to apply the paints he has selected. He shall provide sufficient paint for the trials.

Painting of the main steelwork shall not be started in the shops or on site until procedure trials have been completed to the satisfaction of the Employer's Representative.

Any adjustment to the registered paint formulations shown to be required by the trials, other than an adjustment to the solvent shall be agreed with the Employer's Representative and made at the paint manufacturer's works.

Unless otherwise agreed by the Employer's Representative the Contractor shall carry out further procedure trials whenever he employs replacement skilled labour or proposes to use equipment of a different type.

### *Access and Lighting*

The Contractor shall provide access for inspection by the Employer's Representative. The access shall be agreed with the Employer's Representative as being adequate in all respects for inspection purposes.

Manual surface preparation and coating application work shall only be carried out in good lighting. When the light intensity is inadequate the contractor shall install and maintain temporary lighting at the workface during the work and for inspection when required by the Employer's Representative.

## **MEASUREMENT AND PAYMENT**

Measurement of the work of Painting shall be based on the requirements of the Drawings. Payment for Painting shall be paid for by the square meter.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 09, Incidental Structural Works Item 090201 Painting, using the units of measurement specified.

The rates and prices quoted shall include the cost of all operations and sequences of operations which may be required to comply with the needs of the Works, including the purchase of paint or Epoxy, painting of surfaces shown on the plans or otherwise specified to be painted, preparation of surfaces to be painted, application and curing of the paint, protection of the work, protection of existing facilities, vehicles and the public from damage due to this work, and the furnishing of all labor, equipment, and materials needed to perform the work.

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***SECTION 09070 – CONCRETE REPAIRS***

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## 1-1 DESCRIPTION

This Section covers the repair of cracked, spalled and chipped areas of concrete structures, including culverts and the removal of unsound concrete at locations indicated on the plans or as required by the Project Manager and for replacement with materials in accordance with these specifications and /or as shown on the plans.

### REPAIR

#### *1 Materials*

All materials shall conform to the pertinent requirements of the following Sections:

1. 08020, “Concrete for Structures and Other Uses”
2. 08070, “Pneumatically Placed Concrete”
3. 09090, “Epoxy Materials”

Concrete for repair shall be Grade (Class) 40 (S) in accordance with Section 08020 with a minimum seven (7) day design flexural strength of 28 N/mm<sup>2</sup> or a 28-day compressive strength of 40 N/mm<sup>2</sup>.

Epoxy mortar for repair shall conform to the epoxy manufacturer’s recommendations.

Steel drive pins, studs or expansion bolts, used for the attachment of reinforcement shall conform to the requirements of Section 08070, “Pneumatically Placed Concrete”.

#### *Construction Methods*

Concrete, as defined above, shall be used for the repair of areas with depths of 25 mm or greater. Epoxy Mortar conforming to Section 09090, “Epoxy Materials” shall be used for the repair of areas with depths less than 25 mm. Mortar may be used in lieu of concrete or epoxy mortar for repair, if approved by the Project Manager.

Replacement of concrete may be accomplished in accordance with Section 08070, “Pneumatically Placed Concrete”, or other alternate methods, if approved by the Project Manager. A satisfactory demonstration of the adequacy of any alternate method shall be performed by the Contractor and approved by the Project Manager prior to the actual placement of the concrete on the various structure members.

For small areas (less than 4 m<sup>2</sup>), the Contractor may mix the concrete or mortar in a small motor driven mixer using the volume method of measuring the ingredients. The method used to measure ingredients and the mixing procedure shall be approved by the Project Manager.

Existing concrete designated to be repaired shall be prepared by chipping or other methods to remove all loose or defective concrete. Feather edges shall be eliminated by saw cutting and/or chipping a back-tapered or perpendicular face, approved by the Project Manager, along the periphery of the area to be repaired so that the minimum depth of repair is approximately 12 (twelve) mm. The area being repaired shall be cleaned by sandblasting, high pressure water or other means approved by the Project Manager to remove all loose particles, dirt, deteriorated concrete or other substance that would impair the bond between the old concrete and the repair material.

Exposed reinforcing steel shall be cleaned of old concrete and corrosion, as approved by the Project Manager. Final cleaning of the concrete surface and reinforcing steel shall be by high-pressure air blast.

Air lines shall be equipped with a filter designed to remove all oil from the air.

Size and location of drive pins, studs or expansion bolts and method of attachment of new reinforcement shall be detailed on the plans or as directed by the Project Manager. Installation of drive pins, studs or expansion bolts shall be in accordance with Section 08070, “Pneumatically Placed Concrete”.

Prior to the application of new concrete or mortar, the concrete and steel surfaces shall be painted with an approved epoxy bonding agent, unless otherwise specified. Application of the bonding agent shall be in accordance with the manufacturer’s recommendations.

All repairs shall be done in such a manner as to restore the original lines and surfaces of the structure. Care shall be taken in applying the concrete, mortar or epoxy material so it will be firmly in place and free of voids.

Concrete or mortar repairs shall be water cured in accordance with Section 08020, “Concrete for Structures and Other Uses”, for a period of four (4) days. Pneumatically placed concrete repairs shall be cured in accordance with Section 08070, “Pneumatically Placed Concrete”. Epoxy mortar repairs shall be cured in accordance with the manufacturer’s recommendations. Removal of forms shall be approved by the Project Manager. Upon completion of curing, any repaired areas found defective shall be removed and repaired at the complete expense of the Contractor.

Cracks shall be sealed by “Crack Injection”. The surface to be repaired shall be water jetted to produce a clean surface to the satisfaction of the Project Manager. The nozzle pressure of any jetting equipment shall be such to remove any debris, staining, grease, paints and surface contaminants but will not damage the existing concrete surface. Vacuuming of the crack may be done with the Project Manager’s permission.

The Contractor shall accurately identify and map cracks greater than 0.15 mm on the concrete surface to be repaired. Cracks greater than 4.0 mm in width shall be identified separately.

The surfaces of cracks shall be sealed with an epoxy based adhesive prior to injection. The adhesive must be applied strictly in accordance with the manufacturer’s instructions. After the epoxy adhesive applied to seal the crack has cured, the injection of the crack can proceed. Where the crack has been left for more than 10 days after sealing, it shall be flushed out with water through the injection flanges previously installed. All excess water shall be removed.

The resin shall be injected in a sequence approved by the Project Manager. Excessive pressure shall not be applied to inject the resin.

After injection, the sealed crack shall be protected until the resin has cured for a minimum of 24 hours or to the manufacturer’s recommendations if greater.

#### **Crack widths 0.15 mm – 4.00 mm**

Crack injection flanges shall be firmly located on the face of the concrete straddling the crack at intervals of 75 mm. Injection flanges shall be at least 50 mm in diameter and shall be compatible with the methods and equipment proposed by the Contractor and approved by the Project Manager.

The injection flanges shall be fixed to the concrete surface using an epoxy based adhesive. The epoxy based adhesive shall be used strictly in accordance with the manufacturer’s instructions.

Where cracks are less than 4.0 mm in width, a low viscosity thixotropic resin injection grout shall be used. The resins shall be used strictly in accordance with the manufacturer’s instructions.

**Crack widths greater than 4.00 mm**

As an alternative to injection flanges, 6 mm outside diameter plastic pipes may be used for injection where the widths exceed 4.00 mm. The spacing of the pipes shall not exceed 75 mm.

The epoxy based adhesive shall have the following properties:

<b>Colour</b>	<b>Concrete Grey</b>
Unconfined Compressive Strength (at 7 days)	+ 60 N/mm <sup>2</sup>
Flexural Strength (at 7 days)	+ 30 N/mm <sup>2</sup>
Tensile Strength	+ 10 N/mm <sup>2</sup>

The resins shall have the following properties:

Unconfined Compressive Strength (at 7 days)	+60 N/mm <sup>2</sup>
Flexural Strength (at 7 days)	+30 N/mm <sup>2</sup>
Tensile Strength	+10 N/mm <sup>2</sup>
Application Temperature Range	+4°C to +35°C
Service Temperature Range	-10°C to +40°C
Viscosity (Injection material only)	1.0 poise at 20°C

**RECONSTRUCTION**

All materials shall conform to the pertinent requirements of the following Sections:

1. Section 08020 ‘Concrete for structures and other uses’
2. Construction Methods

The work shall be performed in accordance with the provisions of Section 08020, “Concrete for Structures and other uses” and in conformance with the requirements herein.

The Contractor shall verify all pertinent dimensions of the existing structure, prior to ordering materials required for the renovation or extension(s).

Portions of the existing structure shall be removed to the lines and dimensions shown on the plans and these materials shall be disposed of as shown on the plans or as directed by the Project Manager. The Contractor shall restore any portion of the existing structure, outside of the limits designated for removal, which has been damaged through his operations. The structure shall be restored at the Contractor’s expense to the portion prior to damage. Explosives shall not be used in the removal of portions of the existing structure unless approved by the Project Manager in writing.

When walls, piers and sluice gates are specified in the plans to be reused in the renovated/modified structure, the portion(s) to be reused shall be severed from the old structure to the lines and details shown on the plans. The new concrete and reinforcement shall be placed according to the plan details. The Contractor shall restore any component, outside of the limits

designated for removal, which has been damaged due to his operations. The component shall be restored at the Contractor's expense to the condition prior to damage.

Before breaking bridge slabs or walls, the surface shall first be sawn along the 'break' line twelve (12) mm deep, avoiding any damage to the reinforcement. The concrete shall be severed at the 'break' line using pneumatic tools. During removal of the designated portion of the existing structure, care shall be taken to avoid damage to the remaining reinforcement within one lap length of the 'break' line.

Unless otherwise shown on the plans or approved by the Project Manager, a demolition ball, other swing weight or impact equipment shall not be permitted. The final removal of concrete at the 'break' line shall be with pneumatic tools of a size approved by the Project Manager.

Unless otherwise shown on the plans, new reinforcing bars shall be spliced to exposed bars in the existing structure using lap splices in accordance with Section 08020, "Concrete for Structures and other uses". When welded splices are permitted by the plans, they shall conform to the relevant section of Section 08020, "Concrete for Structures or other uses". New reinforcing steel need not be tied to existing steel where spacing and/or elevation does not match that of existing steel provided the proper lap length is attained.

Concrete surfaces which shall be in contact with new construction shall be roughened and cleaned prior to the placing of forms. These construction joint surfaces shall be further prepared in accordance with Section 08020, "Concrete for Structures or other uses".

The renovated/modified surface shall not be opened to construction traffic or the travelling public until authorised by the Project Manager.

#### **MEASUREMENT AND PAYMENT**

Measurement of the work of Concrete Repairs shall be based on the requirements of the Drawings. Payment for Concrete Repairs shall be paid for by the square meter.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 09, Incidental Structural Works Item 090701 Concrete Repairs, using the units of measurement specified.

The rates and prices quoted shall include the cost of all operations and sequences of operations which may be required to comply with the needs of the Works, including dewatering of damaged areas, including construction and removal of cofferdams, dewatering to expose damaged areas including damaged areas inside culverts, if necessary diversion of drainage water and any other works necessary to gain access to culvert interiors for the purpose of inspection and repair, the purchase of epoxy, removal of unsound concrete at locations indicated on the plans or as required by the Project Manager and replacement with materials in accordance with these specifications and /or as shown on the plans, protection of the work, protection of existing facilities, furnishing of all labor, equipment, and materials needed to perform the work.

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## ***SECTION 09080 – TIMBER***

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**1-1 DESCRIPTION**

1. The work specified in this section includes that associated with removal and replacing wooden access, farm access ramps, old wooden decks, running boards, handrails, piles, revetment, including sheet piling for revetments and toe walls etc, damaged stringers etc and construction of new timber structures including bridges and koker gates in close conformity with the details shown on the Drawings or established by the Employer's Representative.
2. The work shall include for furnishing, preparing, fabricating, erecting, treating, tarring, and painting timber. All timber treated or untreated, shall be as specified conforming to the species, grades and dimensions. It shall also include hardware, lumber of the size and grade specified including all jointing requirements for timber connections and ties. This item shall not include temporary timber construction that is not a part of the finished work.

**MATERIALS*****1 Timber Piles***

Piles shall comply with Guyana grading rules for hardwoods (Ref No GR 03-2002). All piles shall be natural round timber piling cut from sound living trees of the species *Chlorocardium Rodeii* (Greenheart). Black Kakaralli (*Eschweilera* species) can be used if approved by the Project Manager's Representative. All piles shall conform to requirements of Prime or Select grade or with any exception given as an amendment to the technical specifications

***Lumber and timber (solid sawn)***

Sawn lumber shall conform to the specifications for Hardwood under this Section.

Timber shall be sound, well sawed, and if needed properly seasoned to suit the particular use. It shall be cut square and straight and be free from excessive pin borer holes, excessive shakes or splits and any other defect that may render it unsuitable for the work.

All lumber if seasoned should be free from seasoning defects when delivered to the works. Timber shall be air dried to approximately fourteen (14) percent external moisture content as verified by a moisture meter. Sawn timber to be used shall be verified by the Project Manager's Representative by use of a moisture meter. Lumber not meeting this specification must be removed and replaced at the contractor's expense.

All sizes stated on the plans shall be nominal unless otherwise described.

***Structural Timber***

Sawn timber for structural members shall be prime or select grade greenheart or purpleheart Other species such as black kakaralli, bullet wood, kabukalli, manniballi, mora, morabukea, or wamara can be used if approved by the Project Manager's Representative complying with Guyana Timber Grading Rules for Hardwoods 2002. Reference No. 04. Basic working stresses for sawn greenheart or purpleheart must also conform to the standard strength characteristics as set out in the Guyana Grading Rules for Hardwood Timber 1974. (Strength Group A).

Bending and tension parallel to grain	22.1N/mm <sup>2</sup> (3,200 psi)
bearing parallel to grain	15.2N/mm <sup>2</sup> (2,200 psi)
Bearing perpendicular to the grain	6.8N/mm <sup>2</sup> (1000 psi)
Shear in beams	2.0N/mm <sup>2</sup> (300 psi)
Shear in Joints	2.7N/ mm <sup>2</sup> (400 psi)
Modulus of elasticity	2,400,000

The timber shall be dried to external moisture content of fourteen (14) percent.

### *Non-Structural Timber*

Sawn timber for non-structural members shall be prime or select greenheart or other local hardwoods of high density and natural durability listed under **Clause 1-2 MATERIALS, Sub clause 3, Structural timber** in the Guyana Grading Rules for Hardwoods 1977 and complying with the Guyana Grading Rules for Hardwoods 2002. Reference No. 04.

### *Components*

1. Rods, plates, eye bars and shapes, when required, shall conform to the requirements of AASHTO M270/M270 (ASTM A709/A709M-18) Grade 36 unless otherwise specified.
2. Bolts, nuts, drift-bolts, and dowels may be of mild steel. Washers may be O-gee cast or malleable iron castings or they may be cut from mild steel plate when specified. Unless otherwise specified, bolts shall comply with ASTM A307-14-e1 and shall have coarse threads, class 2 tolerance, conforming to ANSI standard Specifications.

All fastenings, including nails, spikes, bolts, dowels, washers and lag screws shall be galvanized unless otherwise permitted.

3. Unless otherwise specified, all hardware for timber structures shall be galvanized in accordance with AASHTO M 232 /M232-10 (ASTM A153/A153M-16a) or cadmium plated in accordance with AASHTO M299-10 (ASTM B696-00(2015)). All steel components, timber connectors and castings other than malleable iron shall be galvanized in accordance with AASHTO M111M/M111-11 (ASTM A123/A123M-17).
4. Machine bolts shall have square heads and nuts unless otherwise specified. Wire nails and spikes shall be of steel or circular cross section without taper, with a head and point and of good quality. Boat spikes shall be of wrought iron with forged heads and wedge shaped points.
5. All bolt threads shall be properly checked after the final adjustment of the nuts. All bolt stock projecting beyond one-fourth of an inch from the top of the nut shall be removed.
6. Washers of the size and type specified shall be used at all points where bolt heads and nuts would otherwise come in contact with wood. Cast washers shall have a thickness equal to the diameter of the bolt and a diameter of four times the thickness. For plate washers, the thickness shall be equal to one-half the diameter of the bolt, and the sides of the square shall be equal to four times the diameter of the bolt.

**CONSTRUCTION REQUIREMENTS FOR ROUND AND SHEET PILING****1 ROUND PILES**

Piles shall have a gradual taper as specified in the Guyana Grading rules for Hardwoods (Ref No GR 03-2002) throughout its length with the minimum butt and tip diameter as given in the grading rules for the particular length of pile shown on the contract drawings. All other requirements given in the Guyana Grading rules for Hardwoods (Ref No GR 03-2002) for round timber piles shall be adhered to. Particular emphasis should be placed on:

1. All piles shall be cleanly axe trimmed of all branch stubs and knot overgrowths projecting more than 50 mm beyond the general surface of the pile.
2. All piles shall be completely debarked and be cleanly cut-off at the butt and tip at right angles to the vertical axis of the piles.
3. Each pile shall be free from short or reverse bends so that a straight line joining the centres of the butt and tip of the pile shall lie within the pile at all times. Each pile shall be generally free of defects which significantly affect the strength or drivability of the pile, such as knots and knot-clusters of width greater than one third of the diameter of the section where they occur, rotten and hollow knots, rotten heart, splits and shakes in tip or butt, insect attack and plugged holes.

Setting out shall be carried out from the main grid lines of the proposed structure. Immediately before installation of the pile, the pile position shall be marked with suitable identifiable markers.

If as a result of the behaviour of piles during driving or for any other reason the bearing capacity of the piles driven to the specified penetration is insufficient, the Project Manager may direct splicing and the piles driven to a deeper penetration. The length of the pile extension and the design of the splice shall be determined by the Project Manager.

All piles shall be driven as shown on the plans or as ordered by the Project Manager.

Piles shall not be driven until after all excavation is completed. Any material forced up between the piles during driving shall be removed to correct elevation without additional cost.

The heads of all timber piles shall be trimmed to a round cross section and fitted with a tight steel ring. The ring shall be not less than 50 mm x 18 mm cross section and the joint shall be welded for its full section.

As an alternative to a ring, a metal helmet may be used, the top of the pile being trimmed to fit closely into the recess of the underside of the helmet. A hardwood dolly and if necessary a packing shall be used above the helmet.

All piles shall be pointed and painted with 2 coats of an approved bituminous tar meeting the requirements of ASTM D490-92(2016) and marked at 300 mm (one Ft) intervals.

Full length piles shall be used where practicable. Splicing of piles may be permitted only in such cases as may be approved and at such directions as may be given by the Project Manager.

Piles should be driven with either a manually operated, crane operated, tractor operated drop hammer or a pneumatically, vibratory or diesel power driven hammer. When a manually, crane or tractor operated drop hammer is employed the Contractor shall satisfy the Project Manager

regarding its suitability, efficiency and energy of the driving equipment to be employed. All relevant details of the method of piling and plant to be used by the Contractor shall be supplied to the Project Manager. The top of the pile should be trimmed to fit closely into the recess of the underside of the helmet. A hardwood dolly and if necessary a packing shall be used above the helmet.

When a gravity hammer is employed the fall of the gravity hammer shall be so regulated as to avoid injury to the piles and in no case shall exceed 15 feet. Each pile shall be driven continuously until the specified or approved set or depth has been reached except that the Project Manager may permit the suspension of driving if he is satisfied that the rate of penetration prior to the cessation of driving will be substantially re-established on its resumption or if he is satisfied that the suspension of driving is beyond the control of the Contractor.

At all stages during driving and until incorporation in the superstructure the pile shall be adequately supported and restrained by means of leaders, trestles, temporary supports or other guide arrangements to maintain position and alignment and to prevent bending.

There shall be no 'swamping' of piles and no lubricant, including water, shall be used to assist in the driving of piles.

The pile driver leads shall be constructed in such a manner as to afford freedom of movement of the hammer, and they shall be held in position by guys or stiff braces to insure support to the pile during driving operations.

The leads shall be of sufficient length so that the use of a follower will not be necessary except where piles are driven through water.

Piles must be driven with a variation of not more than 1 in 75 from the vertical. Foundation piles shall not be out of position shown on the plan more than 150 mm in any direction after driving.

Foundation piles shall not be out of position shown on the plan more than 150 mm in any direction after driving.

The procedure incident to the driving of the piles shall not subject them to excessive and undue abuse producing injurious splitting, splintering, brooming of the wood or other damage to the pile.

Manipulation of piles to force them into proper position after driving will not be permitted when such manipulation is considered by the Project Manager to be excessive.

Any pile damaged by reason of internal defects, or by improper driving or driven out of its proper location or driven below the elevation fixed by the plans or by the Project Manager shall be replaced at the Contractor's expense.

Defective piles may be corrected or replaced at the Contractor's own expense by one of the following methods approved by the Project Manager for the pile in question:

1. The pile shall be withdrawn and replaced by a new and if necessary, a longer pile.
2. The pile shall be spliced or built up or a sufficient portion of the footing extended to properly embed the pile.
3. A second pile shall be driven adjacent to the defective pile.

All piles pushed up by the driving of adjacent piles or by any other cause shall be driven down again.

The Contractor shall keep records of the installation of each pile and shall submit two signed copies of these records to the Project Manager not later than noon of the next working day after the pile was installed.

Any unexpected change in driving characteristics shall be immediately reported to the Project Manager. The Contractor shall give adequate notice and provide all facilities to enable the Project Manager to check driving resistances. A set shall be taken only in the presence of the Project Manager unless otherwise approved.

After driving, piles shall be cut off square at the designed cut-off elevation and the cut surfaces shall be heavily coated with an approved preservative. The length of the pile above the elevation of cut-off shall be sufficient to permit the complete removal of all the material injured by the driving operations.

### ***SHEET PILING***

Materials for sheet piling shall range in size from 25mm x 250mm to 75mmx300mm sap free prime or select grade dressed greenheart or purple-heart boards or planks. The boards or planks must be cut to true dimensions in order that they can be fabricated into Wakefield sheet piles. Only full length boards can be used for sheet piling as splicing is not permitted.

Prior to preparing the piles the boards or planks must be completely treated with two coats of tar meeting the requirements of ASTM D490-92(2016). For Wakefield piles preparation includes offsetting the centre board a distance of 75mm so that each pile will have a seventy five mm tongue as well as a seventy five mm groove. The three boards must be bolted together with bolts spaced at 750mm and staggered as shown on the contract drawings. The bottom of the piles must be cut at an angle of 45 degrees so that during driving there the force acting on the pile being driven will force the tongue into the groove of the pile already in place. Alternately 75mm planks can be mill dressed to give a recess on one side (groove) of the plank that could accept a tongue from the adjoining plank

Setting out shall be carried out along the line of the proposed structure. Prior to driving abutment or revetment sheet piles the round piles and walers for the abutment must be in place. In the case of toe piles only setting out is necessary.

Initial driving can be achieved by pressing the sheet pile into the ground using the bucket of a hydraulic excavator or some other appropriate machine.

Piles should then be driven with either a manually operated, crane operated, tractor operated drop hammer or a pneumatically, vibratory or diesel power driven hammer. When a manually, crane or tractor operated drop hammer is employed the Contractor shall satisfy the Project Manager regarding its suitability. The top of the pile should be trimmed to fit closely into the recess of the underside of the helmet. A hardwood dolly and if necessary a packing shall be used above the helmet.

At all stages during driving pile shall be adequately supported and restrained by means of guide arrangements secured to the walers to maintain position and alignment and to prevent bending.

Piles must be driven with a variation of not more than 1 in 75 from the vertical.

The procedure incident to the driving of the piles shall not subject them to excessive and undue abuse producing injurious splitting, splintering, brooming of the wood or other damage to the pile.

Manipulation of piles to force them into proper position after driving will not be permitted when such manipulation is considered by the Project Manager to be excessive.

Any pile damaged by reason of improper driving or driven out of its proper location or driven below the elevation fixed by the plans or by the Project Manager shall be replaced at the Contractor's expense.

Defective piles will be replaced at the Contractor's own expense.

Any unexpected change in driving characteristics shall be immediately reported to the Project Manager. The Contractor shall give adequate notice and provide all facilities to enable the Project Manager to check driving resistances

After driving, piles shall be cut off square at the designed cut-off elevation and the cut surfaces shall be heavily coated with an approved preservative. The length of the pile above the elevation of cut-off shall be sufficient to permit the complete removal of all the material injured by the driving operations.

#### CONSTRUCTION REQUIREMENTS OF FABRICATED ELEMENTS

1. Workmanship shall be first class throughout and all framing shall be true and exact. Unless otherwise specified, nails and spikes shall be driven with just sufficient force to set the heads flush with the surface of the wood. Deep hammer marks in wood shall be considered evidence of poor workmanship and sufficient cause for rejection of the work.

All lumber and timber shall be accurately cut and framed to a close fit so that the joints will have an even bearing over the entire contact surface. No shimming will be permitted in making joints, nor will open joints be accepted.

Mortises shall be true to size for their full depth and tenons shall make snug fit therein.

Countersinking shall be done wherever smooth faces are required.

2. Lumber and timber stored at the construction site shall be kept in orderly piles and stacks. Untreated material shall be open stacked on supports at least 300 mm above ground surface to avoid absorption of ground moisture and permit air circulation and it shall be so stacked as to permit free circulation of air between tiers and courses and prevent warping. In particular cases required by the Project Manager, the contractor shall provide protection from the weather by a suitable covering. The ground underneath and in the vicinity of the timber shall be cleared of weeds and rubbish at all times.

The storage area shall be chosen or constructed so that water will not accumulate under or near the stored timber/lumber.

3. Treated timber shall be handled carefully without sudden dropping, breaking of outer fibers, bruising or penetrating the surface with tools. It shall be handled with rope or web slings or other approved methods. Use of cant dogs, peaveys, pike poles or hooks will not be permitted. When metal bands are used to bundle members, corner protectors shall be provided (by the Contractor) to prevent damage to the treated timber.

4. All cutting, framing and boring of treated timber shall be done before treatment in so far as is practicable. Cuts and recesses shall be covered with two applications of a mixture of 60 percent creosote oil and 40 percent roofing pitch or brush coated with at least two applications of hot creosote oil and covered with hot roofing pitch. Unless otherwise specified, hot preservatives shall be heated to a temperature between 65°C (149° F) and 90°C (194° F).

For timbers originally treated with pentachlorophenol creosote solution or waterborne preservative, all cuts, abrasions and recesses that occur after treatment shall be field treated by two liberal applications of a comparable preservative to the approval of the Project Manager.

5. Holes for machine bolts shall be bored with a bit of the same diameter as the finished bolt. Holes for lag screws shall be bored with a bit not larger than the body of the screw at the base of the thread.

To prevent splitting or stripping the threads, the hole for the shank shall be bored the same diameter and to the same depth as the shank. The depth of holes for lag screws shall be approximately 25 mm less than the length under the head. Countersinking shall be done where smooth and flush surfaces are required. All spikes shall be driven hard and straight, flush with the timber.

Holes for round drift bolts and dowels shall be bored with a bit 1.5 mm less in diameter than the bolt or dowel to be used. The diameter of holes for square drift bolts or dowels shall be equal to the least dimension of the bolt or dowel.

Holes for rods shall be bored with a bit 1.5 mm greater than the diameter of the rod.

All cuts and drilled holes in treated piling or timbers and all abrasions, after having been trimmed carefully, shall receive treatment as specified in the relevant Specifications dealing with 'Timber Preservative and Treatment'.

6. Posts shall be fixed to deck planks by one of the following methods, as indicated on the plans:
  - a. By dowels of not less than 18 mm diameter extending at least 150 mm into both posts and planks.
  - b. By drift-bolts of not less than 10 mm diameter driven diagonally through the base of the post and extending at least 30 mm into the plank.
  - c. By other methods of construction approved by the Project Manager.
7. Shear connectors needed to resist shear and provide holding-down capacity between timber and concrete support elements shall be furnished and installed in conformity with the details shown on the Drawings. If no such details are provided and the construction is described as composite, the Contractor shall provide such details and devices for the approval of the Project Manager prior to the commencement of the works.
8. Wheel guards and railings shall be accurately framed in accordance with the drawings and erected true to line and grade. Unless otherwise specified, wheel guards, rails and rail posts shall be surfaced on four sides.
9. Stringers/beams shall be sized to uniform depth at bearings and shall be placed in position so that any knots near the edges will be in the top portion of the members.

Stringers/beams may have butt joints or lapped joints as shown on the plans. The lapped ends of untreated stringers/beams shall be separated at least 12 mm to permit the circulation of air. When stringers/beams are two panels in length, adjacent stringers/beams shall be lapped at alternate bents. All stringers/beams shall be fastened securely by bolts where shown on plans.

Outside stringers/beams may have butt joints with the ends cut on a taper but interior stringers shall be lapped to take bearing over the full width of the support member at each end.

10. Unless otherwise specified, cross bridging or blocking shall be placed at the centre of each span. Cross bridging between stringers shall be neatly and accurately framed and securely toe-nailed with at least two nails in each end. All cross-bridging members shall have full bearing at each end against the sides of stringers. Blocking shall be snug fit and held in place by either prefabricated galvanized steel beam hangers or by tie-rods as detailed on drawings.
11. Unless otherwise specified, planks for flooring shall be surfaced on four sides.
12. Single plank floors shall consist of a single thickness of plank supported by stringers or joints. The planks shall be laid heart side down with 5 mm openings between them for seasoned material and tight joints for unseasoned material. Each plank shall be securely spiked to each joist or nailing strip with not less than two spikes. The planks shall be carefully graded as to thickness and so laid that no two adjacent planks shall vary in thickness by more than 0.75 mm.
13. The strips shall be placed on edge, at right angles to the centerline of the roadway. The spikes shall be sufficient length to pass through two strips and at least halfway through the third strip.

If timber supports are used, every other strip shall be toe-nailed to every other support. When specified on the Drawings, the strips shall be securely attached to steel or concrete supports by the use of approved galvanized metal clips or bolts. Care shall be taken to have each strip vertical and tight against the preceding strip and bearing evenly on all the supports.
14. Rail and rail posts of timber or any other parts designated on the Drawings to be painted shall be painted with one coat of approved primer and at least two coats of approved oil paint of the colors approved by the Project Manager. The Project Manager may select reflectorized paint for this use.
15. The top surface of Walkway Deck Planks shall be thoroughly coated with a thick coat of coal tar epoxy, suitable for floors.

#### **MEASUREMENT AND PAYMENT**

Measurement of the work of Furnishing, Pitching and Driving Timber Piles, Furnishing and Construction using Timber shall be based on the requirements of the Drawings. Payment for Furnishing Pitching and Driving Round Timber Piles shall be paid by the meter while payment for Furnishing and driving sheet piles/toe piles shall be paid by the sq m. Payment for round timber piles used in the construction of a sheet pile installation shall be paid as round piles while the timber frame of the sheet pile installation will be paid as Construction of Timber

Structures. Construction of Timber Structures shall be paid for by the board foot or if appropriate by the cubic meter.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 09, Incidental Structural Works, Item 090801 Furnishing Timber Piles, Item 090802 Pitching and Driving Timber Piles, Item 090803 Driving Sheet Piles, Item 090804 Furnishing Structural Timber, Item 090805 Construction of Timber Structures, using the units of measurement specified.

Payment for removal, storage of reusable material, disposal of unusable material, supply of ancillary materials excepting wood, labor etc, and replacement of wooden access an farm access ramps specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 09, Incidental Structural Works, Item 090806 Removal and Replacement of Wooden Access using the units of measurement specified. Payment for new wood used in the replacement of wooden access shall be paid under Item 090804. Payment for new wood used in the replacement of wooden farm access ramps shall be paid under Item 090804.

The rates and prices quoted shall include the cost of all operations and sequences of operations which may be required to comply with the needs of the Works, including the purchase of Piles, providing the Components listed in Section 1-2 **Materials**, Sub Section 5, and Compliance with all steps listed in Section 1-3, Construction requirements for round piling

The rates and prices quoted shall also include the cost of all operations and sequences of operations which may be required to comply with the needs of the Works, including the purchase of Timber, providing the Components listed in Section 1-2 **Materials**, Sub Section 5, Purchase of Structural Timber and Compliance with all steps listed in Section 1-4 Construction Requirements of Fabricated Elements

The rates and prices quoted shall include protection of the work, protection of existing facilities, furnishing of all labor, equipment, and materials needed to perform the work.

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## ***SECTION 09090 – EPOXY MATERIALS***

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## 1-1 DESCRIPTION

This item shall govern the various types of epoxy materials shown on the plans and in this item.

**Epoxy material for steelwork shall refer to section 09020, 'Paint'.**

## MATERIALS

Epoxy bonding agents shall be thermosetting 100% solid compositions that do not contain solvent or any nonreactive organic ingredient except for pigments required for coloring. Epoxy bonding agents shall be of two components, a resin and a hardener. The two components shall be distinctly pigmented, so that mixing produces a third color similar to the concrete in the segments to be joined, and shall be packaged in pre-proportioned, labeled, ready-to-use containers.

The materials covered by this item are as follows:

1. Concrete adhesives
2. Binder for epoxy grout on concrete
3. Epoxy for crack injection
4. Epoxy coating for concrete

Epoxy bonding agents shall be formulated to provide application temperature ranges that will permit application at substrate temperatures from 4.5°C to 46°C (40°F to 115°F). If two surfaces to be bonded have different substrate temperatures, the adhesive applicable at the lower temperature shall be used.

Epoxy bonding agents shall be insensitive to damp conditions during application and, after curing, shall exhibit high bonding strength to cured concrete, good water resistivity, low creep characteristics, and tensile strength greater than the concrete. In addition, where applicable, the epoxy bonding agents shall function as a lubricant during the joining of the match cast segments, as a filler to accurately match the surface of the segments being joined, and as a durable watertight bond at the joint.

Epoxy bonding agents shall be tested to determine their workability, gel time, open time, bond and compression strength, shear, and working temperature range.

The Contractor shall furnish the Project Manager with samples of the material for quality assurance testing, and certification from a reputable independent laboratory indicating that the material has passed the required tests as stated in AASHTO Standard Specification for Highway Bridges, Division II Article 8.13.7.

## TYPES

The various types of epoxy materials and their uses are described below:

### **1 Concrete Adhesives**

The following epoxy adhesives with different viscosities are used to bond fresh Portland cement concrete to existing Portland cement concrete, hardened concrete to hardened concrete and steel to fresh or hardened concrete.

1. Standard Epoxy Adhesive- Medium viscosity adhesives for applying to horizontal and vertical surfaces. This material is suitable for surface sealing of fine cracks on concrete and setting of dowel bars.
2. Low Viscosity Epoxy Adhesive- For application with spray equipment to horizontal surfaces.
3. Epoxy Adhesive Paste- Paste consistency for overhead application and where a high build-up is required. The material is suitable for surface sealing of cracks in concrete which are veed out prior to sealing.

Any specific colouring of resin and hardener components shall be as directed by the Project Manager.

### ***Epoxy Binder***

This material is used for mixing with selected aggregates to produce an epoxy mortar or concrete for grouting dowel bars or repairing spalls or other defects in existing Portland cement concrete. This type of epoxy binder shall comply with the requirements of low viscosity epoxy except that the mixing ratio of resin to hardener shall be as specified by the manufacturer and the required ability to bond fresh Portland cement to hardened concrete does not apply.

The aggregates used with the epoxy binder to form epoxy mortar or concrete shall be clean and dry. Siliceous aggregates are required unless otherwise approved by the Project Manager.

### ***Crack Injection***

This material is a low viscosity epoxy material designed for pressure injection into cracks in existing concrete to restore the structural integrity. The epoxy shall be capable of bonding to damp surfaces.

### ***Epoxy Coating***

This is a high-solids epoxy coating used for water proofing columns, caps etc. This material is designed for application by brush or roller but can also be applied by airless spray with the addition of a maximum of five percent toluene solvent with the approval of the Project Manager.

## **PACKAGING, LABELING AND STORAGE**

The components shall be packaged according to mixing ratio in suitable, well-sealed containers. The containers shall be clearly labeled as to the type material and the ratio of components to be mixed by volume. Any special instructions regarding mixing and application shall be included. The label shall show resin or hardener component, the brand name, name of the manufacturer, lot or batch number, date of packaging and the quantity contained therein. Caution warnings regarding contact of the epoxy with skin and eyes shall be included on the labels. The epoxy components must be stored at temperatures between 20<sup>0</sup>C and 36<sup>0</sup>C. Any materials which show evidence of crystallization, lumps, skinning, extreme thickening or settling of pigments which cannot be readily dispersed with normal agitation shall not be used.

**CONSTRUCTION METHODS**

Mixing and application of epoxy materials shall be as specified herein.

1. Mixing.

Prior to use, each component shall be stirred to re-disperse any settling or separation of the filler and liquid portions. The components shall then be immediately placed in the proper reservoir, when used in automatic mixing and dispensing equipment. For application by other means, the components must be properly proportioned and mixed until uniform colour and appearance are obtained. No addition of solvents will be allowed unless indicated by the manufacturer or approved by the Project Manager.

2. Application and surface preparation.

Requirements for application and preparation of the surface upon which the epoxy is to be placed shall be in accordance with the applicable specification.

**MEASUREMENT AND PAYMENT**

Measurement of the work for Supplying and Applying Epoxy shall be based on the requirements of the Drawings or as directed by the Project Manager's representative. Payment for Supplying and Applying Epoxy shall be paid for by the square meter.

Payment for the work specified in this section of the Specification shall be made against the appropriate items of the Bill of Quantities, Bill 09, Incidental Structural Works Item 090901 Supplying and Applying Epoxy, using the units of measurement specified.

The rates and prices quoted shall include the cost of all operations and sequences of operations which may be required to comply with the needs of the Works, including the purchase of epoxy, applying epoxy to surfaces shown on the plans or otherwise specified to be painted, preparation of surfaces to be epoxied, application and curing of the epoxy, protection of the work, protection of existing facilities, vehicles and the public from damage due to this work, and the furnishing of all labor, equipment, and materials needed to perform the work.

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## ***SECTION 10010– DAYWORKS***

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## 1-1 DESCRIPTION

The Project Manager may instruct that additional or substituted work may be executed on a day work basis.

Provisional items are included in the Dayworks section of the Bill of Quantities to cover the payment of plant, labour, and materials for work executed in accordance with the Project Manager's instructions on a day work basis by the Contractor or by his subcontractors.

## 1-2 MEASUREMENT AND PAYMENT

### *1 Plant*

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities Bill 10, Dayworks. Item 100101: CAT D4 Tractor of equivalent with dozer/ripper attachment included; Item 100102: Cat 12 Motor Grader or equivalent with ripper and Scraper; Item 100103: Heavy Grid or Sheep Foot Roller; Item 100104: Drawn Vibrating Roller; Item 100105: 15 ton Pneumatic Roller; Item 100106: 16-18 Ton Smooth Wheel Roller; Item 100107: 6-8 Ton Smooth Wheel Roller; Item 100108: Small Hand Propelled Vibrating Roller; Item 100109: Whacker Hand Compactor or equivalent; Item 1001010: Vibrating Plate Compactor or equivalent; Item 1001011: CAT 225 Backhoe Excavator or equivalent; Item 1001012: CAT 416 Backhoe Loader or equivalent; Item 1001013: CAT 950 Wheeled Loader or equivalent; Item 1001014: 3 ton Lorry; Item 1001015: 10 ton Lorry; Item 1001016: Land Rover or equivalent; Item 1001017: 0.75 - 1 tonne Delivery Van; Item 1001018: 0.75 -1 tonne Pickup; Item 1001019: Compressor 8.5 cu.m/min c/w all tools, hoses, breakers, etc.; Item 1001020: Compressor 85 cu.m/min c/w all tools, hoses, breakers, etc.; Item 1001021: Sludge Pump, Hand Operated; Item 1001022: 75 mm Delivery Water Pump and Motor; Item 1001023: 100 mm Delivery Water Pump and Motor; Item 1001024: Concrete Mixer 21/4; Item 1001025: Concrete Mixer 7/5; Item 1001026: Concrete Vibrator Poker Type; Item 1001027: Tractor and Trailer; Item 1001028: Dumper 0.75 cu.m capacity; Item 1001029: Self-Propelled Water Tanker 13750 Litres; Item 1001030: Self-Propelled Water Tanker 20500 Litres; Item 1001031: Mechanical Broom; Item 1001032: Bitumen Distributer 6800 litre capacity; Item 1001033: Bitumen Distributer 3400 litre capacity; Item 1001034: Chainsaw 400mm Blade; Item 1001035: Chainsaw 600mm Blade; Item 1001036: Power Generator 30 KVA; Item 1001037: Portable Power Generator 5KW; Item 1001038: Electric Welding Set and Item 1001039: Oxy Acetylene Cutting Welding Equipment; using hours worked as the unit of measurement.

Payment shall only be made for the time each item of plant is actually required to be present on Day work instructed by the Project Manager. Idle time, where due solely to delays outside the Contractor's control and agreed with the Project Manager, shall be paid for at one-half of the tendered rate. Idle time due to breakdowns, inefficiency or incompleteness of the plant shall not be paid.

The rates for plant shall include for the costs of the following:

1. Supervision and transport of supervisory staff.
2. Transporting or travelling of each item of plant to and from the place of Day work.
3. Operators, drivers, and turn boys including overtime.
4. Electrical power, water, fuel, oil grease, and other consumables and equipment.

5. Power cables, delivery or suction pipes and fittings, steam or air hoses and tackle, and all other appurtenances of whatever nature required for the safe and efficient operation of the plant.
6. Maintenance, spare parts, drill bits and chisel points and all costs of repairs.
7. Depreciation, insurance, overheads, profits and any other costs or allowances.

## **2 Labour**

Payment shall only be made for the time each class of labour is actually present on Day work instructed by the Project Manager.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities Bill 10, Dayworks. Item 1001040: Ganger; Item 1001041: Unskilled Labour; Item 1001042: Surfacing Contractor; Item 1001043: Carpenter; Item 1001044: Steelwork Erector; Item 1001045: Driver for Vehicle over 10 tons; Item 1001046: Driver for Vehicle up to 10 tons; Item 1001047: Operator for Excavator, Dragline, Shovel, pile driver, crane, grader and bulldozer; Item 1001048: Operator for Tractor with Dozer Blade, Ripper, vibrator, ransom, plate compactor, water pump and generator; Item 1001049: Project Manager, using hours worked as the unit of measurement.

The rates for labour shall include for the cost of the following:

1. Supervision and transport of supervisory staff.
2. Any special allowance to such labour in respect of the nature of the work, subsistence, overtime, bonuses, feeding, housing, holidays, transport to and from the place of Day work, overhead charges in respect of recruitment, camp administration and welfare and insurances.
3. Supply, transport about the site, use, maintenance and renewal of small tools used on Day work, such as picks, shovels, barrows, trowels, hand saws, buckets, trestles, hammers, chisels, and all items of a like nature and not specifically referred to in the items for Constructional Plant, and protective clothing.
4. All other costs which the Contractor may incur in the employment of labour including overheads, profit and any other costs or allowances.

## **3 Materials**

Payment shall only be made for the materials instructed by the Project Manager for use on Dayworks. The net weights, volumes, and areas as appropriate verified by the Project Manager in accordance with his instructions shall be measured.

Payment for the work specified in this section of the Specification shall be made under the relevant items of the Bill of Quantities Bill 10, Dayworks. Item 1001050: Cement, Ordinary Portland or equivalent in bags; Item 1001051: Hydrated Lime; Item 1001052: Mild Steel Reinforcing Bar up to 16 mm diameter to BS 4449 or equivalent; Item 1001053: High Yield Steel (any diameter); Item 1001054: Fine Aggregate for Concrete; Item 1001055: Coarse Aggregates for Concrete (max 25mm size); Item 1001056: Formwork Class F1; Item 1001057: Formwork Class F2; Item 1001058: Formwork Class F3; Item 1001059: Cutback Bitumen MC 30; Item 1001060: Grade 60/70 Bitumen; Item 1001061: Grade 80/100 Bitumen; Item 1001062: Fine Aggregate for Asphalt Concrete; Item 1001063: Coarse Aggregate for Asphalt

Concrete; Item 1001064: Sand for Asphalt Concrete; Item 1001065: Asphalt Concrete Compacted; Item 1001066: White Sand Compacted; Item 1001067: White Sand/Sand Clay Blend Compacted; Item 1001068: Greenheart Lumber (Structural); Item 1001069: Greenheart Piles 20m long; Item 1001070: Greenheart Piles 15m long; Item 1001071: Road Paint and Item 1001072: Crusher Run Compacted, using the unit specified in the Bill of Quantities for individual material items as the unit of measurement.

The rates for materials shall include for the cost of purchase or provision of the material, transport to the site and place of Day work, storage, insurance, handling, wastage, placing, supervision, profit, and any other costs or allowances.

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## ***SECTION 22 PRECAST,    PRESTRESSED    CONCRETE COMPONENTS***

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## **SECTION 22 PRECAST, PRESTRESSED CONCRETE COMPONENTS**

### **1-1 22-1 SCOPE OF SECTION**

This section covers the manufacture of pre-cast, pre-stressed concrete components including piles, pre-cast deck slab units, pre-stressed concrete beams, and similar members. It also includes handling and transport. Installation or incorporation of pre-cast, pre-stressed concrete components into the structure, shall comply with this and other sections of the Specifications.

### **1-2 22-2 TERMINOLOGY**

**Anchorage:** - An assembly of various hardware components which secure a tendon at its ends after it has been stressed and imparts the tendon force into the concrete.

**Bar (Bar tendon):** Post-tensioning bar of high strength steel, normally available in diameters from 5/8" to 1-3/8" with coarse thread.

**Coupler:** - (Bar-coupler) The means by which a tendon is connected from one partial - length tendon to another to transmit the pre-stressing force.

**Pre-stressed concrete:** - Concrete, which is placed under a compressive stress in order to counteract subsequent tensile, stresses due to applied loads. Pre-stressed concrete may be pre-tensioned or post-tensioned. Pre-stressing is the process of applying a compressive stress to the concrete by means of pre- or post-tensioning.

**Pre-tensioning:** - the application of a compressive force to the concrete by strands, which are stressed prior to placing the concrete and then released to transmit that force by bond after the concrete has sufficiently hardened.

**Post-tensioning:** - the application of a compressive force to the concrete by stressing tendons after the concrete has been cast and cured.

**Post-Tensioning Scheme or Layout:** - The pattern, size, locations and forces of the post-tensioning tendons shown on the Contract Plans.

**Post-Tensioning System:** A proprietary system where the necessary hardware (anchorage, wedges, strands, bars, couplers, etc.) is supplied by a particular manufacturer or manufacturers of post-tensioning components.

**Set (Also anchor set, wedge set or seating loss):** Set is the total movement of a point on the strand just behind the anchoring wedges during load transfer from the jack to the permanent anchorages. It is the sum of slippage of the wedges with respect to the anchorage head and the elastic deformation of the anchor components. For bars, set is the total movement of a point on the bar just behind the anchor nut at transfer and is the sum of slippage of the bar and the elastic deformation of the anchorage components. Anticipated set is that set which was assumed to occur in the design calculation for the post-tensioning force immediately after load transfer.

Strand: - An assembly of several high-strength steel wires wound together. Strands usually have six outer wires helically wound around a single straight wire of a similar diameter. Strand may be used in both pre- and post-tensioned applications.

Tendon: - The main tensile element of high strength steel made up of a number of strands, wires or bars, which is placed in high tensile force by reacting against the concrete in a post-tensioned system.

Transfer: the act and time of imparting a compressive stress to the concrete from the pre-tensioning or post-tensioning system.

Wedge: - A small, conical shaped, steel component placed around a strand to grip and secure it by wedge action in a tapered hole through a wedge plate.

Wedge Plate: - A circular steel component of the anchorage containing a number of tapered holes through which the strands pass and are secured by conical wedges.

Wire: - A single, small diameter, high strength steel member, normally, the basic component of strand, although some proprietary post-tensioning systems are made up of individual or groups of single wires.

## **1-3    22-3    SHOP DRAWINGS**

### **22-3.1 General**

Shop Drawings or Working Drawings are drawings prepared by the Contractor and/or his suppliers of materials, services and components purposely for the project. Shop drawings are intended to clarify construction details, means, methods and procedures in order to accommodate commercially available components, hardware, materials, systems and the like.

The term "shop drawings" shall also mean working drawings, calculations, commercial information and other documents of a technical nature necessary for the Works.

Shop drawings shall conform to the requirements of these specifications, the Plans, notes, Design Criteria and all information therein.

### **22-3.1 Submittals**

Shop, working drawings, supporting calculations and information shall be submitted to the Project Manager at least 30 days in advance of any work addressed therein, or as otherwise approved by the Project Manager. Three copies of all shop, working drawings supporting calculations and information shall be submitted, or as otherwise approved by the Project Manager.

The Contractor shall submit detailed shop drawings that include, but are not necessarily limited to:

1.     Layout, location, and all relevant details of the facility to be used to manufacture pre-cast, pre-stressed concrete members.
2.     Layout of beds for fabrication and casting of pre-cast pre-stressed concrete members including all foundations, supports, forms, abutments and anchorages for the pre-tensioning system and similar devices.
3.     Material storage areas, handling methods, conveyors, all equipment and the like for measuring, mixing and batching concrete, delivery of concrete, placing, consolidating, finishing and curing of concrete.

4. Details of proposed handling, storage, stacking, transport of pre-cast members including any details for lifting, embedded items, attachments, block outs or other details.
5. A complete description and details for the pre-stressing systems proposed for both pre-tensioning and post-tensioning - for both permanent and temporary pre-stressing.
6. Designation of the specific pre-stressing steel, anchorage devices, bars, bar couplers, ducts, vent-pipes, attachments and accessory items.
7. Material properties, sizes and strength characteristics of each of the components of the pre-stressing systems (include stress-strain curves for strands and bars).
8. Details covering assembly and installation of pre-tensioning strands and post-tensioning bars and components of the system.
9. Equipment to be used in pre- and post-tensioning operations (jacks, gauges, etc.) along with calibration charts.
10. Details of the procedure and sequence of operations for pre-stressing, securing strands, bars or other elements during fabrication and erection of the pre-cast pre-stressed planks.
11. Procedure for releasing the pre-tensioning strand in order to transfer pre-stress to the concrete member.
12. Parameters used to calculate the resulting pre-stressing force such as; friction coefficients, anchor set, steel relaxation, for post-tensioning or elastic losses, movement of pre-tensioning abutments, etc. for pre-tensioning.
13. Certified copies of the reports covering tests performed on pre-stressing anchorage devices along with details for any reinforcing steel needed due to stresses imposed in the concrete by anchorage plates or devices.
14. Details and procedures for grouting of post-tensioning tendons (bars); the materials and proportions for grout, details of equipment for mixing and placing grout and methods of mixing and injecting grout including quality control checks to ensure complete filling of tendons.
15. Procedures for sealing ducts and anchors and for filling and finishing of block outs and cast-in-place joints.
16. Miscellaneous calculations, as necessary, to substantiate the pre-stressing system and procedures including stress-strain curves, jacking forces, elongations during tensioning, seating losses, short-term pre-stress losses, long term pre-stress losses, temporary overstress, stresses in pre-stress anchorages including distribution plates and reinforcing steel needed in the concrete to resist stresses imposed by pre-stress anchorages.

#### **22-3.2 Contractor Proposed Options**

The Contractor may propose for consideration by the Project Manager certain variations from the pre-stressing systems shown in the contract document.

##### Restrictions to Contractor Proposed Options

1. Materials and devices used in the pre-stress system shall conform to all of these specifications.

2. The net compressive stress in the concrete after all losses is at least equal to that provided by the system shown on the Plans.
3. The distribution of individual pre-tensioning strands or post-tensioning tendons at each section generally conforms to the distribution shown on the Plans.
4. All provisions of the Design Criteria, as noted on the Plans shall be satisfied, in particular, the ultimate strength of the structure with the proposed pre-stressing system meets the requirements of the Design Criteria on the Plans. Furthermore, all stresses in the concrete and pre-stressing steel at all sections and at all stages of construction meet requirements for service in accordance with the Design Criteria noted on the Plans.
5. The Contractor redesigns and details, as required, the elements where an alternative pre-stressing system is proposed.
6. Transverse post-tensioning anchors may be placed in the forms before the concrete is cast.
7. The Contractor submits shop drawings for the pre-stressing system, showing full details including reinforcing steel, dimensions, concrete cover etc. supported by calculations (including short and long term pre-stress losses) for the Project Manager's approval.
8. Any Contractor proposed alternative to the pre-stressing system approved by the Project Manager, that results in a change in quantity from that shown on the Plans, shall be paid based on the quantity actually used and accepted or the Plan quantity, whichever is less.

**1-4 22-4 MATERIALS**

**22-4.1 Concrete**

Concrete for pre-cast pre-stressed deck slab units and for prestressed beams shall be Grade (Class) 42S, for load bearing 14" by 14" PPC piles shall be Grade (Class) 50P and for PPC sheet piles shall be Grade (Class) 42S all in accordance with Section 08020.

**22-4.2 Prestressing Steel (Strand)**

Unless otherwise noted on the Plans, steel for pre-tensioning of the pre-cast, pre-stressed deck slab units, pre-stressed beams, and piles shall be uncoated, high strength, seven-wire, low-relaxation strand conforming to the requirements of AASHTO M 203, Grade 1860 (ASTM A416/ A416M-18, Grade 270)

**22-4.3 Ducts**

Ducts shall be sufficiently rigid to withstand loads imposed during placing of concrete to maintain their shape. Proper alignment shall be maintained by means of suitably spaced and secured intermediate supports and connections to the forms.

Ducts, including all connections, shall prevent entrance of cement paste or water into the system and shall effectively contain grout under pressure, during grouting of the tendon, without leaks. The duct system must be able to withstand water pressure during flushing of a duct in the event of an aborted grouting operation. Duct shall not be spliced within the width of each pre-cast deck slab unit.

Unless otherwise shown on the Plans, the interior diameter of ducts for 1-1/4 inch diameter bar tendons shall be at least 3 inches but not greater than 4 inches, and shall be straight within the width of each pre-cast slab unit.

Transverse ducts shall be of corrugated plastic of either high-density polyethylene (HDPE) or high-density polypropylene (HDPP). HDPE shall conform to ASTM D3350-14, cell classification range 424432C to 335534C. HDPP shall conform to ASTM D4101-17e1, cell classification range PP210B43542 to PP210B65542. Plastic duct shall be corrugated with a pitch not less than 1/10 of the radius of the duct. Material thickness shall be 0.06 inches, 0.010 inches.

Corrugated plastic duct shall be designed so that a force equal to 40 percent of the ultimate tensile strength of the tendon will be transferred through the duct into the surrounding concrete in a length of 2.5 feet. To verify this requirement, six static pullout tests shall be conducted to determine compliance of a duct with the force transfer requirement. If five of these tests exceed the specified force transfer, the duct is acceptable. The Contractor shall provide to the Project Manager certified test reports verifying that the duct meets specification requirements in regard to force transfer. Alternatively, to satisfy the intent of these tests, the results for static pullout tests from previous projects utilizing the same duct and pre-stressing steel with similar concrete and grout material may be submitted to the Project Manager in lieu of executing new pullout tests. However, if the previous results are unacceptable or if there is a significant difference in the materials used, then the Contractor shall provide results from new tests for this project.

#### **22-4.4 Bar Anchors**

##### **Refer also to Section 23.**

Bar anchors are to be embedded in the pre-cast deck slab, units shall be properly aligned with and connected to the transverse ducts with a grout-tight seal. Any additional reinforcing required to control local bursting stresses arising from a proprietary bar anchorage device, shall be provided and installed at no additional expense.

#### **22-4.5 Sampling and Testing**

All testing shall be done in accordance with ASTM Specifications for the materials.

Samples of materials and devices selected at locations designated by the Project Manager shall be furnished by the Contractor at his expense. These shall include:

1. Three samples of seven foot long pre-stressing wire or bar for each size from each heat number or production lot.
2. Three samples of five foot long pre-stressing strand for each size from each heat number or lot.
3. If bar couplers are to be used, three samples with two specimens each consisting of four-foot lengths of the specific pre-stressing bar coupled with a bar coupler from the materials to be used on the project.
4. One unit of each pre-stress anchorage to be used on the project.

Samples shall be furnished at least 90 days in advance of the time they are to be incorporated into the work. The Contractor shall arrange for an independent testing laboratory or agency, approved by the Project Manager, to perform direct tensile and other tests on these samples as required by the ASTM Specifications and subject to review and approval by the Project Manager.

The Project Manager reserves the right to reject any material or device, which is obviously defective or was damaged subsequent to testing.

#### **22-4.6 Manufacturer's Lots**

The manufacturer of pre-stressing steel, pre-stress anchorages and bar couplers shall assign an individual number to each Lot of strand, wire, bar or devices at the time of manufacture. Each reel, coil, bundle or package shipped to the project shall be identified by tag or other acceptable means as to Manufacturer's Lot number. The Contractor shall be responsible for establishing and maintaining a procedure by which all pre-

stressing materials and devices can be continuously identified with the manufacturer's Lot number. Items, which at any time cannot be positively identified as to Lot number, shall not be incorporated into the work. Low relaxation strand shall be clearly identified as required by ASTM A416/ A416M-18. Any strand not so identified will not be acceptable.

The Contractor shall furnish manufacturer's certified reports covering the tests required by this Specification. A certified test report stating the guaranteed minimum ultimate tensile, yield strength, elongation and composition shall be furnished for each lot of pre-stressing steel. When requested, typical stress-strain curves for pre-stressing steel shall be furnished. A certified test report stating strength when tested using the type pre-stressing steel to be used in the work shall be furnished for each Lot of pre-stress anchorage devices. All certified reports must be provided prior to incorporation of any materials in the Works.

## **1-5 22-5 CONSTRUCTION REQUIREMENTS**

### **22-5.1 General**

#### **Precast Prestressed Concrete Deck Slab Units, Prestressed Concrete Beams, 14" Piles and PPC Sheet Piles**

Piles shall be cast on a horizontal platform in approved molds and details of the formwork and methods of concreting shall be as specified. The concreting of each member shall be completed in one operation and no interruption will be permitted. Inserts for lifting shall be positioned in accordance with the details shown on the approved Shop Drawings, or as otherwise approved by the Project Manager. These requirements shall apply whether the deck slab units, beams or piles are cast on Site or, with the approval of the Project Manager, in a yard off site.

#### **22-5.2 Protection of Prestressing Steel**

##### **The following applies to steel for pre-tensioned and post-tensioned applications.**

All pre-stressing steel shall be protected against physical damage at all times from manufacture to grouting or encasing in concrete. Prestressing steel that has sustained physical damage at any time shall be rejected. Any reel that is found to contain broken wires shall be rejected and the reel replaced.

Prestressing steel shall be packaged in containers or shipping forms for protection of the steel against physical damage and corrosion during shipping and storage. A corrosion inhibitor, which prevents rust or other results or corrosion, shall be placed in the package or form, or shall be incorporated in a corrosion inhibitor carrier type packaging material, or when permitted by the Project Manager, a corrosion inhibitor may be applied directly to the steel. The corrosion inhibitor shall have no deleterious effect on the steel or concrete or bond strength of steel to concrete. Inhibitor carrier type packaging material shall conform to the provisions of Federal Specifications MIL-P-3420 or as otherwise approved by the Project Manager. Packaging or forms damaged from any cause shall be immediately replaced or restored to original condition.

The pre-stressing steel shall be stored in a manner which will at all times prevent the packing material from becoming saturated with water and allow a free flow of air around the packages. If the useful life of the corrosion inhibitor in the package expires, it shall immediately be rejuvenated or replaced.

At the time the pre-stressing steel is installed in the work, it shall be free from loose rust, loose mill scale, dirt, paint, oil, grease or other deleterious material. Removal of tightly adhering rust or mill scale will not be required. Prestressing steel, which has experienced rusting to the extent it exhibits pits visible to the naked eye, shall not be used in the work.

The shipping package or form shall be clearly marked with the heat number and with a statement that the package contains high-strength pre-stressing steel, and care is to be used in handling. The type and amount

of corrosion inhibitor used, the date when placed, safety orders and instructions for use shall also be marked on the package or form.

If the period of time between installation of prestressing steel and grouting of the tendon will exceed 10 calendar days, the prestressing steel shall be protected from corrosion during the entire period it is in place and ungrouted. For this purpose, ducts shall be temporarily sealed and vents shall be plugged to prevent ingress of water or deleterious materials. At all times, the Contractor shall take care to prevent dirt and site debris entering ducts or vents.

The prestressing steel shall be protected from undue exposure to adverse weather when laid out in the forms for pre-tensioned members.

When corrosion protection of in-place prestressing steel is required, a corrosion inhibitor may be applied directly to the prestressing steel providing that it shall have no deleterious effect on the prestressing steel or grout or bonding of the prestressing steel to the concrete or grout. The corrosion inhibitor, the amount and time of initial application, and the frequency of re-application shall be subject to the Project Manager's approval. Corrosion inhibitor shall be washed off the prestressing steel immediately prior to placing concrete or grout.

### **22.5.3. Installation of Ducts**

Ducts shall be securely tied in position, carefully inspected and repaired before placing concrete begins. Care shall be exercised when placing concrete to avoid displacing or damaging the ducts. Internal plastic ducts shall be supported by a mandrel or tying at intervals of not more than 2 feet. Additional mild steel reinforcing, or temporary mandrels, required to support post-tensioning ducts, shall be provided by the Contractor at no expense to the Owner. After installation in the forms, the ends of ducts shall at all times be sealed to prevent entry of water and debris. The tolerance on the installation of ducts shall be plus or minus 1/4 inch at any point.

Vent pipes, shall be installed on each duct for injection or vent ports during grouting. Vent pipes shall be 3/4 inch minimum diameter standard pipe or suitable plastic pipe. Vents shall be mortar tight, and taped as necessary. All grout injection and vent pipes shall be fitted with positive mechanical shut-off valves. Valves, caps or other devices shall be capable of withstanding the pumping pressures.

After grouting all exposed ends of steel vents shall be removed at least one inch below the concrete surface after the grout has set and shall be sealed with an epoxy grout approved by the Project Manager. The ends of plastic vents shall be removed to the surface of the concrete after the grout has set

All ducts or anchorage assemblies for permanent post-tensioning shall be provided with vent pipes or other suitable connections at each end and at each side of couplers for the injection of grout after post-tensioning. Ducts shall be vented at the high points of the post-tensioning steel profile when there is more than a six inch variation in the vertical position of the duct.

All connections to ducts shall be made with suitable, purpose-made, fasteners of an approved plastic material. Waterproof tape shall be used as necessary at connections, vents and grout pipes, except to ensure an effective seal. Plastic components, shall not react with the concrete or enhance corrosion of the post-tensioning steel, and shall be free of water-soluble chlorides.

At all anchorages for bar tendons, ducts shall terminate square to the surface of the block-out for the anchor plate or shall otherwise connect properly to approved, embedded anchor devices. At intermediate cast-in-place joints, non-anchor faces or side faces of the precast deck slab units, ducts shall protrude at least 3 inches from the face of the concrete to enable a grout-tight connection to be made with the similar duct in the adjacent precast deck slab unit.

The contractor's attention is drawn to the need to correctly position all transverse ducts and to set the precast planks in the structure so that all ducts align properly across the deck. (See Also 22-13).

## **1-6 22-6 CONCRETE STRENGTH**

Concrete shall comply with the requirements of Section 8.

Concrete strengths for various activities shall comply with Table 22.6.

**TABLE 22.6: Required Concrete Strengths (psi)**

	Removal of Side Forms		Transfer, Handling	Lifting &	Installation in Structure	
	(6" Cube)	(6" x 12" Cyl.)			(6" Cube)	(6" x 12" Cyl.)
Deck Slab Units, Prestressed Beams and Precast Sheet Piles	3200	2500	4500	4000	6000	5500
Precast Piles	3200	2500	5000	4500	7200	6500

**1-7 22-7 METHOD OF PRETENSIONING**

**22-7.1 General**

The Contractor shall submit his proposed procedures for the longitudinal stressing of precast prestressed components to the Project Manager for review and approval at least 30 days prior to commencing pre-tensioning operations. Pre-tensioning methods shall conform to the following requirements unless otherwise approved by the Project Manager.

**22-7.2 Equipment**

All equipment shall conform to one of the following requirements and shall be approved by the Project Manager prior to use.

(A) A jacking system equipped with calibrated gauges together with an independent means and procedure by which the elongation of the strands can be determined. All jacks shall be equipped with accurate and calibrated gauges for registering the pressure in the jack and corresponding force delivered by the jack to the strands. Gauges shall be calibrated for direct reading to increments of 50 lb force. Jacks shall be able to induce and sustain the load. Means shall be provided for measuring the elongation of the strands to an accuracy of 1/16th inch.

(B) A jacking system which can be adjusted automatically to apply and sustain a predetermined load together with recording equipment to produce a graphic plot of load against time and a continuous digital display of force. The digital display shall show a minimum of three digits and have an accuracy of  $\pm 1.5\%$  of the applied force. Approval of this system will depend upon demonstrated accuracy reliability for repeated loading verified by comparison with pre-tensioning loads indicated either by and independent calibrated load cell or proving ring. For approval, the system shall be subjected to a comparison test once each day for three days in the presence of a representative of the Project Manager. Approval shall be extended only with continued satisfactory performance of the equipment.

**22-7.3 Method of Measuring Prestressing Force**

For jacking system A (above) the stress induced in the strands shall be measured both by force on the jacking gauges and by elongation of the strand, and the results shall agree within  $\pm 5\%$ . After the initial tensioning force has been applied, reference points shall be established for measuring the elongation for the remainder of the required pre-tensioning force. The location of the points and manner of measuring the elongation shall be subject to the approval of the Project Manager. Elongation shall be measured to an accuracy of 1/16th inch.

For jacking system B (above) the records shall provide clear identification of the precast member to which they apply and shall be certified by signature of the Contractor's representative directly responsible for the particular stressing operation.. Two copies of all graphical plots shall be provided to the Project Manager. Plots which are associated with the original approval of the jacking system, control equipment and calibration of the same shall be so identified by the Contractor and shall also be witnessed and certified by a representative of the Project Manager.

#### **22-7.4 Calibration of Jacks and Gages**

Prior to use in the manufacture of precast prestressed members, all jacks with their respective gauges shall be calibrated in accordance with ASTM E4-20 and ASTM E74-18e1.

Calibration of jacks and gauges shall be repeated at intervals not exceeding 12 months by a qualified, independent, calibration agency subject to the approval of the Project Manager or under the direct supervision of a qualified representative of the Project Manager. The Contractor shall cooperate with the Project Manager and shall provide all necessary means and equipment to carry out such supervised calibration all at no additional expense. This may require, but shall not necessarily be limited to, the provision of certified master gauges, proving rings, load cells jacking frames, measuring devices and similar equipment from reputable and qualified sources and all means to set up and use the equipment to perform the calibration. After calibration, a certificate shall be prepared and signed by the person in responsible charge for carrying out the verification as outlined in ASTM E4-20 and ASTM E74-18e1.

When work is in progress, any jacks or gauges, which do not perform satisfactorily under the terms of these specifications shall be checked, re-calibrated or no longer used, all subject to the approval of the Project Manager. For continued approval of jacking system B, weekly checks against a calibrated load cell or proving ring or by comparison with calculated strand elongation. For the latter a minimum of ten strands shall be checked and the difference between the average force indicated by elongation and by jack gauge shall not exceed 5%. For checks using a load cell or proving ring, at least three individual comparison checks shall be made each time (per week).

#### **22-7.5 Adjustment of Discrepancies**

Any discrepancies between force indicated by jack pressure and elongation shall err towards a slight over-stress rather than under-stress.

#### **22-7.6 Allowances for Loss of Stress**

Allowances for friction and all possible slippage or movement of the anchorage devices shall be taken into account when stressing.

For jacking system (A), 10% or a minimum of four strands shall be checked for slippage on each stressing operation.

For jacking system (B), 10% or a minimum of four strands shall be checked for slippage during weekly verifications of the system.

Movement of the pre-tensioning force resisting anchorage abutments shall be determined initially and verified periodically thereafter for each stressing bed and load condition. In addition, independent reference points shall be established adjacent to each anchorage abutment to detect any yielding, slip or movement from the time of initial stressing to release of the strands at transfer. The Contractor shall take all necessary measures to prevent movement of anchorage abutments at no additional expense.

**22-7.7 De-bonded Pre-tensioned Strands**

Where required by the Plans or Shop Drawings, strands shall be de-bonded in a pattern and using materials subject to the approval of the Project Manager.

De-bonding material shall be tubular, not split, high density polyethylene or polypropylene sheath with a minimum wall thickness of 1/16 inch and having an inside diameter exceeding the outside diameter of the strand by 1/16 to 3/16 inches. The sheath shall extend through the end form and shall be taped and sealed around the strand at the termination point in the member.

Release of de-bonded strands shall be in accordance with sequences and procedures on the Plans or approved Shop Drawings, to the approval of the Project Manager.

After transfer, openings between strand and sheath shall be sealed with an approved epoxy or silicone sealer.

**1-8 22-8 TOLERANCES FOR PRECAST PRESTRESSED CONSTRUCTION**

**22-8.1 General**

In general, tolerances for precast, prestressed piles, beams and deck slab units shall be at least as strict as those for reinforced concrete (Section 8).

**22-8.2 Tolerances for Pre-stressed Concrete Slab Units**

Overall depth	±1/4 inch
Overall width	±3/8 inch
Overall length	±1/8 inch per 10 ft, not to exceed 1/2 inch
Block-outs	±1/4 inch in location and size
Transverse ducts*	±1/8 inch in location and line
Ends (square or skew)	±1/4 inch from end plane
Prestressing strand	±1/8 inch in cross section location
Stirrup spacing	±1 inch
Horizontal line	±1/8 inch per 10 ft, not to exceed 3/8" in 40 ft
Differential camber between slab units	±3/16 inch per 10 ft, not to exceed 1"

\*In addition, transverse ducts for one precast deck unit shall align with those of an adjacent unit within an overall maximum tolerance of ±3/8 inch.

Variations in camber between adjacent deck slab units may be removed using clamps, turnbuckles or other devices, as approved by the Project Manager, to jack each deck slab unit against the adjacent unit until any difference in camber is within tolerance for the ducts. Proposed details and procedures shall be submitted to the Project Manager for review and approval at least 30 days prior to installation of the deck slab units. Loading of the deck slab units to satisfy this tolerance shall not be permitted.

**22-8.3 Tolerances for Pre-stressed Concrete Piles**

Width or diameter	-1/4 inch to +3/8 inch
Length of pile	±2 inches
Stirrup spacing	±1 inch
Prestressing strand	±1/8 inch in cross section location
Location of handling device	±6 inches
Longitudinal line (deviation from straight line after transfer in casting yard)	±1/8 inch per 10 ft.

**22-8.4 Tolerances for Pre-stressed I-Beams**

Length, to be measured prior to detensioning	±1 inch
Width (Flanges)	+3/8 inch, -1/4 inch
Depth (Overall)	+1/2 inch, -1/4 inch
Depth (Flanges)	±1/4 inch
Width (Web)	+3/8 inch, -1/4 inch
Sweep - variation from straight line connecting similar points of beam ends:	
After release and before removing from bed	1/8 inch per 10 feet beam length, 1.5 inches maximum.
In storage and after placement in the structure	1/8 inch per 10 feet beam length, 1.5 inches maximum.
Variation from Specified End Squareness or Skew:	
Horizontal	±1/4 inch
Vertical	±1/8 in/ft of beam depth
Position of Strands	±1/4 inch
Position from Location of Deflection Points for Deflected Strands shown in the Shop Drawing	±6 inches
Position of Bearing Plates - horizontal, measured from end of beam	±1/2 inch
Tipping and Flushness of Bearing Plates, longitudinal and transverse over the width and/or length of the plate	1/8 inch
Position of Post-Tensioning Duct:	
Vertical	±1/4 inch
Horizontal	±1/2 inch
Position of Inserts for Structural Connections	±1/2 inch
Position of Handling Devices - Parallel to Length	±6 inches
Position of Stirrups:	
Longitudinal Spacing	
for spacing ≤ 6 inches	±1 inch
for spacing > 6 inches	±2 inches
End Stirrup Bars, from end of beam	not more than 2 inches
Transverse Horizontal Spacing, out to out	±1/4 inch
Projection Above Top	±3/4 inch
Local Smoothness, any surface (does not apply to top surface left rough)	1/4 inch in 10 ft.

Non SI Units:

Position of Strand Sheathing:  $\pm 2$  inches  
Tilt of the Vertical Axis of a Beam End from True Vertical  $\frac{1}{4}$  in/ft of height  
Due to Deviation of Blocking from Horizontal, (not to exceed 1 inch)  
measured in storage. (Tilt is the right or left incline of the beam  
end vertical axis as viewed when facing the beam end.)

**1-9 22-9 FORMS**  
**22-9.1 General**

The design, Project Managering, manufacture and use of the forms for precast members shall be the responsibility of the Contractor. Forms shall be inspected and approved by the Project Manager prior to authorizing the start of regular precast production. Forms, which are worn, damaged or otherwise unacceptable to the Project Manager, shall not be used or shall be repaired to the satisfaction of the Project Manager prior to further use. Forms shall be mortar-tight and sufficiently rigid to prevent distortion under the pressure and consolidation of the concrete and any other loads incidental to precast production operations.

**22-9.2 Forms and Form Surfaces**

Form surfaces for precast members shall provide a Class F3 finish in accordance with Section (8).

In particular, the form surfaces shall be made of steel. The sheet metal surfaces and fabrication of the forms shall be of such thickness that the forms will remain true to shape. All bolt and rivet heads shall be countersunk. Clamps, pins or other connecting devices shall be designed to secure the forms rigidly together and to allow form removal without injury to the concrete.

Care shall be exercised in setting up forms for casting. Provisions for all projections, recesses, notches, openings, block-outs, anchorages and the like shall be made in accordance with the Plans or approved Shop Drawings.

Where sections of forms are to be joined, a maximum offset of 1/16 inch for flat surfaces and 1/8 inch for corners and bends will be permitted. Fabrication and fit-up tolerances for forms shall be such that the finished precast members comply with the tolerances in these specifications. The Contractor shall accurately survey forms on a monthly basis for the purpose of monitoring settlements and distortion in shape. If any settlements or distortions are of great enough magnitude to interfere with achieving the required tolerances, casting with these forms shall be discontinued until the problem is corrected.

The inside surfaces of forms shall be cleaned of all dirt, mortar and foreign material. Forms shall be properly coated with an approved form release oil or agent prior to each use. Form oil or other equivalent release agent shall not discolor the concrete. Form oil or release agent shall be applied such that none is deposited on the reinforcement or prestressing steel in the forms.

**22-9.3 Payment for Formed and Unformed Surface of Precast Members**

There shall be no separate payment for formed or unformed surfaces of precast prestressed concrete members (piles or deck slab units). the costs for all forming and finishing shall be deemed included under

payment for the member No extra payment shall be made for any pockets, blockouts, recesses, holes, voids or other items need to comply with the Plans and Specifications.

## **1-10 PLACING AND FINISHING CONCRETE**

### **22-10.1 Plant**

The plant for handling, placing and curing the concrete shall be arranged to facilitate production of uniformly dense and high grade concrete in all parts of a precast member under all working conditions.

### **22-10.2 Placing and consolidating concrete:**

The Contractor shall submit a plan for the placement and consolidation of the concrete to the Project Manager for review and approval prior to starting production of precast members.

Prior to placing concrete, the forms, reinforcement, prestressing, ducts, block-outs, vent-pipes, anchors and any other embedded items shall be checked by the Contractor for compliance with the specifications and approved Shop Drawings. All materials to be encased within the concrete shall be properly positioned and supported.

The forms and all internal components shall be clean and free grease, dirt and debris. Form oil for the release of the forms shall not be deposited on the reinforcement or prestressing steel.

Concrete shall not be deposited into forms until the entire set up of the forms, reinforcements, ducts, and anchorage has been thoroughly checked. Placing of concrete will not be proceed unless the Project Manager is satisfied that the rate of producing and placing concrete will be sufficient to complete the proposed pour and finishing operations within the scheduled time, that experienced concrete finishers are available where required for finish work and all necessary finishing tools and equipment are on hand at the site of the work and are in satisfactory condition for use. During conveying, placement, and initial set, the concrete shall be protected against undue drying or rise in temperature and inclement weather.

In general, concrete shall be placed and consolidated in accordance with Section (8).

Special care shall be taken to place the concrete so that voids do not occur within the concrete in areas where air is likely to be entrapped within the forms or in areas where flow of the plastic concrete is constrained by embedded items. Concrete shall not be dropped more than four feet, unless confined by closed chutes or pipes. Care shall be taken to fill each part of the form by depositing the concrete as near final position as possible. After the discharge of individual concrete loads into the forms, concrete shall not be bodily moved from place to place within the forms by mechanical vibrators or other similar equipment.

Concrete shall be placed in horizontal layers not more than 18 inches thick except as hereinafter provided. Each layer shall be placed and consolidated before the preceding layer has taken initial set. Each layer shall be so consolidated as to avoid the formation of a cold construction joint with a preceding layer.

Concrete shall be well consolidated by means of internal or external vibration, or both.

External form vibrators shall be operate efficiently to transmit vibration through the forms to the concrete and shall be capable of expelling all air bubbles and to produce dense, well-consolidated concrete. External vibrators shall be attached to the forms by secure mounts with positive locking devices to transmit vibration without significant losses and shall be operated within a frequency range that produces the optimum consolidation. External vibrators shall be operated as long as necessary at each mount location to achieve the necessary consolidation and may then be moved along to the next mount as placement proceeds along

the length of the member. Vibrator mounts shall be spaced at intervals not exceeding twice the effective vibration radius as determined by visual observation of the plastic concrete being consolidated.

Internal vibrators shall be used with care to expel air and work each fresh load of concrete into the previous one and produce dense, well consolidated concrete. Internal vibrators shall be inserted sufficiently deep to work the fresh concrete into the previous layer and withdrawn sufficiently slowly not to leave holes or voids. Internal vibrators shall not be used to move concrete bodily from one location to another. Care shall be taken to avoid damage or displacement of post-tensioning ducts when placing and consolidating concrete.

After placing and consolidating the concrete in the precast deck slab units, ducts for transverse post-tensioning bars shall be inspected for obstructions or damage, by the producer of the precast unit.

Any damage or blockages shall be rectified by the producer of the precast unit, to the satisfaction of the Project Manager. Excessive or reoccurring damage will result in the rejection of the precast unit by the Project Manager. A replacement unit will be made and supplied all at no additional expense.

#### **22-10.3 Top Surface Finish of Precast Slab Units and Piles in the Casting Forms**

After the concrete has been placed and consolidated, all exposed surfaces shall be struck off to lines and levels to leave a dense surface of uniform texture free from surface irregularities, cavities or other defects. Metal ties supporting any reinforcement or embedded components shall be cut back a minimum of 1" from the finished surface while the concrete is still workable and the surface shall be smoothed.

The top surface of precast slab units and piles in the casting bed shall receive a Class U2 finish in accordance with Section (8).

#### **22-10.4 Protection of Concrete**

After casting, precast concrete members shall be protected from the weather. Any concrete surface that has not yet set shall be protected from rain. The top surface of the prestressed beams shall receive a Class U2 finish with an irregular (rough and ridged) surface with an amplitude of  $\pm\frac{1}{4}$  inch.

### **1-11 22-11 CURING OF PRECAST PRESTRESSED CONCRETE MEMBERS**

#### **22-11.1 General**

The Contractor shall submit details of his proposed methods of curing of precast, prestressed concrete members to the Project Manager for review and approval. Production of precast prestressed concrete members shall not proceed until the Project Manager provides written approval. If the method proposed by the Contractor fails to produce satisfactory results in the judgment of the Project Manager, the Contractor shall use other methods or shall alter the method used, so as to provide acceptable results.

#### **22-11.2 Curing Period**

The initial curing period is that time until the concrete has gained sufficient strength for to allow release and removal of the side forms as determined by tests for concrete strength on (cubes or cylinders) of the same mix, cast and cured under the same conditions and prior to transfer. Final curing takes place after the initial curing.

The total curing period shall be at least 7 days or until the concrete has achieved the required transfer strength as determined by compressive tests (cubes or cylinders) of the same mix cast and cured under the same conditions as the precast member.

#### **22-11.3 Curing Methods**

Immediately after placing and finishing, the initial curing shall be by one of the following methods. Membrane curing compound is not acceptable for the initial curing.

1. Forms-in-Place Method - For formed surfaces, leave the forms in place without loosening. Cover the wet concrete deck surface with a waterproof sheet material that prevents moisture loss from the concrete. Secure all moisture barriers so that wind will not displace them. Immediately repair broken or damaged waterproof sheeting.
2. Blanket Method - Electrically heated curing blankets or insulation blankets may be used in cold weather to maintain specified curing temperature and to retain moisture in concrete. Blankets shall be lapped (8 inches minimum) and shall be free of holes. Blankets shall be secured at laps and edges to prevent moisture from escaping.
3. Steam Method - After placement of the concrete, members shall be held for a minimum four hour pre-steaming period. If the ambient air temperature is below 50°F, steam shall be applied during the pre-steaming period to hold the air surrounding the member at a temperature between 50°F and 90°F. When the ambient air temperature is above 50°F, the member shall remain undisturbed in the ambient air for a four-hour pre-steaming period.

To prevent moisture loss on exposed surfaces during the pre-steaming period, members shall be covered with a moisture tight covering as soon as surface finishing is complete or the exposed surfaces shall be kept wet by an approved fog spray. The moisture tight covering shall be removed just prior to initiating the steam curing. The steam enclosure may serve as the moisture tight covering, if so approved by the Project Manager.

Enclosures for steam curing shall allow free circulation of steam around all surfaces of the member either formed or exposed and shall be constructed to contain the live steam with a minimum moisture loss. The use of tarpaulins or similar flexible covers will be permitted, provided they are kept in good repair and secured in such a manner as to prevent the loss of steam and moisture. These enclosures may also provide the required weather protection during conveying, placement and curing of the concrete if they are substantial enough to prevent wind and rain damage during the casting operations.

Steam at the jets shall be low pressure and in a saturated condition. Live steam shall not be locally directed on the concrete, test (cubes / cylinders), or forms to cause localized high temperature. During application of the steam the temperature rise within the enclosure shall not exceed 40°F per hour. The curing temperature shall at no point within the enclosure exceed 150°F and shall be maintained at a constant level for a sufficient time necessary to develop the required strength for handling at the time of form removal. Control test (cubes / cylinders) shall be covered to prevent moisture loss and shall be placed in a location where temperature is representative of the average temperature of the enclosure.

Temperature-recording devices shall be used to provide an accurate, continuous and permanent record of the curing temperature. A minimum of two temperature-recording devices per casting bed will be required.

The steam curing cycle shall include a gradual cooling period during which the rate of decrease in temperature shall not exceed 40°F per hour. The steam curing cycle shall include the gradual cooling period until the temperature inside the enclosure is within 40°F of the outside ambient temperature.

4. Radiant Heat Method - Enclosures for radiant heat curing shall allow free circulation of heat around all surfaces of the precast member, either formed or exposed. Measures shall be taken as soon as possible after casting to prevent moisture loss on all exposed surfaces.

During application of heat, the temperature rise within the enclosure shall not exceed 40°F per hour. The curing temperature shall at no point within the enclosure exceed 150°F and shall be maintained at a constant level for the time necessary to develop the required strength for removal of forms. Strength control test samples (cubes or cylinders) shall be covered to prevent moisture loss and placed in a location where temperature is representative of the average temperature in the enclosure.

A gradual cooling period, during which the rate of decrease in temperature in the enclosure shall not exceed 40°F per hour, shall be included in the curing cycle. This cycle shall include the gradual cooling period until the temperature inside the enclosure is within 40°F of the outside ambient temperature.

Temperature-recording devices shall be used to provide an accurate, continuous and permanent record of the curing temperature. A minimum of two temperature-recording devices per casting bed will be required.

#### **22-11.4 Final Curing**

Except for precast members cured by the Steam or Radiant Heat Methods, after the initial curing period, curing shall continue by application of a membrane-curing compound conforming to the requirements of AASHTO M 148 for top and side exposed surfaces. A Type 1, clear compound shall be used on all exterior surfaces. The membrane-curing compound shall be of a consistency suitable for spraying at temperatures prevalent at the time of construction operations, and which forms a continuous, uniform film. It shall be free from precipitated matter caused by conditions of storage or temperature. The compound shall be relatively nontoxic.

The membrane-curing compound shall remain intact through the minimum curing period of seven days or until the required 28 day strength is achieved for the component. Under no circumstances shall the concrete surfaces be allowed to dry prior to curing compound application. Upon completion of the curing period (attaining 28 day strength) the components may be shipped for erection.

Curing compound shall be delivered in the manufacturer's original container, labeled with the manufacturer's name, plant location, grade designation of compound, lot number and quantity. Curing compound delivered in bulk shall be supplied from and delivered to storage tanks designed to provide thorough agitation. Thorough agitation shall be performed prior to shipment from manufacturer's plant and prior to use at the job site.

Membrane curing compound shall be mixed with a mechanically operated mixer immediately before each use to provide uniform consistency. Application shall be in accordance with the manufacturer's recommendations, subject to the rate of application specified herein. The rate of application for membrane curing compound shall be at least one gallon per 150 square feet. If a surface is dry after stripping forms, the concrete shall immediately be thoroughly wet with water and the curing compound applied just as the surface film of water disappears. If curing compound is to be applied by spraying, the sprayer shall be compressor driven and of sufficient size to provide uniform mist. Standby equipment will be required in case of mechanical failure. Hand held, pump-up sprayers will be permitted for standby equipment. However, the hand held pump-up sprayers shall not be used except in case of mechanical failure. The membrane curing compound covering shall be continuous, flexible and without defects. Failure to comply with these requirements will result in suspension of further concrete placements until proper control is re-established.

#### **22-11.5 Removal of Forms**

Side forms shall not be removed sooner than 1 day after casting with Ordinary Portland Cement, nor 12 hours with Rapid Hardening Portland Cement, nor until the concrete attains the required strength given in Table 22.6.

All forms shall be removed carefully so as not to damage the concrete member. Extra care shall be taken at pockets, block-outs, recesses, anchorages, and ducts to avoid damage to concrete surfaces and embedded items.

**1-12 22-12 TRANSFER OF STRESS (Release of strands)**

**22-12.1 General**

In general, transfer of stress by releasing the force of the pre-tensioning strands from the prestressing bed abutments or anchorages, shall be done carefully and in a controlled manner so as not to impart any shock loading to the concrete member. All procedures for transfer shall be subject to the approval of the Project Manager. Transfer shall not commence without prior approval by the Project Manager, of the proposed method.

**22-12.2 Methods of Transfer (Release of strands)**

Transfer may be accomplished by the following methods:

Method (A) Transfer by multiple strand release; in this method, all strands shall be released simultaneously and the force shall be transferred gradually to the member by control of the jacks.

Method (B) Transfer by single strand release; in this method strands shall be released by slowly cutting each strand with a low-oxygen flame in a sequence subject to the approval of the Project Manager.

Each strand shall not be cut quickly, but shall be heated until the metal loses its strength so that the release of the strand is gradual. The flame shall be played along the strand for at least 5 inches and in a manner that causes the first wire of the strand to fail after a minimum of 5 seconds. The sequence of release shall maintain the force as symmetrical as possible about the centerline of the member.

Single strand release shall be done simultaneously at both ends of the bed and between precast members in line unless otherwise approved by the Project Manager.

After transfer of force by either of the above methods, all strands shall be cut and trimmed to size using any oxygen flame or mechanical cutting device. An electric arc welded shall not be used.

**1-13 22-13 HANDLING, STORAGE AND TRANSPORT**

**22-13.1 Handling**

All members may be handled after transfer of the prestress force except members that are prestressed by a combination of pretensioning and post-tensioning. For the latter, do not handle the members before they are sufficiently prestressed to sustain all forces and bending moments due to handling. Exercise care in handling to prevent damage to members. Lift and move the members so as to minimize stresses due to sudden changes in momentum. Pick up members only at points designated as pickup points as shown on the contract plans or shop drawings. Maintain all members in an upright position at all times.

Evaluate the temporary stresses and stability of beams with a length-depth ratio greater than 20 during handling. The temporary stresses induced into the members during handling shall be within the acceptable stresses at release listed on the plans. Take appropriate action to increase the stability of members during handling when the factor of safety against lateral buckling instability is below 2.0. Include the expected fabrication tolerance for sweep in the analysis. The analysis procedure provided by the Prestressed Concrete Institute or similar procedures may be used for the stability evaluation.

Verify lifting devices for capacity in lifting and handling members, taking into account various positions during handling. Keep multiple component lifting devices matched to avoid non-compatible use. When a member has multiple lifting devices, use lifting equipment (slings, pulleys, etc.) capable of distributing the load at each device uniformly to maintain the stability of the member. When the lifting devices are grouped in multiples at one location, align them for equal lifting.

Take appropriate steps to prevent the occurrence of cracking. When cracking occurs during handling and transportation, revise handling and transporting equipment and procedures as necessary to prevent cracking for subsequent members.

### **22-13.2 Storage**

Store precast prestressed beams and deck slab units on only two points of support located within 18 inches of the end of the member. Support skewed slab units within 18 inches of the end of the full member section. Support other members on an adequate number of supports so as to keep stresses in the members within the allowable stresses at release.

All supports shall be level and on adequate foundation material that will prevent shifting or differential settlement, which may cause twisting, or rotation of members. Immediately pick up members in storage that have rotated or twisted and adjust the supports to provide level and uniform support for the member.

Support prestressed members that are stacked by dunnage placed across the full width of each bearing point and aligned vertically over lower supports. Do not use stored members as a storage area for either shorter or longer members or heavy equipment.

Where feasible, base the selection of storage sites, storage conditions and orientation upon consideration of minimizing the thermal and time-dependent creep and shrinkage effects on the camber and/or sweep of the precast pretension members.

When concrete incorporating micro silica is used, continuous application of water during the initial seven-day moist curing period may be interrupted for a maximum of one hour to allow relocation of precast or prestressed elements within the manufacturing facility.

Check the sweep and camber of beams monthly for conformance with the specified tolerances. If the camber exceeds by 1 inch the design camber shown in the plans, take appropriate action to accommodate the member in the structure to the approval of the Project Manager. If the sweep exceeds the tolerance specified, take immediate measures to bring the sweep of the member back to within tolerance, to the approval of the Project Manager.

### **22-13.3 Precast, Prestressed Piles**

Piles shall be handled and lifted only at locations shown on the Plans, approved Shop Drawings or as otherwise approved by the Project Manager.

**GYSBI EVALUATION CRITERIA**

<b>SUMMARY</b>		
	<b>OVERALL SCORING WEIGHTING</b>	<b>Weighting</b>
<b>1</b>	<b>LOCAL CONTENT - MANDATORY</b>	10%
	Tenderers must show compliance with the Local Content Act and proof as a Guyanese registered business.	
<b>2</b>	<b>TECHNICAL EXPERTISE AND EXPERIENCE</b>	20%
	Tenderers understanding of the project and a demonstration that the Tenderer has the knowledge, experience, and expertise to perform the services.	
<b>3</b>	<b>RESOURCES (Personnel, Manpower, Equipment)</b>	10%
	Analysis of the organisation and associated resources available, future workload and total manpower	
<b>4</b>	<b>PROGRAMME CRITERIA &amp; QUALITY CONTROL</b>	10%
	Analysis of local content, environmental policy, quality assurance, programme and planning issues.	
<b>5</b>	<b>HEALTH, SAFETY, SECURITY AND ENVIRONMENT (HSSE)</b>	10%
	Work programme evaluation in terms of overall organization, experience and specific knowledge of this type of activities and environment	
<b>6</b>	<b>FINANCIAL ANALYSIS</b>	
	Analysis of the Commercial aspects of the tender	40%
	<b>Totals:</b>	100%

<b>LOCAL CONTENT EVALUATION - SECTION 1 – (Mandatory)</b>		
<b>ITEM</b>	<b>LOCAL CONTENT COMPLIANCE</b>	<b>Weighting</b>
<b>1.1</b>	<b>Business Registration Documents</b>	25%
	The company must provide Business Registration or Company Number (As per the Certificate of Business Registration), Date of Registration or Incorporation, Company Tax Identification Number, Business or Company NIS Number, Owners Details (ID Number, TIN, NIS) Partnering Businesses or Companies Details (Owner, TIN, NIS)	
<b>1.2</b>	<b>UBO</b>	25%
	Company must provide Ultimate Beneficial Ownership Chart. What percent of the business or company is beneficially owned by Guyanese Nationals (Citizens of Guyana)	
	<b>51% Guyanese beneficial ownership</b>	
<b>1.3</b>	<b>Management</b>	25%
	What percent of Executive and Senior Management positions within the business, or company is held by Guyanese Nationals (Citizens of Guyana)	
	<b>75% Senior Management (Guyanese National) is required</b>	
<b>1.4</b>	<b>Workforce</b>	25%
	What percent of non-Managerial and other positions within the business, or company is held by Guyanese Nationals (Citizens of Guyana) – <b>90% Guyanese National is required</b>	
	How many persons are employed full-time with the business or company?	
	How many Guyanese nationals are employed full-time with the business or company?	
	How many persons are employed part-time with the business or company	
	How many Guyanese nationals are employed part-time with the business or company	
	<b>Totals:</b>	100%

<b>TECHNICAL EVALUATION - SECTION 2</b>		
<b>ITEM</b>	<b>TECHNICAL EXPERTISE AND EXPERIENCE</b>	<b>Weighting</b>
<b>2.1</b>	<b>Reputation &amp; Compliance to Standard</b>	30%
	Demonstrate a good reputation for reliability and delivery with access to all specialist expertise needed to perform the works.  <i>Please provide any project attracting any litigation.</i>	
<b>2.2</b>	<b>Experience</b>	30%
	<i>Did the bidder offer evidence of experience with projects of a similar technical level:</i>  <i>Provide Details of three (3) projects of similar that were completed within the last 3-5 years</i>	
<b>2.3</b>	<b>SoW understanding</b>	40%
	<i>Assessment of Tenderers Method Statement demonstrating understanding of the scope of work:</i>  <b>Provide detail method statement capturing the scope of works</b>	
	<b>Totals:</b>	100%

TECHNICAL EVALUATION - SECTION 3		
ITEM	RESOURCES (Personnel, Manpower, Equipment)	Weighting
<b>3.1</b>	<b>Organization</b>	40%
	<i>Organisational Chart of its proposed team identifying activities and organizational structures for all phases of the Scope of Work.</i>  <i>Provide detailed Organisational Chart</i>	
<b>3.2</b>	<b>Future workload</b>	25%
	Tenderer is requested to advise confirmed future workload, anticipated future workload and work currently being bid in terms of value and manpower  <i>Provide list and status (%complete) of ongoing works and works tendered for in Public and Private Sector</i>	
<b>3.3</b>	<b>Manpower &amp; Equipment</b>	25%
	Does the bidder state that they have sufficient, suitably experienced resources available  <i>Provide evidence of ownership of equipment to be used for the works same to be stamped by a Commissioner of Oaths.</i> <i>Key equipment:</i> <i>a. 12-ton Excavator</i> <i>b. 10-ton Steel Wheel Roller</i> <i>c. 20-ton Long Reach Excavator</i> <i>d. Motor grader</i> <i>e. Front End loader</i> <i>f. Plate compactor</i>	
	<b>Totals:</b>	100%

TECHNICAL EVALUATION - SECTION 4		
PROGRAMME CRITERIA & QUALITY CONTROL		
ITEM		Weighting
<b>4.1</b>	<b>Quality Assurance</b>	20%
	Did the bidder offer sufficient evidence of experience with completing quality projects within timescales and budgets?  <i>Bidder to provide list of projects not completed on time and/or within budget</i>	

<b>4.2</b>	<b>Works Programme</b>	20%
	Is the bidder able to complete the work within the required timelines?  <i>Bidder to submit detailed Work programme</i>	
<b>4.3</b>	<b>Track Record</b>	20%
	Did Bidder provide example of references / past project history / performance track record  <i>Provide list of past projects within last 5 years capturing:</i> <i>a. Client and contact information</i> <i>b. Value of Project completed</i> <i>c. Project duration</i>	
<b>4.4</b>	<b>Quality Plan</b>	20%
	Review of a submitted project quality plan, which may be taken from an example of a previous project  <i>Provide a quality plan</i>	
<b>4.5</b>	<b>Inspection</b>	20%
	Assessment of the procedure in place to guarantee the quality control of the Works.  <i>Provide evidence of Quality Control Plan</i>	
	<b>Total</b>	100%

<b>HSSE EVALUATION - SECTION 5</b>		
<b>ITEM</b>	<b>HEALTH, SAFETY, SECURITY AND ENVIRONMENT (HSSE)</b>	<b>Weighting</b>
<b>5.1</b>	<b>HSSE Policy and Procedures</b>	65%
	Evidence of robust Contractor HSSE policies, procedures and reporting in place, and alignment with GYSBI HSSE requirements.  <b>Provide evidence of HSSE Policy and Manual</b>	
<b>5.2</b>	<b>HSSE Approach</b>	35%
	Approach to the management of HSSE issues, including a good track record in HSSE.	
	<b>Total</b>	100%

<b>COMMERCIAL EVALUATION - SECTION 6</b>		
<b>ITEM</b>	<b>FINANCIAL ANALYSIS</b>	<b>Weighting</b>
<b>6.1</b>	<b>Tender Price (including all costs)</b>	70%
<b>6.2</b>	<b>Alternative Proposal Providing an Advantage</b>	10%
	(Not always applicable - if n/a change weighting to zero)	
	(If not applicable all score 5)	
<b>6.3</b>	<b>Tenderers Acceptance of Draft Contract Payment Terms</b>	10%
	(If not applicable all score 5)	
	<b>Total</b>	90%

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### REVISION SUMMARY    **16**

# GUYANA SHORE BASE INCORPORATED

## CONFIDENTIAL EMPLOYEE HEALTH ASSESSMENT

### APPLICATION DETAILS



<b>Surname</b>		
<b>Given Names</b>		
<b>Date of Birth</b>		
<b>Date of Medical</b>		
<b>Position applied for</b>		
<b>Contact Telephone</b>	Home:	Mobile:

#### Notes to the potential candidate:

You have been selected as a potential candidate for the position for which you have applied. As part of the selection process, it is necessary for potential candidates to undergo a pre-employment medical examination. This is part of the process to confirm that you are suitable to perform the inherent duties of the position for which you have applied, and to help prevent work-related illness and injury occurring subsequent to your employment.

For the purpose of possible future consideration of your employment, or in the case of a dispute, your company will retain your pre-employment medical examination results.

Use and disclosure of this information should be strictly and confidentially controlled in accordance with the Candidate Declaration and Informed Consent, which you will be required to sign before we can proceed with the pre-employment medical examination.

The extent of the pre-employment medical examination depends primarily on the nature of the position for which you have applied, and takes into consideration statutory requirements and information provided by you in this Health Assessment form. There are no invasive procedures or internal examinations involved in this medical. Use and disclosure of the information provided on this Pre-Employment Health Assessment form will be strictly and confidentially controlled and the form will remain the property of the Company.

You will be required to provide photo identification, such as driver's license or passport. Please bring prescription glasses if you wear them and copies of any relevant medical reports you may have. If for any reason you would prefer a Medical Attendant of the same gender as yourself, you are free to request same. You will not be discriminated for your choice or preference.

### **To be signed by the candidate in the presence of Medical Attendant**

#### **Declaration**

I will not knowingly withhold any information relevant to the pre-employment medical examination. I declare that the information that I will provide in this Pre-Employment Health Assessment form is true and correct.

#### **Consent to Disclosure**

I understand that the Company will require me to satisfactorily undergo a pre-employment medical examination as a condition of appointment for the position to which I have applied. I authorize the examining Medical Attendant to release any relevant information to the Quality, Health, Safety, Security & Environment (QHSSE) Supervisor and Human Resources (HR) Manager.

I understand that information obtained in this Pre-Employment Health Assessment form and pre-employment medical examination will only be disclosed to the QHSSE Supervisor and HR Manager. If persons other than the QHSSE Supervisor and HR Manager require access, this will only occur with my prior written consent, subject to the following exceptions:

- Leaders in my direct line of management will be advised of my fitness to work, any work restrictions required, if there has been any excessive exposure to a hazardous agent at work or if a work-related injury or illness has occurred. However, any clinical medical details will only be disclosed with my prior written consent; and
- Information will be disclosed in response to a court order, if required by legislation or in specific legal circumstances permitted under applicable Privacy Legislation.

### Right of Access

I understand that I have the right to access, and where necessary correct, personal health information held about me by the Company. To obtain access I understand that I will need to contact the QHSSE Supervisor.

### Consent to Use

I understand that for the purpose of possible future consideration of employment with the Company, and my pre-employment medical examination results for a period of 12 months. Use and disclosure of this information will be controlled to only personnel who require such. I have read the information in this Pre-Employment Health Assessment form and I have had any questions answered to my satisfaction. I grant my informed consent to complete the pre-employment medical examination.

Applicant's Name: \_\_\_\_\_

Date: \_\_\_\_\_

The candidate has been given the Pre-Employment Health Assessment form and has stated to me that he/she has thoroughly read and understands the document. I have explained to him/her all of the information contained in it.

**Medical Attendant**

Signature: \_\_\_\_\_

Name Printed: \_\_\_\_\_

Date: \_\_\_\_\_

**Please ensure employee's name is on the top of each page of this Pre-Employment Health Assessment form.**

**MEDICAL QUESTIONNAIRE**

**APPLICANT:.....**

<b>Medical History - General</b>				
Do you have now, or have you ever had these conditions? If yes, please give a brief explanation				
		<b>Yes</b>	<b>No</b>	<b>Details</b> (Include family history where applicable)
1	Do you suffer any disease or disability at present?			
2	Do you have poor hand or finger circulation			

	(Exhibited by numbness or tingling sensation)			
3	Do you have any recurrent health problems that may interfere with your ability to attend work or perform your role? E.g. difficulties with shiftwork			
4	Do you have any problem(s) that may affect your safety or the safety of others? (e.g. daytime sleepiness, sleep apnoea)			
5	Does your health prevent you from doing anything now?			
6	Do you suffer a fear of heights, closed spaces or any other phobia?			
7	Do you usually sleep well?			
8	Do you wake up during the night – regularly?			
9	Do you drink alcohol?			
10	If yes on the above, on the average how often?			

MEDICAL QUESTIONNAIRE

APPLICANT:.....

**Medical History - General**

Do you have now, or have you ever had these conditions? If yes, please give a brief explanation

		<b>Yes</b>	<b>No</b>	<b>Details</b> (Include family history where applicable)
1 1	Heart problems (e.g. heart valve problems, Rheumatic Fever, Angina, Heart Attack or Heart Rhythm problems)			
1 2	Frequent headaches or migraine			
1 3	Epilepsy or fits			
1 4	Faints, dizzy spells, turns or blackouts			
1 5	Severe nervousness, anxiety, depression or psychological illness			
1 6	Indigestion, heartburn, or stomach ulcer			
1 7	Recurrent diarrhea or constipation			
1 8	Vomiting of or passing blood			
1 9	Kidney, bladder or urinary problems			
2 0	Diabetes (Sugar)			

2 1	Skin disease, rash, or skin problems			
2 2	Hernia or rupture			
2 3	Hepatitis or Liver problems			
2 4	Tumor, Cancer or Malignancy			
2 5	Ear trouble			
2 6	Any sinus, nose, or throat problems			

**MEDICAL QUESTIONNAIRE**

**APPLICANT:**.....

**Medical History - General**

Do you have now, or have you ever had these conditions? If yes, please give a brief explanation

		Yes	No	Details (Include family history where applicable)
2 7	Paralysis or weakness of any cause			
2 8	Injury or problem of the back or neck			
2 9	Injury or problem of any bones or joints (e.g. broken bones)			
3 0	Any broken bones that have failed to heal completely			

3 1	Any chest injuries			
3 2	Any operations on your chest (including as a child)			
3 3	Eye problems			
3 4	Glasses or other corrective lenses			
If yes, describe type and usage				
3 5	Do you suffer from any allergies?			
If yes, describe type...				
3 6	High Blood Pressure			
3 7	Asthma			
3 8	Wheezy or allergic bronchitis			
3 9	Pneumonia			
4 0	Hay Fever			
4 1	Any other illness or injury, including surgical operations?			
4 2	Do you smoke?			

If yes, state amount and duration...

MEDICAL QUESTIONNAIRE

APPLICANT:.....

Medical History - Occupational

Do you have now, or have you ever had these conditions? If yes, please give a brief explanation

		Yes	No	Details (Include family history where applicable)
4 3	Have you suffered any illness or injury caused by your occupation?			
4 4	Have you ever had difficulties wearing PPE?			
4 5	Have you ever worked shifts?			
4 6	Do you sleep well after shifts?			
4 7	Have you ever had a heat related illness or rash?			
4 8	Have you ever worked with asbestos?			
4 9	Have you ever worked with hazardous materials?			
5 0	Have you ever been exposed to chemicals, dust, or fume at work?			
5 1	Have you ever worked in a noisy environment? (where you had to raise your voice to be heard)			

**MEDICAL QUESTIONNAIRE**

**APPLICANT:.....**

**Medications**

Have you previously or are you currently taking any of the following?

**Yes**    **No**    *If yes - please provide name of medication and the reason you are taking it and when you took the last dose*

5 2	Prescribed medication (a Doctor must give you a script for this)			
5 3	Over the counter medications (vitamins, pain killers, anti-inflammatories, naturopathic remedies)			
5 4	Any inhaled medications			

5 5	<b>Any other information:</b>
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**MEDICAL ASSESSMENT**

**APPLICANT:.....**

<b>Height</b>			<b>Weight</b>			
			<b>Blood Pressure</b>			
<b>BMI</b>						
<b>Urinalysis</b>	SG	Glucose	Protein	Ketones	Blood	Other
<b>Vision</b>					Together	
<b>Near</b>	Without correction		R	L		
<b>Distance</b>	Without correction		R	L		

<b>Color Vision</b>	Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Ishihara Plates – Numbers of plates misread:
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**To be signed by the candidate in the presence of Medical Attendant**

	<i>Results</i>	<i>Comments</i>
<b>Medical Questionnaire</b>		
<b>Audiometry</b>		
<b>Spirometry</b>		
<b>Drug &amp; Alcohol Test</b>		
<b>Functional Capacity Assessment</b>		
<b>Cardiac Risk Assessment (ECG)</b>		
<b>Fatigue/Shiftwork Assessment</b>		
<b>Medical Officer Review Required</b> No <input type="checkbox"/> Yes <input type="checkbox"/>		

**FITNESS FOR WORK**

**APPLICANT:.....**

**Fitness for Work /Medical Assessment completed by:**

Signature: \_\_\_\_\_

Date: \_\_\_\_\_ Printed: \_\_\_\_\_

<b>A</b>	<b>Fit for all duties</b>
<b>B</b>	<b>Fit for proposed role with the following restrictions:</b>
<b>C</b>	<b>Not suitable for any roles at the Company</b>

Kindly refer to Table below if employee falls into Category A or B.

Comments:

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*Medical Attendant:*

*Date:*

Asterisks indicate areas of emphasis as per job description:

POSITION	TESTS REQUIRED
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DRIVERS/OPERATORS	*VISION, HEARING,* MUSCULO-SKELETAL ASSESSMENT, *CARDIAC RISK ASSESSMENT
SLINGER/BANKSMEN	*MUSCULO-SKELETAL ASSESSMENT,*RESPIRATORY ASSESSMENT,*VISION. *HEARING.
OFFICE STAFF(inclusive of Base Managers, Base Coordinators and Supervisors).	*VISION,*MUSCULO-SKELETAL ASSESSMENT.
MAINTAINANCE(inclusive of Plumbers, Electricians and General Labourers).	*MUSCULO-SKELETAL ASSESSMENT,*RESPIRATORY ASSESSMENT,VISION, HEARING

Potential Candidate will be sent to have their blood and urine samples taken off for testing. The following tests will be done:

**Blood:**

Complete Blood Count	<ul style="list-style-type: none"> <li>• Hemoglobin</li> <li>• White Blood Cells</li> <li>• Differential</li> <li>• Platelets</li> <li>• Bleeding Time</li> <li>• Clotting Time</li> </ul>
Cholesterol	<ul style="list-style-type: none"> <li>• HDL</li> <li>• LDL</li> <li>• Total</li> <li>• Triglycerides (TG)</li> </ul>
Liver Function Test	<ul style="list-style-type: none"> <li>• Bilirubin</li> <li>• Protein</li> <li>• Albumin</li> <li>• Alanine transaminase (ALT)</li> <li>• Aspartate transaminase (AST)</li> <li>• Alkaline phosphatase (ALP)</li> <li>• L-lactate dehydrogenase (LD)</li> </ul>
<b>Urine:</b>	
Complete Urinalysis	<ul style="list-style-type: none"> <li>• Macroscopic Exam</li> <li>• Chemistry</li> <li>• Microscopic Exam</li> </ul>

**Lab:** Sheriff Medical Center

**Date:**

**Date of Result:**

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	22 Jul 2021	Andy Dowson	Initial release of document

**EMPLOYEE HEALTH ASSESSMENT PROCEDURE**

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<b>2</b>	31 Aug 2021	Andy Dowson	Additions made to document and Updated to required GYSBI Format
<b>3</b>	17 Sep 2021	Kurt Busuttill	QHSSE Manager designation removed
<b>4</b>	11 Oct 2021	Kurt Busuttill	Updated formatting.
<b>5</b>	31 Dec 2021	Andy Dowson	Updated formatting and changes made to the consent and disclosure, and information relating to gender request.
<b>6</b>	26 Mar 2022	Andy Dowson	Removal of reference to Tuberculosis and renumbered.
<b>7</b>	07 Jul 2022	Kurt Busuttill	Updated Document Number

# ENVIRONMENTAL MANAGEMENT PLAN

## GUYANA SHORE BASE

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## **LIST OF ACRONYMS AND ABBREVIATIONS**

<b>GYSBI</b>	Guyana Shore Base Inc
<b>QHSSE</b>	Quality Health Safety Security and Environment
<b>EPA</b>	Environmental Protection Agency
<b>CH &amp; PA</b>	Central Housing and Planning Authority
<b>GEA</b>	Guyana Energy Agency
<b>GNBS</b>	Guyana National Bureau Standards
<b>EMP</b>	Environmental Management Plan
<b>ERP</b>	Emergency Response Plan
<b>SWMP</b>	Site Waste Management Plan
<b>HAZCOM</b>	Hazard Communication
<b>SDS</b>	Safety Data Sheets

## INTRODUCTION

The objective of this document is to define the environmental objectives for the Guyana Shore Base Inc (GYSBI) and describe how key environmental issues will be managed. It will provide the basis for minimisation of harm to the environment during construction and operational phases. Further, it will outline how key environmental risks will be identified and managed. The Quality, Health, Safety, Security, and Environmental (QHSSE) Manager will be responsible for ensuring that this plan is established, implemented, regularly reviewed, and updated, and that the plan remains valid throughout the project duration.

### Environmental Management Plan

The Environmental Management Plan (EMP) provides an administrative structure and management processes within which GYSBI will co-ordinate the environmental performance and compliance of their employees, contractors, and subcontractors working on the shorebase to ensure they minimise any impact on the environment.

THIS SHOREBASE-SPECIFIC PLAN IS A CONTRACT DOCUMENT AND DOES NOT RELIEVE CONTRACTORS OF ANY OF THEIR TRADITIONAL OR SPECIFIC LEGAL RESPONSIBILITIES WITH RESPECT TO COMPLIANCE WITH ENVIRONMENTAL REGULATIONS AND STANDARDS.

This plan forms part of the overall Shorebase Management and as such, activities described in it are to be integrated with the requirements of the Quality, Health, Safety, Security and Environmental (QHSSE) Plan and other project documents.

### Plan Administration

As principal contractor, GYSBI will co-ordinate the project environmental management plan and shall have such authority as described in both contractual and administrative documents.

Each contractor is responsible and accountable for the environmental practices of their employees. Each contractor is responsible for compliance with all applicable codes, standards, and regulations of the various regulatory agencies, including international and local agencies, as well as the Client and GYSBI site standards.

### Environmental Objectives

- Consider environmental planning in all our operations, addressing risk and opportunities related to environmental aspects, to prevent undesired events, managing potential impacts on the organization and maintaining documented information.
- Adopt the “Plan-Do-Check-Act” philosophy to monitor and evaluate our results, ensuring environmental performance is maintained.
- Determine external and internal environmental conditions that may affect or be relevant to our operations, delivering a strategic response to achieve the intended outcome.
- Provide adequate resources, infrastructure, and knowledge to manage the system and ensure that all personnel are made aware of GYSBI's environmental policy and the implication of not fulfilling our compliance obligations.

- Understand the needs and expectations of clients, customers, and our stakeholders, thus defining our environmental compliance obligations.
- Demonstrate leadership and commitment by ensuring KPIs are set, communicated, and progress is continually monitored to ensure intended outputs.
- Provide and implement a documented environmental management system aligned to our products and services in accordance with international standards.
- Plan changes in accordance with the business needs to achieve our environmental objectives.
- Maintain emergency processes to mitigate any potential adverse environmental impacts from our operations.
- Identify opportunities for improvement implementing the required actions to enhance performance and customer satisfaction.

## PROJECT DESCRIPTION

### Project Details

The Guyana Shorebase Inc was established in August 2017. At present, there is no foreseeable end to the life of the company.

GYSBI is largest shorebase operator and the preferred Onshore support for oil and gas companies in Guyana. The company was formed by four (4) partners namely, Muneshwers Limited, Pacific Rim Constructors, Totaltec Oil Field Services, and LED Offshore Limited. With a Port and Industrial Estate comprising of 130 acres located at plantation A, Houston, Greater Georgetown on the East Bank of the Demerara River, GYSBI is strategically positioned to meet the needs of the Oil and Gas industry.

The company's business encompasses the management of waste materials, chemical storage, warehousing, construction, berthing of supply vessels,

cargo marshalling area, loading, and offloading, supply chain management, expatriate management, and customs services.

### **Existing Environment**

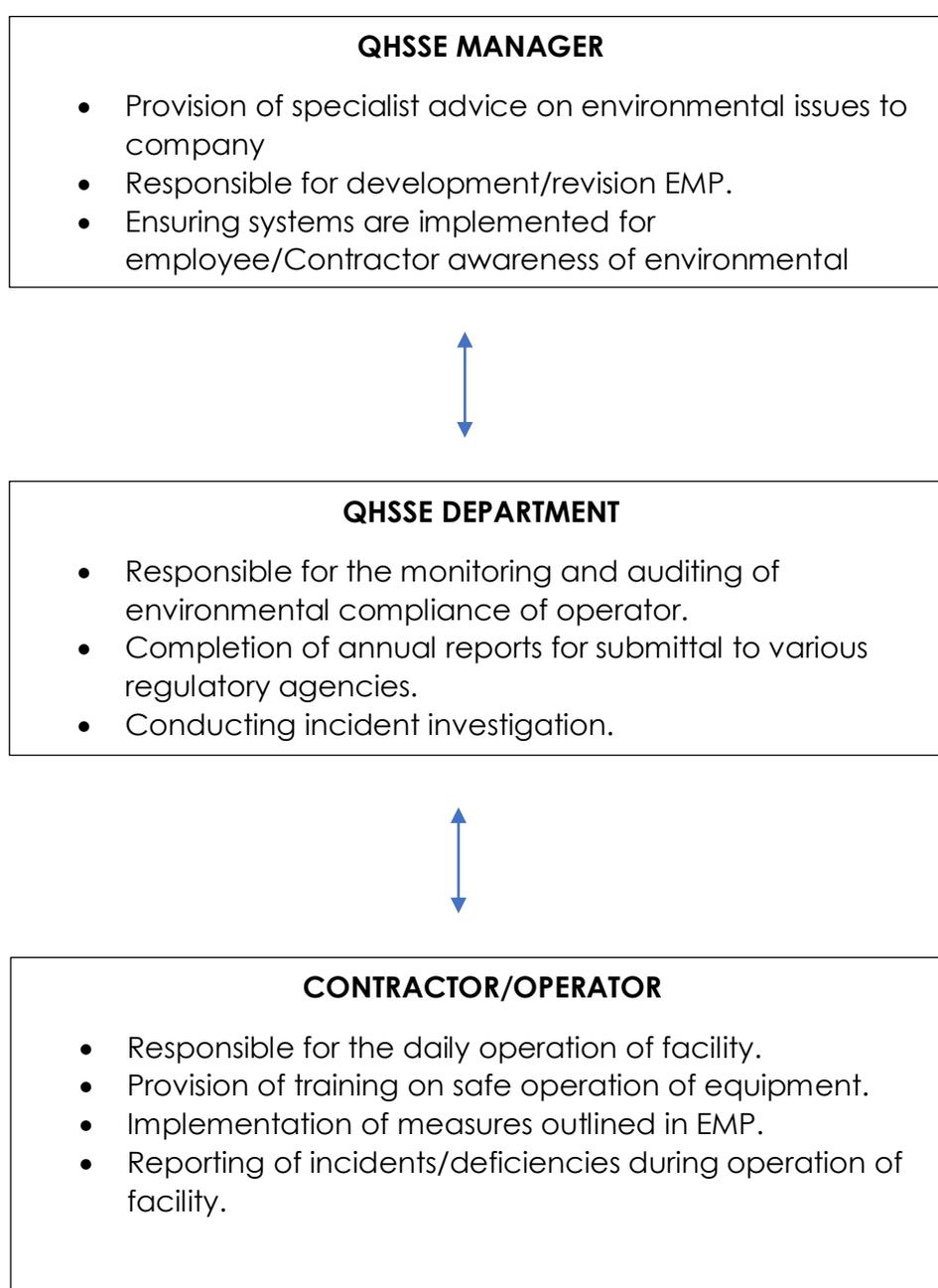
The Guyana shorebase Inc is located on the right bank of the demerara river approximately six kilometres (6 km) from the river mouth. Areas in the immediate proximity of the facility are mainly large industrial and commercial uses. Mixed uses such as residential/commercial, light industrial, and institutional uses such as schools and places of worship along the East Bank Public Road. Notable large- scale infrastructure within the area of influence are the Pritipal Fishery complex on the Southern Boundary and Schlumber/MI Swaco Mud/Cement facility on Northern Boundary. Several heavy industrial sites are also situated in the area, many providing services to the burgeoning oil and gas industry.

## MANAGEMENT OF THE WORK

### Management Structure and Responsibilities

All staff at GYSBI have environmental accountabilities specific to their roles. Contractors working at GYSBI have accountability for preventing or minimising environmental impacts.

The following are the delegated duties and responsibilities to assist in ensuring the effective implementation of this EMP:



## CONTRACTOR ENVIRONMENTAL REQUIREMENTS

### Additional Contractor Duties

All contractors have the following duties

1. Inform GYSBI of problems with the environmental management plan
2. Inform GYSBI of environmental adverse events

### Information for Contractors

Contractors will be informed about environmental risks by the Tender documents, the Project Environmental Plan, accompanying Design Risk Assessments and information advised during the Pre-Order Meeting including common arrangements for temporary power, plant, waste disposal, and lifting.

Contractors are responsible for maintaining clean areas and environmental responsible practices at all times.

Contractors must budget for all necessary equipment including but not limited to spill kits and waste management equipment.

### ENVIRONMENTAL REGULATOR

The Licencing Manager and the QHSSE Manager have assumed responsibility for liaising with the enforcement agencies such as the EPA, CH&PA and the GEA with respect to the issuance of permits. Presently, the Company has an established QHSSE and licencing departments. The current practice entails constant monitoring by QHSSE officers who also carry out inspections and recommend measures to address specific issues that would have been observed or communicated by staff.

## LEGAL REQUIREMENTS FOR THE OPERATIONS

### **The Environmental Protection Act, 1996 (as amended by the Environmental Protection (Amendment) Act, 2005**

The Environmental Protection Act, 1996, and the Environmental Protection Amendment Act 2005, establishes the basic institutional and regulatory framework within which all activities that may significantly impact on the natural, social, and cultural environments are assessed. The Act also provides that the EPA is the central coordinating agency for environmental management in the relevant sectors in Guyana. Section 68 of the Act provides for the elaboration of regulations to articulate specific areas of environmental management, and of relevance are the Regulations on hazardous waste management, water quality, air quality, noise management and environmental authorization which were established under the Environmental Protection Act in 2000. These pollution management regulations were developed to regulate and control the activities of developmental projects during construction and operation. Standards establishing the permissible parameters under these regulations are being developed. Relevant legislations that govern environmental protection and enacted in 2000 are the Environmental Protection (Air Quality) Regulations, the Environmental Protection (Authorizations) Regulations, the Environmental Protection (Water Quality) Regulations, the Environmental Protection (Noise Management) Regulations and the Environmental Protection (Hazardous Waste Management) Regulations.

### **Environmental Protection (Air Quality) Regulations 2000**

These Regulations were formulated to protect the air quality and provide the necessary infrastructure for controlling the quantity of contaminants by stipulating specific allowable levels of emissions that are released into the atmosphere at any given time. Parameters are specified for several contaminants including smoke, solid particles, and carbon monoxide. With the implementation of the HS project workplace air quality will be affected during the construction phase as a consequence of the production of dust during excavation and the operation of equipment.

### **The Environmental Protection (Authorizations) Regulations, 2000**

These Regulations are concerned with the guidelines for granting authorization for projects that can have medium to high environmental impacts in Guyana. Guidelines and procedures are specified in its corpus, and a fee structure in its Schedule.

### **Environmental Protection (Water Quality) Regulations 2000**

These Regulations were developed to manage the discharge of waste matter into inland and coastal water bodies. They provide for minimizing the contamination of potential and existing water supply sources.

### **Environmental Protection (Noise Management) Regulations 2000**

These Regulations are concerned with the control and management of noise emission in Guyana. In practice, the EPA (Guyana) combines the Regulation with the GNBS Noise Standard into the atmosphere since the Regulation is silent on measurements and parameters for ambient noise emission. There is also the Interim Guidelines for Noise Emission into the Environment dated 2009. Developed to assist the Environmental Protection Agency in the enforcement of the Environmental Protection (Noise Management) Regulation 2000 and to reduce the level of noise emanating from

commercial, residential, institutional, educational, industrial, construction, transportation, and recreational activities.

### **Environmental Protection (Hazardous Waste Management) Regulations, 2000**

These Regulations cover the management of waste including chemical waste and cover industrial, commercial and any other activity that produces waste. Some of the key activities which are covered under the Regulations are generation, treatment, transport, and disposal of hazardous waste. The Regulations is read and construed as being in addition to, and not in contravention of the Pesticides and Toxic Chemicals Control Act 2000 (No. 13 of 2000). Based on the definition all chemical wastes including persistent organic pollutants (POPs) are covered under these Regulations for the purposes of management. Permits are required for the generation of waste which is/are monitored throughout the production, storage, transport, and release phases.

For the construction of the HS building, waste streams must be controlled include the wastes from the use of wood preserving chemicals and possibly toxic substances if release may present immediate or delayed adverse impacts to the environment by means of bioaccumulation and/or toxic effects upon nearby systems. This regulation becomes relevant for the construction of the HS building since it is possible that hazardous waste/materials such as flammable liquids, ceiling materials, plastic and corrosives will be used. It is recommended that an emergency preparedness plan be put in place in cases of incidents.

### **Litter Enforcement Regulations 2014**

The Litter Regulations addresses the littering of public spaces and outlines several offences and penalties and provides for Litter Wardens with authority to enforce these Regulations and with special powers of court on convicting offenders. Under „offences“, “A person who, without reasonable excuse, deposits litter in or on any public place... is guilty of an offence”. Also, respondents who deposit litter from a moving vehicle unto a public place will

be considered an offender. Enforcement activities for these Litter Regulations commenced April 2014 with the establishment of a Litter Enforcement Unit at the EPA.

### **COMPETENCY & TRAINING**

GYSBI is committed to providing employees with the necessary training to perform their work safely and effectively.

Training is necessary for all employees, especially for those learning a new trade. It is also essential to keep load handlers, banksman, and skilled operators up to date with current environmental practices and technology.

Therefore, in addition to the induction training, the Onsite Professionals (Lifting and QHSSE) shall ascertain any extra training that will be required for employees and shall either perform the training or assign other competent site personnel to conduct training courses.

The following guidelines, as a minimum, shall be adhered to:

- A training matrix as per contract requirements shall identify specific disciplines and training requirements and shall be approved by the activity manager.
- A formal QHSSE Induction Course shall be given to all employees on the company's environmental objectives.
- All employees training shall be organized by company's training coordinator, recorded, and kept in a central point.
- Company shall submit monthly reports of training conducted to as per local regulations.

At the end of each training session, employees will undergo a test to understand the level of competence.

Contractors must ensure that their site management and supervisors are competent and that operatives are suitably trained to undertake their required activities.

Contractors are required to submit CV's for all managers and supervisors including Health, Safety and Environmental personnel to GYSBI. Where competency deficiencies are identified, GYSBI may request the contractor to provide specific training for an individual or group of people.

All site-based personnel must be able to demonstrate they have sufficient knowledge of environmental protection procedures.

GYSBI will reserve the right to have contractors replace non-competent managers or supervisors with competent personnel.

#### **SITE RESTRICTIONS AND ENVIRONMENTAL ISSUES**

GYSBI considers the protection of the environment to be of prime importance and endeavours to minimise the impact of its operations and products on the environment. All foreseeable environmental issues and risks will be properly assessed and controlled. Any environmental incidents will be properly investigated with appropriate corrective and preventative actions implemented.

Noise and dust emissions are to be minimised during construction and operation activities to mitigate disturbance or annoyance to the occupants of nearby residences.

The potential for accidental discharge to soil or to groundwater of any harmful substance will be minimised.

All plants and equipment will be checked to ensure there are no leakages of fuels or lubricants and that exhaust emissions are controlled. Any plant/equipment found non-compliant will be competently repaired on site or removed from the project.

Fuel storage containers will be placed in bunds to retain any spillage or leakage.

### **IDENTIFIED ENVIRONMENTAL HAZARDS**

A semi quantitative risk assessment of activities was carried out, prior to commencement of operations and will conform to or exceed company requirements. In a systematic approach, it shall be implemented and reviewed by experience competent personnel, using their operational knowledge and best judgment to identify and rank the risk associated with each activity.

This assessment has determined the impacts and risks which are significant and therefore require mitigation and control to minimise the impacts and risks.

Other hazards identified either during the project or arising from variations to the intended works, unforeseen matters, or perceived need for a change in approach will be reviewed before the operation is continued.

### **SITE WASTE MANAGEMENT PLAN (SWMP)**

All employees and sub- contractors on the site are to be made aware of requirements of the Site Waste Management Plan (SWMP) during site induction and are to fully comply with all waste management requirements.

GYSBI will be responsible for the collection, sorting and transportation of all wastes generated by their activities to the designated disposal facilities as indicated by SWMP.

Logs and manifests of the quantity, type of wastes and the planned disposal of all waste generated by its activities will be accurately maintained. Waste reduction opportunities will be identify throughout its activities and where practicable reused, recycled or sold with strict adherence to local and international regulations.

Guyana Shore Base Inc. shall separate wastes at-source; Open burning of waste will not be permitted.

Hazardous wastes shall be stored in appropriate containers and all staff involved in the management of hazardous wastes shall receive appropriate training in waste handling and emergency response. Loading and unloading of hazardous wastes will be supervised by certified personnel.

GYSBI will maintain proper housekeeping of its work site and storage areas and promote workforce awareness of waste management matters.

## MANAGEMENT OF SIGNIFICANT ENVIRONMENTAL RISKS

### Waste

#### Hazardous Wastes

Hazardous wastes generated on site will be identified, separated, and disposed from other wastes based GYSBI Site Waste Management Plan.

Anyone who might be exposed to hazardous wastes will be made aware of their potential effects and what to do with them.

#### Waste Removal

Anyone who removes waste from site (including subcontractors removing their own waste) will be required to be the holder of either:

- 1) An Environment Permit, a Waste Management Licence;
- 2) Be registered as a carrier of controlled waste;
- 3) Be from a waste collection authority in Guyana.

Waste transfer notes are to be completed for wastes before the waste leaves the site in accordance with GYSBI SWMP

### Waste Storage

All wastes will be stored in secure designated areas which are located away from surface drains. Wastes will be stored on impermeable surfaces that are contained within a bund capable of containing the contents of the storage containers +10%, or a drain to a sealed pit that can contain the contents of the storage containers.

Skips will be covered to prevent the spread of wind-blown wastes and consideration will be given to storing waste undercover

All waste containers will be clearly labelled with their intended contents using standardised waste signage. Any container used to store waste must be suitable for use and the intended waste. Regular checks will be made to ensure that containers are not corroded, worn out or damaged. If containers are reused, any old labelling will be completely removed.

### Storage of Hazardous Wastes

Hazardous wastes will be stored in suitably labelled containers away from sensitive receptors and the risk of damage by site traffic.

Hazardous waste will not be mixed with non-hazardous waste or with different types of hazardous waste, and will not be stored longer than is necessary to complete documentation to arrange its disposal

If plant maintenance is carried out on-site, used oil will be stored in a bunded area for collection. Oil and fuel filters will also be stored in a designated bin in a bunded area for separate collection and recycling.

### Handling Waste

Employees and contractors will be instructed how to handle and dispose of each type of waste outlined in GYSBI's SWMP.

### Transporting Waste

Waste will only be transported in suitable and secure containers and vehicles that prevent waste from being spilled. Suitable containers include tankers, skips, IBCs, and drums. Any loose materials will be covered or netted to prevent them being blown out of the vehicle prior to leaving site.

Hazardous materials will be transported by a licensed carrier only and clearly identified with signs posted to warn of the nature of the material being transported. Transport vehicles will be equipped with firefighting and spill response equipment. Personnel involved in the transportation of these materials will be appropriately trained in the nature and hazard of the materials.

### Water

GYSBI will NOT allow foreign materials (wastes, sediment, aggregates, fuel, oil etc.) and untreated discharges or effluents (sewage, grey water, cement wash, etc) resulting from operations to enter watercourses.

GYSBI will apply corrective measures to ensure compliance with applicable discharge standards to the satisfaction of the EPA and GYSBI QHSSE department prior to discharges.

In the event of an untreated discharge being released the EPA will be immediately informed and GYSBI Emergency Response Plan (ERP) will be activated to mitigate impacts on the environment.

No machinery or equipment will not be fuel, service nor wash adjacent to or in a watercourse; and these activities will be conducted in designated facility.

Discharges of water by sub-contractors will only be made when given permission to do so by GYSBI who will apply to the EPA for the appropriate discharge consents

The amount of exposed ground and stockpiles will be minimised, and watercourses will be protected from runoff from exposed ground and stockpiles.

#### Avoiding Spillages

Liquids, solids, and powders will be stored appropriately, and away from drains and watercourses, in appropriately bunded areas with a minimum capacity of 110% of the total stored volume and be protected from extremes of temperature. Solvents, chemicals, or paints will also be stored in accordance with their HAZCOM/datasheets.

Appropriate spill kits will be available wherever liquids are stored and used (e.g. oil only, chemical, or general use), adequately stocked and restocked after use.

All deliveries will be supervised by a responsible person. All tank levels will be checked before delivery to prevent overfilling and that the correct tank is filled. All valves and trigger guns will be protected from vandalism, unauthorised interference and be turned off and securely locked when not in use.

Leaking or empty oil drums will be removed from the site immediately and disposed of in accordance with GYSBI SWMP.

Any tanks, drums or bowsers will be stored in a secure container or compound, which will be locked when not in use. Before any tank is moved or perforated all contents and residues will be emptied by a competent operator for safe disposal. Pipes which may contain significant quantities of oil or chemicals, will be carefully drained and then capped, or valves closed, to prevent spillage

#### Refueling

Fuel will be transferred to all mobile equipment in a designated area. This area will be fully Bunded with non-permeable surface and designed to drain to secondary containment areas for treatment in the event of an unplanned release of fuels. Hoses and pipes used for fuel transfer will be equipped with properly functioning and approved check valves, spaced to prevent backflow of fuel in the case of failures.

Stationary Equipment will be refuelled using fuel trucks equipped with all emergency equipment. During loading and unloading of fuel, trucks will be appropriately grounded and bunded to avoid the possibility of static charge.

Emergency equipment will be readily available whenever refuelling takes place and personnel conducting refuelling will undergo training on operating and emergency procedures outlined by GYSBI ERP

Vehicles will never be left unattended during refuelling or delivery valves must not be jammed open. All hoses and valves will be inspected before use regularly for signs of wear.

## Air

GYSBI shall control emissions on roadways, lay down areas, material stockpile and sand work areas using approved suppression/control media.

Suppression media used to control emissions will be approved by the EPA adhering to all local regulations.

All plant and equipment used onsite is to be well maintained and subject to regular inspection according to GYSBI Preventative Maintenance Program.

If there is any unforeseen malfunction of plant and equipment that generates abnormal exhaust, fumes, or dust emissions this will be promptly

repaired. GYSBI will install and properly maintain emission control devices in all emission generating equipment.

All vehicles used by contractors must always comply with GYSBI emissions standards. Vehicle engines, plant and equipment will be switched off when they are not in use.

### **Noise and Vibration**

GYSBI will be responsible for ensuring compliance with the applicable regulations and guidelines for noise emissions and shall minimize the nuisance caused by noise through the implementation of internationally recognized industry best practices. The following are the minimum requirements for noise management during shorebase activities.

#### **Audible Warnings**

Light signals such as stroboscopes will be used in place of whistles, bells, or other audible warnings to indicate shift changes, lifting manoeuvre's and other site activities. Audible backup warnings will be adjustable and operated such that the warnings do not exceed 85 dB(A) at a distance of 1 m from the device. Where incidents occur, mitigation measures are to be implemented by GYSBI.

#### **Equipment**

Noise levels will not exceed 85 dB(A) at a distance of 1 m from the equipment. Where accidents occur, mitigation measures are to be implemented by GYSBI. Consideration will be given to the use of electric equipment in preference to pneumatic or hydraulic equipment and, where possible, percussion tools fitted with noise-abatement devices.

#### **Internal Combustion Engines**

GYSBI will fit all internal combustion engines of heavy earthmoving and power Equipment (e.g. generators, cranes, etc.) with mufflers; and shall not operate equipment with defective mufflers.

No equipment with a defective muffler will be permitted to operate on the shorebase site.

The disturbance to site neighbours from noise and vibration will be kept to a minimum at all times.

Any activities and plant that generate large amounts noise and vibration will be located away from sensitive receptors.

Any acoustic enclosures supplied with equipment, will be closed, tight fitting and well-sealed.

#### Environmental Noise Monitoring

Environmental noise monitoring will be undertaken by competent personnel using calibrated equipment. Noise monitoring is usually undertaken by a specialist contractor who can provide audiometric reports

#### Light Pollution

Site lighting will be kept to the minimum brightness necessary for adequate security and safety. Lighting will be located and directed so that it does not intrude on nearby properties and does not blind motorists on nearby roads.

#### Flora and Fauna Protection

GYSBI will inspect areas to complete any necessary flora and fauna rescue and relocation that will be undertaken by Specialized Contractors.

GYSBI will ensure that its employees are aware of the importance of the protection of flora and fauna and trained in procedures associated with encounters with wildlife. Employees shall not approach, injure, hunt, capture, possess, feed, transport, rear or trade wild animals and/or collect birds' eggs while working on the site.

Natural habitats outside of project areas will not be disturbed and only designated roads or paths will be followed with strict adherence to established speed limits.

### **Marine Environment**

GYSBI will ensure the protection of marine environment while conducting operations at its port facility. To effectively mitigate impacts all equipment will be maintained in good working order to prevent leaking or spilling of potentially hazardous or toxic products. This includes but not limited to hydraulic fluid, diesel, gasoline, and other petroleum products.

All store fuels and petroleum products will be safely stored in appropriate containment facilities that provide adequate protection in case of spills.

Water borne equipment will be positioned in a manner that will minimize damage to the marine environment and where possible, alternative methods will be employed. In the event that circumstances will not allow an alternative; GYSBI will minimize the damage and where require restore habitat to its original state at the completion of the project.

The use of exclusion devices such as protective netting or geo textile material suspended in the water column around the operations area to prevent fish access or when required.

Silt curtains will be used to prevent sediment migration from operations area where required and bubble curtains will be used to mitigate shock waves where required.

GYSBI will have emergency spill equipment available whenever working near or on the water according to GYSBI ERP.

## Heritage

In the event that human remains or items of cultural, religious or archaeological value are unearthed by construction and operation activities, GYSBI will immediately stop work in the area and notify the relevant authority through its QHSSE Department. Work will not resume in the area until authorization is received from relevant authority.

Operations will be prohibited in areas designated to be protected due the presence of archaeological, religious, or cultural resources. These areas will be signed, information panels posted and where necessary fenced. A 10 m buffer of undisturbed area will be left between any identified archaeological, religious, or cultural heritage places.

GYSBI will provide training for personnel on any likely types of archaeological, religious or culturally important sites that has been identified and procedures to take to ensure that the sites are not disturbed.

## Community Protection

GYSBI will not disturb or interfere with the inhabitants of local communities close to or in the area of influence of the shorebase, and will respect their houses, cultures, animals, properties, customs and practices.

GYSBI will control access to the work area to ensure that members of the local community will not be allowed to wander around the worksite. Where community members are found on the work site, they will be requested to leave the area in a polite manner.

GYSBI will ensure that all its workers and sub-contractors conduct themselves according to the company's Code of Conduct.

## **SUSTAINABILITY AND USE OF RESOURCES**

### **Water**

Reduce the amount of water wasted by ensuring that:

- 1) Taps and hoses are not left running unnecessarily.
- 2) Manual spray guns used to where possible.
- 3) Any leaks reported and repaired quickly.
- 4) Rainwater is collected for use onsite.

### **Energy**

Reduce the amount of energy used onsite as follows:

- 1) Turn off vehicle engines and machinery when not in use
- 2) Switch from compressed-air power tools to electric-powered equipment (instantly achieving ten times greater energy efficiency)
- 3) Maintain minimum temperatures wherever possible
- 4) Switch off electrical equipment
- 5) Do not leave computers, lights, copiers, printers, vending machines or water coolers when not in used.
- 6) Avoid leaving equipment on 'stand-by' mode. This wastes energy, which would be saved if the device was switched off.
- 7) Ensure all equipment with 'power-down' devices have them activated.
- 8) Use energy saving light bulbs.

- 9) Switch off lights when they are not needed or fit light and/or movement sensors.

### **DESCRIPTION OF MONITORING PROGRAMME**

Environmental Monitoring provides an indication of the change in an environmental parameter, and is a critical component in environmental management because it can inform an entity whether the mitigation measures implemented are successful in avoiding, reducing or remedying potential negative impacts of the facility. Additionally, environmental monitoring allows for early detection of any potential problems and will therefore empower the manager/s to develop appropriate and timely solutions.

This EMP will capture two of the three categories of monitoring: impact monitoring and compliance monitoring and will be conducted based on the guidelines/parameters outlined in the environmental permit.

The objectives of the Environmental Monitoring Programme are as follows:

- To ensure project components are conducted in compliance with national, and where applicable, international laws and regulations and the conditions of the environmental audits;

- To measure the success of proposed mitigation measures in minimizing and/or reducing potential environmental and socio-economic impacts;
- To facilitate a continual review of operation activities based on performance data and consultation feedback; and
- To implement corrective actions or new adaptive management programmes, as required, if proposed mitigation measures are unable to reduce and/or eliminate potential project related impacts or meet the predetermined level of performance.

#### **DOCUMENT CONTROLS AND RECORD KEEPING**

GYSBI has established a systematic approach to capture and manage all records. Records will be stored in accordance with (API Q2:2001 Clause 4.4.2 & 4.5). A document control procedure to manage all controlled documents, including but not limited to policies, procedures, standard work instructions, forms, manuals, plans, and report related to activities carried out.

#### **EMERGENCY RESPONSE PROCEDURE**

GYSBI Operations and QHSSE management team members will co-ordinate emergency situations in accordance with GYSBI ERP. All personnel on site are required to comply with all directions and instructions given during an emergency.

All accidents, injuries, diseases, dangerous occurrences, and near misses will be reported to GYSBI QHSSE Department at the earliest opportunity and always on the day of occurrence.

Contractors will submit a preliminary report to GYSBI within **TWENTY FOUR HOURS (24hr)** of an adverse event occurring.

Contractors will investigate all accidents and incidents and submit a formal report to GYSBI QHSSE Department within **Seven (7) days** of the date of occurrence.

All adverse events however minor will be investigated so that incident causal factors and corrective actions can be identified and implemented.

GYSBI will notify the enforcing authority when appropriate. Contractors must report in-line with their in-house / company policy and legislative requirements.

### Revision Summary

Revision	Date	Approved by	Summary of change
1	28 <sup>th</sup> April 2020	Kurt Busuttil	Initial release of document
2	12 <sup>th</sup> September 2020		Change of Document to New Company Format
3	03 <sup>rd</sup> October 2020	Iain Martain	
4	07 Jul 2022	Kurt Busuttil	Updated Document Number

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**This policy shall be used and updated by the QHSSE Department**

## 1 PURPOSE

To provide a documented procedure for pre-employment and periodic medical examination for all GYSBI employees.

## 2 PROCEDURE DETAILS

- A role specific health risk assessment (HRA) has been carried out, see Appendix I. The role specific HRA identifies health hazards, risks, control measures and clinical examinations required as part of a pre employment medical and periodic health surveillance.
- Pre-employment and Periodic Medical Examinations will be conducted at the company's medical centre and/or nominated medical clinic.
- The results of the medical examinations shall be kept in the employees' personal file for further reference under responsibility of the HR Department.
- The company Medics will advise the HR Department regarding an employee's specific medical condition that affects his work performance.
- Periodic medical examinations due to risk factors identified in the HRA will be provided at appropriate frequencies based upon the specific exposure. The HR Department will notify employees and their Manager's of the need to report to the clinic for the Periodic Medical Examinations.
- Employees will be required to have medical examinations in accordance with this procedure.
- The company may request that an employee undertake a medical examination at any time, should they feel that the employee is suffering

an illness, condition, or injury which may impair his/her ability to perform the requirements of the job.

- The company Medic shall complete all inhouse medical examinations, and shall schedule all external medical examinations with the company approved medical clinic.
- The company Medic shall complete FORM QH-152 Pre-Employment & Periodic Health Assessment. The completed forms are returned to the HR Department for review prior to the candidate being allowed to report to the specified position.
- No candidate will travel to the site or start work prior to the completion of the Pre-employment Medical Examinations and this person is deemed fit to satisfactorily perform their job.

### 3 FREQUENCY OF TESTS BASED ON HRA

POSITION	TEST REQUIRED	FREQUENCY
DRIVERS/OPERATORS	VISION, HEARING, MUSCULO-SKELETAL ASSESSMENT, CARDIAC RISK ASSESSMENT	12 months
SLINGER/BANKSMEN/ LOAD HANDLERS/WASHBAY	MUSCULO-SKELETAL ASSESSMENT, RESPIRATORY ASSESSMENT, VISION. HEARING.	12 months
OFFICE STAFF (including Base Managers, Base Coordinators and Supervisors).	VISION, MUSCULO-SKELETAL ASSESSMENT.	24 months

MAINTAINANCE (inclusive of Plumbers, Electricians and General Labors).	MUSCULO-SKELETAL ASSESSMENT, RESPIRATORY ASSESSMENT, VISION, HEARING	12 months
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## REFERENCE

[QH-153-GYSBI Risk Assessment](#)

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	21.07.2021		Policy was created
<b>2</b>	07 Jul 2022	Kurt Busuttil	Updated Document Format

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## 1 INTRODUCTION

The Security Plan (SP) lays out and explains the various risks and planned response to situations occurring in and associated with Guyana Shore Base Inc (GYSBI) operations, including its staff and locations. The overall objectives as outlined in this plan are the protection of:

- GYSBI assets & staff
- GYSBI's clients & their assets
- The image and reputation of the company

The goals to be achieved in providing an effective security response system are as follows:

- An organizational framework that will guarantee a rapid and effective response to any given situation.
- A list of actions that must be taken with clear indications as to their priority.
- The assignment of persons tasked with the various roles and responsibilities.
- A list of the necessary equipment and materials needed to effectively perform port security duties.

## 2 OVERVIEW

The GYSBI Port/site is located along the western bank of the Demerara River at Plantation 'A', Houston, East Bank Demerara. The area is accessible by two entrance / exit areas. The north entrance serves as entrance / exit for pedestrians and light vehicles. The second entrance / exit is at the southern section of the facility which serves as an entrance / exit for medium to heavy vehicles.

The operation is split into two separate areas. The 'Base' is 28 acres in size at which the port facility operations occur. This comprises warehouses, wash bay and storage base for Exxon Exploration Production Guyana Limited (EEPGL). It has a contracted security force, along with CCTV and other electronic security measures to provide early detection of any security breaches. The facility has an

eight (8 ft) high chained link fence, topped with razor wire, along with electronic locks at key access points.

The 'Annex' is 100 acres in size separated into plots. Each plot is approximately 10 acres and comprises of a wash bay, pipe storage, warehouses, demountable semi-permanent office buildings and amenities and laydown areas. It has a contracted security force, along with CCTV and other electronic security measures to provide early detection of any security breaches. The facility has an eight (8 ft) high chained link fence, topped with razor wire.

The Security situation in Guyana is very fluid, with the crime situation ranging from violent armed robberies, gang violence to petty crime - which occurs daily and often goes unreported. In order to have a clear picture of the current security overview within the country, please refer to the GYSBI – Weekly Security Summary.

### **Name of Operating Company**

Guyana Shore Base Inc.

### **Full Postal Address**

Plantation "A" Houston, Greater Georgetown

### **General Telephone and Contact Details**

Tel: 592-227-2381; 592-227-2380

Email: [www.gysbi.com](http://www.gysbi.com)

### **Name and Contact of Port Facility Security Officer (PFSO)**

Zulfikar Niaz Khan

Address: 8L Nigg New Scheme Corentyne Berbice

Mobile: 608-2613

Office: 227-2381

Email: [gysbi.securitycoordinator@gysbi.com](mailto:gysbi.securitycoordinator@gysbi.com)

## Name of Company Director/Chief Executive

Mr. Sean Hill

Address: Plantation Houston, Greater Georgetown

Mobile: 608-2852

Office: 227-2381

Email: [sean.hill@gysbi.com](mailto:sean.hill@gysbi.com)

## Concept of Operations

The following layers of security will be employed:

- a. Security Management of all GYSBI personnel & assets.
- b. Enhancement and implementation of the security and travel management policies and procedure.
- c. Conduct Security Risk Assessments and review every six (6) months.
- d. Physical & electronic security measures at access control points.

## Safety and Security Briefings

Security Briefings are provided by the Security Coordinator to key GYSBI personnel and are regularly updated in response to the changing security risks and environment.

GYSBI Security Coordinator will provide Weekly security briefings to the QHSSE Manager. Ad hoc security briefs will also be delivered based on unfolding security situations.

## Security Risk Assessment

A security risk assessment will be done in accordance with PRO-QHSSE-026 QHSSE Risk Assessment Procedure and the ISPS Code.

## Intellegence (General)

The Security Manager will utilize a network of local contacts in and around the surrounding area, as well as other sources that include, but are not limited to law enforcement, foreign missions, the media, the private security associations.

## Security Alert Levels

There are three levels of alert in use and these are:

MARSEC LEVEL 1	<b>(LOW)</b>	Normal
MARSEC LEVEL 2	<b>(MEDIUM)</b>	Potential threat
MARSEC LEVEL 3	<b>(HIGH)</b>	

	means the level for which minimum appropriate security measures shall be maintained at all times.
	means the level for which appropriate additional protective security measures shall be maintained for a period of time as a result of heightened risk of a transportation security incident.
	means the level for which further specific protective security measures shall be maintained for a limited period of time when a transportation security incident is probable, imminent, or has occurred, although it may not be possible to identify the specific target.

## Changing Security Levels

The changing of security levels at Port Facilities is the responsibility of the Designated Authority in Guyana (the Maritime Administration Department). Once MARAD has approved the raising or lowering of security level at Port Facility, then the Security Coordinator will inform Management of such a change and take the necessary actions to implement same.

## Key Threats / Risks

The threats to the operations and personnel at this facility are:

- a. **Acts of piracy/unauthorized boarding:** Raise alarm via air horn. Follow emergency protocol of vessel. Report incident to shift supervisor. Shift supervisor reports incident to security contractor who will dispatch marine patrol. Shift supervisor to report incident to GYSBI's security coordinator and / or QHSSE supervisor who will relay information to senior management and to authorities.
- b. **Unauthorized entry:** Verbally challenge intruder and promptly report intrusion to shift supervisor. Isolate intruder and keep under observation while shift supervisor make contact with authorities and GYSBI security coordinator and / or GYSBI's QHSSE supervisor. Await arrival of authorities to apprehend intruder.
- c. **Robbery and theft:** Report to GYSBI Security coordinator who will inform the GYSBI QHSSE Manager and Contracted Security HQ. GYSBI Security Manager will also remain on scene or accompany any GYBSI staff to police station to make necessary report. Security supervisor
- d. Robbery and theft.
- e. **Vandalism:** Immediately report instances of vandalism to direct line supervisor / QHSSE supervisor and / or security coordinator. Security coordinator will inform company's management and also local authorities for further investigation.
- f. **Fire:** Raise fire alarm, go to muster point, evacuate to "safe area" as required, under direction of the GYSBI Base Manager or QHSSE Manager.
- g. **Civil Unrest:** Raise incident alarm, move to safe room, evacuate to "safe area" under direction of the GYSBI Security Manager, who will inform GYSBI QHSSE Manager and General Manager. Close both northern and southern

entry points. Increase patrols along perimeter. Inform security contractor HQ and local authorities for quick response.

## **Yard Security**

Security at the facility is maintained by a contracted security provider and this is controlled by the GYSBI Security Coordinator/PFSO who will provide strategic guidance / direction to the company and be the corporate security focal point for incidents, and responsible for overall security-related operational issues. The GYSBI Security Coordinator/PFSO reports directly to the GYSBI QHSSE Manager. Contracted Security Officers are deployed on a 24-hour basis daily. Additional security coverage is provided through our CCTV system.

## **Marine Security**

GYSBI security mechanism includes measures that ensure security is maintained on its wharf and adjoining areas inclusive of the waterside. Contracted Security Officers are deployed on a 24-hour basis daily. Additional security coverage is provided through our CCTV system.

## **GYSBI Port Facility Security Team**

GYSBI Facility security is provided by a local security company. The security team consists of the following:

- a. GYSBI QHSSE Supervisor
- b. GYSBI Security Coordinator
- c. Contracted Security Officers (20 at day and 20 at night).

## **GYSBI Port Facility Security Committee**

The GYSBI Port Facility Security Committee will consist of the following persons:

- a. GYSBI QHSSE Supervisor
- b. GYSBI Security Coordinator/PFSO.

- c. GYSBI Operations Manager
- d. GYSBI Base Manager
- e. Security Contractor Representative.

The Committee will meet once per month.

## **General Responsibilities of GYSBI Facility Security Team**

The general responsibilities of the security team are as follows:

- a. Ensure security patrols are conducted to cover the entire facility inclusive of the main office, Wharf, Warehouses, and storage areas.
- b. Ensure the security of vessels berthed at the wharf at all times.
- c. Provide training and support to key GYSBI staff on security related issues.
- d. Record and monitoring of all persons (GYSBI Staff, Clients, Contractors & Visitors) entering the facility.
- e. Record and monitor all persons (GYSBI Staff, Clients, Contractors & Visitors) exiting the facility.
- f. Record, monitoring and searching all vehicles and drivers (GYSBI, Clients, Contractors & Visitors) entering the Facility.
- g. Record, monitoring and searching all vehicles and drivers (GYSBI, Clients, Contractors & Visitors) exiting the Facility.
- h. Maintain daily record of all activities and irregularities, security incidents or unusual occurrences.
- i. Ensure all personnel entering the facility have the necessary Personal Protective Equipment (PPE).
- j. Maintain a physical presence at all gates and barriers to control entry and exit– pedestrian as well as vehicle access.
- k. Conduct security checks on all personnel and vehicles to deter theft and the entry of prohibited items
- l. Screen individuals and vehicles to prevent passage of prohibited articles into restricted areas.

- m. Carry out any other task allotted by the company in the interest of security of the premises.
- n. Coordinate with police or fire departments in the event of an emergency, such as fire or security related incident e.g., unlawful entry of unauthorized persons.
- o. Enforcement of company policies, especially those relevant to safety and security.
- p. Responding to any security related incidents and investigating disturbances.
- q. Perform duties within the administrative building – screening persons entering, maintaining visitor records, Issuance of visitors passes.
- r. Maintain security records, including shift records, security incident reports, visitor logs, and logs of any visitor badges issued.
- s. The Security Guards shall assist the visitors in reaching their desired locations as well as provide escort for visitors or senior staff
- t. Screening of all incoming and outgoing goods and maintain their proper record.
- u. Ensure all COVID 19 protocols are adhered to.

In the event of a security incident that requires armed intervention (use of firearms/lethal weapons), the Security Contractor will deploy an armed response team to the Facility. Such incidents will also be reported to the Guyana Police Force and the requisite assistance will also be sought from the Guyana Police Force.

## **General Security Layout**

The general security layout at this facility is as follows:

- a. Access control at the northern and southern access points.
- b. Access control at the admin building.
- c. Security at the various Berths (Wharf).

- d. Security at strategic locations on the facility.
- e. Vessel security.

Access control will be conducted in accordance with the GYSBI Entry and Exit Procedures.

## **Security Training**

Training of security personnel will be the responsibility of the Security contractor. Training will be conducted once monthly and as need arise; with a focus on matters such as the ISPS Code and Guide to Maritime Security, General Security etc.

## **Security Drills and Exercise**

Security drills will be conducted once per quarter while security exercise will be conducted once per year.

## **Incident Reporting**

All incidents of security and/or safety nature must be immediately reported to the following persons:

- a. Security Coordinator/PFSO.
- b. Security Contractor (On site Supervisors).
- c. GYSBI QHSSE Supervisors/Officers.

The appropriate documentation of the incident is to be completed in the appropriate ledgers, forms, and reports. An assessment of the incident is to be conducted by the members of the security team.

## **Close Circuit Television System**

GYSBI Port Facility security mechanism includes a CCTV system which is operational on a 24/7 basis covering the entire facility and other strategic areas.

The CCTV system must have the capacity to record and store one (1) month's data at any given time.

## **Journey Management and Vehicles**

### **Journey Management**

Journey management will be conducted as per PRO-QHSSE-014 Journey Management.

### **Communications**

The following means of communication will be made available in order of preference:

- GSM (voice or SMS)
- Email
- Radios

## **Liaison**

All security liaisons will be handled by the GYSBI QHSSE Supervisor and/or GYSBI Security Coordinator/PFSO.

## **IT Asset Protection**

All matters concerning IT security are the responsibility of GYSBI IT Manager and of the employees for their own IT equipment.

## **Parking**

All vehicles are to be parked in their designated areas with their vehicle pass clearly displayed. Only authorized vehicles will be permitted to park within the facility. All contractors and third-party vehicles are to be issued with temporary passes which must be clearly visible to security. All vehicles entering and leaving the facility will be subjected to security checks.

## Offices

All administrative and operations offices will remain secured after working hours (unless operations dictate otherwise.) Any confidential paperwork is to be kept safe and not visible to other staff, visitors or cleaners at all times. There will be a document shredder in each office and all confidential documentation no longer required, shall be shredded prior to being discarded.

## Crisis Management (Overview)

All staff must be prepared and respond with the most appropriate course of action. This can either entail the shutting down of operations at the facility, evacuation of the facility or the worst-case scenario requiring evacuation out of the country for the expatriate staff.

To aid this, GYSBI has an Emergency Response Plan which has been developed and will be managed closely between the GYSBI QHSSE Manager, GYSBI Base Manager and GYSBI GM.

## Incident Safety

All incidents will be managed as per PRO-QHSSE-002 Incident Reporting & Investigation.

## Communications

Critical to the management and successful conclusion of a medical or other emergency is to ensure all parties remain in communications 24/7. GYSBI utilize messaging apps such as WhatsApp and Slack for internal communications.

The GYSBI Security Coordinator/PFSO and GYSBI Base Manager, along with GYSBI HR Manager must ensure that they have an up-to-date contact list, to include all details of the GYSBI Insurance / Medical Evacuation Provider.

All emergency communication equipment (spare batteries etc.) and emergency telephones plus numbers, are to be tested on a quarterly basis as a minimum.

## Summary

This Security Plan has been compiled to address the GYSBI security and general support of the Shore Base facility. The information in this plan will be constantly assessed and is subject to revision every year or as new and updated information becomes available on security situation and or the nature of the project changes.

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	-	-	Initial release of document
2	20 August 2020	Michael James Sean Hill	Document layout changed to new company format
3	May 12, 2021	Iain Martin Sean Hill	The structure of the document was rearranged to include: <ul style="list-style-type: none"> <li>a. Name change from Shore Base Security Plan to GYSBI Port Facility Security Plan.</li> <li>b. Content change to the Introduction, Overview, Name of PFSO, Concept of Operations, Safety &amp; Security Briefing, Security Risk Assessment, Changing Security Levels, Key threats &amp; risks, Yard security, Marine Security, GYSBI Security Team, Security Drills and Exercise, Incident Reporting and Liaison.</li> <li>c. The useful contact persons list was also updated to include Iain Martin and the new PFSO.</li> <li>d. The following were introduced/included into the plan: <ul style="list-style-type: none"> <li>i. GYSBI Port Facility Security Plan.</li> <li>ii. General Security Layout.</li> <li>iii. Security Training.</li> <li>iv. CCTV System.</li> </ul> </li> </ul>
4	Dec 31, 2021	Andy Dowson Zulfikar Khan	<ul style="list-style-type: none"> <li>A. Updated PFSO name</li> <li>B. Updated Appendix A: <ul style="list-style-type: none"> <li>a. Names &amp; Contact of Base Managers</li> <li>b. Names &amp; Contact of Yard Coordinator</li> </ul> </li> <li>C. Corrected General Manager Email Address</li> <li>D. Change from QHSSE Manager to QHSSE Supervisor</li> <li>E. Change made to include south entrance for medium to heavy vehicles</li> <li>F. Added MARSEC Levels under security alert levels</li> <li>G. Added GYSBI to port facility security team and committee</li> <li>H. Added COVID 19 Protocols adherence under General Responsibilities of GYSBI Facility Security Team</li> <li>I. Changed HR Manager details</li> <li>J. Corrected Full Postal Address</li> </ul>
5	26 Jan 2022	Kurt Busuttil	A. Included response for key security threats / risks.

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		Zulfikar Khan	
6	07 Jul 2022	Kurt Busuttil	Updated Document Number

## Annex A – Crisis Management Team Contact Lists

Name / Position	Position	Priority	Satellite Phone	GSM	Email
Zulfikar Khan	GYSBI SC/PFSO	1		6082613	<a href="mailto:gysbi.securitycoordinator@gysbi.com">gysbi.securitycoordinator@gysbi.com</a>
Kevin Black	Base Manager	1		608 2855	<a href="mailto:GYSBI.BaseManager@gysbi.com">GYSBI.BaseManager@gysbi.com</a>
Stephen Clarke				608 2855	<a href="mailto:GYSBI.BaseManager@gysbi.com">GYSBI.BaseManager@gysbi.com</a>
Phillip Smith				608 2855	<a href="mailto:GYSBI.BaseManager@gysbi.com">GYSBI.BaseManager@gysbi.com</a>
Stuart Gowing				608 2855	<a href="mailto:GYSBI.BaseManager@gysbi.com">GYSBI.BaseManager@gysbi.com</a>
Jason Clements				608 5814	<a href="mailto:GYSBI.YardCoordinator@gysbi.com">GYSBI.YardCoordinator@gysbi.com</a>
Ian Thomson				608 5814	<a href="mailto:GYSBI.YardCoordinator@gysbi.com">GYSBI.YardCoordinator@gysbi.com</a>
Mark Clarkson				608 5814	<a href="mailto:GYSBI.YardCoordinator@gysbi.com">GYSBI.YardCoordinator@gysbi.com</a>
				QHSSE Supervisor	1
Sean Hill	General Manager	2		608 2852	<a href="mailto:sean.hill@gysbi.com">sean.hill@gysbi.com</a>

## Annex B - Useful Contacts and Numbers within GYSBI

Point of Contact	Department	Appointment	Email	Contact Numbers
Lilowtie Indira Chintamani	HR	HR Manager	<a href="mailto:Lilowtie.Chintamani@gysbi.com">Lilowtie.Chintamani@gysbi.com</a>	633 3192

## Annex C – Monthly Security Bulletin

<b>Monthly Security Bulletin</b>	
<b>DATE:</b>	
<b>CRIME TRENDS BY AREA:</b>	
<b>LOCAL PRESS COVERAGE:</b>	

**CRIME PREVENTION ADVICE:** *Related to the above. Basic advice for all personnel*

**Miscellaneous Information:**

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## POLICY STATEMENT

Guyana Shore Base Inc. (GYSBI) recognizes the importance of supporting its clients, contractors, and service companies with whom we have similar clients (all hereinafter referred to as “third parties’), in a way which promotes and sustains, positive, productive, and safe working environments.

This Policy outlines GYSBI's requirements for all third parties involved in the transport, handling and/or storage of hazardous substances in transit through and/or being delivered on site for short-term staging and/or longer-term storage, prior to uplift on to a vessel.

## POLICY DETAILS

Third Parties shall transport, handle all chemicals and radioactive material in a manner suitable for their nature and potential to pollute or cause harm, taking account all liquid, gaseous and solid substances that are to be staged at GYSBI in line with:

- Occupational Safety & Health Act #32,1997
- Maritime Administration Regulation-Guyana Shipping Act, 1997
- Environmental Protection Act 1996
- Pesticides and Toxic Chemicals Control Act 2000
- Environmental Protection (Hazardous Waste Management) Regulations 2000

Third parties are required to provide full documentation to ensure this is always kept legally compliant whilst on GYSBI property.

GYSBI shall provide a staging area to accommodate chemical or radioactive deliveries for a period of no longer than 24 hours. Third parties are responsible to protect hazardous substances from rain and sun where necessary.

Secondary containment shall be used for the storage/staging of all Hazardous Substances at GYSBI facilities.

GYSBI will provide the resources to transport the hazardous substances from the staging area to the vessel.

GYSBI will provide an emergency spill response in the event a spill is identified during transportation to and from the vessel, or an unintentional event occurs during staging that impacts the staging area resulting in an uncontrolled release of any hazardous substance.

Any waste from a spillage which is deemed a direct cause of the third party i.e., poor packaging, damaged or leaking containers etc. whilst on the GYSBI site would be taken to a licensed waste treatment facility and recharged back to the third party.

All hazardous substances transported to GYSBI yard, must be stored in secure packages clearly and permanently labeled to include the following information: MSDS (Radioisotope fact sheet for radioactive materials), Name of substance, UN number, Hazard identification, Quantity, SDS number, Manufacturer. The labeling requirements apply to both the outside packaging and any individual units.

Incompatible hazardous substances shall not be stored together such that potentially dangerous reactions could occur, (even when storage is temporary). It is the responsibility of the third party to provide this information within their risk management documentation, along with an emergency response plan for the hazardous substances that would be staged at the GYSBI facility.

Before any hazardous substances are to be allowed on to site, the third-party emergency plan should be supplied ensuring, as a minimum, it clearly identifies the steps to mitigate the risk of the following occurring and provide evidence of the resources to prevent one of the items below becomes a reality.

- Hazardous substance leak where workers could be asphyxiated.
- Exposure to radioactive materials resulting in ARS or life-threatening diseases.
- Corrosives substances reacting with metal and damaging buildings or plant.
- Acute toxic liquids spilling and contacting workers.
- Workers developing symptoms from long term exposure to carcinogens.
- Fire and explosion

I certify that I have received a copy of the “QH 134 Hazardous Substances Staging Policy” I have read and understand the content, requirements, and expectations of the Policy and I agree to abide by the policy guidelines.

\_\_\_\_\_ Printed Name

\_\_\_\_\_ Signature

\_\_\_\_\_ Company

\_\_\_\_\_ Date

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	04 Jun 2021	Andrew Dowson	Initial release of document
2	11 Aug 2021	Andrew Dowson	Document updated to include requirement for secondary containment for the storage of Hazardous substances
3	29 Aug 2021	Andrew Dowson	Updated to include secondary containment for storage and staging
4	20 Jul 2022	Andrew Dowson	Document updated to include requirements for radioactive substances. Updated Document Format

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**This procedure shall be used by all departments and updated by QHSSE  
Department**

## 1 INTRODUCTION

The purpose of this procedure is to:

- Define methods of reporting incidents/accidents/near miss events;
- Classify incidents/accidents/near misses and determine the levels of investigation;
- Implement measures for the prevention of recurrences;
- Monitor results of prevention methods.

Following an internal investigation, the main objective is to prevent undesired events happening again. The responsibility for an incident investigation lies with the Management, which will be assisted by the QHSSE Department.

## 2 PROCEDURE DETAILS

### Scope

The scope of this procedure is applicable to all GYSBI sites.

### Definitions

Term	Definition
<b>Incident</b>	General term to define an unplanned event or chain of events which has caused or could have caused injury (injuries), damage to assets and/or to environment. Incidents include Accidents and Near Misses.
<b>Injury or Illness</b>	An injury or illness is an abnormal condition or disorder of an individual. Injuries include cases such as, but not limited to, a

Term	Definition
	cut, fracture, sprain, or amputation. Illnesses include both acute and chronic illnesses, such as, but not limited to, a skin disease, respiratory disorder, or poisoning.
<b>Work-Related</b>	An injury or illness is considered work-related if an event or exposure in the work environment either caused or contributed to the resulting condition or significantly aggravated a pre-existing injury or illness. Injuries or illnesses that are not work-related are not recordable.
<b>Recordability Criteria (as per Exhibit G)</b>	<p>Work-related injuries or illnesses are recordable if they involve one or more of the following:</p> <ul style="list-style-type: none"> <li>a) Death</li> <li>b) Day(s) away from work</li> <li>c) Restricted work or transfer to another job</li> <li>d) Medical treatment beyond First Aid</li> <li>e) Loss of consciousness</li> <li>f) A significant diagnosed injury or illness</li> </ul>
<b>Near Miss Incident</b>	A Near Miss Incident is an unintended or unwanted event that, under slightly different conditions, would have had a negative effect on safety, health of people, property, or the environment. Does not include Clinic Visits Without Treatment. (All Near Misses are thoroughly investigated despite PHL, In the event a Near miss has a potential Hurt level (PHL) of 3 or more it would then be classed as a recordable incident, a PHL of 2 or less would not be recordable, however all near misses are

Term	Definition
	looked at case by case to establish if the correct PHL has been assigned).
<b>Clinic Visit Without Treatment</b>	Also known as a No Treatment. A Clinic Visit Without Treatment is an incident which has actual consequences, but the injured person does not require any type of medical treatment. Is not considered a Near Miss.
<b>First Aid Case (FAC)</b>	<p>FACs are generally defined as any one-time treatment, and any follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, etc., which do not ordinarily require medical care. Such treatment and follow-up is considered first aid even though provided by physician or registered professional personnel. FACs are not recordable. FAC classification is appropriate when any of following treatments are provided:</p> <p>a) Using a non-prescription medication at non-prescription strength (for medications available in prescription and non-prescription form, a recommendation by a physician to use a non-prescription medication at prescription strength warrants classification as an MTI).</p> <p>b) Administering tetanus immunizations. (Other immunizations, such as Hepatitis B vaccine or rabies vaccine, warrant classification as an MTI.)</p> <p>c) Cleaning, flushing, or soaking wounds on the surface of the skin.</p>

Term	Definition
	d) Using wound coverings such as bandages, Band-Aids™, gauze pads, etc.; or using butterfly bandages or Steri-Strips™ (other wound closing devices such as sutures, staples, tapes/glues, etc. warrant classification as an MTI).
	e) Using hot or cold therapy (e.g., compresses, soaking, whirlpools).
	f) Using any non-rigid means of support, such as elastic bandages, wraps, non-rigid back belts, etc. (devices with rigid stays or other systems designed to immobilize parts of the body warrant classification as an MTI).
	g) Using temporary immobilization devices while transporting a victim (e.g., splints, slings, neck collars, backboards, etc.).
	h) Drilling of a fingernail or toenail to relieve pressure or draining fluid from a blister.
	i) Using eye patches.
	j) Removing foreign bodies from eye using only irrigation or cotton swab.
	k) Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs or other simple means (procedures involving the excision of the outer layer of skin warrant classification as an MTI).

Term	Definition
	<p>l) Using finger guards.</p> <p>m) Using massages (physical therapy or chiropractic treatment warrants classification as an MTI).</p> <p>n) Drinking fluids for relief of heat stress.</p> <p>o) Preventive use of Oxygen in absence of symptoms is not considered an MTI.</p>
<b>Medical Treatment Incident (MTI)</b>	<p>A work-related injury or illness that requires the management and care of a patient to combat disease or disorder. MTIs are recordable. MTIs do not include the following:</p> <p>a) visits to a physician solely for observation or counseling.</p> <p>b) the conducting of diagnostic procedures, such as x-rays and blood tests, including the administration of prescription medications used solely for diagnostic purposes (e.g., eye drops to dilate pupils.)</p> <p>c) application of First Aid.</p>
<b>Restricted Work Incident (RWI)</b>	<p>A work-related injury or illness that results in a person being unable to perform one or more of the routine functions of the person's job, or from working the full workday that the person would otherwise have been scheduled to work on any calendar day after the day of the illness or injury. RWIs are recordable. [Routine functions are those work activities that the person regularly performs at least once per week. Do not</p>

Term	Definition
	<p>record as a RWI where persons produce fewer goods or services than they would have produced prior to the injury or illness but otherwise perform all of the routine functions of their work. If follow-up with the persons making the restriction indicates that the restriction does not prevent the persons from either their routine job functions or from working all of their normally assigned work shift, then the case should not be recorded as a RWI. Work restrictions recommended by a physician result in a RWI classification even if the person does not follow the restrictions. In cases where recommendations are received by two (2) or more physicians, Company may decide which recommendation is the most authoritative and determine recordability based on that recommendation.]</p>
<p><b>Lost Time Incident (LTI)</b></p>	<p>Also known as a Days Away from Work Case (DAFWC). Any work-related injury or illness (including fatalities) that results in at least one (1) lost workday after the day of the incident. If a condition resulting from an injury or illness causes a person to be unable to return to work on the calendar day following the day on which the incident occurred, the case is recordable and should be classified as an LTI. [It does not matter whether the next calendar day is a scheduled workday or not, only whether the person was able to work on that day. If the injury or illness occurs on the last day a person is scheduled to work (e.g., last day of the work week) and the person reports to work on the next scheduled workday, record the case as an LTI only if information is received from a physician indicating the person should not have worked. An injury or illness in which the</p>

Term	Definition
	<p>person is unable to work is classified as an LTI even if the individual takes unscheduled vacation on the day following the day of the injury or illness. Exclude classification as an LTI where an individual is capable of working, but unable to return to work solely due to circumstances such as:</p> <p>a) a seaman missing a ship sailing</p> <p>b) a person unable to return to a location due to bad weather or lack of reasonably available transportation</p> <p>c) a lack of local medical facilities needed for observation/ treatment provided there was no unnecessary delay in traveling to seek such medical treatment</p> <p>d) person refuses to work.</p>
<b>Fatality</b>	A recordable incident which results in the death from a work-related injury or illness, regardless of the time intervening between the incident and death.
<b>Regional Illness</b>	Regional illnesses are illnesses that could result in a debilitating condition or death, or a health-related situation that could disrupt ongoing operations. Vector borne examples include Malaria, Dengue, and Yellow Fever. Person-to-person spread examples include Meningitis, TB, and Ebola. Food or water borne examples includes Typhoid, Cholera, and Salmonella.

Term	Definition
<b>Incident investigation Level</b>	Incident investigation level is to be identified with relation to real and/or potential hurt levels, comparing it to the hurt Level Matrix
<b>Level A</b>	Incidents with a potential hurt level of 0 or 1. Such incidents require a lower level of investigation using form A.
<b>Level B</b>	Incidents with a potential hurt level of 2 to 5. Incidents requiring a more detailed investigation using form B
<b>Lessons Learnt Observation</b>	<p>A Lesson Learnt Observation is an investigation, to establish information on unintended or unwanted events, to:</p> <ul style="list-style-type: none"> <li>• record what happened,</li> <li>• establish what was learnt,</li> <li>• identify positives and,</li> <li>• action(s) taken to prevent a reoccurrence.</li> </ul> <p>Lesson Learnt Observation are not classified as recordable incidents, but the lessons shall be actively considered by the workforce in future actions and behaviors.</p>
<b>Loss Time Incident Rate (LTIR)</b>	Loss Time Incident Rate (LTIR) - $(\text{Number of Loss Time Incidents} \times 200,000) / \text{Number of Work Hours}$
<b>Total Recordable Incident Rate (TRIR)</b>	Total Recordable Incident Rate (TRIR) - $(\text{Number of Recordable Incidents} \times 200,000) / \text{Number of Work Hours}$

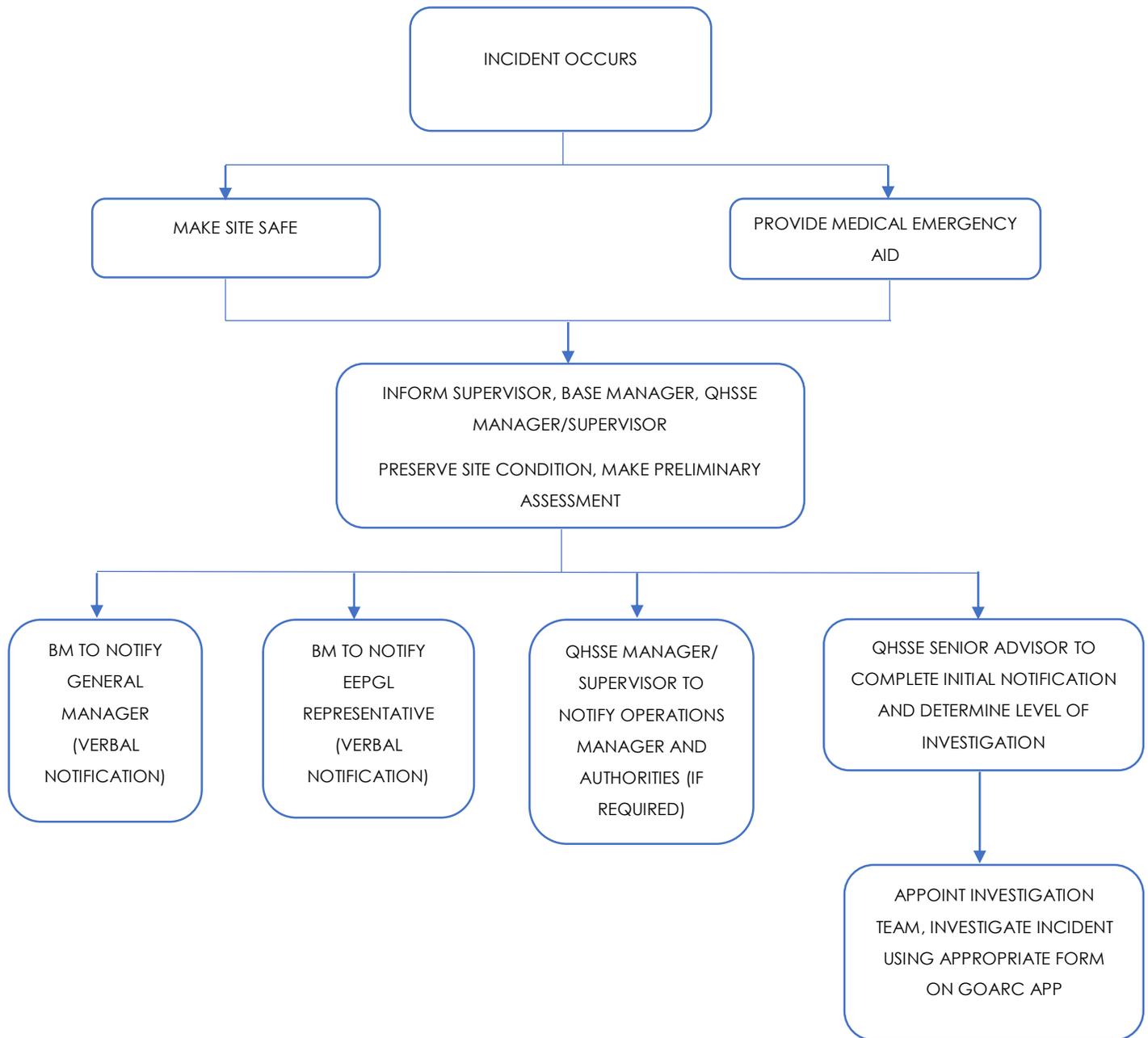
Term	Definition
<b>Actual Hurt Rate (AHR)</b>	Actual Hurt Rate (AHIR) - (Number of Actual Hurts x 200,000)/Number of Work Hours
<b>GOARC</b>	An industrial safety app designed for use by company workers, operators and subcontractors to easily and effectively manage Health, Safety and Environmental systems in real time, conduct incident investigations and to record safety reports identifying unsafe acts and unsafe conditions in their workplace. It also includes positive feedback and suggestions.

### 3 PROCEDURE

#### Notification

- Take appropriate action to make the people and the area safe, and prevent escalation of the situation;
- Initiate the site Emergency Response Plan if required;
- Facilitate the provision of any medical treatment required;
- Ensure preservation of the incident scene and implement actions to prevent escalation and recurrence of further incidents;
- Make arrangements to photograph/video the scene as soon as possible;
- Ensure perishable evidence is preserved;
- Identify witnesses to the event and retain these personnel on site if possible, or take preliminary statements;
- Conduct preliminary assessment of the incident;
- Document emergency response actions;
- With cause testing conducted for drugs & alcohol where deemed appropriate following an incident;
- Report in line with regulatory/GYSBI requirements.

On site, the initial notification will be done verbally (immediately after occurrence). The notification process is summarized below:



The Base Manager and QHSSE Manager/Supervisor will evaluate the situation and take appropriate action to protect personnel, the environment and the asset. The QHSSE Manager/Supervisor shall also be responsible for assessing the event and submitting the Initial Incident Notification Form not later than 24 hours from the incident. The initial notification will be generated using the GOARC App, exported as a PDF, then sent via email.

In the case of incidents which directly influence EEPGL Operations, or one of their suppliers, the initial notification will be sent by the QHSSE Manager/Supervisor to the distribution list below:

1. General Manager
2. Operations Manager
3. Base Manager
4. Yard Coordinators
5. Security Manager
6. HR Manager
7. QHSSE Team
8. Relevant Head of Department
9. EEPGL Shorebase Logistics Superintendent
10. EEPGL Logistics SSHE Specialist

In the case of incidents which are solely and undeniably related to GYSBI, the incident notification and investigation report shall be distributed internally only.

## **Reporting To Enforcing Authority**

In accordance with Occupational Safety and Health Act 1997 (Laws of Guyana), any accident arising out of and in the course of the employment of any worker occurs and:

- (a) Causes loss of life to such worker; or

- (b) Disables such worker, for more than one day, from earning full wages at the work at which he was employed at the time of such accident,

Written notice of the accident in the form and accompanied by the particulars set out in the Fifth Schedule, shall forthwith in the case of paragraph (a) and within **four days** in the case of paragraph (b), be sent by the employer to the Authority and the committee, safety and health representative or trade union, if any.

**Reporting to the authorities shall be guided by the Occupational Safety and Health Act Cap 69 – Notification of Accidents.**

Written notice of the accident shall be sent to the Chief Labor Officer, Lot 82 Brickdam, Georgetown, Guyana. Notice will be sent by the HR Manager to the enforcing authority, using the forms below:

**NOTICE OF ACCIDENT**

Accident Register No.....

1. Name of employer .....

2. Address of place where accident happened

.....  
.....

3. Nature of occupation† .....

4. Branch or department and exact place where the accident happened .....

5. Injured, person’s surname .....

Other names .....

Address .....

.....

6. (a) Sex.....

(b) Age (last birthday) .....

(c) Occupation of injured person  
.....

7. Date and time of accident .....

8. (a) Cause or nature or the accident  
.....

(b) If caused by machinery—

(i) give name of the machine and part causing  
accident.....

(ii) state whether it was worked by mechanical  
power at the time .....

(c) State exactly what injured person was doing at the  
time .....

9. Nature and extent of injuries (e.g. fatal, loss of finger,  
fracture of leg, scalp, scratch followed by sepsis)  
.....

10. (a) State whether the accident was fatal or not  
.....

(b) If the accident was not fatal, state the estimated  
period that the injured person will be unable to earn full  
wages at the work at which he was employed at the time of  
the accident .....

11. Has the accident been entered in the Register?  
.....

Date: .....

Signature of Employer or  
Agent  
.....

**SECOND SCHEDULE**

**NOTICE OF CESSATION OF DISABILITY**

s. 69(3)

(To be submitted when disability ceases)

Accident Register No. ....

Name of employer .....

Address of place of employment .....

Injured person’s surname.....

Other names .....

Date of accident.....

Date when disability ceased .....

Actual number of days of disability .....

Amount of compensation paid .....

Signature of Employer or Agent  
.....

"A register of all accidents to which this section applies shall be kept by the employer in the form prescribed by regulations made under this Act."

GYSBI Accident Register shall be managed by the QHSSE department with oversight from HR Department.

THIRD SCHEDULE

NOTICE OF OCCUPATIONAL DISEASE

- Works
- 1 Name of employer.....
  - 2. Address of place of employment .....
  - 3. Address of office .....
  - (if work on the place of employment is only temporary).
  - 4. Nature of industry, occupation, or business

s. 70(3)

.....

5. Nature of occupational disease.....

6. (a) Surname .....

(b) Other names .....

- Person affected
- 7. Address (permanent) .....
  - 8. Temporary address (if any)
  - 9. Sex, and age last birthday. ....

10. Precise occupation .....

(avoid (the term "labourer" where possible).

Date: .....

Signature of Employer or Agent

.....

## Investigation

A thorough investigation of all accidents, incidents and near misses is vital for the identification of the immediate and underlying cause(s), to enable effective control measures to be developed. It is also important to assess the potential consequences of all accidents/incidents to establish the urgency of response and level of investigation required, and to prioritize corrective actions and the implementation of control measures. The level of investigation should be linked not only to the “Actual Hurt Levels”, but also to the “Potential Hurt Levels” of the event i.e., what might have happened “realistically” and what actually happened. The “Actual Hurt Levels”, the “Potential Hurt Levels” and the level of investigation should be established using the Hurt Matrix (refer to Appendix A – Hurt Level Matrix).

The QHSSE Manager will establish a preliminary Investigation Level using the Hurt Matrix to determine which level of investigation should be taken in relation to either Form A, Form B or Lessons Learnt Observation (LLO) based on the initial findings.

The final level of investigation (A, B or LLO) will be established taking into consideration the worst case identified between the Actual Hurt Levels and Potential Hurt Levels and the Investigation Team will be identified accordingly.

The appointed Investigation Team shall carry out a complete and detailed investigation using the GOARC App.

Level A Investigations – Complete Investigation form A

Level B Investigations – Complete Investigation form B

Lessons Learnt - Near Miss/Observation

*Note:* Recordable Incidents as per exhibit G: Includes work-related injuries or illnesses involving one or more of the following: Death, Day(s) away from work,

Restricted work or transfer to another job, medical treatment beyond First Aid, Loss of consciousness, a significant diagnosed injury, illness or a Near Misses with a PHL of 3 or more (refer to Appendix A – Hurt Level Matrix).

Events that do not fall into this bracket are none recordable but will still be investigated.

## Property & Asset Damage

All asset damage/property incidents shall be reported to the QHSSE department. The QHSSE Manager/Supervisor shall initiate standard investigation procedure if:

1. The damaged asset/property is owned or controlled by a third party (e.g., GYSBI damage vessel property or asset, GYSBI damage tenant property etc.) and the damage costs more than USD 5,000 (five thousand USA Dollars) to repair.
2. The damaged asset/property is owned by GYSBI, and the damage costs more than USD 5,000 (five thousand USA Dollars) to repair.
3. The damage resulted in downtime i.e., client deducts payment for equipment
4. The potential outcome could have resulted in personal injury.

All other asset/property damage incidents will be recorded using LLO and the GOARC Safety Report feature with appropriate remedial action. Supporting multimedia (pictures, etc..) should be included in the GOARC submission.

## Investigation for Events Involving a Contractor

GYSBI will issue an initial notification report for GYSBI contractor incidents which occur on GYSBI controlled sites. The Contractor must, within 5 days, complete their own investigation and provide a copy of the report to GYSBI, along with a plan to close out relevant improvement actions in a timely manner. For all High Potential Events, investigations must follow the GYSBI methodology or equivalent, as a minimum. The Contractor must assign a competent person as an investigation leader. On some occasions it may be necessary for GYSBI to carry out an independent investigation, however this will be determined on a case-by-case basis by the QHSSE Manager.

Contractor employee incidents will be recorded independently of GYSBI employee incidents and will not impact GYSBI Operations incident statistics.

## Reporting

The investigation will be carried out and documented by the investigation team using the GOARC App. The investigation report will be reviewed and approved by the QHSSE Manager/Supervisor. The following principles for the preparation of an Incident Investigation Report shall be adhered to:

- the report should be factual, concise and conclusive;
- unsubstantiated speculation should be avoided at all times;
- interpretations of findings should be based only on the facts as identified in the investigation;
- where events and conditions are listed in the report but are not essential pre-conditions for occurrence of the incident, these should be clearly identified;
- an assessment of underlying root causes should be made, based on an analysis of the evidence;
- where events or conditions are listed, that are not critical for the incident to have occurred, this should be clearly indicated;

- the report should be readable as a stand-alone document. References to other documents not in the public domain, i.e., not readily open to inspection by others, should be avoided;
- all previous drafts of the report should be destroyed;
- an audit trail of the documents relevant to the incident and the report should be established;
- the QHSSE Senior Advisor should ensure that all documentation is collected during the investigation and that the report is adequately prepared;
- final copy of the report may include a confidentiality statement.

All reports will be available on the GOARC CMS. Reports shall be kept available for at least three years.

Notification and reporting of spills shall be done in accordance with the below table:

**Table 1: Spill Reporting Criteria**

Spill Type	Reporting Criteria	
	Reportable	Non-Reportable (No investigation required)
Oil <sup>(1)</sup> spills to water	<ul style="list-style-type: none"> <li>• Spills directly to water or reaching surface water (e.g., creeks, streams, rivers, lakes, ponds, or ocean)</li> <li>• Spills from loading/unloading operations reported consistent with the cargo custody or responsibility</li> </ul>	<ul style="list-style-type: none"> <li>• Off-premises, non-marine transportation spills where the product is in the custody of a third-party carrier</li> </ul>
Oil spills to land	<ul style="list-style-type: none"> <li>• Spills that make contact with the soil</li> </ul>	

Spill Type	Reporting Criteria	
	Reportable	Non-Reportable (No investigation required)
	<ul style="list-style-type: none"> <li>Spills or leaks from tank bottoms and underground storage tanks</li> <li>The total volume, in barrels or litres, of oil spilled to the land, regardless of the amount contained or recovered</li> </ul>	<ul style="list-style-type: none"> <li>Spills inside lined containment or collection areas where there is no contact with soil</li> <li>Off-premises transportation spills where the product is in the custody of a third-party carrier</li> </ul>
Chemical spills to water	<ul style="list-style-type: none"> <li>Chemical spills directly to water or reaching surface water (e.g., creeks, streams, rivers, lakes, ponds, or ocean)</li> <li>Spills of all non-petroleum derived chemicals (e.g., methanol, sulphuric acid, caustic, stimulation acid, etc.)</li> </ul>	<ul style="list-style-type: none"> <li>Spills of insoluble solids to water that have no environmental impact (e.g., plastic pellets)</li> <li>Off-premises, non-marine transportation spills where the product is in the custody of a third-party carrier</li> </ul>
Chemical spills to land	<ul style="list-style-type: none"> <li>Spills that make contact with the soil</li> <li>Spills of all non-petroleum derived chemicals (e.g., methanol, sulphuric acid, caustic, stimulation acid, etc.)</li> <li>Spills or leaks from tank bottoms and underground storage tanks</li> <li>Total mass, in kilograms, of chemical spilled to the land, regardless of the mass contained or recovered</li> </ul>	<ul style="list-style-type: none"> <li>Spills inside lined containment or collection areas where there is no contact with soil</li> <li>Spills of insoluble solids to land that have no environmental impact (e.g., plastic pellets)</li> <li>Off-premises transportation spills where the product is in the custody of a third-party carrier</li> </ul>

## Notes:

- Oil includes all petroleum-derived liquids, such as crude oil, condensate, gasoline, diesel fuel, petroleum derived solvents (e.g., toluene, xylene, etc.), lubricating or hydraulic oil, asphalt, or any material defined as oil by a regulatory agency.

## Follow-Up

The aim of the procedure is to prevent the events from recurring. All Incident Reports will be sent with the suggested remedial action(s).

After taking initial/immediate action(s), the remedial action is verified with the on-site management.

## Corrective Actions Management

Corrective actions generated by the accident/incident/near miss investigation will be assigned to the responsible party/parties as action items through GOARC. The party/parties responsible will ensure the action is done and submit evidence for closure. When the action is fulfilled within the stipulated timeline, the status will be changed to completed on GOARC. The responsibility for implementing corrective actions rests with the base management. Weekly operations meetings shall be held to verify such actions have been implemented. The meetings shall be organized by the Operations Manager and the following persons should make their best efforts to attend:

- General Manager
- Operations Manager
- QHSSE Manager
- Base Manager
- Fleet Manager
- HR Manager
- Maintenance Manager
- Construction Manager
- Procurement Manager
- Site Lifting Coordinator
- Security Coordinator

- Base Coordinator
- Training Coordinator

The QHSSE Team shall verify closure of incidents by collecting relevant evidence. Once the evidence has been verified, it will be updated on GOARC. The QHSSE team and departmental heads will monitor the effectiveness of remedial actions.

## Communication and Consultation

The incident investigation will be generated using the GOARC App, exported, distributed via email and posted in conspicuous places around the GYSBI bases. Details of the lessons learnt from significant incidents in the form of Safety Bulletins/ Alerts shall be distributed by the QHSSE Manager. Safety Bulletins/Alerts will be posted on the QHSSE notice boards. See Appendix B for template of LLO.

## Daily and Monthly Reporting of QHSSE Statistics

[Refer to QH-PR-010 – QHSSE Reporting Procedure](#)

## 4 APPENDIX

## Appendix A - Hurt Level Matrix

Serious Injury or Fatality (SIF)	Hurt Level	Severity	Duration	AHL-PHL Consequence: <u>Injury</u> Examples <i>(List notates a typical level for injury type)</i>	AHL-PHL Consequence: <u>Illness</u> Examples <i>(List notates a typical level for illness type)</i>
 <p>SIF EVENT</p>	5	Death	Forever	<ul style="list-style-type: none"> <li>Multiple Fatalities (applicable for PHL Only)</li> </ul>	<ul style="list-style-type: none"> <li>Multiple Fatalities (applicable for PHL Only)</li> </ul>
	4	Death	Forever	<ul style="list-style-type: none"> <li>Fatality</li> </ul>	<ul style="list-style-type: none"> <li>Fatality</li> </ul>
	3	Life-altering and severe impact to daily activities	Long-term / Years / Forever	<ul style="list-style-type: none"> <li>Debilitating laceration / sprain / strain</li> <li>Severe compound bone fracture</li> <li>Debilitating partial and full thickness burns</li> <li>Amputation with complete loss of any bone</li> <li>Severe disfigurement</li> <li>Loss of organ function</li> <li>Severe vision loss / blindness in an eye(s)</li> </ul>	<ul style="list-style-type: none"> <li>Severe to complete noise induced hearing loss in an ear(s)</li> <li>Debilitating Serious Illness Event (SIE) or non-fatal Ebola</li> <li>Most non-fatal Cancer</li> <li>Some Mental Illness (e.g. PTSD)</li> <li>Severe Frostbite resulting in amputation</li> <li>Toxic or irreversible neuropathy</li> <li>Pneumoconiosis with debilitating restrictive lung disease (e.g. Silicosis)</li> <li>Debilitating Musculoskeletal Disorder (MSD)</li> </ul>
 <p>NON SIF EVENT</p> <p>Endorsed 09Nov15</p>	2	Moderate impact to daily activities	Week(s) to Months to Recover	<ul style="list-style-type: none"> <li>Significant laceration, penetration</li> <li>Significant strain or sprain</li> <li>Bone fracture without long-term issues</li> <li>Cracked or loss of tooth (teeth)</li> <li>Joint dislocation</li> <li>Deep partial or full thickness burns</li> <li>Distal phalanx amputation (partial bone exci, thumb)</li> <li>Minor-to-moderate vision loss in an eye(s)</li> </ul>	<ul style="list-style-type: none"> <li>Heat Stroke issues; e.g. seizures, core temp &gt;105°F</li> <li>Severe asthma or irritant / allergic contact dermatitis / sensitization</li> <li>Moderate to moderately-severe noise induced hearing loss</li> <li>Non-debilitating TB, Malaria, Dengue // Mental Illness</li> <li>Severe (Deep) Frostbite (Stage 3)</li> <li>Major infection post-injury or from illness</li> <li>Severe Metal Toxicity // Minor Skin Cancers</li> <li>Pneumoconiosis with moderate restrictive lung disease</li> <li>Moderate MSD; RSI requiring surgery or physical therapy</li> </ul>
	1	Minor impact to daily activities	Minutes-Hours-Days to Recover	<ul style="list-style-type: none"> <li>Minor laceration, penetration, scratch</li> <li>Minor strain, sprain, bruising, swelling</li> <li>Minor burns</li> <li>Slight-to-mild abrasion of corneal / UV Keratitis</li> <li>Minor chipping of tooth / enamel</li> <li>Minor fracture of distal phalanx (finger or toe)</li> <li>Subungual hematoma (blood under nail)</li> <li>Anaphylactic Reactions</li> </ul>	<ul style="list-style-type: none"> <li>Heat Exhaustion issues; e.g. confusion, fainting, vomiting</li> <li>Moderate asthma or irritant / allergic contact dermatitis / sensitization</li> <li>Slight-to-mild noise induced hearing loss</li> <li>Deep Vein Thrombosis (confirmed blood clot)</li> <li>Superficial Frostbite (Stage 2)</li> <li>Minor infection post-injury or from illness</li> <li>Metal Fume Fever</li> <li>Pneumoconiosis with minor restrictive lung disease</li> <li>Minor MSD; early RSI relieved via rest, treatment</li> </ul>
	0	No significant impact to daily activities	No Physical Body Damage; Lessons Learned for Preventing Future Incidents	<ul style="list-style-type: none"> <li>Slight skin abrasion/scratch with no bleeding</li> <li>First-degree skin burns; no blistering</li> <li>Foreign object in eye but no corneal abrasion</li> <li>Slip / Trip / Fall without bruising or swelling</li> <li>General muscle soreness, tweaks, body aches</li> <li>Temporary Discomfort Event (body aches, etc.)</li> <li>Mild shock from static electricity</li> <li>Mild Oxygen Hypoxia / Deficiency</li> </ul>	<ul style="list-style-type: none"> <li>Mild Heat-related issues; e.g. cramps, heat rash, headache</li> <li>Mild asthma or irritant / allergic contact dermatitis</li> <li>Frostnip (Stage 1 Frostbite)</li> <li>Altitude / Motion Sickness</li> <li>Mild-to-moderate food poisoning symptoms</li> <li>Needle stick syncope (fainting)</li> <li>Pre-RSI discomfort relieved via ergonomics resolution</li> </ul> <p>*Ergo AHL/PHL is stewarded on a separate basis from other illnesses.</p>

## Appendix B – Lessons Learnt Observation (sample snapshot)

### MINOR ELECTRIC SHOCK WHILE EXITING OPERATIONS REST CONTAINER AT CMSY/BERTH 2 AREA.



#### WHAT HAPPENED?

- WHILE THE BERTH 2 AND CMSY TEAM MEMBERS WERE ASSEMBLED IN THE OPERATIONS REST CONTAINER THEY HEARD A LOUD NOISE AND OBSERVED THAT THERE WAS A LOSS OF CONTAINMENT FROM THE SCHLUMBERGER SILOS. THIS UNIDENTIFIED SUBSTANCE HAD CLOUDED THE AIR WHICH WAS LATER IDENTIFIED TO BE MICROBAR. THIS WAS REPORTED TO THE LOGISTICS SUPERVISOR, BASE COORDINATOR, AND BASE MANAGER IMMEDIATELY VIA RADIO. THE BASE MANAGER THEN INSTRUCTED ALL PERSONNEL TO CLEAR THE WHARF AND CMSY AREA.
- AS TWO PERSONS WERE ABOUT TO EXIT THE OPERATIONS REST CONTAINER THROUGH THE METAL DOOR, A TRIZLING SENSATION WAS FELT THROUGH THEIR HANDS AS THE DOOR WAS PUSHED OPEN.
- THIS WAS REPORTED TO THE QHSSE ADVISOR, AND THEY WERE THEN BROUGHT TO THE MEDICAL CENTRE BY THE MEDIC FOR A VITALS ASSESSMENT. IT WAS VERIFIED THAT NO INJURIES WERE CAUSED. PERSONNEL RETURNED TO WORK.
- THE ELECTRICIANS WERE CALLED IN TO CARRY OUT AN ELECTRICAL ANALYSIS OF THE OPERATIONS REST CONTAINER.

#### WHAT WAS LEARNT?

- WATER DISPENSER WAS GIVING A VERY LOW RESISTANCE READING ON THE MULTI-TESTER DEVICE TO GROUND FRAME DUE TO A FAULT IN THE SYSTEM. THIS CAUSED THE SYSTEM TO SHORT CIRCUIT, ALLOWING A BYPASS OF ELECTRICAL ENERGY TO FLOW FROM THE WATER DISPENSER (PLUGGED IN AT THE TIME) WHICH WAS CONDUCTED TO THE DOOR.
- THERE WAS WATER PRESENT ON THE FLOOR OF THE CONTAINER SURROUNDING THE WATER DISPENSER, FURTHER CONDUCTING THE FLOW OF ELECTRICITY.
- PERSONS REPLACING WATER BOTTLES ON THE DISPENSER WOULD CAUSE THE WATER TO FLOW ONTO THE DISPENSER HOUSING PENETRATING PARTS OVER TIME WITHIN THE SYSTEM, CREATING AN OPEN CIRCUIT.

#### POSITIVES

- IMMEDIATELY REPORTED, FOLLOWING THE APPROPRIATE CHAIN OF COMMAND.
- VITALS ASSESSMENT WAS CONDUCTED BY THE MEDIC.
- PERSONNEL ABLE TO RETURN TO WORK WITH NO IDENTIFIED INJURIES.
- ELECTRICIANS WERE CONTACTED TO CONDUCT AN ELECTRICAL ANALYSIS OF THE CONTAINER.
- WATER DISPENSER WAS QUARANTINED.

#### WHAT HAS BEEN DONE TO PREVENT REOCCURRENCE?

- GROUND FAULT CIRCUIT INTERRUPTER (GFCI) TO BE INSTALLED WHERE ALL WATER DISPENSERS ARE PLUGGED IN.
- COACHING TO BE CONDUCTED ON THE BENEFITS OF ADAPTING HOUSEKEEPING PRACTICES.

## REVISION SUMMARY

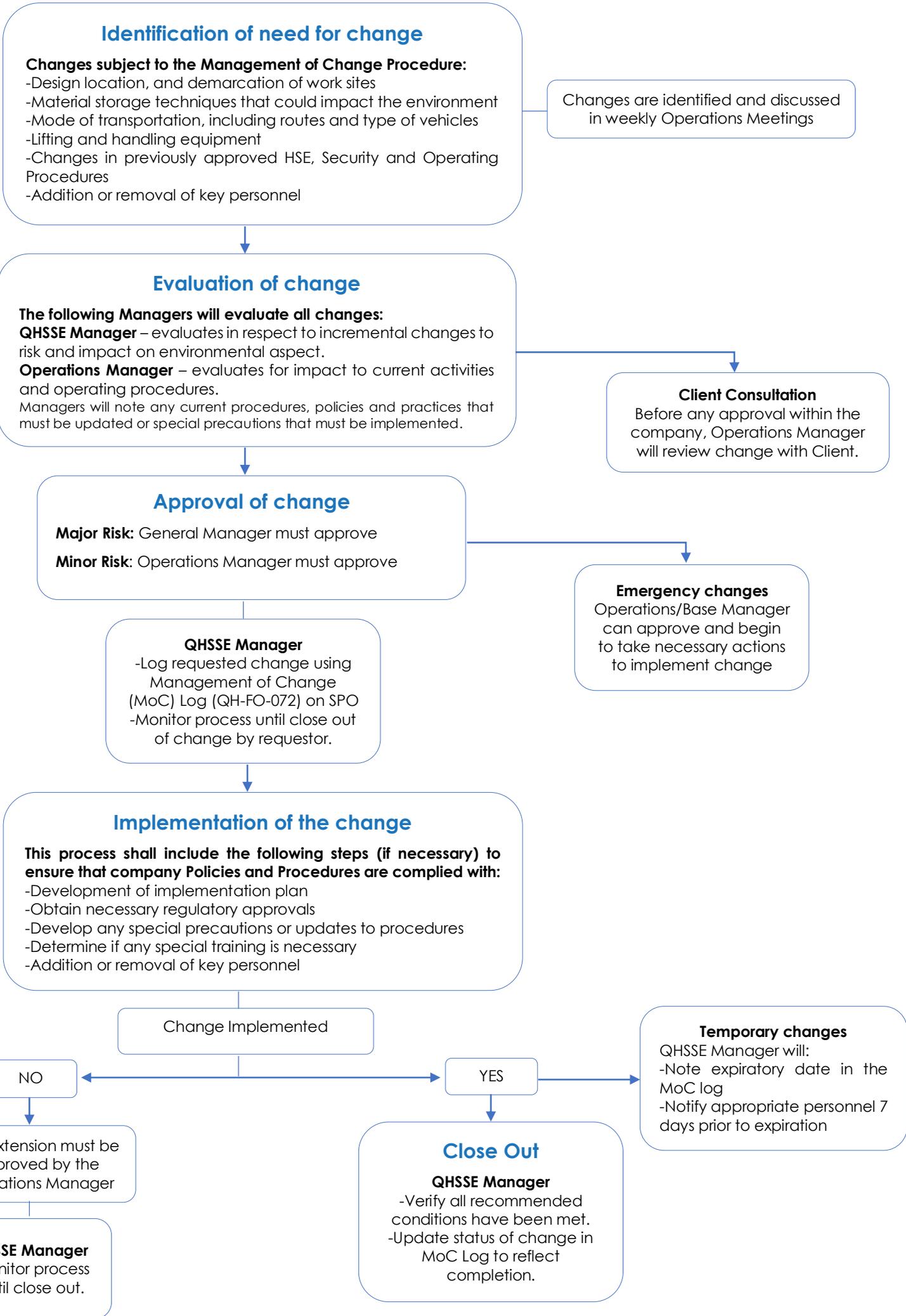
Revision	Date	Approved by	Summary of change
1	29 Nov 2019	-	Initial release of document
2	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format.
3	12 Oct 2020	Iain Martin QHSSE Manager	Final review of changes to Property & Asset Damage criteria.
4	23 Dec 2020		Reviewed definitions, notification process, follow up process Added Appendix
5	17 Aug 2021	Sean Hill	Updated document references with SPO links
6	17 Sep 2021	Kurt Busuttill	Updated to include Operations Manager and Removal of QHSSE Manager designation
7	3 March 2022	Andy Dowson	Changed the AHL-PHL Communication medium from the Initial Notification Form to Form A or Form B.
8	28 Apr 2022	Kurt Busuttill	Included Investigation for events involving a contractor
9	19 Sep 2022	Andy Dowson	Included Lessons Learnt Observations, Recordable and Non-Recordable Incidents (as per exhibit G) Updated Document Number
10	24 Oct 2022	Kurt Busuttill	Included the integration of GOARC App and sample snapshot of LLO

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<b>1</b>	<b><i>Management of Change Flowchart</i></b> .....	<b>2</b>
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	<b><i>Revision Summary</i></b> .....	<b>3</b>

**This flowchart shall be used by all Departments and updated by QHSSE Department**

# 1 MANAGEMENT OF CHANGE FLOWCHART



## 2 DOCUMENTS

[QH-FO-072 Management of Change Log](#)

### REVISION SUMMARY

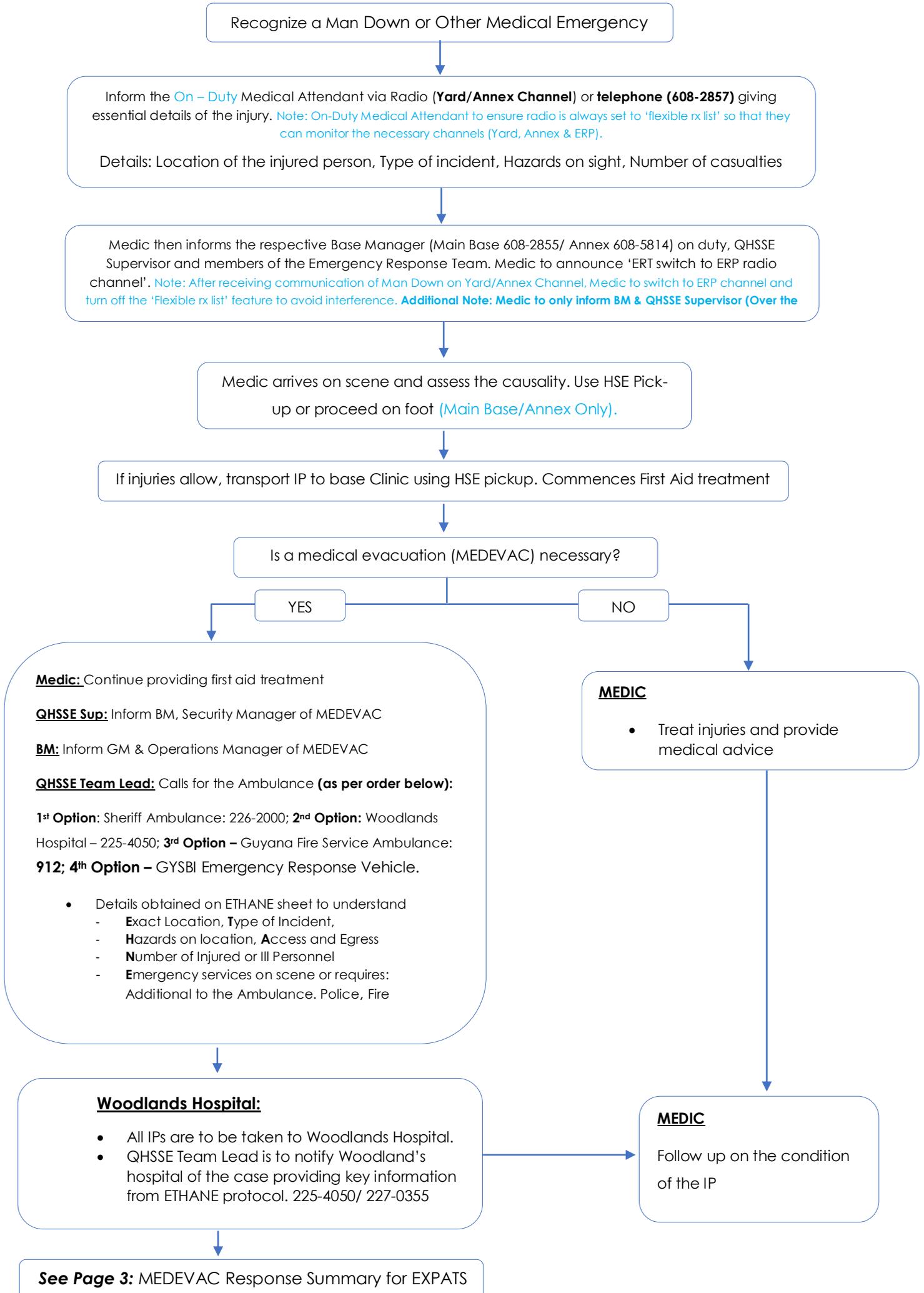
Revision	Date	Approved by	Summary of change
1	21 Nov 2018	-	Initial release of document
2	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
3	17 Sep 2021	Kurt Busuttil	Updated to include Operations Manager and removal of QHSSE Manager designation
<b>4</b>	25 Oct 2022	Kurt Busuttil	Inclusion of Flow chart to outline Management of Change Process Updated to reflect use of MoC log and operations meetings as medium to identify need for change. Addition of QHSSE Manager designation.

## CONTENTS

<b>1</b>	<b><i>Medical Emergency Response Flowchart</i></b> .....	<b>2</b>
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<b>2</b>	<b><i>Appendix 1: Release of Medical Information Form (ROMIF)</i></b> .....	<b>5</b>
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**This flowchart shall be used by all Departments and updated by QHSSE  
Department**

# 1 MEDICAL EMERGENCY RESPONSE FLOWCHART



## MEDEVAC Response Summary for EXPATS

### Medic – On Site-Response

Stabilize and provide initial treatment to the patient according to GYSBI protocols and assess further needs.

Contact international SOS Philadelphia Assistance Centre via the following contact numbers:

- **Primary (Philadelphia):** +1 215 354 2641
- **Secondary (London):** +44 20 8762 8008

Provide Project Membership Number: **Guyana Shore Base Inc./335OPA971991** and discuss the case with the coordinating doctor (CD).

Provide Patient particulars (Name, Nationality, Passport details, insurance details etc.) to the Assistance Centre.

Obtain Patient's consent for Internationals SOS to access patient medical records.

Forward the completed and signed Release of Medical Information Form (ROMIF), provided in Appendix I.



### In-Transit Care Facilities

Follow up the first phone call with verbal and written updates, including patient movement to the pre-agreed **In-Transit Care Facility**.

- **Woodlands Hospital** – Tel: + 592 227 0355 / +592 2262024 / +592 223 7023 / +592 231 7024  
Address: 110-111 Carmichael St. Georgetown, Guyana
- **St. Joseph's Mercy Hospital** – Tel: + 592 227 2075/ 72 / 73 / 74 / +592 223 5449 Hotline  
Address: 130-132 Parade St. Kingston, Georgetown, Guyana
- **Dr. Balwant Singh Hospital** – Tel: +592 227 1087 / +592 226 5783 / +592 226 4279  
Address: 314 East Street, Georgetown, Demerara-Mahaica, Guyana



### Medic – First Phase evacuation Summary

Make pre-identified local transport asset (Medics Vehicle) and/or local transport providers (Sheriff Medical Ambulance Service) under GYSBI's control available for the **First Phase Evacuation**.

Ensure International SOS is in possession of the latest information related to First Phase Evacuation plan.

Manage and implement the First Phase Evacuation plan.

Prepare Patient's travel necessities including passport, other travel documents, clothes, etc.

Escalate internally, as appropriate.

Inform patient's next of kin, as appropriate.

### Client contact Details – Authorizing Persons

AP1 Mark Clarkson – Senior Base Manager  
Tel: +592 608 2822  
Mobile: +592 608 2855  
Email: [gysbi.basemanager@gysbi.com](mailto:gysbi.basemanager@gysbi.com)

AP3 Kurt Busuttill – QHSSE Supervisor  
Tel: +592 608 2898  
Mobile: +592 608 2845  
Email: [gysbi.qhsse-supervisor@gysbi.com](mailto:gysbi.qhsse-supervisor@gysbi.com)

Site Contact Details  
Tel: +592 227 2381

AP2 Steve Clark – Senior Base Manager  
Tel: +592 633 3099  
Mobile: +592 608 2855  
Email: [gysbi.basemanager@gysbi.com](mailto:gysbi.basemanager@gysbi.com)

AP4 Andrew Dowson – QHSSE Supervisor  
Tel: +592 608 2643  
Mobile: +592 608 2845  
Email: [gysbi.qhsse-supervisor@gysbi.com](mailto:gysbi.qhsse-supervisor@gysbi.com)

Medical Staffing: Medic  
Tel: +592 608 2857  
Email: [gysbi.medic@gysbi.com](mailto:gysbi.medic@gysbi.com)

## Actions and Responsible Personnel

Person	Action
All personnel	<ul style="list-style-type: none"> <li>• Report all injuries and medical emergencies to the Medic on 608-2857, Radio Yard Channel</li> </ul>
Medic	<ul style="list-style-type: none"> <li>• Inform BM, QHSSE Supervisor</li> <li>• Inform ERT to proceed to site of the incident</li> <li>• Switch Radio channel to ERP</li> <li>• Proceed to the site of the incident and provide First Aid</li> <li>• Follow up on IP</li> </ul>
Emergency Response Team	<ul style="list-style-type: none"> <li>• Switch to ERP Radio Channel</li> <li>• Proceed to the site of the incident</li> <li>• Follow instructions of Medic</li> <li>• Annex: ERT Lead Provide initial first aid until Medic Arrives</li> </ul>
Driver	<ul style="list-style-type: none"> <li>• Collect Medic &amp; drive HSE pick up to the Site of the incident</li> </ul>
QHSSE Supervisor	<ul style="list-style-type: none"> <li>• Proceed to the site of the incident &amp; provide support</li> <li>• If necessary, inform BM &amp; Security of MEDEVAC</li> </ul>
Base Manager	<ul style="list-style-type: none"> <li>• Proceed to the site of the incident &amp; provide support</li> <li>• If necessary, inform GM &amp; Operations Manager of MEDEVAC</li> </ul>
QHSSE Team Lead	<ul style="list-style-type: none"> <li>• Proceed to the site of the incident</li> <li>• If necessary, contact Sheriff Ambulance Services. If unsuccessful, Woodlands Hospital Ambulance is to be called. If that proves futile, Guyana Fire Service Ambulance is to be called.</li> </ul>
All Other Personnel	<ul style="list-style-type: none"> <li>• Continue normal operations and follow instructions of BM</li> </ul>
Security	<ul style="list-style-type: none"> <li>• Stop the flow of traffic and clear Traffic routes for the ambulance</li> </ul>

## 2 APPENDIX 1: RELEASE OF MEDICAL INFORMATION FORM (ROMIF)

International SOS Philadelphia  
 Tel: +1 215 354 2641  
 Fax: +1 215 354 2338  
 E-mail: [Philadelphia@internationalsos.com](mailto:Philadelphia@internationalsos.com)

**AC/CLINIC**

### AUTHORISATION FOR RELEASE OF MEDICAL INFORMATION

PATIENT INFORMATION					
Print Name:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">First</td> <td style="width: 50%; text-align: center;">Last (surname)</td> </tr> </table>	First	Last (surname)		
First	Last (surname)				
Birth Date:	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 60%; text-align: center;">Day/Month/Year</td> <td style="width: 40%; text-align: center;">Case #:</td> </tr> </table>	Day/Month/Year	Case #:		
Day/Month/Year	Case #:				
TREATING PHYSICIAN IN COUNTRY OF ORIGIN: <i>(please fill in name, address, e-mail address and telephone number)</i>	TREATING PHYSICIAN IN CURRENT LOCATION: <i>(please fill in name, address, e-mail address and telephone number)</i>				
PURPOSE					
This authorisation is to authorise the collection, release, use, storage, processing, amendment and transferring of medical, travel and other personal data for the purpose(s) of providing assistance to me, including arranging medical treatment, assessing and paying and/or obtaining payment for that treatment and assistance; running International SOS' normal business and operations, and to comply with legal obligations and respond to emergencies such as those relating to public health ("Data Collection Purposes").					
AUTHORISATION OF DISCLOSURE					
I hereby authorise any organisation or person who has or may have information concerning me or my health to furnish International SOS Philadelphia, including the International SOS Group of Companies and/or their respective representatives and/or agents ("International SOS"), who are acting on behalf of Guyana Shore Base Inc., with:					
(a) all relevant medical information pertaining to my medical history (including any condition for which medical advice or treatment was sought, any form of consultation, investigation, prescription or treatment), it being understood that such disclosure must be compliant with applicable local rules, if any (which may where applicable restrict release to medical professionals only);					
(b) all relevant information pertaining to my employment history;					
(c) a medical certificate completed by any health provider which International SOS may require; and					
(d) travel information including all itineraries, ticket information and proof of payment documentation. (collectively known as "Personal Data")					
I understand that information related to sexually transmitted diseases, acquired immunodeficiency syndrome (AIDS), human immunodeficiency virus (HIV), genetic test results, behavioral or mental health services, and treatment for alcohol and drug abuse, shall not be disclosed unless: (i) required by law or (ii) I specifically authorise International SOS to make such disclosure by initialing here. <div style="float: right; margin-top: 5px;"> <input style="width: 30px; height: 20px; border: 1px solid black;" type="checkbox"/> </div>					
CONSENT TO USE MEDICAL INFORMATION					
I consent to International SOS:					
(a) Collecting by using telephone recordings, electronic, paper or other means, processing and using my Personal Data for the Data Collection Purposes;					
(b) Subject to local legal requirements (which may where applicable prevent disclosure to non-medical personnel and/or restrict release to medical professionals only) disclosing my Personal Data to :					
(i) entities of Guyana Shore Base Inc., and/or of other International SOS entities or their respective representatives and/or agents, my personal representatives or family member involved in my care;					
(ii) the insurer or other entities which will be directly or indirectly responsible for or involved in payment of relevant medical and other costs,					
(c) Transferring my Personal Data outside Guyana, to and from my doctors in my country of origin, and to and from the doctors where I am currently being treated and to other territories that may not have the same level of personal data protection.					
<b>AGREED AND ACCEPTED</b>					

<p><b>I understand and agree that :</b></p> <p>(a) A copy of International SOS' Customer Personal Data Privacy Statement including information about my rights and instructions on how to fill a complaint and access, correct, restrict access to or delete my Personal Data may be obtained by writing to: Director of Assistance, International SOS or may be accessed through the International SOS website at <a href="http://www.internationalsos.com">www.internationalsos.com</a></p> <p>(b) I have the right to refuse to sign this authorisation, and that if I do refuse, International SOS may be prevented from or limited in providing the services described above and may not be able to assist me.</p> <p>(c) This authorisation expires one (1) year from the date of signature below.</p> <p>(d) If I sign this authorisation, I will have the right to withdraw/ revoke it at any time, except to the extent that action has been taken prior to receipt of the withdrawal/ revocation. If I wish to withdraw/ revoke this authorisation, I can write to the Privacy Officer at <a href="mailto:dpo@internationalsos.com">dpo@internationalsos.com</a>.</p> <p>(e) This authorisation and my Personal Data will be kept no longer than is desirable for the purposes they were collected and, subject to applicable local law, will be destroyed in accordance with the periods set out in International SOS' policy on data retention (published at <a href="https://www.internationalsos.com/privacy">https://www.internationalsos.com/privacy</a>).</p> <p>(f) A copy, including photostat, electronic or fax copy of this authorisation, shall be considered as effective and valid as the original and I have specifically authorised its use as such.</p>			
<p>_____ Signature Patient/Legal Representative/ Guardian</p>		<p>of</p>	<p>_____ Printed Name</p>
<p>_____ Date</p>		<p>Relationship</p>	<p>with Patient</p>

## REVISION SUMMARY

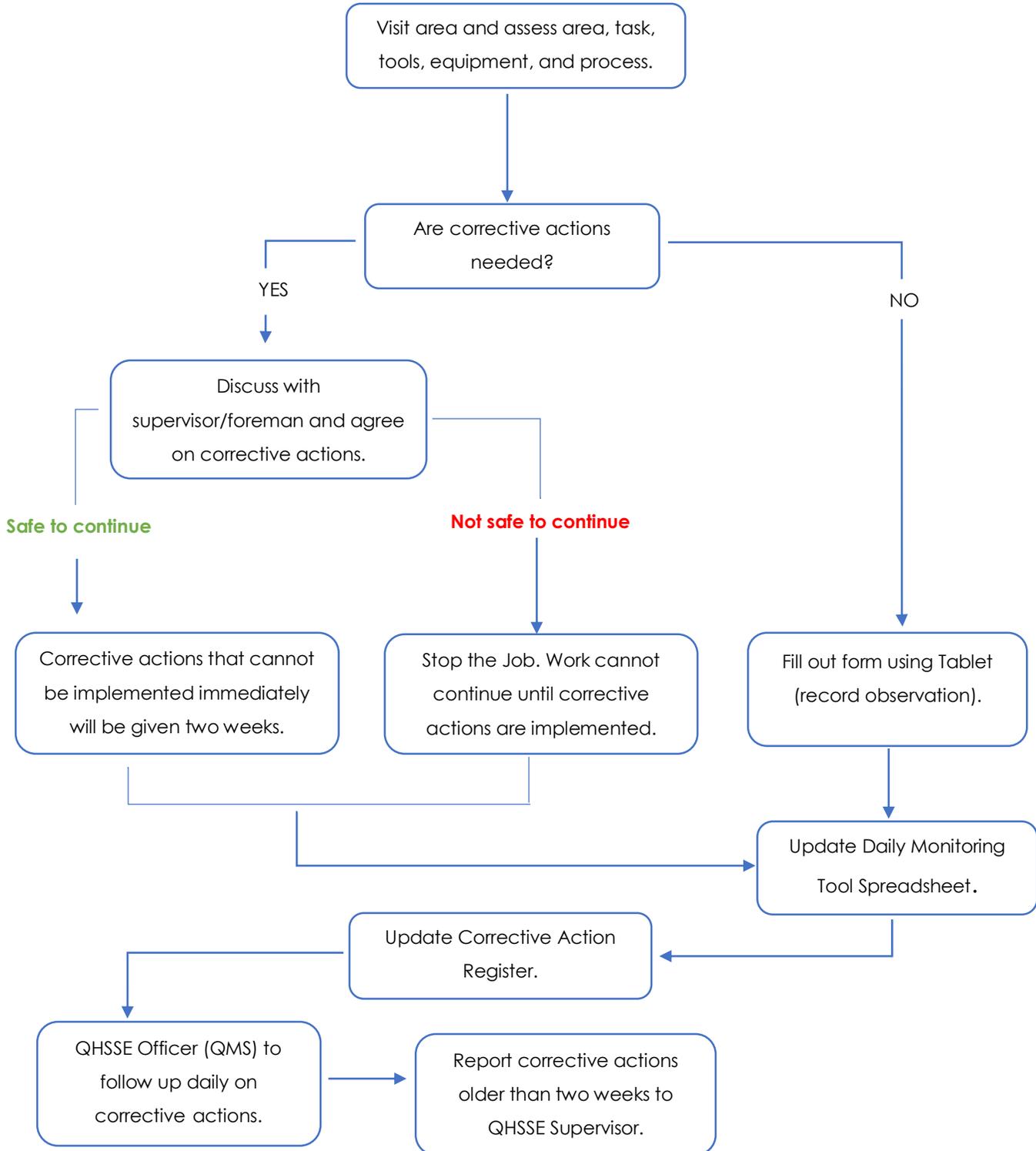
Revision	Date	Approved by	Summary of change
1	8 May 2020	Michael James Sean Hill	Initial release of document
2	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
3	03 Jul 2021	Iain Martin Sean Hill	Modified flowchart to replace ISOS with Sheriff Medical Center.
4	17 Sep 2021	Kurt Busuttil	Updated to include Operations Manager and Removal of QHSSE Manager designation.
5	21 Mar 2022	Andrew Dowson	Inclusion of MEDEVAC Response Summary EXPATS and Release of Medical Information Form
6	24 Oct 2022	Kurt Busuttil	Modified flowchart to replace Sheriff Medical Center with Woodlands Hospital. Replace Kevin Black with Mark Clarkson as an Authorizing Personnel. Updated Document Number

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	<b><i>Revision Summary</i></b> .....	<b>3</b>

This flowchart is used and updated by QHSSE Department

# 1 MONITORING TOOL FLOWCHART



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## REVISION SUMMARY

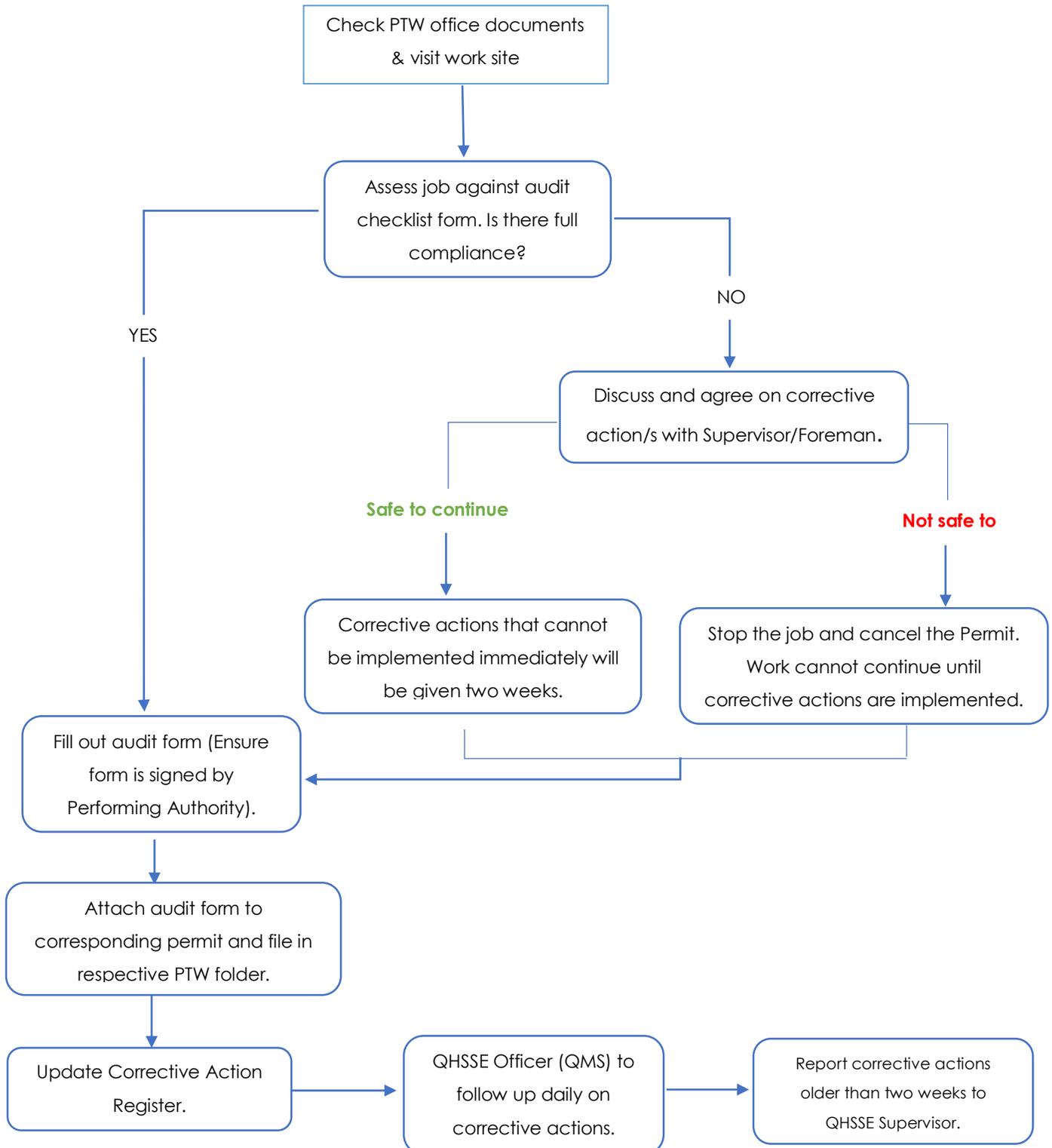
Revision	Date	Approved by	Summary of change
1	17 April 2020	Michael James Sean Hill	Initial release of document
2	13 August 2020	Michael James Sean Hill	Document layout changed to new company format
<b>3</b>	07 Jul 2022	Kurt Busuttill	Updated Document Number

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**This flowchart shall be used and updated by QHSSE Department**

# 1 PTW AUDIT FLOWCHART



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## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	17 April 2020	Michael James Sean Hill	Initial release of document
2	13 August 2020	Michael James Sean Hill	Document changed to new company format

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**This procedure shall be used and updated by QHSSE Department**

## 1 INTRODUCTION

This procedure defines the Control of Work Permit to Work element process and requirements in detail, particularly in relation to the requirements of GYSBI Control of Work Standard, Site Operating Procedures and Projects QHSSE Procedures.

## 2 POLICY DETAILS

### Scope

The scope of this procedure is applicable to all operations and construction related activity undertaken by: GYSBI, EEPGL & Subcontractors and Vendors at the Guyana Shore Base Inc locations (Shore Base, Industrial Estate and all GYSBI-related projects).

### Responsibility

#### Issuing Authority

The Base Manager (Operations Issuing Authority) and Construction Project Manager (Construction Issuing Authority) or their delegated issuing authority are responsible for issuing PTW in their area of responsibility. They shall have a complete overview of all planned and ongoing activities in their area, to manage the risks, including any potentially conflicting simultaneous activities. They shall have detailed knowledge of the PTW System process.

The Issuing Authority is responsible for:

- Verifying that the PTW is filled correctly and that relevant certificates are in place.
- Authorizing all PTW;

- 
- Ensuring the nature of the work and hazards are fully understood by involved parties;
  - To ensure in consultation with the performing authority that all safety precautions and any isolations required are clearly detailed on the Permit and associated certificates.
  - Request to Mechanic to verify that Mechanical Isolations are in place.
  - Request to Electrician to verify that Electrical Isolations are in place.
  - Ensuring worksite is safely prepared and all specified precautions on PTW Form have been taken by visiting worksite/workplace at the beginning.
  - To ensure worksite is examined to confirm safe & acceptable conditions on i) Work Suspension, ii) Prior to start work, iii) on returning to normal operation.
  - Ensuring that all permits are closed at the end of the shift;
  - To ensure precautions and isolations have been withdrawn and the system returned to normal operation prior to closing or cancelling a work permit.
  - To ensure that work permit is signed off by all authorities and equipment returned to operation on completion work.
  - When required, ensuring gas tests are undertaken by a competent person;
  - Verifying that every mechanical and electrical isolation associated to single PTW has been removed before cancellation of any isolation;
  - Ensuring that all relevant documentation is attached to the PTW;
  - All other works which would create a hazard, if undertaken at the same time, are suspended.
  - Will identify critical works and will ensure continuous supervision of critical works including follow-up by Permit Issuer on regular intervals.

### Performing Authority (PA)

The Performing Authority (PA) is the responsible person for the activity being carried out under the permit. The PA's main duties are:

- 
- Creating the Permit and identifying the hazards and control measures for the task being planned.
  - Participating in any Risk Assessment for the planned activity where required.
  - Ensuring that where other persons are involved in the task, they fully understand the scope of the work and the hazards and controls for the job by holding a pre-job safety toolbox meeting. This includes ensuring all the work parties sign off the worksite hard copy of the permit.
  - Ensuring supplementary controls are applied, including isolations and gas testing.
  - Ensuring that only work covered within the scope of the permit takes place.
  - Ensuring that lessons learned from the job are captured.
  - Ensuring that the worksite is kept in a clean and safe condition both during and upon completion of the job.
  - Ensuring adequate handovers take place at shift change and crew change periods.
  - Stops unsafe work.
  - Inspect PPE for suitability, condition and correct use prior to the commencement of the task and periodically during the activity.
  - Ensures all equipment/tools are inspected and fit for purpose.

**Note: The same person cannot act as Performing Authority and Issuing Authority for the same task.**

#### Authorized Gas Tester (AGT)

Authorized Gas Testers (AGT) are authorized to test for the presence of flammable vapors, toxic gases and oxygen as required in support of permit or Confined Space Entry certificates as requested by the issuing authority. Any hot work being conducted within 25ft of the fuel farm or fuel lines require continuous gas monitoring. For Confined space entry, the Authorized gas tester shall complete

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the confined space entry certificate and declare that the confined space is gas free.

### Isolating Authority (IA)

The Isolating Authority (IA) is responsible for isolating specific sections of plant or items of equipment to the highest quality and security of isolation which is reasonably practicable.

The IA is also responsible for demonstrating the integrity of the isolation to the Area Authority and Performing Authority and for monitoring the integrity of isolations whilst they are in effect and ensure the removal of isolations when the job is complete and prior to equipment start up.

The IA shall also witness the insertion of spades to achieve positive isolation when required.

The IA shall complete the relevant Isolation certificate, mechanical or electrical.

Only an individual listed as an Isolating Authority in the Guyana Shore Base Standing Instruction 003 is allowed to perform any isolation in GYSBI.

### QHSSE Advisor

The QHSSE Advisor is responsible for:

- Providing advice and guidance on the use of the PTW system
- Ensuring that relevant risk assessments or JSAs are attached to the PTW;
- Monitoring the correct use of this procedure by performing daily verification on site.

### Subcontractors Shall

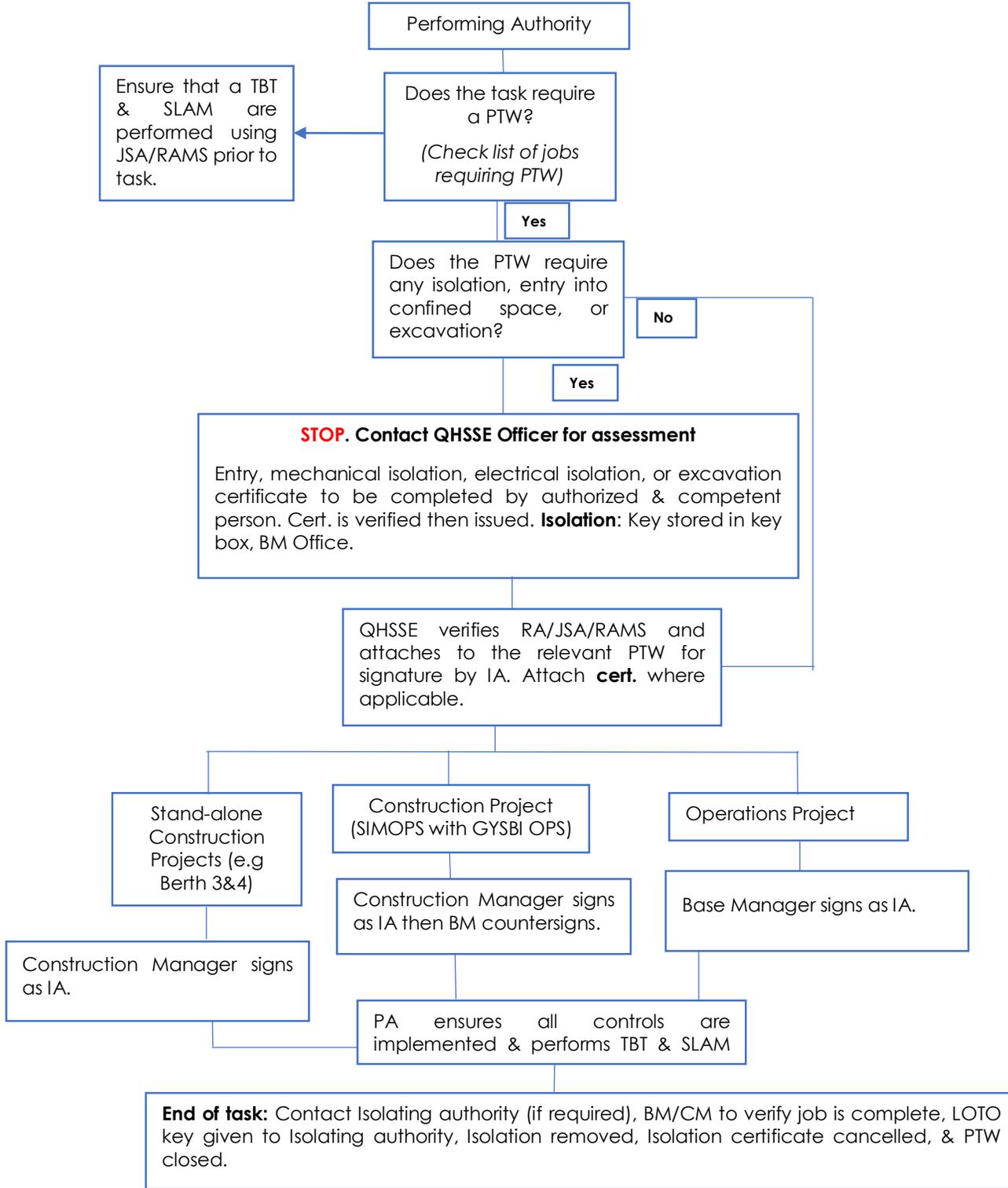
- Ensure adequate resources and arrangements are made to support this Procedure.
- Be responsible for ensuring their reporting employees comply with this procedure.

### All Site Personnel

- Without exception, all site personnel shall have an individual responsibility to ensure that the PTW system operates correctly and that they comply with all its stated requirements where applicable.

### 3 PROCEDURE

When performing a work activity, the below process must be followed:



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The list of activities which require a permit to work are listed in Appendix I.

Permits to Work are completed in the GOARC system by the Performing authority and assigned to the QHSSE advisor for review.

## Isolations, Lock Out-Tag Out System

It is a system to ensure that dangerous machinery and equipment are properly shut off and not started up again prior to the completion of maintenance or servicing work. The keys of padlocks used for the isolations will be placed in a lock out key box. The lock out key box will be in the Base Manager's office or Construction Project Manager's office.

All isolation points will be identified by an isolation tag, which will be attached to the point of Isolation at the time when the isolation is applied by competent and trained person and removed when de-isolation takes place. All isolation/deisolation will be done only by personnel listed as an Isolation Authority in Standing Instruction 003.

**Note: Before a permit to work is issued for maintenance work on the Schlumberger valves, manifolds or hardlines, the unit must be isolated using a line spade or blind flange. Evidence of this must be shown to the Issuing Authority before approval is given.**

### Distribution of Isolation Certificate

On receipt of the Permit to Work and/or Isolation Certificate, and appropriate padlock keys, the QHSSE Advisor shall place the padlock keys in the lock out box.

### Removal of Isolations

When the QHSSE Advisor verifies that the work is complete, the isolations can be safely removed and will then:

1. Give the pad lock key.
2. The isolating authority will remove the isolation.
3. When the isolations have been removed, the isolating authority will verify and sign the certificate to close the isolation. This certificate will be assigned to the Issuing Authority to be signed.

### Long Term Mechanical Isolation

Long Term Mechanical Isolation is an exception to the normal rules.

Each Permit to Work has a maximum duration of 12 hours and does not exceed over shift changes, however Long-Term Isolations may be authorized for a period of up to 4 months and need to be revalidated by the isolating authority every month.

## Entry into Confined Space Certificate

A Confined Space Entry Certificate is used to specify the precautions that need to be taken to eliminate dangerous gas and fumes or prevent a lack of oxygen before a person is allowed to enter a confined space. The certificate shall confirm that the space is free from unsafe conditions.

Precautions shall be specified on the certificate to protect the atmosphere against the ingress of airborne contaminants from adjacent sources.

The Confined Space Entry Certificate shall be used together with relevant Permit to Work.

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## Excavation works

When a task involves excavation QH-017 Permit to work form will be completed indicating excavation works, to accompany this CO-017-Excavation Work Permit Form must be completed and supplied with the appropriate documentation that will allow the work to commence. This would include as a minimum, drawing that outlines existing utilities. Drawing to be attached with CO-17-Excavation Work Permit Form properly completed and signed.

Trained and competent personnel shall scan the area to verify and identify underground utilities. The individual who scans the area shall sign onto the CO-17-Excavation Work Permit Form. The CO-17-Excavation Work Permit Form shall remain active for the duration of the project.

If excavation depth is greater than 5ft, a soil analysis will be required to determine the appropriate protective system that will be utilized. A Competent Person shall be on site during trenching and/or excavating activities.

A rescue plan shall also be developed for any carried out in a trench/pit greater than 5ft.

## Competency & Training

All roles identified in the PTW process shall have a defined level of competency as shown in Appendix II. Competence levels shall be checked regularly, and training and competency records kept and updated.

Training, including refresher training, shall be provided to ensure that the roles and responsibilities within the PTW Process are fully understood and standards of

competency are acceptable. All personnel will be trained & certified for their roles and responsibilities.

Training and competency records will be maintained for all personnel involved in the PTW process. This will include training received (including dates) as well as qualifications and certifications held. The records shall also include the due dates for refresher training and re-certification.

Training records will be retained by both the QHSSE department and the GYSBI Training Department.

## **Co-ordination and Prioritization of Simultaneous Activities**

All work activities that are related and are likely to interact and influence one another shall be identified and the impact of the interaction understood. The planning, scheduling, and implementation of these shall be coordinated and priorities of execution defined by the Issuing authority. Where there are several subcontractors or work parties working on a site, arrangements shall be made for scheduling & work planning meetings with all parties to ensure adequate coordination of activities in line with GYSBI SIMOPS Procedure.

\*SIMOPS – Simultaneous Operations

## **Work Permit Duration**

A work permit shall be valid for maximum 12 hours which could cover the entire duration of a working shift (6:00hrs to 18:00hrs or from 18:00hrs to 6:00hrs). The work permit is not transferable; therefore, if the work will be continued by the next shift or another work group, a new work permit shall be issued to the new Permit applicant and authorized by the issuing authority.

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## Monitoring of Work

It must be ensured that all conditions detailed on the PTW have not been compromised and that work proceeds in a safe manner in accordance with the conditions stipulated. It is the issuing authority's responsibility to decide and provide the appropriate level of monitoring of work and maintain regular communication with those performing the work.

The issuing authority may delegate the responsibility for monitoring work but retains accountability for the PTW. A member of the QHSSE Team should be assigned to regularly visit the worksite to ascertain that the PTW conditions are being complied with by the workforce and to continually assess whether the original PTW still covers the work in progress.

To ensure that the above requirements are met:

- The QHSSE Advisor assigned to monitor the work must have the required competence to recognize when site conditions no longer comply with the PTW requirements.
- The person assigned to monitor the work must investigate any indication from the workforce that the work may be unsafe.

## Status of Work Permits

The status of PTWs (including a register of associated isolations) shall be accurate, up to date and accessible by the QHSSE Advisor. This shall include a live PTW database showing the location of activities.

The QHSSE Advisor will monitor the status of all PTWs and ensure that associated registers for isolations, overrides and inhibits are maintained in an up-to-date condition.

## Safe Work Site Conditions

During all project activities, with or without a PTW, effort must be made to continually ensure that the work areas are kept free of unnecessary materials, tools and personnel. Housekeeping responsibility shall be assigned, usually by the PA. This should cover all areas affected by the work.

On completion of the work activities, the PA shall ensure that:

- The area has been cleared of any tools, rags, debris etc.
- Fittings and equipment removed during the work are cleared and taken away for proper storage or safe disposal.
- The area has been cleaned as required and any spills and contaminants removed and disposed of safely.
- The work site shall be inspected by both the PA and QHSSE advisor and confirmed as being in a safe condition on completion of work. Upon satisfactory inspection of the work site the PTW shall be closed by signature from the issuing authority.

## 4 AUDITING/SELF-VERIFICATION

To maintain a consistently high standard of PTW Procedure application, it is essential that a program of regular auditing / self-verification be established. The audits should review and make recommendations for improvements on the correct application of the PTW Procedure, including all documentation, controls, training, and competency. Any discrepancies noted should be communicated to the site management with a requirement that corrective action plans are developed, and those actions are closed out in a timely manner.

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## APPENDIX I: LIST OF ACTIVITIES THAT REQUIRE A PERMIT TO WORK

- All hot work involving welding, burning, heating, any other spark producing activity generating an actual or potential source or ignition, except when done in the approval site workshop.
- Isolation/Override/Disabling/Removal of safety critical equipment/ systems.
- High pressure testing of equipment such as piping, vessels, manifolds/lines etc.
- Personal basket hoist operations.
- Work on electrical equipment in hazardous areas that can generate sources of ignition.
- Working on equipment which requires Energy isolation
- Working on equipment which requires Isolation from hazardous substances (hydrocarbon, flammable materials, toxic materials, etc.)
- Use of nitrogen
- Scaffold erection on site.
- All non-routine inspection & maintenance activity on critical equipment
- Commissioning of new machinery during routine operations.
- Handling materials weighing more than 90% of SWL of the lifting equipment.
- Work on / or near moving equipment where safety barriers and guards have to be bypassed / removed.
- Working at height
- Operations where heavy machinery (e.g. cranes, mechanical excavators, trucks etc.) which could pass over live hydrocarbon systems or come into contact with overhead power lines
- Any work generating ignition sources inside hazardous area.
- Confined Space Entry where there is a risk from toxic and hydrocarbon fumes or oxygen depletion.
- Work in contaminated or possibly contaminated atmosphere or in an atmosphere where TLV of a toxic gas is exceeding the acceptable limits.

- 
- All operations involving X-ray, radioactive & explosives sources.
  - Bulk Transfer
  - Fluid discharge in GYSBI drains or the river
  - Demolition
  - Excavation (must be accompanied by CO-17 Excavation permit)
  - Working over water
  - All work performed by third party contractors
  - Construction Activities
  - Any other activities which deviate from regular procedures having potential for high risk where JSA alone cannot provide adequate risk mitigation.

**NB: Any mechanical work being conducted in the Mechanical Workshop by the GYSBI mechanical team does not require a permit to work unless an isolation is required.**

## APPENDIX II: COMPETENCY & TRAINING REQUIREMENTS

Table 2 Competency & Training Requirements

ROLE QUALIFICATIONS	QUALIFICATIONS	EXPERIENCE	KNOWLEDGE	TRAINING
<b>All site personnel:</b>	Relevant to their particular trade	Previous experience relevant to shore base ops, large scale construction activities	Site specific rules including the Life Saving Rules	Induction Life Saving Rules PTW Awareness
<b>Issuing Authority</b>	No specific requirement	Control of Work in operations / construction environments. Working with subcontractors.	Ops /Project Regulations & Standards. Relevant knowledge of the Site and associated work activities.	Induction Life Saving Rules CoW & PTW awareness Issuing Authority Section
<b>QHSSE Advisor</b>	NEBOSH or Guyana recognized HSE qualification	3 – 5 years dependent of level 1, 2 or 3	GYSBI Ops / Project Regulations & Standards. Relevant knowledge of the Site and associated work activities. GYSBI HSE Management System	Induction Life Saving Rules Control of Work & PTW and other topics as defined in the training matrix
<b>Performing Authority</b>	Trade Qualifications Good level of English both	Relevant experience in in managing trade operatives	GYSBI Ops / Project Regulations & Standards.	Induction / Control of Work & PTW.

	written and spoken		Relevant knowledge of the work activity process	Life Saving Rules RAMS / JSA /Risk Assessment Lock out /Tag out
<b>Authorized Gas Testers (AGT):</b>	Good level of English both written and spoken	Previous experience	GYSBI Ops / Projects Regulations & Standards.	Induction Life Saving Rules Control of Work & PTW. Gas tester / Confined space
<b>The Isolation Authority</b>	Engineering Diploma or Technical Certificate (Electrical and/or Mechanical)	10 years	GYSBI Ops / Projects Regulations & Standards.	Lock out / Tag out Life Saving Rules

## 5 REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	-	-	-
2	-	-	-
3	6 April 2020	Michael James Sean Hill	-
4	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
5	25 Aug 2021	Sean Hill	Updated to include excavation work and reference to permit CO-017 reference
6	28 Dec 2021	Andrew Dowson	Updated PTW Flowchart
7	27 Apr 2022	Kurt Busuttil	Updated PTW Flowchart to include project types
8	01 Jul 2022	Kurt Busuttil	Appendix 1, point #12- requirement for permit to work for handling loads changed from weighing more than 85% of SWL of lifting equipment to 90%.
9	20 Oct 2022	-	Updated: Scope to include offsite projects. Responsibilities section Use of the PTW system on GOARC Isolation Lockout/ Tagout section Excavation Section Training Records retention Work Permit Duration Appendix I and Appendix II- Isolation Authority Isolation of Schlumberger units during maintenance work  Updated Document Number

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**This procedure shall be used by all departments and updated by QHSSE Department based on QHSSE Policies**

## 1 INTRODUCTION

Personal protective equipment (PPE) comprises a range of clothing and equipment which is worn by employees, contractors or visitors as appropriate to protect or shield their bodies from workplace hazards.

This document describes the appropriate PPE that each employee, contractor and visitor shall wear to prevent injury. It describes what is required, when and where it shall be worn.

**This document does not address Ionizing Radiation or H<sub>2</sub>S PPE. Should this or other Hazards arise within GYSBI operations requiring specialized PPE, it will be addressed later and added to this procedure.**

It is mandatory for all GYSBI employees, contractors and visitors to wear PPE as prescribed in this document.

Minimum PPE required consists of:

- Coveralls, or a Hi-Vis Vest and clothing for managers to wear when not having Coveralls
- Hardhat
- Safety glasses with side shields
- Work boots
- Gloves

*(Note: The full extent of PPE requirements shall be assessed by carrying out the appropriate TBRA/JSA).*

## 2 PROCEDURE DETAILS

## 2.1 Definitions

JSA	a procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation.
TBRA	a careful examination of what, in the workplace/environment, could cause harm to persons. It enables one to decide whether enough precautions have been taken or what should be taken to prevent harm.
H <sub>2</sub> S	Hydrogen sulfide - a colorless, flammable, extremely hazardous gas with a “rotten egg” smell.
Hi-Vis	High Visibility - any clothing worn that is highly luminescent in its natural matt property or a color that is easily discernible from any background.
Physical Work Duties	Executing a manual task that requires bodily force. Example: lifting an object, climbing to height, directing/operating machinery, strapping of loads, construction activities, maintenance work, etc.

## 2.2 Responsibilities

All operatives and contractors are to strictly follow the requirements of this procedure whilst working on site. Failure to comply will result in irrevocable removal permanently from all GYSBI locations.

The QHSSE team shall provide guidance and advice on the implementation of this procedure.

## **2.3 PPE Exceptions**

GYSBI employees, contractors, visitors etc., will not be required to wear PPE inside buildings or enclosed vehicles.

PPE is not required when walking to/from an enclosed motor vehicle to a building provided the parking space is close to the building and not in an operations area.

Emergency response team personnel, Fire Dept, Military & Law Enforcement are exempt from standard PPE when responding to an incident. The PPE requirements will be determined by the On-Scene Commander/QHSSE Supervisor.

Managers, whose typical working location is office are exempt from coveralls but must wear Hi-Vis Vests instead. Management and visitors touring the base and not engaged in physical work duties are exempted from wearing coveralls.

## **2.4 GYSBI Employees**

All GYSBI employees, including supervisory staff, shall be provided with PPE based on the level of risk.

For inclement weather, employees who work outside shall be furnished with waterproof clothing.

## 2.5 Contractors & Visitors

Contractor employees are required to wear PPE in the same circumstances as GYSBI employees.

At own expense, visitors entering GYSBI facilities are expected to furnish their own PPE.

## 2.6 Green Hat Policy

All GYSBI & contract employees shall wear **Green Hats** under the following circumstances:

Where the employee is new to the organization – for a period 6 months.

**All** infrequent, short-term visitors e.g. management, VIP's regardless of when they were last on site

**Note:** Before switching to white hats an assessment shall be carried out by the shift QHSSE Supervisor, where same shall ensure employees understand the site, and are aware of access & egress points, Muster Points, emergency procedures, emergency shutdown points, fire alarms and firefighting equipment.

## 3 PPE REQUIREMENTS

### 3.1 Coveralls

Coveralls shall be utilized by any person on the base conducting physical work duties.

Coveralls - Color: Blue with Hi-Vis stripes

At a minimum, fabrics shall be the equivalent of tropical 4 oz./yard or equivalent. With multiple bands of reflective trim. There should be 1 band around each arm and 1 band around each leg with GYSBI logo rectangle tag on the right chest above pocket.

Coverall shall meet ANSI 107-2010 approved standard.

*(Note: Elastic Reflective Belt-Safeguard does not meet the requirement of ANSI 107-2010 Standard and is not reflective of a PPE).*



Coveralls shall be worn by all GYSBI operational personnel. A Hi-Vis Vest may be required e.g. Banksmen.

### 3.2 Eye and Face Protection

All personnel shall wear safety glasses, conforming to approved personal eye protection standards, with side shields or goggles (see below).

Where required, prescription safety glasses with side shields should be worn. GYSBI employees will be allowed one pair of prescription safety glasses at company cost.

**Tinted** type **safety glasses** may be worn from dawn to dusk only.

Eye protection is not required when operating or riding in an enclosed vehicle.

Note: If the window is open the vehicle is no longer enclosed and minimum eye protection is required.

Contact lenses may be worn under approved safety glasses

A basic impact approved **face shield** over **safety glasses** is required for the following tasks:

- High pressure water blasting

- When using a grinder or powered wire wheel

- Chipping or hammering that could result in flying fragments or debris

- Handling and sampling of acids, caustics & other corrosive chemicals

Basic impact approved goggles shall be worn for the following tasks:

- Working in a dusty environment

- Mixing cements or other dusty materials

- Handling or working around materials that generate excessive dust

- As determined in the pre-job risk assessment.

To protect against direct gas welding light or reflected rays in confined spaces, filter lens burning goggles shall be worn. To protect against indirect arc rays when assisting welders, dark green plastic cover goggles shall be worn.

When arc welding, filter lens, arc welding shields/hoods over safety glasses shall be worn.



Required Features:

General Purpose Safety Spectacle - Conforming to EN 166.1.F / ANSI Z87+ - Clear Polycarbonate anti-scratch lenses (with side shields). Dark versions may be used outside of buildings and during daylight hours only.

Safety Over Spectacle – Conforming to EN 166.1.F / ANSI Z87+ - Clear Polycarbonate anti-scratch lenses (with side shields)

Safety Goggles – Conforming to EN166.1.B.3.4.9 / ANSI Z87+ - Dust and Liquid protection Indirect Vent Goggle with Ant-mist

Safety Face Shields - Conforming to EN 166.1.F / ANSI Z87+ - Clear Polycarbonate anti-scratch shield

Prescription Safety Glasses- ANSI Z87 prescription safety glasses which provide impact, splash, dust and optical radiation protection, Shatterproof lenses, Side Protection, Clear/dark lenses for day and night shift, UV protection, Scratch Resistant Coating

### 3.3 Head Protection

Required Features: General Safety Helmet (Hard Hat) conforming to safety requirements for Industrial head protection LT (Low Temp), HT (High Temp) ANSI/ISEA Z89.1 - 2014, Type 1, Class E/BS EN 397

GYSBI Standard issue Hard Hat – MSA V-Gard®

- Colors – Green and White



(Pictures for illustration only)

Each employee shall be furnished with a protective helmet by the company in White or Green, referred to above, and in accordance with the Green Hat Policy. The employee must make sure the fit is good and the suspension should be inspected before use.

Hard hats must be worn with the bill forward unless under a welding helmet. Chin straps must be worn when working at height and in high winds.

Employees working on electrical equipment must wear a protective helmet designed to reduce electrical shock hazards ANSI/ISEA Z89.1 - 2014, Type 1, Class E with the same required features stated above.

GYSBI issued Safety Helmets will have the company name at the front of the helmet and no other stickers or similar attached.

Hard hats shall be replaced after being subjected to impact, struck by a falling object, extreme heat and in any case every two (2) years.

#### Hair Length Requirements – Long hair around Machines and Equipment:

Employees are required to cover and protect long hair to prevent it from getting caught in machine parts such as belts, chain, and rotating parts.

Employees are also encouraged to pay close attention to work pieces that have slots or other surface profiles that may increase the risk of entanglement. 'Primary Personal Protective Equipment Standards'. Title 29 of the Code of Federal Regulations, Part 1910 Subpart 1.

Hair length with the potential to be caught in Machines, Slings, CCU's, should be securely fastened, using hair net, soft caps, ponytails. Extremely long hair (dreadlocks, braids) can be tied up in a knot or bun, and a hair net or wave cap can be used to support same.



Dreadlocks tied up in a Knot

### 3.4 Hand Protection

The number of applications for which hand protection must be provided is too extensive to list. In general, protection shall be provided wherever there is a hazard. A comprehensive list of hazards must be compiled for each workplace and suitable hand protection obtained for each process.

Gloves shall also be worn when there is a potential for hand injury, such as climbing ladders, closing toolboxes, picking up trash, etc. Personnel are encouraged to carry gloves whenever standard PPE are worn.

Gloves will be selected based on the material being handled, the hazard involved, and their suitability for the operation being conducted. One type of glove will not work in all situations. For general work, the minimum specification is cotton general duty work glove, to protect the hand from cuts. All employees, contractors and visitors are required to select and wear the proper gloves for the types of hazards expected in performing a task.

It is acceptable to work without gloves on jobs requiring a greater amount of dexterity than a gloved hand would allow. However, a pre-task risk assessment must be completed prior to beginning work.

Some examples of specialized protective gloves are:

- Chemical Protective
- Thermal Protective
- Abrasion Resistant
- Fire Fighting

Gloves may create a hazard when worn around revolving tools or machinery. The pre-task risk assessment should consider whether gloves are appropriate.

**The following types of glove should be used under most circumstances on the**

**Shore base:**           BS EN 388 or ANSI 105-2016



General use



Chemical handling



Wash bay

Features:

General Purpose Safety Gloves - Conforming to ANSI/ISEA 105:2011

Chemical Protection Gloves - Conforming to ANSI/ISEA 105:2016, Level 1- For applications less than 176 degrees Fahrenheit/80 degrees Celsius.

### 3.5 Foot Protection

For general use a good grade of work boot is the minimum standard. Footwear shall have a protective safety-toe (such as steel toed or non-metallic toe cap) meeting the requirements of ASTM F2413-05 / BS EN 345 -1

Required Features as a minimum:

Fitted snugly to the feet via laces, zippers, other securing mechanism, or slip on.

Dual density polyurethane anti-static sole.

Pierce resistant steel midsole.

200 Joule Toe Cap Protection

Off-set heel.

Ankle protection (AN)

When working near electrical equipment, non-conductive footwear or overshoes should be worn.

Chemical protective foot protection will be worn when working with chemicals.



(Pictures for illustration only)

Unacceptable footwear includes:

Athletic style shoes, flat soled shoes without an offset heel, open toed shoes, crepe soled shoes, tennis shoes, sneakers, canvas type shoes, sandals, high heeled shoes, clogs or shoes with metal taps are unacceptable in any Process, Maintenance, Warehouse, Field area.

### 3.6 Hearing Protection

Line Managers shall consult with the QHSSE Team in selecting hearing protection devices with appropriate noise reduction ratings.

Features	Disposable Foam Earplugs to Protect Against Long-term Exposure - SNR Testing according to ANSI S.3.19-1974
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### 3.7 Respiratory Protection

Some tasks may require the use of Respiratory Protection Equipment (RPE). The most common on site is the use of Dust Masks. When handling chemicals which produce excessive airborne vapors or fumes, a Respirator may be required. The Respirator and its filter/cartridge are to be selected for filtering the appropriate contaminants (refer to 4.5 Cartridge and Filter reference chart) and shall not be used in oxygen deficient atmospheres. Consult the SDS and produce a COSHH risk assessment to confirm the type of RPE required.

Features of Respirators should conform to ANSI Z88 Standards.



Respirators



Dust Masks

### 3.8 Chemical Handling

Personnel handling chemicals need body protection against splashes and droplets, which will be identified as one or more of the control measures after conducting a COSHH assessment.

They should wear protective clothing (suits or aprons) manufactured from materials conforming to BS EN 465 (spray tight connections), BS EN 466 (liquid

tight connections) or ANSI 101-2014 (basic liquid chemical protection), depending on the risk identified by the assessment. Refer to This should include an assessment of the chemical breakthrough times of the product.



### 3.9 Harnesses / Lifejackets etc.

Working at height may require the use of a safety harness. On site a variety of harnesses are used for different purposes. Working at a height without adequate handrails or in a Mobile Elevated Work Platform (MEWP) will require a double lanyard / single block harness.

Features should conform to ANSI Z359.11-2014 standards or equivalent.



Double lanyard/single block

Lifejackets are required for use on the wharf when using the gangway to access/egress a vessel or when working beyond the yellow line at the wharfs edge.

Below is the recommended life jacket for work use.



Standard: AS 4758 or ISO 12402: level 275, level 150, level 100 or AS 1512.

Level 100 and higher lifejackets provide a high level of buoyancy and are:

- Approved for use in unprotected waters.

- Fitted with head and neck support.

- Designed to keep you in a face up floating position.

- Manufactured using high-visibility colours.

- Suitable for offshore and general boating in all waters.

## 4 MAINTENANCE AND REPLACEMENT OF PPE

### 4.1 PPE Issuance

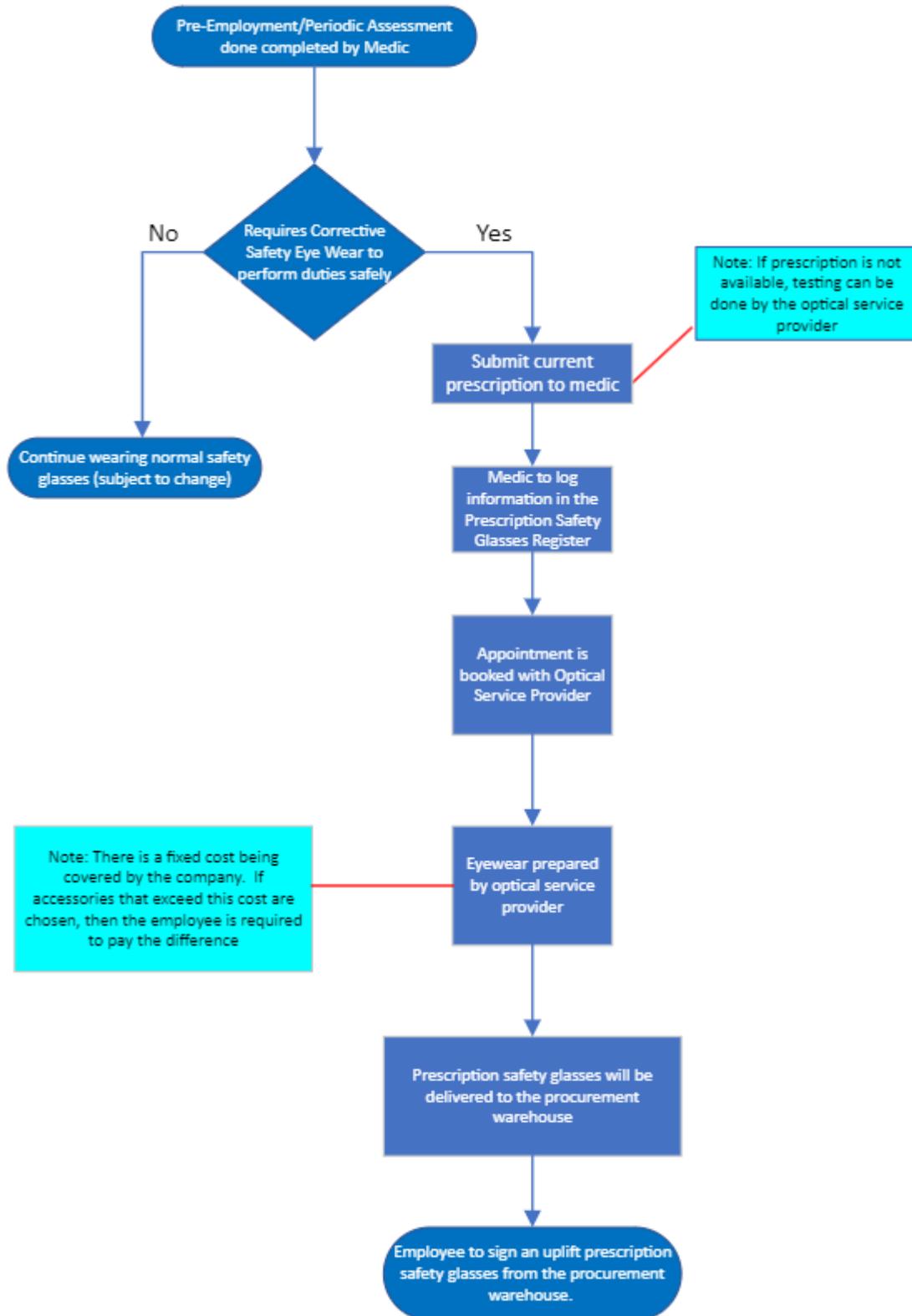
As a minimum requirement, the manufacturer's recommendations for replacement periods and shelf life of equipment must be adhered to.

Operatives are required to show 'proof of need' to the storekeeper when requesting new PPE. The old PPE will be handed in before new is issued.

Prescription safety glasses will be replaced if damage occurs due to work activity or when its functionality decreases due to time. When not in use, prescription glasses shall be stored in protective casing, and cleaned as directed by manufacturer. Staff resigning within six months of being issued prescription safety glasses are liable to repay the cost expended by the company.

Prescription Safety Glasses will be issued as follows:

### Prescription Safety Glasses Flow Chart



ADDITIONAL INFORMATION

For any queries please contact:

Dr Michele Ming BSc (Hons), MCOptom. (UK), FAAO (USA)

Optometrist/Contact Lens Specialist

225-4395 Office / 623-4283 Mobile

To book appointments:

[mingsoptical25@gmail.com](mailto:mingsoptical25@gmail.com)

**Days, time, and number of persons per day at each location:**

<p><b>Georgetown</b> Tues, Wed, Thurs, Fri. 2 Pts. @ 13:00h 2 Pts. @ 13:30h 2 Pts. @ 14:00h 2 Pts. @ 14:30h <b><u>Total 8 persons daily × 4 days</u></b></p>	<p><b>Parika</b> Tues and Thurs 2 Pts. @ 12:00h 2 Pts. @ 12:30h 2 Pts. @ 13:00h 2 Pts. @ 13:30h <b><u>Total 8 persons daily × 2 days</u></b></p>	<p><b>Mon Repos</b> Wed and Sat 10:00h to 13:00h <b><u>6 persons daily × 2 days</u></b></p>
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Every GYSBI employee will receive an annual issue of PPE as follows:

Coveralls	4/year
Safety Glasses / Over-glass	4/year
Prescription Safety Glasses	As required/ as needed
Safety Boots	1pr/year
General Purpose Gloves	4/year
High Visibility Vest	1/year
White Hard Hats	1 every 2 years
Green Hard hats	Exchanged to White after 6 months

**NOTE:**

The above is meant to provide some control over the issuance of PPE and is based on lifetime expectancy. It is understandable that conditions can arise that will warrant issuance before the timelines stated e.g., wear and tear, unexpected damage, incidents, theft, etc. When assigned tasks, workers will be given the appropriate PPE to work safely.

## 4.2 PPE Requisition

Refer **SC-PR-006 Issuing PPE Procedure** and **SC-FO-012 PPE Requisition Form**

## 4.3 PPE Distribution Matrix

**PERSONAL PROTECTIVE EQUIPMENT REQUIREMENT MATRIX**

D U T I E S	COVERALLS	RAIN SUIT	HARD HAT	SAFETY BOOTS	LONG BOOTS	GENERAL PURPOSE PROTECTIVE GLOVES	HEAT / CHEMICAL RESISTANT GLOVES	SAFETY GLASSES	FACE SHIELD	DISPOSABLE EAR PLUGS	SUN VISOR	HIGH VISIBILITY VEST	LIFE JACKET	GREEN APRON	ANTI-DUST MASK	TYVEK SUIT	ANTICHEMICAL GLOVES	RESPIRATOR	DISPOSABLE GLOVES	WELDERS GLOVES
	MAINTENANCE STAFF	X	X	X	X	X	X		X	X	X	X	X	X		X	X		X	
LOAD HANDLERS	X	X	X	X	X	X		X	X	X	X	X	X		X					
WASHBAY ATTENDANTS	X	X	X	X	X	X	X	X	X	X	X	X		X	X	X	X			
WATERBUNKERING	X	X	X	X	X	X		X		X	X	X	X		X		X	X	X	
SUPERVISORS	X	X	X	X	X			X			X	X								
BASE MANAGERS	X	X	X	X	X			X			X	X								
CLERICAL STAFF		X	X	X	X			X			X	X								
ADMINISTRATIVE STAFF		X	X	X	X			X			X	X								
JANITOR		X	X	X	X			X			X	X			X		X		X	
MECHANIC	X	X	X	X	X	X		X		X	X	X			X	X	X			
ELECTRICIAN	X	X	X	X	X	X		X		X	X	X			X					
CONSTRUCTION STAFF	X	X	X	X	X	X		X	X	X	X	X	X		X					X
CRANE OPERATOR	X	X	X	X	X	X		X			X	X			X					
FORK-LIFT OPERATOR	X	X	X	X	X	X		X			X	X			X					
SITE DOCTOR		X	X	X	X			X			X	X								
TRUCK DRIVERS	X	X	X	X	X	X		X			X	X			X					
SAFETY OFFICER	X	X	X	X	X			X			X	X			X					
DRIVER	X	X	X	X	X			X			X	X			X					

**4.4 Standards for PPE**

PPE	STANDARD
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Footwear	
Safety Boots (steel toed)	ANSI Z41   BS EN 345 -1   EN ISO 20345
Long Boots (steel toed)	ANSI Z41   EN345   EN ISO 20345
Coveralls	
GYSBI Coverall	ANSI 107-2010   EN ISO 20471
Tyvek Suits	ANSI 101-2014   BS EN 465, BS EN 466
Clothing	
Hight Visibility Vest	ANSI 107-2010   EN ISO 20471
Rain Suits	ANSI/ISEA 107 Type O, Class 1
Life Jackets	AS 4758 or ISO 12402
Head and Face protection	
Safety Glasses and Over Glass (clear and dark)	ANSI Z87+   EN 166.1.F
Face Shields	ANSI Z87+   EN 166.1.F
Ear Plugs	ANSI S3.19   EN 352-2
Hard Hat	ANSI/ISEA Z89.1   BS EN 397
Respirators	ANSI Z88
Dust Masks	EN 149
Hand Protection	
General Use Gloves	ANSI 105-2016   BS EN 388
Chemical Resistance Gloves	ANSI 105-2016   BS EN 388
Welders Gloves	ANSI Z49.1   EN 12477
Other Equipment	
Safety Harness	ANSI/ASSE Z359   EN 361, EN 1497, EN 358
Apron	ANSI 103-2010   ISO 13998

## 4.5 Cartridge and Filter Reference Chart

CARTRIDGE AND FILTER REFERENCE CHART			
CARTRIDGES AND FILTERS FOR AIR-PURIFYING RESPIRATORS			
Part No.	GAS AND VAPOR CARTRIDGES		Label Color
75SC		Defender™ Multi-Purpose Cartridge: Organic Vapor, Ammonia, Methylamine, Formaldehyde and Acid Gas (Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Fluoride, Chlorine Dioxide) and Formaldehyde Cartridge	Olive
N75001		Organic Vapor Cartridge	Black
N75002		Acid Gas (Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Fluoride, Chlorine Dioxide) and Formaldehyde Cartridge	White
N75003		Organic Vapor and Acid Gas (Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Fluoride, Chlorine Dioxide) Cartridge	Yellow
N75004		Ammonia and Methylamine Cartridge	Green
N750052		Mercury Vapor and Chlorine Cartridge with End-of-Service-Life-Indicator (ESLI) for Mercury Vapor	Olive
COMBINATION GAS AND VAPOR CARTRIDGES WITH P100 PARTICULATE FILTERS			
75SCP100		Defender™ Multi-Purpose Cartridge and P100 Particulate Filter: Organic Vapor, Ammonia, Methylamine, Formaldehyde and Acid Gas (Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Fluoride, Chlorine Dioxide) with a P100 particulate filter (99.97% minimum filter efficiency) for all particulates	Olive and Magenta
7501P100		Organic Vapor Cartridge with a P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates	Black and Magenta
7502P100		Acid Gas (Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Fluoride, Chlorine Dioxide) and Formaldehyde Cartridge with a P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates	White and Magenta
7503P100		Organic Vapor and Acid Gas (Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Fluoride, Chlorine Dioxide) Cartridge with a P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates	Yellow and Magenta
7504P100		Ammonia and Methylamine Cartridge with a P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates	Green and Magenta
75052P100		Mercury Vapor and Chlorine Cartridge with End-of-Service-Life-Indicator (ESLI) for Mercury Vapor, with a P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates	Olive and Magenta
PARTICULATE FILTERS			
7500P100		P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates	Magenta
75FFP100		Pancake: Low Profile P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates	Magenta
7535FFP100		Pancake Filter Assembly. Low Profile P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates. Filter Assembly includes 5 pair 75FFP100 and 1 pair N750035 adapters for use with air-purifying gas and vapor cartridges (except Defender™)	Magenta
75FFP100NL		Pancake with odor relief: Low Profile P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates; with odor relief from nuisance levels of organic vapors, acid gases and ozone	Magenta
7506N95		N95 Non-Oil Particulate Filter (95% minimum filter efficiency) for non-oil based aerosol particulates	
7531N95		N95 Filter Assembly. Includes 1 pair each of 7506N95 filter; N750015 filter holder and N750027 filter cover	
7506N99		N99 Particulate Filter (99% minimum filter efficiency) for non-oil based aerosol particulates	
7531N99		N99 Filter Assembly. Includes 1 pair each 7506N99 filter, N750015 filter holder and N750027 filter cover	
7506R95		R95 Particulate Filter (95% minimum filter efficiency) Note: R class filters are limited to 8 hours of use in environments with oil based aerosol particulates	
7531R95		R95 Filter Assembly. Includes 1 pair each of 7506R95 filter; N750015 filter holder and N750027 filter cover	
ACCESSORIES			
N750035		Adapter for assembly of 75FFP100 and 75FFP100NL Pancake Filters to gas and vapor cartridges, (except Defender™)	
N750015		Filter Holder	
N750027		Seal Check/Filter Cover	
N750029		Shower Cap for 7500P100 Filter	

CARTRIDGES AND FILTERS FOR POWERED AIR-PURIFYING RESPIRATORS			
GAS AND VAPOR CARTRIDGES			
4001		Organic Vapor Cartridge	Black
4003		Organic Vapor, Acid Gas (Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Fluoride, Chlorine Dioxide, Hydrogen Sulfide) and Formaldehyde Cartridge	Yellow
4004		Ammonia and Methylamine Cartridge	Green
COMBINATION GAS AND VAPOR CARTRIDGES WITH HEPA FILTERS			
4001HE		Organic Vapor Cartridge with HEPA (High Efficiency Particulate Air-purifying) filter, (99.97% minimum filter efficiency) for all particulates	Black and Magenta
4003HE		Organic Vapor, Acid Gas (Chlorine, Hydrogen Chloride, Sulfur Dioxide, Hydrogen Fluoride, Chlorine Dioxide, Hydrogen Sulfide) and Formaldehyde Cartridge with HEPA (High Efficiency Particulate Air-purifying) filter, (99.97% minimum filter efficiency) for all particulates	Yellow and Magenta
4004HE		Ammonia and Methylamine Cartridge with HEPA (High Efficiency Particulate Air-purifying) filter, (99.97% minimum filter efficiency) for all particulates	Green and Magenta
HEPA (HIGH EFFICIENCY PARTICULATE AIR-PURIFYING) FILTER			
40HE		HEPA (High Efficiency Particulate Air-purifying) filter, 99.97% minimum filter efficiency for all particulates	Magenta
CANISTERS AND CARTRIDGES FOR GAS MASKS			
40CBRN		CBRN CAP1 Canister: Chemical, Biological, Radiological and Nuclear, Capacity 1 (18 minutes minimum usage). Challenge agents: Mustard, Sarin, Ammonia, Cyanogen, Chlorine, Cyclohexane, Formaldehyde, Hydrogen Cyanide, Hydrogen Sulfide, Nitrogen Dioxide, Phosgene, Phosphine, Sulfur Dioxide, P100 particulate filter (99.97% minimum filter efficiency) for all particulates including biological, radiological and nuclear	Olive
40RCP100		Responder and Riot Control Cartridge: Tear Gas (Chloroacetophenone [CN], Chlorobenzylidene malononitrile [CS] and Acid Gas (Chlorine, Hydrogen Chloride, Hydrogen Fluoride, Hydrogen Sulfide (escape), Sulfur Dioxide) with P100 Particulate Filter (99.97% minimum filter efficiency) for all particulates including biological, radiological and nuclear	Olive and Magenta

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	23 Sep 2020	Sean Hill Iain Martin	Initial release of document
2	15 Dec 2021	Andy Dowson	Included: Elastic Reflective Belt-Safeguard does not meet the requirement of ANSI 107-2010 Standard and is not reflective of a PPE. Banksman only to wear reflective vests over coveralls. Replaced PPE Requisition with appropriate references to procedure and form.
3	25 Apr 2022	Kurt Busuttil	Included: Issuance of Prescription Safety glasses, use and specifications.
4	27 Jun 2022	Kurt Busuttil	Flow chart for issuance of Prescription Safety glasses updated
5	27 Jul 2022	Andy Dowson	Included: Hair length requirements – Long hair around machine
6	26 Oct 2022	Kurt Busuttil	Included: Requirement of coverall for any person conducting physical work duties.  Updated Document Number

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## 1 INTRODUCTION

Guyana Shore Base Inc. (GYSBI) recognizes the importance of supporting its Employees in a way which promotes and sustains, positive, productive and safe working environments.

## 2 PURPOSE/DETAILS

To ensure that relevant QHSSE information is communicated via QHSSE meetings and notices and a commitment to safety is demonstrated at all levels within the Operations Supply Base.

## 3 REFERENCES

- [QH-FO-013 – Toolbox Talk Attendance Form](#)
- [QH-FO-036 – QHSSE Meeting Minutes form](#)
- [QH-FO-057 – S.L.A.M \(Stop, Look, Assess, Manage\) Card](#)
- [QH-FO-072 – Management of Change Log](#)

## 4 PROCEDURE

### **QHSSE Communication**

QHSSE Communication shall encompass multi-layered formal and informal means of sharing relevant information via:

- Daily Pre-Job/Pre-Tour Meetings
- Weekly Operations Meetings
- Weekly QHSSE Site Safety Meetings

- 
- Toolbox talk meetings
  - Monthly Safety Committee Meetings
  - Notice Boards
  - Other means of communication e.g., Share Point, GOARC, Lessons Learnt, Posters, Emails, Safety Inductions.

Verbal communication is a vital tool to promote health, safety and environmental management effectively. All verbal, visual and written communications require to be clearly understood for those communications to be effective, therefore it is essential that all communications be in English.

QHSSE meetings shall be used as a two-way forum in which information shall be conveyed by management, supervision, or delegate with operative's questions on Health, Safety and Environmental issues answered.

QHSSE meetings shall be used by the management and supervision teams as a tool to assess the effectiveness of GYSBI policies and procedures along with the standards of morale that these generate.

#### Daily Pre-Job/Pre-Tour Meetings

Pre-Job/Tour meetings shall be conducted daily on each shift, 6:30h/18:30h with the Management and Operations crew where daily Work Plan and Safety related topics are discussed, safety shares are given by selected personnel and significant Observation and Intervention (O&I) safety reports are highlighted.

Daily Pre-Tour meetings shall be recorded on Toolbox Talk Attendance Form (QH-FO-013) and minutes shall be prepared by a QHSSE Advisor and signed by QHSSE Manager/Supervisor and Base Manager once reviewed.

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### Weekly Operations Meetings

The Operations/Base Manager shall conduct a weekly Operations meeting with Managers and Supervisors. These meetings shall be used to convey the QHSSE strategy, target setting, review all accidents, incidents and near misses across the GYSBI organization with lessons learned from investigation teams for implementation.

Managers and supervisors shall be given the opportunity to discuss their individual and group concerns which can then be addressed at corporate level.

The QHSSE Manager shall log all discussed and approved changes using the Management of change Log (QH-FO-072) and shall monitor all changes until close out of the actions.

### Weekly QHSSE Site Safety Meetings

Weekly QHSSE Site Safety Meetings shall be conducted at the QHSSE training venue every Monday on each shift at 06:00h/18:30h in lieu of the Pre-job/Pre-tour meetings; with Management, the Operations crew and other third-party representatives in attendance.

The QHSSE Advisor shall provide an agenda for the meeting to the QHSSE Manager for review and discussion.

The agenda shall comply with, but is not limited to the following format:

- Review all Incident Reports raised thus far for that week - The reports shall be summarized giving details of the causes and the analysis of what could have prevented them from happening, actions to prevent recurrence and lessons learned.
- High Potential Incidents (HIPO) - Review all information from these events with, as required, visual aids and the lessons learned, using examples of our

working practices to describe how similar situations may arise in our working environment.

- O&I safety reports - Breakdown of the number O&I safety reports raised with the positive and negative trends developing and actions required to promote or close these out.
- H, S & E Highlights – This relates to, but is not limited to general safety alerts, safety shares or reports regarding operations, onshore/offshore, for the purpose of raising awareness.
- Close meeting with a safety mission statement as a method of motivation to always achieve the highest standards possible.

The QHSSE Manager and QHSSE Advisor shall discuss the agenda ensuring that trends have been analyzed from O&I safety reports and incidents and agree on the emphasis of the delivery strategy, to ensure that lessons learned shall be understood in relation to operations.

Visual aids shall be used to provide maximum impact in delivery of key themes. Photographs, posters, and theme handouts shall be, where texted, in English.

The QHSSE Advisor shall deliver the safety meeting as per the agenda, relaxing the attendees with a warm welcome. Emphasis shall be given to encourage all attendees to contribute to the meeting by offering solutions, experience, and questions at any time through the meeting.

Any questions that cannot be answered shall be recorded for further investigation and clarification. Answers shall be provided to the individuals as they become available and closed out by discussing at the first available safety meeting to inform all other operatives.

The QHSSE Advisor shall minute the safety meeting using the QHSSE Meeting Minutes Form (QH-FO-036); the Base Manager and QHSSE Manager/Supervisor shall be in attendance throughout the meeting.

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The QHSSE Advisor shall provide the Base Manager and QHSSE Manager/Supervisor with a draft of the minutes for review and authorization.

The toolbox talk attendance sheet along with the meeting minutes shall be retained on GOARC and SPO respectively, where they will be accessible to all interested parties for viewing.

The Managing Director shall attend an Operations Base Safety Meeting once a quarter, taking the opportunity to demonstrate senior management's commitment to safety by delivering a nominated industry and base related theme.

### Toolbox Talk Meetings

Toolbox talk meetings shall be conducted prior to the commencement of all operations where the task(s) to be conducted are discussed by all parties involved, in relation the Picture Based Risk Assessment/Risk Assessment Method Statement (RAMS) specific for the job. In conjunction, a Last-Minute Risk Assessment (LMRA) using the S.L.A.M (Stop, Look, Assess, Manage) tool (QH-FO-057) shall be completed using GOARC, where additional hazards related to the task are identified and controlled. All persons in attendance are to affix their digital signature to the S.L.A.M LMRA indicating that the task is fully understood.

### Safety Stand Down Meetings

Safety Stand Down meetings are conducted at 10:00h and 14:00h to refocus the teams during the first and second half of their shift. The Safety Stand Down meeting times are subject to the intensity of the operations, however, the QHSSE Advisor at each station should try to maintain the times as far as practical.

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The QHSSE Advisor present shall give a safety share related to a relevant safety topic and minute the Safety Stand Down meeting. All persons in attendance are to affix their digital signature to the Toolbox Talk Attendance Form (QH-FO-013) on GOARC.

### Monthly Safety Committee Meeting

Monthly safety committee meetings shall be held with representatives of the Operations team, the Operations Manager/Base Manager, and all other interested parties. At the meeting, the health, safety, or environmental concerns of the operations representative shall be recorded and addressed by the relevant authorities.

The meeting minutes shall be recorded by the QHSSE Coordinator or a designated party using the QHSSE Meeting Minutes form and shall be sent to all attendees before the following monthly meeting is convened.

### Notice Boards

Notice Boards shall be updated and managed by the designated QMS Advisor with relevant QHSSE information related to Policies, Procedures, Incidents, Monthly Theme information, O&I safety report awardees recognition, QHSSE posters, Lessons Learned related to incidents and other learnings, Health information, Memos, Emergency Response information, etc.

Notice Boards shall be used to communicate relevant QHSSE information across the Shore base at all levels and to contractors and visitors.

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## Other Means of Communication

GOARC and GYSBI's SharePoint Online platform shall be used for document retention, where applicable.

Lessons Learned reports shall be prepared in relation to learning from past and recent incidents and other events. It shall cover specific topics, what went wrong, what was learned and how reoccurrences can be prevented. These shall be presented at various QHSSE Meetings and discussed during toolbox sessions.

Themed Posters shall be prepared in relation to Monthly QHSSE Theme information and shall be posted around the Shore Base at various locations, for the assigned period for which it covers.

Emails shall be used to communicate relevant QHSSE information across the Shore base at all levels and to contractors and visitors. They shall be used to inform the relevant persons of notice of failure, give updates, share instructions, guidelines, or documents etc.

QHSSE Safety Inductions shall be conducted with all new personnel, Contractors and Visitors where all relevant QHSSE information shall be conveyed to same so that all are made aware of the on-site requirements and routes.

Inductions shall be conducted online or via scheduled meetings where questionnaires are issued at the end of the process to evaluate understanding of key points. These documents shall be filed and kept by the QHSSE department and soft copies shall be uploaded to SharePoint Online Records, for the prescribed retention period.

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## External Communication

External communication with interested parties, includes members of the community, media, and the client. Communication with the client takes multiple forms, including written correspondences, meetings, and presentations.

Weekly IMM meetings are held with the client to present statistical reports on incident trends, O&I participations, lessons learned, key performance indicators (KPIs) and other QHSSE related matters.

Additionally, initial notifications and investigation reports for incidents which occur at the Shore Base and Annex are sent to Exxon representatives by way of emails, to notify them of these events.

Communication with members of the community and other members of the public, is controlled by the Public Relations department. Complaints made by community members, are inputted into a log which is retained by the PR department. However, investigations of the complaints are done and reported on by the QHSSE department.

## Document Retention/Management

Soft copies of Toolbox Talk Attendance, Meeting Minutes, Lesson Learned reports along with all other electronic forms of QHSSE communication shall be retained on GOARC and GYSBI's SharePoint Online Platform where applicable.

Hard copies of these communications shall also be kept and filed by the QHSSE Department for a minimum of one year or for a period specified by the QHSSE Manager/ Supervisor. They shall then be archived in the QHSSE storage container beyond this period.

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	21 Nov 2018	-	Initial release of document
2	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
3	23 Jan 2022	Kurt Busuttill	Document name changed and revised to compliance with Clause 7.4 of ISO 45001.
<b>4</b>	28 Oct 2022	Kurt Busuttill	Document was amended to include a procedure for external communications and the use of GOARC.  Updated Document Number

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## 1. SCOPE

This Policy represents the QHSSE Department's positions regarding the retention and disposal electronic and printed records. This policy applies to all physical records and electronic documents generated and received by the QHSSE department, but it does not apply to files and records of other departments of the Company.

## 2. PURPOSE

The purpose of this policy is to ensure that the necessary records of the QHSSE Department are adequately protected and maintained until such time that records are no longer needed by the department and are discarded in the correct way and at the right time.

## 3. RESPONSIBILITY

### QHSSE Supervisor

The retention schedule under Appendix A provides the retention period for all records owned by the QHSSE Department. The QHSSE Supervisor shall oversee the administration of this Policy and the implementation of processes to ensure the retention schedule is followed and make modifications to the retention schedule to ensure compliance with local legislation.

### QHSSE Supervisor/QHSSE Officer (QMS)

The QHSSE Supervisor and QHSSE Officer (QMS) shall be responsible for keeping track and assigning records to be destroyed based on the record retention schedule (Appendix A). The QMS Officer shall ensure that all records are shredded before being disposed of via the Company's regular garbage disposal system.

## 4. SUSPENSION OF RECORD DISPOSAL

It shall remain the right of the QHSSE Department to suspend the disposal of all records and documents for legal requirements and audits.

## APPENDIX

## Record Retention Schedule

Document Type	Soft Copy			Hard Copy	
	Electronic	Scanned	Duration	Printed	Duration
QHSSE Daily Report	✓	✗	5 Years	✗	N/A
QHSSE Monthly Report	✓	✗	5 Years	✗	N/A
QHSSE Daily Supervisor Handover	✓	✗	5 Years	✗	N/A
QHSSE Team Lead Handover	✓	✗	5 Years	✗	N/A
QHSSE Supervisor End of Shift Handover	✓	✗	5 Years	✗	N/A
QHSSE Daily Monitoring Report	✓	✗	5 Years	✗	N/A
QHSSE Weekly Safety Meeting Minutes and Attendance	✗	✓	5 Years	✓	2 Years
QHSSE Daily Pre-tour Meeting Minutes	✓	✓	5 Years	✓	2 Years
– QHSSE Daily Pre-tour Meeting Attendance	✗	✓	5 Years	✓	2 Years
QHSSE General All Hands-on Safety Meeting	✓	✓	5 Years	✓	2 Years
– QHSSE General All Hands-on Safety Meeting Attendance	✗	✓	5 Years	✓	2 years
Hazard Hunt Report	✓	✗	5 Years	✓	2 Years
– Hazard Hunt Attendance Sheet	✗	✓	5 Years	✓	2 Years
Return to Work Induction Attendance	✗	✓	5 years	✓	2 Years
Incident Investigation Report	✓	✗	5 Years	✓	5 Years
– Initial Notification	✓	✗	5 Years	✓	5 Years
– QHSSE Incident Witness Statements	✗	✓	5 Years	✓	5 Years
QHSSE Site Inspection Checklist	✗	✓	5 Years	✓	2 Years
QHSSE Fire Extinguisher Checklist	✗	✓	5 Years	✓	2 Years
Fire Extinguisher Report	✗	✓	5 Years	✓	2 Years
Fall Protection Equipment Checklist	✗	✓	5 Years	✓	2 Years
Food Hygiene Checklist	✗	✓	5 Years	✓	2 Years
Resident Building Inspection Checklist	✗	✓	5 Years	✓	2 Years
QHSSE Office Inspection Checklist	✗	✓	5 Years	✓	2 Years
QHSSE Induction Checklist	✗	✓	5 Years	✓	2 Years
Journey Management Plan	✗	✓	5 Years	✓	2 Years
– QHSSE Truck and Trailer Inspection Checklist	✗	✓	5 Years	✓	2 Years
Confined Space Entry Certificates	✗	✗	N/A	✓	2 Years

Work Permit Forms	x	x	N/A	✓	2 Years
– Job Safety Analysis 1 (JSAs for all jobs requiring permit to work)	x	x	N/A	✓	2 Years
– Permit to Work Audit Sheets	x	x	N/A	✓	2 Years
– Electrical Isolation certificate	x	x	N/A	✓	2 Years
– Mechanical Isolation certificate	x	x	N/A	✓	2 Years
– MEWPs Rescue Plan	x	x	N/A	✓	2 Years
– Maintenance Job Sheet	x	x	N/A	✓	2 Years
Observation and Intervention Cards	x	x	N/A	✓	2 Years
Weekly O & I Award of the Week	✓	x	5 Years	✓	2 Years
Job Safety Analysis 2	x	✓	5 Years	✓	2 Years
Registers/Trackers/Logs	✓	x	Permanent	x	N/A
Policies/Procedures/Plans	✓	✓	Permanent	✓	Permanent

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	12 Sep 2020	Michael James	Initial release of document
2	17 Sep 2021	Kurt Busuttil	QHSSE Manager designation removed
3	07 Jul 2022	Kurt Busuttil	Updated Document Number

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## 1. SCOPE & PURPOSE

GYSBI's Management System covers the delivery of Shore Base Services, Logistics and Industrial Park Services in Guyana. The application of the Quality Health, Safety Security & Environment (QHSSE) Management Plan is based on relevant Occupational Safety & Health, and Environment criteria, standards, and performance. It aims at providing a method to access and improve performance in the prevention of workplace incidents and accidents, throughout the effective management of hazards and risks in the workplace.

This Plan applies to all Employees, Contractors, Vendors, and Visitors associated with operational activities at GYSBI Port Facility and GYSBI Industrial Estate (GIE).

## 2. DOCUMENT REFERENCES:

### Internal References

#### Policies:

- QH-PO-001 – QHSSE Policy
- QH-PO-002 – Smoking Policy
- QH-PO-003 – COVID-19 Guidelines
- QH-PO-004 – Cellular and Wireless Devices in the Workplace
- QH-PO-005 – Hazardous Substances Staging Policy
- QH-PO-006 – Fitness to Work Policy
- QH-PO-007 – Drug, Alcohol and Contraband Policy

#### Procedures/Plan:

- QH-PR-001 – Investigation – Reporting Procedures
- QH-PR-002 – Permit to Work (PTW) Procedure
- QH-PR-003 – Simultaneous Operations Procedure
- QH-PR-004-A/B – Simultaneous Operations Procedure-SIMOPS Matrix-Forms A & B
- QH-PR-005 – Working at Height Procedure
- QH-PR-006 – Management of Change Procedure
- QH-PR-007 – QHSSE Communication Procedure
- QH-PR-008 – Shore Base Entry and Exit Procedure
- QH-PR-009 – Risk Assessment Procedure
- QH-PR-010 – QHSSE Reporting Procedure
- QH-PR-011 – Monitoring Tool Flowchart
- QH-PR-012 – Permit to Work (PTW) Audit Flowchart
- QH-PR-013 – Medical Response Flowchart
- QH-PR-014 – Audit Procedure
- QH-PR-015 – Contractor Site Assessment Procedure
- QH-PR-016 – Site Induction Procedure

- QH-PR-017 – Confined Space Entry Procedure
- QH-PR-018 – QHSSE Documentation Retention Procedure
- QH-PR-019 – PPE Procedure
- QH-PR-020 – Dropped Object Prevention Scheme Procedure
- QH-PR-021 – Waste Management Procedure
- QH-PR-022 – Employee Health Assessment Procedure
- QH-PR-023 – Bomb Threat Procedure
- QH-PR-024 – Annex Entry Exit Procedure
- QH-PR-025 – Drone Management Procedure
- QH-PR-026 – Control of documented Information
- HR-006 Career Progression Procedure
- HR-019-Fair Play Guide
- Supplier Evaluation Questionnaire-Service QH-FO-080
- SC-003-Tender Procedure for Services
- SC-018-Vendor Management Procedure for Goods and Services.
- OP-044-Manual Handling Procedure
- QH-018-Hand Tools (Powered) Procedure
- OP-041 – Journey Management Procedure
- OP-016-Lifting & Hoisting Procedure
- OP-045 – Lifting Colour Code Chart
- OP-014-Chain Saw Usage Procedure
- OP-015-Circular Saw Usage Procedure
- OP-050-Container Stacker Operating Procedure
- OP-030-Crane Pallet Fork Procedure
- OP-028-Crawler Crane Operating Procedure
- OP-021-Forklift Truck Procedure
- OP-002-Fuel Truck Procedure
- QH-012-Hand Tools (Non-Powered) Procedure
- QH-018-Hand Tools (Powered) Procedure
- OP-012- Impact Driver Procedure
- OP-016-Lifting & Hoisting Procedure
- OP-10-Minibus Usage
- OP-027-Mobile Crane-Rough Terrain & All Terrain Procedure
- OP-013-Pressure Washer Operating Procedure
- OP-020-Rigging Loft Procedure
- OP-031-Truck and Trailer Procedure
- OP-023-Truck Loading & Unloading Procedure
- OP-025-Vehicle Pre-Use Inspection Procedure
- OP-003-Water Truck Procedure
- OP-032- Lifting Categorization Procedure
- HR-018-Disciplinary Policy (used in conjunction with HR-019-Fair Play Guide).

**Standing Instructions:**

- QH-SI-001 – S001 – Requirement for Banksman
- QH-SI-002 – S002 – Use of Cones to Demarcate Red Zones at the Main Base & Annex
- QH-SI-003 – Isolation Authorities Standing Instructions
- QH-SI-003 – S003 – Isolation Authorities
- QH-SI-004 – S004 – Alcohol Testing

### **Emergency Response Procedures:**

- QH-EXT-001- Fuel Transfer – External ERP
- QH-EXT-002 – Fuel Farm – Operations External ERP (SOL)
- QH-PL-001 – Staff house ERP
- QH-PL-002 – Emergency Response Strategy
- QH-PL-007 – Fuel Farm – GYSBI Operations ERP
- QH-PL-008 – Wash Bay – ERP
- QH-PL-009 – Fuel Farm – SOL Pipeline ERP
- QH-PL-010 – Station Bill
- QH-PL-011 – Green Acres ERP
- QH-PL-012 – Annex ERP
- QH-PL-013 – Station Bill \_ Annex
- QH-PL-014 – WINSOR ERP
- QH-PL-015 – Shorebase ERP

### **QHSSE Plans:**

- QH-PL-003 – Environmental Management Plan
- QH-PL-004 – GYSBI Port Facility Security Plan
- QH-PL-005 – Traffic Management Plan

### **External References**

- Occupational Safety & Health Act #32,1997
- Maritime Administration Regulation-Guyana Shipping Act, 1997
- Environmental Protection Act, 1996
  - Environmental Protection (Authorisation) Regulations 2000
  - Environmental Protection (Hazardous Waste Management) Regulations 2002
  - Environmental Protection (Water Quality) Regulations 2000
  - Environmental Protection (Air Quality) Regulations 2000
  - Environmental Protection (Noise Management Regulation)
- Guyana Energy Agency Act (Petroleum and Petroleum Products) Regulations 2004
- Pesticides and Toxic Chemicals Control Act 2000
- ISO 45001 – Occupational Health and Safety Management Systems Standard
- ISO 14001 – Environmental Management Systems

### 3. DEFINITION AND TERMINOLOGY

TERM	DEFINITION
Management	Senior representatives with decision making responsibilities at a general management level, or a direct report to the General Manager, or anyone with line management responsibilities within the Base.
ALARP	As Low as Reasonably Practical
Hazard	A situation with potential for human injury, damage to property or the environment, discharge of potential pollutants into the environment.
Hazard Identification	Hazard identification is the process used to identify all the possible situations in the workplace where people may be exposed to injury, illness, or disease
Injury	Means damage or harm done to or suffered by a person or thing
Investigation	A systematic examination of an event and its cause/contributing factor to person, plant, materials of the environment
Risk	Event or condition involving exposure to a hazard.
Risk Control	Risk control is the process used to identify all practicable measures for eliminating or reducing the likelihood of injury, illness or disease in the workplace, to implement the measures and to continually review the measures in order to ensure their effectiveness
KPI	Key Performance Indicators is a measurable value that demonstrates how effectively a company is achieving key business objectives.

## 4. ORGANIZATION

### 4.1. QHSSE OBJECTIVES & CONTRACTUAL KPIS

Management Review Meetings are conducted bi-annually with key personnel, and the corresponding actions from this review are entered in the [Management Review Log](#). Actions generated from the Management Review Meetings are tracked for completion by the stated timeline. It is the responsibility of the various Managers who are assigned actions from the review to ensure closure of these actions by the stated time. The QHSSE Manager/Supervisor shall regularly review the log and follow up with the respective Managers. Where an action is overdue, this will be escalated to Top Management.

Esso Exploration and Production Guyana Limited (EEPGL) is GYSBI's main client that manages GYSBI's QHSSE performance via the Contractual key performance indicators (KPIs).

#### Indicators

GYSBI OBJECTIVES	2022 TARGETS
Fatality	0
LTI	0
Days Lost	0
Restricted Work Case	0
Medical Treatment	0
O&I Card Reporting	10% increase from 2021
LTIFR (Lost Time Injury Frequency Rate)	0
Weekly Safety Meetings	52
HSE Audit (HSE MS, ISO 45001)	As per audit schedule
Worksite Monitoring	Daily

GYSBI reports on its performance on a weekly basis at the Interface Management Meeting (IMM) Meeting and in the [Monthly KPI - Contractual key performance indicators report](#).

## 4.2. RESPONSIBILITY MATRIX

<b>Responsibility Matrix Legend:</b> R = Responsible for performing the action A = Accountable to ensure action happens Only one A in case of more R C = Consulted during the action I = Informed after the action has been completed	<b>BOD/ GM</b>	<b>Ops Manager &amp; BMs</b>	<b>HR Function</b>	<b>QHSSE Function</b>	<b>Other HODs</b>	<b>Employees</b>
Establish, implement, and maintain QHSSE Policy	A	R	C	R	C	I
Assign and communicate the responsibilities and authorities for relevant roles within the organization	A	R	R	C	C	I
Establish, implement, and maintain process for consultation and participation of workers in QHSSE Management System	A	R	C	R	C	I
Determine and assess risk and opportunities that are relevant to the intended outcome of the QHSSE Management System. Implement Management of Change (MoC) procedures.	A	R	C	R	C	C
Establish, Implement, and maintain process for hazard identification that is ongoing and proactive	A	R	I	R	C	I
Maintain and retain up-to-date documented information on GYSBI's legal requirements.	A	R	R	R	R	I
Provide resources needed for the establishment, implementation, maintenance, and continual improvement of GYSBI's QHSSE Management System.	A	R	C	R	R	I
Establish competencies for each role; ensuring workers are competent and system in place to acquire competence; retain competence records.	A	R	R	R	R	C
Establish, implement, and maintain internal and external communication relevant to QHSSE Management System.	A	C	C	R	C	I
Establish and maintain Document Control Procedures for QHSSE Management System	A	C	C	R	C	I

Establish, implement, and maintain procedure to control the procurement of goods and services to ensure it conforms to QHSSE Management System.	A	C	C	C	R	I
Establish, implement, and maintain procedures to ensure contractors comply with GYSBI's QHSSE Management System.	A	R	I	R	C	I
Establish, Implement, and maintain Emergency Response Procedures commensurate with operational risks.	A	R	I	R	C	I
Establish, Implement, and maintain Procedure for monitoring, measurement, analysis, and performance evaluation of QHSSE Management System.	A	C	I	R	C	I
Conduct Internal audits at planned intervals to evaluate QHSSE Management System.	A	C	C	R	C	I
Review organization's QHSSE Management System, at planned intervals, to ensure suitability, adequacy, and effectiveness.	A	R	C	R	C	I
Establish, implement, and maintain procedures including reporting, investigating, taking action, to determine and manage incident and nonconformities.	A	R	C	R	C	I
<p><b>RACI matrix rules and roles</b></p> <p>The RACI model brings structure and clarity to describing the roles that stakeholders play within a project. The RACI matrix clarifies responsibilities and ensures that everything the project needs done is assigned someone to do it.</p> <p>The four roles that stakeholders might play in any project include the following:</p> <p><b>Responsible:</b> People or stakeholders who do the work. They must complete the task or objective or make the decision. Several people can be jointly Responsible.</p> <p><b>Accountable:</b> Person or stakeholder who is the "owner" of the work. He or she must sign off or approve when the task, objective or decision is complete. This person must make sure that responsibilities are assigned in the matrix for all related activities. Success requires that there is only one person Accountable, which means that "the buck stops there."</p> <p><b>Consulted:</b> People or stakeholders who need to give input before the work can be done and signed-off on. These people are "in the loop" and active participants.</p> <p><b>Informed:</b> People or stakeholders who need to be kept "in the picture." They need updates on progress or decisions, but they do not need to be formally consulted, nor do they contribute directly to the task or decision.</p>						

## 5. QHSSE MANAGEMENT SYSTEM

### 5.1. CONTEXT OF THE ORGANIZATION

#### Activities & Scope:

Guyana Shorebase Inc. (henceforth referred to as GYSBI) was established in 2017 primarily to provide Shorebase support to Oil and Gas Exploration and Production companies Operating in Guyana.

The success and reputation of GYSBI can be measured by the high standing of its customers. A policy of continuous self-appraisal and attention to detail has helped GYSBI to continue to expand its services.

As part of this policy, GYSBI has established a Management System to demonstrate its ability to provide a consistent service that meets customer and relevant statutory and legislative requirements.

This enables GYSBI to address and achieve customer satisfaction through the effective application of the systems including processes for continuous improvement and the prevention of non-compliance.

**GYSBI's Management System covers the delivery of Shore Base Services, Logistics and Industrial Park Services in Guyana.**

#### Issues, Stakeholders and SWOT

Issues		Interested Parties	
Internal	External	Internal	External
<ul style="list-style-type: none"> <li>• Size and complexity</li> <li>• Resources</li> <li>• Strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Legal Requirements</li> <li>• Competition</li> <li>• Social &amp; Economical</li> <li>• Technological Advancements</li> </ul>	<ul style="list-style-type: none"> <li>• Employees</li> <li>• Directors</li> </ul>	<ul style="list-style-type: none"> <li>• Customers</li> <li>• Contractors</li> <li>• Suppliers</li> <li>• Regulators (EPA, GRA, Labour Ministry, Fire Department, etc.)</li> <li>• Certification bodies</li> <li>• Shareholders</li> <li>• Insurance Companies</li> <li>• Community</li> <li>• Media</li> </ul>

Strengths	Weaknesses	Opportunities	Threats
<i>What is done better than anybody else in the immediate market?</i>	<i>What we need to improve?</i>	<i>What can we do to improve our revenue or market share?</i>	<i>What external factors should we worry about?</i>
<ul style="list-style-type: none"> <li>• Largest market share in the country for Shorebase Services, OCTG handling and care.</li> <li>• Reputable and regarded as a premium service provider.</li> <li>• Largest available asset list (lifting equipment) to support demand.</li> <li>• Strong management &amp; financial backing.</li> </ul>	<ul style="list-style-type: none"> <li>• Workforce competency.</li> <li>• Processes are a bit labour intensive.</li> <li>• Transformation of data into business insights.</li> <li>• Environmental Perception.</li> </ul>	<ul style="list-style-type: none"> <li>• Expand the services to include other OCTG related services, logistics services.</li> <li>• Diversification of services.</li> <li>• Create more market exposure in surrounding countries – visits, exhibitions etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Competitors can venture into.</li> <li>• Obtaining permits is a lengthy process. May impede development plan.</li> <li>• Global O&amp;G Market</li> <li>• Regulations and Legislations</li> <li>• Socio-Economic Constraints</li> <li>• Political Factors</li> <li>• Local Infrastructure</li> </ul>

The QHSSE function provides expertise and support for GYSBI Operations at the Shorebase & GIE. QHSSE performance is subject to regular review by the Board of Directors and Client(s). All employees at GYSBI have a direct reporting line structure to the General Manager who is ultimately accountable for QHSSE Performance at GYSBI.

## 5.2. LEADERSHIP AND EMPLOYEE ENGAGEMENT

GYSBI's QHSSE Policy (QH-PO-006 QHSSE Policy) emphasizes that GYSBI is committed to delivering a high standard of service to its customers of which QHSSE is an integral part of this goal. As such, Leadership & Management is committed to:

- Protecting and continually improving health, safety, and security of employees.
- Adhering to all applicable standards, statutory and regulatory requirements
- Continually improvement in the functioning and performance of the QHSSE Management System.
- Assessing all identified risk to quality, health, safety, security, and the environment to eliminate or minimize the risks to ALARP.

- Consulting with employees on issues related to occupational health and safety.
- Minimizing impact to the environment via reduction of pollution and emissions, and the reduction and recycling of waste where applicable.
- Engaging competent employees and encouraging an atmosphere of learning and development in QHSSE.

GYSBI's QHSSE Policy places a duty on all staff to implement the QHSSE Management System in the performance of their duties. In addition, the Leadership Team shall foster an operating environment where every worker, contractor, visitor, or client rep. feels empowered to stop the job if they deem the work unsafe, in any way. This is reinforced by the Line Management Team as they demonstrate their responsibility to lead in QHSSE, leveraging the support of the QHSSE Team.

GYSBI shall implement and maintain a Balance of Consequence where all employees are justly accountable for their actions. This is highlighted in GYSBI's Fair Play policy where negative behaviour is corrected, and positive behaviour rewarded. This Policy is applicable to both Management/Supervisor and Employees.

GYSBI Leadership/Management shall engage employees via any of the forums listed in Section 5.4.3 – Communication. Leadership will engage staff on QHSSE related matters. In addition, Leadership/Management will participate in QHSSE focused walkthroughs to validate compliance with QHSSE objectives, rules, regulations, and performance regulations. In addition, Leadership/Management shall also solicit feedback from the workforce from the forums listed in Section 5.4.3 – Communication and via employee engagement surveys.

GYSBI Leadership/Management shall ensure QHSSE budget and staffing is sufficient to support the performance expectations of the organization.

- Reference: QH-000-QHSSE Policy & HR-019-Fair Play Guide

## **5.3. PLANNING AND ASSESSMENT**

### **5.3.1. PLANNING**

QHSSE shall be involved in shaping the strategic direction of the company as this is a major area of focus at all levels of the organization. As such, QHSSE is considered in all business decision from the Board Level to the shop floor. This is critical in order to adequately assess risk and develop programs to ensure regulatory compliance, injury prevention & to fulfil client obligations. QHSSE Planning in the initial stages and Management of Change (MoC) will allow GYSBI to develop appropriate solutions for risk elimination and/or the most effective control measures.

- Reference: QH-PR-006 Management of Change Procedure

## 5.3.2. LEGAL REQUIREMENTS AND REGULATIONS

GYSBI Senior Management shall implement processes to ensure that its Personnel, Vendors and Sub-Contractors, while on GYSBI premises, are fully informed of and comply with all applicable laws or regulations and statutory requirements while performing all activities within GYSBI premises.

## 5.3.3. RISK MANAGEMENT

The identification and communication of hazards is the responsibility of all personnel who access within GYSBI Base controlled areas. Management shall ensure that hazards with potential to harm personnel are identified, risk assessed and controlled to reduce the risk to ALARP.

Risk Assessment framework is in place to provide for the efficient assessment of risks and allow for the implementation of controls commensurate with the level of risk identified. GYSBI provides a range of tools to assist in the identification of hazards prior to commencing a task, including Risk Assessment Method Statement (RAM), Last Minute Risk Assessment (Stop Look Assess & Manage – SLAM) & Job Safety Analysis (JSA).

Hazards and risks identified through other means such as:

- Throughout the course of a work activity
- During workplace inspections
- During pre-start inspections of equipment
- Through incident analysis
- During auditing activities
- Walk-through safety inspections

Identified hazards or risks are reported, assessed, communicated, and controlled in accordance with GYSBI Procedures.

All potential hazards related to Shore Base and the GIE operations to be performed by company shall be systematically identified, the risks assessed, and appropriate controls and actions implemented by:

- Developing and maintain hazard identification and risk assessment procedures and criteria (Risk Analysis)
- Identifying hazards and risks and eliminating/controlling these to a level, which can be demonstrated as being ALARP, in the following order of preference:
  - Eliminating or minimizing hazards by engineering design.
  - Providing safe working procedures along with the necessary training to minimize exposure to remaining hazards.
  - Providing personal protective equipment.
  - Systematically reviewing all operations to identify hazards and risks

- Documenting the process of hazard identification, assessment of risk, selection of controls and records of implementation.

RAMS & SLAM will be conducted prior to commencement of operations at GYSBI Facilities. RAMS & S.L.A.M is carried out on an ongoing basis and to be effective it is essential that all employees co-operate wherever they can in the RAMS & SLAM to ensure the assessment accurately reflects the process, which is undertaken. RAMS will be done prior to the job and will be available for review in the SLAM discussions as a reference document. SLAM will be done digitally via the GO-ARC QHSSE Platform. Contractors not signed onto the GO-ARC system can complete SLAM via paper-based format and submit same to QHSSE Reps.

Third Party Contractor shall accurately complete the JSA for the specific job/task and shall use same to apply for the correct permit for the job. The QHSSE Rep. shall review the JSA that the Contractor(s) submit before the permit is issued to the respective contractor.

- Reference: QH-PR-009 Risk Assessment Procedure

GYSBI shall develop and maintain a Risk and Opportunities Register that identifies and records the significant QHSSE risks affecting different areas of the business so that same can be managed. In addition, the Risk and Opportunity register will allow GYSBI to assess the risk in context with the overall strategy and help record the controls and treatments of those risks. Opportunities identified from the assessment will be used to drive continual improvement.

- Reference: Risk Register – see link ([Risk Register 2-Reviewed.xlsx](#))

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### 5.3.3.1.TASK SPECIFIC HAZARD PREVENTION

#### Permit to Work ('Work Permit')

The Permit to Work reporting is in accordance with the relevant Control to Work Procedure and forms to be used are there enclosed. The objectives of the Permit to Work System are:

- To ensure the proper authorization of designated work, whether of a specific nature or in a restricted hazardous area.
- To ensure that personnel carrying out the work are informed of the exact nature of the job, relevant possible hazards, and the limitation placed on the performance of the task.
- To ensure that the person in charge of the area in which the work is taking place is informed of the nature of the work being undertaken.
- To ensure that there is traceable and editable record of the type of work being carried out, and that checks have been made by a QHSSE Team Member.
- To provide a hand back procedure which ensures that work has been completed, and that the work site had been checked and left in a safe and operational condition.
- A bridging document shall be developed by Client and GYSBI to avoid any interference in the Permit to Work System implementation. This procedure shall be implemented for all the operation performed by GYSBI Personnel and Third-Party Contractors on the Shore Base and GIE.

A work permit authorizes specific works to be conducted in a restricted area. This serves as a record that steps have taken to ensure safe working conditions at the location.

Application for Work Permit shall be made prior to the commencement of the work activity. All conditions on work permit shall be completely met before the start of any activity.

All third-party permits will be obtained by sub-contractors. If the contemplated work involves any change, addition, or simultaneous work, it will be coordinated between GYSBI Base Manager, Client, and Sub-Contractor.

#### General Requirement

Before the commencement of any activity in a restricted area, a Work Permit is necessary. The work at site must be performed according to the instructions and precautions mentioned in the Work Permit.

The Authorizing Authority/QHSSE has the responsibility to stop the work any time and advise the performing authority that the safety situation on the job does not meet the condition of the Work Permit.

Performing Authority copy of the Work Permit shall always remain on the job site for the duration of the activity pointed out in the Work Permit. Where an incident or emergency occurs, the Work Permit will be withdrawn immediately, pending confirmation to recommence work.

Administration of Work Permit procedures shall follow GYSBI safety requirements.

## Hot Work

Hot Work Permits are generally applied to any type of work which involves actual or potential sources of ignition and work for which there may be a risk of a fire and/or explosion or which involves the emission of toxic fumes from the application of heat.

Hot Work Permit shall include, but not be limited to the following:

- Burning
- Welding
- Cutting
- Heating
- Grinding
- Needle gunning
- Working on live electrical equipment or the use of portable combustion engines and electrical power tools.

## Entry Certificate

An entry certificate is issued to specify the necessary precautions to be taken to eliminate dangerous fumes or gases or prevent a lack of oxygen before a person is permitted to enter a confined space.

The certificate shall confirm that the space is free from dangerous fumes or asphyxiating gases.

Precautions shall be specified on the certificate to protect the atmosphere against the ingress of airborne contaminants from adjacent sources.

A Work Permit for entry into confined spaces cannot be issued without the Entry Certificate having been correctly completed.

## Isolation Certificates

An Isolation Certificate is required before any work can be started on process, mechanical or electrical plant or equipment.

An Isolation Certificate is also required where access to the work site is restricted, or its safety is jeopardized by any adjacent plant or equipment.

An activity cannot commence until all the necessary isolation requirements are in place.

## Lock-Out Tag-Out System

The purpose for the Lock-Out System is to make controllers not operative (i.e., circuit breakers, disconnect switches, valves, etc.) or any systems (electrical, steam, hydrocarbon, water, acid, etc.), where the operation of the control device could be hazardous to personnel working on the system.

Hold Tags and Locks are primarily intended to protect the person doing the work from being injured by an inadvertent start-up.

Whenever our employees work on or near equipment and could be injured because of energy in the system, the equipment shall be isolated from its energy sources.

Additional precautions will be taken in conjunction with 'use of hold tag and multiple lock outs' procedure.

- Reference - QH-PR-002 – Permit to Work (PTW) Procedure

### 5.3.3.2. GENERAL HAZARD PREVENTION

#### Manual Handling

Where a manual handling task is required risk assessment shall be completed to identify the hazards. The risk of injury should be assessed for each hazard, and appropriate controls implemented, including manual handling training as appropriate.

Management must ensure suitable powered mechanical plant or equipment and lifting aids are provided to enable personnel to avoid heavy manual tasks.

Employees shall undertake manual handling training as required.

- Reference: OP-044-Manual Handling Procedure

#### Hand Tools

Where personnel are required to use hand tools in the course of their job, they shall be inspected before use to check for damage. Certain hand tools are prohibited from been used on the Shore Base and GIE.

- Reference: QH-012-Hand (Non-Powered) Tools

#### Portable (Powered) Tools

Personnel are required to visually inspect portable tools prior to use. If the tool is broken, cracked, missing parts or worn down, take the tool out of service and report to Supervision.

- QH-018-Hand Tools (Powered) Procedure

## Working at Heights

Management must ensure that all personnel undertaking activities where there is a risk of a person falling from one level to another do so in a controlled manner to reduce the risk of personal injury.

Specific regulations set out certain mandatory methods that are required to control the risk such as fall prevention systems, edge protection, and protection of holes and openings.

- Reference: QH-PR-005 – Working at Height Procedure

### 5.3.3.3. PERSONAL PROTECTIVE EQUIPMENT (PPE)

Personal protective equipment (PPE) comprises a range of clothing and equipment which is worn by employees, contractors, or visitors as appropriate to protect or shield their bodies from workplace hazards.

This document describes the appropriate PPE that each employee, contractor, and visitor shall wear to prevent injury. It describes what is required, when and where it shall be worn.

This document does not address Ionizing Radiation or H2S PPE. Should this or other Hazards arise within GYSBI operations requiring specialized PPE, it will be addressed later and added to this procedure.

It is mandatory for all GYSBI employees, contractors, and visitors to wear PPE as prescribed in this document.

Minimum PPE required consists of:

- Coveralls, or a Hi-Vis Vest and clothing for managers to wear when not having Coveralls
- Hardhat
- Safety glasses with side shields
- Work boots
- Gloves

(Note: The full extent of PPE requirements shall be assessed by carrying out the appropriate TBRA/JSA).

#### **Exceptions**

GYSBI employees, contractors, visitors etc., will not be required to wear PPE inside buildings or enclosed vehicles.

PPE is not required when walking to/from an enclosed motor vehicle to a building provided the parking space is close to the building and not in an operations area.

Emergency response team personnel, Fire Dept, Military & Law Enforcement are exempt from standard PPE when responding to an incident. The PPE requirements will be determined by the On-Scene Commander/QHSSE Supervisor.

Managers, whose typical working location is office are exempt from coveralls but must wear Hi-Vis Vests instead.

All GYSBI employees, including supervisory staff, shall be provided with PPE based on the level of risk. For inclement weather, employees who work outside shall be furnished with waterproof clothing.

Contractor employees are required to wear PPE in the same circumstances as GYSBI employees. At own expense, visitors entering GYSBI facilities are expected to furnish their own PPE.

### **Green Hat Policy**

All GYSBI & contract employees shall wear Green Hats under the following circumstances:

- Where the employee is new to the organization – for a period 6 months.
- All infrequent, short-term visitors e.g., management, VIP's regardless of when they were last on site

Note: Before switching to white hats an assessment shall be carried out by the shift QHSSE Supervisor, where same shall ensure employees understand the site, and are aware of access & egress points, Muster Points, emergency procedures, emergency shutdown points, fire alarms and firefighting equipment.

### **Standards for PPE**

PPE	STANDARD
Footwear	
Safety Boots (steel toed)	ANSI Z41   BS EN 345 -1   EN ISO 20345
Long Boots (steel toed)	ANSI Z41   EN345   EN ISO 20345
Coveralls	
GYSBI Coverall	ANSI 107-2010   EN ISO 20471
Tyvek Suits	ANSI 101-2014   BS EN 465, BS EN 466
Clothing	
Hight Visibility Vest	ANSI 107-2010   EN ISO 20471
Rain Suits	ANSI/ISEA 107 Type O, Class 1
Life Jackets	AS 4758 or ISO 12402
Head and Face protection	
Safety Glasses and Over Glass (clear and dark)	ANSI Z87+   EN 166.1.F

Face Shields	ANSI Z87+   EN 166.1.F
Ear Plugs	ANSI S3.19   EN 352-2
Hard Hat	ANSI/ISEA Z89.1   BS EN 397
Respirators	ANSI Z88
Dust Masks	EN 149
Hand Protection	
General Use Gloves	ANSI 105-2016   BS EN 388
Chemical Resistance Gloves	ANSI 105-2016   BS EN 388
Welders Gloves	ANSI Z49.1   EN 12477
Other Equipment	
Safety Harness	ANSI/ASSE Z359   EN 361, EN 1497, EN 358
Apron	ANSI 103-2010   ISO 13998

- Reference: QH-PR-019 – PPE Procedure

## 5.4. TRAINING, COMPETENCY AND COMMUNICATION

### 5.4.1. TRAINING

#### Site Safety Induction

All personnel working within the Shore Base and the Annex are required to complete the QHSSE Safety Induction. This induction informs participants of minimum safety, environment, and security requirements.

The QHSSE Site Safety Induction Training will be performed on all new arrivals (Employees and Third-Party Contractors) within the first day of arrival on site. The subjects to be covered by the QHSSE personnel shall consist of:

- QHSSE Policy
- Alcohol and Drug Abuse
- Smoking
- Mobile Phone Restriction
- Vehicular Access/Movement/Parking
- Permit to Work System
- Pre-Tour meetings/Toolbox Talks/Weekly QHSSE Meetings
- Observation and Intervention Cards (O&I Cards System)
- Accident/Incident/Near-Miss Reporting System
- Job Safety Analysis
- Personal Protective Equipment Policy

- Lifting Operation/Lifting equipment inspection colour code
- Fire Prevention/Fire Fighting Equipment
- Emergency equipment location
  
- Reference: QH-PR-016 – Site Induction Procedure

## Training Process

Training material and sessions are conducted via the Learning Management System (LMS) online platform and the Onsite training facility. The LMS online platform is used for the introductory and theory-based courses. An assessment is delivered with limited attempts for the employees as an element of their probationary period curriculum. The curriculum and training matrix is developed by the dedicated & certified training instructor in conjunction with the QHSSE team. The training curriculum for personnel vary according to the employee's designation and career progression path.

The Onsite Training facility can accommodate classroom sessions and allows for the facility to be utilized for practical assessments.

Upon completion of theory and practical assessment, personnel training in a capacity for equipment operation such as trucks, forklifts and cranes are required to log their practice hours in their career progression logbook. Practices hours are stewarded by experienced operators with the approval of the training instructor.

- Reference: HR-006-Career Progression Procedure

## 5.4.2. COMPETENCY

The Company's Career Progression Procedure provides the framework for the Company's Internal Competency Program and provides a predefined and structured development plan which maps out how employees can:

- Move from one position to the next aligned with the GYSBI's Progression Matrices
- Develop in their current position to be an expert in the field and function as a mentor (if desired).
  
- Reference: HR-006 Career Progression Procedure

## 5.4.3. COMMUNICATION

Communications among key stakeholders including the clients, contractors and management is facilitated through regular formal meetings. The QHSSE Team shall develop a communication plan to ensure QHSSE information is communicated to all

interested parties. This will be in the form of Monthly Campaigns/Themes of various QHSSE related topics and concepts.

Some examples of communication may include the following:

- Pre-Start Meetings
- Toolbox Meetings
- QHSSE Committee Meetings
- Strategic Risk Review Meetings
- Integrated Management Committee Meetings
- Contract Management Meetings
- Planning Meetings
- Contract Management Meetings
- Operations Meetings
- Email Communication
- Incident Investigation Reports
- Lessons Learned
- QHSSE Posters
- Stand Down Meeting & Interrupters
- Weekly Site Safety Meeting
- Town Hall Meetings
- Safety Committee Meetings
- Quarterly GYSBI Newsletter

External communication of potentially sensitive or legally binding QHSSE information shall follow a review and approval process to ensure the accuracy of the information. Top Management shall review and approve all QHSSE external communications before communication to relevant parties.

#### **5.4.3.1. DOCUMENTED INFORMATION**

QHSSE policies, plans, procedures and standing instructions shall be made available to personnel via the company's SharePoint platform. All documents shall be in alignment and comply with QH-PR-026 – Control of Documented Information.

#### **5.4.3.2. GO-ARC QHSSE PLATFORM**

GYSBI has recently migrated from its former paper based QHSSE Management Systems to an online digital database that will help GYSBI to:

- analyze all system data in real time,
- monitor permit activities,
- connect with employees more easily and,
- respond to and address issues more efficiently.

The entire QHSSE Management System from Incident Investigation to day-to-day pre-use inspection of equipment shall be managed via the online database. This will

provide real time data for Management to make informed decisions about QHSSE at the Shorebase & GIE.

The GOARC platform fully integrates with equipment, software, Internet of Things (IoT), sensors and other sources, enabling remote monitoring and real-time data visualization in a single command centre. The technology-based platform provides data-driven decision-making capabilities with AI-based preventive analytics and insights. A central source of reliable data consolidates information, monitors and tracks workers, equipment, tasks, and maintenance procedures to improve operational performance, enable fast response, and ensure correct actions for an efficient and safe environment.

### 5.4.3.3.OBSERVATION & INTERVENTION CARDS

On the level of commitment in creating a culture of prevention in the workplace in the use of observation and intervention card. Through this system persons actively participates by making reports and suggestions. These are reviewed and implementations are made accordingly.

Observations and interventions (O&I) promote incident/accident prevention in various ways:

- They help workers and supervisors to identify hazards and adopt preventive or corrective measures immediately.
- They provide personal and site-level communication and learning.
- They provide information for company-wide health and safety management.
- They help workers to prevent others from performing tasks in risky ways.

The observation & intervention card is not only available to workers on base. Inducted personnel and senior management are also encouraged to use it.

Any observation that helped to identify a significant hazard, will be awarded, and published on the safety bulletin board. The intention is to promote company-wide learning. O&I cards are entered and managed via the GO-ARC QHSSE Platform.

### 5.4.3.4.CELLULAR & WIRELESS DEVICES USAGE AT GYSBI

The Company is committed to achieving the highest performance in occupational health and safety with the aim of creating and maintaining a safe and healthy working environment. Consistent with this the Company accepts that use of cell phones while operating in a high-risk environment, can create an unsafe condition in which your mind is not on task and therefore a significant hazard.

The purpose of this policy is to help us get the most out of the advantages these instruments offer our company while minimizing distractions, accidents, and frustrations improper cell phone use can cause.

The Guyana Shore Base Inc. (GYSBI) cell Phone workplace policy offer general guidelines for using personal and company phones during work hours in certain locations.

The following are basic guidelines set out by the Company for proper employee, subcontractor, and visitor cell phone while involved in the operations. In general, these cell phone should not be used when they could pose a security or safety risk, or when they distract from work tasks. Specific circumstances include:

- Never use a cell phone while driving.
- Ensure cell phones are not inside the cabs of GYSBI/Contractor operated equipment (eliminating the temptation to use)
- Never use a cell phone while operating equipment.
- Do not use cell phones for surfing the internet or gaming during work hours.
- Avoid using work cell phones for personal tasks.
- Avoid using personal cell phones for work tasks.
- Do not use cell phones during meetings.
- Do not use cell phones to record confidential information.
- Never use cell phones while in an active work zone.

The following guidelines are examples when phones are accepted to be used under the condition it has been approved from Base Manage/Base Coordinator & QHSSE Supervisor:

- Following an incident (and key personnel are required to be contacted)
- Evidence based pictures for investigation purposes
- Evidence based pictures to provide clarity for customers, contractors, client & Management who make this request.
- Limble (software) for pictures to submit a maintenance issues. Note: the documented information that is required to complete a Limble completed whilst in a phone friendly zone.
- References: QH-PO-004-Cellular and Wireless Devices in the Workplace Policy

## 5.5. QHSSE OPERATIONS

### 5.5.1. INCIDENT MANAGEMENT

#### **Incident/Accident/Near-Miss**

The incident/accident/near-miss reporting, and investigation is in accordance with the relevant procedure for GYSBI Operations and the forms to be used are there enclosed. The purpose of the procedure is to:

- Define methods of reporting incidents/Near-Miss and more generally undesired events
- Classify incidents/Near-Miss and determine the levels of investigation
- Implement measures for the prevention of re-occurrences
- Monitor results of prevention methods

Following an internal investigation, the main objective of this document is to prevent that undesired events happen again. The responsibility for incident investigation lies with management and will be assisted by the QHSSE Department. The philosophy behind the event's reporting system is that:

- All accidents/incidents are preventable through a continuous reporting of all the existing hazard conditions and behaviours.
- Safety is everyone's responsibility
- Site management has the responsibility to conduct accurate analysis of the outcomes of this reporting system and take appropriate actions to eliminate the unsafe conditions and avoid re-occurrence.
- Reporting and eliminating unsafe acts and unsafe conditions contributes to safe working site and environment.

The QHSSE Manager shall be responsible for reporting all accidents/incidents/near-misses, personnel injuries, casualties, damages, and fires to Management and Government Authorities (if mandatory by law and/or required by Local Authorities).

Investigation and Reporting shall be implemented as follows:

- In the event of fatal accidents or serious injuries, satisfactory investigation will be carried out by the Base Manager, QHSSE Manager and QHSSE Supervisor and will be reported verbally, being followed by a written report to GYSBI Management.
- All incidents/accidents/near-miss will be reported in writing to GYSBI Management and Client not later than 24 hours.
- QHSSE Monthly reports shall be submitted to GYSBI Management.
- Level of investigation will be determined by assessing the actual hurt level and the potential hurt level by using GYSBI Hurt Matrix and report using specified GYSBI Incident Investigation Form.

Lessons learned from investigations shall be shared and communicated to personnel as per 5.4.3 \_ Communication.

- Reference: QH-002-Investigation - Reporting Procedure

## 5.5.2. EMERGENCY RESPONSE MANAGEMENT

The ultimate focus in responding to emergencies at the Shore Base and GIE is to save lives and or reduce the severity of injuries and environmental damages.

The ER Strategy (QH-PL-002 – Emergency Response Strategy) has been developed to provide overarching guidance on the type of actions to be taken in the individual ER Procedures (see reference list below). The ER Strategy defines the key stages of an ER Procedure, and its general objective is to ensure that all areas of the base have their individual ERPs. GYSBI comprises of a multi occupancy site with various tenants that have their individual Emergency Response Plans. Different Strategic ERP Objectives have been determined for the respective operations and facilities.

The strategy on this site is to:

- **Alert / Activate:** Incident is confirmed, and a local alarm is activated to alert personnel to the incident. On-Scene Commander (OSC) to be alerted and GYSBI ERC informed.
- **Muster & Isolate:** Muster of non-essential personnel to the designated Muster Area(s). Whilst the Muster is occurring, isolation and if appropriate depressurisation/blowdown will be initiated.
- **Control & Evaluate:** OSC to evaluate the incident.
- **Stay at Muster Points:** Until the event is brought under control or evacuate if event itself or escalation requires.

In line with GYSBI's Emergency Response Goals, it is necessary to add definition to turn this ER Strategy into event-specific plans to reflect the individual conditions of the event and the resources of the facility(s) (personnel, equipment, and layout). This has been achieved through the creation of ER Plans for all reasonably foreseeable Major Accident Hazard (MAH) events. Each ER Plan details the actions to be followed for that event in line with the ER Strategy.

It is the responsibility of each member of GYSBI Management, Supervision, and staff to familiarize themselves with the emergency procedures, which apply to the Shore Base and GIE activities.

- References: QH-PR-001 – Investigation – Reporting Procedures, QH-PR-008 – Shore Base Entry and Exit Procedure, QH-PR-013 – Medical Response Flowchart, QH-PR-024 – Annex Entry Exit Procedure, QH-EXT-001- Fuel Transfer – External ERP, QH-EXT-002 – Fuel Farm – Operations External ERP (SOL), QH-PL-001 – Staff house ERP, QH-PL-002 – Emergency Response Strategy, QH-PL-007 – Fuel Farm – GYSBI Operations ERP, QH-PL-008 – Wash Bay – ERP, QH-PL-009 – Fuel Farm – SOL Pipeline ERP, QH-PL-010 – Station Bill, QH-PL-011 – Green Acres ERP, QH-PL-012 – Annex ERP, QH-PL-013 – Station Bill \_ Annex, QH-PL-014 – WINSOR ERP & QH-PL-015 – Shorebase ERP.

### 5.5.3. ENVIRONMENTAL MANAGEMENT

The environment is paramount, therefore GYSBI shall employ all efforts to prevent and take reasonable precaution to avoid contamination or pollution of the working locations or waterways therein, arising out of performance of the work.

Preserving the environment and minimizing project footprints are the prime objectives of GYSBI. GYSBI will carry out all operational activities in line with its environmental management system guidelines.

As part of GYSBI environmental protection requirements, the following are the prime objectives:

- Consider environmental planning in all our operations, addressing risk and opportunities related to environmental aspects, to prevent undesired events, managing potential impacts on the organization and maintaining documented information.
- Adopt the “Plan-Do-Check-Act” philosophy to monitor and evaluate our results, ensuring environmental performance is maintained.
- Determine external and internal environmental conditions that may affect or be relevant to our operations, delivering a strategic response to achieve the intended outcome.
- Provide adequate resources, infrastructure, and knowledge to manage the system and ensure that all personnel are made aware of GYSBI's environmental policy and the implication of not fulfilling our compliance obligations.
- Understand the needs and expectations of clients, customers, and our stakeholders, thus defining our environmental compliance obligations.
- Demonstrate leadership and commitment by ensuring KPIs are set, communicated, and progress is continually monitored to ensure intended outputs.
- Provide and implement a documented environmental management system aligned to our products and services in accordance with international standards.
- Plan changes in accordance with the business needs to achieve our environmental objectives.
- Maintain emergency processes to mitigate any potential adverse environmental impacts from our operations.
- Identify opportunities for improvement implementing the required actions to enhance performance and customer satisfaction.

GYSBI will ensure high standard of housekeeping and materials storage at all project sites as well as residential homes. All areas will be always kept in a clean and neat condition. Effective housekeeping with respect to waste storage/disposal will be included as an item in the routine inspections of the QHSSE Officer.

Collection, storage, and disposal of any hazardous waste generated from GYSBI operational activities will be in line with applicable local legislation.

GYSBI will strictly adhere to all applicable local laws, regulations, and codes of practice relevant to the protection of environment and to incorporate best practice in environmental principles into all GYSBI operational activities.

- Reference – QH-PL-003 – Environmental Management Plan

### 5.5.4. SECURITY MANAGEMENT

GYSBI shall maintain a Security Plan that lays out and explains the various risks and planned responses to situations occurring in and associated with the company operations, including its staff and locations. In addition, GYSBI shall maintain additional procedures (Annex & Shorebase Entry-Exit Procedures) to provide controls that will protect people, property and assets whereby should an undesired event occur GYSBI can account for all people on the Shorebase and Annex.

- Reference: QH-PL-004 – GYSBI Port Facility Security Plan, QH-PR-008 – Shore Base Entry and Exit Procedure & QH-PR-024 – Annex Entry-Exit Procedure

### 5.5.5. TRAFFIC MANAGEMENT

Management of traffic and the movement of mobile plant and equipment is a key component of QHSSE Management at the Shorebase & GIE. All vehicles at GYSBI locations are mandated to follow the designated speed limit – 15 kmph or as specified by non-routine activities, weather, and road conditions. In addition, operators of vehicles carrying loads are mandated to adjust their speed to compensate for the resulting decrease in vehicle road handling and stopping distance. Further, the interface between Pedestrian and Vehicle/Equipment movement shall be adequately controlled. To that end, pedestrian shall use pedestrian pathways where available, cross roadways at right angles, never approach operating mobile equipment without first making positive contact with the operator, or signal from a banksman that it's safe to approach. Further, personnel working in proximity of operating vehicles or Mobile Equipment must adhere to the banksman mandate in QH-SI-001 – S001 – Requirements for Banksman.

All incidents and near miss events must be reported to the Base Manager. When a vehicle or Mobile Equipment breakdown occurs, an attempt must be made to park the vehicle at a safe place. The operator is to inform the Base Manager immediately by telephone. The Base Manager in liaison with QHSSE Manager/Supervisor and Base Coordinator shall arrange recovery in accordance with an approved Recovery Plan.

Journey Management must be done in accordance with OP-041-Journey Management Procedure.

- Reference: QH-PL-005 – Traffic Management Plan, QH-SI-001 – S001 – Requirements for Banksman & OP-041-Journey Management Procedure

### 5.5.6. OPERATION MANAGEMENT

GYSBI QHSSE Management System for operational activities derived directly from the QHSSE Procedures and practices, including QHSSE Management Plan, Procedures, and standing instructions which has demonstrated to be effective through other

similar projects. Once adapted to GYSBI operational activities, these will establish coherent and inclusive program planning, execution, and monitoring for all activity of the Shore Base and GIE Progression.

GYSBI trust that the effectiveness of the QHSSE Management System passes through a consistent planning of the operations. Through this approach, risks connected to the planned operations are identified. Unplanned operation and conditions are always the most dangerous and for this reason they must be avoided.

A proper planning, it is of outmost importance to define a proper and easily identifiable set of plans and procedures. The here below description represents the GYSBI System developed for the Shore Base and GIE projects.

### **QHSSE Procedures/Standard Operational Procedures**

Critically controlled document procedures and standing instructions are develop and maintained for activities crucial to the management of QHSSE at the Shore Base and GIE. These critical activities, procedures and standing instructions are identified in GYSBI Guidance Booklet.

It is important that persons responsible for preparing procedures and work instructions are closely involved with activities covered. Procedures and work instructions are written simply and unambiguously, indicating the persons responsible, the methods to be used and where appropriate, state performance standards and criteria to be satisfied.

### **Lifting Operations**

Each GYSBI site / area, shall have lifting procedures that provide a safe system of work, and that monitor compliance with this practice, local legislation, and site standards, through a robust and rigorous assurance and self-verification system. This shall be managed by competent personnel who are sufficiently trained. As such, all Site Lifting Coordinators (SLCs) shall assure that all direct and related risks identified are effectively managed through risk assessment, planning, execution, and monitoring in accordance with GYSBI risk assessment. In addition, all Departments shall have a system for managing lifting operations ensuring that every lift uses a systematic repeatable process, implementing safeguards, controls and lessons learned and thus avoiding repeat incidents.

All lifting operations shall be categorised as Category 1, Category 2, or Category 3. Category names may be altered to suit established local terminology, but the intent, definition and content shall remain unchanged as minimum requirements; however, the Site Lifting Coordinator may add additional requirement which make the categorization more stringent. Once categorized, this will dictate the level of risk assessment, lift planning, required personnel, training, competence, approval, endorsement, and authorisation that is required. All Category 1 Lifts shall be supported by a Level 1 risk assessment and Category 2 and 3 lifts shall be supported by a level 2 risk.

If there are changes to the expected lifting operation conditions and circumstances, the lift categorization shall be reviewed and if required the approval process repeated. Site Lifting Coordinator shall agree and periodically verify the categorization of Category 1 (Generic) lifting plans / standard operating procedures. Lift categorization is specific to the lifting environment and hence onshore, lift categories differ in approach as per the relevant lift.

Lifting operations shall only be executed with an approved and authorized plan. Lifting Plans shall be developed by a competent person along with input from those involved in the operation, before approval, endorsement, and authorization. The lift plan and accompanying Level 1 or Level 2 risk assessments shall define how the lifting operation will be performed and a safe system of work to be used, including the identification of necessary equipment, personnel, resources, controls, and actions.

Lift plans shall not make use of process pipe work to bear any load and shall consider the deck or ground strength required to carry out the operation safely.

All lifting operations should be planned to ensure that they are carried out safely, and that all foreseeable hazards are identified, and all risks eliminated or mitigated to as low as reasonably practical.

All lifting equipment used shall be certified, examined, and inspected to meet the legal requirements and/or international standards and to ensure safe work conditions.

Planning shall basically contain and consider the following steps:

- Weight of the load
  - Method of lifting
  - Working radius
  - Communication system
  - Selection of equipment
  - Size of the load
  - Selection of appropriate rigging
  - Positions of obstacles
  - Weather conditions
  - Appropriate work permit and lifting plan
- 
- Reference: OP-016-Lifting & Hoisting Procedure/OP-032- Lifting Categorization Procedure.

## Colour Code System

GYSBI's Colour Code System shall be developed and implemented for portable items of lifting equipment used such as slings, shackles, rope wire, belts etc. Colour code bands shall be painted on every piece of lifting gear. The colour shall indicate to the user and the inspector, that an examination has been performed within the prescribed period.

A new colour shall be introduced every six (6) months, with the old colour code being changed out but over fourteen (14) days to allow inspection and new colour coding to be applied. During the change out period (7 days before or 7 days after the changeover date), the two in date colour codes are accepted. From the 7<sup>th</sup> day after the change over date, then only the colour code for the 6 monthly period will be valid.

Any lifting gear that does not have a visible colour band, or where the colour is out of date, should not be used. It shall be returned to store and not use without a thorough examination by a competent person. A Label reporting all colour codes shall be posted on site and in cabins of cranes and fork-lift to inform all workers about the colour in force.

- Reference: OP-045 – Lifting Colour Code Chart

## Demarcation & Barricading

Management will provide requirement for the set-up and maintenance of barricades, that restrict entry and/or provide warning or area that involve hazardous activities, unsafe conditions, or unusual circumstances.

Demarcation shall be maintained for the duration it is in place by either the work crew accountable for the work area, or the person accountable to resolve a reported hazard.

When demarcation is no longer required, all traces of demarcation tape and information tags shall be removed from the area. Retractable demarcation barrier housings may be left in situ when not in use, provided the tape is fully retracted.

- Reference: GYSBI Standing Instruction S/002-Use of Cones to Demarcate Red Zones for further Information.

## 5.5.7. HEALTH MANAGEMENT

### Occupational Safety and Health

GYSBI will assess and manage the exposure of all employees to safety and health hazards associated with its operations; and will ensure adequate medical facilities.

Specific procedures will be implemented to address the safe handling of all hazardous materials. The requirements for procedures will be identified by risk assessments performed by the appropriate responsible Manager or Supervisor.

### Medical Facility

Health and First Aid facilities shall be provided in accordance with the relevant statutory requirements applicable to the company's operation.

Additional on-plant equipment such as stretchers, resuscitations, and eyewash stations will be identified during the risk assessments (health risk assessment/first aid needs assessment) based on the health hazards and the facility layouts.

## Medical Emergency Procedure

The emergency procedure shall address the problems of medical emergencies. Provisions to deal with these emergencies shall be developed in consultation with GYSBI's QHSSE Department and ISOS Emergency Services.

- Reference: QH-PR-013 – Medical Response Flowchart

## Hygiene Inspection

To guarantee the desired level of hygiene, the QHSSE Department shall maintain regular and accurate inspection of:

- Domestic and potable water
- Lunchrooms
- Accommodation
- Toilets and showers
- Drainage
- Disposal of waste materials

Hygiene inspections are organised on weekly basis and findings recorded and communication to relevant department for improvement. These inspections shall be done on the GO-ARC platform and corrective actions identified shall be assigned to the relevant Managers/Supervisors for action.

## Drug, Alcohol-free and Contraband Free Workplace

All personnel are required to undergo a drug and alcohol test prior to commencing work with GYSBI or in GYSBI controlled areas. Personnel must not commence work if they are not fit for duty or if they are impaired by alcohol, illicit drugs, or medication.

All personnel accessing GYSBI base controlled areas shall be subject to the GYSBI alcohol and drug testing program, which incorporates random for cause and for concern testing.

Company Personnel are disqualified following non-compliance with the prohibitions below:

1. Using, possessing, selling, manufacturing, distributing, concealing, or transporting on company or customer property (including off-duty time) any of the following items:
  - a. Any prohibited substance; or
  - b. Contraband, or
2. Being under the influence of any Prohibited Substance.

3. Switching or adulterating any urine, blood, or any other specimen, participating in any attempt to adulterate or substitute a specimen, obstructing the collection or testing process, failing to promptly proceed to a collection site and provide specimens when told to do so, refusing to sign required forms, and failing to cooperate with an inspection.
4. Prohibited from operating a vehicle on behalf of the company or customer while under the influence.
5. While employed or being considered for employment, employees are prohibited from:
  - a. A confirmed Positive for Alcohol or a MRO Positive for drugs, or
  - b. A refusal to test for Alcohol and Drugs, or
  - c. A refusal to submit to an inspection

At any time, company and/or customer may conduct or require an unannounced inspection of company personnel and their property for items that may include prohibited substances or contraband. Inspections may include, but are not limited to:

- a. Clothing, wallets, purses, baggage, lockers, work areas, desks, toolboxes, and vehicles.
- b. Company or customer may authorize inspection specialists, including scent-trained animals to conduct an inspection.
- c. If discovery of Prohibited Substances or Contraband cannot be directly associated with individual company personnel, but can be reasonably associated with a defined group of company personnel (e.g., people who use one change room):
- d. Customers may conduct or require company to conduct an inspection of company personnel group's clothing, wallets, purses, baggage, lockers, work areas, desks, toolboxes, vehicles, and any other designations by customers, and/or
- e. Customers may require company to conduct Group suspicion-based testing of company personnel within this group.

Company personnel in Safety Sensitive positions may only use potentially impairing medication (e.g., Prescription Drug, over-the-counter medication, herbal medicine) under the following conditions:

- a. Medication(s) have been obtained in a manner consistent with applicable laws and regulations
- b. Company personnel have notified company that they will be in possession of, or using, potentially impairing medication(s).
- c. Company's health professional has assessed the capability or fitness of company personnel to perform safety sensitive duties.

GYSBI's Drugs, Alcohol, and Contraband Policy is in place to ensure a safe, healthy, and productive work environment for the employees of the company, customers, and others on company or customer property.

- Reference: QH-PO-007-Drugs, Alcohol and Contraband Policy

## 5.5.8. MANAGEMENT OF HAZARDOUS SUBSTANCES

Management, control, and use of hazardous substance shall comply with all applicable Local and International Safety Laws, supporting QHSSE Standards and Policy, which set out the principles of occupational safety and health in relation to work with all substances whether in a solid, liquid, or gaseous form. The regulations also cover microorganisms. Where do not exist, GYSBI will adopt and apply standards that reflect its commitment to QHSSE Management plan.

All personnel are required to make full and proper use of any control measure and to report any defects. Workers are also required to participate in any health surveillance that may be undertaken.

In developing controls for substance hazardous to health, risks should be reduced to as low as reasonably practicable, applying the following steps:

- Substance elimination
- Engineering controls
- Substitution of hazardous substances or procedures with those that are less hazardous
- Suppression of emissions to reduce dust, mist, or vapor.
- Total enclosure of the process
- Partial enclosure and the use of local extract ventilation (LEV)
- Improved general ventilation
- Reduction of numbers of personnel exposed and the periods of exposure
- Suitable personal protective equipment
- Proper storage
- Appropriate measures to ensure correct spillage prevention and containment
- Adequate facilities for washing to remove risk of contamination
- Correct of number of personnel exposed and the periods of exposure
- Provision and availability of up to date 'Safety Data Sheets'.

Third Parties shall transport, handle all chemicals and radioactive material in a manner suitable for their nature and potential to pollute or cause harm, taking account all liquid, gaseous and solid substances that are to be staged at GYSBI in line with:

- Occupational Safety & Health Act #32,1997
- Maritime Administration Regulation-Guyana Shipping Act, 1997
- Environmental Protection Act 1996
- Pesticides and Toxic Chemicals Control Act 2000
- Environmental Protection (Hazardous Waste Management) Regulations 2000

Third parties are required to provide full documentation to ensure this is always kept legally compliant whilst on GYSBI property. GYSBI shall provide a staging area to accommodate chemical or radioactive deliveries for a period of no longer than 24 hours. Third parties are responsible to protect hazardous substances from rain and sun where necessary.

Secondary containment shall be used for the storage/staging of all Hazardous Substances at GYSBI facilities.

GYSBI will provide the resources to transport the hazardous substances from the staging area to the vessel.

GYSBI will provide an emergency spill response in the event a spill is identified during transportation to and from the vessel, or an unintentional event occurs during staging that impacts the staging area resulting in an uncontrolled release of any hazardous substance.

Any waste from a spillage which is deemed a direct cause of the third party i.e., poor packaging, damaged or leaking containers etc. whilst on the GYSBI site would be taken to a licensed waste treatment facility and recharged back to the third party.

All hazardous substances transported to GYSBI yard, must be stored in secure packages clearly and permanently labelled to include the following information: MSDS (Radioisotope fact sheet for radioactive materials), Name of substance, UN number, Hazard identification, Quantity, SDS number, Manufacturer. The labelling requirements apply to both the outside packaging and any individual units.

Incompatible hazardous substances shall not be stored together such that potentially dangerous reactions could occur, (even when storage is temporary). It is the responsibility of the third party to provide this information within their risk management documentation, along with an emergency response plan for the hazardous substances that would be staged at the GYSBI facility.

Before any hazardous substances are to be allowed on to site, the third-party emergency plan should be supplied ensuring, as a minimum, it clearly identifies the steps to mitigate the risk of the following occurring and provide evidence of the resources to prevent one of the items below becomes a reality.

- Hazardous substance leak where workers could be asphyxiated.
  - Exposure to radioactive materials resulting in ARS or life-threatening diseases.
  - Corrosives substances reacting with metal and damaging buildings or plant.
  - Acute toxic liquids spilling and contacting workers.
  - Workers developing symptoms from long term exposure to carcinogens.
  - Fire and explosion
- 
- References – QH-P0-005 – Hazardous Substances Staging Policy

### **Safety Data Sheets (SDS)**

GYSBI shall maintain an inventory of hazardous materials or substance that are used at the worksite such as:

- Mud and treatment products
- Cement products
- Corrosion protection

- Combustibles
- Solvents and paints
- Compressed gases

GYSBI shall make readily available, for each of these hazardous materials, a safety data sheet (SDS) to reinforce awareness of the risk and knowledge for the control and recovery measures by all concerned.

### **Spill Response at GYSBI**

GYSBI shall endeavour to prevent leaks or spills, and to control them if they do occur. To prevent soil and water contamination from fuel, grease, waste oils and other petroleum products, the following will be implemented to minimize the risk of a spill:

- Inspect equipment's thoroughly for fuel or oil leaks before and after using
- Ensure refuelling of equipment's is done at a designated area and procedure are followed.
- Never fill any tank above the safe filling level
- Level indicators in the tanks
- Float level switches
- Continuous daily monitoring
- Recycling of wastewater
- Berm erected around the perimeter of the wash-bay and generator(s).

Clean-up equipment and absorbent materials are readily available at all emergency station and fuel truck are equipped with spill kit.

#### Spill Assessments & Scenarios – GIE

Fuel/oil spill/leak from forklifts/Trucks/Generators.

The generator, although in a bunded area, is near a waterway. Rainwater overflow or damage to the bund, could result in adverse impacts on the marine environment.

- Overflow of wastewater from tanks and wash-bay drain or leak from wastewater conduit

Damage to the wash-bay bund or overflow, resulting in wastewater seeping into the ground and into the drain, causing soil and water pollution, respectively.

- Overflow of fuel when refuelling forklift/ generators
- Hose from fuel truck fail while refuelling.
- Chemical spill while transporting around the site.
- Chemical spill cause by Schlumberger activities in warehouse.

#### Spill Assessments & Scenarios – Shorebase

- Fuel/oil spill/leak from forklifts/Trucks/Generators.
- Overflow of fuel when refuelling forklift/ generators.
- Leak or spill from stored waste oil containers.

- Fuel leak or spill at the fuel farm.
- Defective secondary containment wall around waste oil storage sites.
- Hose from fuel truck failure while refuelling.
- Chemical spill during chemical load out on the wharf.
- Chemical spill while transporting around the site.
- Chemical spill caused by Schlumberger activities in warehouse.

The collection, storage, transport, treatment, and disposal of waste from a clean-up will require a significant logistics effort and must be managed in compliance with local Regulations and QH-PR-21-Waste Management Procedure.

- References: QH-PL-012-Annex ERP, QH-PL-015-Shorebase ERP & QH-PR-21-Waste Management Procedure

### 5.5.9. INSPECTION OF SAFETY EQUIPMENT

GYSBI is strongly committed to apply procedures to ensure the safe conditions of equipment in use in the workplace. It applies to all equipment used by personnel, and it covers the safe handling maintenance, storage, and use.

A list of common types of equipment to which the requirements apply comprises:

- Fire extinguishers
- Eye wash stations
- First Aid Kit
- Vehicle safety equipment
- Spill kits
- Oxygen tanks
- AED
- Air Horn
- Oxygen Cylinders
- EKG Machines/Leads
- BP Apparatus
- Self-contained breathing apparatus
- Personal Protective Equipment (PPE)

GYSBI sets out to ensure that all equipment is maintained in first class working condition and to minimize any downtime. Safety equipment are inspected based on a defined schedule for the different types/classes of equipment (i.e., medical equipment, spill response equipment etc.) e.g., fire extinguishers are checked monthly.

### 5.5.10. INSPECTION OF OPERATIONAL EQUIPMENT/VEHICLE

All work equipment, machinery and vehicles shall be inspected prior to use to identify whether it can be operated, adjusted, and maintained safely, with any deterioration detected and remedied before it results in a QHSSE risk.

Failure to inspect any work equipment before use represents a breach of GYSBI QHSSE Policy/Procedures/Practices and shall result in disciplinary action.

- References: OP-014-Chain Saw Usage Procedure, OP-015-Circular Saw Usage Procedure, OP-050-Container Stacker Operating Procedure, OP-030-Crane Pallet Fork Procedure, OP-028-Crawler Crane Operating Procedure, OP-021-Forklift Truck Procedure, OP-002-Fuel Truck Procedure, QH-012-Hand Tools (Non Powered) Procedure, QH-018-Hand Tools (Powered) Procedure, OP-012-Impact Driver Procedure, OP-016-Lifting & Hoisting Procedure, OP-10-Minibus Usage, OP-027-Mobile Crane-Rough Terrain & All Terrain Procedure, OP-013-Pressure Washer Operating Procedure, OP-020-Rigging Loft Procedure, OP-031-Truck and Trailer Procedure, OP-023-Truck Loading & Unloading Procedure, OP-025-Vehicle Pre-Use Inspection Procedure, OP-003-Water Truck Procedure & HR-018-Disciplinary Policy (used in conjunction with HR-019-Fair Play Guide).

## 5.6. PERFORMANCE MEASUREMENT AND MONITORING

### 5.6.1. AUDITING

#### 5.6.1.1. INTERNAL

GYSBI shall develop and maintain an internal audit program that is applicable to all operations and construction related activities undertaken by GYSBI, Subcontractors and vendors at the Shorebase and GIE. Internal audits shall be used to demonstrate conformity to QHSSE standards and will drive continual improvement for the company's operations. The QHSSE Team shall develop a quarterly audit plan and ensure that all processes are audited once a year as a minimum. All Managers and Supervisors shall participate in QHSSE audits and shall address nonconformities within the stipulated timeframe.

- Reference: QH-PR-014 – Audit Procedure

#### 5.6.1.2. EXTERNAL

All tenders shall be subjected to technical and QHSSE Evaluation and any tenders that do not pass either the technical or QHSSE evaluation will not be commercially evaluated. In addition, GYSBI shall maintain a Vendor Performance Evaluation program to ensure audits are conducted according to specified frequency for the different types of vendors. As such, GYSBI shall maintain a classification system for vendors and all vendors shall be identified based on the said classification system (Critical, Non-Critical, Default & Blacklisted). Any vendor that is moved to a Blacklisted Category owing to poor performance or QHSSE issues will be informed and given a full report of the reason for being blacklisted.

- Reference: Supplier Evaluation Questionnaire-Service QH-FO-080, SC-003-Tender Procedure for Services & SC-018-Vendor Management Procedure for Goods and Services.

## 5.6.2. MANAGEMENT REVIEW

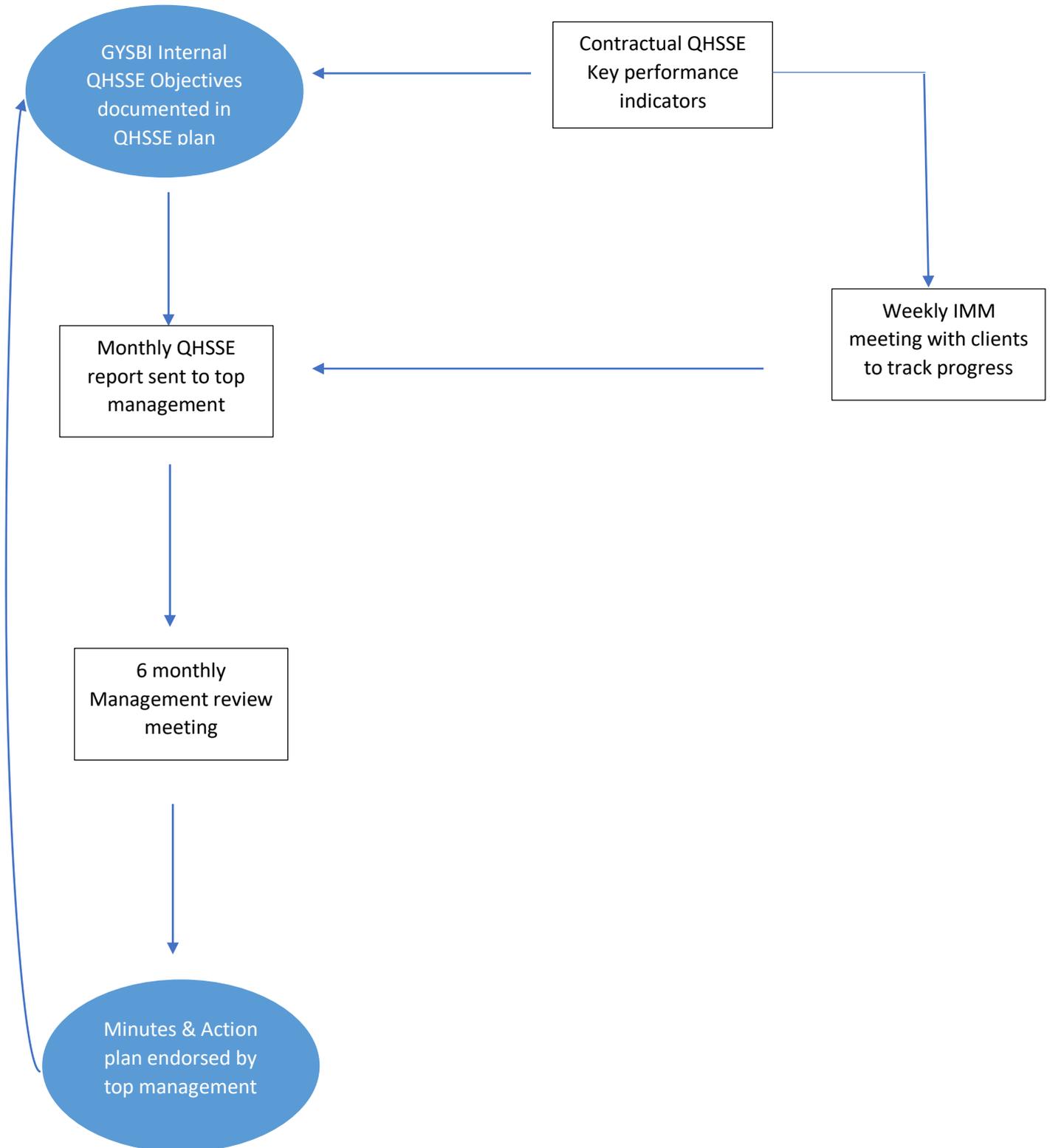
The Quality, Health, Safety, Security, and Environment Plan for GYSBI shall be reviewed on a regular basis for the purpose of improvement.

A formal management review will be held every 6 months, in accordance with flow chart below.

Top management shall review the performance and the effectiveness of the QHSSE Management System, taking into consideration the following:

- A. The status of actions from previous management reviews.
- B. Changes in external and internal issues that are relevant to the OH&S management system, including:
  1. The needs and expectations of interested parties.
  2. Legal requirements and other requirements.
  3. Risks and opportunities.
- C. The extent to which the OH&S policy and the OH&S objectives have been met.
- D. Information on the OH&S performance, including trends in:
  1. Incidents, nonconformities, corrective actions, and continual improvement.
  2. Monitoring and measurement results.
  3. Results of evaluation of compliance with legal requirements and other requirements.
  4. Audit results.
  5. consultation and participation of workers.
  6. risks and opportunities.
- E. adequacy of resources for maintaining an effective OH&S management system.
- F. relevant communication(s) with interested parties.
- G. opportunities for continual improvement.

## GYSBI Management Review Process



### 5.6.3. CONTINUAL IMPROVEMENT

Management regularly reviews and continually improves the GYSBI Safety Management Plan with the objective of improving OSH Performance. Opportunities for improvement are revealed from various sources including but not limited to:

- Internal Feedback
- Client Feedback
- QHSSE Committees' Meetings
- Lessons Learnt from Incidents
- Bi-annual Management Review Meetings
- Risk and Opportunities Register
- Audits and Reviews

### REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	-	-	Initial release of document
2	12-Sep-2020	Michael James	
3	25-Feb-2022	Andrew Dowson	Reviewed and updated all sections.
4	19-Sep-2022	Andrew Dowson	Updated Document References; inclusion of Management review requirement Updated Document Number
5	18-Oct-2022	Kurt Busuttil	Updated Scope; Inclusion of EEPGL KPIs

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**This procedure shall be used and updated by QHSSE Department**

## 1 INTRODUCTION

This procedure provides the format and content requirement for the preparation of QHSSE daily and monthly reports. This procedure also seeks to outline clearly the required standard for the reports in order to ensure consistency and efficiency thereby promoting document control and reducing error.

All data used shall be representative of information gathered from activities carried out at GYSBI Main Base and the GYSBI Industrial Estate. Information on relevant activities of all departments (operations, maintenance, construction and engineering) shall be captured in the reports.

## 2 PROCEDURE DETAILS

### Definitions

<b>ExxonMobil/EEGL</b>	The client
<b>Guyana Shore Base Inc.</b>	The company
<b>Construction data</b>	Safety information generated from construction department
<b>Year to date (YTD)</b>	The period between the first day of the calendar year and the current date.

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<b>Job Safety Analysis</b>	A document used to identify, analyze and record the steps involved in performing a specific hazardous job, the existing or potential safety hazards associated with each step and the recommended action(s) that will eliminate or reduce these hazards and the risk.
<b>Risk Assessment Method Statement (RAMS)</b>	A step-by-step picture-based document that provides a comprehensive overview of a specific operational activity/task, the risk associated in each stage of the activity/task and the corresponding mitigation measures.
<b>Risk assessments</b>	A formal process used to identify hazards and evaluate their associated risks in order to make suitable recommendations to eliminate or reduce the severity or likelihood of the hazard resulting in injury or ill health.
<b>Stop Look Assess Manage (S.L.A.M)</b>	A last-minute risk assessment tool used prior to the commencement of operational tasks and during operational tasks when conditions would have changed or where the risk of a potential incident is increased. SLAM is used in conjunction with the RAMS that is specific to the operational task to be conducted.

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<b>Work Permit</b>	A formal document issued under the Permit to Work procedure (system) that grants permission for a task to be carried out in the safest possible manner. Work permits are issued as either hot or cold work permits for a variety of tasks carried out on the base.
<b>GOARC App and CMS</b>	An industrial safety app designed for use by company workers, operators and subcontractors to easily and effectively manage Health, Safety and Environmental records in real time, conduct incident investigations and to record safety reports identifying unsafe acts and unsafe conditions in their workplace. It also includes positive feedback and suggestions.
<b>Pre-shift meeting</b>	A meeting held before the start of every shift to discuss general tasks to be performed throughout the shift. HSE related issues are also discussed.
<b>Toolbox talks</b>	Brief meeting conducted by supervisors which focuses on HSE issues related to an imminent task. Toolbox Talks shall not include shift pre-shift meeting/briefing conducted before beginning of each shift.
<b>Worksite inspections</b>	Detailed scheduled examination of workplace (office/field) and processes by HSE and operations personnel. This is done with the use of a checklist

where findings are recorded and addressed immediately.

**Management safety  
walkthrough**

An activity performed by Senior management, which consists of visiting a site to observe the state of HSE policy implementation. At the end of the visit written feedback is provided to QHSSE department.

**Safety committee  
meeting**

Meeting held by the company's formal safety committee group which include member from management and workforce.

**HSE meetings**

Any Meeting held at work Site, base camp and offices where HSE matters are predominately discussed. It must be recorded by means of Minutes of Meeting. HSE meeting shall include daily pre-shift meetings, general weekly site safety meeting but shall not include weekly QHSSE departmental progress meeting.

**HSE inductions**

Formal safety training session designed to introduce new employees, visitor and contractor to the worksite, procedures, rules and other important aspects of the company's operation.

**Safety drills**

Method used to assess emergency preparedness that is practiced to ensure orderly evacuation in the

event of any emergency that can cause panic or chaos.

**Training hours**

Include the Health, safety and environmental training courses provided to employees, contractors and visitors that was facilitated by the company. HSE Training Hours must be calculated by multiplying the number of attendees by the duration of the training session.

HSE Training hours SHALL NOT include:

- i. Safety Induction Training
- ii. Emergency Drills
- iii. On the job training
- iv. Toolbox talks and shift pre-start briefings.

**Fatality**

Term to define a death resulting from a Work-related Injury, regardless of the time intervening between the injury and the death. Fatalities are included when calculating the number of Lost Time Injuries and Frequency Rate.

**Lost time injury (LTI)**

LTI is any work-related injury which renders the injured person temporarily unable to perform any regular Job or Restricted Work any day after the day on which the injury occurred (in this case “any day” includes rest day, weekend day, and holiday). The

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day of the Accident is not counted when calculating Lost Workdays.

**Total recordable incident**

Term to define the sum of Lost Time Injuries, Restricted work incidents and Medical Treatment incidents.

**Restricted work incidents**

Any work-related incident that results in the injured person being unfit to fully perform regular duties on any day after the injury.

**Medical treatment incident**

Term to define any work-related injury (infected wounds, application of stitches, embedded foreign bodies in the eyes, etc.) that involves neither Lost Workdays nor Restricted Workdays, but which requires repeated treatment by, or under the specific order of a physician. Medical Treatment does not include First Aid even if this is provided by Physician or Medical Attendant.

**First aid cases**

The term to define any one-time treatment of minor injuries that usually do not require medical care by a physician (i.e. scratches, cuts, burns, splinters, not embedded foreign bodies in the eyes, etc.) and its eventual subsequent visits.

**Security incidents**

An event that may indicate that an organization's security systems have been compromised or that

measures put in place to protect the security of persons working on the base have failed.

**Environmental incidents** An unplanned or unwanted event that results in damage to the environment.

**Equipment damage** Any damage of equipment or asset as result of an accident. The damage can be the result of inappropriate use of the asset, asset use above standard parameters, destruction as result of explosion, fire, high pressure, etc.

**Near miss incidents** Is an incident which, under slightly different circumstances, could have caused an accident affecting people, environment or assets.

**Lost time incidents rates (LTIR):** 
$$\frac{\text{Number of Loss Time Incidents} \times 200,000}{\text{Number of Work Hours}}$$

**Total recordable incident rate (TRIR):** 
$$\frac{\text{Number of Recordable Incidents} \times 200,000}{\text{Number of Work Hours}}$$

**Actual hurt rate:** 
$$\frac{\text{Number of Actual Hurts} \times 200,000}{\text{Number of Work Hours}}$$

## **Roles & Responsibilities**

All departments shall make relevant information available for the preparation of the reports. All data must be provided formally and within a reasonable time period.

### **QHSSE Manager/Supervisor**

The QHSSE Manager/Supervisor shall be responsible for ensuring that this procedure is adhered to and that all reports are prepared accurately and made available for dissemination within a timely manner. The QHSSE Manager/Supervisor shall review the monthly report and provide feedback if necessary. The monthly report must be shared with a designative representative of the Client (Exxon SHE department) and the heads of departments of GYSBI within the stipulated time period (seventh day of the new month).

### **QHSSE Manager/Supervisor/Coordinator/Senior Advisors/Advisors**

The QHSSE Senior Advisors shall compile the daily report. The QHSSE Coordinator shall compile the monthly and quarterly reports with assistance from the QHSSE Senior Advisors and Advisors. QHSSE Manager/Supervisor shall review both reports and provide feedback within a reasonable time period to the QHSSE Coordinator or designated representative so that corrections/adjustments can be made if necessary and report finalized.

## Procedure

### Reports Preparation Guidelines

Data/information inputted into the reports must be accurate and verifiable. Information sources must be readily available for review and provided upon request.

The following table provides a summary in chronological order of the report preparation process.

*Table 1 Showing the Report Preparation Process*

QHSSE Daily Report		QHSSE Monthly Report	
Person Responsible	Task	Person Responsible	Task
QHSSE Advisors	Update report attachments and information sources as necessary (GOARC Logs).	QHSSE Coordinator	Gather information  Prepare report  Submit report to QHSSE Manager/ Supervisor for review
QHSSE Senior Advisor (Day)	Gather information for the preparation of the report.	QHSSE Manager/ Supervisor	Review report  Provide feedback to QHSSE

	Prepare report.		Coordinator in a timely manner.
QHSSE Senior Advisor (Night)	Review report	QHSSE Coordinator	Finalize report
	Finalize report		Submits final report to QHSSE Manager/ Supervisor.
	Send report to recipients in Daily Report email list	QHSSE Manager/ Supervisor	Send final report to management
	Saves report (soft copy) in appropriate QHSSE folder on SPO.		
QHSSE Advisors	Update QHSSE statistics board as necessary (LTI, HFD, SLAM, O&I).	QHSSE Coordinator	Saves report (soft copy) in appropriate QHSSE folder on SPO.

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## QHSSE Daily Report

The aim of this report is to provide up to date information on the company's daily safety performance which is used to guide safety presentations and lectures and to make improvements on the company's day to day activities.

Form QH-FO-010 will be used to prepare this report and shall be populated with the relevant information during the dayshift and handed over to the night shift for completion. This report covers a period of 24 hours beginning from 00:00 h and ending 24:00 h and shall be sent to recipients no later than 07:00 h on the following day. The night shift QHSSE Senior Advisor shall share the report in PDF file format via email to the relevant persons.

The daily report is given as a table format and represents necessary data as per items mentioned below.

**LTI Free days:** This indicates the number of days worked with no lost time injury. Everyday worked without injury provides one day increment.

**Medical Treatment Case YTD:** This represents the total number of medical treatments given on the base for a period beginning from the first day of the current calendar year up to the current date.

**Safety Reports YTD:** This represents the total number of Observation and Intervention safety reports recorded for a period beginning from the first day of the current calendar year up to the current date.

**First Aid Case YTD:** This represents the total number of first aid cases that were attended to on the base for a period beginning from the first day of the current calendar year up to the current date.

**Property/ Asset Damage YTD:** This represents the total number of property/ assets damaged as a result of an incident on the base for a period beginning from the first day of the calendar year up to the current date.

**Manpower hours:** This indicates the total hours worked by the entire company inclusive of operations, security, water treatment personnel, drivers, office staff maintenance and construction personnel but does not include or any other sub-contractor working on the base.

**Drugs and alcohol tests:** This represents the total amount of drugs and alcohol tests done for the reporting period. This includes personnel from every department of the company.

**Critical Observations:** This refers to any observation made by or reported to the QHSSE department that has the potential of becoming worse if not addressed immediately. Observations related to a breach in the GYSBI's LSR can also be classified as critical observations.

**Significant Observations and Intervention Safety Reports of the Day:** O&I safety reports that was selected based on the relevance of the observation and impact of the intervention in comparison to the other reports submitted on that day.

### **QHSSE Monthly Statistical Report**

Safety performance is one of the main parameters used to monitor and measure GYSBI's performance. Therefore, it is very important that this information is managed properly and shared with the Client and GYSBI Management in a timely manner. This report provides information that will guide decision making in relation to priority or critical areas for improvement. Statistical trend analysis can be carried out to measure progress of long and short-term safety goals.

Statistical data shall be provided for Key Performance Indicators (KPIs). Specific KPIs are detailed in the Monthly Report Form (QH-FO-021-Monthly Report).

## Report Dissemination and Filing

**Daily report:** This report shall be regarded as a GYSBI public document and shall be shared with all departments of GYSBI and EEPGL. A hard copy of the report shall be posted on the QHSSE noticeboard where it can be viewed by employees, contractors and visitors. Soft and hard copies of this report shall be filed in accordance with the QHSSE filing system.

## 3 REFERENCES

[QH-FO-010 – QHSSE Daily Report](#)

[QH-FO-021 – Monthly Report](#)

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	1 Feb 2020	Michael James Sean Hill	Initial release of document
2	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
3	17 Sep 2021	Kurt Busuttil	QHSSE Manager designation removed SPO Links to Appendix A and B documents inserted
4	24 Oct 2022	Kurt Busuttil	QHSSE Manager and QHSSE Coordinator designations added Designations for QHSSE Senior Advisors and QHSSE Advisors updated. Document references and links updated. Inclusion of RAMS, SLAM and GOARC App.  Updated Document Number

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**This procedure shall be used by all departments and updated by QHSSE  
Department**

## 1 PURPOSE

The purpose of this procedure is to outline the responsibilities and activities required to ensure the RAMS (Risk Assessment Method Statement) and S.L.A.M (Stop, Look, Assess, Manage) Last Minute Risk Assessments (LMRA) are carried out consistently and effectively in a formal manner. The implementation of this procedure ensures that RAMS & SLAM are carried out to aid in the identification of all associated risks with the activities and /or processes of Guyana Shore base Inc.

## 2 RESPONSIBILITY

RAMS & S.L.A.M is carried out on an ongoing basis and to be effective it is essential that all employees co-operate wherever they can in the RAMS & S.L.A.M to ensure the assessment accurately reflects the process, which is undertaken.

Managers/Coordinators/Supervisors/Foremen shall be responsible for conducting RAMS & S.L.A.M for their respective areas of operation, with the support of the QHSSE accountable persons and employees from the operational area. Additionally, Managers/Coordinators/Supervisors/Foremen shall ensure RAMS are reviewed regularly and remedial issues are identified and instituted on a regular basis.

If at any time an employee considers that there is a serious hazard in their area or there are deficiencies in existing QHSSE measures, or an opportunity for improvement has been identified, the employee must inform his/her

Manager/Coordinator/Supervisor/Foreman. It shall be the responsibility of all personnel to STOP any job or task that they feel is unsafe and to report this to their immediate supervisor or QHSSE Advisor to have a S.L.A.M Last-Minute RAMS meeting conducted to reassess the job

### 3 DEFINITION

**Hazard** – A hazard is any source of potential damage, harm or adverse health effects on something or someone. Basically, a hazard is the potential for harm or an adverse effect (for example, to people as health effects, to organizations as property or equipment losses, or to the environment).

**Risk** – the chance or probability that a person will be harmed or experience an adverse health effect if exposed to a hazard or the combination of the likelihood of a hazardous event occurring and the consequence of the event should it occur. Risk is made up of two parts:

- The likelihood (chance) that the hazardous event will occur.
- The consequence (severity) of the harm should it occur.

**Risk assessment** – a process that is, in turn, consists of three processes: risk identification, risk analysis, and risk evaluation.

**Risk identification** – Is a process that is used to find, recognize, and describe the risks that could affect the achievement of objectives.

**Risk analysis** – Is a process that is used to understand the nature, sources, and causes of the risks that you have identified and to estimate the level of risk. It is also used to study impacts and consequences and to examine the controls that currently exist.

**Risk evaluation** – Is a process that is used to compare risk analysis results with risk criteria to determine whether a specified level of risk is acceptable or tolerable.

**Risk Rating** – Risk Rating is assessing the risks involved in the daily activities of GYSBI and classifying them (low, medium, high risk) based on the impact.

**Inherent Risk** – The inherent risk, is the level of risk that an activity/hazard category would pose if no controls or other mitigating factors were in place.

**Current Risk** – The current risk is the level of risk associated with an activity after existing controls have been implemented to further eliminate or reduce the risk.

**Accepted Risk** – is a risk exposure that is deemed acceptable to GYSBI due to factors such as cost and secondary risk. Acceptable risk allows GYSBI to set practical targets for Risk Management and is helpful than the ideal that no risk is acceptable.

**Monitoring** – a process of supervising and continually checking and critically observing. It means to determine the status and to assess whether required or expected performance levels are being achieved.

**Management Review** – to evaluate the overall performance of the RAMS procedure, and to identify improvement opportunities

**Manager** – Base Manager at both the Main Base and the Annex/Industrial Park and other Managers at GYSBI inclusive of the QHSSE Manager

Coordinator – Base Coordinators at both the Main Base and the Annex/Industrial Park and QHSSE Coordinator

**Supervisors** – Logistics Supervisor & Warehouse Supervisor

**Foreman** – A person who oversees a specific task or a group of workers at the Main Base, Annex/industrial Estate & Berths.

**Risk Assessment Method Statement (RAMS)** - a step by step document that provides a comprehensive overview of a specific operational activity/task, the risk associated in each stage of the activity/task and the corresponding mitigation measures.

**Stop Look Assess Manage (S.L.A.M)** – a last-minute risk assessment tool used prior to the commencement of operational tasks and during operational tasks when conditions would have changed or where the risk of a potential incident is increased. SLAM is used in conjunction with the RAMS that is specific to the operational task to be conducted.

**Job safety Analysis (JSA)** – the process is a technique for systematically analyzing a job by listing the key job phases & associated tasks and identifying potential hazards associated with each key phase and associated task.

Critical actions or safeguards to eliminate or control the hazards are then developed, documented, and implemented.

**GOARC** - An industrial safety app designed for use by company workers, operators and subcontractors to easily and effectively manage Health, Safety and Environmental systems in real time, conduct incident investigations and to record safety reports identifying unsafe acts and unsafe conditions in their workplace. It also includes positive feedback and suggestions.

## 4 SEVERITY OF HARM

When considering how severe the harm from a hazard could be, it is important to be realistic. Almost every hazard could result in death; however, a practical approach must be adopted. Factors affecting severity include:

- The number of people who may be affected in one incident.
- Individuals especially at risk because of disabilities or medical conditions.
- Concentration of a substance, speeds, heights, weights, amount of energy etc.
- The frequency with which the activity is carried out
- Potential damage to the environment.

## 5 RECORDING SEVERITY

Judging the severity of the most probable effect of a hazard can be entered on the general RAMS form in the Severity column as a number using the following scale:

No Personal Injury Limited Material Damage More than One (1) hour loss of operations No Damage to Environment Cost of Clean-up/Repair – Less than \$1,000,000.00	<b>1</b>  <b>MINOR</b>
Personal Injury requiring First Aid (Non-LT) Minor Damage to Equipment More than Eight (8) hours loss of Operations Minor Environmental Emission (could cause breach of regulation) Cost of Clean-up/Repair – Between \$1,000,000.00 & \$10,000,000.00	<b>2</b>  <b>MODERATE</b>

<p>Lost Time (LT) Accident - Reportable</p> <p>Major Damage to Equipment</p> <p>Between One (1) and Seven (7) days loss in Operations</p> <p>Significant Environmental Emission (definite breach of regulation)</p> <p>Cost of Clean-up/Repair – Between \$10,000,000.00 &amp; \$50,000,000.00</p>	<p><b>3</b></p> <p><b>SERIOUS</b></p>
<p>Major Injury, Long Term Incapacity, Disabling Injury</p> <p>Major Damage</p> <p>More than Seven (7) Days delay Operations</p> <p>Major Environmental Emission with extensive Damage (definite breach of regulation)</p> <p>Cost of Clean-up/Repair – Between \$50,000,000.00 &amp; \$100,000,000.00</p>	<p><b>4</b></p> <p><b>SEVERE</b></p>
<p>Fatality, Permanent Incapacity</p> <p>Total Loss of Facility or Equipment</p> <p>Permanent Loss of Facility</p> <p>Severe Environmental Emission – Major Financial Consequences or Incarceration (if applicable)</p> <p>Cost of Clean-up/Repair – More than \$100,000,000.00</p>	<p><b>5</b></p> <p><b>CATASTROPHIC</b></p>

The numbers provide an easy way of recording the judgment of severity and likelihood and make it easier to create a list of priorities. It is important not to become too preoccupied by figures, as part of the purpose of RAMS is to identify the measures needed to improve HSSE performance in the workplace or comply

with relevant statutory provisions and these figures are designed to help with prioritizing such measures.

Therefore, the objective of this process is not to arrive at a certain number, but to provide a systemic method of ensuring that severity and likelihood are analyzed carefully, and a record made of the analysis for future reference and review.

## 6 RECORDING LIKELIHOOD

Judging the likelihood of the most probable effect of a hazard can be entered on the general risk assessment in the Likelihood column as a number using the following scale:

Not expected to occur for years. The event may occur only in exceptional circumstances	<b>1 Extremely Unlikely</b>
Expected to occur at least annually. Unlikely to occur.	<b>2 Unlikely</b>
Expected to occur at least monthly. Reasonable chance of occurring.	<b>3 Likely</b>
Expected to occur at least weekly. The event will occur in most circumstances.	<b>4 Extremely Likely</b>
Expected to occur at least daily. Most likely to occur than not.	<b>5 Almost Certain</b>

## 7 RISK RATING EVALUATION

Risk evaluation is a process of multiplication of the Severity value by the Likelihood value that is used to compare risk analysis results with risk criteria to determine whether a specified level of risk is acceptable or tolerable. This number is entered in the Rating column of the Risk Assessment.

The numbers in the Rating column provide **an indication of priority and the extent of the risk** that remains despite the control measure already provided. The information provided by this step will be used to evaluate whether the risk is adequately controlled or not in the next stage of the risk management process.

Likelihood (Probability)	Frequent	5	10	15	20	25
	High	4	8	12	16	20
	Medium	3	6	9	12	15
	Low	2	4	6	8	10
	Negligible	1	2	3	4	5
		Minor	Moderate	Serious	Severe	Catastrophic
	<b>Hazard Effect (Severity)</b>					

The rating considers the control measures in place to control the hazard; the result of this analysis indicates the amount of remaining risk or the residual risk. The residual risk is recorded in the column provided on the RAMS form, according to the definitions given in the table below.

<b>Low Risk (1-5)</b>	<b>Activity may proceed and should be monitored. Further risk reduction measures where possible, should be implemented</b>
<b>Medium Risk (5-12)</b>	<b>Activity may proceed but should be carefully monitored at intervals to determine if further risk reduction measures are required</b>
<b>High Risk (15-25)</b>	<b>Activity must not proceed. Alternative ways of completing activity must be researched and risk assessed before being utilized.</b>

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## 8 CONTROL MEASURES

Controls are any measures or actions that modify (mitigates or eliminates) risk. Controls shall include any policy, procedure, practice, process, technology, technique, method, or device that modifies or manages risks of the organization.

Control measures will be identified during the risk analysis process. As a result, the company policies, procedures, work instructions and processes may require change to ensure that the control measures listed are adapted:

- Eliminate the hazard
- Substitute with less hazardous processes, operations, materials or equipment
- Use engineering controls and reorganization of work.
- Use administrative controls, including training.
- Use adequate personal protective equipment.

## 9 RESIDUAL RISK

Residual risk is the risk left over after you've implemented controls. It's the risk remaining after you've reduced the risk, removed the source of the risk, modified the consequences, changed the probabilities, transferred the risk, or retained the risk.

## 10 RISK CONTROL PLAN

Low	Medium	Very High
<p>Recommend risk control measure upgrade ONLY if risk rating is not as low as reasonably practicable. Actions to further reduce risk are assigned low priority.</p> <p>Maintain and monitor controls.</p>	<p>Recommended risk control measure to reduce risk rating to under 5 or to a level, which is as low as reasonably practicable.</p> <p>Risk reduction measures implemented within a defined time frame.</p> <p>Arrangements in place to monitor and measure risk control systems.</p>	<p>Stop activity and seek further advice, unacceptable risk. Substantial improvements are required. If not possible to reduce risk, work should be prohibited.</p>
1-6 months	Fix Within 30 Days	Fix Now

## 11 COMMUNICATION OF RAMS & SLAM

Toolbox talk meetings shall be conducted prior to the commencement of all operations where the task(s) to be conducted are discussed by all parties involved, in relation to the RAMS specific for the job. In conjunction, the S.L.A.M LMRA tool shall be done using GOARC, where additional hazards related to the task are identified and controlled. All individuals involved are to be selected from the list of names in the SMS (safety management system) or scan their personal

GOARC generated barcode to be registered on the S.L.A.M LMRA tool, indicating that the task is fully understood.

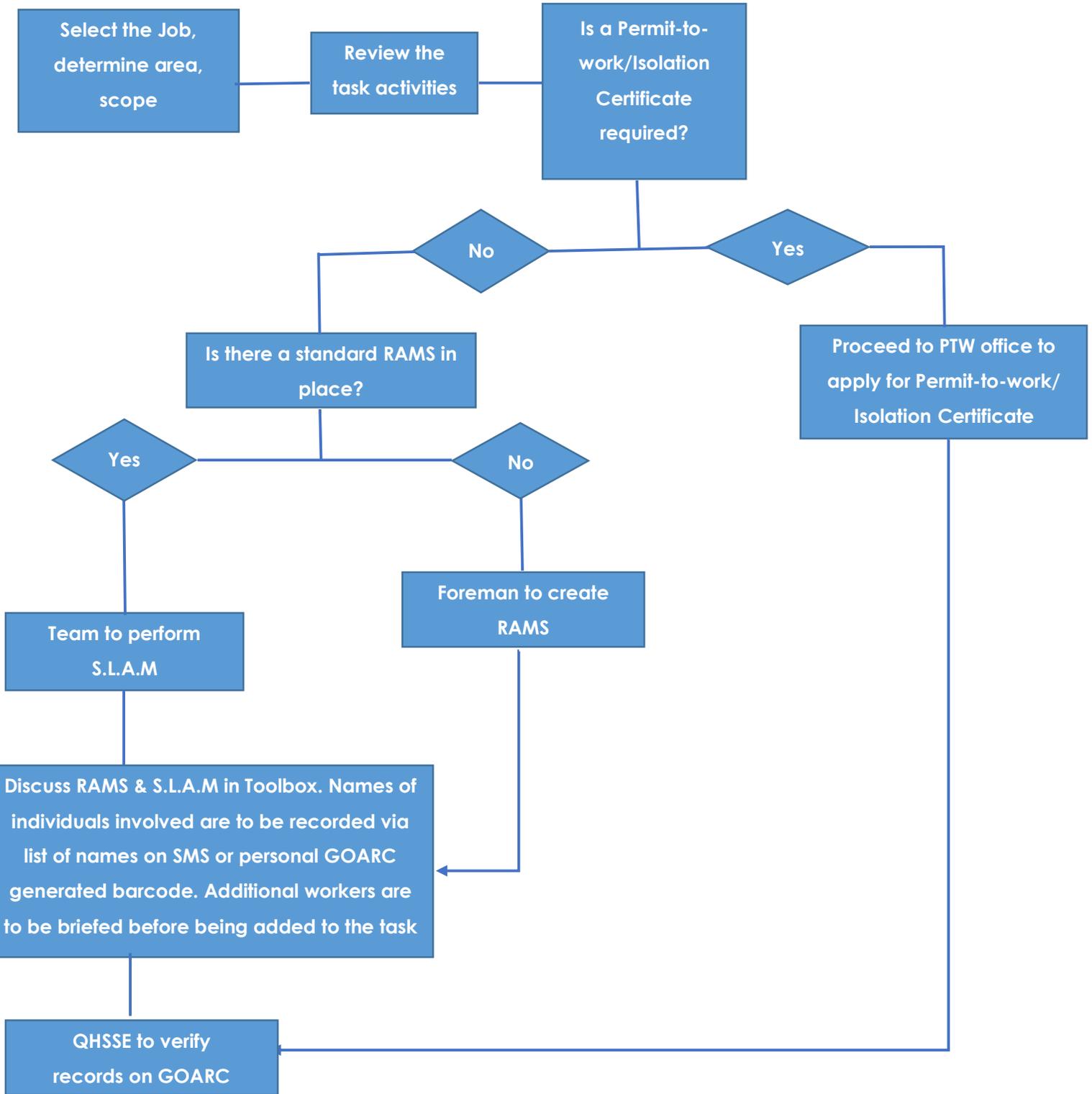
- RAMS and S.L.A.M discussions shall be conducted in the vicinity of the work area where the operational task is being performed.
- It shall be the responsibility of the Foreman to conduct the S.L.A.M / RAMS at the beginning of that task and or if during task if the condition changes.

## 12 S.L.A.M LMRA AND PROCEDURE

S.L.A.M shall be conducted in the following circumstances:

- Before commencing a task – to be used in conjunction with a RAMS
- To control changes to work processes, equipment, or environmental conditions
- To identify hazards and assess risks associated with activities where a RAMS is not required.

### 13 RAMS / S.L.A.M FLOW CHART



## 14 REVISION OF LMRAS

RAMS and S.L.A.M LMRAs shall be revised as required should any incidents or any significant changes arise via legislation or within the company.

## 15 REFERENCES

QH-FO-160-SLAM Card

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	17 Mar 2020	Michael James Sean Hill	Initial release of document
2	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
3	03 Feb 2022	Kurt Busuttil	Update Risk Assessment to reflect RAMS and SLAM Update format to GYSBI format
4	26 Oct 2022	Kurt Busuttil	Updated to include GOARC SMS and revision of LMRAs  Updated Document Number

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## 1 INTRODUCTION

The purpose of this procedure is to provide controls that will protect people, property and assets whereby should an undesired event occur GYSBI can account for all people on the Shore Base.

## 2 PROCEDURE DETAILS

### GYSBI Shore Base Entry Procedure – Vehicular access

#### A. Shore Base Personnel – Guyana Shore Base Inc. & On-site

##### Contractors/Tenants

1. Security indicates for the opening of the barrier directly in front of vehicle, removes cone and vehicle enters the security checkpoint or buffer zone.
2. Upon entering the buffer zone, personnel are required to have their GYSBI Electronic Access badges (issued to all GYSBI employees and tenants) & vehicular pass prominently displayed. Shore base personnel parking in the main car park are not required to have a pass. They are not to take their vehicles to work zones. Vehicular passes shall be supplied once applied for via form#QH-118-Visitor Registration and recorded in the vehicle pass log#QH-115-Vehicle Pass Log controlled by the Security Coordinator.
3. vehicles entering the GYSBI Shorebase is subject to search. All hand carry luggage, bags, backpacks, and vehicles will be searched by Security.
4. The search of vehicles includes but is not limited to the following
  - a. **Trunk & Trunk Pockets**
  - b. **Glove compartment,**
  - c. **Door pockets**

**d. May also include under carriage searches with the use of an under-carriage mirror**

5. The driver shall facilitate the search by opening doors and compartments.
6. Passengers must exit the vehicle and access the base via the pedestrian walkway and turn style.
7. Driver disembarks the vehicle to swipe in and returns to the vehicle. Passengers swipe in, proceeds through turn style and along the walkway to return to the vehicle once it is beyond the second barrier.
8. Driver returns to the vehicle and the second barrier is opened. Security officer removes the cone for the vehicle to proceed beyond the second barrier.
9. Vehicle will then proceed to designated parking areas.
10. The use of under carriage mirrors for automobile searches and metal detector wands for personnel searches shall be at the Security Coordinator's and or QHSSE Supervisor's discretion, dependent on the perceived security risk, prevailing conditions and security intelligence received.

## **GYSBI Shore Base Entry Procedure – Vehicular Access (Northern Access Gate)**

### **B. Shore Base Personnel – Guyana Shore Base Inc. & On-site Contractors/Tenants/Visitors**

In addition to the procedures listed above at Para 2 A, the northern access gate will be used to facilitate entry and exit to the following categories of vehicles:

1. Small vehicles such as bicycle, motorcycle, car, minibus, 4x4 pick-up/SUV and small canter truck.
2. Larger vehicles such as medium and large size canter truck, trucks/lorries and low bed trailer.
3. Vehicles are required to exit through the gate they entered.
4. **Trucks supporting the operations Schlumberger and Falcon can enter and exit the Facility through the northern access gate.**
5. **Vehicles conducting pipe transfer operations will be allowed to enter through one gate and exit through another if situation demands such.**

## **GYSBI Shore Base Entry Procedure – Vehicular Access (Southern Access Gate)**

### **C. Shore Base Personnel – Guyana Shore Base Inc. & On-site Contractors/Tenants/Visitors**

In addition to the procedures listed above at Para 2 A, the southern access gate will be used to facilitate entry and exit to the following categories of vehicles:

1. Small vehicles such as 4x4 pick-up and small canter truck providing escort to larger vehicles.
2. Larger vehicles such as medium and large size canter truck, trucks/lorries and low bed trailer.
3. **All vehicles using this access gate MUST following the directions of the Traffic Police and/or the traffic light located at the Mc Doom Public Road Junction (in the vicinity/opposite the Gafoor's Access Road).**
4. **NO pedestrian traffic is allowed through this southern access gate.**

5. **NO vehicles are to be parked on the access road of this access gate.**
6. **Vehicles are to exit through the gate they entered.**
7. **Vehicles conducting pipe transfer operations will be allowed to enter through one gate and exit through another if situation demands such.**

#### **A. Visitors**

A visitor shall be defined as personnel entering the shore base for a short-term period and not permanently stationed at the shore base.

1. Visitors who arrive for official business within the facility are only allowed to enter if they are on a pre-registered list. The pre-registered list is generated from the preparation of a visitor registration form. The Pre-registered list will assign a numbered Visitor Access badge and vehicle pass (if required).
2. Visitors not on a pre-registered list will not be allowed to enter the facility, until the person they are visiting advises Main Gate Security and requests approval for their entry and comes to security to collect them.
3. All Visitors are required to SIGN IN on the "Visitor List" at Main Gate Security to obtain visitor Electronic Access Badges. Identity must be verified with a form of photographic identification.
4. Upon completion of sign-in they will be issued the respective Visitors Access Badge and vehicle pass (if required); which will be collected from the visitor upon their departure and their photographic identification returned.
5. Visitors will be subjected to guidelines in Section A. regarding entry protocols.

## General Guidelines when entering Shore Base

1. Personnel should be observant of all posted work areas, safety cones, cordoned areas, caution tape barriers and adhere to directions from authorized facility staff when requested.
2. Personnel should proceed directly to their designated site without deviation. Under no circumstances will any Personnel be allowed into unauthorized areas of facility.
3. Anyone found to be in unauthorized areas will be escorted from facility with future access permanently prohibited.
4. Everyone entering the operational facility must have minimum PPE (Hard Hat, Safety Eye Wear, Hi-Vis Reflective Vest, Safety Toed Footwear). No PPE means no entry.
5. PPE Exceptions - Exxon employees and their visitors who have PPE in the ExxonMobil office may drive directly to the parking lot to retrieve their PPE.

**GYSBI reserves the right to deny entry to this facility, and permanently prohibit future access to anyone found breaking GYSBI rules.**

## GYSBI Shore Base Entry Procedure – Pedestrian access

### B. Shore base Personnel – Guyana Shore Base Inc. & On-site

#### Contractors/Tenants

1. Personnel are to prominently display their GYSBI Electronic Access badges upon entering the Main Gate. Failure to present an access badge will prohibit access.
2. **Pedestrian traffic is ONLY allowed through the northern access gate.**

3. All bags and backpacks will be searched by Main Gate security.
4. Personnel may also be subject search via metal detector wand to determine if any hidden offensive weapons are present.
5. Personnel will then proceed to swipe at the turn style and proceed along the walkway to their destination.

### **C. Visitors**

1. Visitors who arrive for official business within the facility are only allowed to enter if they are on a pre-registered list approved by the Security Manager or delegated officer. The pre-registered list is generated from the preparation of a visitor registration form. The Pre-registered list will assign a numbered Visitor Access badge and vehicle pass. Access badges will be color coded to indicate areas the visitor is permitted.
2. Visitors who do not have their names on a pre-registered list will not be allowed to enter the facility, until the person they are visiting advises Main Gate Security and requests approval for their entry and comes to security to collect them. Approval will be given by the Security Manager or delegated officer.
3. All Visitors are required to SIGN IN and OUT on the "Visitor List" at Main Gate Security to obtain Electronic Access Badge. Identity must be verified with a form of photographic identification.
4. Upon completion of sign-in they will be issued the respective Visitors Access Badge will be collected from the visitor upon their departure and their photographic identification returned.
5. Visitors will be subjected to guidelines in Section C. 1-4.

## GYSBI Shore Base Entry Procedure – Vessel Crew Change

1. Notice of arrival of crew change transport is provided by EEPGL representative to the Security Manager and the QHSSE Supervisor who will be responsible for advising Main Gate Security.
2. Vehicle will be confirmed to be for crew change and signaled to proceed beyond first and second barrier. Main Gate security will let the vehicles enter without stopping for checks to avoid potential transmission of COVID-19.
3. Dedicated transportation service by EEPGL and affiliates will transport persons to GYSBI to directly board vessel.
4. No persons may interact with any other person outside the transport while waiting to access the facility and must stay in the transport.
5. Taxi/Bus Services associated with marine vessel crew changes (drivers & vessel crew members) that are arriving at GYSBI for crew change. Process is as follows:
  - Taxi/Bus Drivers and Passengers are to be directed to the PPE Free Zone at the Field Office Parking Lot
  - Taxi/Bus w/ Passengers are to wait at PPE Free field office parking lot area for GYSBI QHSSE approval and escort to access the wharf area for boarding the vessel.
  - Once approval is given, Taxi will drive directly to vessel gangway to drop-off or pick-up vessel crew. Driver shall always remain in the vehicle.



Figure 1 : Picture showing the PPE free zone and the taxi drop zone.

## Shore base Personnel – Guyana Shore Base Inc. & On-site Contractors/Tenants

### A. VEHICLES

1. Vehicles arrive at the first exit barrier, passengers exit, and the Main gate security raises the barrier. Once the barrier is fully upright, the vehicle enters the buffer area.
2. Driver to swipe out at card reader.
3. Vehicle is then subjected to a security check. The search of vehicles includes but is not limited to the trunk and glove compartment and may also include vehicle under carriage searches with the use of an under-carriage mirror. The driver will facilitate the search by opening doors and compartments. Passengers must exit the vehicle and the base via the pedestrian walkway and turn style.
4. Vehicle is given all clear, driver return to the vehicle.

5. Security officer then signals to have the second exit barrier opened for the driver to proceed out of the area.

#### **B. PEDESTRIAN**

1. Pedestrian swipes at the turn styles and proceeds to security.
2. All bags and backpacks will be searched by Main Gate security.
3. Once given all clear, the pedestrian can proceed to the exit.

### **GYSBI Shore Base Exit Procedure - Visitors**

#### **A. VEHICLES & PEDESTRIAN**

1. Pedestrian visitors will proceed to the exit card reader and swipe their badge out. Passengers will proceed along the pedestrian walkway and swipe out at the turn style.
2. Vehicles arrive at the first exit barrier and the Main gate security raises the barrier. Once the barrier is fully upright, the vehicle enters the buffer area.
3. Driver swipes out at card reader.
4. Vehicle is then subjected to a security check. The search of vehicles includes but is not limited to the trunk and glove compartment and may also include vehicle under carriage searches with the use of an under-carriage mirror. The driver will facilitate the search by opening doors and compartments.
5. Visitors must return GYSBI Access badges and vehicle passes to receive their lodged photograph identification. All Visitors are required to SIGN OUT on the "Visitor List" at Main Gate Security.
6. Vehicles and pedestrians are given all clear to exit. Driver returns to the vehicle.
7. Security officer then signals to have the second exit barrier opened for the driver to proceed out of the area.

### 3 ENFORCEMENT

Failure to comply with all points in this procedure may lead to denial of access into GYSBI Shore Base.

#### **Removing Items from the facility**

- A. Nobody is permitted to take anything from the facility unless accompanied by a Material Dispatch Form (See attached below for example of form) with authorized signature.
- B. Company owned Material being transferred out of facility will require a Company Material Dispatch Form detailing items for removal with respective Supervisor authorization.
- C. List of authorized signatories are to be provided to security for use in verification of approved Material Dispatch Forms.

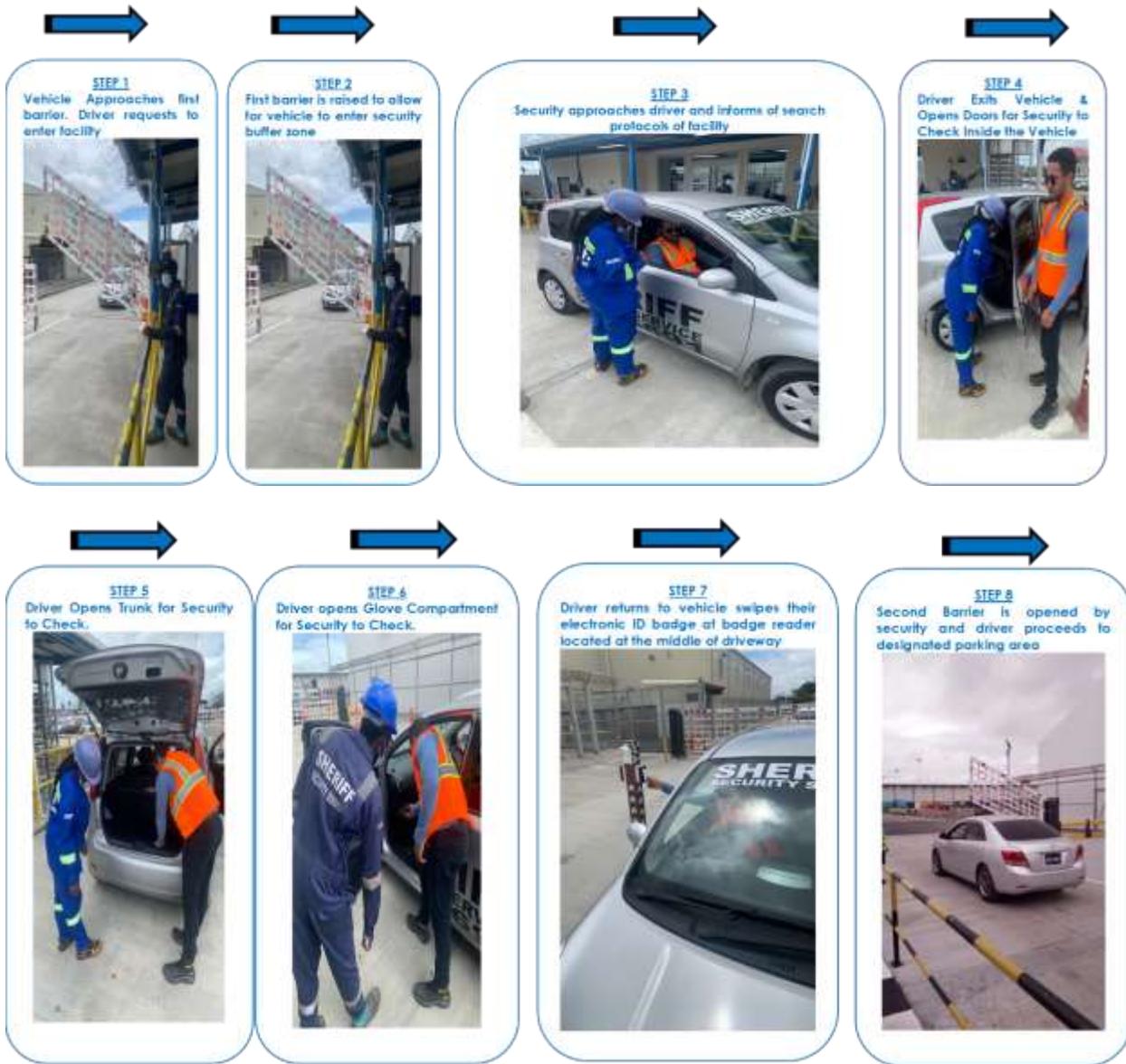
## APPENDIX I: VEHICULAR ACCESS (VISITORS)





**Process Is Repeated When Vehicles Are Exiting the Facility.**

## **APPENDIX II: VEHICULAR ACCESS (GYSBI EMPLOYEES / TENANTS / CONTRACTORS)**



**Process Is Repeated When Vehicles Are Exiting the Facility**

### APPENDIX III: PEDESTRIAN ACCESS (VISITORS)



Process Is Repeated When Visitor's Are Exiting the Facility. Upon Exiting The Facility, Visitor's are Required To Return The Visitor's Badge To Security.

## APPENDIX IV: PEDESTRIAN ACCESS (GYSBI EMPLOYEES / TENANTS / CONTRACTORS)



Process Is Repeated When Persons Are Exiting the Facility

## APPENDIX V: FORMS

QH-117 Material Dispatch Form

QH-118 Visitor Registration Form

## APPENDIX VI: EXAMPLES OF ITEMS BEING SEARCHED FOR

The below are examples of items being searched for but not limited to the following:



Guns And Ammunition



Alcohol



Offensive Weapons

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	17 Jan 2020	Michael James Sean Hill	Initial release of document
2	13 Aug 2020	Kurt Busuttil Sean Hill	Document layout changed to new company format
3	18 Dec 2020	Kurt Busuttil Sean Hill	Entry and exit procedure updated due to installation of barriers and turnstiles
4	31 Mar, 2021	Iain Martin Sean Hill	Entry and exit procedure updated due to installation of the Southern Access Road and Barrier Gates.
5	21 Sep 2021	Kurt Busuttil	Introduction of the use of under carriage mirrors for vehicular searches and metal detector wands for personnel searches. Placement of cones in front of vehicles before opening gate.
6	01 Feb 2022	Kurt Busuttil Zulfikar Khan	Removed requirements for visitors to lodge photographic ID with security when entering Shorebase.
7	02 Jun 2022	Andy Dowson	Removed COVID 19 Protocols Remove colour coding for visitor badges Updated appendixes I – IV Introduced appendix VI
8	07 Jul 2022	Kurt Busuttil	Updated Document Number

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# 1 INTRODUCTION

## Scope

### Scope

The scope of this procedure is applicable to all operations and construction related activity undertaken by: GYSBI, EEPGL, Subcontractors and Vendors at the GYSBI Main Base and GYSBI Industrial Estate (GIE). The Procedure aims to highlight and mitigate any potential restrictions and/or safety impact when planning SIMOPS work activities.

## Definition

### Simultaneous

### Operation (SIMOPS)

SIMOPS are performed when two or more operations which may have an impact upon each other are to be performed at the same time in the same area.

Example: A typical example of this is when construction activities such as welding and burning are to be performed within proximity of a vessel carrying hazardous materials like Methanol berthed at GYSBI. The construction activities can have a life-threatening impact on the ship's crew and construction team.

## Reference

[QH-PR-002-Permit to Work \(PTW\) Procedure](#)

[QH-PR-004-A/B-Simultaneous Operations Procedure-SIMOPS Matrix](#)

[QH-FO-060-SIMOPS Deviation and Request Approval Form](#)

## 2 PROCEDURE

### Planning and Control of SIMOPS

When SIMOPS are to be conducted on GYSBI facilities, accurate evaluation and control of the operational parameters are of prime importance for safe and efficient operation.

Any SIMOPS activity to be undertaken shall be reviewed and scheduled to minimize any interference or safety impacts. Information relevant to any SIMOPS activity which has potential impact to other personnel working in the same area shall be provided to all concerned personnel prior to the commencement of the planned SIMOPS activity.

#### Steps in Planning SIMOPS

1. Prior to the study, the relevant parties shall provide a detailed list of the operations they shall perform to pre-populate the SIMOPS Matrix (referenced QH-PR-004-A/B).

The completed SIMOPS matrix shall be used by all parties when analyzing SIMOPS. It shall be used when evaluating primacy issues and is a particularly useful tool for the GYSBI Base Managers when issuing Permit to Work (PTW) to other parties on the GYSBI facility.

2. Risk assessments of the activities are required as an integral part of the study process and should be provided to the Base Manager and QHSSE Manager/Supervisor/Delegate. All parties shall endeavor to provide as much information as possible relating to the operations to be performed and the vessels/platforms involved. This should include but not be restricted to drawings, procedures, schedules, charts, and photographs. During the analysis of the SIMOPS activity, support should be provided by relevant personnel from all parties involved in the activity.

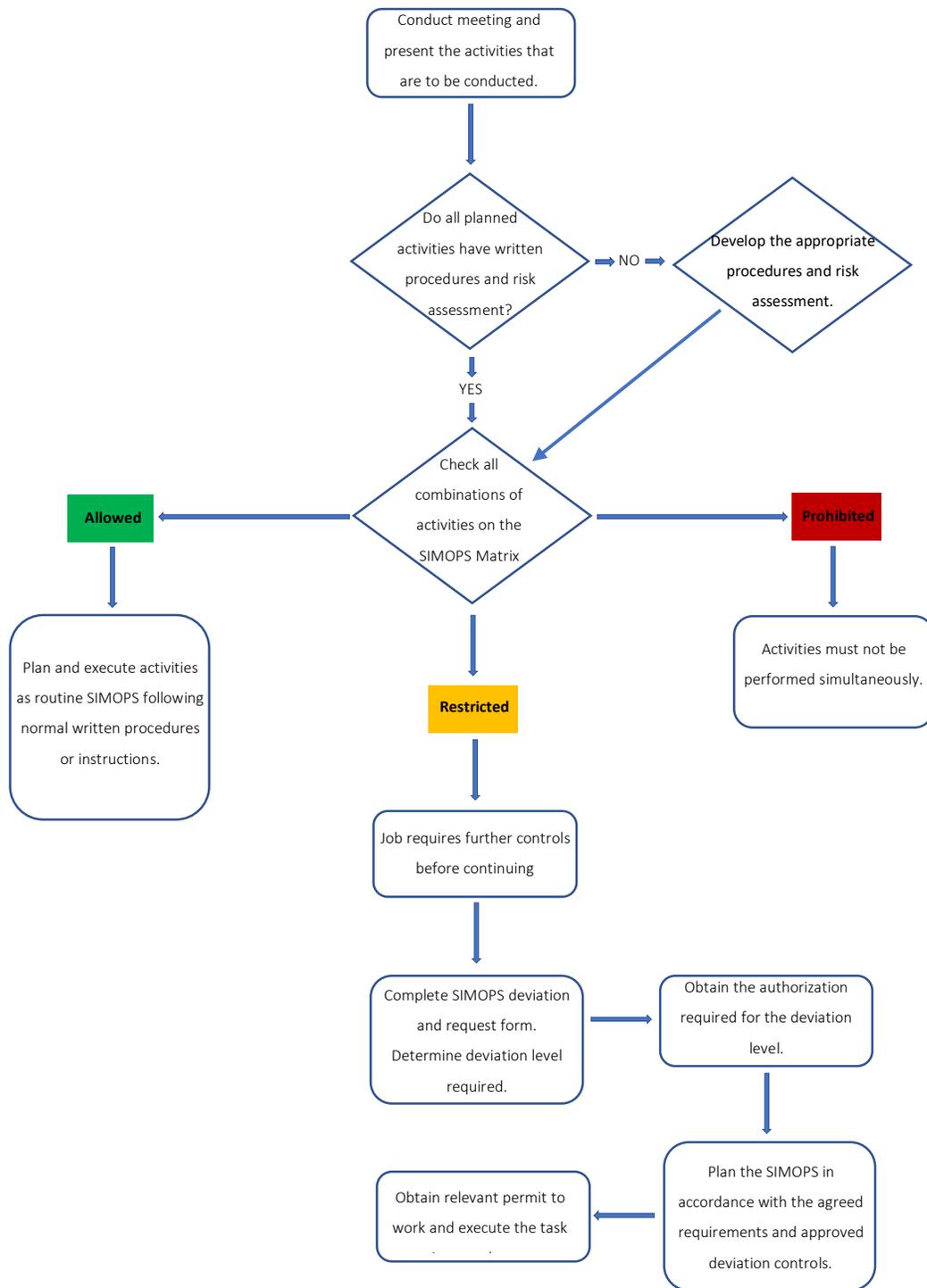
3. The performing authorities of the SIMOPS shall meet with the Base Manager and QHSSE Manager/Supervisor to verify the aspects of the operation, identify constraints and/or limitations, indicate conflicting activities and to confirm emergency procedures. The QHSSE Manager/Supervisor or Base Manager shall give an introduction of the SIMOPS process and each party shall give a presentation of their work scope and the risk assessment for each activity should be discussed. Following this, the individual operations of each party shall be evaluated against the activities of the other parties and a conclusion should be reached as to the SIMOPS status. (Job can continue, Job cannot continue, or job can be continued with the necessary controls in place).

During this process, it will become clear where SIMOPS can or cannot be permitted. However, there will be several cases where this is not evident, and the following step needs to be conducted.

4. The risk assessment process will need to be employed for the interaction between the activities. Following this process, a list of mitigating factors shall be developed which when employed, may result in an acceptable residual risk (risk reduction to ALARP) that will allow SIMOPS to be performed with the relevant identified restrictions/control measures in place.  
It is common for an action list to be compiled from the meeting and it is imperative to assign these to the relevant parties and to identify dates for completion of the actions.
5. A report shall be compiled following the meeting including the completed SIMOPS matrix and the action list. All attending parties should have the opportunity to comment on the report to ensure accuracy and understanding of the conclusions reached.

6. The SIMOPS will be approved using the QH-PR-004- Simultaneous Operations Procedure-SIMOPS Matrix (forms A and B). **PROHIBITED** activities (red) must not be performed simultaneously. For all **ALLOWED** activities (green), the Base Manager will approve given the necessary control of work documents are in place. However, for **RESTRICTED** activities (amber) further safety controls should be developed before commencement. Deviation approval should be given and QH-FO-060-SIMOPS Deviation Request and Approval Form should be completed.
  
7. If the activity requires a PTW then the control of work document has to be issued as per QH-PR-002-Permit to Work (PTW) Procedure before the work commences. Additional documents required, such as emergency rescue plan and lift plan, should be in place before the permit is issued.

**Methods of communication shall be clearly established between all work parties during the planning and execution of any SIMOPS activity.**



**SIMOPS Planning and Co-ordination Flowchart**

## Monitoring

SIMOPS shall be actively monitored and supervised by the performing authorities, whether GYSBI or third-party contractors. The QHSSE Team shall monitor SIMOPS and any non-conformity with respect to set precautions/procedure shall be immediately corrected/forwarded to the Base Manager for information/action.

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	29 Nov 2019	Sean Hill	Initial release of document
2	13 Aug, 2020	Michael James Sean Hill	Document layout was changed to new company format
3	14 <sup>th</sup> Oct, 2021	Kurt Busuttil	Addition of the SIMOPS Matrix, Flowchart and Deviation Request and Approval Form. Development of the Scope and Purpose, Responsibilities, Definition, Reference, and Monitoring. Amendment to the planning and control Section of the procedure.
4	07 Jul 2022	Kurt Busuttil	Updated Document Number

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## 1 INTRODUCTION

The purpose of this procedure is to outline Guyana Shore base Inc QHSSE induction that all personnel and visitors shall undergo upon first arrival on GYSBI Port facility and Industrial Park sites. It will define policies, shore base layout and specific QHSSE information relating to the general operation of GYSBI.

This induction shall also cover emergency equipment, fire & gas alarm system and emergency procedures.

## 2 PROCEDURE DETAILS

### 2.1 References

QH-080	<a href="#">QHSSE Induction Checklist</a>
QH-105	QHSSE Document Retention Policy

### 2.2 Definition

<b>QHSSE Induction</b>	Briefing given on the mode of operation given to New arrivals to get familiarized with the system, hazards and save operation related activities.
------------------------	---

### 2.3 Procedure

#### 2.3.1 Roles & Responsibilities

QHSSE Supervisor

The QHSSE Supervisor shall be responsible to ensure there are necessary resources and facilities for the implementation of this procedure and monitor the correct implementation of this procedure at both GYSBI Port Facility and Industrial Park.

---

The QHSSE Supervisor shall be responsible to monitor that site induction is arranged for all new employees, contractors, and visitors at GYSBI sites.

#### QHSSE Team Lead/Officers

The QHSSE Team Lead/Officer shall be responsible for performing the QHSSE induction to all persons when they first arrive on the shore base.

#### All Personnel

All personnel (Employees, Tenants and Third-party contractors), on first arrival on site, shall undergo the site QHSSE induction as detailed within this procedure.

Upon completion of Induction, they shall sign the “QHSSE Induction Form” (QH-080 QHSSE Induction Checklist) to confirm that they have received and understood all the topics that are detailed on the form.

#### General Requirements

All personnel (Employees, tenants, third party contractors, visitors) on the shore base facility shall be subject to QHSSE Induction when they arrive for the first time on site.

All personnel requiring an QHSSE induction will be required to submit prior notification (24hrs) to the QHSSE department for scheduling within the daily allocated times outlined below:

- Dayshift- 9:00am – 10:00am and 1:00pm to 2:00pm
- Night shift- 7:00pm – 9:00pm

Training aids like transparency power point presentation, video, etc. shall be used for induction.

Induction programme will consist of:

- Presentation and discussion of QHSSE topics.
- An Escorted Tour (Non- Mandatory) of the GYSBI Port facility/industrial Park.
- Recording the induction and issuance of Inducted Helmet Sticker.

### 2.3.2 Induction Briefing

Induction Briefing is a short meeting for presenters to outline the general rules to induct the attendance to follow the existing safety procedures on the shore base site.

The topics that shall be covered by the QHSSE Personnel shall consist of:

- QHSSE Policy
- Alcohol & Drug Abuse
- Smoking
- Mobile Phone Restriction
- Vehicular Access / Movement / Parking
- Permit to Work System
- Pre-tour meetings/ Toolbox Talks / Weekly HSE Meetings
- Observation and Intervention Cards (O & I Cards System)
- Accident / Incident / Near Miss reporting system
- Job Safety Analysis
- PPE Policy
- Lifting Operations/ Lifting equipment inspection colour code
- Fire Prevention/ Fire Fighting Equipment
- Emergency equipment locations
- Clinic Location
- Shore base specific rules

### 2.3.3 Tour of the Shore Base

The QHSSE Lead/Officer shall arrange for all new employees to be taken on a guided tour of the Shore base, as a means of familiarization to:

- Show escape routes
- Show primary and secondary muster points.
- Show location of safety equipment such as fire extinguishers.
- Indicate specific hazards and precautions, including any restricted areas and who has authorized access.
- Emergency Alarms

### 2.3.4 Induction Completion

On completion of the QHSSE Induction, the QHSSE Lead/Officer shall issue each person with the induction form (Appendix 5.1), where they shall complete the relevant data to confirm that they have received the induction and understood all the noted points.

The person and the QHSSE Lead/Officer (escort) shall sign the form.

The QHSSE Officer shall maintain file of all these forms both hard and soft copies. In addition, the safety Lead/officer is to update QHSSE Induction register (Appendix 5.2) with the particulars of inducted person as outlined.

All records of QHSSE induction shall be kept available and traceable on site for periods outline in the QH-105 QHSSE Document Retention Procedure.

### 2.3.5 QHSSE Induction for Visitors

QHSSE Induction shall be held for all visitors coming on shore base. The temporary visitor compare to company employees will receive an abbreviated QHSSE Induction.

The topics that shall be covered by the QHSSE Lead/Officer shall consist of:

- 
- QHSSE Policy
  - Smoking Policy
  - Mobile Phone Restriction
  - Vehicular Access / Movement / Parking
  - Hazard Observation Reporting (O & I Cards System)
  - Accident / Incident / Near Miss reporting system
  - PPE Policy
  - Muster points
  - Emergency equipment locations
  - Clinic Location
  - Shore base specific rules

### 2.3.6 New Employee Orientation

Prior to engage any new employee on work, Logistics Supervisor will ensure that new employees direct Foreman gives specific instruction on duties and other pertinent information such as immediate hazards, type of equipment under usage and adjacent works that are going on around etc.

### 2.3.7 Green Helmet Program

The new junior employee upon arrival on site will be issued with the **Green Color Helmet** which will be used by employee all the time during his probationary period for at least 3 months. This period could be increased as per the decision of the supervisor of concerned employee according to his/her improvement.

This green color helmet indicates that the user is the new employee and requires proper care and supervision:

- Supervisor will ensure that the new employee with the green helmet receives all required QHSSE instructions to perform task in a safe manner.

- Each new employee will be assigned to one of the regular crew members for assistance in working safely during his probationary period (Mentoring Program)
- New employee will be supervised either personally or through delegated / experienced employees until the new employee is able to satisfactorily demonstrate his ability to perform work safely.
- On-going Shore base safety training continues as a mixture of training, instruction at QHSSE meetings, and on-the-job familiarization.

## REFERENCES

QH-080-QHSSE Induction Questionnaire

QH-098-QHSSE Induction Log

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	23 May 2020	Michael James Sean Hill	Initial release of document
2	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
3	17 Sep 2021	Kurt Busuttil	QHSSE Manager designation removed SPO Links to reference documents inserted
4	07 Jul 2022	Kurt Busuttil	Updated Document Number

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## 1 SMOKING POLICY STATEMENT

Guyana Shore Base Inc. provides and supports a smoke free work environment for all our employees, contractors, Visitors, and stakeholders at our Shore Bases.

To achieve this commitment all employees are expected to:

- a) Protect all employees, contractors, visitors, and stakeholders from exposure to second-hand smoking.
- b) Promote an attitudinal and behavioural change to smoking.
- c) Maintain a smoke free working environment by applying the following rules.

## 2 POLICY DETAILS

- No smoking in any part of any indoor workplace, medical facilities, or washrooms.
- No smoking in any GYSBI motor vehicle on any location.
- No smoking in outdoors places within six meters from a window ventilation inlet including air conditioner units, doorways to any indoor workplace.
- No smoking within the wash bays facilities, workshops, pipe yards, or quayside.
- No smoking in any areas that are potential fire hazards.
- Support employees to improve their health and wellbeing.

All rules also apply to persons using vape pens and e-cigarette.

Designated smoking areas have been identified around the bases and are clearly marked with "Designated Smoking Area" signage and suitable cigarette butt dispensers have been provided.

Non-compliance to this policy may result in disciplinary action being taken.

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	19 June 2020	Michael James Sean Hill	Initial release of document
2	20 August 2020	Michael James Sean Hill	Document layout changed to new company format
3	07 Jul 2022	Kurt Busuttil	Updated Document Number

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## 1 INTRODUCTION

A key component is management of traffic, and how mobile plant and equipment communicates with people and the environment. This plan serves to set out GYSBI's continued commitment to maintaining a safe operating arena 24 hours a day, seven days a week.

## 2 TRAFFIC CONTROL

All traffic MUST be communicated to the relevant area supervisor with the following details:

- the vehicle being used;
- the occupants and the driver's name.

In principle, a one way system exists within the operating area of the shore base, flowing south past the modular offices and clockwise around the central roadway network of the base.

The Storage Yard (Annex) will have one way where permissible. Banksman will be used where this is unavoidable.

Drivers operating within the base, may be subject to PRO-QHSSE-010 Drugs & Alcohol.

All visitors to GYSBI as well as project related traffic must be approved by the Base Manager e.g. vehicles providing a service or support to the operation.

## 3 SPEED LIMITS

The following speed limits apply to all road going vehicles:

- All designated access roadways – 15 kmph or as specified by non-routine activities, weather and road conditions.

Operators of vehicles carrying loads must adjust their speed to compensate for the resulting decrease in vehicle road handling and stopping distance.

## 4 PEDESTRIAN CONTROL

Pedestrians must:

- Use designated pedestrian pathways where available;

- Cross roadways at right angles;
- Never approach operating Mobile Equipment without first making positive contact with the operator, or signal from a banksman that it's safe to approach.

## 5 VEHICLE AND EQUIPMENT PARKING

Light Vehicles must be parked in designated light vehicle parking using reverse parking as standard practice. Vehicles must have an operable hazard beacon. Main parking area is at the administration building.

Trucks must be parked in designated truck parking areas.

Mobile Equipment must be parked in designated Mobile Equipment parking area with implements grounded i.e. blades/buckets/jacking legs lowered and all potential hydraulic energy must be released.

## 6 SAFE APPROACH DISTANCE

Pedestrians, road going vehicles and other Mobile Equipment must maintain a separation distance of at least 20 metres from operational Mobile Equipment unless positive contact has been made with the operator, and the operator has acknowledged that it is safe to approach.

## 7 COMMUNICATION REQUIREMENTS

All and any radio communication must be in English. Communication must be brief and clear. Drivers may not utilise a communication device without having stopped at a safe location. Drivers may not use any handheld communication until vehicle is stationary and fully stopped with handbrake on / hazards lights in use.

## 8 RIGHT OF WAY / OVERTAKING RULES

Pedestrians must always be prepared to give way to Vehicle and Mobile Equipment.

Drivers of light vehicles must always give way to heavy vehicles.

Vehicles approaching one another should slow down and stop if necessary. The vehicle with sufficient clearance on its side should move into this area to allow the other vehicle to pass. Light vehicles give way to heavy vehicles.

Emergency Vehicles have right of way over ALL other vehicles when their flashing lights are ON.

When following other vehicles drivers must maintain a separation distance of at least 20 meters. Driving in poor visibility conditions, the separation distance should be increased.

## 9 ACCESS REQUIREMENTS

Access into the parking main building area via the main gate is restricted to approved vehicles that are required to perform tasks within that area, any entry should be coordinated via Security.

Non routine Vehicles and Mobile Equipment accessing the operating base area via the internal gates must first obtain a visitors pass and be escorted at all times by a base staff member until safely parked. Once parked, the keys must be removed from the vehicle or Mobile Equipment and retained by the work supervisor until the delivery is completed and the vehicle is ready to leave the area.

Mobile Equipment work areas must be clearly demarcated by traffic cones.

The Southern access/exit gate facilitates the movement of heavy load handling vehicles. GYSBI will utilize it for transportation to and from the annex. Movement will be two way and detailed by the Journey Management Plan (JMP). No pedestrian nor light vehicles are allowed through the gates at this end. Authority to use the gates will be under the control of the base manager and as detailed in the entry/exit procedure. When not in use, the roller gates will be pulled shut to prevent unauthorized access to the facility especially at nights. Due to the type of vehicles expected through this gate, right of way must be given as they merge with the one-way traffic on the southern access road near the pipe yard. Area must remain unobstructed especially at the merging point with the southern access road.

## 10 RESTRICTED AREAS

The following locations are restricted areas and require authorisation from the Base Manager prior to being accessed:

- Muster areas
- Fuel Storage Area
- Generators and Electrical Power supply Facility
- Water Treatment plant
- Wharf and Quayside

- Any other area designated by a JSA or work order.

## 11 USE OF A BANKSMAN

Personnel working in close proximity of operating vehicles or Mobile Equipment must adhere to the banksman mandate in Appendix 1.

## 12 DAMAGE, NEAR MISS, BREAKDOWN AND RECOVERY

All incidents and near miss events must be reported to the Base Manager.

When a vehicle or Mobile Equipment breakdown occurs an attempt must be made to park the vehicle at a safe place. The operator is to inform the Base Manager immediately by telephone:

The Base Manager in liason with HSE Supervisor and Base Coordinator is to arrange recovery in accordance with an approved Recovery Plan.

## 13 CESSATION OF ACTIVITY AND GO/NO GO CRITERIA

Adverse weather conditions such as heavy rain, fog, lightning, wildlife activity or operator fatigue is to be reported immediately to the Base Manager who is authorized to make the decision whether to cease all activities or continue working.

## 14 JOURNEY MANAGEMENT

Journey Management must be done in accordance with PRO-QHSSE-014 Journey Management.

Appendix 1. Banksman Standing Instruction

**Guyana Shore Base  
Standing Instruction  
Number S/001**

**Requirement for Banksman at the main base & Annex**

Date: 16/03/2020

The role of a Banksman is crucial to the overall safety of a site. The organization has adopted a risk based approach to determine the need for a Banksman. Based on the attached risk assessment, a banksman is required in the following scenarios;

- Movement of vehicles in work zones whilst operations are ongoing.
- Any movement of material handling equipment, mobile elevating work platforms and heavy goods vehicles in a work zone.
- Any reversing of material handling equipment, mobile elevating work platforms and heavy goods vehicles. Reversing of the water truck and the fuel truck requires a banksman.
- Any additional scenario where a dynamic risk assessment identifies the need for a Banksman

The general movement of vehicles along the base ring road does not require a banksman, unless a dynamic risk assessment identifies the need for a Banksman.

Signed:

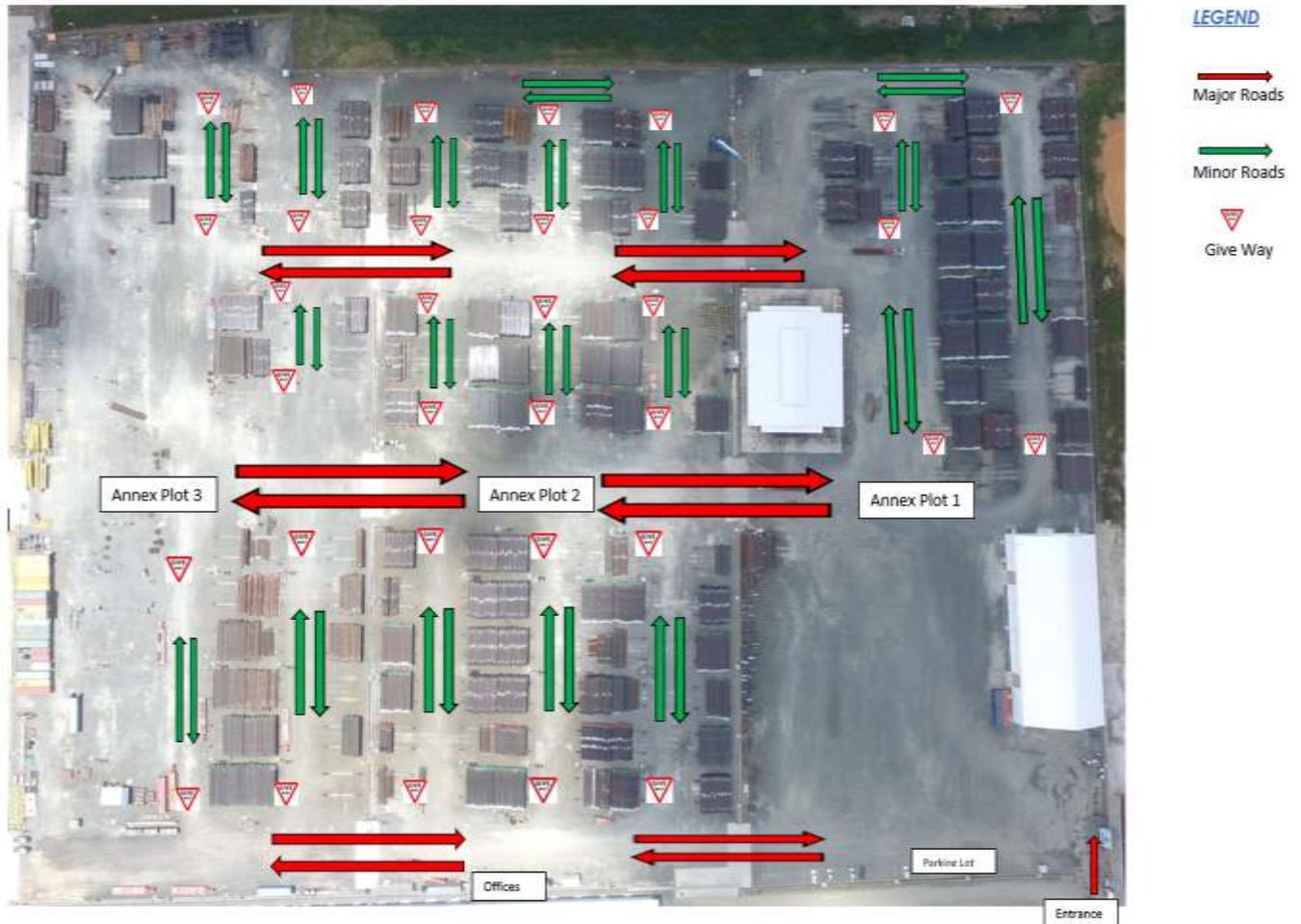
Base Manager	QHSSE Manager
 <b>Base Manager</b> Date: 17/3/20	 Date: 26/03/2020

Appendix 2. Tiger Tanks and SBM routes at Shore Base





Appendix 4. Annex Traffic Management Map



REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	-	-)	Initial release of document
2	20 August 2020	Michael James Sean Hill	Document layout changed to new company format
3	29 Sep 2020	Iain Martin	Appendix 3, Traffic map updated
4	6 Oct 2020	Iain Martin	Appendix 4, Traffic Map of the Annex
5	07 Jul 2022	Kurt Busuttil	Updated Document Number



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# 1 INTRODUCTION

## 1.1.0 Scope and Purpose

This Procedure is applicable to wastes generated from daily activities conducted at Guyana Shore Base Inc- Main Base & the Industrial Estate.

This Waste Management Procedure provides an overview of the wastes produced and the strategies implemented by GYSBI to manage these wastes, thus ensuring that the potential for harm to human or the environment by improper waste management is minimized.

## 1.2.0 References

QH-003-CHEMICALS AND HAZARDOUS SUBSTANCES- REV 02

QH-106-ENVIRONMENT MANAGEMENT PLAN

QH-136-A/B-WASTE MANAGEMENT LOGBOOK

QH-138-A/B-MANIFEST OF TRANSPORTATION AND DISPOSAL OF HAZARDOUS AND NON-HAZARDOUS WASTE

## 1.3.0 Definitions

### **Hazardous Waste**

Waste that contains substances or has properties that are harmful to human health or the environment. For example: batteries, LED bulbs, solvent-based paints, engine waste oils etc.

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<b>Non-hazardous Waste</b>	Waste that does not exhibit any hazardous properties and does not cause harm to human health or the environment. For example: paper, food scraps etc.
<b>Waste Management</b>	Collection, storage, transportation, treatment, processing, recycling, disposal, and monitoring of waste materials to reduce or prevent harm to humans and/or the environment.
<b>Storage</b>	Temporary holding of waste that is pending treatment or disposal. Storage methods include containers, bins, and tanks.
<b>Contamination</b>	Release of hazardous material, waste or wastewater into soil, surface water and/or groundwater.

## 1.4.0 Responsibilities

### **Base Manager & Logistics Supervisor**

The Base Manager and Logistics Supervisor are responsible for ensuring that there are satisfactory arrangements for the safe and correct collection, labelling, storage, transportation, and disposal of wastes arising at GYSBI.

### **All Departments**

All personnel share the responsibility for ensuring that wastes are deposited in the appropriate container and that all precautions are taken when hazardous wastes are being handled. Departments are responsible for ensuring that the necessary

information as it relates to hazardous waste is disseminated to subcontractors who are collecting wastes.

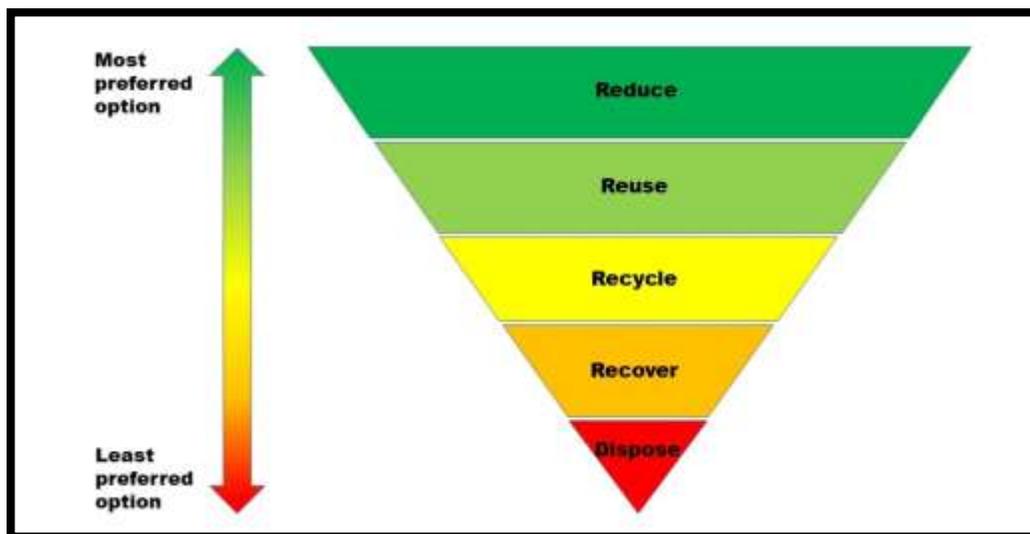
### **QHSSE Supervisor and QHSSE Officers**

The QHSSE Team is responsible for audits and ensuring that waste is being managed in accordance with the Statutory Regulations and the Company Waste Management Plan.

## **2 PROCEDURE DETAILS**

### **2.1.0 Waste Hierarchy**

All wastes generated from operations or any other activities shall be managed to ensure protection of the environment and human health by using a hierarchical approach as illustrated in Figure 1 below.



*Figure 1 Waste Hierarchy*

As seen above, the most preferred option is to reduce the overall waste that is being generated by Guyana Shore Base Inc. Steps should be taken to maximize the use of resource and procedures should promote sustainability.

Where possible, wastes should be reused for its conceived purposes or repurposed for another use that does not reduce its value.

If composition of the waste allows, steps should be taken to recycle or recover materials/energy from the waste. In cases where GYSBI lacks the resource to manage wastes in accordance with the waste hierarchy or where it may not be economically feasible for internal management, then a licensed contractor shall be used.

## 2.2.0 Classification of Waste

There are four main categories of wastes that are generated and handled at GYSBI. These are:

- a. Non-Hazardous Industrial Waste
- b. Non-Hazardous Office Waste
- c. Non-Hazardous Domestic Waste
- d. Hazardous Waste

## 2.3.0 Waste Management Process

### 2.3.1 Segregation, Storage, Transportation and Disposal of Waste

Wastes generated at Guyana Shore Base Inc will be identified, handled, stored, removed, and transported as mentioned in QH-106-ENVIRONMENTAL MANAGEMENT PLAN. Waste removal should be done by a subcontractor that is a holder of either:

- 1) An Environmental Permit and a Waste Management License.
- 2) Be registered as a carrier of controlled waste.
- 3) Be from a waste collection authority in Guyana.

The table below outlines the categories, sources, storage, and disposal of waste being generated by GYSBI.

Waste Category	Department	Waste Description	Approved Storage & Handling Measures	Waste Management Measure
Non-Hazardous Industrial Waste	Maintenance	Tyres	Stored in metal dumpsters provided by licensed contractors. Should be stored in a manner that minimizes rainwater collection; animal, vermin, and pest inhabitation.	Collected, transported, and recycled/recovered by a licensed contractor.
	Maintenance/ Construction	Scrap metal- steel, aluminum, copper, iron, lead	Temporarily stored in metal dumpsters provided by licensed contractors.	Collected, transported, and recovered/recycled by a licensed contractor.
	Construction	Wood	Temporarily stored in metal dumpsters/skips provided by licensed contractors. Should be stored in a manner that minimizes weathering; animal, vermin, and pest inhabitation.	Where possible, scrap wood should be reused on site. If scrap wood cannot be reused on site, then it should be collected, transported, recycled/recovered/disposed by a licensed contractor.
		Demolition waste- concrete	Segregate any wood, textiles, metals, or plastics to leave only concrete.	Recycle- Crush concrete and use for landfill at appropriate locations.
	All Departments	Used Standard PPE- High Visibility Vests, Helmets, Safety Boots, Safety Gloves, Safety Glasses, Coveralls, Face Shields Note: PPE that are not contaminated with hazardous substances.	Collected and stored in covered bins that are clearly labelled as ' <b>Used PPE</b> '.	Collected, transported, and disposed of by licensed contractor.
Non-Hazardous Office Waste	All Departments	Papers, Cardboard Boxes, Pencil Shavings, etc.	Collected and stored in covered bins that are clearly labelled as ' <b>Office Waste</b> '.	Collected, transported, and recycled/disposed by a licensed contractor.  Where possible, the amount of paper and cardboard waste can be minimized by reusing on the base.

## WASTE MANAGEMENT PROCEDURE

Non-Hazardous Domestic Waste	All Departments	General Domestic Waste- Food Waste, Biodegradable Cups/boxes, Cloth, etc.	Collected and stored in covered bins that are clearly labelled as ' <b>General Domestic Waste</b> '.	Collected, transported, and recovered/disposed by a licensed contractor.
Hazardous Waste	All Departments	Plastic Waste- Cups, Spoons, Bottles, Boxes & Bags	Collected and stored in covered bins that are clearly labelled as ' <b>Plastic Waste</b> '.	Collected, transported, and recycled/recovered by licensed contractor.
	Maintenance	Batteries	Batteries must be sorted by type and stored in separate labelled bins to prevent cross-contamination.	Properly sorted batteries should be collected, transported, and recycled by a licensed contractor.
		Waste Oil	Use of spill tray for temporary containment when changing oil/dealing with oil. Spill tray and oil from equipment should be drained into containment drum that is labelled ' <b>Waste Oil</b> '. This waste drum should be stored in a bunded area or on a spill tray that is clear of ignition sources. Waste oil of different chemical composition should not be mixed for storage.	Collected, transported, and disposed/recovered by a licensed contractor.
	Maintenance/ Operations/ Construction	Oily Rags, Used Absorbent Pads/Pillows/Socks, Chemical Buckets or bottles, Brushes, Used Oil Filters, Used Washbay PPE (Tyvek Suit, Nitrile Gloves), Used Nitrile Gloves from Mechanics.	These materials should be placed in clearly labelled enclosed metal bin for temporary storage.	Collected, transported, and recovered/disposed by a licensed contractor.
	Maintenance/ Construction	Fluorescent Tubes & Lamps	Segregated and temporarily stored in clearly labelled airtight containers	Collected, transported, and disposed by a licensed contractor
	Maintenance/ Construction	Paint	Leftover paint should be stored in original containers	Leftover paint should be used on other projects.

Hazardous Waste			until depleted.	Empty containers collected, transported, and disposed of by licensed contractor
	QHSSE Department- Medic	Medical Waste	Medical waste should be placed in biohazard bags that are placed in a labelled ' <b>Medical Waste</b> ' bin. Sharp medical waste should be stored in a separate sealed bin that is clearly labelled as ' <b>Medical Waste-Sharps</b> '.	Collected, transported, and treated/disposed of by a licensed contractor
	IT Department	E-Waste- Used Printing Toners & Cartridges, Printers, Computer Hardware, etc.	To be temporarily stored in clearly labelled " <b>Electronic Waste</b> " bin.	Collected, transported, and recycled/disposed of by a licensed
	All Departments	Domestic Wastewater- Sewage/septic	Accumulated in all septic storage tanks and in portable washroom units.	Collected, transported, and disposed by a licensed contractor.
	Operations	Washbay Waste- Sludge and Wastewater	Collected by the drainage system of the washbay. Stored in approved storage tank/area inside the bunded washbay.	Wastewater to enter the water treatment system and to be reused for washing activity after treatment. Excess wastewater and accumulated sludge to be collected by licensed contractor for treatment/recovery.

**Note: All hazardous substances should be handled, stored, and transported as per procedure QH-003-CHEMICALS AND HAZARDOUS SUBSTANCES- REV 02.**

### 2.3.2 Waste Tracking

The quantities and movement of wastes will be tracked using internal Waste Manifests, Logbooks, and the Deposit Slips from the relevant Sanitary Landfill Sites.

QH-138-B MANIFEST OF TRANSPORTATION AND DISPOSAL OF HAZARDOUS AND NON-HAZARDOUS WASTE (*hazardous waste sheet*) shall be completed when hazardous waste is being collected and disposed of by a licensed contractor.

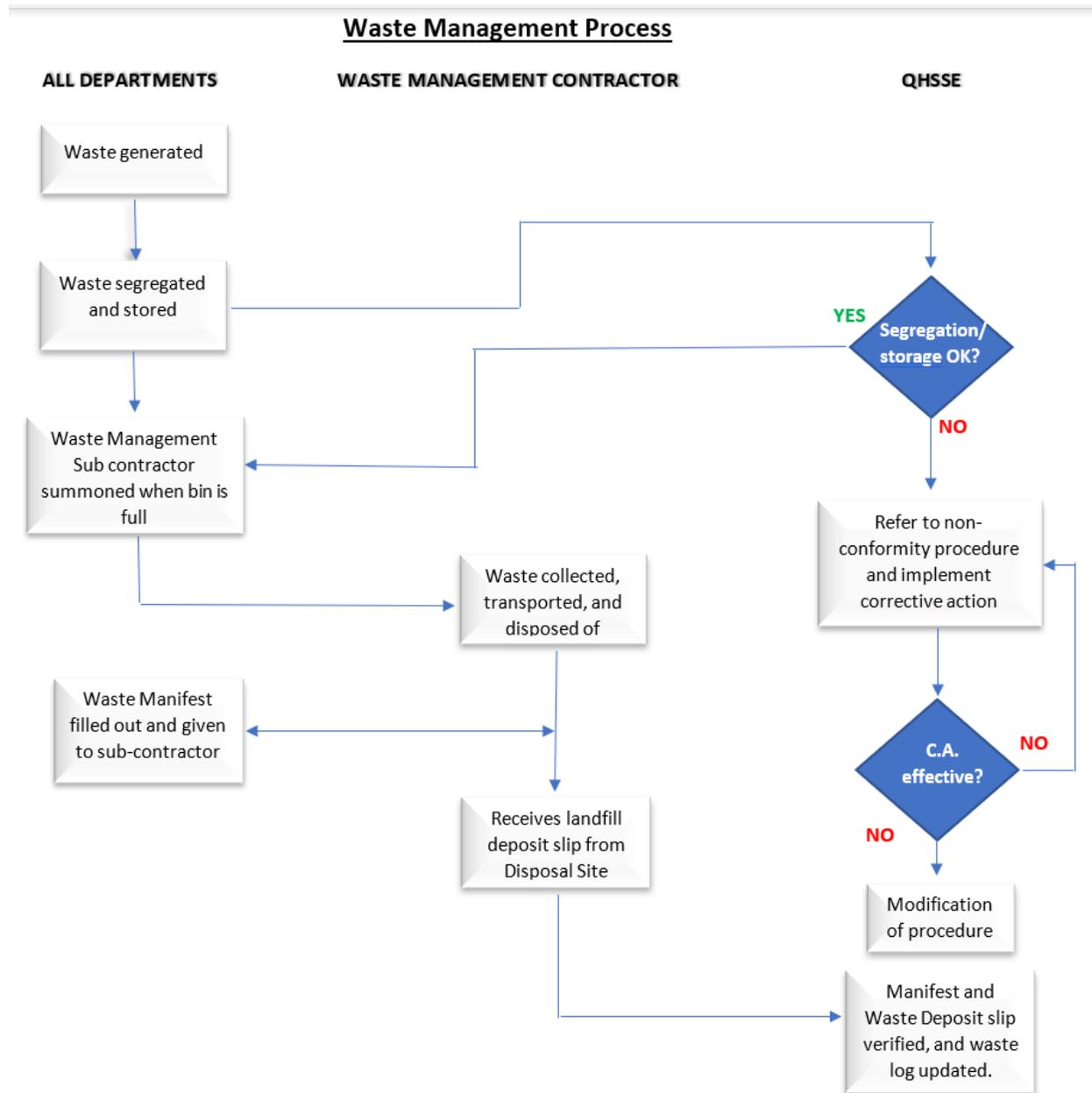
QH-138-A MANIFEST OF TRANSPORTATION AND DISPOSAL OF HAZARDOUS AND NON-HAZARDOUS WASTE (*non-hazardous waste sheet*) shall be completed when non-hazardous waste is being collected and disposed of by a licensed contractor.

All Waste Manifests shall be recorded in the appropriate Waste Management Logbook. QH-136-B WASTE MANAGEMENT LOGBOOK (*hazardous waste sheet*) shall be used for Hazardous Waste Manifests and QH-136-A WASTE MANAGEMENT LOGBOOK (*non-hazardous waste sheet*) shall be used for Non-hazardous Waste Manifests.

Proof of disposal at an EPA approved sanitary landfill site must be provided in written format by the licensed contractor.

Note: GYSBI's responsibilities do not cease when waste is taken off-site by the disposal contractor, hence these guidelines aim to track waste from collection to disposal, with supporting records for reference.

### 2.3.3 Waste Management Process Flowchart



The flowchart above displays the steps that should be taken by all departments generating waste, the waste management contractor/s and the QHSSE Team in the Waste Management Process.

## 2.4.0 Monitoring

Performance monitoring shall be conducted to determine compliance with the applicable regulations, conditions of relevant permits and this Procedure. Compliance shall be monitored through routine checks and bi-weekly audits done by the QHSSE Team.

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	11-June-21	Sean Hill Iain Martin	Initial release of document
2	17-Aug-21	Andy Dowson	Reference document numbers and forms in Appendix updated
3	9-Aug-22	Kurt Busuttil	Amended to include updated waste management flowchart Updated Document Number

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**This procedure shall be used by all departments and updated by QHSSE  
Department**

## 1 PURPOSE

The purpose of this procedure is to ensure that all GYSBI workers and 3<sup>rd</sup> party contractors are not subject to any hazards in relation to work at heights.

## 2 SCOPE

GYSBI recognises that work performed at heights presents a significant risk if not correctly managed. This procedure applies on all GYSBI work sites where there is a risk of persons falling 2 meters or greater, or where persons are working within 2 meters of a live edge or brittle surface.

## 3 PROCEDURE

### Working at Heights

Working at height remains one of the biggest causes of fatalities and major injuries. Common cases include falls from ladders, platforms, scaffolds, cages and through fragile surfaces. 'Work at height' means work in any place where, if there were no precautions in place, a person could fall a distance liable to cause personal injury.

At GYSBI we are committed to protect employees and others against risks to their health and safety while working at height.

The working at height procedure shall be implemented with all GYSBI safe systems of work; including but not limited to QH-PR-009-Risk Assessment Procedure, QH-SI-001-Requirement of Banksman, and QH-SI-002-Use of cones to demarcate red zones at the Main Base & Annex.

N.B: Work zone demarcation should be determined based on the drop zone for potential dropped objects and control of pedestrian and vehicular traffic.

## Permit to Work

Prior to start any task involving working at height one should evaluate the scene where work is to take place and produce a suitable and sufficient risk assessment outlining all the hazard present, potential hazards while work is ongoing to the persons involved in the task and others working in adjacent areas or passing underneath and the corrective measures to be taken to mitigate the risks.

After finalizing the risk assessment, the Performing Authority (employee performing task) shall fill the permit, pass it on to the QHSSE Advisor for verification that control measures have been implemented and finally to the Area Authority (Base Manager) for the final review and approval. When permit is issued, and more employees are involved other than the Performing Authority the risks present, and control measures need to be communicated in order to provide a clear picture of the task.

## Scaffold

All scaffolding shall be erected in accordance with the industry best guidelines and practice. Erected by a competent person possessing adequate experience of such work. The scaffold shall be properly designed, constructed and maintained to ensure that it does not collapse or move accidentally including full platforms, handrails, mid rails and toe- boards. Persons erecting scaffolds shall use a fall-prevention system in situations where it is not possible to maintain three points of contact with the scaffold, i.e. using two hands to perform work. After erecting, the structure must be inspected and tagged safe for use by a competent person:

- before being put into service;

- subsequently, at periodic intervals;
- after any modification;
- period without use;
- exposure to bad weather or seismic tremors;
- any other circumstance which may have affected its strength or stability.

## Ladders

As a rule, ladders should be used as a means of access and egress or for short-term work, must be sufficiently strong and correctly maintained and must be correctly used, in appropriate places and in accordance with their intended purpose. Below are aspects to consider when working with a ladder:

- When ascending or descending, always face the ladder and maintain three points of contact at all times. Do not climb from one ladder to another.
- Always work within easy arms reach and remain centred between the stiles, maintaining three points of contact.
- Use a tool-pouch, shoulder bag or haul bag to convey tools.
- Ensure that only light work is undertaken where three points of contact can be maintained and tools can be operated safely with one hand.
- Where a portable or fixed ladder is used as a working platform and a fall of more than 2metres is possible, a fall-restraint or arrest system should be used.
- Do not attempt to 'walk' or move a ladder while a person is on the ladder.
- Do not erect a portable ladder on elevated walkways, scaffolding or elevated work platforms to gain extra height.
- Do not carry out 'hot work' such as welding or oxy-acetylene cutting.
- Ensure that the manufacturer's instructions regarding the erection use and maintenance of the portable ladder are followed.
- Metal, wire reinforced, or otherwise conductive ladders shall not be used on or near equipment if an electrical hazard might result from their use.

- Ladders should be inspected and maintained in good condition. Inspect the ladder before and after use to ensure it is structurally sound and free from any defects.
- Ladders should be fitted with rubber feet (or similar non-slip material). Ladders should not be used on a slippery surface unless suitable means to prevent slipping are used.

## Personnel Cages

### Construction and design

GYSBI shall ensure that any cage proposed as a personnel cage on a crane or other lifting device, including a forklift truck is designed for that purpose, is registered and has a visible compliance plate displaying SWL and date of registration.

Cage features must include:

- Handrails and grid mesh to all sides.
- Anchor points for fall arrest devices in appropriate locations.
- An inward opening or sliding door that is self-closing and self-latching.

Where the cage is to be used on a forklift truck, it shall:

- Have a back at least 2m high with appropriate infill to protect occupants from any moving portion of the lifting mechanism.
- Have at least two independent locks to secure the cage to the tines.

### Use on a forklift truck

GYSBI shall ensure that when a personnel cage is used on a forklift truck (FLT):

- The FLT driver is at the controls at all times

- The FLT is only operated on a hard level surface
- The FLT is not moved with the platform raised
- All work is carried out while standing on the deck of the platform
- No more than two persons occupy the platform at any time.

## Use on a crane

GYSBI shall ensure that when a personnel cage is used on a crane or similar lifting device:

- A portable crane is not moved (driven) with people suspended in the cage
- All work is carried out while standing on the deck of the platform
- Personnel are to only access and egress personnel cages when the cage is at ground access level and where there is no risk of falling.

## Elevated work platform (EWP)

All employees who operate elevated work platforms, shall be fully instructed in the details of the equipment and the nature of the work.

### EWP safe work practices

The following safe work practices must be adhered to:

- Pre-use inspection – each day of use.
- The work platform is operated safely by a properly trained user and is used in accordance with its operating instructions.
- The safe working load at the work platform is not exceeded.
- Never operate on more than 5-degree slope.
- Never position ladders, steps or similar items on these platforms to provide reach for any purpose.

- Wear fall arrest or fall prevention equipment where appropriate.
- Be aware of clearances when travelling or operating.
- Do not enter or exit from platforms when elevated.
- During travel keep a safe distance from changes in slope depressions, debris, buildings, overhead power lines and other obstacles.

## Working over water

When working over water in an EWP the following options may be considered/adopted with regards to the use of harnesses. (**Work safe Exemption No:11/2012 – dated 26/06/2012**)

1. Wear a harness with a built-in personal flotation device (PFD);
2. Wear a separate harness and PFD;
3. The harness must be attached until over water at which time it can be unclipped. The harness must be reattached before moving over land or any hard surface.

When working over water and not attached to the EWP basket by a harness, a chin strap must be worn to secure helmet in case of a fall.

Rescue flotation device (e.g. life ring) must be readily available when working over water in addition to PFDs. Ensure workers know where rescue ladders are located.

When working in an EWP or work box over water a banksman must be present at all times to guide the operator, monitor work and use the life ring for rescue if required.

In addition to the above harness exemption, workers are exempted from wearing a harness subject to the following conditions:

- a banksman to guide the crane operator and monitor persons working over water;
- an appropriate flotation device is readily available for use.

This exemption relates to workers who are required to operate in a workbox that is suspended over water and on berth fenders. Other uses of a workbox outside these specific circumstances require full protection.

## Signage

For work carried out at height that poses a risk to people below from falling objects, access shall be restricted and, as far as reasonably practicable barricaded. Signage shall be erected that clearly states: "Keep Clear – Working at Heights. Beware of Falling Objects".

## Training

Workers shall be provided with the information, training instruction and supervision necessary to protect them from risks to their health and safety for the type of work at heights activities they may be performing or supervising.

## Rescue Plan

If a worker falls and is suspended by a safety harness, the site supervisor or his delegate shall implement the emergency response plan by following the steps below.

1. Take control of the situation and raise the alarm;
2. Stop all work in the immediate vicinity of the incident;
3. Quickly evaluates the situation and identifies any further hazards that could arise;
4. Get help if workers are close by. If no one is close enough, call for help;
5. Call 912 to notify local fire department, and ambulance if required;

6. Instruct the crane operator to remain on standby and free the hook and waits for further direction in case the designated rescue team must perform a basket rescue;
7. Isolate the accident zone and its perimeter to limit further exposure;
8. Move all non-affected personnel to a safe zone or direct them to remain where they are.
9. Send a designated worker to the site gate to meet the response team (medical, fire, etc.) and ensure that they have a safe access path to the accident scene.
10. Assemble the emergency rescue team at the accident site as quickly as possible to determine the best rescue procedure for the situation.

**Note:** It's important to know your role.

## Rescue Procedures

The following rescue procedures are advised (6.1.1) through (6.1.4.), with (6.1.1) being the preferred method and (6.1.4) being the method used when there is no other means of rescue.

## Elevating Work Platform Rescue

If an elevating work platform (EWP) is available on site and the suspended worker can be reached by the platform, follow the procedure below.

1. Bring the EWP to the accident site and use it to reach the suspended worker.
2. Ensure that rescue workers are wearing full-body harnesses attached to appropriate anchors in the EWP.
3. Ensure that the EWP has the load capacity for both the rescuer(s) and the fallen worker. If the fallen worker is not conscious, two rescuers will probably be needed to safely handle the weight of the fallen worker.

4. Position the EWP platform below the worker and disconnect the worker's lanyard when it is safe to do so. When the worker is safely on the EWP, re-attach the lanyard to an appropriate anchor point on the EWP if possible.
5. Lower the worker to a safe location and administer first aid. Treat the worker for suspension trauma and any other injury.
6. Arrange transportation to hospital if required.

## **Ladder Rescue**

If an elevating work platform is not available, use ladders to rescue the fallen worker with the procedure outlined below.

1. If the fallen worker is suspended from a lifeline, move the worker (if possible) to an area that rescuers can access safely with a ladder.
2. Set up the appropriate ladder(s) to reach the fallen worker.
3. Rig separate lifelines for rescuers to use while carrying out the rescue from the ladder(s).
4. If the fallen worker is not conscious or cannot reliably help with the rescue, at least two rescuers may be needed.
5. If the fallen worker is suspended directly from a lanyard or a lifeline, securely attach a separate lowering line to the harness.
6. Other rescuers on the ground (or closest work surface) should lower the fallen worker while the rescuer on the ladder guides the fallen worker to the ground (or work surface).
7. Once the fallen worker has been brought to a safe location, administer first aid and treat the person for suspension trauma and any other injury.
8. Arrange transportation to hospital if required.

## **Rescue from Work Area or Floor Below**

If the fallen worker is suspended near a work area and can be safely reached from the floor below or the area from which they fell, use the following procedure.

1. Ensure that rescuers are protected against falling.
2. If possible, securely attach a second line to the fallen worker's harness to help rescuers pull the fallen worker to a safe area. You will need at least two strong workers to pull someone up to the level from which they fell.
3. Take up any slack in the retrieving line to avoid slippage.
4. Once the worker has been brought to a safe location, administer first aid and treat the person for suspension trauma and any other injury.
5. Arrange transportation to hospital if required.

## **Basket Rescue**

If a worker has fallen and is suspended in an inaccessible area, you may need to perform a basket rescue.

For basket rescues, the basket must be designed by a professional engineer in accordance with good manufacturing processes to withstand all loads to which it may be subjected. It must be kept on site at all times in an accessible location where it is clear of material or other equipment. Fit the rescue basket with appropriate rigging for quick hookup by the crane operator.

Always keep the following items in the rescue basket.

1. First-aid kit;
2. Three lanyards equipped with shock absorbers;
3. One full body harness;
4. Tag line attached to the basket at all times;
5. Descent controller rescue device in good working condition;
6. Secondary safety line to tie the basket above the headache ball of the crane.

To perform a basket rescue, follow the steps below.

1. Make sure preferred methods 6.1.1, 6.1.2, and 6.1.3 are not possible.
2. Notify the crane operator right away to position the crane to attach the basket.
3. While the basket is being attached, the crew leader checks that all safety rigging is done and all the required safety equipment is available.
4. With two rescuers in the basket, hoist it to a position that is above and as close as possible to the fallen worker. A designated worker on the ground guides the basket with a tag line. The designated worker must make sure that when the rescue basket reaches the right elevation, the door of the basket is facing the structural steel to provide an easy exit for rescuer #1.
5. Rescuer #1 exits the rescue basket and gets into a position to reach the fallen worker. When doing this, rescuer #1 must be tied-off at all times to either the structure or the rescue basket.
6. Rescuer #2, who is still in the rescue basket, lowers the line that will be used to retrieve the worker. Rescuer #2 attaches an extra lanyard to the line if required.
7. Rescuer #1 assesses the fallen worker for injuries and then decides how to proceed (i.e., treat injuries first, guide the fallen worker into the rescue basket, or lower the basket to the ground with the fallen worker attached to it).
8. Once the fallen worker has been brought to a safe location, administer first aid. Treat the person for suspension trauma and any other injury.
9. Arrange transportation to hospital. One of the duty safety officers/delegate, must accompany the injured worker to hospital.

If the basket rescue is the method used, keep the following points in mind.

- Perform a basket rescue only when it is not possible to use conventional equipment to rescue the fallen worker in a safe manner.
- Never exceed the maximum number of workers in the basket as listed on the nameplate.

- Ensure that a competent worker inspects the crane and equipment being used prior to lifting rescuers.
- Always equip the crane with a fail-safe mechanism to prevent the boom from descending in the event of a power source or system failure.
- Maintain an adequate means of communication between the rescuers in the basket and the crane operator at all times.
- Ensure that workers in the rescue basket wear full-body safety harnesses attached to a lanyard and anchored to appropriate points in the basket at all times.
- Make sure that all rigging used to attach the rescue basket to the hook of a load line has a safety factor of 10 against failure. There should be a safety line attached to the load line directly from the basket.
- Do not allow cranes to travel while rescuers are in the basket.
- Do not use suspended rescue baskets during high winds, electrical storms, or other adverse conditions that could affect the safety of personnel on the platform or in the basket.

## **Post-Rescue Procedure**

All non-affected workers should remain in the designated safe gathering zone until the site supervisor notifies them to do otherwise.

The site supervisor and health and safety supervisor should:

- Begin the accident investigation.
- Quarantine all fall-arrest equipment that may have been subjected to fall fatigue effects and/or shock loading for further investigation.
- Secure the area (the OHSA requires that an accident scene not be disturbed where a fatal or critical injury has occurred).
- Determine if the jobsite-specific rescue and evacuation plans were followed as designed.

**WORKING AT HEIGHT PROCEDURE**

- Record modifications or additions to the plans that the rescue team deems necessary.
- Record all documented communications with fire, police and other contractors involved.
- Record all documented statements from employees, witnesses, and others.
- Save all photographs of the incident.
- Record all key information such as date, time, weather, general site conditions, and specific accident locales including sketches of the immediate incident area, complete with measurements if applicable.

**References**

(Work safe Exemptions No:11/2012 – dated 26/06/2012)

**REVISION SUMMARY**

Revision	Date	Approved by	Summary of change
1	17 Mar 2019	-	Initial release of document
2	13 Aug, 2020	Michael James Sean Hill	Document layout changed to new company format
3	17 Sep 2021	Kurt Busuffil	Permit to Wok designations adjusted
<b>4</b>	07 Jul 2022	Kurt Busuffil	Updated Document Number



# SIMOPS

 <b>SIMOPS</b>		Overhead Working	Hot Work
		C1	C2
		Overhead Working	R1
Hot Work	R2	PROHIBITED	PROHIBITED
Cargo Handling	R3	PROHIBITED	PROHIBITED
Maintenance Other than vessel maintenance (Cold Work)	R4	PROHIBITED	RESTRICTED
Berthing	R5	PROHIBITED	RESTRICTED
Quaside Traffic	R6	PROHIBITED	RESTRICTED
Tank Cleaning	R7	PROHIBITED	PROHIBITED
Security Checks	R8	RESTRICTED	RESTRICTED
Works under the Wharf	R9	PROHIBITED	RESTRICTED
Pedestrian Traffic	R10	PROHIBITED	RESTRICTED
Use of Gangway	R11	PROHIBITED	RESTRICTED
Installing hoses Fuel	R12	PROHIBITED	PROHIBITED
Installing hoses Bulk	R13	PROHIBITED	RESTRICTED
Pressure Testing	R14	PROHIBITED	RESTRICTED
Installing hoses- Water	R15	PROHIBITED	ALLOWED
Pumping Fuel	R16	PROHIBITED	PROHIBITED
Pumping Bulk/Water	R17	RESTRICTED	RESTRICTED
Removing Hoses- Fuel	R18	PROHIBITED	PROHIBITED
Removing hoses- Bulk	R19	PROHIBITED	RESTRICTED
Removing Hoses- Water	R20	PROHIBITED	ALLOWED
Tank Entry	R21	PROHIBITED	PROHIBITED
Loading/ Unloading Vessel	R22	PROHIBITED	RESTRICTED
Vessel Maintenance	R23	RESTRICTED	RESTRICTED
Sea fastening	R24	PROHIBITED	RESTRICTED
Heavy lifts	R25	PROHIBITED	RESTRICTED
Use of Vessel Crane	R26	PROHIBITED	RESTRICTED
Refuelling Machinery	R27	PROHIBITED	PROHIBITED
Removal of sludge from vessel	R28	PROHIBITED	PROHIBITED
Chamion X Chemical Transfer	R29	PROHIBITED	PROHIBITED
Dredging	R30	PROHIBITED	PROHIBITED
Vessel Survey	R31	PROHIBITED	PROHIBITED
Walking of Crane	R32	PROHIBITED	PROHIBITED
Berth Construction	R33	PROHIBITED	ALLOWED
Diving Ops	R34	ALLOWED	ALLOWED

**PROHIBITED:**  
Job cannot continue

Cargo Handling	Maintenance (Cold Work)	Berthing	Quaside Traffic
C3	C4	C5	C6
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	RESTRICTED	RESTRICTED	RESTRICTED
	PROHIBITED	PROHIBITED	RESTRICTED
PROHIBITED		PROHIBITED	RESTRICTED
PROHIBITED	PROHIBITED		RESTRICTED
RESTRICTED	RESTRICTED	RESTRICTED	
RESTRICTED	ALLOWED	PROHIBITED	ALLOWED
RESTRICTED	RESTRICTED	RESTRICTED	ALLOWED
RESTRICTED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
RESTRICTED	ALLOWED	PROHIBITED	ALLOWED
RESTRICTED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
ALLOWED	ALLOWED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	RESTRICTED
RESTRICTED	ALLOWED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
PROHIBITED	RESTRICTED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	RESTRICTED
RESTRICTED	RESTRICTED	PROHIBITED	ALLOWED
RESTRICTED	RESTRICTED	PROHIBITED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	ALLOWED	PROHIBITED	ALLOWED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	RESTRICTED	PROHIBITED
RESTRICTED	RESTRICTED	ALLOWED	RESTRICTED
ALLOWED	ALLOWED	PROHIBITED	ALLOWED

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**RESTRICTED:**  
Job requires further controls

**ALLOWED:**  
Job can continue

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Tank Cleaning	Security Checks	Works under the Wharf	Pedestrian Traffic
C7	C8	C9	C10
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	RESTRICTED	RESTRICTED	RESTRICTED
RESTRICTED	RESTRICTED	RESTRICTED	ALLOWED
ALLOWED	RESTRICTED	RESTRICTED	RESTRICTED
PROHIBITED	RESTRICTED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
	ALLOWED	RESTRICTED	ALLOWED
ALLOWED		ALLOWED	ALLOWED
RESTRICTED	ALLOWED		ALLOWED
ALLOWED	ALLOWED	ALLOWED	
ALLOWED	ALLOWED	ALLOWED	ALLOWED
PROHIBITED	ALLOWED	PROHIBITED	ALLOWED
RESTRICTED	ALLOWED	PROHIBITED	ALLOWED
ALLOWED	RESTRICTED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	PROHIBITED	ALLOWED
PROHIBITED	ALLOWED	PROHIBITED	RESTRICTED
RESTRICTED	ALLOWED	PROHIBITED	RESTRICTED
PROHIBITED	ALLOWED	PROHIBITED	ALLOWED
RESTRICTED	ALLOWED	PROHIBITED	ALLOWED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
RESTRICTED	PROHIBITED	PROHIBITED	RESTRICTED
RESTRICTED	RESTRICTED	RESTRICTED	ALLOWED
RESTRICTED	ALLOWED	ALLOWED	ALLOWED
PROHIBITED	PROHIBITED	PROHIBITED	RESTRICTED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
ALLOWED	RESTRICTED	RESTRICTED	RESTRICTED
RESTRICTED	ALLOWED	PROHIBITED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	ALLOWED	RESTRICTED	ALLOWED
PROHIBITED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	PROHIBITED	PROHIBITED	RESTRICTED
ALLOWED	RESTRICTED	RESTRICTED	RESTRICTED
ALLOWED	ALLOWED	RESTRICTED	ALLOWED

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**BLACK:**  
Not Applicable

**BLUE:**  
Controlled by GYSBI  
Permit to Work

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Use of Gangway	Installing hoses Fuel	Installing hoses Bulk	Pressure Testing
C11	C12	C13	C14
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
RESTRICTED	PROHIBITED	RESTRICTED	RESTRICTED
RESTRICTED	RESTRICTED	ALLOWED	ALLOWED
ALLOWED	RESTRICTED	RESTRICTED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
ALLOWED	PROHIBITED	RESTRICTED	ALLOWED
ALLOWED	ALLOWED	ALLOWED	RESTRICTED
ALLOWED	PROHIBITED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	ALLOWED	RESTRICTED
ALLOWED	ALLOWED	ALLOWED	RESTRICTED
ALLOWED	ALLOWED	ALLOWED	RESTRICTED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
ALLOWED	ALLOWED	ALLOWED	RESTRICTED
ALLOWED	PROHIBITED	RESTRICTED	PROHIBITED
ALLOWED	RESTRICTED	PROHIBITED	PROHIBITED
ALLOWED	PROHIBITED	RESTRICTED	PROHIBITED
ALLOWED	ALLOWED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
ALLOWED	ALLOWED	ALLOWED	PROHIBITED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
RESTRICTED	ALLOWED	ALLOWED	ALLOWED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	RESTRICTED	RESTRICTED	RESTRICTED
ALLOWED	RESTRICTED	RESTRICTED	RESTRICTED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
RESTRICTED	PROHIBITED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
ALLOWED	RESTRICTED	RESTRICTED	RESTRICTED

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**ORANGE:**  
Controlled by Vessel  
Permit to Work

**WHITE:**  
No Permit to Work Required

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# Wharf SIMOPS Matrix

Installing hoses- Water	Pumping Fuel	Pumping Bulk/Water	Removing Hoses- Fuel
C15	C16	C17	C18
PROHIBITED	RESTRICTED	ALLOWED	PROHIBITED
ALLOWED	PROHIBITED	RESTRICTED	PROHIBITED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
ALLOWED	PROHIBITED	RESTRICTED	PROHIBITED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
ALLOWED	RESTRICTED	RESTRICTED	ALLOWED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
ALLOWED	PROHIBITED	RESTRICTED	PROHIBITED
ALLOWED	RESTRICTED	PROHIBITED	RESTRICTED
RESTRICTED	PROHIBITED	PROHIBITED	PROHIBITED
	RESTRICTED	RESTRICTED	RESTRICTED
RESTRICTED		RESTRICTED	PROHIBITED
RESTRICTED	RESTRICTED		RESTRICTED
RESTRICTED	PROHIBITED	RESTRICTED	
RESTRICTED	RESTRICTED	PROHIBITED	RESTRICTED
PROHIBITED	RESTRICTED	RESTRICTED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	RESTRICTED
RESTRICTED	PROHIBITED	RESTRICTED	RESTRICTED
ALLOWED	RESTRICTED	ALLOWED	ALLOWED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
PROHIBITED	PROHIBITED	ALLOWED	PROHIBITED
RESTRICTED	RESTRICTED	ALLOWED	RESTRICTED
RESTRICTED	ALLOWED	ALLOWED	RESTRICTED
RESTRICTED	ALLOWED	ALLOWED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED

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Removing hoses- Bulk	Removing Hoses- Water	Tank Entry	Loading/ Unloading Vessel
C19	C20	C21	C22
PROHIBITED	PROHIBITED	ALLOWED	PROHIBITED
RESTRICTED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	ALLOWED	ALLOWED
RESTRICTED	RESTRICTED	ALLOWED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	ALLOWED	RESTRICTED
RESTRICTED	ALLOWED	ALLOWED	RESTRICTED
ALLOWED	ALLOWED	ALLOWED	RESTRICTED
PROHIBITED	PROHIBITED	ALLOWED	PROHIBITED
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PROHIBITED	ALLOWED	ALLOWED	RESTRICTED
PROHIBITED	ALLOWED	PROHIBITED	RESTRICTED
RESTRICTED	PROHIBITED	PROHIBITED	RESTRICTED
RESTRICTED	RESTRICTED	PROHIBITED	RESTRICTED
PROHIBITED	RESTRICTED	PROHIBITED	RESTRICTED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
	ALLOWED	ALLOWED	PROHIBITED
ALLOWED		ALLOWED	PROHIBITED
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PROHIBITED	PROHIBITED	RESTRICTED	
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PROHIBITED	PROHIBITED	RESTRICTED	ALLOWED
RESTRICTED	RESTRICTED	ALLOWED	RESTRICTED
RESTRICTED	RESTRICTED	ALLOWED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	ALLOWED	PROHIBITED
RESTRICTED	RESTRICTED	ALLOWED	RESTRICTED
RESTRICTED	RESTRICTED	ALLOWED	RESTRICTED

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Vessel Maintenance	Sea fastening	Heavy lifts	Use of Vessel Crane
C23	C24	C25	C26
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	RESTRICTED	RESTRICTED
RESTRICTED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	RESTRICTED	ALLOWED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
RESTRICTED	RESTRICTED	PROHIBITED	RESTRICTED
RESTRICTED	ALLOWED	RESTRICTED	RESTRICTED
RESTRICTED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	RESTRICTED	RESTRICTED
RESTRICTED	ALLOWED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
RESTRICTED	ALLOWED	PROHIBITED	RESTRICTED
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ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
RESTRICTED	ALLOWED	RESTRICTED	ALLOWED
RESTRICTED	PROHIBITED	ALLOWED	RESTRICTED
	ALLOWED	RESTRICTED	RESTRICTED
ALLOWED		PROHIBITED	ALLOWED
RESTRICTED	PROHIBITED		PROHIBITED
RESTRICTED	ALLOWED	PROHIBITED	
ALLOWED	ALLOWED	PROHIBITED	RESTRICTED
RESTRICTED	ALLOWED	PROHIBITED	RESTRICTED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	PROHIBITED	PROHIBITED
RESTRICTED	ALLOWED	RESTRICTED	RESTRICTED
RESTRICTED	PROHIBITED	RESTRICTED	ALLOWED

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Refuelling Machinery	Removal of sludge from vessel	Chamion X Chemical Transfer	Dredging
C27	C28	C29	C30
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	PROHIBITED	ALLOWED
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
ALLOWED	RESTRICTED	PROHIBITED	ALLOWED
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RESTRICTED	RESTRICTED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	RESTRICTED
RESTRICTED	RESTRICTED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	PROHIBITED	PROHIBITED
ALLOWED	ALLOWED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	PROHIBITED
ALLOWED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	RESTRICTED	PROHIBITED	PROHIBITED
ALLOWED	RESTRICTED	PROHIBITED	RESTRICTED
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PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
RESTRICTED	RESTRICTED	PROHIBITED	PROHIBITED
	RESTRICTED	PROHIBITED	PROHIBITED
RESTRICTED		PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED		PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	
PROHIBITED	PROHIBITED	PROHIBITED	PROHIBITED
PROHIBITED	PROHIBITED	PROHIBITED	ALLOWED
RESTRICTED	RESTRICTED	PROHIBITED	RESTRICTED
ALLOWED	ALLOWED	PROHIBITED	PROHIBITED

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# Pipe Yard SIMOPS Matrix

## SIMOPS

	Movement of Machinery	Slinging and Un/Bundling	Movement of Tubulars	Movement of CCU	Ground Maintenance Works
Movement of Machinery		AMBER	AMBER	AMBER	RED
Slinging and Un/Bundling	AMBER		AMBER	AMBER	RED
Movement of Tubulars	AMBER	AMBER		AMBER	RED
Movement of CCU	AMBER	AMBER	AMBER		RED
Ground Maintenance Works	RED	RED	RED	RED	
Offloading/Loading of Third-Party Truck	AMBER	AMBER	AMBER	AMBER	AMBER
Dismantling and Building of Racks	AMBER	AMBER	AMBER	AMBER	AMBER
Movement of Container by Stacker	RED	RED	RED	RED	RED

**RED:**  
Job cannot continue

**AMBER:**  
Job requires further controls

**GREEN:**  
Job can continue

	Doc no: QH-PR-004-B	
	Revision No.	1
	Date	14-Oct-21
Offloading/Loading of Third-Party Truck	Dismantling and Building of Racks	Movement of Container by Stacker
AMBER	AMBER	RED
	AMBER	RED
AMBER		RED
RED	RED	
	<b>BLACK:</b> Not Applicable	

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**This procedure shall be used and updated by QHSSE Department**

## 1 INTRODUCTION

One of the core values of GYSBI is the Health, Safety and Wellbeing of its employees and contractors as well as the protection of its property and the environment. In addition, GYSBI has a legal and moral obligation to ensure its workers and all who can be affected by its acts and omissions are safe guarded against occupational injuries and ill health as a direct cause of its operations. The company is also obliged to comply with Environmental Regulations.

GYSBI expects the same commitment to the Health & Safety of personnel and property and the protection of the environment from its contractors. In this regard, sub-contractors and third parties are required and expected to conduct their operations within a structured and controlled safety management system and conscientious environmental responsibility during the performance of the contract work scope. Consequently, GYSBI management and employees are required to comply by this procedure when engaging the services of a contractor to work on company sites and/or third-party sites managed by GYSBI.

## 2 PROCEDURE DETAILS

### 2.1 Contractors Assessment

At enquiry stage, for any enquires in which Health, Safety and Environment (QHSSE) assessment is required, the QHSSE department is to be informed. The QHSSE department will review and follow up on the request as specified in the QHSSE Management System. If the duration and extent of the job being contracted is such that it will be done over several weeks or months, the QHSSE bridging process may be carried out with the contractor to clearly establish the

contractor's QHSSE alignment with that of GYSBI and identify roles and responsibilities of all parties involved.

All contractors and subsequent subcontractors must satisfy several criteria before being engaged to conduct work for/and on its behalf. Responsibility for screening of subcontractors lies with the main contractor who must ensure that all company criteria are met before job is subcontracted to another contractor to conduct work on behalf of GYSBI. Contractors must also satisfy the criteria listed in the QHSSE Bridging Document Checklist.

These include but are not limited to:

- Evidence of safe work practices including but not limited to a documented QHSSE policy
- Proof of competence of employees in the capacity of their duties
- Proof of maintenance and certification of all equipment that will be used on GYSBI sites as required by law
- Document of resources allocated to QHSSE performance

## 2.2 Contractor Classification

The company may make use of several different kinds of contractors, as is described hereunder:

### 2.2.1 General Contractor

A person, persons, company or business entity that provides goods or services to GYSBI under terms of a contract. Such contractors may be:

Consultants that provide a service or professional advice for remuneration

Contractors delivering a service as per purchase agreement

Contractors appointed to perform maintenance and infrastructure services

### 2.2.2 Temporary Employees

A person that is employed within the group for a short period of time to perform a specific job or fill a void temporarily under a contract agreement.

### 2.2.3 Service Contractor

A person or company providing a service to GYSBI on a regular or as needed basis including the likes of service technicians and suppliers for water bottles, septic disposal etc.

## 2.3 Responsibilities

General responsibilities lie with all parties involved as indicated in the local legislation and they all must take necessary precautions and act in such a manner so as to minimize the safety and environmental risks that are inherent to the workplace for employees, the public and the environment.

### 2.3.1 Contractor Responsibilities

#### **Contractors engaged by GYSBI are responsible to:**

- Ensure prior to service commencement all relevant personnel and equipment certificates required to complete the requested service are forwarded to GYSBI.
- Ensure that the Scope of works is understood, request the latest GYSBI QHSSE documentation, conduct a suitable and sufficient risk assessment to assess, continuously monitor and mitigate risks.
- Ensure compliance with the GYSBI minimum QHSSE requirements and Site Safety Procedure by its own personnel and/or its contractors.

- An QHSSE responsible is appointed to monitor, guide, train and manage safety issues.
- Communicate with GYSBI, all issues and areas of concern relating to QHSSE.
- Notify GYSBI QHSSE Department in due time for QHSSE Inductions to be delivered to contractors' visitors and or employees.

## 2.4 Contractor Management

The way that contractors are managed is dependent on the job being undertaken. This means that the requirement for a formal written legal contract or a simple service agreement is based on the extent, magnitude, complexity and cost of the project in question. This document must include information such as:

Processes and procedures to be used to ensure compliance to QHSSE company policy.

- Site, plant, facilities and activities it applies to.
- Clearly define responsibilities of parties involved.
- Specific instructions of supplier evaluation procedure for appointment of sub-contractors.

This document must be separate from but can be part of any agreement to conduct a job or operation for GYSBI. If the contractor will be making use of the services of a subcontractor he must ensure, through a supplier evaluation process, that subsequent sub-contractor will conform to all pertinent GYSBI policies and procedures. Contractor is also responsible to monitor his QHSSE record and compliance whilst on GYSBI sites.

*Associated Documentation*

*Bridging Document Checklist QHSSE-PRO-032*

## 2.5 Site Registration System

In pursuance of Health & Safety all contractor personnel working on sites operated by the company are obligated to register their entry and exit into the site at the security gate and/or reception areas. This serves the purpose of facilitating headcount in case of emergency as well as monitoring of movement of third-party personnel on GYSBI sites.

## 2.6 Auditing and Inspection

An integral part of contractor management is site inspections and auditing of SSOW employed by the latter. The system will be audited for compliance with QHSSE regulations by GYSBI management but could also be scrutinized by the OHSA in case of an accident. Should the company be subject to other external regulatory audits, all third-party contractors working on site will be subjected to the same audits as a company contractor.

The QHSSE department is to keep a list of principal contractors whose work may present risks to personnel and the environment. QHSSE will request generic risk assessment documents from these contractors. Contractors are responsible to update GYSBI when risk assessments change and to carry out JSA's prior to performing the task.

GYSBI can request a risk assessment from any contractor that is not included in the List of Principal Contractors.

GYSBI supervisors are to raise any QHSSE concerns relating to Contractors to the QHSSE Supervisor or QHSSE Officer/s.

*Associated Documentation*

**QH-176 -Contractor QHSSE Evaluation Assessment****2.7 Incident Reporting and Investigation**

If a contractor or one of his personnel has an accident whilst operating on a company site, they must inform company management immediately. They are also obligated to fill in an accident report and present to the QHSSE Department to be kept on record.

**REVISION SUMMARY**

Revision	Date	Approved by	Summary of change
1	-	-	Initial release of document
2	-	-	-
3	4 Jun 2020	Michael James Sean Hill	-
4	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
5	17 Sep 2021	Kurt Busuttil	QHSSE Manager designation removed
6	14 Jan 2022	Andrew Dowson	QH-176 -Contractor QHSSE Evaluation Assessment added as Reference Document for Audit and inspections.
7	07 Jul 2022	Kurt Busuttil	Updated Document Number

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**These guidelines shall be followed by all departments and update by QHSSE Department**

## 1. SUSPECTED COVID-19

- Anyone who experiences symptoms at work is expected to report to the medic for further instructions.
- Any employee who experiences fever and/or other symptoms whilst at home should not report to work. The employee should contact the Medic via mobile (592) 608-2857 or email [GYSBI.Medic@gysbi.com](mailto:GYSBI.Medic@gysbi.com) for further direction.
- Once an employee tests positive, the standard sick-leave process applies: each employee is expected to present a medical certificate to HR and this off time will be counted as sick leave, failure to provide a certificate will be labelled as absent.
- Tests for persons experiencing symptoms at work are to be paid using insurance cards.

## 2. RETURN TO WORK AFTER A POSITIVE COVID-19 TEST

It is the employee's responsibility to ensure that they produce a negative PCR or Antigen Test from a recognized lab (not GYSBI's Medical Center) and are fit to return to work. If unsure they should contact the medic and seek guidance.

## 3. WORKING VESSELS

### Cargo Operations

- Only 1 RAMPS employee on board to verify cargo against manifest and must wear a mask.
- Maximum 4 GYSBI (Guyana Shore Base Incorporated) employees on vessel deck for cargo ops, and must wear a mask. Vessel crew could remain by or in house during cargo ops to maintain social distancing.
- Surveyor to be on board for independent 3<sup>rd</sup> party inspection of bulk transfers and must wear a mask.

## Dry or Wet Bulks

- RAMPS stay quayside. Does not board the vessel. Can speak with Captain / Chief Engineer regarding any safety concerns. Can pass any paperwork across the gangway.
- Surveyor to be on board for independent 3rd party inspection, and must wear a mask

## Security

- Security guards to stay on the deck of the vessel for both day and night patrols ensuring a face covering is worn at all times.

## 4. VESSEL CREW CHANGES

- Security guards will let the vehicles enter without stopping for checks to avoid potential transmission.
- No person may interact with any other person outside the vehicle while waiting to enter the vessel. Stay in the vehicle.
- Berth will be cleared of persons to avoid potential transmission
- Vehicle must immediately leave the GYSBI facility, after receiving new passengers. No interaction with anyone on the GYSBI facility is allowed.

## 5. PROTECTION

- Wearing a face mask in the open is not mandatory; it remains subjected/preferable to the individual's choice. However, all persons entering and/or operating within office areas either for work or business will be required to wear a mask.
- Hand wash basins have been strategically stationed at the entrance and around the facility so that persons can have the opportunity to wash or sanitize their hands when entering and when around the facility.
- Proof of vaccination is not mandatory to enter buildings neither is a recent PCR.

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	22 Oct 2020	Iain Martin Sean Hill	Initial release of document
2	17 Jul 2021	Sean Hill	Changes to section 7, 12 and 13 Changes to contact tracing form

3	17 Sep 2021	Kurt Busuttil	QHSSE Manager designation removed Updated to include Operations Manager
4	1 Oct 2021	Kurt Busuttil	Changes to section 7 that were already included in internal Company Memo
5	4 Jan 2022	Andrew Dowson	Changes to section 7, 12, 13 and Positive COVID-19 Test Result Follow up Process
6	7 Jan 2022	Andrew Dowson	Removal of outdated and irrelevant information from section and Test Follow up process
7	15 Jan 2022	Andrew Dowson	Changes to format Removal of Medical Response Flowchart Update of Mask Guidance picture Updated section 8
8	18 March 2022	Sean Hill	Alignment with updated national guidelines
9	20 May 2022	Andy Dowson	Section 4 updated to ensure Masks are worn in the office.
10	29 May 2022	Andy Dowson	Section 2: Returning to work after a positive COVID-19 test added.
11	04 Jun 2022	Andy Dowson	Section 2: Returning to work after a positive COVID-19 test updated.
12	07 Jul 2022	Kurt Busuttil	Document Format Update

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# 1 INTRODUCTION

This procedure aims to serve as a guide for flight operations, planning and execution. The operational procedures outline best practices and the internal process for safe and effective flight operations. This includes roles and responsibilities and emergency procedures. The aim is to document everything that needs to be done while drones (Unmanned Aerial Vehicle) are being flown to carry out operations at GYSBI MAIN BASE and the ANNEX. Flight operations shall be conducted in accordance with all the relevant statutory requirements.

## 2. APPLYING FOR A DRONE PERMIT

### 2.1. Four Simple Steps

1. Submit a formally written letter addressed to the Director General of the Guyana Civil Aviation Authority requesting permission to operate. Email your letter to [dronesunit@gcaa-gy.org](mailto:dronesunit@gcaa-gy.org).
2. Attached the UAV Information Sheet along with a copy of your National Identification Card or the Bio Data Page of your passport (Foreign applicants) with the letter.
3. A Drone Security Clearance Check will be conducted for each applicant (time span of security clearance is a minimum of 29 days)
4. Drone Away

## 3 AERIAL SURVEILLANCE

### 3.1. Using an Unmanned Aerial Vehicle

1. No person shall operate an Unmanned Aerial Vehicle, irrespective of the dimensions or maximum weight of that aircraft, for the purposes of obtaining, recording, or transmitting information, whether in the visible spectrum or otherwise, unless that person has obtained written authorization from the Authority to obtain, record, or transmit such information.

2. Refer to the legislation for further guidance: [https://drone-laws.com/drone-laws-in-guyana/#UAS\\_Laws\\_-\\_General\\_rules\\_for\\_flying\\_drones\\_in\\_Guyana](https://drone-laws.com/drone-laws-in-guyana/#UAS_Laws_-_General_rules_for_flying_drones_in_Guyana)

### 3.2. Operating a Drone

1. No person shall operate an unmanned aerial vehicle in Guyana airspace without having first received written permission from the Civil Aviation Authority, unless such a vehicle is operating in accordance with Paragraph 13.
2. For further guidance: <https://www.gcaa-gy.org/drones.html>

## 4 PERSONNEL

### 4.1. Base Manager

1. The Base Manager (Operations Issuing Authority) is responsible for issuing of the permit to work (PTW) for the drone operations.
2. They shall have a complete overview of all planned and ongoing activities in their area, in order to manage the risks, including any potentially conflicting simultaneous activities.

### 4.2 GYSBI Security coordinator (PFSO or Designate)

1. The security supervisor shall maintain a file for each operator and airframe. The file shall include copies of training records, flight incidents, etc.
2. It is the responsibility of the security supervisor to be current and up to date with all relevant statutory provisions applicable to drone operations and amend this procedure as those regulations change.
3. The security supervisor shall ensure that the remote pilot-in-command has all documents as per the requirements of the law.
4. The security coordinator (PFSO or Designate) and/or GYSBI training department shall also ensure the pilot-in-command is current with the training and knowledge.

### 4.3 Remote pilot-in-command:

1. To be considered for selection as an operator, applicants must meet all the requirements for and successfully pass the remote pilot certification to be accepted as a suitable candidate.
2. Operators interacting with air traffic control shall have sufficient expertise to perform the task readily and must understand and comply with the regulations applicable to air space where GYSBI operations are to be carried out using drones.
3. An operator's primary duty is the safe and effective operation of the drone in accordance with the manufacturer's approved flight manual, relevant state regulations, GYSBI policies and procedures.
4. An operator may be temporarily removed from flight status at any time by the security supervisor for reasons including performance, proficiency, physical condition etc. should this become necessary he/she will be notified verbally and in writing of the reasons for removal.
5. The pilot-in-command must ensure all drones are in airworthy condition and are registered if required by law.

#### **4.4 Observers (optional)**

1. Observers when they are used as an additional control, they must be sufficiently trained to communicate clearly to the operator any turning instructions required to stay clear of conflicting traffic and obstacles.

#### **4.5 Third Party Drone Operators**

1. GYSBI may be approached by a third party regarding the proposed flight of a drone over GYSBI properties for a third-party purpose. The person operating a drone for a third-party purpose must meet the GCCA licensing requirements of and agree in writing to comply with all relevant sections of this procedure.

## 5. PRE-FLIGHT OPERATIONS

### 5.1 PRE-FLIGHT ACTIVITIES ARE THE DUTY OF THE REMOTE PILOT-IN-COMMAND BEFORE THE FLIGHT OPERATION

Activities include:

1. Inspection of the aircraft.
2. Assessment of the operating location.
3. Briefing crew members involved in the operation.
4. Equipment checkouts.
5. The checklist in the appendix provide more detailed guidance.

### 5.2 Planning

1. The flight crew should be familiarized with information pertaining to the flight such as weather conditions, hazards and no fly zones.

### 5.3 Inspection

1. Use the flight checklists in Appendix.

### 5.4 Weather

1. Before each flight the remote pilot-in-command and observer(s) should ensure that he/she gathers enough information about the existing and anticipated near-term weather conditions throughout the entire operation, and the remote pilot-in-command should consult with hydromet's weather forecast.

## 6 PREFLIGHT INSPECTION CHECKLIST/FLOWCHART

1. A detailed pre-flight checklist in APPENDIX 1 should be used to ensure all safety and operational procedures are addressed and to ensure safety of the mission.
2. The drone flight inspection checklist must be completed before the (PTW) is issued and the flight operations commences.

## 7 DURING FLIGHT OPERATIONS

1. No person shall, during take-off or landing, operate the drone within 30 meters of any person, other than the Pilot or another person assisting in the operation and under the supervision of the pilot.
2. The Pilot in Command of the drone shall not operate that aircraft
  - Over or within 150 meters of any congested area or organized open air assembly.
  - Within 100 meters of any vessel, vehicle, or structure, which is not under the control of the person accountable to the Authority for the aircraft, or someone who has contracted the services of the aircraft; or
  - within 50 meters of any person, either vertically or horizontally

## 8 POST FLIGHT OPERATIONS

### 8.1 After landing:

1. Shut down the drone and disconnect batteries.
2. Power down camera or sensors.
3. Visually check the aircraft for signs of damage and/or excessive wear.
4. Enter logbook entries recording flight time and other flight details.
5. Verify that all objectives have been met.
6. The permit to work (PTW) to fly the drone should be closed.

## 9. EMERGENCY PROCEDURES

Emergency procedures are specific to each UAS type as designed by the manufacturer. It is the responsibility of the flight crew to be proficient with the aircraft operational manual provided by the vendor before any flight operations are conducted. It is also a

best and safe practice to prepare an Emergency Checklist (Appendix xxx) in case of emergencies. The RPIC should always be prepared to execute an emergency procedure in instances where there is a lost link, loss of GPS, or there are other aircraft or obstructions in the flight path. He/she should brief the flight crew before the start of the flight operations about emergency procedures and have a mission abort site for landing in the case of an emergency. After the aircraft has safely landed, it should be documented for maintenance purposes.

Some possible emergencies due to system failures are as follows:

1. Loss of Data Link communications
2. Loss of GPS
3. Autopilot Software error/failure
4. Loss of Engine power
5. Ground Control System failure
6. Intrusion of another aircraft into the drone's airspace

## **10. FLIGHT AREA/PERIMETER MANAGEMENT**

1. It is the job of the pilot-in-command to ensure that all flight operations are within authorized airspace parameters and the drone flight limits.
2. Flight boundaries including, including any restrictions imposed by the law and any restricted areas should be reviewed before flight operations.

## **11. ACCIDENT & INCIDENT REPORTING**

1. All incidents involving damage to the drone, property of others, personal injury to employees or others should be reported to GYSBI'S management as soon as possible or within 24 hours.
2. A drone pilot or operator shall immediately report to the Authority (GCAA), in a manner deemed acceptable, any drone accident involving any of the

following: (a) serious injury or death to a person; (b) damage to any property other than the drone; (c) airspace incursion; or (d) destruction of the drone beyond economical repair.

3. If an incident occurs, return the drone to the home location or turn the engine off and protect the scene to the best of your ability to prevent further damage/injury.
4. Ensure medical attention is provided to any injured parties as quickly as possible. Follow the Medical Emergency Response flow chart for details.
5. Remote Pilot in Command will be responsible for investigating any perceived drone incidents.

## 12. TRAINING

1. Operators of drones must hold a certificate of training from GCAA or from another ICAO member State that has an acceptable framework of Regulations governing UAV operations and training of pilots.
2. Where it is not practicable for a person to obtain a certificate of training, a person must have operated similar drones as Pilot In Command and have accumulated at least two hundred (200) hours of flight-time.
3. Regular flying is required to maintain proficiency.
4. Emergency procedures training is required for all drone operators.
5. Visual Observers shall have completed sufficient training to efficiently communicate pertinent inflight observations with the RPIC so that the drone remains clear of conflicting air traffic and obstructions.
6. This training, at a minimum, includes:
  - a. Knowledge of the supporting tasks with respect to maintaining Line of Sight, and effective communication.

- b. Knowledge of the supporting tasks Operating Near Other Aircraft; Right-of-Way Rules; and Basic VFR Weather Minimums.
- 7. If formal training is not available for Visual Observers, the RPIC is responsible for briefing the ad hoc observer and ensuring the understanding of the role and the supporting tasks.

## 13. INSURANCE

It is the responsibility of every drone operator to ensure they have appropriate insurance coverage. This is a condition of each operational authorization that is issued by the GCAA.

## 14. APPENDIX 1

### 14.1. Drone flight inspection checklist

### 14.2. Flight emergency checklist

**DRONE FLIGHT INSPECTION CHECKLIST**

DRONE FLIGHT INSPECTION CHECKLIST									
PRE-FLIGHT		DURING FLIGHT			POST FLIGHT			COMMENTS	
➔		Y	N	➔			Y	N	
AT THE OFFICE		AFTER LAUNCH			AFTER LANDING				
Aircraft Documentation				Aircraft reach safe altitude			Power down the air craft		
Permission from GYSBI and civil aviation				Observer(s) has the drone in sight			Remove and safely store battery		
Proximity to the airport				All systems green			Airframe inspection		
Tablet/cell phone charged				Satalite and GPS check			Check to ensure data is collected		
All bateries are charged				Check remaining battery			Trans data and flight log		
Assign crew duties/responsibilities							Make log book entry		
Verify datalink with all devices									
PTW and other relevant document									
Check SD card/device memory									
SIMMOPS Assesed and managed									
Data cable check									
IN THE FIELD		BEFORE LANDING			BACK AT THE OFFICE				
Flight gears checked				Ensure flight done according to plan			Flight and maintenance report		
Weather conditions permits flying				Scan landing area for obstacles			Charge batteries		
Verify launching and landing areas				Wind check			SD card cleaned and ready to use		
Check all aircraft components				Observer briefing for landing			Airframe checked		
Flight gears checked				All systems green			Data processed		
Take off and landing pad ok									
Cameras ok									
Ensure display device is connected									
Check signal strenght									
Remove gimbal lock									
Check emergency settings									
Check warm up notifications									
Risk assess take-off/landing area									
Identify alternate/emergency landing area									

## FLIGHT EMERGENCY CHECKLIST



## 15. REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	07 July, 2022	Kurt Busuttill	Initial Release of Document

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**This procedure shall be used and updated by QHSSE Department**

## 1. INTRODUCTION

### Scope and Purpose

This Procedure describes the management of objects that have the potential to fall/drop during operations performed by GYSBI personnel and Third-Party Contractors.

### References

QH-004-PERMIT TO WORK

QH-008-WORKING AT HEIGHT

QH-119-Drops Inspection Checklist (180 Ton Crawler Crane)

QH-120-Drops Inspection Checklist (160 Ton Mobile Crane)

QH-121-Drops Inspection Checklist (80 Ton Mobile Crane)

QH-122-Drops Inspection Checklist (160 Ton Mobile Crane)

### Definitions

#### **JSA**

A procedure which helps integrate accepted safety and health principles and practices into a particular task or job operation.

#### **Working at Height**

Working at height means work in any place where, if precautions are not taken, a person can fall a distance liable to cause personal injury.

**Dropped Object**

A dropped object is any object that has fallen to a lower level from a previously higher position.

**Tethered Tool**

A way of preventing tools from falling or being dropped. It involves attaching tools to either the operative using them or, in the case of heavier tools, to a fixed or anchor point.

## 2. PROCEDURE DETAILS

### Responsibilities

#### Performing Authority

All operatives and contractors are to strictly follow the requirements of this procedure whilst working on site. Failure to comply will result in disciplinary actions.

#### QHSSE Team

The QHSSE Team shall be responsible for monitoring the correct implementation of Dropped Objects Prevention Procedure at both GYSBI Main Base and Annex. Also, personnel shall lead checks for the potential dropped objects listed in the inventory/drop survey picture book of equipment. The QHSSE Team shall participate in identification of potential dropped object and propose remedial / preventive action.

#### Base Manager

Base Manager shall provide adequate resources and time for drop inspections to be conducted and for recommended corrective measures to be implemented.

### Site Lifting Coordinator

The SLC is responsible for overseeing the set-up, maintenance, and safe and efficient operations involving lifting equipment. SLC shall ensure that corrective actions from drop surveys that are within his capabilities are actioned in a timely manner.

### Managers and Supervisors

Managers and supervisors shall ensure that workers under their control are provided with adequate training and equipment to comply with this procedure.

### Awareness Campaign

Regular campaigns should be implemented to raise awareness about the hazards and risks of dropped objects.

Toolbox talks should be held with all crews to promote awareness of the hazard/risk of dropped objects and their consequences. The necessary steps to eliminate dropped objects must also be discussed.

The Performing Authorities must be updated whenever there are any changes made to the DROPS INSPECTION SHEETS or if the procedures are updated. Awareness sessions should be held to discuss these changes with all the crews/parties that are required to comply with the procedures.

## **DROPS Inspection Checklist/Picture Book**

All the potential drop objects, those that structurally are not part of the machinery must be listed on the drop inspection checklist (For example, light fittings, sheaves, and shackles). Also, permanent fixtures should be identified as single items. Sample of the Drops Inspection checklist for the 180-ton Kobelco Crawler Crane can be seen on the following page.

Additional Drops Inspection Checklists of this nature are:

- QH-120-Drops Inspection Checklist (160 Ton Mobile Crane)

- QH-121-Drops Inspection Checklist (80 Ton Mobile Crane)
- QH-122-Drops Inspection Checklist (160 Ton Mobile Crane)

A Drops Inspection shall be done every week on each crane that is used at the Annex and Main Base. This inspection shall be led by a QHSSE Representative and the assigned Crane Operator. Available operation's employees should be asked to join the inspection team so that they can be aware of the various parts of the crane that are potential drop objects and to share ideas of securing such parts. Findings shall be recorded, and checklist should be signed by the participants. Final report should be signed and approved by the Base Manager onsite at the time of the inspection. Once approved, corrective actions to be taken shall be entered into the QHSSE Corrective Actions Registry and progress should be tracked.

All necessary parties (not limited to Fleet Manager, SLC and Operation Team) shall place high importance on addressing the findings of the drops survey in a timely manner, thus improving the overall safety of the employees working with these equipment on a daily basis.

### Securing Methods of Crane Parts

While conducting inspections, it is necessary to identify the securing method of various parts attached to the crane.

Reliable securing is the appropriate selection, application and management of all fastenings and fixings. These must be designed correctly, installed properly, and maintained consistently to achieve the required level of performance.

Refer to Industry Standard "Reliable securing"

## Inspection

**Daily Check-** Daily checks/ Frequent inspections cover the operating mechanisms, parts of the air or hydraulic systems, and the hooks and hoist chains. In addition, the operator performs a drops check (please see sample of Crane Daily Inspection sheet on the following page). These items need to be visually examined daily, by both dayshift and nightshift operators. These daily checks are recorded on the necessary check sheets and are submitted to the Base Co-Ordinator/Base Manager.

Note: Daily Equipment Inspections are done on all the cranes, forklifts, and Mobile Elevated Work Platforms.

In addition to daily equipment inspection, a formal drops inspection shall be done on a bi - weekly basis on all cranes.

	<b>CRANE DAILY INSPECTION / HAND OVER SHEET – Rev: 4</b>			
	<b>TADANO - 160t – MC1</b>		Crane Hours:	Date:
<b>DAILY/WEEKLY PRE-USE &amp; FUNCTION CHECKS</b> <b>MUST be completed at the start of every shift, even if there are no lifting operations</b>		Hand Over from (Name)	Shift:	
		Crane Operator Signature	DAY / NIGHT	
		Hand Over to (Name)	Shift:	
<b>DAILY PRE-USE &amp; SAFETY CHECKS:</b>	OK	Repair	<i>Hand Over Comments</i>	
360° check for leaks or damage				
Engine Oil Level				
Fuel Level				
Hydraulic Oil Level				
Coolant Level				
Air Tanks				
Inspect Main/Aux/Boom Wire Ropes				
Inspect Main/Aux/Boom Winches/Brakes				
Rope socket/pin/nut/bolt/keepers				
Tyre Pressures, Cuts & Damage				
Correct Operation of all Controls				
Cab Gauges & Warning Lights				
Slew Lock Pin & Slew Brakes Alarm				
Lubrication/Grease components				
Operation of Hoist/Derrick Brakes				
Hook and boom over-hoist devices (ATB)				
Check Hook Blocks & Safety Catches				
LMI monitor and error codes				
Horn, work light and wipers				
Walkways, Steps & Mirrors.				
Ground condition & crane levelling				
Cleanliness of Crane & Decking				
Security of any Loose Objects				
Fire Extinguisher in cab				
Standard/Specific load chart visible in cab				
Operation & Maintenance manual in Cab				
Inspect all rigging to be used				
Crane Keys Handed over				
<b>WEEKLY CHECKS:</b>				
Lubricant Levels in Transmission				
Windscreen Washer Reservoir levels				
Grease & Lubricant				
Tyres, tyre pressure and axles				
Inspect full length all Wire Ropes				
Lubricate Wire Ropes if required				
Brake, Clutch & Steering Reservoir Levels				
Check Hydraulic Oil Level & hose leaks				
Check Boom Pin				
Hook sheaves, bearings & rope guide				
<b>DROPS CHECK:</b>				
Check the security of all fitted items on & around the crane & especially the full length of the boom i.e. nuts/bolts, brackets pins cables rollers hooks & lifting eqpt wires sheaves warning lights anemometer ETC				

Checked By:

Area Foreman: Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Base Coordinator: Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

## Maintenance

Any maintenance work on equipment should be controlled by the Permit to Work System. The Performing Authority should provide a JSA/Risk Assessment for the task to be done and request for a PTW.

In addition, an inventory of all the tools to be used for the maintenance work should be provided by the Performing Authority. These documents should be reviewed by the QHSSE Representative and the PTW should be approved by the Base Manager before task commences.

At the end of the task, the work area should be inspected by the QHSSE Team to ensure that housekeeping was done, and tools and equipment were returned to its normal place. Also, before the permit is closed the Performing Authority should provide the list of tools that were used and show evidence that these tools were in their possession at the end of the task.

Note: All maintenance works on these equipment should be done using tethered tools.

## 3. WORKING AT HEIGHT USING MEWP, LADDER AND SCAFFOLDS

Any job performed at height must be controlled by the following:

1. Tool inventory checklist for tools used at height.
2. Permit to Work System
3. Securing tools to fixing points with lanyards (use of tethered tools).
4. Safe method to carry hand tools and parts i.e. bags, tool belts.
5. Control of the area under the workplace (caution tape/ cone).
6. Secure PPE as required. (i.e. Helmet with chin strap).



*Example of tethered tools for work at height*

## 4. CONTROL OF THIRD-PARTY EQUIPMENT

Permit to Work System shall be used to control works done by Third-Party Contractors at the Annex and GYSBI Main Base. Before a PTW is issued, the Performing Authority should provide the necessary documents to indicate that their equipment is certified and fit for use. These documents should be reviewed by the Site Lifting Co-Ordinator, and the use of the lifting equipment should be approved by the same personnel.

All conditions of the PTW should be followed and red zones/drop zones should be adequately demarcated by use of cones or hard barriers.

Installation of temporary third-party equipment must be done as per procedure and Permit to work must be issued before any task is being carried out.

## 5. MONITORING

Completed inspection forms should be given to the Base manager for review and

sign off. Any non-conformity identified that cannot be immediately corrected should be addressed with the Base manager. The further action needed should be decided accordingly and recorded. The Base Manager, Site Lifting Coordinator and QHSSE team to decide on whether immediate action is warranted. Monitoring of works should be continuously done by the Supervisors, QHSSE Team, SLC and Base Manager.

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	31 Jan 2021	Sean Hill Iain Martin	Initial release of document
<b>2</b>	18 Aug 2021	Sean Hill	Updated hyperlinks and formatting.
<b>3</b>	07 Jul 2022	Kurt Busuttil	Updated Document Number

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**This policy shall be used by HR Department and updated in collaboration with QHSSE Department**

## 1. PURPOSE

To ensure a safe, healthy, and productive work environment for the employees of the company, customers, and others on company or customer property. To protect company and customer property and assets, ensure efficient operations, and meet any specific requirements of customers. Company shall enforce this drug, alcohol, and contraband policy in a fashion consistent with the laws of the states in which the company employees are employed.

## 2. DEFINITION

### **Alcohol:**

consumable liquid containing ethanol (e.g. beer, wine, spirits) and powdered alcohol which can be reconstituted into an alcoholic drink.

### a) **Company Property or Customers Property:**

Locations and property owned (or leased or chartered from others or accessed through rights secured by company, customers, or their affiliates) operated, and/or controlled by the company or its customers whether fixed or mobile

### b) **Collector:**

A person who 1) collects a specimen from company personnel, 2) makes an initial inspection of the specimen, and 3) completes the Custody and Control Form (CCF). When Field Screen Device (FSD) is used, Collector may be responsible for reading and recording screening test results.

### d) **Company Personnel:**

All company employees, agents, subcontractors, or subcontractors' employees performing field operations work on company or customer property, or those who are being considered for employment by the company. This includes temporary and part-time personnel.

### e) **Confirmation Test:**

For drug testing, a second analytical procedure performed by a Laboratory on a different aliquot of the original specimen to identify and quantify the presence of a specific drug or drug metabolite typically using gas or liquid chromatograph

with mass spectroscopy. For Alcohol testing, a breath test using Evidential Breathalyzer testing device (EBT) or a blood test analyzed by a laboratory.

f) **Contraband:**

- a. Any drug or alcohol related paraphernalia used or designed for use in testing, packaging, storing, injecting, ingesting, inhaling or otherwise introducing into the human body any Prohibited Substance, or
- b. Any paraphernalia or substance used or designed for use to dilute, substitute, or adulterate any alcohol or drug test specimen, or to otherwise obstruct the alcohol or drug testing process or
- c. Firearms, ammunition, explosives, and weapons

g) **Custody and Control Form (CCF):**

The form used to document the collection, custody, and transport of a drug specimen or blood Alcohol specimen until it is received by the Laboratory.

h) **Cutoff:**

The decision point or value used to establish and report a specimen as negative or positive.

i) **Designated Employee Representative (DER):**

Company personnel with oversight of the company Drug and Alcohol program and authorized by the company to receive test results and make required decisions regarding test results.

j) **Disqualified:**

Company personnel are disqualified from performing work if they fail to meet or comply with, or in any way violate this policy and policy of customers.

k) **Fatal Flaw:**

An error that results in a significant break of chain of custody or collection procedures that cannot be corrected and results in a cancelled test (e.g. missing or damaged tamper evidence seal, CCF and specimen ID do not match, missing collector name and signature on CCF)

l) **Field Screen Device (FSD)- also referred to as a POCT- Point of Collection Testing device:**

Testing device that is utilized to field-screen a specimen for the presence of alcohol or drugs.

m) **First Aid:**

First aid refers to medical attention that is usually administered immediately after the injury occurs and at the location where it occurred. It often consists of a one-time, short-term treatment and requires little technology or training to administer. (List of First Aid treatments as defined by U.S. OSHA is found in the Addendum).

n) **Laboratory:**

A laboratory certified to the requirements of the relevant jurisdiction for purposes of performing legally compliant alcohol and drug testing.

o) **Laboratory Negative Result:**

The result reported by a laboratory when a specimen is a valid specimen and contains no drug or the concentration of the drug is less than the cutoff concentration for the drug or drug class.

p) **Laboratory Positive Result:**

The result reported by a laboratory when a specimen contains a drug or drug metabolite equal to or greater than the cutoff concentration.

q) **Medical Review Officer (MRO):**

A licensed or certified physician, designated by the company, responsible for the review and verification of the integrity of drug testing results and for the final interpretation and reporting of drug test results.

r) **MRO Negative:**

Final classification of a drug test as negative after MRO review of all relevant data (e.g. laboratory test result, donor interview, legitimate medical explanation for use of medication).

s) **MRO Positive:**

Final classification of a drug test as positive after MRO review of all relevant data (e.g. laboratory test result, donor interview, legitimate medical explanation for use of medication)

t) **Prescription Drug:**

A regulated pharmaceutical medicine that requires physician or other qualified healthcare professional authorization before it can be obtained in the jurisdiction where Company personnel are performing services.

The term is used to distinguish it from over-the-counter drugs, which can be obtained without authorization.

u) **Prohibited Substances:**

- i. Illicit drugs that are not or cannot be prescribed, or mind-altering substances including all forms of naturally occurring and synthetic drugs, e.g. synthetic cannabinoids, stimulants, and hallucinogens, that would inhibit the ability of company personnel to perform work safely.
  - ii. Potentially impairing medications (e.g. may be prescription drug or over-the-counter medication or herbal medicine):
    1. Used without a prescription, or
    2. Used in a manner inconsistent with the prescription or directions for usage, or
    3. Used without disclosure to company as provided by Section 3(b)(iii) of this Policy
  - iii. Alcohol
  - iv. Marijuana in any form, even if legal in the local jurisdiction
- v) **Random Pool:**  
The pool or grouping consisting of Safety Sensitive company personnel designated for random testing.
- w) **Reasonable Suspicion:**  
A belief based on objective and articulable facts sufficient to lead a supervisor to suspect use of prohibited substances. For the purposes of this section a *supervisor* is a company employee acting in an official supervisory capacity who has successfully completed drug and alcohol supervisor training as outlined in this policy.
- x) **Safety Sensitive Positions:**  
Any position with job responsibilities such that a lapse by an individual in that position could increase the probability of serious injury, significant environmental or community impacts or significant damage to company or customer assets
- y) **Screening Test (also referred to as Initial Test):**  
The test used to differentiate a negative specimen from one that requires further testing (i.e. confirmation test) for alcohol, drugs, or drug metabolites.
- z) **Serious Injury:**  
Injuries or illnesses causing significant physical body damage with potential for days away from work.
- aa) **Stand Down:**  
Requires immediate removal of company personnel from covered services

**bb) Under the Influence:**

A condition in which the mental or physical faculties are impaired by the use of Prohibited Substances as to reduce ability to think and act with ordinary care and must be indicated by specific, contemporaneous, articulable observations such as appearance, behavior, speech, body odor, etc. A confirmed positive alcohol or drug test shall be accepted as evidence conclusive of being Under the Influence.

### 3. PROHIBITIONS

Company Personnel are disqualified following non-compliance with the prohibitions below:

1. Using, possessing, selling, manufacturing, distributing, concealing or transporting on company or customer property (including off-duty time) any of the following items:
  - a. Any prohibited substance; or
  - b. Contraband, or
2. Being under the influence of any Prohibited Substance.
3. Switching or adulterating any urine, blood, or any other specimen, participating in any attempt to adulterate or substitute a specimen, obstructing the collection or testing process, failing to promptly proceed to a collection site and provide specimens when told to do so, refusing to sign required forms, and failing to cooperate with an inspection.
4. Prohibited from operating a vehicle on behalf of the company or customer while under the influence.
5. While employed or being considered for employment, employees are prohibited from:
  - a. A confirmed Positive for Alcohol or a MRO Positive for drugs, or
  - b. A refusal to test for Alcohol and Drugs, or
  - c. A refusal to submit to an inspection

### 4. PROGRAM MANAGEMENT

- a). **Identify a Designated Employee Representative (DER):**
-

Designated Employee Representative (DER) should be an employee within the Health, Safety, Security and Environment (HSSE) department who is authorized to receive test results and other communications, take immediate action to remove workers from a company or customer's jobsite and make required decisions in the testing and evaluation process. Specific roles and responsibilities assigned to a DER should include, at a minimum, the following:

1. Select and contract with a laboratory or service provider, based on pre-determined criteria, to help implement all or part of the Drug, Alcohol and Contraband Program.
2. Coordinate training for all supervisors on the following:
  - reasonable suspicion
  - post incident testing
  - stand down procedures
  - disqualified personnel requirements
  - random notification
3. Schedule and coordinate drug and alcohol testing activities applicable to any local legal requirements and customer requirements.
4. Maintain confidential files for the Drug, Alcohol and Contraband Program.

**b. Identify a Medical Review Officer (MRO):**

An MRO is responsible for receiving and reviewing laboratory test results and evaluating medical explanations for certain drug test results. Roles and responsibilities assigned to an MRO typically include the following:

1. Serve as an independent party to oversee the accuracy and integrity of the company Drug and Alcohol Testing process (DOT and NON-DOT).
2. Review appropriate copies of chain-of-custody forms to determine if problems exist
3. Conduct verification interviews with workers for non-negative drug test results or results indicating that the specimen has been adulterated or substituted.
4. Interpret drug test results to determine if a legitimate medical explanation exists for a laboratory's confirmed positive, an invalid test result or adulterated or substituted specimen.

5. Immediately report verified positive or invalid results, results requiring immediate collection under direct observation, adulterated or substituted specimens, and other refusals to test to appropriate personnel.
6. Report written drug test results in a confidential manner to appropriate personnel authorized to receive such information

**c. Site Specific Requirements:**

Company will follow any specific site requirements established by the customer as well as any local legal requirements applicable to alcohol and drug testing.

## 5. SEARCHES AND INSPECTIONS

- a. At any time, company and/or customer may conduct or require an unannounced inspection of company personnel and their property for items that may include prohibited substances or contraband. Inspections may include, but are not limited to:
  - o Clothing, wallets, purses, baggage, lockers, work areas, desks, toolboxes, and vehicles.
- b. Company or customer may authorize inspection specialists, including scent-trained animals to conduct an inspection.
- c. If discovery of Prohibited Substances or Contraband cannot be directly associated with individual company personnel, but can be reasonably associated with a defined group of company personnel (e.g. people who use one change room):
  - o Customers may conduct or require company to conduct an inspection of company personnel group's clothing, wallets, purses, baggage, lockers, work areas, desks, toolboxes, vehicles, and any other designations by customers, and/or
  - o Customers may require company to conduct Group suspicion-based testing of company personnel within this group.

## 6. MEDICATION DISCLOSURE

Company personnel in Safety Sensitive positions may only use potentially impairing medication (e.g. Prescription Drug, over-the-counter medication, herbal medicine) under the following conditions:

- a. Medication(s) have been obtained in a manner consistent with applicable laws and regulations
- b. Company personnel have notified company that they will be in possession of, or using, potentially impairing medication(s).
- c. Company's health professional has assessed the capability or fitness of company personnel to perform safety sensitive duties.

## 7. POSITION CATEGORIES AND TESTING REQUIREMENTS

### a. **Position Categories**

Company personnel providing services on customer premises shall be assigned to one of the categories below.

Safety Sensitive (SS): Any position with principal job responsibilities such that a lapse by an individual in that position could increase the probability of serious injury, significant environmental or community impacts, or significant damage to customer assets.

Roles submitted for D&A Audit (Safety Sensitive):

- Crane Operator
- Forklift Truck Operator
- Forklift Operator
- Truck Driver
- All Rolling Stock Operators and Drivers

Low Exposure (LE): Any position not included in the definition of Safety Sensitive is defined as Low Exposure.

**b. Testing Requirements**

Company will conduct drug and alcohol testing per the test types below:

Position Category	Test Types
<b>Safety Sensitive</b>	Pre-enrollment Individual Random Individual Reasonable Suspicion Post Incident Group Random* Group Suspicion-based*
<b>Low Exposure</b>	Individual Reasonable Suspicion Post Incident Group Suspicion-based*

\*can be initiated by the company or the customer

**c. Pre-enrollment Testing**

1. Safety Sensitive personnel must be admitted to the Random Pool prior to commencing services.
2. A pre-enrollment test is required for entry into the Random Pool unless a negative result was obtained from any category of test (e.g. pre-employment, random, post incident, individual reasonable suspicion, group suspicion-based, group random, etc.) using a drug test panel that meets or exceeds the requirements of this policy within the previous 6 months.

**d. Individual Random Testing**

Company's random testing program will include the following features:

1. A means of generating random selections using a scientifically valid method (e.g. random number table or computer-based random number generator) matched to a unique personal identifier. The random selection process will preclude company from preselecting company personnel for testing.

2. A random testing rate of at least 50% of the total random pool per calendar year.
3. Company personnel, who have not been tested to the required drug test panel for any test reason in a two-calendar year period, must be selected for an unannounced test before the end of the second calendar year.
4. Selection is the process of randomly choosing individuals from the Random Pool. There must be a minimum of 4 selections per year. Quarterly selections must be reasonably spread throughout the year.
5. All Safety Sensitive personnel must have an equal chance of being selected in each random selection period. All safety sensitive personnel will participate in each random selection period, even if the safety sensitive personnel were selected for testing in a prior period.
6. If company personnel are not in the random pool when a random selection is made, they must complete another pre-enrollment test before being re-admitted to the random pool.
7. Testing is the process of collecting an alcohol and drug testing specimen from an individual. Testing must be evenly dispersed throughout the year and must not be predictable.
8. Specimen collection must occur within 2 hours of notification to the personnel of the need to be tested. Personnel must proceed to testing immediately after being notified of a test requirement. The reason for any delay must be documented.
9. If the person who normally announces tests is a member of the Random Pool, they must have no advance notice of their own test.

#### **e. Individual Reasonable Suspicion Testing**

1. Individual reasonable suspicion testing is conducted when there is suspicion of specific company personnel being under the influence.
2. Company will immediately "stand down" the personnel.
3. Alcohol and drug testing specimen collection must be completed as soon as possible after the decision to test. If specimen collection is not completed within 2 hours, the reason for delay must be documented. Customers may request to review reasons for delay and decide if they are acceptable.

#### **f. Post Incident Testing**

Retaliation against employees who report accidents is strictly forbidden. Any drug and alcohol testing under this section will be applied in a neutral fashion, to foster a safe

work environment, and only to identify drug/alcohol use in the recent past. Testing under this section will not be undertaken to retaliate against employees for reporting workplace injuries. Immediately following an incident or as soon as possible; company should communicate with the customer and receive confirmation that post-incident drug and/or alcohol testing will be required.

1. If the performance of company personnel contributed to an incident or cannot be completely discounted as contributing factor to the incident, company will immediately "stand down" personnel.
2. Alcohol and drug testing specimen collection must be completed as soon as possible after the decision to test. If specimen collection is not completed within 2 hours, the reason for delay must be documented. Customers may request to review reasons for delay and decide if they are acceptable.
3. For purposes of this part, "incident" includes, but is not limited to, an actual event that caused, or had potential to cause, significant safety, environmental, or property damage incidents such as:
  - a. Medical treatment beyond first aid, or
  - b. Reportable environmental release, or
  - c. Disabling damage to a vehicle, or
  - d. Significant property damage.

Note: customer may define more stringent criteria

**g. Group Random Testing**

1. Safety sensitive personnel on company and/or customer premises are subject to unannounced random selection for testing by group (e.g. skill/trade, location, vehicle/vessel, or shift) for drugs and alcohol.
2. Company will maintain and generate group random selections using a scientifically valid method (e.g. random number table or computer-based random number generator) matched to a unique group identifier. Appropriate safeguards must be used to ensure that the identity of a safety sensitive group which could be selected cannot be determined until after the safety sensitive group is selected.
3. Each safety sensitive group must participate in each group random selection, even if the safety sensitive group has been previously randomly selected for testing.
  4. Company personnel selected for group random testing can be counted towards the 50% annual random testing rate for safety sensitive personnel.

#### **h. Group Suspicion-based Testing**

1. Group suspicion-based testing of safety sensitive and low exposure personnel may be required without notice on company and/or customer premises, based on evidence of prohibited substances or contraband on company and/or customer premises that cannot be identified to a specific individual. Group suspicion-based testing must be limited to the likely affected work group or work area
2. Company will immediately “stand-down” the personnel
3. Alcohol and drug testing specimen collection must be completed as soon as possible after the decision to test. If specimen collection is not completed within 2 hours, the reason for delay must be documented. Customers may request to review reasons for delay and decide if they are acceptable.

## **8. TESTING OF GOVERNMENT REGULATED POSITIONS**

1. Company personnel in positions for which alcohol and/or drug testing is required by regulation will at a minimum be tested according to all aspects of the regulation.
2. In addition to government required testing, customers may require company to perform additional testing in accordance with customer’s testing requirements.

## **9. TESTING PROTOCOL**

#### **a. Drug Testing/ Specimen Collection / Security**

1. Company or its agents will follow either US DOT procedures for drug specimen collection or those in the Addendum
2. Details of Collection Kits are described in the Addendum
3. Company will ensure that all drug test specimens requiring laboratory analysis are stored in a secured location, with at least one physical control point restricting no collector access, from the time of collection to the time of pick-up for laboratory shipment.
4. Acceptable drug testing methods and Specimen Validity Testing (STV) requirements are found in the Addendum.

## 2. Drug Testing using Field Screening Device (FSD)

1. Company may use a customer approved FSD which follows the customers drug test panel, where allowed to be used by local law, as identified in the Addendum. All nonnegative FSD results must be sent to a certified laboratory for confirmation testing.
2. Quality Control Checks – When a FSD is used, company will send 10% FSD specimen, whether negative or non-negative, to the laboratory to confirm FSD accuracy and collector visual reading of results.

## 3. Custody and Control Form (CCF)

1. A CCF is required for every drug test
2. Alcohol screening test results will be documented on either a CCF or an alcohol testing form. A CCF is required for every blood alcohol confirmation test. For confirmation alcohol tests using a breath alcohol device, result and zero blank printouts must be attached to the CCF or attached to the alcohol testing form.
3. Company or its agents will follow the CCF required elements in the Addendum; however, the DOT CCF must only be used for DOT-required test.

## 4. Laboratory Certification / Accreditation

1. Drug testing must be done at a laboratory certified and/or accredited by a recognized international, national, or regional organization that address workplace drug testing to a forensic standard.
2. Recognized standards are listed in the Addendum

## 5. Alcohol and Drug Test Panel and Cutoffs:

1. Company's alcohol and drug program will specify substances and screening and confirmation cutoff levels that comply, at a minimum, with the drug test panel provided in the Addendum.
2. Company will include the full alcohol and drug test panel in all test types, except for government regulated testing requirements.

## 6. Alcohol Testing and Specimen Security

1. Company or its agents will follow either US DOT procedures for alcohol testing or the process included in the Addendum.
2. An alcohol test is to be done any time a drug test is done.

3. Company will ensure that all alcohol test specimens requiring laboratory analysis are stored in a secured location, with at least one physical control point restricting no collector access, from the time of collection to the time of pick-up for laboratory shipment.
4. Company will use only the test matrices (breath, urine, oral fluid, etc.) specified in the Addendum.

### 7. Drug Test Review Process by MRO

Company or their agents must as a minimum use this process for review of relevant drug tests results by an MRO.

MRO review is required for:

1. All non-negative laboratory results, including
  - a. Laboratory positive results for drug(s)/drug metabolite(s)
  - b. Adulterated or substituted specimen
  - c. Laboratory invalid result
2. Alleged inability to provide a specimen

MRO review is not required for:

1. Laboratory negative drug test results
2. Laboratory negative dilute results
3. Specimens rejected for testing
4. Fatal flaw
5. Alcohol test results MRO Qualifications:

An MRO must:

1. Be a physician with a license and/or certification to practice medicine, prescribe medications, and diagnose and treat medical conditions.
2. Have a working knowledge of workplace drug testing, drug pharmacology and pharmacokinetics.
3. Have participated in a formal educational program pertinent to workplace drug testing.

## 10. NON-COMPLIANCE

Company personnel will be found to be in non-compliance if they:

1. Violate any portion of this policy or the customer's policy, or
2. Refuse to cooperate with the searches and tests included in this policy or the customer's policy.

## **11. COMPANY PERSONNEL DISQUALIFIED FROM PERFORMING SERVICES FOR CUSTOMERS**

With respect to company personnel that are disqualified from performing services for customers:

1. Company shall immediately remove the individual from customer property.
2. Company shall immediately notify the customer that the individual is disqualified from performing services.
3. Company will not assign or reassign the disqualified individual to perform services for the customer or in any other facility of the customer in the future.
4. Company will immediately review with customer the nature of the work previously performed by the individual.
5. At customer's request, company shall, at its sole cost and risk, inspect all work in which the individual may have participated and submit a written report to the customer that documents the inspection and any findings and the actions taken to assure all deficiencies have been corrected.

## **12. RETURN TO SERVICES**

Note: Customer may define more stringent criteria in writing.

1. Alcohol Testing
  - a. Following alcohol testing for any test type, company personnel shall immediately "stand-down" if alcohol screening test result is at or over the screening cutoff level, as defined by the test panel in this policy.
  - b. If confirmation test is negative company personnel must not return to services until 8 hours have elapsed.
2. Individual reasonable suspicion and Post incident testing - Customer in its sole discretion will consider company request for company personnel to

return to services only after negative alcohol and drug test results have been documented.

3. Group suspicion-based testing – Customer in its sole discretion may consider company personnel to return to low exposure services while awaiting alcohol and drug test results. Customer in its sole discretion will consider company request for company personnel to return to Safety Sensitive services only after negative alcohol and negative drug test results have been confirmed by company management and communicated to customer.
4. Fitness for Work – After a fitness for work concern is identified, and before company can return personnel to services, company's health professional must evaluate company personnel, clear them to return to work, define restrictions if applicable, and document the conclusion. A fitness for work concern may be identified from such events as:
  - a. MRO review of a laboratory positive test result may lead to a MRO negative determination, but the MRO may identify a fitness for work concern.
  - b. A required medication disclosure by those in safety sensitive positions or the admission of possession or use of a potentially impairing substance by those in low exposure positions.

## 13. SUBSTANCE ABUSE AWARENESS

Company warrants that company personnel performing work have each been fully informed of the requirements of this policy and customer's policy. Before beginning work on company or customer property, all company personnel will sign a written acknowledgment that they have been so informed and agree to be bound by the requirements. (See Form QH-151)

## 14. APPLICABLE LAWS

Local laws and regulations take precedence over this Policy. Local laws and regulations may require a more stringent or less stringent approach and may limit certain components of this Policy.

## 15. SUPERVISOR TRAINING

Company shall provide training/education to company supervisors. The list, at a minimum, should consist of:

1. Recognition of performance indicators of probable drug and/or alcohol use
2. Effects and consequences of drug and/or alcohol use to personal health, safety, and the workplace
3. Random testing notification process
4. Post-incident testing process
5. Stand-down process
6. Disqualified individual processes, which includes flagging those individuals to ensure they won't be sent back to work for a customer.

\*\* Records of trained individuals (including name and date) must be maintained by the company and available to customers upon request.

## 16. AUDIT

- a) Company shall keep records required by this policy available for inspection by customers and its authorized agents, assigns, and representatives.
- b) Company will retain documents that support compliance with customer requirements for current calendar year plus the previous three calendar years. Company will ensure that its subcontractors comply with the requirements of customers and provide documentation that support compliance when required.
  - i) Such records to be retained are detailed in Addendum:
- c) At their discretion, customers (or its authorized agents, assigns, and representatives) may perform unannounced audits of the company's alcohol and drug program to verify that the company's policy and its enforcement comply with their guidelines.

### 1. SUPERVISOR TRAINING

Managers and supervisors must be adequately trained in the topics listed below to ensure they effectively communicate and implement the Drug, Alcohol and Contraband Program.

- Requirements contained in the Program
- Procedures for implementing the Program
- Random testing notification

- Post incident testing
- Reasonable suspicion that an employee is under the influence of drugs or alcohol, Stand down and disqualified personnel requirements.

Training on the recognition of performance indicators of probable drug and/or alcohol use and on its effects and consequences to personal health, safety and the workplace shall be included. Records of individuals trained (including name and date) will be maintained by the company and available to customers upon request.

(See FORM QH-152: Supervisor Drug and/or Alcohol Checklist)

## 2. EMPLOYEE EDUCATION

To communicate the Drug and Alcohol Testing program to employees a list of education topics might be, but not limited to:

- Requirements contained within this Drug, Alcohol and Contraband Program
- Types and effects of drugs, including prescription and over-the-counter medication, and alcohol on employees and the ability to perform their work safely.
- Ways to assess whether employees may have drug and alcohol dependency problems or may be under the influence of drugs or alcohol.
- Requirement for Company personnel to notify company that they will be in possession of, or using, potentially impairing medication(s).
- Disciplinary actions for employees failing to comply with the Drug, Alcohol and Contraband Program.

## 17. ADDENDUM

**This Addendum supplements the Drug, Alcohol and Contraband Policy.**

## 1. Definitions used in this Addendum

- B. *Alcohol Test Results* - Alcohol test results shall be reported as Blood-Alcohol Content (BAC) or its equivalent. All references in this addendum to blood Alcohol test results are expressed on this basis.
- C. *Alcohol Testing Technician* - An Alcohol Testing Technician is a person who is responsible for performing an Alcohol screening and/or confirmation test using the approved alcohol test methods.
- D. *Direct Observation* - a urine collection during which the monitor directly observes the donor urinate into the collection container.
- E. *First Aid* - Link to the full list of First Aid treatments as defined by U.S. OSHA - [https://www.osha.gov/recordkeeping/firstaid\\_list.pdf](https://www.osha.gov/recordkeeping/firstaid_list.pdf).
- F. *Limit of Detection (LOD)* - The lowest concentration at which an analyte (e.g., a drug/metabolite or adulterant) can be definitively identified, but the concentration cannot be accurately calculated (for quantitative assays).
- G. *Monitored Collection* - a urine collection during which monitor must be in visual contact with donor as permitted by local culture and regulations but does not watch urine go from donor body into the collection container. Monitor must:
  - 1) Be the same gender (unless monitor is medical professional).
  - 2) Remains just outside the toilet enclosure, but the toilet enclosure must remain ajar for the monitor to maintain visual contact with donor.
  - 3) Listens for sounds indicating the specimen is directly from donor.
  - 4) Listens for any sounds indicating an attempt to tamper with the specimen.

## 2. Position Categories and Testing Requirements

### A. Guidance on Safety Sensitive Categorization

Safety Sensitive positions include as a minimum:

- i. Positions which require the exercise of independent action and can result in direct and immediate irreversible effects. That is:
  - 1) An individual's action is taken independently and not subject to review, modification, or control by another person, a supervisor, or a system, and/or

- 2) An individual's action is not subjected to checks and balances which could or would override or change the individual's action, and/or
- 3) There is little if any time- delay between an individual's action and the resulting effect such that others cannot reasonably intervene to override or change the action.

OR

- ii. An activity recognized in the industry for incidents and near misses with potential for fatality or serious injury, or event that could substantially and adversely impacts on the environment, Company and/or Customer assets, or the community.

### 3. Testing of Government Regulated Positions

Some countries may require government regulatory testing:

#### United States

In addition to government required testing (DOT), Company Personnel working U.S. government regulated positions and also classified as Safety Sensitive, as defined by Customers, will be Alcohol and Drug tested for all test types and to the test panel as defined in the Policy and Addendum.

#### Other Countries

Company Personnel in government regulated positions, as required by local laws, and in Safety Sensitive positions only have to comply with the random testing program defined by the regulations and are not required to comply with the Customer random testing program. However, if the regulatory testing program does not include a random testing component, the Company will comply with the Customers random testing program for their Personnel also in SS positions, as allowed by local laws.

### 4. Alcohol Testing and Specimen Security

#### a. *Approved Alcohol Test Methods*

Alcohol Screening Test shall be performed by either breath or oral fluid. Alcohol Confirmation Test shall be performed by either breath (EBT) or blood. b. *Specifications for Alcohol Testing Devices*

- i. Alcohol Screening Test Devices must be:
  1. Listed on the U.S. National Highway Traffic Safety Administration Conforming Products List of Alcohol screening devices (ASD), or

2. Certified by the U.S. Food and Drug Administration with a minimum Cutoff of 0.020 g/dL or
3. European CE marked, with a minimum Cutoff of 0.020 g/dL or
4. Any device that is approved for confirmation breath testing can be used for screening breath testing.

c. *Alcohol Confirmation Breath Testing Device:*

Must be approved by:

- a. Listed on U.S. National Highway Traffic Safety Administration Conforming Products List for Evidential Breath Testing Devices; or
- b. European Norm EN 15964; or
- c. UK Home Office for Breath Alcohol Screening Devices; or
- d. Canadian Alcohol Test Committee Approved Screening Devices.
  1. Must provide a printed test result.
  2. Must assign a unique number to each test.
  3. Must print the instrument name, the serial number, and time of the test on the printout.
  4. Must perform and pass a blank test prior to all subject tests.

d. *Alcohol Testing Technicians*

Only an Alcohol Testing Technician or Collector that meets the requirements of this section can perform Alcohol testing.

An Alcohol Testing Technician or Collector is not required to be a medical professional unless required by local law.

An Alcohol Testing Technician or Collector must be trained according to manufacturer's instruction on any devices used.

An Alcohol Testing Technician or Collector must maintain documentation of training and demonstrated competency.

For confirmation Alcohol blood collections, a Collector must be a trained phlebotomist or healthcare professional and trained in the completion of a CCF.

e. *Alcohol Procedures*

An Alcohol Testing Technician or Collector must:

- i. If saliva testing is used, allow the Company personnel to select one (1) of three (3) saliva test screening devices.
- ii. If breath disposable screening device is used, allow the Company personnel to select one (1) of three (3) breath test screening devices.

- iii. If breath testing instrument (EBT) is used, allow Company personnel to select one (1) of three (3) mouth pieces.
- iv. Document all tests on CCF or Alcohol testing form.
- v. Sign the test result.
- vi. Have the Company personnel sign the test result?
- vii. Provide a copy to the Company personnel.
- viii. Provide a copy to the Company.
- ix. For breath alcohol testing devices, conduct and document accuracy check at least once per calendar month.
- x. Visually examine the device before conducting the test.
- xi. Perform the Screening Test according to manufacturer instructions.
- xii. If the Screening Test result is negative  $< 0.02$  g/dL (0.02%) by breath or oral fluid, document the result on either an Alcohol testing form or a CCF and conclude testing.
- xiii. If the Screening Test is  $\geq 0.02$  g/dL (0.02%) by breath or oral fluid, a Confirmation Test is required.
- xiv. Wait 15 minutes but no longer than 30 minutes before conducting the Confirmation Test, not allowing the Company personnel to eat, drink, smoke, chew, or put anything in his/her mouth. If the time between the Screening and Confirmation Test is greater than 30 minutes, document the reason for the delay.
- xv. If the Alcohol Confirmation Test is by breath, perform the Confirmation Test according to manufacturer instructions.
  1. If the Confirmation Test result is Negative (*i.e.*,  $< 0.02$  g/dL (0.02%) in breath (or equivalent)), attach the printed results to either the Alcohol testing form or a drug test CCF and conclude testing.
  2. If the Confirmation Test result is  $\geq 0.02$  g/dL (0.02%) in breath (or equivalent)), attach the printed results to either the Alcohol testing form or a drug test CCF and immediately inform the Company site supervisor.
- xvi. If the Confirmation Test is by conducted using a blood specimen:
  - a. Use a Blood Collection Tube for a specimen container.
  - b. Clean skin with non-Alcohol disinfectant.
  - c. Draw blood with a clean (Alcohol-free) needle or syringe.
  - d. Add sample to blood tube via needle. Do not remove stoppers.
  - e. Slowly invert the tubes completely at least five times to insure proper mixing of the anticoagulants. Do not shake vigorously.

- f. Complete a CCF for the blood specimen. Prepare the specimen for shipment to the laboratory, noting site where blood was drawn and time and date of collection.
- g. Prepare the specimen for shipment to the laboratory and distribute the documentation.
- h. Vials must be sealed with tamper evident labels. If the CCF does not have an integrated specimen seal (*i.e.*, tamper-evident tape) printed with the same unique specimen identifier on the form and seal, a separate secure seal for each specimen container that is capable of uniquely identifying and linking the specimen with the form. (See CCF Elements).
- i. Packaging materials that satisfy current applicable courier and customs regulations.

*f. Company Notification*

The Alcohol Testing Technician or Collector must notify the DER or Company site supervisor when there is:

- i. Positive Alcohol screen and/or Confirmation Test result.
- ii. Refusal to test.
- iii. Uncooperative or belligerent behavior by Company personnel.
- iv. Failure to complete the collection process.
- v. Company personnel who admits to Alcohol abuse.
- vi. Unusual circumstance.

**5. Approved Alcohol and Drug Test Matrices** (*not applicable for government regulated testing*)

Test Matrix	Screening Test	Confirmation Test
	<b>Alcohol</b>	
Blood	Not Approved	Approved
Breath	Approved	Approved (EBT)
Oral Fluid	Approved	Not approved
Urine	Not approved	Not approved
	<b>Drug</b>	
Blood	Not Approved	Not Approved

Hair	Not Approved	Not Approved
Oral Fluid	Not Approved	Not Approved
Urine	Approved	Approved

## 6. Drug Specimen Collection / Security

### a. Collectors

Collectors must meet the requirements of this section.

A Collector is not required to be a medical professional unless required by local law.

A Collector must be trained in all steps necessary to complete a collection correctly and the proper completion and transmission of the CCF, including:

1. The steps to complete the CCF.
2. Collection procedure and urine collection kit.
3. Instructions for unusual collections (e.g., shy bladder).
4. Collection site preparation.
5. Company personnel Identification.
6. Fatal Flaw.
7. Company personnel Privacy.
8. Reading of FSD test results.
9. Color blindness test (for colorimetric field testing).
10. Specimen handling and storage.
11. Packaging of specimens to be shipped to the laboratory.
12. Manufacturer instructions for FSD

A Collector must maintain documentation of training and demonstrated competency.

### b. Collection Site

For urine collections, the collection site should be a private area with toilet facilities. In the event a private facility is not available, the Collector should perform the urine collection in the area that will provide the Company personnel as much privacy as practicable. The toilet facilities shall be free of all possible additives and adulterants (e.g., running water, soap, and cleaning agents).

### c. Collection Kits for Laboratory Testing

1. Blood Alcohol collection kit.

- a. A gray top blood collection tube containing Sodium Fluoride preservative and anticoagulant (e.g., 10ml tube containing 25mg sodium fluoride and 20mg potassium oxalate).
- b. Single-use needle or butterfly.
2. Urine drug collection kit.
  - a. Collection cup for laboratory-based testing with integral temperature measurement or POCT device with integral temperature and validity measurements (pH, oxidants, and creatinine).
3. Specimen container (if collection cup is not designed to be used for specimen transport).
- d. **Collection Procedure** A Collector must:
  1. Conduct only one Company personnel collection at one time and complete the collection before beginning another collection. For FSD testing, complete the entire collection process from test collection through interpreting and recording the results before beginning a collection of another Company personnel.
  2. Conduct the Alcohol testing before collecting the specimen for drug testing.
  3. Verify the Company personnel's identity by viewing original photo identification (*i.e.*, government or Company-issued photo identification). If photo identification is not available, the Company's policy pertaining to additional methods of verifying Company personnel identity applies. If the Company personnel cannot be positively identified, stop the collection process and notify the DCR.
  4. Briefly explain the collection process to the Company personnel, including the collection steps, the tamper-evident seal application, the certification procedure, and, for FSD testing, the requirement for laboratory confirmation for non-Negative specimens.
  5. Allow the Company personnel to select one from at least three collection kits.
  6. Follow the specific device, laboratory, or Company instructions for the collection, including completion of the CCF.
  7. Ensure that sufficient quantity of specimen has been collected to allow re-analysis. Mitigate any opportunity to substitute, dilute or adulterate the specimen.
  8. For FSD testing, record the result on the CCF, and in event of a non-Negative result, immediately notify the site supervisor.
  9. For Direct Observation Urine Collections, if allowed by local law and custom, collect a second specimen (using a new CCF), and send both specimens to the laboratory, when:

- a. The urine specimen temperature is out of range.
- b. The urine specimen validity measures are outside the normal range (e.g., oxidants, creatinine, pH).
- c. The physical appearance of the specimen indicates possible tampering (e.g., unusual color or odor).
- d. The Collector observes suspicious behavior by Company personnel.
- e. Direct Observation Urine Collections will be conducted when directed by the DCR or the MRO.
- f. If Direct Observation Urine Collections are not allowed by local law or custom, conduct a Monitored collection.

The monitor does not watch the Company personnel urinate into the collection container. If the monitor hears sounds or makes other observations indicating an attempt to tamper with a specimen, this should be considered a refusal to test and observations and collection complete notes should be included in the remarks section of the CCF.

10. If the CCF does not have an integrated specimen seal (*i.e.*, tamper-evident tape) printed with the same unique specimen identifier on the form and seal, a separate secure seal for each specimen container that is capable of uniquely identifying and linking the specimen with the form. (See CCF Elements).
11. After collection, prepare the specimen for shipment to the laboratory using packaging materials that satisfy current applicable courier and customs regulations, except for FSD specimens that are Negative, and distribute the documentation.

e. **Company Notification**

The Collector must notify the DCR or Company site supervisor when there is:

- a. Non-Negative FSD result.
- b. Refusal to test.
- c. Uncooperative or belligerent behavior by Company personnel.
- d. Failure to complete the collection process.
- e. Company personnel who admits to drug use.
- f. Unusual circumstance.

7. **Custody and Control Form (CCF)**

- a. *Required Elements for CCF*

Secure seal for each specimen container, with the same specimen identifier as the CCF. The unique identification number should preferably be in both human readable and barcode format on both the CCF and seal.

1. Identification of the Company personnel (by name or code).
2. Confirm identity of Company personnel.
3. Confirmation of specimen integrity (will vary according to the type of specimen being collected).
4. Medication will be listed on the CCF in the remarks section only if required by local law.
5. Date and time of specimen collection.
6. Signature of specimen Collector.
7. Name of testing laboratory.
8. Names and signatures of all Company personnel who had custody of the specimen during the collection process.
9. Name and contact information of the MRO.
10. If an Alcohol screening or Confirmation Test is performed with a drug test, the Alcohol result may be documented on the CCF. One option is to record the Alcohol results on the drug CCF with an indication of device manufacturer / model type and lot number used.
11. FSD results, if applicable, must be recorded on the CCF as either Negative or non-Negative with identification of the device and lot number used.
12. CCF should be labeled "Private" if required by local law.
13. Paper CCF must be at least 4-part carbonless form, with one copy for each of:
  - a) Collector
  - b) Donor
  - c) Lab
  - d) MRO

#### **8. Laboratory Certification / Accreditation Regional Laboratory Requirements**

1. *North America:* A laboratory must be accredited to either: College of American Pathologists Forensic Drug Testing (CAP-FDT) (all specimen types) or National Laboratory Certification Program (NLCP) (for urine testing laboratories).

2. *Australia / New Zealand:* A laboratory must be accredited to AS/NZS 4308.

## 9. Drug Testing Requirements

Screening Test must be performed using an appropriate and validated technique.

Positive Screening Test must be confirmed using a laboratory chromatographic technique in combination with mass spectrometry.

### a. Regional Drug Testing Requirements

*United States:* FDA 510(k) clearance of device required for the testing of specimens.

- b. *European Union:* CE-marked assays and/or devices are required for the testing of specimens.

- c. Drug testing must be done at a laboratory that is certified and/or accredited by a recognized international, national or regional organization that addresses workplace drug testing to a forensic standard. Recognized standards include current versions of:

1. AS/NZS 4308 (Urine).
2. U.S. SAMHSA current Guidelines for federal workplace testing (Urine and oral fluid).
3. College of American Pathologists, Forensic Drug Testing Accreditation (CAP-FDT).
4. Accredited to the ISO/IEC 17025 standard by a forensic organization such as FQS Forensic Quality Services - International (FQS-I), or UKAS (*United Kingdom Accreditation Service*).
5. Accredited to the ISO/IEC 17025 or ISO 15189 standard and maintains in possession a certified letter from the laboratory director stating that it meets and will maintain compliance with the following criteria:
  - a. Two independent analytic methods are used for determining a Positive result:
    - A screening process, usually an Immunoassay screen, on one portion of the original specimen; and
    - A confirmatory test, usually Gas or Liquid Chromatography in combination with Mass Spectrometry on a different portion of the original specimen.

- b. Specimen validity testing is performed that is appropriate to the specific specimen tested, including reliably identifying specimens that are adulterated or substituted.
- c. Chain of custody procedures (including both specimens and aliquots) are utilized throughout laboratory.
- d. The testing methodology reliably discriminates between specimens that contain drug(s) at or above the specified Cutoff levels of the required drug test panel and those that do not.
- e. Quality control procedures, include:
  - Internal open/blind controls.
  - External open proficiency testing (PT) program.
  - External blind proficiency testing program.
- f. Personnel qualifications are documented, and competency assessment is performed annually.
- g. Laboratory safety procedures are implemented to protect the health and safety of laboratory personnel and visitors.
- h. Quality improvement and quality management are an integral part of laboratory operations.

<b>DRUG CLASS</b>			<b>SYNTHETIC CANNABINOIDS</b>		
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- i. Document control procedures are implemented.
- j. Records and specimen management procedures are implemented.
- k. Method validation and verification is performed, and records maintained.
- l. Internal and external facility and on-site inspections/audit occur at least once every two years and records are available for review.
- m. Security of specimen, records, and testing area/facility is maintained.

**10. Specimen Validity Testing (SVT)**

- a. Urine - The following validity tests must be performed and reported on every urine specimen:
  - ph.
  - Oxidizing Adulterants (e.g., nitrites, chromium VI).

- Creatinine.
- Specific gravity when the creatinine is <20 mg/dL or 2.0 mmol/L (depending on the standard the chosen laboratory uses).

In order to report a urine specimen as dilute, invalid, adulterated, substituted or as having failed specimen integrity, confirmatory testing on a second aliquot must be performed utilizing a well-recognized technology as indicated below:

- pH – pH meter.
  - Oxidizing Adulterant – ion-chromatography or ICP-MS (as applicable).
  - Creatinine – colorimetric/spectrophotometry □ Specific gravity:
    - 1) Dilute – 3-place (preferably, 4-place, with printout) digital refractometer.
    - 2) Substituted – 4-place digital refractometer with printout.
    - 3) Invalid – spectrophotometry.
- b. Blood Testing (for Alcohol confirmation) - Laboratories will test blood specimens for ethanol (Alcohol) using a validated gas chromatographic confirmation method with a Cutoff of 0.020 g/dL or lower.

## 11. Drug Testing using Field Screening Device (FSD)

FSD is also referred to as Point of Collection Testing device or POCT.

Where allowed to be used by local law, Company may choose to use a Customer approved Quest Diagnostics' Drug "Express Results Integrated Multi-Drug Screen Cup" for all test types (i.e., pre-enrolment, random, Reasonable Suspicion, Post Incident, Group Suspicion-based test.).

Non-Negative results must be forwarded immediately to a laboratory meeting the qualifications stated in this exhibit for confirmation of the FSD result.

Company must send 10% of FSD specimen, whether Negative or non-Negative, to the laboratory to confirm FSD accuracy and Collector visual reading of results.

The approved FSD may be purchased from Quest Diagnostics at Customer (ExxonMobil) contracted rates. Company may contact the Customer (ExxonMobil) Account Representative at Quest to order FSD at:

Phone number: +1-610-454-4750

U.S. Toll free phone number: 855-470-4677

E-mail address: [ExxonMobilSetup@questdiagnostics.com](mailto:ExxonMobilSetup@questdiagnostics.com)

Website: [www.employer-solutions-resources.com/exxon](http://www.employer-solutions-resources.com/exxon)

## 12. Alcohol and Drug Test Panel and Cutoffs

			* (US only)		
*Drugs tested			PARENT COMPOUND		
	Screening/ml	Confirmation ng/ml		Screening/ml	Confirmation ng/ml
<b>AMPHETAMINES</b>	500		JWH-018/AM-2201	0.2	0.2
*AMPHETAMINE		250	JWH-073	0.2	0.2
*METHAMPHETAMINE		250	UR-144/XLR-11	0.5	0.5
*MDMA		250	AKB-48-(APINACA)	2.5	2.5
*MDA		250	BB-22	5	5
*MDEA		250	PB-22-(CUPIC)	5	5
<b>BARBITURATES</b>	300		5-FLUORO-PB-22-(5F-PB-22)	5	5
* AMOBARBITAL		200	AB-FUBINACA	2.5	2.5
* BUTALBITAL		200	ADB-PINACA	5	5
*PENTOBARBITAL		200	AB CHMINACA	2.5	2.5
*PHENOBARBITAL		200	AB PINACA/5-F-ABPINACA	5	5
*SECOBARBITAL		200	ADBICA	5	5
<b>BENZODIAZEPINES</b>	300				
*ALPRAZOLAM METAOLITES		100			
*NORDIAZEPAM		100			
*OXAZEPAM		100			
*TEMAZEPAM		100			

* FLURAZEPAM METABOLITES		100			
* LORAZEPAM		100			
*TRIAZOLAM METABOLITES		100			
<b>COCAINE METABOLITES</b>	150				
*BENZOYLECGONINE		100			
<b>MARIJUANA METABOLITES</b>	20				
* THCA (11-nor delta- 9THCA)		10			
<b>METHADONE</b>	300	200			
<b>OPIATES</b>	300				
*CODEINE		100			
*MORPHINE		100			
*HYDROCODONE		100			
*HYDROMORPHONE		100			
*6-ACETYLMORPHINE (6- AM)	10	10			
<b>OXYCODONES</b>	100				
* OXYCODONE		100			
*OXYMORPHONE		100			

### 13. Drug Test Review Process by MRO

#### a. Review Process

For Non-Negative results, the process must include:

1. Authenticating the identity of Company personnel.
2. Reviewing the external chain of custody for Fatal Flaw.
3. Reviewing the confirmed laboratory test result.
4. The opportunity for Company personnel to speak to the MRO.

5. The opportunity when deemed appropriate by the MRO for the Company personnel to request re-analysis of the original specimen.

If, after five calendar days after receipt of the laboratory report, no contact with the Company personnel has been made, the MRO will report the result to the DCR. MRO staff members or assistants who are not physicians may assist the MRO Review process.

b. MRO Review

MRO actions based on review of Non-Negative confirmed laboratory results are as follows:

1. For a Fatal Flaw, cancel the test and inform the DCR to order a new collection.
2. For a confirmed laboratory Positive result, for an over the counter medication, verify the result as Positive unless the Company personnel presents a legitimate medical explanation for the presence of the drug/metabolite in his/her specimen. (See Exhibit Section 7 - Medication Disclosure).
3. For a confirmed laboratory Positive result for a Prescription Drug, verify the result as MRO Positive unless Company personnel presents a legitimate prescription for the presence of the drug/metabolite in the specimen.
4. If during the MRO Review process, concerns about fitness for duty are found, from either medical condition or use of potentially impairing medications, inform the DCR to order a medical examination and a have fitness for duty assessment performed. Company personnel must Stand Down from Covered Services pending resolution of MRO Fitness for Duty concern.
5. For a confirmed laboratory Positive result of marijuana, for an alleged medical marijuana use or exposure (e.g., second-hand / passive inhalation), but not due to a legitimate prescription (e.g., Marino, Dronabinol, Sativex), verify the result as Positive but offer to report the alleged legitimate use of marijuana to the DCR.
6. For a confirmed laboratory adulterated or substituted result, verify the result as a refusal to test because of adulteration or substitution unless Company personnel present a legitimate explanation for the presence of the adulterant or substitution in his/her specimen.
7. For a confirmed laboratory adulterated or substituted result, cancel the test if the Company personnel presents a legitimate explanation for the presence of the adulterant in his/her specimen. If allowed under local law

and custom, inform the DCR to order a new collection under Direct Observation or Closely Monitored.

8. For a laboratory invalid result, cancel the test. If allowed under local law and custom, inform the DCR to order a new collection under Direct Observation or Closely Monitored.
9. If a valid urine specimen cannot be produced due to legitimate medical reasons determined by a specialist (see 1. below), inform the DCR to order a new drug test using an alternative specimen type, if allowed by Buyer's approved alcohol and drug test matrices in section above. In the absence of a legitimate medical reason, record the result as Refusal to Test.
10. If Company personnel request re-analysis of the specimen, the MRO will arrange for re-analysis at Limit of Detection (LOD) at a laboratory in compliance with this Guideline. If there is insufficient specimen for re-analysis, contact the DCR for instruction.

MRO actions for an alleged inability to provide a specimen:

1. Confidentially inform the DCR of the alleged inability of Company personnel to provide a specimen and direct the DCR to order a specialist medical examination of the Company personnel.
2. All communications with the DCR must be kept confidential.

#### c. Review Process for Drug Tests not requiring MRO Review

The Review process for laboratory drug test results not requiring MRO review are:

1. Review the external chain of custody for completeness.
2. Review laboratory result.
  - a. For a laboratory Negative result, report as Negative, and no further action is required.
  - b. For all laboratory Negative-dilute results, report as Negative and no further action is required.
  - c. For specimens Rejected for Testing or Fatal Flaw, order a new collection.

#### 14. Monitoring and Review – KPI's

Parameter	Target / Notes
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Random Percentage (%) testing rate (number of random tests performed divided by the actual number of Company personnel in the Random Pool on selection day)	Example for quarterly cumulative expectations: 1Q – 12.5% 2Q – 25% 3Q – 37.5% 4Q – 50%
Are 10% of drug Field Screening Devices being sent to laboratory for results validation?	Should be yes (for Company using FSD)
Number of Company personnel in Random Pool who have not been tested in last 2 calendar years	Should be zero
Number of the following YTD on Covered Services: i. Reasonable Suspicion tests ii. Post Incident tests iii. Group Suspicion-based tests iv. Contraband inspections	Be prepared to discuss action taken following Positive tests and contraband discoveries.

Additionally, Customers may request, data for overall positivity rate and positivity rate by test type (random, post-incident, reasonable-suspicion, unannounced group) and specific drugs for testing conducted to satisfy recommendations of their guideline. This data must be provided within 15 business days from the date of the request.

## 15. Records to be Retained

- a. The following documentation is to be retained by Company, or accessible on request by Customer and its authorized agents, assigns, and representatives.
  1. Designated Company Representative contact information.
  2. Electronic or hard-copy record of Company supervisors' training in:
    - Random testing notification
    - Post Incident testing
    - Reasonable Suspicion testing
    - Stand Down procedures
  3. TPA contact information (if used)
  4. MRO(s) name and contact information
  5. List of collection sites

6. Records of personnel training and demonstrated competency in drug specimen collection and use of Field Screen Device (FSD) and Evidential Breathalyzer Tester (EBT). (Must be retained by the Company's Collector.)
7. Laboratory contact information for all testing labs utilized, as well as laboratory certifications, and drug test panel details.
8. Agreement from any service provider of drug/Alcohol testing services under this agreement that they will provide the requested data upon submission by Buyer of a list, or lists, of personnel names (or unique ID numbers if names are not allowed per country regulation), chain-of-custody ID numbers and test dates.
9. Actual number of Safety Sensitive Company personnel on Covered Services on each selection day and the number of random tests and the random testing percentage rate achieved each quarter (to be available quarterly).
10. A list of all Company personnel in Random Pool (personnel names or unique identification numbers).
11. List of all personnel names (or identification numbers (ID) if names are not allowed per country regulation) randomly selected on each random selection day.
12. Records to demonstrate that all SS Company personnel in Random Pool had been tested at least once in last 2 calendar year period.  
**Note:** If Company personnel have not been tested at least once in the 2 calendar years Company must provide reason for non-test (e.g., Disqualification, permanently reassigned off Covered Services, contract element completed, resigned, retired, etc.).
13. Dates of each of the following on Covered Services:
  - a. Reasonable Suspicion tests
  - b. Post Incident tests
  - c. Group Suspicion-based tests
  - d. Contraband inspections
  - e. Accuracy check log, calibration records, and manufacturer's certification for EBT. (Must be retained by the Company's Collector.)
14. Records of results of laboratory confirmation of FSD result (Positive, Negative, or invalid specimen).
15. Buyer may request data for overall positivity rate, positivity rate by test type, and positivity rate by specific drug.

16. Records to demonstrate periodic check of subcontractors to ensure their compliance with the requirements of this Exhibit.
17. Records of drug and alcohol test results, by names (or unique ID's if names are not allowed per country regulation), to verify compliance for all test types.  
**Note:** All requests for drug and alcohol testing data require the following information:
  - a. CCF (physical or electronic).
  - b. Test results: laboratory report, EBT printout, Negative alcohol screen documentation, Drug FSD CCF, if used.
  - c. Any associated Attachment 2 submitted to Buyer.
18. Written procedure for ensuring Company personnel who are disqualified from Covered Services continue to be excluded from Covered Services at any location.

## REVISION SUMMARY

Revision	Date <sup>§</sup>	Approved by	Summary of change
1	31 Jul 2021	Sean Hill	Initial release of document
2	9 Nov 2021		Addition to Safety Sensitive Positions
3	13 Jul 2022	Kurt Busuttill	Updated Safety Sensitive Positions List Updated Document Format

<sup>§</sup>Change the Revision No. and Date in Header of the document each time the new revision is rolled out.

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## 1 INTRODUCTION

The purpose of this procedure is to provide controls that will protect people, property and assets whereby should an undesired event occur GYSBI can account for all people on the Shore Base.

## 2 PROCEDURE DETAILS

### Annex – Vehicular access plot 4

#### A. GYSBI's – (Guyana Shore Base Inc.) & On-site Contractors/Tenants

1. All vehicles requiring entrance must stop before the cones placed at the entrance of plot 4. Security removes cone and vehicle enters the security checkpoint or buffer zone.
2. Upon entering the buffer zone, personnel are required to have their GYSBI Electronic Access badges (issued to all GYSBI employees and tenants). Personnel are not to take their vehicles to work zones.
3. Vehicles are then logged by security personnel and subjected to a search. All hand carry luggage, bags, backpacks, and vehicles will be searched by Security.
4. The search of vehicles includes but is not limited to the following
  - a. **Trunk & Trunk Pockets**
  - b. **Glove compartment,**
  - c. **Door pockets**
5. The driver shall facilitate the search by opening doors and all compartments of vehicle.
6. Passengers are required exit the vehicle and access the base via the pedestrian walkway.
7. Driver disembarks the vehicle to swipe in and returns to the vehicle.

8. Vehicle will then proceed to designated parking area and will reverse park.

### **Visitors**

A visitor shall be defined as personnel entering the Annex for a short-term period and not permanently stationed at the Annex.

1. Visitors who arrive for official business within the facility are only allowed to enter if they are on a pre-registered list. The pre-registered list is generated from the preparation of a visitor registration form.
2. Visitors not on a pre-registered list will not be allowed to enter the facility, until the person they are visiting advises Security and requests approval for their entry and comes to security to collect them.
3. All Visitors are required to SIGN IN on the "Visitor List" by providing identification for verification at Main Gate. Name will be recorded by security personnel for legibility purpose.
4. Visitors will be subjected to guidelines in Section A. regarding entry protocols.

### **Annex – Vehicular access plot 7**

1. All vehicles requiring entrance must stop before the gate at the entrance of plot 7. Security opens gate and vehicle enters the security checkpoint or buffer zone.
2. Upon entering the buffer zone, personnel are required to have their GYSBI Electronic Access badges (issued to all GYSBI employees and tenants). Personnel are not to take their vehicles to work zones.
3. Vehicles are then logged by security personnel and subjected to a search. All hand carry luggage, bags, backpacks, and vehicles will be searched by Security.

4. The search of vehicles includes but is not limited to the following
  - a. **Trunk & Trunk Pockets**
  - b. **Glove compartment,**
  - c. **Door pockets**
5. The driver shall facilitate the search by opening doors, trunk and all compartments of vehicle.
6. Passengers are required exit the vehicle and access the base via the pedestrian walkway.
7. Security will then log all personnel and vehicles accessing plot 7
8. Vehicle will then proceed to designated parking area.

### **General Guidelines when entering Annex**

1. Personnel should be observant of all posted work areas, safety cones, cordoned areas, caution tape barriers and adhere to directions from authorized facility staff when requested.
2. Personnel should proceed directly to their designated site without deviation. Under no circumstances will any Personnel be allowed into unauthorized areas of facility.
3. Anyone found to be in unauthorized areas will be escorted from facility with future access permanently prohibited.
4. Everyone entering the operational facility must have minimum PPE (Hard Hat, Safety Eye Wear, Hi-Vis Reflective Vest, Safety Toed Footwear). No PPE means no entry.
5. PPE Exceptions - Exxon employees and their visitors who have PPE in the ExxonMobil office may drive directly to the parking lot to retrieve their PPE.

**GYSBI reserves the right to deny entry to this facility, and permanently prohibit future access to anyone found breaching GYSBI rules.**

## **Annex – Pedestrian access**

### **A. Shore base Personnel – Guyana Shore Base Inc. & On-site**

#### **Contractors/Tenants**

1. Personnel are to prominently display their GYSBI Electronic Access badges upon entering the plot 4 main entrance or plot 7's entrance.
2. All bags and backpacks / baggage will be searched by plot 4 and 7 security. Personnel will facilitate this by opening all compartments for security to inspect.
3. Security will log all personnel entering plot 7
4. Personnel entering via plot 4 will then proceed to swipe at the main security container at plot 4 and proceed along the walkway to their destination.

### **B. Visitors**

1. Visitors who arrive for official business within the facility are only allowed to enter if they are on a pre-registered list approved by the Security Manager or delegated officer. The pre-registered list is generated from the preparation of a visitor registration form. The Pre-registered list will assign a numbered Visitor Access badge and vehicle pass. Access badges will be color coded to indicate areas the visitor is permitted.
2. Visitors who do not have their names on a pre-registered list will not be allowed to enter the facility, until the person they are visiting advises Main Gate Security and requests approval for their entry and comes to security

to collect them. Approval will be given by the Security Manager or delegated officer.

3. All Visitors are required to SIGN IN and OUT on the "Visitor List" at Main Gate Security.
4. Visitors will be subjected to guidelines in Section C. 1-4.

## **Annex Plots 4 & 7 Exit Procedure - Visitors**

### **A. VEHICLES & PEDESTRIAN**

1. Pedestrian visitors will proceed to indicate to security that they are exiting facility and security will record exit time.
2. Personnel will facilitate searches of any baggage on their person by opening all compartments to allow for security to inspect.
3. Passengers will proceed along the pedestrian walkway and proceed to exit facility.
4. Vehicles arrive at the cone barrier / gate security raises the barrier. Once the barrier is fully upright, the vehicle enters the buffer area.
5. Driver swipes out at card reader.
6. Vehicle is then subjected to a security check. The search of vehicles includes but is not limited to the trunk and glove compartment and may also include vehicle under carriage searches with the use of an under-carriage mirror. The driver will facilitate the search by opening doors and compartments.
7. Visitors must return GYSBI Access badges and vehicle passes to receive their lodged photograph identification. All Visitors are required to SIGN OUT on the "Visitor List" at Main Gate Security.
8. Vehicles and pedestrians are given all clear to exit. Driver returns to the vehicle.
9. Security officer then signals to have the second exit barrier opened for the driver to proceed out of the area.

### 3 ENFORCEMENT

Failure to comply with all points in this procedure may lead to denial of access into the GYSBI's Annex facility.

#### **Removing Items from the facility**

- A. Nobody is permitted to take anything from the facility unless accompanied by a Material Dispatch Form (See attached below for example of form) with authorized signature.
- B. Company owned Material being transferred out of facility will require a Company Material Dispatch Form detailing items for removal with respective Supervisor authorization.
- C. List of authorized signatories are to be provided to security for use in verification of approved Material Dispatch Forms.

**4 APPENDIX I: VEHICULAR ACCESS ANNEX PLOT 7 (VISITORS / GYSBI EMPLOYEES / TENANTS / CONTRACTORS)**



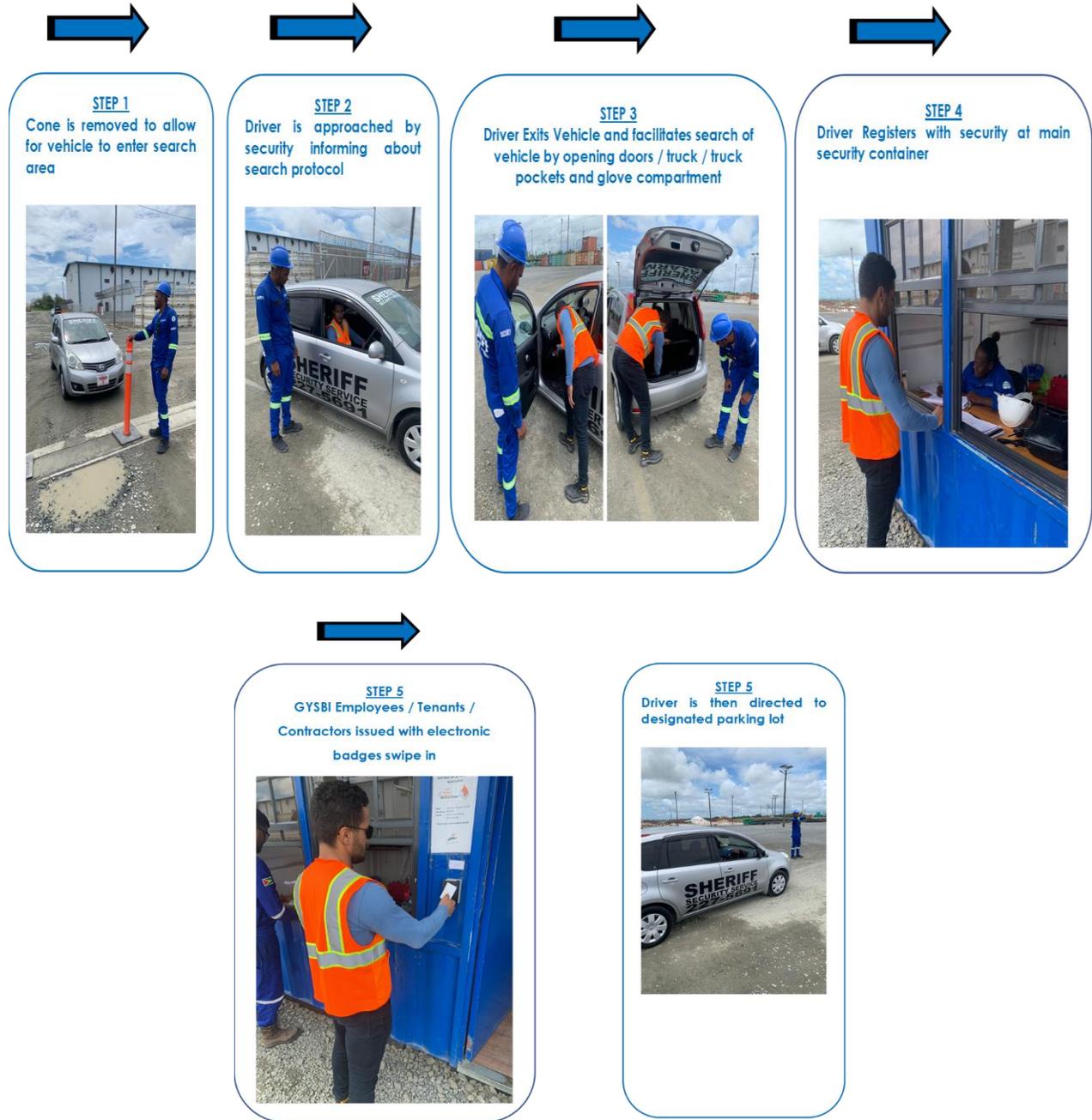


**STEP 4**  
Driver is then directed to  
designated area parking lot



Process Is Repeated When Vehicles Are Exiting the Facility.

APPENDIX II: VEHICULAR ACCESS PLOT 4 (GYSBI EMPLOYEES / TENANTS / CONTRACTORS / VISITORS)



Process Is Repeated When Vehicles Are Exiting the Facility.

**APPENDIX III: PEDESTRIAN ACCESS PLOT 4 (GYSBI EMPLOYEES / TENANTS / CONTRACTORS / VISITORS)**



Process Is Repeated When Personnel Are Exiting the Facility.

**APPENDIX IV: PEDESTRIAN ACCESS (GYSBI EMPLOYEES / TENANTS / CONTRACTORS / VISITORS)**



Process Is Repeated When Personnel Are Exiting the Facility.

**APPENDIX V: FORMS**

[Material Dispatch Form.xlsx](#)

[Visitor Registration Form.xlsx](#)

[Visitors Sheet.xlsx](#)

## APPENDIX VI: EXAMPLES OF ITEMS BEING SEARCHED FOR

The below are examples of items being searched for but not limited to the following:



Guns And Ammunition



Alcohol



Offensive Weapons

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	01 June 2022	Andy Dowson	Initial Release
2	07 Jul 2022	Kurt Busuttill	Updated Document Number

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**This procedure shall be used and updated by QHSSE Department**

## 1 INTRODUCTION

The scope of this procedure is applicable to all operations and construction related activity undertaken by: GYSBI, Subcontractors and vendors at the GYSBI Shore Base and Annex Sites.

The purpose is to plan and implement the monitoring, measurement, analysis and improvement processes needed to demonstrate conformity of the organisation with regards to QHSSE and to continually improve the effectiveness of the management systems.

## 2 PROCEDURE DETAILS

### Responsibilities

It is the responsibility of the QHSSE Supervisor to ensure that adequate resources are allocated for the effective implementation of this Procedure.

The QHSSE Supervisor shall develop a quarterly audit plan. All processes shall be audited once a year as a minimum. QHSSE Supervisor shall provide training to the QHSSE Officers covering audit techniques and the requirements of this procedure.

QHSSE Officers shall perform audits and follow up on corrective actions, in accordance with their training and this procedure.

All Managers and Supervisors shall participate in QHSSE audits and shall address nonconformities within the stipulated time frame.

### Procedure

## Internal Audits

It is the responsibility of the QHSSE Supervisor to ensure that adequate resources are allocated for the effective implementation of this Procedure

The QHSSE Supervisor shall develop a quarterly audit plan. All processes shall be audited once a year as a minimum. QHSSE Supervisor shall provide training to the QHSSE Officers covering audit techniques and the requirements of this procedure

QHSSE Officers shall perform audits and follow up on corrective actions, in accordance with their training and this procedure

All Managers and Supervisors shall participate in QHSSE audits, and shall address nonconformities within the stipulated time frame

## Audit Reporting

The auditor(s) will compile an audit report consisting of an Audit Check List, Audit Summary Sheet and all IN's raised, and forward this to the QHSSE Supervisor.

The QHSSE Supervisor will review the audit outcome and discuss as necessary with the auditor. The auditor will save an electronic copy of all documentation in the appropriate folder. The audit report will be distributed to the relevant persons by email.

All non-conformances will be recorded in the existing nonconformance tracker. The corrective action must be affected within the agreed time period. If there are genuine reasons why the action cannot be completed on time, it should be brought to the attention of the auditor, who may decide to extend the time scale. Failure to complete corrective actions by the extended date will be referred to the QHSSE Supervisor for review and action.

The auditor will then carry out a follow up audit to determine that the action has been implemented.

The Auditor on completion of the audit will examine all checklists and reports ensuring the necessary corrective action has been carried out and where necessary arrange further audits, and the updating of the Audit Plan ensuring the necessary preventative action has been put in place to prevent recurrence.

## Documents

[Audit Summary Report](#)

Audit Schedule

[Audit Checklist](#)

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	13 May 2020	Michael James Sean Hill	Initial release of document
2	13 Aug 2020	Michael James Sean Hill	Document layout changed to new company format
3	17 Sep 2021	Kurt Busuttill	QHSSE Manager designation removed and SPO Links to documents inserted
4	07 Jul 2022	Kurt Busuttill	Updated Document Number

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## 1 INTRODUCTION

The purpose of this procedure is to provide guidance in the event of a bomb threat in order to ensure the safety of all GYSBI's personnel and property and by extension the general public.

## 2 PROCEDURE DETAILS

### Bomb Threat Received By Phone

1. Remain calm. Keep caller on the line for as long as possible. DO NOT HANG UP, even if the caller does.
2. Listen carefully. Be polite and show interest in what the caller is saying.
3. If possible, write a note to a colleague to notify Base Manager, QHSSE Supervisor or the Security Coordinator who will immediately notify the authorities and GYSBI Management or as soon as the caller hangs up, immediately contact the above-mentioned personnel.
4. If phone has a display copy the number, if displayed.
5. Write down as much details as possible and complete QH-159 Bomb Threat Checklist. Try to get exact words.
6. Upon receiving bomb threat send discrete messages for all personnel to muster at designated muster area.
7. MARAD should be notified at tele: (592) 225-7330/226-3356
8. Personnel should remain at muster areas until authorities arrive, a search is done and await authority's instruction to either evacuate facility or an all clear is given.

### Bomb Threat Received Hand Written Note

1. Notify Base Manager, QHSSE Supervisor or the Security Coordinator who will immediately notify the authorities and GYSBI management.
2. Upon receiving bomb threat send discrete messages for all personnel to muster at designated muster area.
3. MARAD should be notified at tele: (592) 225-7330/226-3356
4. Personnel should remain at muster areas until authorities arrive, a search is done and await authority's instruction to either evacuate facility or an all clear is given.

### Signs of a Suspicious Package

- No Return Address
- Excessive Postage Stamps
- Stains
- Strange Odor
- Strange Sounds
- Unexpected Delivery
- Poorly Handwritten
- Misspelled Words
- Foreign Postage

### DO NOT:

- Use a two-way radios or cellular phone; radio signals have the potential to detonate bomb
- Activate fire alarm
- Touch suspicious package
- Evacuate until police arrive and evaluate the threat.

## Appendix I: Bomb Threat Checklist

QH-159-BOMB THREAT CHECKLIST

Revision No.: 1  
Date: 20 SEPT 2021

BOMB THREAT CHECKLIST		
Date:	Time:	
Time Caller Hung Up	Phone Number Where Call Received:	
ASK CALLER		
Where is the bomb located?		
When will it go off?		
What does it look like?		
What kind of bomb is it?		
What will make it detonate?		
Did you place the bomb? YES <input type="checkbox"/> NO <input type="checkbox"/>		
Why?		
What's your name?		
CALLER'S EXACT WORDS OF THREAT		
INFORMATION ABOUT CALLER		
Where is the caller located? (Background and level of noise)		
Estimate age:		
Is the voice familiar? if so who does it sound like?		
Callers Voice	Background Sounds	Threat Language
<input type="checkbox"/> Accent <input type="checkbox"/> Calm <input type="checkbox"/> Coughing <input type="checkbox"/> Crying <input type="checkbox"/> Deep Breathing <input type="checkbox"/> Distinct <input type="checkbox"/> Female <input type="checkbox"/> Laughter <input type="checkbox"/> Loud <input type="checkbox"/> Normal <input type="checkbox"/> Rapid <input type="checkbox"/> Slow <input type="checkbox"/> Soft	<input type="checkbox"/> Angry <input type="checkbox"/> Clearing Throat <input type="checkbox"/> Cracking Voice <input type="checkbox"/> Deep <input type="checkbox"/> Disguised <input type="checkbox"/> Excited <input type="checkbox"/> Male <input type="checkbox"/> Male <input type="checkbox"/> Nasal <input type="checkbox"/> Ragged <input type="checkbox"/> Raspy <input type="checkbox"/> Slurred <input type="checkbox"/> Stutter	<input type="checkbox"/> Animal Noises <input type="checkbox"/> House Noises <input type="checkbox"/> Kitchen Noises <input type="checkbox"/> Street Noises <input type="checkbox"/> Booth <input type="checkbox"/> PA System <input type="checkbox"/> Conversation <input type="checkbox"/> Music <input type="checkbox"/> Motor <input type="checkbox"/> Clear <input type="checkbox"/> Static: _____ <input type="checkbox"/> Office Machinery: _____ <input type="checkbox"/> Factory Machinery: _____ <input type="checkbox"/> Local <input type="checkbox"/> Long Distance
<input type="checkbox"/> Incoherent <input type="checkbox"/> Message Read <input type="checkbox"/> Taped <input type="checkbox"/> Irrational <input type="checkbox"/> Profane <input type="checkbox"/> Well – Spoken		

Other Information:

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## Appendix II: Authority Contact

- Police – 911
  - Ruimveldt Police Station – 226 – 3405
  - Providence Police Station – 265 -7382
  - Police Head Quarters – 225 – 6411
- Fire Service – 912
  - West Ruimveldt Fire Station – 225 – 9702
- MARAD – 225 – 7330 / 226 – 3356
  - Dwain Nurse – Office – 225 – 7330 / Cell – 646 - 3001

## 3 REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	20 September 2021	Kurt Busuttil	Initial Release of Document
2	07 Jul 2022	Kurt Busuttil	Updated Document Number

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**This procedure shall be used by IT Department and updated in collaboration with QHSSE Department**

## **1 1 PURPOSE**

The Company is committed to achieving the highest performance in occupational health and safety with the aim of creating and maintaining a safe and healthy working environment.

Consistent with this the Company accepts that use of cell phones while operating in a high-risk environment, can create an unsafe condition in which your mind is not on task and therefore a significant hazard.

The purpose of this policy is to help us get the most out of the advantages these instruments offer our company while minimizing distractions, accidents, and frustrations improper cell phone use can cause.

## **2 2 SCOPE**

This policy covers cellular phones at both the GYSBI Main Base and Annex locations and applies to all Personnel at the GYSBI facility

### 3 3 CELLPHONE USAGE GUIDELINES

The Guyana Shore Base Inc. (GYSBI) cell Phone workplace policy offer general guidelines for using personal and company phones during work hours in certain locations.

The following are basic guidelines set out by the Company for proper employee, subcontractor, and visitor cell phone while involved in the operations. In general, these cell phone should not be used when they could pose a security or safety risk, or when they distract from work tasks. Specific circumstances include:

- Never use a cell phone while driving.
- Ensure cell phones are not inside the cabs of GYSBI/Contractor operated equipment (eliminating the temptation to use)
- Never use a cell phone while operating equipment.
- Do not use cell phones for surfing the internet or gaming during work hours.
- Avoid using work cell phones for personal tasks.
- Avoid using personal cell phones for work tasks.
- Do not use cell phones during meetings.
- Do not use cell phones to record confidential information.
- Never use cell phones while in an active work zone.

The following guidelines are examples when phones are accepted to be used under the condition it has been approved from Base Manage/Base Coordinator & QHSSE Supervisor

- Following an incident (and key personnel are required to be contacted)
- Evidence based pictures for investigation purposes
- Evidence based pictures to provide clarity for customers/contractor/client/Management who request this.

- Limble (software) for pictures to submit a maintenance issues. Note: the documented information that is required to complete a Limble completed whilst in a phone friendly zone.

## 4 4 ACCESS

Staff members can access their cellphone during working time in the following designated areas identified in appendix 1 & 2 (highlighted green):

## 5 5 DISCIPLINARY ACTION

Improper use of cell phones shall result in disciplinary action. Continued use of these instruments at inappropriate times or in ways that distract from work may lead to having cell phone privileges revoked.

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	26 May 2021	Iain Martin Sean Hill	Initial release of document
2	26 Feb 2022	Andrew Dowson	Addition of Scope. Additional areas added to access Maps of Phone-friendly Areas
3	26 Mar 2022	Andrew Dowson	Additional areas identified with involvement from GYSBI & Annex key personnel.
4	07 Jul 2022	Kurt Busuttil	New Document Number

## APPENDIX 1



Figure 1: Phone-Friendly Zones at Main Base

## APPENDIX 2



*Figure 2: Phone-Friendly Zones at Annex*

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**This procedure shall be used and updated by QHSSE Department**

## 1 INTRODUCTION

A Confined Space can be any space of an enclosed nature where there is a risk of death or serious injury from hazardous substances or dangerous conditions (e.g. lack of oxygen).

Some confined spaces are easy to identify, for example:

- Enclosures with limited openings
- Storage tanks;
- Silos;
- Enclosed drains and sewers.

Others may be less obvious, but can be equally dangerous, e.g.

- Open-topped chambers;
- Vats;
- Combustion chambers in furnaces;
- Ductwork;
- Unventilated or poorly ventilated rooms.

It is not possible to provide a comprehensive list of confined spaces. Some places may become confined spaces when work is carried out, or during their construction, fabrication or subsequent modification.

## 2 PROCEDURE DETAILS

### 2.1 Purpose

The purpose of this procedure is to ensure that:

- Entry into confined spaces is avoided where possible.
- When entry into confined spaces is unavoidable, all hazards have been considered and there are sufficient safe systems of work and emergency arrangements in place that will reduce the risk of injury to the persons involved.

- Ensure compliance with relevant legislation.

## 2.2 Scope

GYSBI is committed in providing a safe working environment to all its employees, visitors and 3<sup>rd</sup> parties on its premises. This procedure applies to all confined spaces on GYSBI premises and when GYSBI employees are entrusted to provide services on other sites under its control.

## 2.3 Definitions

**Competent person:** means a person having suitable training and sufficient knowledge, expertise and skill for the safe performance of the specific task or work required.

**Confined space:** means an enclosed space which has limited openings for entry or egress, and, or which may contain insufficient levels of oxygen or contain or produce dangerous air contaminants liable to cause a risk to the health and safety of workers who enter such a space, and includes any room, chamber, booth, tunnel, tank, silo, vat, pit, pipe, drain, sewer or flue and any other enclosed space

**Employer:** means any person for whom work, or service is performed by a worker or who has an employment relationship with a worker and includes a contractor or subcontractor who performs work or supplies a service or undertakes to perform any work or to supply services.

**Explosive atmosphere:** means a mixture with air, under atmospheric conditions, of flammable substances in the form of gases, vapors, mists or dusts in which, after ignition has occurred, combustion spreads to the entire unburned mixture

**Supervisor:** means a person appointed or employed by an employer having overall direction on site and or having the task of supervising entry and work in a confined space, and who has received appropriate training for such a task.

## 2.4 Hazards

### 2.4.1 Lack of Oxygen

This can occur:

- Where there is a reaction between some materials and the oxygen in the atmosphere thus reducing oxygen levels in the process;
- Following the action of groundwater on chalk and limestone which can produce carbon dioxide and displace normal air;
- In freight containers, lorries etc. as a result of the cargo reacting with oxygen inside the space;
- Inside steel tanks and vessels when rust forms;
- When using inert gases, for example, during cutting and welding operations.

### 2.4.2 Poisonous Gas, Fume or Vapor

These can:

- Build-up in sewers and manholes and in pits connected to the system;
- Enter tanks or double bottoms which have not been vented properly;
- Enter tanks or vessels from connecting pipes;
- Leak into trenches and pits in contaminated land.

### 2.4.3 Ingress of Liquids and Solids

Liquids and solids, which can suddenly fill the space, or release gases into it, when disturbed. Free flowing solids such as cement, barite, bentonite etc., can also partially solidify or 'bridge' in silos causing blockages, which can collapse unexpectedly.

### 2.4.4 Fire and Explosions

Fire and explosions may occur due to flammable vapor concentrations being within the flammable range or excess oxygen being present in a sufficient concentration.

### 2.4.5 Residues

Residues left in tanks, vessels etc., or remaining on internal surfaces can give off gas, fume or vapor.

### 2.4.6 Dust

Dust (especially organic materials) present in high concentrations may pose a risk of explosion.

### 2.4.7 Temperature

Hot conditions or the generation of heat by the task being undertaken may lead to a dangerous increase in body temperature.

### 2.4.8 Live Electromechanical Environment

Mechanical/electrical isolations and 'lock off' systems may be necessary prior to entering a confined space to prevent inadvertent start-up of equipment. Where this is necessary 'test starts' should always be carried out to demonstrate the isolation is effective.

### 2.4.9 Hazards Arising Out of Work Activity

Some of the above conditions may already be present in the confined space. However, some may arise through the work being carried out, or because of ineffective isolation of plant nearby, e.g. leakage from pipework, ducting or other ancillary equipment connected to the confined space. The enclosure and working space may increase other dangers arising through the work being carried out, for example:

- Machinery being used may require special precautions, such as provision of exhaust/dust extraction, or special precautions against electric shock and generation of sparks that may be a source of ignition;
- Gas, fume or vapor can arise from welding, or by use of volatile and flammable solvents from paints and adhesives etc. It may be necessary to mechanically ventilate the confined space continuously;

- If access to the space is through a restricted entrance, such as a manhole, escape or rescue in an emergency will be more difficult (see Emergency procedures).

## 2.5 Procedure

### 2.5.1 Risk Assessment

The main emphasis throughout the confined spaces procedure is that entry must be avoided if it is reasonably practicable to undertake the work from outside the confined space.

Where this is not possible a risk assessment must be made and appropriate precautions must be taken to mitigate any hazards identified.

Prior to entry a risk assessment must be undertaken. The assessment must consider whether the confined space entry can be avoided in the first instance. Where entry cannot be avoided, then all hazards and risks detailed in section 2.4 must be considered. Note: this list is not exhaustive and other additional risks may have to be considered.

It is the responsibility of the appointed supervisors as specified in 2.5.3 to carry out these risk assessments in conjunction with the HSE and personnel from within the area where the confined space work is to be carried out.

### 2.5.2 Safe Systems of Work

It is a requirement of this procedure that there is a safe system of work for all confined space entries. To be effective, a safe system of work needs to be continuously monitored. It is the responsibility of the employer to ensure that this requirement is fulfilled. The typical components of a safe system of work are detailed in sections 2.5.3 to 2.5.17.

### 2.5.3 Appointment of Supervisor

Supervisors must be appointed to oversee all confined space work. It is their responsibility to ensure all the necessary precautions are taken and that the safe

system of work is being followed. It is the responsibility of the employer to appoint a suitably trained and experienced supervisor.

The degree of supervision will be based on the findings of the risk assessment. In some cases, periodic checks may be sufficient if the work is low risk and routine.

It is more likely that the level of risk will require a competent person to supervise the work and remain present while the work is being undertaken.

#### 2.5.4 Competence

Specific training for work in confined spaces is required for all personnel involved in this type of work. The training will include topics such as:

- Awareness of the Confined Spaces regulations and in particular the need to avoid entry where possible;
- An understanding of the work to be undertaken, the hazards, the safe system of work and all necessary precautions;
- An understanding of the 'permit to work system' and the 'confined space entry permit';
- How emergencies arise, the need to follow prepared emergency plans and the dangers of not doing so.

#### 2.5.5 Communication

An adequate communication system is required to enable:

- Communication between people inside and people outside the confined space;
- Help to be summoned in an emergency;
- Emergency rescue procedures to be initiated.

Systems can include speech, tugs on a rope, telephones, radios etc. Equipment to be used in potentially flammable or explosive atmospheres should be specially protected so they do not present a source of ignition (EX proof – intrinsically safe).

### 2.5.6 Testing the Air and Provision of Ventilation

The risk assessment shall highlight the need to check that the atmosphere is free from both toxic and flammable vapors and that there is an adequate concentration of oxygen prior to entry. A competent person using a suitable gas detector, which is correctly calibrated, must carry out testing. Where the risk assessment indicates that conditions may change, or as a further precaution, continuous monitoring of the air may be necessary. Test results must be recorded on the entry certificate.

**Note:** The acceptable oxygen concentration range is between 19.5% and 23.5%. Work must not be undertaken if the oxygen concentration is outside this range.

It is the responsibility of the supervisor to ensure that air-testing requirements identified by the risk assessment are carried out by a competent person, who is trained in the use of the equipment and can interpret results.

Ventilation may be improved by increasing the number of openings, however, mechanical forced ventilation may be necessary to ensure an adequate supply of fresh air, if this is the case, then continuous monitoring is required. Fresh air should be drawn from a point where it is not contaminated either by used air or other contaminants.

Use of portable gas cylinders and diesel equipment should be avoided where possible. If their use cannot be avoided, then forced ventilation is essential to prevent the accumulation of gases/fumes.

**Warning:** carbon monoxide in the exhaust from petrol-fueled engines is so dangerous that use of such equipment in confined spaces must **never** be allowed.

### 2.5.7 Decontamination Before Entry

It is essential to ensure fumes do not develop from residues while the work is being done. All decontamination requirements must be carried out and the

atmosphere tested prior to work starting. It is the responsibility of the supervisor to ensure effective decontamination is carried out.

### 2.5.8 Isolation from Gases, Liquids and Other Flowing Materials

Confined spaces will often need to be isolated from ingress of substances that could pose a risk to those working within the space. Methods of isolation may include:

- Complete disconnection of pipes or ducts.
- Insertion of blanks.
- Reliable valves that can be locked shut.

Whatever means of isolation is used, it needs to be tested to ensure it is suitably reliable. It is the responsibility of the supervisor to ensure that all necessary isolations have been made and are effective under an isolation permit.

### 2.5.9 Isolation from Mechanical and Electrical Equipment

Mechanical and electrical isolation of equipment is essential if it could otherwise operate, or be operated, inadvertently. It is the responsibility of the supervisor to ensure that all necessary mechanical and electrical isolations (including lock-out of isolation switches) have been made by a competent person and are effective.

### 2.5.10 Use of Suitable Equipment

Any equipment provided for use in a confined space needs to be suitable for the purpose. Consideration should be given to:

- Likelihood of flammable atmospheres and sources of ignition.
- Emissions of fumes/gases.
- Risk of electrocution.
- Earthing requirements with regard to static electricity.
- Mechanical hazards (e.g. trapping, falling, shearing etc.).

### 2.5.11 Personal Protective Equipment (PPE) and Respiratory Protective Equipment (RPE)

Ideally the need to wear PPE or use RPE should be evaluated by implementation of robust risk control measures. It should only be used as a last resort, except for rescue work. If the use of specific PPE or RPE is necessary, then it must be assessed for suitability by a competent person and offer the correct level of protection.

**Note:** Wearing of excessive PPE and RPE can contribute to heat stress.

### 2.5.12 Gas Supplied by Pipes and Hoses

The use of pipes and hoses for conveying oxygen or flammable gases into confined spaces must be controlled to minimize the risk.

At the end of every working period:

- Supply valves for pipes and hoses must be securely closed.
- Pipes and hoses must be withdrawn from the confined space to a well-ventilated area.
- Where pipes and hoses cannot be removed, they must be disconnected from the supply at a point outside the confined space.

### 2.5.13 Size of Entrance

The access/egress point must be big enough to allow workers wearing all the necessary equipment to climb in and out easily and provide ready access and egress in an emergency.

### 2.5.14 Fire Prevention

Flammable and combustible materials must not be stored in confined spaces that have not been specifically created or allocated for that purpose. If this type of material is used during work, it must be kept to a minimum and not be allowed to accumulate. Control of ignition sources and ventilation requirements must also be considered. Smoking is prohibited in all confined spaces; it may be necessary to extend this exclusion area to a distance beyond the confined space.

### 2.5.15 Lighting

Adequate and suitable lighting, including emergency lighting should be provided. The lighting must be specially protected where flammable/explosive atmospheres are likely to occur. Lighting may need to be protected from impacts and be suitable for use in wet environments. Where possible, residual current devices should be utilized to protect against electric shock.

### 2.5.16 Permit to Enter a Confined Space

Permission to enter a confined space can only be given by a person who has received appropriate training and is authorized to sign a confined space entry certificate. An example of a Permit to work and entry certificate can be found in Appendix 1. A Permit to work and entry certificate is required for ALL Confined Space work at GYSBI premises. It must be signed in the authorization and acceptance section prior to work starting by the Base Manager. A hand-back signature must also be completed on the permit when work is complete or the expiry time exceeded. It is the responsibility of the supervisor to ensure that a permit to work and entry certificate have been completed for every confined space entry.

### 2.5.17 Suitability of Persons

Those persons required to enter confined spaces must be mentally suitable (e.g. not claustrophobic), physically fit, have received general training in the hazards presented by confined spaces and the procedures to be followed. In addition, prior to entry to any confined space, persons entering must be instructed by the area supervisor in the specific hazards and precautions applying, and in the confined space rescue plan. All Confined Spaces training must be recorded. When limiting the working time, consideration should be given to temperature, humidity, restricted movement, the need to wear PPE/RPE etc. It is the responsibility of the relevant employer to ensure only suitable persons are selected for confined space work.

## 2.6 Emergency Arrangements

No confined space work must be undertaken unless there are emergency plans in place for the rescue of persons in an emergency. Account needs to be taken not only of accidents arising out of specified risks, but also any other accident in which a person may need to be recovered.

To be suitable and sufficient the arrangements for rescue should include consideration of:

- Rescue and resuscitation equipment;
- Raising the alarm and rescue;
- Safeguarding the rescuer;
- Fire safety;
- Control of plant;
- First aid;
- Public emergency services;
- Training.

It is the responsibility of the employer to ensure an assessment of the emergency requirements has been made. It is the supervisor's responsibility to ensure any measures deemed necessary are in place **and tested** prior to any confined space entry.

## 3 DOCUMENTS

[Confined Space Entry Certificate](#)

[Electrical Isolation Certificate](#)

[Mechanical Isolation Certificate](#)

## REVISION SUMMARY

Revision	Date	Approved by	Summary of change
1	13 Aug 2020	Michael James Sean Hill	Initial release of document
2	17 Aug 2021	Sean Hill	Updated document references in section 3 with SPO links
3	07 Jul 2022	Kurt Busuttil	Updated Document Number

## QHSSE Policy

Guyana Shore Base Inc. (GYSBI) provides an array of Shore Base Services, Logistics Services, and Industrial Park Services in Guyana. The Company has developed its expertise since its establishment, and it aims to deliver a high standard of services to its customers.

GYSBI is committed to:

- Meeting specified customer requirements and ensuring customer satisfaction.
- Adhering to all applicable standards and statutory and regulatory requirements.
- Setting clear HSE objectives for HSE performance with measurable performance indicators.
- Promoting employee well-being and providing a safe, healthy and secure working environment, for the prevention of work-related injury and ill health, by reducing risk and eliminating identified hazards.
- Ensuring effective participation and consultation with employees on issues relating to quality, occupational health and safety, security and the environment.
- Minimizing our impact on the environment through the reduction of pollution and emissions and the reduction and recycling of waste where applicable.
- Empowering personnel to intervene to prevent unsafe acts and conditions.
- Continual improvement in the functioning and performance of our QHSSE management system.

It is the duty of all GYSBI employees to integrate the QHSSE management system in the performance of their duties and to ensure that the above Policy is supported and maintained.

Management at every level lead in the communication and implementation of QHSSE Management System policies and procedures while ensuring compliance.

This Policy shall be regularly reviewed to ensure ongoing suitability.



Robert Albiez  
General Manager