VOLUME 2 –EMPLOYER'S REQUIREMENTS

SECTION V - SCOPE OF THE WORKS

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1. AIRFIELD PAVEMENT DESIGN

1.1. TRAFFIC FORECASTS

The traffic mix of aircraft is likely to contain all proposed aircrafts. The actual percentages are difficult to assess at this time. However, in all likelihood it will be probably take period of at least 10 years to reach the predictions. Based on this assumption it is likely that over the first five years there will be one flight per week and one flight per week over the next 10 years (52x1x10) + (52x6x10) = 3,640 total movements which is low frequency trafficking.

The design standard for pavements shall be based on a minimum 20 year-design life. As recommended in the FAA design standards, departing aircrafts are assumed to be at Minimum Take-Off Weight (MTOW). Total number of aircraft movements to be considered for the pavement design is based on low traffic figures, which allows for 100,000 movements in the Design Life, the expected Traffic Figures using the BOEING 777-300ER as Design Aircraft show less than 500 equivalent movements a year.

The current airport operational data and weekly flight schedule varies. Bidders are requested to liaise with the airport operator, Island Aviation.

2. AERODROME REFERENCE CODE

2.1. AERODROME NUMBER (4) LETTER (E)

The existing airport is non instrument runway (VFR). Runway procedures for visual approach only.

The current airport is not equipped with navigation aids such as VOR, ILS, etc.

The proposed airfield lighting shall meet the minimum criteria of CAT-I and approval certification and operational readiness from MCAA/RA including GPS Approach and PAPI."

As the runway will not be the full length for a maximum weight B777, the proposed new runway will be operated with a B777 with restricted loads for take-off.

No centerline lights are required.

The AIP of Maafaru is included in section IX – Supplementary Information

The link to Aeronautical Information Publication of Maafaru Airport is https://macl.aero/corporate/services/operational/ans/aip

3. BASIC AERODROME PHYSICAL REQUIREMENTS

The Scope of the Airport is based on the requirements outlined below:

Runway Final Length:	2,850 m
Runway Width:	45 m
Strip Length:	60m beyond both ends of the runway
Strip Width:	280 m (140m either side of the centerline)
Taxiway Length:	as agreed
Taxiway Width:	23 m
Runway End Safety Area (RESA) Length:	240 m
Runway End Safety Area (RESA) Width:	90 m
Transverse gradient:	1.5% from Runway & Taxiway.
Transitional surface:	1:5 slope
Approach slope:	2%
Divergence angle:	15%
Take off Climb Slope:	2%
Pavement Classification (PCN)	Minimum accepted PCN – 65 (proposed critical aircraft Boeing 777-300 ER (Medium Strength) Contractor to verify through their design that this PCN is acceptable for B777-300ER aircraft.
Designation No:	06/24
Subgrade Strength Category	CBR ≥ 15%

4. PAVEMENT STRUCTURE

Contractor shall confirm all the pavement depths and strengths as per the project requirements and approved Design.

Runway and taxiways to be modified to meet the project requirements.

- Minimum Subgrade CBR strength to be ≥ 15.
    - Subgrade, Sub-base and asphalt depths to be determined by contractor to meet the design load criteria.
    - Sub-base compaction shall not be less than 95% of Proctor. To be verified by in-situ bearing tests (*I.e. bearing plate with hydraulic jack*).
    - Asphalt compaction shall not be less than 98% of Marshall. To be verified by core samples.
    - In-situ tests for Subgrade, Sub-base and Asphalt to be conducted and submitted for review and approval.
    - Asphalt paving to utilize a laser to ensure the paving elevation is maintained and is within tolerances.
- Both of the taxiways need to be widened. Existing taxiway lights (curve and straight section) needs to be relocated and installed.

- The existing runway and taxiways are asphalt 100mm thick. The extended portion as well as the existing runway and taxiway will need to be paved with asphalt (thickness to be designed) to upgrade to the new runway strength.
- The drawings (PDF and AutoCAD) of the runway including cross sections are included in the bidding documents. There is no existing pavement assessment report as it is only 3 years old.
- The concrete apron is to remain and any modifications are not in this scope.
- The crown of the runway is expected to increase with an increased runway thickness.
- The shoulder edge next to the runway will need to be raised and compacted to match the new runway edge (such that no ponding occurs on the runway) and blend into the existing airfield. The shoulder will also need to be seeded in grass. It is our intention that the existing edge lights do not need to be raised.
- The drainage for the runway and taxiways utilize simple surface drainage with crowns. A drain might need to be employed between the apron and taxiway interface if the surface drainage can't be obtained. currently there is no underground drainage system except in front of the hangar between the hangar and apron.
- During the course of construction, temporary pavement markings and lights are often required to allow for aircraft operations during or between work periods. Contractor will need to coordinate with the consultant project manager & airport operations to determine minimum temporary markings required. Markings must be in compliance with the standards of AC 150/5340-1, Standards for Airport Markings, except as noted herein. Runway and taxiway closed to aircraft operations are marked with a yellow X.

5. ASSUMED ELEVATION

Current Runway Midpoint Crown Elevation is 1.700m from M.S.L. (Final Crown Elevation will be finalized with new design).

6. DREDGING, RECLAMATION AND REVETMENT

The design and construction methodology shall be durable and friendly to the local environment. The proposed design and construction should be as practiced in Maldives or any alternative method proposed by the Contractor and approved by the Consultant and Ministry of Planning and Infrastructure.

a) Dredging and Reclamation
b) Revetment
   a. The shore protection structures shall be designed for a minimum maintenance free period of 10 years. Design life of all structures shall not be less than 30 years.
   b. Geobags shall be made of durable synthetic materials such that they

conform to the design life stipulated above.

c. GeoBags are specified, however, Geotubes may be used, provided that the revetment meets the requirement to hold sustain the embankment and prevent erosion. Also, the cement criteria for the geobags must be maintained for the geotubes.
d. The EPA permit will be provided.
e. The required finished height of revetment structures will need to be determined by the contractor and their engineer team. The revetment height will need to be determined by the contractor and approved by the consultant upon review of the design. The intent is to prevent any erosion and over splash that may compromise the revetment in the future.

7. RUNWAY END SAFETY AREA (RESA)

RESA at 06 and 24 including graded areas of both sides. RESA shall be levelled and graded to the specification and the drawing. Safety zone on both sides shall be compacted with suitable soil organized from the land or dredged soil to the specification.

8. UPDATED AIRFIELD LIGHTING

Airfield Lighting shall comply with the ICAO International standards and recommended practices for Aerodromes given in Annex 14, Volume 1 for Aerodrome Design and Operations. Reference should also be made to Aerodrome Design Manual Part 4 – visual aids and Part 5 – Electrical Systems and Maldivian Civil Aviation Authority (MCAA).

The following types of airfield lighting fixtures complete with (isolating transformers (ADB), primary and secondary connectors (ADB), primary cable & secondary cable (Eupen) Brass tape, 6sqmm, 6.6A, 5Kva and bare copper cable 16sqmm and earth rods with clamps), lamps, prism, lens, filters, mounting elbows, brackets, masts or any other accessories including concrete bases / foundation etc. as required for the complete installation.

a) Procurement and Installation of High Intensity Bidirectional elevated Runway Edge lights for one halogen lamp – 150W, 6.6A (appx. 20 lights, contractor to verify).
b) Procurement and installation of High Intensity Unidirectional Inset & Elevated Simple Approach light for one halogen lamp – 150W, 6.6A (24-06 End) (appx. 48 lights, contractor to verify).
   Carry approach profile study and height calculations before the installation of approach lights. Study for the GPS approach and approval from relevant authorities MCAA/RA.
c) Procurement and installation of High Intensity Bi-directional Combined Runway Threshold & End Inset lights for three halogen lamps 105W, 6.6A

12 Inch diameter along with shallow base (appx. 36 lights for 45m wide R/W. Equally spaced 3m Max). (Contractor to verify).

d) Procurement and installation of new Primary Wind cone (with wind sock) at the 06 End along with power connection, including No's 02 spare wind socks. Power connection from CCR Room and controlling from HMI Control panel in the ATC. (Contractor to verify location).

e) Procurement and installation of High Intensity Unidirectional threshold Elevated Wing bar light for one halogen lamp – 150W, 6.6A (appx. 20 lights, contractor to verify).

f) Procurement, installation and calibration of Precision approach path indicator (PAPI) light (four units system) for three halogen lamps 200W, 6.6A with adjustable frangible legs for both sides of the runway (24 – 06). Connectivity with the existing APAPI circuit and 20KVA CCR.

Existing APAPI has single 20KVA CCR with circuit selector switch installed in CCR Room. (Contractor to verify the size of the CCR and any other additional requirements as per ICAO).

g) Dismantling of the already installed APAPI System (2 sets) each side of the runway.

h) Procurement of PAPI calibration tool box.

i) Relocation, readjustment and addition of Taxiway edge lights as ICAO requirements.

j) Procurement and installation of High Intensity Bi-directional Inset Runway Edge light for two lamps 105W, 6.6A, 12 Inch for Left Side Amber.

k) Procurement and installation of Constant Current Regulators complete with power, control and transformer section, lamp circuit fault detection, earth fault detection etc. of 7.5KVA rating or as per the circuit load. (appx. 04 Nos, contractor to verify).

l) Modification and integration of the newly installed runway lights into the existing ALCMS panel.

The modification of the ALCMS shall include but not limited to allow the operations of the individual lighting system for runway edge, taxiway edge, PAPI (06-24), approach lights (06-24), signage and wind cone (24-06) and the Auxiliaries on the HMI in the control tower.

Modification (with the provision of warranty by OEM) for the ALCMS system in the tower shall accommodate CAT I lighting system including all associated works (communication & control tower protocol etc.) to ensure complete functionality and control of the upgraded AFL system.

Upgraded AFL system must be designed so as to enable its operations for non-Cat or CAT I conditions as required by the operators.

m) Procurement of Constant Current Regulator 20KVA for Individual Taxiway Lighting System and LED signage. (Contractor to verify the size of CCR).

n) Installation of mandatory and information LED signage, integration of its circuits with the taxiway circuits and connectivity with 20KVA CCR in the CCR Room. (appx. 10 signs, contractor to verify)

o) Procurement and Installation of the new AGL power Panel for the newly installed CCR with the provision to accommodate 2 extra regulators in future.

New AGL power panel load and internal cable rating has to be provided as per manufactures recommendations and site requirements. New AGL panel has to be powered from existing 250A MCCB main breaker AGL Panel. (Contractor to confirm the rating is sufficient for additional CCRs).

p) Modification and extension of the CCR Room inside the Fire Station and installation of an additional Air Conditioning (24,000BTU) unit.

q) Contractor shall include spares for all the above.

r) Contractor to provide initial report for the integration of the new system into the existing system. Survey & drawings for the overall AGL system and calculation for the PAPI system and approach lighting system to ensure ICAO & MCAA requirements are met.

Contractor is required to undertake detailed survey(s) of site (at his own cost) to understand the works already carried out, in order to identify required scope of works pertaining to design and execution of the up-gradation works and prepare design and construction drawings accordingly.

s) For the current status of existing low voltage distribution system Please refer to the drawing provided "Maafaru Airport As Built SLD"

   a. From LV Cabinet Power house, 2 runs of 95 sqmm cable are connected to the CCR Room Power cabinet 250 Amp MCB.
   b. Standby 80KVA DG SET, Engine brand Cummins 6BT5.9-G2, Stamford UCI224G, Smartgen HGM6120. Country of origin China.

t) For material brands required for the upgrade of existing ALCMS system Please refer to "CCR to ATC System overview" in the drawings provided which include the following:

   a. Brand: ADB SAFEGATE or any equivalent and reputable western brand. Modification of the existing ALCMS system and the integration of the newly installed AGL lights, constant current regulator etc. is the responsibility of the contractor.
   b. Modification (with the provision of warranty by OEM) for the ALCMS system shall accommodate CAT-I lighting system including all associated works to ensure complete functionality and control of the upgraded AFL system.
   c. Upgraded AFL system must be designed so as to enable its operations for non- Cat or CAT I conditions as required by the operators.

u) The existing airport facilities do not include the ILS, VOR, DME and other equipment?

v) There are no existing approach lights on the runway. There are only end lights at each end. Contractor to install simple approach lights at both 24-06 approaches.

w) There are 6 no. runway end lights at each end of the runway.

x) There are no existing centreline lights and Center line lights are not required for extension.

y) The navigation system is not in this scope of works.

z) The product model of equipment and software version for the existing control system of navigation lights is as follows:

a. Reliance Compact (ADB SAFEGATE), Profibus <10 CCR.

b. CAT 6 Ethernet connection between CCR Room and the Tower Control Room.

c. There is one PLC's of family S7-300 in CCR Room.

d. Hardware in Control Tower

Panel-PC with Touchscreen:

- Type: s&t Flatman PRO V2
- CPU: Intel® Core i3
- RAM: 4GB
- SSD: 64GB
- Size: 15''
- Native Resolution: 1024 x 768
- Power Supply: 100 to 240 VAC, 60/50 Hz

e. The Software:

- Linux Ubuntu is used as the common operating system.
- Reliance Compact (ADB SAFEGATE), Profibus <10 CCR.
- CAT 6 Ethernet connection between CCR Room and the Tower Control Room.
- There is one PLC's of family S7-300 in CCR Room.

f. Siemens Simatic S7-300 PLC for standard and higher-end applications equipped with:

- Communication modules for Serial Bus controlled CCRs.
- I/O modules for the control and monitoring of the multiwire equipment
- Fully pre-installed and labeled interface relays for Multiwire controlled Auxiliaries, providing an easy connection for on-site installation.

aa) The existing lights at the 06 end, apron and taxiways may be reused, provided that there is no damage.

bb) The level of needed navigation and air navigation aids after the extension works is CAT-I.

cc) There are no existing approach and wingbar lights available. Approach lights on 24-06 ends are entirely new circuits.

dd) Existing threshold and runway end lights are connected to the runway edge circuit.

ee) It is the responsibility of the contractor to propose and design circuitry as per ICAO recommendations and requirments.

Note: It is possible for contractor to replace the designated brands with material which of equivalent standards and meet international civil aviation standards except for control system provided that the proposed brands shall be in compliance with ICAO, FAA and certified by Intertek. These proposed brands need to be compatible with the existing equipment and systems.

9. UPGRADE OF EMERGENCY GENERATOR

The existing emergency generator (80 kva) in the power house will need to be replaced with a new 150kva generator. The existing 80kva generator will need to be moved to a storage location on the airport site, to be determined during construction.

The new 150kva generator will need to be incorporated into the existing system and confirm to all MCAA and MEA requirements.

The works under this section consists of supplying, installations, testing and commissioning of all materials and services of the complete DG SET including synchronization with the existing DG SET's control panel.

The diesel generator set shall be standard design of the reputed manufacturer such as Cummins. The set shall be prime duty and suitable for indoor installations

The engine shall be directly coupled to the generator, and shall have a rated speed of 1500 rpm.

The set shall be capable of starting and accepting full load in accordance with ICAO recommendations for CATI operations. As per ICAO CAT I requirement the switch over time shall not exceed 15 sec. It is necessary to provide an uninterruptible or near continuous source of power when the primary power source fails to catch all critical equipment.

The Diesel engine shall be four strokes, compression ignition, suitable for prime duty. Starting shall be through electric starter motor operated on DC supply from lead acid batteries mounted on the skid. The batteries shall be furnished with the set.

The engine shall be equipped with an Alternator type automatic charging system to charge the batteries during running of the engine. Connection from the static charger installed in the LV Room shall also be provided to charge the batteries when the engine is not running.

Suitable attenuators shall be installed to reduce noise at the air inlet. Engine shall have a forced air draft, water cooled radiator supplied with a core guard. The radiator shall be set mounted and suitable for tropical 50 degree ambient conditions with cooling system having an engine driven centrifugal pump for cooling water

circulation. Cooling shall be thermostatically controlled. An engine shut down timer shall be provided to keep the engine running with no load after any operation. This will allow the engine to sufficiently cool so that it may start again instantly, without the temperature rising above the manufactures "safe" limits, if required.

The circuit breaker shall be triple pole with adjustable releases for thermal overload, instantaneous over current, under voltage and over voltage protections. The circuit breakers in Generator panels shall be interlocked so that any of the generators can be used as Duty Generator.

Standard test procedures shall be furnished. The initial load to be applied to the generator set shall be calculated in accordance with BS ISO 8528-5:2005 using the BMEP for the engine. The generator shall be load tested at 100% of rated material at 1.0 PF.

10. REQUIRED SIGN UPGRADES

These sign boards will lighted with LED lamps. All of these signs will need to be connected to the taxiway lighting circuit. The following airfield signs will need to be added or replaced:

a) Sign board (Taxi B) will be replaced in case taxi B will be relocated.
b) Sign board (24 A) to be added.
c) Sign board (A 24) to be added.
d) Sign Board (24 - 06 B) to be added.
e) Sign Board (B 24 - 06) to be added.
f) Sign Board (Apron) to be added.
g) Sign Board (Stop) to be added.
h) Sign Board (06→) to be added.
i) Sign Board (←Apron A) to be added.
j) Sign Board (↑Apron B A→) to be added.
k) Sign Board (←24 - 06) to be added.

11. REQUIRED AIRFIELD MARKING

a) Runway Centre Marking
b) Runway Edge Marking
c) Touchdown Zone Marking
d) Turning Pad Curve Marking
e) Taxiway Centre Line Marking
f) Taxiway Curve Marking
g) Taxiway Edge Marking
h) Runway Holding Position Marking
i) Any additional marking required as per 777 local requirements and best practices.
j) Any and all temporary markings as required to maintain a functioning runway including temporary end lighting.

12. REMOVAL OF TREES AND VEGETATION

a) All trees and vegetation to removed inside the airport development to

prevent any obstructions to the airport.

b) The only vegetation to remain is grass

c) All areas of the new construction area to be planted with grass.

   i. Grass type, application rates and locations to be submitted for approval prior to commencing seeding.

d) The tree removal within the project boundary has already been accepted in the EIA report. Any trees within the airport will need to be removed.

13. INSTALLATION OF AIRSIDE BOUNDARY FENCE

a) Airside fencing to be installed on the 24 end as per the drawings

b) Fencing should match the existing design and specification

   i. Fence design, installation method, materials and location all shall be submitted for approval prior to installation.

c) Fence shall be completed as per Maldives Civil Aviation Regulations (MCAR's) and Ministry of Defense and Security (AVSEC)

SECTION VI - GENERAL SPECIFICATIONS

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Section 01100 – Summary

PART 1 - GENERAL

1.1. PREAMBLE

A. This division (Division 01) of the Specification contains general requirements relating to the Works as a whole and where the requirements contained herein conflict with any other requirements contained elsewhere in other documents forming part of the Contract then the more stringent shall prevail.

The Contractor shall identify any conflict to the Project Manager. The Project Manager's determination in this regard is final.

B. In examining the requirements of any section of the Specification the Contractor shall examine all other sections of the Specification and the other relevant documents and Drawings, which affect the work of that section.

C. The Works in this package as described in the "Scope of Works" included as part of the Contract or Subcontract documentation are inclusive of, but not limited to the sections in Division 01. The requirements detailed in "Scope of Works" included in the Contract or Subcontract documentation are supplementary and complementary to the requirements elaborated in this Division 01

D. The term "Contractor" or "contractor" as used in this Division 01 (only) shall apply to the Contractor and also to all Subcontractor packages procured by the Employer and nominated or assigned as subcontractors (domestic or otherwise) to the Contractor. While the primary responsibility to implement the requirements of this specification Division 01 rests with the Contractor, other contractors and subcontractors are not absolved of their responsibilities and obligations with respect to the requirements detailed in this Division 01.

E. Certain sections of this Division 01 explicitly identify requirements that are part of scope of one or more specific contractor(s) and/or subcontractor(s) and in such cases, all other contractors and subcontractors shall coordinate with the said contractor(s) and/or subcontractor(s) in performing their obligations.

F. The "Supervision Consultant" means any party appointed from time to time by the Employer to act as Supervision Consultant for the purposes of Contract including the Inspector.

1.2. SECTION INCLUDES

A. The sub-sections of Section 01100 contain descriptions and procedures related to the following:
   1. Section 01110 - Summary of Work
   2. Section 01120 - Multiple Contract Summary
   3. Section 01140 - Work Restrictions
   4. Section 01180 - Project Utility Sources

END OF SECTION 01100

Section 01110 – Summary of Work

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Summary of Work related to the Contract.

1.2. PROJECT

A. The Project is the design, construction and completion of the Development and Expansion of the Maafaru Airport-Phase II on Maafaru Island in the Noonu Atoll in the Maldives.

B. The Expansion of the Maafaru Airport is situated on the Maafaru airport. This project will be comprised the following principal components:

1. Clearing of trees and shrubbery;
2. Installation and completion of the boundary fence;
3. Dredging and reclamation to widen the runway strip and runway extension;
4. Installation of revetment along both sides of the runway strip;
5. Installation of new runway lighting;
6. Installation of additional CCR and the retrofitting of the existing CCR room;
7. Asphalt paving of the new runway, overlay of the existing runway and taxiways;
8. Painting new runway and taxiway markings;

1.3. EXTENT OF WORKS

A. The extent of Works included in this Contract is described within the documentation comprising the "Tender Documents" (as defined in the Instructions to Tenderers).

B. A summary of the extent of Works included in this Contract is provided in the "Scope of Works" enclosed as part of the Contract (or Subcontract) documentation.

1.4. CONTRACT REQUIREMENTS

A. The particular division or section of Specification shall be read in conjunction with the Drawings and other divisions and sections of the Specification. Specification given in any one division shall apply to other divisions unless specifically stated otherwise.

B. Notwithstanding anything contained herein, the Contractor shall be responsible for complying in all respects with bylaws and regulations imposed by authorities having jurisdiction, as may be in force at the time of execution of the Works.

C. The Contractor shall provide and do everything necessary for the proper execution of the Works according to the intent and meaning of the Tender Documents, whether the same may or may not be particularly shown on the documentation comprising the Tender Documents, provided the same is reasonably inferable there from.

D. The Works shall be completed strictly in accordance with the Tender Documents and any further drawings or instructions issued or approved by the Project Manager during the execution of the Works

E. The work to be performed under this Contract includes, but is not necessarily limited to, the furnishing of all supervision, labor, materials, temporary works, temporary utilities, false-work, plant, machinery, cranes, equipment, testing and commissioning, parts, tools, taxes, duties, insurance, commissions, supplies, transportation, utilities, construction facilities, scaffolding, incidentals and logistical support necessary for the performance and maintenance of the Works, and accomplishing the same in a workmanlike manner.

F. All work shall be executed by skilled tradesman who shall be thoroughly acquainted with all aspects of their trade including any special local customs and modes of operation.

G. The Contractor shall be deemed to have based his Tender on the hydrological, physical and climatic conditions that prevail at the Site and have inspected the Site and its surroundings and satisfied himself as to all prevailing conditions before submitting his Tender. Visits to the Site to review the existing conditions shall be strictly by agreement with the Project Manager.

H. The Employer, the Project Manager and the Supervision Consultant and any person authorized by them shall at all times have access to the Works and to the Site and to all workshops and places where work and/or material or equipment is being obtained and/or undertaken for the Works.

I. The Contract documents include Drawings and Specifications, which indicate the scope of the Works in terms of the dimensions of the installation; the scope, quality, character, and capacities of architectural, structural, mechanical, electrical, utility and other systems of construction for the Works. The Drawings and Specification do not necessarily indicate or describe in detail, all of the work required for the performance and completion of the Works. The Contractor shall execute all works that can be reasonably inferred, in the opinion of the Project Manager or the Supervision Consultant, whether or not specifically shown or described. The Contractor shall provide all items required for the proper execution and completion of the Works, in so far as such items are consistent with the intent, quality and character indicated on the Drawings and Specification, all to the approval of the Supervision Consultant and the Project Manager. The Contractor shall provide all supplementary parts necessary to complete the Works whether or not each component or detail is specifically shown on the Drawings or specified in the Specification. Any modifications that appear on the construction documents shall not be considered as a basis for additional compensation.

J. All government fees, duties, visa charges, permits, deposits, etc., as applicable and in compliance with the laws, regulations and codes of the Maldives, shall be included in the scope of the Contract.

K. The Contractor shall be aware that the Project is proceeding on a fast track basis and as such, the structural, architectural, mechanical, electrical and other drawings included in the Tender are progress drawings and are not completely coordinated. Modifications that appear on completed drawings will not be considered as a basis for additional compensation. All conflicts between drawings and technical specifications shall be brought to the attention of the Project Manager, whose resolution shall be final.

L. The Contractor shall include any and all sundry expenses such as transportation, freight charges, taxes, interim storage, escalation, any special permits required to carry out the work, related quality control, compliance to safety requirements as called for in the Specification and in compliance with applicable laws and regulations of the Maldives.

M. The Contractor is responsible for coordination with the various package contractors and other subcontractors, not limited to those identified in Section 01120 “Multiple Contract Summary” of this Division 01, during all phases of engineering, construction, testing, commissioning, completion and handover.

1.5. NOT USED

1.6. WORK UNDER OTHER CONTRACTS

A. The Employer shall be awarding other contracts in connection with this Project and the Contractor should refer to the Conditions of Contract and all Sections of this Division 01 and in particular to Section 01120 and comply with the requirements therein.

1.7. INSPECTION TESTING ALLOWANCES

A. The Contractor shall allow in his Contract Sum for all costs and time for carrying out all tests on the Works required by the Specification and/or those that are required by the Supervision Consultant or for the provision of assistance to any Employer's Independent Testing Agencies

1.8. LICENSES AND APPROVALS

A. Not Used

B. The Contractor shall obtain all required permits from the necessary authorities having jurisdiction including but not limited to Civil Defense Approvals, Municipality Approvals, Telecommunication approvals/ connections, and approvals/connections for Water, Electricity, Gas, etc. The Building Permits will be obtained by the Employer.

C. The Contractor shall obtain all local authority approvals as applicable required for construction from various government agencies. The Contractor shall coordinate with the Supervision Consultant for this requirement.

D. The Contractor shall include for all governmental inspections as required and applicable fees during the various phases of work, as per the rules, regulations of various authorities concerned. Include for all necessary inspections required for the operation prior to final acceptance / hand over.

E. Not Used

F. During the construction period, the Contractor shall submit to the Project Manager copies of all Certificates of Approval, Permits, or Licenses obtained from Municipality Departments and other Authorities having Jurisdiction, which are required for the performance of the work.

G. The Contractor shall note that fees for obtaining approvals shall be borne by him.

H. The requirements under this Clause includes also for the provision of all temporary facilities, utilities and the like, as appropriate; however all costs resulting thereof shall be borne by the Contractor.

END OF SECTION 01110

Section 01120 – Multiple Contract Summary

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Multiple contract packages, contracts' interface and phasing of construction.

1.2. WORK SEQUENCE

A. The overall phasing and sequence of construction shall be agreed between the Contractor and the Project Manager. The Works shall be performed in accordance with the Milestone Dates, Sectional Completion Dates, and Time for Completion and Schedule requirements in the Contract Documents. The Contractor shall fully acquaint himself with the contents of this schedule and ensure compliance therewith. The Contractor shall note that the Project is based on a fast track approach to design and construction with multiple packages. His schedule of works shall be flexible enough to accommodate the special needs arising there from. The Contractor shall allow for certain "out of sequence" work and "come-back" work that will be necessitated on the Project. The Contractor shall allow for all costs arising out of such phasing, sequencing, out-of-sequence and come-back work.

B. The Contractor shall refer to the requirements for schedule, phasing and completion of the Works, as detailed in the Scope of Works. Other contractors will be present on the Site and the Contractor shall allow for all costs resulting from fazing the Works around these parties.

C. The phasing may be changed at the discretion of the Project Manager. The Contractor shall allow for any such changes that may be issued from time to time, at no additional cost to the Employer.

1.3. CONTRACT INTERFACE

A. The Contractor shall Coordinate his work with that of any other contractors, authorities or organizations performing works under separate contracts to ensure no delay, disruption or interference is caused to such other contracts.

1.4. SEPARATE CONTRACT AND SUBCONTRACT PACKAGES

A. Not Used

END OF SECTION 01120

Section 01140 – Work Restrictions

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Explanation of access to Site, use of Site and premises and restrictions applicable.

1.2. LOCATION OF SITE

A. The Site of the Works is located on Maafaru Island in the Noonu Atoll of Maldives.

B. The Layout of the Site is detailed on the drawings.

1.3. CONTRACTOR USE OF PREMISES

A. The Contractor shall not use the Site for any purpose other than carrying out the Works.

B. Access to the Site shall be agreed with the Project Manager prior to commencement. The Contractor shall take all necessary steps to ensure the safety of all authorized persons. In addition, the Contractor shall be responsible for all damage resulting from the use of the agreed access.

C. All construction operations and Site establishment facilities shall be confined to within the Site boundaries as shown on the Drawings unless otherwise agreed with the Project Manager. The Contractor shall be responsible for safeguarding all structures and the likes in the vicinity of his work and the Site.

D. Should any work performed under the Contract expose previously unknown or unforeseen conditions whose presence could cause additional construction cost or endanger the Project in any way, such work shall be stopped and the matter reported immediately to the Project Manager and Supervision Consultant, for instruction. However, the Contractor shall immediately use measures or methods necessary to ensure safety and prevent any threatened or further damage, injury or loss.

E. The Contractor shall have possession of the Site at the location of the Works only and be subject to the rights and obligations of other contractors and be responsible for arranging his own working space, the storage of materials, locating all temporary accommodations, utilities and other logistical issues at locations to be agreed with the Project Manager. No claim whatsoever will be entertained for any reason regarding the location, allocation or relocation of any working space regardless of the distance.

F. The Contractor shall perform his Works in a manner not to cause danger, inconvenience, or difficulties to road users, private and public vehicles, in and around the Site.

G. The Contractor shall ensure that his activities are conducted not to interfere with vehicular traffic.

Lights, markers, notices, traffic management systems and other such provisions shall be exhibited at all times and places as required by the Municipality, Works departments, Traffic Police and in accordance with relevant regulations.

H. The Contractor shall be responsible for consulting regularly through the Supervision Consultant and the Project Manager with the relevant authorities to confirm that his method of working is not such as to impede in any way vehicular road traffic and for modifying his method of working if any operations or activities are adversely affected by his activities. On the instruction of the Project Manager, the Contractor shall promptly

remove any vehicle or equipment and plant within his control that may be causing obstruction to the use of the existing facilities by others.

I. Safety, maintaining aircraft operations, and construction costs are all interrelated. Since safety must not be compromised, the contractor must strike a balance between maintaining aircraft operations and construction activities. The contractor will require to coordinate with airport operator and ATC. As the project progresses, the necessary construction locations, activities and associated works will be identified and their impact to airport operations must be assessed. Adjustments are made to the proposed constructions activities, often by phasing the project, and/or to airport operations to maintain operational safety.

J. Contractor with the approval from airport operators and project management team must determine the geographic areas on the airport affected by the construction project. Some, such as a runway extension, will be defined by the project. Others may be variable, such as the location of haul routes and material stockpiles.

K. To the extent practical, current airport operations should be maintained during the construction. In consultation with airport operators and project management team, Aircraft Rescue and Fire Fighting (ARFF) personnel, and Air Traffic Organization (ATO) personnel, the airport operator can identify and prioritize the airport's most important operations. The construction activities should be planned, through project phasing if necessary, to safely accommodate these operations.

L. Everyone has a role in operational safety on airports during construction: the airport operator, the airport's consultants, the construction contractor and subcontractors, airport users, airport tenants, ARFF personnel, Air Traffic personnel, including Technical Operations personnel, and others, such as airport security personnel (e.g. national guard or a joint use facility). Close communication and coordination between all affected parties is the key to maintaining safe operations. Such communication and coordination should start at the project scoping meeting and continue through the completion of the project. The airport operators. consultant and contractor should conduct onsite safety inspections throughout the project and immediately remedy any deficiencies, whether caused by negligence, oversight, or project scope change.

M. Contractor to convene a preconstruction meeting with the consultant, airport operator and ATC, to review and discuss project safety before beginning construction activity. Airport operators can notify contractors, ARFF personnel, and ATO personnel of construction and conditions that may adversely affect the operational safety of the airport via Notices to Airmen (NOTAM) and other methods, as appropriate. Participate in meetings to review construction limits, safety mitigations, NOTAMs, and understand all special airport operational needs during each phase of the project.

N. Contractor to ensure that construction personnel know applicable airport procedures and changes to those procedures that may affect their work. Ensure that all temporary construction signs are located per the scheduled list for each phase of the project. Ensure vehicle and pedestrian operations addressed in the safety management plan are coordinated with airport security, the airport traffic control tower (ATCT), and airport operators and take immediate action to resolve safety deficiencies.

O. Contractor to ensure that construction personnel are familiar with safety procedures and regulations on the airport. Provide a point of contact who will coordinate an immediate response to correct any construction-related activity that may adversely affect the operational safety of the airport. Restrict movement of construction vehicles and

personnel to permitted construction areas by flagging, barricading, erecting temporary fencing, or providing escorts, as appropriate, and as instructed by the project management team and airport operators.

P. Contractor to ensure that no contractor employees, employees of subcontractors or suppliers, or other persons enter any part of the air operations area (AOA) from the construction site unless authorized.

Q. Stockpiled materials and equipment storage are not permitted within the RSA and OFZ, and if possible should not be permitted within the Object Free Area (OFA) of an operational runway. Contractor must ensure that stockpiled materials and equipment adjacent to these areas are prominently marked and lighted during hours of restricted visibility or darkness. This includes determining and verifying that materials are stabilized and stored at an approved location so as not to be a hazard to aircraft operations and to prevent foreign object damage from blowing or tracked material.

R. Contractor employees must park and service all construction vehicles in an area designated by the airport operator and project management consultant outside the OFZ (obstacle free zone) and never in the safety area of an active runway or taxiway. Unless a complex setup procedure makes movement of specialized equipment infeasible, inactive equipment must not be parked on a closed taxiway or runway. If it is necessary to leave specialized equipment on a closed taxiway or runway at night, the equipment must be well lighted. Employees should also park construction vehicles outside the OFA when not in use by construction personnel (for example, overnight, on weekends, or during other periods when construction is not active). Parking areas must not obstruct the clear line of sight by the ATCT to any taxiways or runways under air traffic control nor obstruct any runway visual aids, signs, or navigation aids.

S. Waste and loose materials, commonly referred to as FOD, are capable of causing damage to aircraft landing gears, propellers, and jet engines. Construction contractors must not leave or place FOD on or near active aircraft movement areas. Materials capable of creating FOD must be continuously removed during the construction project. Fencing (other than security fencing) or covers may be necessary to contain material that can be carried by wind into areas where aircraft operate.

T. Contractors operating construction vehicles and equipment on the airport must be prepared to expeditiously contain and clean-up spills resulting from fuel or hydraulic fluid leaks.

U. Inspections should be conducted of all areas to be (re)opened to aircraft traffic to ensure the proper operation of lights and signs, for correct markings, and absence of FOD. The contractor should conduct an inspection of the work area with project management consultant and airport operations personnel. The contractor should ensure that all construction materials have been secured, all pavement surfaces have been swept clean, all transition ramps have been properly constructed, and that surfaces have been appropriately marked for aircraft to operate safely. Only if all items on the list meet with the airport operator's approval should the air traffic control tower be notified to open the area to aircraft operations. The contractor should be required to retain a suitable workforce and the necessary equipment at the work area for any last minute cleanup that may be requested by the airport operator prior to opening the area.

V. Contractor must provide procedures for locating and protecting existing underground utilities, airfield primary and secondary cables, wires, pipelines, and other underground facilities in excavation areas. This may involve coordinating with project management

consultant and airport operators. This includes marking, lighting, signs, and visual NAVAIDs. The contractor must ensure that areas where aircraft will be operating are clearly and visibly separated from construction areas, including closed runways. Throughout the duration of the construction project, verify that these areas remain clearly marked and visible at all times and that marking, lighting, signs, and visual NAVAIDs that are to continue to perform their functions during construction remain in place and operational. Visual NAVAIDs that are not serving their intended function during construction must be temporarily disabled, covered, or modified as necessary.

W. Airport markings, lighting, signs, and visual NAVAIDs must be clearly visible to pilots, not misleading, confusing, or deceptive. All must be secured in place to prevent movement by prop wash, jet blast, wing vortices, and other wind currents and constructed of materials that will minimize damage to an aircraft in the event of inadvertent contact. Items used to secure such markings must be of a color similar to the marking.

X. During the course of construction projects, temporary pavement markings are often required to allow for aircraft operations during or between work periods. During the design phase of the project, the contractor should coordinate with the consultant project manager, airport operations to determine minimum temporary markings. Markings must be in compliance with the standards of AC 150/5340-1, Standards for Airport Markings, except as noted herein. Runways and runway exit taxiways closed to aircraft operations are marked with a yellow X. The preferred visual aid to depict temporary runway closure is the lighted X signal placed on or near the runway designation numbers.

Y. When disconnecting runway and taxiway lighting fixtures, disconnect the associated isolation transformers. See AC 150/5340-26, Maintenance of Airport Visual Aid Facilities, for disconnect procedures and safety precautions. Alternately, cover the light fixture in such a way as to prevent light leakage. Avoid removing the lamp from energized fixtures because an excessive number of isolation transformers with open secondary's may damage the regulators and/or increase the current above its normal value. Secure, identify, and place any above ground temporary wiring in conduit to prevent electrocution and fire ignition sources.

Z. Open trenches or excavations are not permitted while the runway and taxiway is operational. Backfill trenches before the runway/taxiway is opened. If backfilling excavations before the runway must be opened is impracticable, cover the excavations appropriately. Covering for open trenches must be designed to allow the safe operation of the heaviest aircraft operating on the runway across the trench without damage to the aircraft.

1.4. INSPECTION AND INVESTIGATION OF SITE

A. Not used.

B. The Contractor shall inspect and examine the Site and its surroundings and shall satisfy himself before submitting his Tender as to the nature of the ground and sub-soil, the quantities and nature of the Works and materials, tools and equipment necessary for the completion of the Works.

C. Not Used

D. The Contractor's Contract Sum shall include for all costs involved in negotiating obstacles. In addition, no claim of any kind will be considered for additional expenses the Contractor may incur on account of any unforeseen obstacle of whatever nature, over and above those

which would have been incurred had the existence of the obstacle been known at the time of preparing the Tender Drawings.

E. The Contractor shall obtain all further information required as to the risks, contingencies and other circumstances, which may influence or affect the execution of the Works and include the costs thereof in his Tender.

1.5. EXISTING SERVICES

A. The Contractor is to obtain the extent, position, size and type of public utilities from the relevant local authorities and coordinate with the Airport Manager. The Contractor is responsible to obtain any other approvals required from the various authorities to perform the Works in a timely manner.

B. Any information provided by the Supervision Consultant as to the whereabouts of services is believed to be correct but no warranty is given as to the accuracy or completeness of that information.

C. The Contractor shall contact the government and/or semi-government and/or private utility authorities to determine the exact locations of the services which may affect or be affected by the Contractor's works.

D. Locations of services shown on the drawings are for guidance only and do not necessarily show the exact locations, depths and spacing, nor the smaller branches of services which are not normally indicated on such drawings. The Contractor shall uncover and verify locations of all services and be in accordance with any special requirements of the Municipality and/or the utility authorities concerned.

E. The Contractor shall not be allowed to work in any area where services are still covered and the Project Manager and/or the Supervision Consultant shall have the right to stop the work in any part of the Works where the Contractor fails to take the necessary measures to uncover these services and the Employer shall not entertain any claims from the Contractor resulting from such instruction.

F. The Contractor shall, before using mechanical plant in the vicinity of existing services, carry out full and adequate preliminary investigations by means of hand-dug trial holes and the like, to verify the location of existing services.

G. All drains, pipes and cables, whether above or below ground, that are encountered during the course of the work shall be left in position and be carefully supported and guarded from damage by the Contractor to the satisfaction of the Employer and the authorities so that such drains, pipes and cables may continue in use until completion of the Works or until no longer required.

H. The Contractor shall refer to and comply with the current regulations and specifications of utilities authorities before commencing any works adjacent to equipment, plant, cables, pipelines, etc. The above requirement will not relieve the Contractor of any responsibility for taking every precaution to avoid damage to equipment, plant, cables, pipelines, etc. and he will be held responsible for the cost or repair of all damage in accordance with the Conditions of Contract and Specification. Payment for complying with the above requirements will be deemed to have been included in the Accepted Contract Amount.

1.6. PROTECTION OF EXISTING UTILITIES AND SERVICES

A. During construction the Contractor shall provide all protection for existing utilities and services as may be required for his construction operations, including protection for the

construction of detours and diversions, as indicated on the Drawings, as directed by the Supervision Consultant and/or the Project Manager and as required by the Contract Documents.

B. Permanent protection of certain items shall be as included under other sections of the Specification. In addition to the requirements as specified elsewhere, the Contractor shall comply with the following explicit minimum requirements:

1. Use of all necessary precautionary and protective measures required to maintain existing utilities, services and appurtenances. In particular, the Contractor shall take adequate measures to prevent undermining of utilities and services, whether they are presently in service or not.
2. Protect existing or new utilities and services when considered necessary and directed by the Supervision Consultant and/or the Project Manager. The Contractor shall be responsible for bracing and supporting utilities and services to prevent settlement, displacement or damage to the same. The protection of utilities and services as specified herein will not be paid for separately but shall be deemed to be included in the Accepted Contract Amount.
3. The Contractor shall make his own arrangements for any diversion or removal of existing services which he may require for his own convenience or because of his proposed method of working and shall in all cases inform the Supervision Consultant and the Project Manager in advance of his proposals.
4. The Contractor shall recover, remove or abandon redundant utility and service lines as required by the Drawings and Specification and/or as directed by the Supervision Consultant and/or the Project Manager.
5. The Contractor shall not remove any utility or service line, conduit or structure until he has received written permission from the Supervision Consultant and/or the Project Manager.
6. The Contractor shall, at all times during the progress of the Works, afford facilities to properly accredited agents of any Authority for access to all or any of their equipment situated in or under the Site, as may be necessary for inspecting, reporting, maintaining, removing, renewing or altering such equipment in connection with the construction of the Works or for any other purpose whatsoever.

C. Prior to commencing construction and subsequent to the Contractor's determination of the location of the existing utility and service lines and the condition of the adjacent areas, the Contractor shall prepare and submit to the Supervision Consultant for his review shop drawings complete with the description of procedure and materials and related data of the Contractor's proposed method of protection for the said lines. Review, comments and approval by the Supervision Consultant shall in no way relieve the Contractor of the full responsibility for all protection of services and precautions required during the Works.

1.7. DAMAGE TO EXISTING UTILITIES AND PROPERTIES

A. The Contractor shall provide, prior to commencement of work, a detailed video and photographic survey of all existing structures within or immediately adjacent (ten (10) meters) to the limits of work. Further, the Contractor shall provide updates of this survey every ninety (90) days for the duration of the Contract, as directed by the Project Manager and/or the Supervision Consultant.

B. These video reports will be used to monitor any damage that may occur to the existing structures as a result of the execution of the Contract and for which the Contractor shall be liable for repairing at his own cost, to the approval of the Employer.

C. The Contractor shall exercise the greatest care during the execution of the Works to avoid damage to or interference with any existing services and shall be responsible for any such

damage caused by him or his agents directly or arising indirectly from anything done or omitted to be done. The Contractor shall carry out all temporary works necessary to adequately support and protect any existing services.

D. If, in the opinion of the Project Manager or the Supervision Consultant, damage may be caused by the operation of mechanical plant over or adjacent to existing services, the Contractor will be required to excavate by hand in their vicinity.

E. Any damage to mains or services shall be notified immediately to the Supervision Consultant and the Project Manager.

F. In the event of any damage to utilities or properties as a result of work carried out by the Contractor, his agents, employees, or by any sub-contractors or their agents, or employees, the Contractor shall be responsible for indemnifying the Employer, Project Manager and the Supervision Consultant against such damages.

G. The Employer and/or the Project Manager shall have the right, upon receiving any claims from the party concerned in respect of such damages, to deduct the actual costs charged to the Employer and/or the Project Manager from monies due or becoming due to the Contractor without it being necessary to serve a notice or warning or to take any legal action and the Contractor shall not be entitled to object, refrain from or suspend the work on account of such deduction.

H. In the event of any damage whatsoever to any existing or relocated utility and/or service lines, the Contractor shall immediately notify the Employer, the Project Manager and the Supervision Consultant and the relevant utility or service Ministries, authorities or companies. The Contractor shall co-operate with the Employer and the Project Manager and the owner of such utility or service and take whatever steps necessary to repair and restore such utility or service all in accordance with the requirements of the Drawings and Specification. The decision of the Employer and/or the Project Manager regarding responsibility for any damage or interruption of any utility or service shall be final.

I. The Employer may make such arrangements as in his opinion are necessary, whether by employment of the Contractor or otherwise, to effect rapid repair of any service which may be damaged in the execution of the Works. Such arrangement shall not affect the extent of the liability of the Contractor in respect of such damage.

1.8. RESTRICTION ON USE OF HIGHWAY AND ROADS

A. The Contractor shall not make use of roads for depositing or storing plant, materials, tools or implements other than such plant, materials, tools and implements as may from time to time be required for immediate use on the Works.

B. Plant, materials, tools implements and temporary works shall be placed in such a way as to cause minimum interference with the use of any right of way by the Employer or other parties and the Contractor shall maintain those parts of the roads not temporarily occupied by the Works in a clean, passable and safe state at all times.

1.9. BLASTING

A. The storage and use of explosives will not be permitted on the Project.

1.10. ADVERTISING

A. The Contractor shall not display or permit any signs, posters, or other advertising on or about the premises without the prior written approval of the Project Manager and the Employer.

1.11. WORKING HOURS

A. The normal working hours of the Project Manager and the Supervision Consultant are from 0800 to 1300 hours and from 1400 to 1700 hours on Sunday through Thursday; from 0800 to 1300 hours on Saturdays; with Friday being the weekly day off.

B. The Project Manager shall be informed of the starting and finishing times, lunch and tea breaks of the day and night shift proposed by the Contractor.

C. The Contractor is allowed, subject to the prior approval of the Project Manager to work in multiple shifts as necessary to meet the construction schedule.

D. Due consideration must be given by the Contractor with regard to work timing restrictions that are imposed in the area of the site. No additional time and/or monies will be due to the Contractor as a result of any restrictions that are put in place with regard to work timings. The Contractor is deemed to have allowed for this within their Contract Sum and Programme.

E. The Contractor shall note that staggered work hours may require to be adopted to ease congestion on the site, access road routes, security gates, and elsewhere on the Site or to avoid inconvenience to the surrounding residential areas and public as applicable.

1.12. ACCIDENT PREVENTION

A. Refer to section 01735.

1.13. ADJOINING PROPERTY

A. All reasonable precautions must be taken by the Contractor to prevent damage to adjoining property.

B. The Contractor shall obtain permission as necessary from owners of adjoining property if requiring to erect scaffolding or otherwise use adjoining property, and shall pay all charges and shall clear away and made good on completion or when directed.

C. The Contractor shall take all measures necessary to protect existing structures, fences, gates, walls, paving and other site features from damage during the currency of the Contract.

D. Fences, walls, etc. crossed by the Works and forming boundaries of plots outside the area occupied by the Works shall not be cut through or destroyed for more than the distance necessary to permit the erection of new fencing etc. and the Contractor shall make the ends of the cut fences reasonably secure. Where fences or walls are damaged or destroyed, the whole shall be restored and reinstated with like materials to the satisfaction of the owners or occupiers and the Project Manager.

1.14. STRUCTURAL FABRIC

A. The Contractor shall provide and maintain during the execution of the Works all shoring, strutting, Needling and other supports as may be necessary to preserve the stability of the structures, whether new or existing, on the Site or adjoining that may be endangered or affected by the Works.

1.15. ROADS AND FOOTPATHS

A. The Contractor shall ensure that no damage is caused by Site traffic to roads and footpaths outside the site boundaries and shall adequately maintain approaches to the Site. Each Contractor will be required to repair damage directly attributable to his work, such as,

excavation and trenches access the site access road including replacing and making good street paving around the site boundary. The Contractor shall comply with all procedures laid out by statutory authorities having jurisdiction and costs arising thereof shall be borne by the Contractor.

1.16. LABOR RECORD

A. The Contractor shall provide a daily record to the Project Manager in a format to be approved by the Project Manager, showing the number and description of craftsmen, laborers and other persons employed on or in connection with the Works, including those employed by sub-contractors. This record shall be incorporated in the "Daily Report" (hereinafter referred to as Daily Report) in section 01320.

B. The Contractor shall deploy only workmen legally permitted to work in the Maldives, who shall hold the necessary employment permits and documentation.

1.17. PLANT RECORD

A. The Contractor shall provide a daily record to the Project Manager in a format to be approved by the Project Manager, showing the type, model and capacity of all mechanical and power-operated plant employed on the works. The Contractor will not be permitted to remove any plant or material unless written approval is obtained from the Project Manager. This record shall be incorporated in the Daily Report in Section 01320.

1.18. VISITORS RECORD

A. The Contractor shall maintain a record of visitors to the Site.

1.19. OVERTIME WORKING

A. The Contractor is required to work overtime hours and nighttime as necessary to complete the works in line with the Programme giving due consideration to working restrictions that are in place.

B. Concealed work executed outside normal hours for which approval has not been given may be required to be opened up for inspection and reinstated at the Contractor's expense.

1.20. RADIO AND TELEPHONE COMMUNICATION

A. The Contractor shall be responsible for all necessary communications with all relevant authorities.

B. The Contractor shall obtain permits and licenses from the authorities having jurisdiction prior to operating two-way radios in the Site.

C. All radio equipment shall be operated on a private frequency that shall not interfere with any other local transmission or other equipment of any type. The Contractor shall ensure that his transmissions and equipment comply with the requirements of the appropriate Statutory Authorities.

D. The Contractor is responsible to provide and maintain a communication system, including telephone and radio until the completion of the works.

E. The Contractor will be required to provide the Supervision Consultant, Project Manager and Employer with the necessary communication systems as required.

1.21. CONVERSION OF METRIC AND IMPERIAL UNITS

A. Conversion of metric to imperial units and vice versa shall be carried out in accordance with the conversion factors in B.S. 350 Part 1 and 2 and B.S.I. Publication PD6030 and PD6031.

1.22. AVOIDANCE OF NUISANCE

A. The Contractor shall ensure at all times that spillage does not occur of concrete, oils or other deleterious material into any new or existing drainage, duct system or water course. Nevertheless, should any drainage or duct system or water course be fouled by such materials the Contractor shall clean the drainage or duct system or water course at his own expense, to the satisfaction of the Supervision Consultant.

B. The Contractor shall ensure that there is no spillage of oil or other contaminant on to the public roads.

1.23. EXISTING GROUND LEVELS

A. The Contractor shall, before commencing work, check, verify and satisfy himself as to the existing levels of the Site and existing structures and agree them with the Supervision Consultant.

1.24. TESTING AND INSPECTION

A. Wherever it is required under the Contract that the Contractor is required to undertake testing or inspection of any materials or installed works, reasonable notice of the date of testing shall be provided. The Contractor shall also provide for the Supervision Consultant being present, and if required, provide adequate facilities and assistance to validate the tests. The Contractor shall report all test results to the Supervision Consultant promptly.

B. The Contractor shall provide an area for the Supervision Consultant to establish an on-Site laboratory as required.

C. For all other laboratory requirements, the Contractor shall use the facilities of an established laboratory as agreed with the Supervision Consultant and/or Project Manager.

1.25. EMERGENCY ARRANGEMENTS

A. The Contractor shall maintain arrangements whereby he can quickly call out labor outside normal working hours to carry out work needed for an emergency associated with the Works. The Project Manager and/or the Supervision Consultant shall be provided at all times with a list of addresses and Telephone numbers of the Contractor's staff who are currently responsible for organizing emergency work.

B. The Contractor shall acquaint himself and his employees with any relevant local arrangements that are in existence for dealing with emergencies.

1.26. CLEARANCE OF SITE ON COMPLETION

A. The Contractor shall leave the whole of the Works clean and tidy on completion, all to the satisfaction of the Project Manager.

B. The Contractor's site compound shall be reinstated to the original or to a better condition as approved by the Project Manager.

END OF SECTION 01140

Section 01180 – Project Utility Sources

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Names of utility providing agencies or government departments.

1.2. PROJECT UTILITY SOURCES

A. The utilities on the project are self-contained and coordination shall be made with the airport operator.

END OF SECTION 01180

Section 01200 – Price and Payment Procedures

PART 1 - GENERAL

1.1. MEASUREMENT AND PAYMENT

A. The payments and related procedures shall be in accordance with the Conditions of Contract.

B. Refer to "Rates and Measurements" included in the Contract Documents.

C. Sections within this Division 01 and other documents forming part of Contract may also refer to certain specific clauses related to payments.

1.2. SECTION INCLUDES

A. The sub-sections of Section 01200 contain descriptions and procedures related to the following:

1. Section 01230 - Alternates

END OF SECTION 01200

Section 01230 – Alternatives

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Submission and acceptance procedures for alternates.

1.2. ALTERNATES

A. An "Alternate" (hereinafter referred to either as Alternate or Alternative) shall be any material, product, detail, equipment, system, installer, manufacturer, supplier, subcontractor, country of origin, codes, standards, warranties or any other detail, proposed by the Contractor that are not specified or indicated in the List of Manufacturers or Sub-contractors or Materials or similar in the Specification.

B. The Contractor shall not propose Alternates to materials, product, manufacturers, subcontractors, etc., that are not in the specified list of acceptable manufacturers, sub-contractors, materials, or similar in the Specifications unless provisions of this section are satisfied.

C. Proposals for Alternates shall be submitted for review by the Supervision Consultant and the Project Manager only if specifically authorized to do so by the Supervision Consultant and/or the Project Manager.

D. The proposed items that are not specifically listed in the Specifications under "Acceptable Manufacturers" or similar, but are submitted under "or Approved Equal" category will be considered as Alternates, unless the Supervision Consultant and/or Project Manager and/or the Employer accepts, based upon the recommendation by the Supervision Consultant, the proposed items as 'equals' to the list specified. Until that time, the proposed items shall be considered only as Alternates.

1.3. PROPRIETARY PRODUCTS

A. Where items of material or product are described by, or where reference is made to, proprietary manufacturer(s) or product(s) the Contractor shall be deemed to have included for the provision of such items by the brand name(s). Any deviation in this respect, even if specifically detailed in the submitted Tender, shall be disregarded.

B. Where the material or product detailed in such submissions does not exactly comply with the Drawings and Specification, and is therefore a proposed alternative, approval of this alternative shall be at the sole discretion of the Employer, notwithstanding that the proposal was made at Tender; approval shall be as an Alternate in accordance with this Section. Where approval is refused, the Contractor shall provide a material or product that fully conforms to and in accordance with the Drawings and Specification.

C. Where the Contractor proposed a superior material or product with his Tender, the Contractor shall be obligated to provide that material or product, unless rejected by the Employer or the Project Manager. In case of rejection by the Employer or the Project Manager, the Contractor shall provide a material or product from that listed in the Specification without any cost, time or any other implications.

D. Proprietary manufacturer or product shall mean any reference to a manufacturer, part number, brand name or trade mark. Patented brand name(s) are specified solely to establish the required quality standard.

1.4. PROCEDURES

A. If the Contractor wants to propose an Alternate, then his proposal shall be applicable to engineering, and details, subject to the approval of the Supervision Consultant and the Project Manager. This shall be clearly indicated as such on the submittal of the engineering and detail. Approval of any such Alternate shall be entirely at the discretion of the Employer and shall not relieve the Contractor of any of his liabilities or obligations under the Contract. Any changes to the design or related designs or drawings as a consequence of the proposed Alternative shall be at the responsibility and cost of the Contractor. Any increase in cost or any related costs incurred by the Project Manager and/or Employer shall be borne by the Contractor and any saving shall be to the benefit of the Employer.

B. All Proposals shall be submitted to the Project Manager, copied to the Employer, in writing, and shall include the following minimum data and documentation in respect of each item :

1. Manufacturer's data of proposed material or product. The data shall be in the form of complete catalogues, brochures, calculations, data sheets in the original, and / or copy / description of specified detail and copy / description of proposed detail.
2. Copy of specified code or standard, and copy of proposed code or standard.
3. Comparison between the specified and proposed material or product, and / or description of variances between the specified and proposed detail.
4. Comparison between the specified and proposed code and standard. This comparison shall be limited to the salient points for the material or detail in question.
5. A cost analysis shall be provided with the Alternative, including all required related charges. The cost analysis shall be supported with calculations, invoices, and all other required substantiation. CIF quotation of specified and of proposed material or product shall be provided.
6. Impact upon the approved Programme for the Alternative shall be provided. This shall be supported with calculations and all other required substantiation. Written evidence of supply source, availability of sufficient quantity, and delivery dates shall be provided.
7. Reason for Proposal. The Proposal will not be considered unless the Contractor identifies one or more of the following reasons:
    a. When the specified products are no longer available. The proposed Alternative will not be considered unless proof is submitted that a firm order was placed within ten (10) days of the review and approval of the corresponding submittal by the Supervision Consultant of the item listed in the Specification, or the unavailability is due to strikes, plant shutdown, lockouts, discontinuation of the product line, bankruptcy, or a national disaster.
    b. When a guarantee of performance is required. In which case, in the opinion of the Contractor, the specified product will not produce the desired result.
    c. Where substantial cost and/or time benefit shall accrue to the Employer.

C. Alternatives will not be considered if:

1. They are indicated or implied in the Contractor furnished drawings and other information without presenting a formal request as stipulated above.
2. They are directly requested by a supplier or Subcontractor, and do not meet the criteria noted above.
3. Subject to the Employer, if acceptance will result in substantial revision to the Contract.

1.5. VALUE ENGINEERING

A. The Tenderer / Contractor may propose alternate methods / engineering for installation that would reduce the cost and/or improve the schedule both during the Tender and the course of the Works, under the following conditions:

1. The proposed suggestions shall in no way delay the Project schedule or result in additional cost to the Employer.
2. Proposals shall be subject to review and acceptance of the Supervision Consultant, Project Manager and the Employer.
3. All costs associated with any additional works required by the Supervision Consultant/ Project Manager and / or appropriate governing authorities shall be borne by the Contractor.
4. Value engineering suggestions detailed with the Tender shall be accompanied with a guaranteed minimum saving.

B. Value engineering suggestions shall always be submitted with an estimate of the resultant minimum cost and time savings. It shall include a detailed breakdown of the labor and material savings. Upon acceptance and completion of the detailed engineering, the cost saving shall be finalized.

C. While submitting comparative potential saving for the Alternative proposal or suggested value engineering proposal, it shall remain the responsibility of the Contractor to identify consequential effects, both positive and negative, on other trade disciplines and/or on the work of other contractors and subcontractors and to identify costs and time associated with such impacts in the potential savings. No further cost reduction to the guaranteed minimum savings shall be accepted by the Employer and the Project Manager should the impact is determined by the Project Manager as a consequence of the Contractor proposed Alternative or a value engineering suggestion.

No additional time impact to any Milestone Date completion or Sectional Completion Date or an extension to Time for Completion shall be accepted by the Employer if it is determined by the Project Manager that the time impact is due to the consequence of the Contractor proposed Alternative or a value engineering suggestion.

END OF SECTION 01230

Section 01300 – Administrative Requirements

PART 1 – GENERAL

1.1. SECTION INCLUDES

A. The sub-sections of Section 01300 contain descriptions and procedures related to the following:

1. Section 01310 - Project Management and Coordination
2. Section 01320 - Construction Progress Documentation
3. Section 01330 - Submittal Procedures

END OF SECTION 01300

Section 01310 – Project Management and Coordination

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Administration, Contractor's organization and staffing, coordination and meetings.

1.2. PRE-CONSTRUCTION CONFERENCE

A. A Pre-construction meeting will be convened by the Project Manager within five (5) days of the acknowledgement by counter-signature of the Employer's Letter of Acceptance by the Contractor, which shall be attended by the Contractor and his major subcontractors.

1.3. AGENDA

A. The agenda for the Pre-construction meeting will be provided to the Contractor by the Project Manager prior to the meeting.

B. The general outline of the agenda will be as following:
   1. Contractor's organization arrangements.
   2. Channels and procedures for communication.
   3. Construction Schedule, including sequence of critical work.
   4. Drawings and Specification, including distribution of required copies.
   5. Processing of shop drawings and other data to be submitted to the Supervision Consultant for review.
   6. Processing of Project Manager's and Supervision Consultant's instructions and Variation Orders.
   7. Rules and regulations governing performance of the Works.
   8. Procedures for safety and first aid, security, quality control, housekeeping etc.
   9. Procedures for reporting and monitoring progress, cost, materials, labor and equipment.
   10. Procedures for reporting and managing LEED requirements.

C. The above procedures, reviews, rules, policies, processes and requirements will be defined by the Project Manager and will be reviewed at the meeting.

D. The Contractor shall comply with all aspects of the Project Manager's requirements and with any revisions that are made thereto during the progress of the Works.

1.4. CONTRACTOR'S PROJECT TEAM

A. Contractor's Project Manager: The Contractor's Project Manager shall be the representative of the Contractor and is the first point of contact between the Contractor and the Project Manager and the Supervision Consultant. The Contractor's Project Manager shall be well qualified and experienced to perform the functions that are required of him. The Contractor's Project Manager shall have at the minimum a bachelor's degree in engineering or architecture. The Contractor's Project Manager shall be well versed in the overall management of his team, Contractual obligations, time and cost aspects of the Contract, planning and executing the Works, implementation of work discipline on and off Site, various construction complexities, etc. The Contractor's Project Manager shall have a minimum twenty (20) years' experience in the construction industry with minimum ten (10) years employed with the Contractor. The Contractor's Project Manager shall have extensive job specific experience. The Contractor's Project Manager must be fluent in written and spoken English.

B. Engineering: The Contractor's engineering team shall be headed by an Engineering Manager who shall be responsible for production of all shop drawings, construction details, fabrication drawings and coordination drawings. The Contractor's Engineering

Manager shall have a minimum twenty (20) years' experience in the construction industry with minimum ten (10) years employed with the Contractor. The Engineering team shall be responsible for all submittals of materials, samples and drawings. The team shall ensure that submittals are comprehensive and in conformance with the Contract Specifications and Drawings and also make sure that submittals are made in a timely manner. The team shall be capable of identifying any discrepancies in the Contract Specifications and Drawings and bring to the notice of the Supervision Consultant for resolution. The Contractor's Engineering team shall be responsible for coordinating all submittals and drawings of the Contractor's subcontractors and other relevant package contractors. The Contractor's Engineering Manager shall have substantial experience along with multi-discipline qualifications and training. The Engineering Manager shall have problem solving capabilities and shall be able to generate construction details quickly, when required. The engineering team shall consist of qualified and experienced trade engineers relevant to his package scope of work. The Contractor's Engineering Manager must be fluent in written and spoken English.

C. Commercial: The Contractor's Commercial team shall be headed by an Engineering Manager who shall be responsible for production of all shop drawings, construction details, fabrication drawings and coordination drawings. The Contractor's Engineering Manager shall have a minimum twenty (20) years' experience in the construction industry with minimum ten (10) years employed with the Contractor. The Engineering team shall be responsible for all submittals of materials, samples and drawings. The team shall ensure that submittals are comprehensive and in conformance with the Contract Specifications and Drawings and also make sure that submittals are made in a timely manner. The team shall be capable of identifying any discrepancies in the Contract Specifications and Drawings and bring to the notice of the Supervision Consultant for resolution. The Contractor's Engineering team shall be responsible for coordinating all submittals and drawings of the Contractor's subcontractors and other relevant package contractors. The Contractor's Engineering Manager shall have substantial experience along with multi-discipline qualifications and training. The Engineering Manager shall have problem solving capabilities and shall be able to generate construction details quickly, when required. The engineering team shall consist of qualified and experienced trade engineers relevant to his package scope of work. The Contractor's Engineering Manager must be fluent in written and spoken English

D. Construction: The Contractor's Construction team shall be headed by a Construction Manager who shall be qualified in engineering and/or construction disciplines and have a minimum of twenty (20) years' experience in the construction industry and with minimum ten (10) years employed with the Contractor. The Construction Manager shall be well versed with construction organization, site logistics, security, arranging and allocating manpower and equipment resources, capacities and limitations of construction equipment, job site safety, implementation of quality control, job site planning and progress control, considerable knowledge of various engineering disciplines (civil, structural, mechanical and electrical), coordination between different trade disciplines, etc. The Contractor's Construction Manager shall have trouble shooting skills, and capabilities to expedite corrective actions as and when any delay occurs. The Contractor's Construction Manager shall make plans for the execution of Works at Site and have alternatives and contingency plans worked out in order to achieve the Project schedule and Milestone requirements. The Contractor's Construction Manager shall liaise with the representatives of the Project Manager and The Supervision Consultant who are involved with on-Site activities. The Contractor's Construction Manager shall also coordinate with authorities having jurisdiction such as local government, semi-government and non-government agencies as required. The Contractor's Construction Manager shall have extensive job specific experience. The construction team shall consist

of qualified and experienced trade engineers relevant to his package scope of work who shall be responsible for execution and the planning and scheduling of work activities. The Contractor shall deploy sufficient number of supervisors with at least fifteen (15) years' experience in the trade in which they will be engaged, who have worked with the Contractor for a minimum period of five (5) years. Well-experienced supervisors and foremen shall ensure that job Site works are performed in accordance with the requirements of the Contract. The Contractor's Construction Manager must be fluent in written and spoken English

E. Coordination: The Contractor's Engineering team shall have at least two engineers, one with strong multi-discipline (structural, architectural, cladding) background and another with (architectural, mechanical and electrical) background who will take a leading role with the inter-contract and subcontracts coordination during the engineering phase (preparation of drawings, submittals and the like). In addition, at least two engineers with similar backgrounds shall be in the Construction team for taking a lead role with the inter-contract and subcontracts coordination during construction. The Subcontractors shall have dedicated coordination engineers in similar capacities. The coordination engineers shall be suitably qualified and shall have a minimum of fifteen (15) years of suitable experience.

F. Planning & Scheduling: The Contractor shall designate a full-time qualified and experienced Senior Planning & Scheduling Engineer who shall be responsible for all functions relating to planning, scheduling and reporting. The Project Manager shall approve the Senior Planning & Scheduling Engineer of the Contractor. The Senior Planning & Scheduling Engineer and other members of the Planning and Scheduling team shall not work under the direction of the Contractor's Construction Manager, but shall maintain continuous communication, interaction and coordination with the Construction team. The Senior Planning & Scheduling Engineer shall report to the Contractor's Project Manager and shall be responsible to monitor the progress of Works at Site and report accurately the progress, delays, critical activities, constraints, bottle-necks, etc. The Senior Planning and Scheduling Engineer shall, at times, act as an independent auditor to verify the performance of construction progress reported by the Construction team.

G. Procurement: The Contractor shall have dedicated staff that shall be responsible for all material procurement. The Procurement team shall be given all "required on job" dates for all materials as soon as Construction Schedule is finalized. The Procurement team shall be headed by a Procurement Officer who is well versed in identifying all long lead items and knowledgeable in sourcing all materials. The Contractor's Procurement Officer shall have extensive and in-depth knowledge of local market, availability of vendors, fabricators of specialist materials and assemblies, government authorities' regulations, banking rules, world markets for sourcing of materials and products, customs procedures, shipping procedures, etc. The Contractor's Procurement Officer shall act as an expeditor to place orders, follow up with vendors and manufacturers, ensure that quality norms are achieved by the vendors and manufacturers, get the required inspections done and certified, and ensure that deliveries are made in satisfaction of the Project requirements.

H. Quality: The Contractor's Quality Management team, QA/QC Manager, the team's responsibilities and functions are explained in Section 01430.

I. Safety: The Contractor's Safety organization and staffing, responsibilities and functions are explained in Section 01735.

J. Installers: All work shall be performed by trained and capable installers or craftsmen with sufficient experience to meet the quality and schedule requirements of the Project. All

works shall be executed by specialist skilled craftsmen approved by the Consultants. These craftsmen shall have a proven record of experience in workmanship for a minimum period of five (5) years in comparable quality projects. Any craftsmen not meeting these requirements will not be accepted.

K. The requirements for key positions detailed in this section shall act as guidelines to the Contractor prior to proposing personnel for the Project. All of Contractor's key personnel shall be approved by the Project Manager and Supervision Consultant prior to assignment to the Project. The Project Manager and Supervision Consultant have the authority to ask the Contractor to remove any staff in the Contractor's organization if in the opinion of the Project Manager and/or the Supervision Consultant the performance of the said staff is not satisfactory. The replacement of such staff shall take place within ten (10) days of the Project Manager's and/or Supervision Consultant's notice.

1.5. PROJECT COORDINATION

A. The Contractor shall be entirely responsible for the coordination and proper execution and completion of the Works as required in this document and the Conditions of Contract. This responsibility shall in no way be reduced by the employment of Subcontractors whether approved, nominated, assigned or otherwise. The Contractor shall coordinate the work of each trade with that of all other trades and shall ensure that all trades cooperate to assure the required and steady progress of all work under the Contract.

B. The Contractor shall also coordinate his work with that of any other contractors, authorities or organizations performing works under separate contracts to ensure no delay, disruption or interference is caused to the Works under the Contract, and/or to such other contracts.

C. The Contractor shall coordinate with other affected package contracts on an ongoing basis and it is the responsibility of the Contractor to make due allowance and provisions within his shop drawings for interfacing details based upon information and documents as and when they are received. When other packages are not represented due to the late award, then the Contractor must make allowance and provisions based on the Contract documents in his possession.

D. The Project Manager will monitor the coordination efforts of the Contractor on Site and will set priorities as required should conflicts occur. Where the Contractor delays the coordination of the Works, he shall hold the Employer, the Project Manager and Supervision Consultant or their representatives harmless for any claim and/or consequential claims received from any other contractor or party resulting from such delays.

1.6. SCHEDULING AND SERVICES COORDINATION

A. The Contractor shall prepare a schedule to be approved by the Project Manager in which he shall elucidate procedures and measures and identify activities to be followed and the date of completion of stages of work. The Schedule of Works and subsequent updates shall all be in accordance with the requirements of relevant sections of this specification Division 01.

B. Each contractor shall schedule its construction operations in the sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its own installation.

C. Where availability of space is limited, each contractor or subcontractor shall coordinate installation of different components with other contractors to assure maximum accessibility for required maintenance, installation, service, and repair.

D. The Contractor shall provide Computer Aided Design (CAD) drawings as appropriate showing the coordination of the Works where related to other package contractors including submittals of computer back-up CD's. The Contractor shall submit the final coordinated drawings in CAD format and in master prints, signed off by all affected contractors to the Supervision Consultant for approval. The submission and distribution shall also be made using electronic format as needed as per Section 01330.

E. Any conflicts with affected contractors and sub-contractors are to be resolved before commencement of work.

F. Progress drawings and specifications of other contract and subcontract packages will be available for the Contractor's review at the offices of the Employer during regular work hours by appointment only. The Contractor shall request such appointment if required through the Project Manager. Certain drawings and documents may be issued to the Contractor after Contract award in order to provide additional information regarding coordination requirements. During the Tender stage, drawings and specifications of other tender or contract packages will be available at the office of the Employer for reference.

G. This Contractor's personnel belonging to the coordination team shall establish daily/weekly planning and coordination meetings with the other package contractors employed on the Project to monitor progress, identify construction opportunities and redirect work efforts to avoid construction delays.

H. The Contractor shall submit a method statement and an amplification of his coordination methodology that he proposes to employ to satisfy this coordination requirement in detail. On appointment, the Contractor shall submit similar details for review of the Project Manager and the Supervision Consultant.

I. In the event that any equipment to be supplied and installed by Third parties on or adjacent to works to be constructed by the Contractor, and in the event that this equipment is not available at the requisite time the provision for the later installation of same shall be made by the Contractor with no time or cost impact to the Employer.

1.7. COORDINATION DRAWINGS

A. Coordination drawings are detailed in Section 01330.

1.8. PROGRESS, SCHEDULE AND COORDINATION MEETINGS

A. Site progress meetings will be held weekly or as required by the Project Manager to review the Contractor's Safety Program, Schedule update, daily activities, Contractor's submittals and procurements, and any administration matters. Attendees at this meeting shall include the Employer, Project Manager, Supervision Consultant, the Contractor, Sub-contractors and other contractors as required. Work progress and the Schedule update will be reviewed to verify:

1. Safety tool box meeting records, equipment test certificates, accident reports, etc.
2. An updated list of RFI (Request for Information), PMI (Project Manager's Instructions), NCR (Non Conformance Reports), Procurement and Submittal Status Reports.
3. Actual start and finish dates of the completed activities during update period. Remaining duration and percentage of completion for all activities not completed.

4. Contractor's measures to rectify delays from the planned dates, such as increasing manpower, materials and equipment resources, working extended hours or additional shifts.

B. The Site progress meetings shall be as directed by the Project Manager.

C. Separate meetings with the Contractor and each of the major Sub-contractors shall be held at least once every month to review the status of:
   1. Contractor's submittals and approvals of shop drawings, materials, samples, etc.
   2. Contractor's procurement of materials, plant and equipment
   3. RFI (Request for Information), PMI (Project Manager's Instructions), NCR (Non Conformance Reports), Procurement and Submittal Status Reports.

D. Additional meetings required by Contractor to comply with his obligations shall be requested in writing by him to the Project Manager with full details of agenda and names of other contractors who are required to attend. Such meetings will be chaired by the Project Manager or the Supervision Consultant, as appropriate.

E. Two (2) days before each site meeting or as directed by the Project Manager, the Contractor shall submit the weekly report.

F. The Contractor must attend meetings adequately prepared to discuss, address and answer all items as detailed in this clause and to report on action required from previous meetings.

1.9. SUB-CONTRACTOR'S SITE MEETINGS

A. The Contractor shall hold meetings with Subcontractors and suppliers shortly before site meetings to facilitate accurate reporting of progress.

B. Additional meetings between the Contractor and his Subcontractors for coordination, progress, trouble-shooting, procurement activities, etc., are the Contractor's responsibility.

1.10. CORRESPONDENCE / SUBMITTALS

A. The Contractor shall use only the metric system. Where any North American or other systems of units are referred, the Contractor shall convert such units to the metric system.
   1. All dates on correspondence, reports, letters, etc. shall use the nomenclature Date-Month-Year (i.e. 12 Dec. 2020 or 12 December 2020).

B. All correspondence shall be made using A-4 sheets. All other submittals shall be according to the related international paper standards.

C. Standard sizes drawings are preferred, the maximum size being A0. (Note: The design drawings may be in custom size larger than A0 format). The Contractor shall agree with the Supervision Consultant on the size of drawings for production by the Contractor. Provide for two sets of reduced half-sizes (A2 if drawn on A0 and A3 if drawn on A1) of drawings for use by the Project Manager.

   The format of the drawings such as title blocks, approval stamp blocks, numbering system, etc., shall be subject to the approval of the Project Manager and the Supervision Consultant.

D. The transmittal forms used for submittals shall be in a format approved by the Project Manager and the Supervision Consultant.

E. Only the following software shall be used for Contract related documents:
   1. Drawings – Latest version of AutoCAD and Architectural Desktop – (from Autodesk). Any other software will be required to satisfy any local authority requirements
   2. Correspondence - Microsoft Word from Office XP suite or later version
   3. Scheduling – Primavera Project Planner Version 6 or later version.
   4. Schedule related matrices, spreadsheets, and similar reports - Microsoft Excel from Office XP suite or later version
   5. The Contractor must provide all software upgrades and maintenance and bear all expenses arising from such upgrades as required.
   6. Others - as approved by the Supervision Consultant or the Project Manager, compatible with established systems.

END OF SECTION 01310

Section 01320 – Construction Progress Documentation

PART 1 – PROGRAMME FOR TENDER SUBMISSION

1.1. PROGRAMME OVERVIEW FOR TENDER SUBMISSION

A. The Contractor is required to provide a detailed level 3 programme as part of their tender return that clearly indicates their best substantiated, maintainable production & installation rates they can achieve in order to complete, commission, and hand over. A milestone schedule & construction zoning plan has been provided to guide the Contractor as to the targeted Employer handover timeframe for each construction contract, as indicated under this section.

B. Should the Contractor not be able to substantiate and carry out the works in accordance with the target schedules milestone dates and achieve betterment, then the Contractor must schedule the works in accordance with the best dates the Contractor can reliably achieve and substantiate his earliest delivery of the works.

C. The object behind the Contractor's preparation of the programme and the required supporting documentation is to demonstrate earliest reliable and accurate achievable time frames the Contractor can achieve for the release and handover of the foundations and substructure zones to following Contracts (2b to 9).

D. The intent of the milestone schedule is to show the Contractor where the sequence for the foundation and framing works will be focused to meet the critical path for the overall main project works.

1.2. SEQUENCE

A. The Contractor should follow the excavation and shoring concept sequence for the completion of construction zones based on the concept that SE1 has the priority in terms of critical path for follow-on project works (foundations & substructure framing etc.) and as such should be targeted by the Contractor for the earliest possible release to the Employer to carryout follow on works, followed by SW1, SW 2, Send etc. and finally zone M1 in priority order.

1.3. FORMAT FOR ALL PROGRAMMES

A. The format for the tender programme submission should be 2 copies each of both paper color copies and electronic copies. The electronic copies should be in an editable Primavera (minimum version 6.1 or higher as per Project Manager's request) format.

1.4. ACTIVITIES & CONTENT

A. The programme must include for the following activities but is not limited to:

1. Individual listings detailing the individual plans and documentation require d from the Contractor under the requirements of this tender document before site works can commence including individual preparation periods & periods for Employer reviews, revisions and approvals periods
2. Mobilization (& Demobilization) activities including Site setup activities e.g. Offices and welfare, hoardings compounds etc.
3. Procurement activities, in particular long lead items.
4. Detailed list of temporary activities showing temporary works design and approvals, e.g. hoarding and gates, tower cranes and hoists, temporary foundations and temporary service provisions etc.
5. Detailed construction activities building by building if relevant.
6. Detailed building construction activities including but not limited to the head line elements of foundations, substructure, waterproofing etc.

7. Handing Over periods.
8. Programme Milestones.
9. Engineering Works

PART 2—GENERAL REQUIREMENTS FOR WORKSCHEDULE & PROGRAMMING

2.1. GENERAL

A. General Contract Clause 17.3 "The Contractor shall within the period after the Commencement Date stated in the Particular Conditions prepare and submit to the Project Manager for his approval a programme for the carrying out of the Works in accordance with the requirements of the Specification and any further requirements of the Project Manager."

2.2. PARTICULAR CONDITONS

A. According to the General Conditions of Contract, Clause 17.3, the Contractor shall within 14 fourteen (14) days after the Commencement Date prepare and submit to the Project Manager and Employer for his approval, a programme for the carrying out of the Works in accordance with the requirements of the Specification and any further requirements of the Project Manager.

2.3. PROGRAMME TO BE SUBMITTED: (BASELINE PROGRAMME)

A. Contractor to prepare and submit Programme using Primavera (minimum version 6.1 or higher as per Project Manager's request) inclusive Project Planner formed on of the Works carried by daily basis (Day Unit) the Contractor. The Programme shall be such detailed and inclusive of;
   1. the order in which the Contractor proposes to carry out the Works;
   2. the time periods required for the preparation, submittal, and review by the Project Manager and Employers Representative of all submittals including, but not limited to, drawings, material submittals, subcontractor statements,
   3. a detailed work progress method statement as required
   4. Resource Loaded: details of the human and other resources required to achieve the Programme.
   5. Planned dates of equipment, subsystem and system start-up and testing.
   6. Off-site activities as defined elsewhere in this section, start up, testing, mobilization and demobilization, shop drawing submittals, approval etc. The "Off Site Activities" shall include but not necessarily be limited to:
      a) Activities for submitting, ordering, manufacturing, fabricating and delivering long lead items to the project site.
      b) Significant construction related activities performed by the Contractor away from the project site, including material and equipment purchase and delivery.
      c) Contractor's Shop drawings and other Submittals
      d) Required off site inspection activities by the Project Manager and Employer Representative.
      e) Include all procurement related activities in the Programme. Also detail procurement of Long Lead Items in the schedule. Long lead for items are equipment or materials which require more than one month between the time an order is placed and the time the item is delivered to the project site.
      f) Show all restraints and dependent activities which may affect the Programme.
      g) Interfaces with the work of other Contractors including but not limited to the various utilities and the Employer's plant operating personnel. All interface activities requiring mutual support between the Contractor, Nominated Subcontractors, Other Contractors, suppliers, or the Employer. Interfaces with the work of outside contractors including but not limited to the various utilities and the Employer's plant operating personnel.

h) The Programme shall clearly indicate the dates at or periods over which any deliverable items that shall be supplied by the Employer. All Employer Supplied materials and utility connections shall be detailed on the Programme. Where the Contractor requires Employer supplied materials to be delivered over a phased period the quantities required shall be clearly indicated, and the delivery periods identified.

i) Quantity Loaded: Include major driving quantities for each activity.

j) Cost Loaded: Include cost for each activity.

k) Critical path for the project shall:
   i. Be clearly shown and easily recognizable,
   ii. Show on the time-scaled network diagrams,
   iii. Clearly show the relationship between all non-critical activities and activities on the path.

l) Planned progress curve (S-Curve) consisting of a plot of percent complete versus time for each schedule of value item and the total project.

m) Submit a narrative report with the Programme indicating anticipated use of the following resources and work shifts:
   i. Labor resources.
   ii. Equipment resources.
   iii. Quantities placed.
   iv. Work shifts (e.g. single, double, or triple shifts)
   v. Work weeks (5, 6, or 7 day work week)

n) Include and detail describe in the narrative Coding Structure including Activity ID, Activity Code, WBS codes and structures.

o) Include detail drawings to describe and clearly show Construction Zoning/Phasing as per the Programme. Detail, describe and show sequence of construction and teams.

p) KPI's: Include Tabular Schedule, Histogram & S-Curve for Major Critical Indicators (Manpower, Material, Equipment)

q) Submit Tabular Schedule, Histogram & S-Curve for Monthly & Cumulative Cash flow

r) Submit Weight Factor Based on Cost (EVA)

s) Submit Production rates at quarry; include planned, manpower and equipment productivity rates. All activities duration and resource amounts to be based on and calculated on the submitted productivity rates.

t) If the Employer or Project Manager chooses so or if the Employer deems that Contractor activity list in the programme is not sufficient to monitor the Works, the Employer or Project Manager can dictate the list of Site activities to be incorporated to the Work Schedule. For this list of activities; Activity ID, Description, BOQ quantity and amounts can also be dictated and issued to Contractor by Employer. In such case the Contractor has to adjust the activities to a timeline by forming relationships and calculate the productivities of resources and submit the Work schedule to Employer for final approval. The Contractor is sole responsible to carry out the works sequence according to the work schedule and the Contractor shall ascertain himself that the works can be carried out as per the work schedule sequence.
   i. Once approval is granted by the Employer, Work schedule contents shall not be changed without written consent of the Employer.

B. Include Contract Milestones in the baseline schedule; roll-up programme shall reflect these milestones.

2.4. WORK PROGRAMME METHOD

A. The Programme shall be prepared in precedence format using Primavera Project Planner version 6.1 or higher as per Project Manager's request and shall clearly indicate all restraints and Contract milestones. The Programme shall be a detailed CPM logic linked network with activity durations, cost and resource allocations. The network shall be a closed network with all activities having successors linked to an overall completion milestone. This overall completion milestone shall be the only activity without a successor.

B. The network is to have a work breakdown structure (WBS) to provide reference to shop drawings, procurement, and subcontracting, constructing, commissioning, inspection and handover phases. By using sub-codes within the WBS the network activities shall relate to discipline, areas, material use, trades and commissioning by system. Contractor shall schedule all project activities using critical path scheduling techniques and update the Programme as specified.

C. The network activities shall be sufficiently detailed to provide a meaningful measurement tool for the progress of the Works. With the exception of manufacturing and delivery activities no activity shall have duration of more than 14 calendar days. Divide activities with a duration exceeding 14 days using logical Measuring points of quantities, time location or accomplishment.

D. The Programme calendars shall include the normally observed holidays and rest days within the Maldives.

E. The Programme shall show the following data for all activities:
   1. Activity ID
   2. Activity description
   3. Original Duration
   4. Early Start
   5. Early Finish
   6. Late Start
   7. Late Finish
   8. Total Float

F. The Programme shall be submitted in bar-chart form in both software and colored printed copy. The printed copy shall take precedence over the software copy in the case of any discrepancy between the two.

G. Based upon the schedule of works, an overall S-curve shall be developed to provide a meaningful measure of overall progress. The S-curve shall be updated weekly and monthly to display actual progress.

H. Failure of the Contractor to submit the Programme or any weekly or any monthly update thereof may result in the withholding of any payments due to the Contractor until the Programme or subject weekly or monthly update has been submitted.

I. Contractor's application for payment shall not be processed until the Contractor has submitted an acceptable Programme meeting the requirements of these Specifications.

J. If the Project Manager or Employer rejects the Contractor's Programme including any subsequent update or revision, the Contractor shall within 14 days of receiving the

rejection, revise the Programme to comply with the Contract Documents and resubmit it to the Project Manager or Employer's Representative.

K. The Programme shall represent an accurate, efficient, reasonable and feasible plan and method for completing the Works.
   1. Project Manager or the Employer Representative will review the Programme but they will not be responsible for whether the Programme will result in timely Project completion.
   2. The Programme shall be the Contractor's sole responsibility, including but not limited to preparation, content, revisions and updating in accordance with the Contract requirements.

L. The Programme shall be such that work included under this Contract does not affect or unduly interfere with work being undertaken by the Employer or another contractor. Contractor shall adjust network logic, activity sequences, activity durations and similar items as necessary to maintain adequate progress to ensure that the project is completed within the specified time frame. Contractor shall be solely responsible for expediting material and equipment deliveries to ensure the latest approved Programme is maintained.

M. "Float" or "slack time" is defined as the amount of time between the early start date and the late start date or between the early finish date and the late finish date of any activity in the Programme. Float or slack time is not for the exclusive use or benefit of either the Contractor or the Employer. Contractor's work shall proceed according to early start dates, and the Project Manager shall have the right to reserve and apportion float time according to the needs of the project.

N. The Contractor acknowledges and agrees that actual delays, affecting paths of activities containing float time, will not have any effect upon contract completion times, providing that the actual delay does not exceed the float time associated with those activities.

O. Float time of an activity should not exceed thirty (30) calendar days.

P. The Programme shall be used as the basis for progress reporting, schedule controlling and schedule forecasting. It shall also be used by both the Contractor and the Employer Representative as the basis for evaluating changes, claims and applications for payment.

Q. No claim of delays will be entertained due to delays in transportation of material, people or shortage of working space.

R. The network shall be updated weekly and monthly for actual progress.

S. No changes or amendments shall be made to logic, durations or schedule dates contained within the baseline or monthly update schedules without prior written consent from the Employer Representative or Project Manager.

T. If at any time it should appear that the actual progress of the Works does not conform to the Programme, the Contractor shall, at the request of the Project Manager or Employer and within the period required by the Project Manager, prepare and submit to the Project Manager for his approval a revised programme showing the modifications to the Programme necessary to ensure completion of the whole of the

Works and each Section and Portion of the Works within the applicable Time for Completion.

U. Following the update a critical activity listing shall be reviewed with the project management to identify problem areas and corrective actions necessary.

V. Monthly Programme Updates can be used to determine the Interim Payment amounts to the Contractor.

PART 3—PROGRAM UPDATES AND REVISIONS

3.1. UPDATE THE PROGRAMME EVERY MONTH TO REFLECT THE ACTUAL PROGRESS OF THE WORKS

A. Monthly updates shall be carried out with the following methodology;
   1. The Programme update will also be used to review the Contractor's payment application.
   2. Contractor shall submit to Project Manager the preceding month's Programme marked with the proposed updates.
   3. Contractor shall submit monthly marked up proposed updates to Programme on cut-off date or data date for this report shall be the 25th of the month prior to submitting each monthly payment application.
   4. Prior to the date of Application for Progress Payment, the Contractor's Project Manager and Superintendent and the Project Manager shall meet at the job site for the purpose of reviewing the Contractor's report of actual progress, and obtaining from the Contractor (following it's meeting with all concerned Subcontractors and suppliers) up-to- date and accurate progress data.
   5. The Project Manager will review the marked up schedule and return one annotated copy to the Contractor for use in preparing the monthly update. Contractor shall only use the Project Manager's annotated updates during the monthly update of the Programme.
   6. Indicate the following in the weekly and monthly updated Programme:
      a) Activities in progress or to be performed in the next period,
      b) Actual Start and (if activity completed 100%) Actual Finish
      c) The percent complete for each activity in progress or completed.
      d) The critical path for the project based on the latest update data,

PART 4—PROGRESS REPORTS

4.1. DAILY REPORTS

A. Submit to the Project Manager and if required to the Employer a report within end of each working day.

B. The report shall be in such form and with such detail as the Project Manager and the Employer shall reasonably require.

C. The report shall be including but without limitation the list and status of activities carried out in report date, manpower status, machinery status, list and quantity of delivered material in reports dates.

4.2. WEEKLY REPORTS

A. Submit a weekly report prior to each progress meeting which summarizes work progress.

B. The format of the report shall be acceptable to Project Manager and Employer Representative.

C. Required information shall include but not necessarily be limited to the following:
1. Work progress whether in the mills, shops or in the field.
2. State existing status, rate of progress, actual site productivities for resources, estimated time of completion and cause of any delay (if any) with reasons therefor and recovery measures for delays.
3. Description of work accomplished since submission of previous progress schedule.
4. Compare actual work status against the baseline Programme.
5. Major Critical Indicators/Resources Status and Histograms / S-Curves, with comparison to planned values
6. Status of equipment and material deliveries.
7. Details of work for the next period.
8. Details of all testing and results.
9. Information regarding any design changes.
10. Information regarding any variations.
11. Details of inspections and approvals required to proceed with work.
12. Records of manpower, plant etc. compared to planned requirements.
13. Information required from the Employer.
14. Weather records.
15. Value of work done.
16. Changes or additions to Contractors supervisory personnel since the preceding progress report including Updated Organization Chart.
17. Changes in logic, construction sequence and activity duration. Include an explanation of why the changes are necessary.
18. Proposed actions by the Contractor to restore the Programme. Include what is being done or what is planned to be done in each problem area.
19. Identify anticipated problems or changes and present plan to deal with them so as to minimize or prevent delays.

D. Updates and revisions to required schedules and reports shall not modify or limit in any way, the Contractor's obligations to meet the Time for Completion.

4.3. MONTHLY REPORTS

A. According to Conditions of Contract Clause 17.6 (Progress Reports) the Contractor shall by the 1st day of each month provide a Monthly Progress Report. Monthly Progress Reports shall be prepared on monthly basis and submitted to Project Manager and Employer. All recovery measures for recovering the delays (if any) shall be detail described in the Monthly reports, Cut-off date will be as mentioned above the 25th of each month.

B. The Contractor shall prepare monthly progress reports and shall submit the same to the Project Manager and Employer's Representative in three copies.

C. The first report shall cover the period up to the end of the first calendar month following the Commencement Date.

D. Reports shall be submitted monthly thereafter, each by the 1st day at next month of the period to which it relates. The Contractor shall submit monthly reports until the

Contractor has completed all work which is known to be outstanding at the completion date stated in the Taking-Over Certificate for the Works.

E. Monthly progress reports shall include as a minimum the following information:
   1. An executive information summarizing progress and significant events during the subject month;
   2. A summary of the Programme including Milestone Schedule;
   3. The existing updated critical path of the programme;
   4. A statement of problem areas and potential impacts;
   5. A statement of any changes in the construction sequence
   6. A statement of upcoming activities and expected progress;
   7. Appendices, including:
      a) Bar charts with updated status;
         i. Summary by Contract / task / Discipline / System / WBS
         ii. Period Look Ahead layouts
         iii. Total float report
         iv. Early start by area report;
         v. Bar chart of critical path
         vi. Cost control report (summary by activity)
      b) Overall Project Progress updated Histogram and S-Curve based on Cost.
      c) Cash flow and progress measurement curves;
      d) Manpower histogram by trade, in tabular graphical representation – Actual vs. Planned And Detailed Monthly Average Manpower list per trade and discipline indicating the total of direct and indirect manpower.
      e) Major Critical Indicators/Resources Status and Histograms / S-Curves, with comparison to planned values
      f) Delayed (if any) Activities Log with reasons for delays and recovery measures
      g) Procurement Status Report
      h) Progress by Systems Planned (Early) vs. Actual based on Work in Place Cost
      i) Progress Payment Tracking Table – monthly and cumulative
      j) Material, Subcontractor and Shop Drawing Submittal Log (Planned vs. Actual)
      k) Machinery and Equipment list and status
      l) Progress Photographs
      m) Back-up Primavera network, on CD-ROM.
   8. Information regarding any design changes.
   9. Information regarding any Variations and Claims
   10. Safety Report

4.4. Cash Flow Estimates to be Submitted

A. The Contractor shall, within 30 days after the Commencement Date, provided to the Employer Representative for his information a detailed cash flow estimate, in monthly periods, of all payments to which the Contractor will be entitled under the Contract and the Contractor shall subsequently supply revised cash flow estimates at monthly intervals.

4.5. Employer's Milestone Schedule

A. See Scope of Works for Project Milestones.

END OF SECTION 01320

Section 01330 – Submittal Procedures

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. This section addresses only the general requirements for submittals. Specific submittals shall be made as per the different project Specifications and other Sections in this Division 01.

1.2. SUMMARY

A. In general, the submittals to be made by the Contractor shall be inclusive of and not limited to the following:
   1. Shop Drawings, Coordination Drawings
   2. Product Data
   3. Design Data
   4. Catalogues
   5. Calculations
   6. Samples and Mock-ups
   7. Certificates
   8. Test Reports
   9. Asset details
   10. Manufacturer's Instructions
   11. Manufacturer's field reports
   12. Submittals for Temporary work
   13. Construction Method Statement
   14. Other Items as identified under Technical Specifications

1.3. RELATED SECTIONS

A. Section 01320 – Construction Progress Documentation

B. Section 01450 – Quality Control

C. Section 01780 – Closeout Documentation

1.4. CONTRACT DRAWINGS

A. The drawings issued with the Tender are issued solely to show the basic principles on which Tenders are to be prepared. The drawings are not to be taken as coordination, shop, or working drawings.

B. Where required by the Supervision Consultant, coordination, shop, or working drawings and, where specified, design drawings are to be prepared and submitted by the Contractor in accordance with the Contract Documents. Certain progress drawings included in the Contract are for Contractor's guidance in the evaluation of coordination and installation interface requirements.

   The Supervision Consultant shall issue updated, more complete drawings as they become available. The Employer shall entertain no request for Contract Sum adjustment if the modifications do not materially change the original design intent.

C. Dimensions should not be scaled from Drawings. The Contractor shall obtain from the Supervision Consultant any dimensions required but not given in figures on the Drawings nor calculable from figures on the Drawings.

D. The Contractor shall note that the construction drawings provided represent the extent of design information available at the time of Contract Award and it is the Contractor's

responsibility to prepare shop drawings with all relevant information and details prior to submission as detailed shop drawing or working drawing for the review of the Supervision Consultant. The Contractor shall schedule the submittal of shop drawings in a timely manner to achieve the requirements of the Milestone Dates, Sectional Completion Dates and the Time for Completion.

E. The Contractor shall include for additional shop drawings in 1:50, 1:25 scales as required for detailed coordination.

F. The Contractor shall submit detailed equipment schedules, hardware schedules, sanitary ware and accessories schedules, door schedule, etc. as required.

G. It is the responsibility of the Contractor to plan and prepare detailed working drawings to supplement the design information and facilitate the re-measurement of the Works, where so defined in the Contract Documents. Such responsibility shall also extend to the re-measured works of his subcontractors.

H. The Contractor shall be responsible for coordinating between the various trades to provide copies of drawings, schedules, etc. that are required for the re-measurement of the Works.

1.5. GENERAL REQUIREMENTS

A. Contractor's Checking of Submittals: Thoroughly check Submittals for completeness and for compliance with the Contract Documents before submitting them for review of the Supervision Consultant, and mark them with the Contractor's stamp certifying that they have so been reviewed. Any submittal without such stamp shall be returned to the Contractor without review.

1. Shop Drawing Coordination: In checking shop drawings, verify the dimensions and field conditions and check and coordinate the shop drawings of each section or trade with the requirements of other sections or trades whose Work is related thereto, as required for proper and complete installation of the Work.

B. Identification of Submittals: Mark, tag, or otherwise properly label each submittal item with the name of the Contractor, name of the project, the date, and a reference to the applicable specification section number for identification of each item. Accompany each submittal with a letter of transmittal containing similar information, together with the purpose for which the submittal is being made. Each submittal item, or the label affixed thereon, shall have a clear space suitable to receive the stamps of the Contractor and the Supervision Consultant.

1. Numbering of Shop Drawings: Consecutively number the shop drawings for each portion of the Work, and retain the numbering system throughout all revisions, in accordance with the Project Manager's approved numbering system.
2. Labeling of Samples: Identify each sample item with the name of the manufacturer and the product name or number, in addition to the other information required on the tag or label.

C. Completeness of Submittals: Make complete submittals for each separate and definable system or subsystem of the Work, and include in each submittal all the items necessary to completely define and explain the system or subsystem including its performance and installation. Such items shall consist of the shop drawings, product data, supplementary product literature, samples, calculations, statement of manufacturer's review, or other information as required by the technical specification sections. Unless otherwise acceptable to Supervision Consultant, combine the submittal items required for each system or subsystem and furnish together at one time in a single submission.

D. Submittals to be Returned Unreview: A submittal which, in the Supervision Consultant's opinion, is incomplete or deviates from the requirements of the Contract Documents, or contains numerous errors, or has not been checked or only checked superficially, will be returned without being reviewed by the Supervision Consultant and the Contractor shall make a new submittal. A submittal which is not required by the Supervision Consultant will be returned without review.

1.6. COORDINATION DRAWINGS AND SHOP DRAWINGS

A. The Contractor shall be responsible for the preparation and timely provision of coordination drawings showing the coordination of the work of sub-contractors and all other contractors. The coordination drawings shall be in sufficient detail to show overall dimensions of structural members, architectural features, including finishing, ductwork, piping, conduit, equipment, fixtures, etc., and show clearance between each work.

B. Coordination drawing shall bear a signature block with the following certification:

"The work represented on this drawing has been coordinated with all sub-contractors and other affected contractors.

Contractors' Representatives Date Initials"

C. The signature block shall include spaces for the company names and signatures of sub-contractors and contractors.

D. Reproducible, original, coordination drawings shall be signed by each affected sub-contractor, other contractors and the Contractor indicating agreement that the work has been coordinated. The Contractor shall then distribute a copy of signed coordination drawings to each of the affected sub-contractors and contractors. All coordination drawings shall be submitted for review of the Supervision Consultant.

E. For the purposes of coordination each contractor and subcontractor shall provide other contractors whose work is affected with the required information and drawings for coordination of their work.

F. Shop Drawings: The term "Shop Drawings" includes graphic representations which document the required type, number and location of each system component in the Work. Such drawings and other illustrations, including fabrication and layout drawings, diagrams, and related schedules, shall establish the actual detail of manufactured or fabricated items, indicate proper relation to adjoining work, amplify design details, and incorporate minor changes of design or construction to suit actual conditions. Shop drawings shall not be reproductions or tracings of the Design Consultant's Drawings.

G. The Contractor shall be responsible for the preparation and timely provision of shop drawings which shall indicate proposed materials and methods of construction, fabrication, erection, layout and setting out, diagrams on various systems, equipment control, and other descriptive data, catalogues and brochures required to show that materials, equipment and system and position thereof shall conform to the Drawings and Specification. Shop drawings shall establish actual detail of all assembled, manufactured or fabricated items, coordinate and indicate proper relation to adjoining work, amplify design details of mechanical and electrical equipment in proper relation to physical spaces within the structure and incorporate minor changes of design or construction to suit actual conditions. Shop drawings review by Supervision Consultant is for general conformance only. The Contractor shall be solely responsible for interpretation and execution of such shop drawing documents.

H. Shop drawings shall be taken to mean the same as detail drawings, fabrication drawings, working drawings, erection drawings, assembly drawings, or any drawing required to supplement the design drawings and/or the Contractor's coordination drawings.

I. The Contractor shall submit shop drawings following the distribution of the signed coordination drawings.

J. All shop drawings shall bear the following certification:

"This drawing has been checked for completeness, accuracy, coordination, and compliance with the Contract Documents. All dimensions and field conditions have been verified.

Contractor's Representative Date"

K. Shop drawings should include a title box that indicates the Project Name, Project Location, revision number and date, drafter's signature, checker's signature, and drawing description, signed off for co-ordination by other contractors, all as per format established by the Design Consultant.

L. The shop drawings for concrete and structural steel and long delivery items shall be submitted in advance of the start of the fabrication. This requirement should allow sufficient time for review and any necessary revisions.

M. All shop drawings (for elements of work, such as, but not limited to, concrete and structural steel members and assemblies, curtain wall assemblies, stone works, finishes etc.) shall be stamped and approved for co-ordination by all other associated subcontractors prior to submission by the Contractor.

N. All shop drawings for Contractor designed work such as structural steel connections / details, curtain wall / cladding, stone works, etc., shall be stamped by licensed professional engineers performing the design and engineering.

O. Elevations of walls shall indicate all electrical, telephone and other outlets, switches, push buttons and any other accessories. The Contractor shall obtain the actual dimensions from related contractors.

P. The Contractor shall submit detailed floor and ceiling plans, along with elevation drawings of all walls and any associated special details in scale per ISO standards (1:20 minimum) for final acceptance of proposed work prior to proceeding with the installation. The drawings should indicate the locations where the Contractor's scope requires co-ordination with other contractors.

Q. The Contractor shall submit two (2) high quality reproducible drawings and three (3) prints of all A0 or A1 size drawings (scaleable). Additionally three (3) prints of A2 (A0-half size) or A1 full size (respectively) may be required to be provided for each discipline. One high quality reproducible drawing with the Supervision Consultant's review stamp shall be returned to the Contractor. The Contractor shall submit documents also in electronic format in CD's.

R. The Contractor shall submit three (3) copies of all A3 and smaller size drawings. One copy with the Supervision Consultant's review stamp shall be returned to the Contractor.

S. A consistent and logical numbering system has been used for design drawings and must be used for Contractor drawings and site drawings as directed by the Supervision Consultant.

The drawing number includes the AIA code that indicates the discipline and work category, the block code indicating geographical location, the level number, the serial number and the revision number.

T. Contractor shall be responsible for producing, updating and issuing a drawing index monthly to Supervision Consultant, in soft and hard copies. The format shall be approved by the Project Manager and the Supervision Consultant.

U. The Contractor shall be responsible for and shall pay for the preparation of all drawings necessary to provide those amplifications of drawings needed for completion of the construction.

1.7. PRODUCT DATA (CATALOGUES, BROCHURES, TECHNICAL DATA, ETC.)

A. Product Data: The term "Product Data" includes technical data which document the primary performance for each system and material component in the Work. Primary product data shall consist of a Material List, together with manufacturers' literature if any, which is necessary to clearly identify the primary function, quality and performance of the products. Product data shall be custom prepared for the project and made specific for the Work. Manufacturers' literature which does not document the primary performance characteristics shall be deemed to be supplementary data and "for information only".

1. Material List: With each submittal, furnish a Material List which stipulates the primary performance characteristics of the materials as required by the Contract Documents. Arrange the Material List in a vertical schedule format. Specifically identify materials by manufacturer's name, product name or model number, reference to applicable section of the technical Specifications and any related shop drawings, specific location(s) of use in the Work, and the primary performance characteristics.

B. The Contractor shall be responsible for the provision of all product data such as catalogues, brochures, and technical data or any other descriptive data required by the specification or the Supervision Consultant.

C. The Contractor shall submit three (3) sets of all product data such as catalogues, brochures, and technical data (in original). One set with the Supervision Consultant's review stamp shall be returned to the Contractor. The Contractor shall submit documents also in electronic format in CD's.

1.8. CALCULATIONS

A. The Contractor shall be responsible for any design or design calculations which may be specified, or required by the Supervision Consultant, in order to establish or demonstrate that his submittal conforms to the requirements of the Contract for quality, performance or in any other aspect.

1. Further, any design or engineering consultant employed by the Contractor shall possess a license to work in the Maldives; and five (5) year local experience. A proof of such credentials shall be submitted for Supervision Consultant's review. The calculations are required to be signed and sealed by the engineering consultant.

B. The Contractor shall provide for the design, engineering and calculations for temporary and permanent supports, miscellaneous bracing, scaffolding, props, temporary construction, leave-outs in structure, supports for construction equipment and machinery, including removal after permanent installation of the equipment if necessary. The design shall be carried out by licensed professional engineers.

C. The Contractor shall provide design and engineering for those works specified under performance- based specifications complying with stated requirements and as per established practices in the industry.

D. The Contractor shall provide for any design and engineering work associated with the builders' work and coordination with other contractors.

E. Submittals for Temporary Work: When specifically required by governing code or local authority, certain information relative to temporary construction systems, such as structural loading diagrams Including specific points of load application, shall be submitted by the Contractor for the Consultant's review. Each such submittal shall be prepared and sealed by the Contractor's qualified professional/structural engineer, who is registered in the Maldives. The Supervision Consultant's review will be limited solely to the effects of the temporary construction systems upon any permanent building component. The design, installation, use, and maintenance of such temporary construction systems are solely the responsibility of the Contractor

1.9. SAMPLES

A. Samples: The term "Samples" includes various natural materials, fabricated items, equipment, devices, appliances or components thereof, as may be required to verify visual appearance of such items for compliance with the Contract Documents.

B. Samples of all materials and workmanship proposed to be employed in the execution of the Works comprised in this Contract may be called for at any time by the Employer or the Project Manager or the Supervision Consultant and are to be furnished by the Contractor without delay.
The samples, when approved will be kept by the Employer. The Supervision Consultant will reject all materials or workmanship not corresponding in quality and character with the approved samples. Suitably labeled boxes for the storage of samples shall be provided by the Contractor without additional charge.

C. Samples of materials shall be furnished in manufacturer's standard containers bearing manufacturer's descriptive labels and printed application instructions. Samples not submitted in manufacturer's standard containers shall be furnished with manufacturer's descriptive labels and application instructions.

D. Samples shall be properly identified with Contractor's tag or sticker, as directed by the Supervision Consultant and submitted with approved transmittal form.

E. Samples for testing shall be taken at the place of origin, mixing plants or working site from the Works, as appropriate, and as required by the Project Manager or Supervision Consultant. After inspection/approval the sample shall be marked for identification as shall be required by the Project Manager or Supervision Consultant.

F. Samples shall be submitted in two (2) sets.

1.10. METHOD STATEMENTS

A. A Construction Method Statement is required to be submitted as a part of the Tender, to cover major aspects of construction. This shall encompass the Tenderer's management and implementation plan for the Works including but not limited to, organization, staffing, general approach to engineering, fabrication, installation, quality control, safety, schedule control, security, access control, site logistics, storage, distribution, methodology for fabrication and erection of Works with particular attention to special details, etc. The method Statement shall detail the sequence of operations and

strategy to be utilized in order to achieve completion within the Schedule. This shall address clearly all major components of the Tenderer's scope and this shall be used to demonstrate and evaluate the technical capabilities and expertise of the Tenderer.

B. Upon award of Contract, and prior to commencement of any work at Site whatsoever, the Contractor shall prepare and submit a more detailed method statement addressing all aspects of the work listed above. This shall be exhaustive and cover all major components of execution, all to the approval of the Supervision Consultant and/or Project Manager.

C. The Contractor shall not be permitted to commence the Site work until he has submitted all details regarding the execution of work as listed below. Particular attention shall be paid to coordination of the work with other contractors and subcontractors, quality, safety and schedule requirements in the preparation of the detailed method statement. The Method Statement shall be clearly titled, with revisions numbered and dated, the format for which shall be as approved by the Supervision Consultant and Project Manager.

D. The Contractor's Construction Method Statement, as a minimum, shall:
   1. Describe the management and implementation methods for the engineering, fabrication, transportation, Installation and testing of major materials.
   2. Describe the methods of construction.
   3. Identify specific coordination/interface requirements with other contractors' work.
   4. Address specific safety related precautions and measures proposed to be taken and describe emergency procedures.
   5. Address security procedures and access control.
   6. Identify the access routes and site logistics.
   7. Describe all temporary construction requirements including detailed locations of construction equipment, their capacities, clearances, etc. supplemented by relevant sketches.
   8. Identify areas for storage of materials and detail handling procedures.
   9. Identify existing services, structures, etc. in the proximity of works to be carried out and detail the methods of execution.
   10. Detail how the works are to be set-out.
   11. Describe the procedures for verification of construction and erection tolerances, and the stages at which checking of constructed works shall be done.
   12. Detail the proposed construction equipment and manpower to be utilized.
   13. Identify the person designated to be in-charge of the specific work being addressed.
   14. Include contingency plans to be implemented to mitigate the effects of risks which may occur.
   15. Make reference to the approved working drawings and materials.
   16. Include sufficient number of detailed sketches, diagrams, calculations, etc., to render the method statements easily comprehensible.
   17. Relate to the approved Construction Schedule activities.
   18. Provide details relating to how the LEED requirements of the Project are to be managed and monitored.

E. The Construction Method Statements shall be submitted to both the Supervision Consultant and the Project Manager for review and approval. The details such as site logistics, storage of materials, construction equipment and manpower, security, safety precautions, etc., shall be reviewed and approved by the Project Manager and all other details shall be reviewed and approved by the Supervision Consultant.

F. In addition to the above method statement, the Contractor shall submit for the review of the Supervision Consultant and the Project Manager, when requested, more detailed method statements for specific portions of the work not clearly identified previously.

G. In scheduling the Works, the Contractor shall allow a sufficient period for the review and approval of the Detailed Construction Method Statements.

H. The Contractor shall note that the methods proposed by the Contractor may not necessarily be approved in its entirety. Any modifications or changes suggested by the Project Manager and/or the Supervision Consultant shall be complied with, by the Contractor at no additional cost to the Employer.

1.11. OTHER SUBMITTALS

A. Supplementary Product Literature: Supplementary technical literature shall be used to document the characteristics of various building system components or products. Such literature may include manufacturer's catalogue information, product specifications, standard illustrations, diagrams, and standard details. The supplementary product literature shall describe physical characteristics such as size, weight, finish, material analysis, electrical requirements, and also furnish other information such as load tables, test results, and industry quality standards.

B. Certifications: Certified reports, prepared by the Contractor, verifying either
   1. Contractor's review of certain existing conditions and/or existing information prior to commencing with the next phase of construction work, or
   2. the chemical and physical properties of various building materials, as noted. Materials reports shall state compliance of each item with respect to the technical requirements of the Contract Documents.

C. Preconstruction Testing Reports: Technical reports, prepared by the Contractor, which record the results of the Contractor's testing of certain building systems, system components, and/or materials, as required by the Contract Documents, prior to the installation of such systems and products.

   The report shall state compliance with the technical requirements of the Contract Documents.

D. Quality Control Testing and Inspection Reports: Technical reports which have been made in summary of quality control tests and inspections as performed by the Contractor's agencies for the fabrication and installation of various materials and systems as required by the Contract Documents. Such reports shall clearly state conformance or non-conformance with the technical requirements of the Contract Documents, for each respective item which has been tested and inspected. (Refer Section 01450).

E. Warranties/Guaranties: Specific warranties and guaranties for system and materials components verifying the technical performance, as required by the Contract Documents, for the time durations noted.

F. Record Documents: Documents prepared by the Contractor recording the as-built conditions of the systems and/or materials, and specifically defining the variations from requirements of the Contract Documents, as described in Section 01780.

G. Operation & Maintenance Manuals: Manuals prepared by the Contractor, as described in Section 01780 and to be used by the Employer, for the Employer's maintenance and

operations of various building systems and/or components thereof resulting in the technical performance required by the Contract Documents.

H. Commissioning Reports: Technical testing and commissioning reports, prepared by the Contractor or independent testing agency, verifying that each component of the system, in each specific area served, has been tested and commissioned such as to obtain the technical performance required by the Contract Documents

1.12. ASSET DATABASE

A. The Contractor shall provide electronically a database of all materials, equipment, assemblies, products, etc., as a comprehensive data for maintaining a log of all assets. The format for the database shall be provided by the Project Manager or the Employer. The database shall contain the following information, as a minimum:

1. Asset Number
2. Description
3. Category
4. Make
5. Model
6. Serial Number
7. Asset location
8. Warranty period
9. Warranty end date
10. Warranty details
11. Reference to Spare parts list
12. Manufacturer's Name, Contact person, Address, Telephone, Fax & Email addresses
13. Vendor Name, Contact person, Address, Telephone, Fax & Email addresses
14. Local Agent Name, Contact person, Address, Telephone, Fax & Email addresses
15. Drawing reference
16. O & M Manual reference
17. Remarks

B. The asset information database shall be submitted monthly in soft and hard copy (as required) on a cumulative basis, i.e. updated database (that supersedes the earlier submission) shall be provided at the end of each month.

1.13. SUPERVISION CONSULTANTS REVIEW OF SHOP DRAWINGS, PRODUCT DATA, CALCULATIONS, SAMPLES & MOCK-UPS, CONSTRUCTION METHOD STATEMENTS, ETC.

A. Except for finish, color and other aesthetic matters left to the Supervision Consultant's decision by the Contract Documents, the Supervision Consultant's review of shop drawings, catalogues, samples, mock-ups and method statements submitted by the Contractor is only for general conformance with the design concept and information given in the Drawings and Specification. Such review shall not relieve the Contractor from responsibility for any deviations from the requirements of the Drawings and Specification.

B. Certain materials, products and equipment submittals are likely to be reviewed and approved by both the Supervision Consultant and the Employer. The Contractor will be instructed accordingly by the Project Manager and the Supervision Consultant. The Contractor shall present such materials and samples as required by the Employer for review. The Contractor shall make his submittals for such items with ample time for review of the Supervision Consultant and the Employer.

C. The Supervision Consultant's review and approval shall not be construed as a complete check nor shall it relieve the Contractor from responsibility for errors of any kind in shop drawings, method statements, or schedules, or from the necessity of furnishing any work

required by the Drawings and Specification, which may have been omitted on the shop drawings. The Supervision Consultant will review shop drawings and samples with promptness and will return them to the Contractor with the Supervision Consultant stamp applied thereto. No acceptance or approval of shop drawings or samples, nor any indication or request marked by the Employer or the Supervision Consultant on any shop drawing, catalogue, sample or mock-up shall constitute an authorization for any increase in the Contract Sum or Time for Completion.

D. Notations by the Supervision Consultant which may increase Contract Sum or Time for Completion shall be brought to the Project Manager's attention with adequate details and substantiation before proceeding with the works; otherwise any claim regarding this subject matter will not be considered. All specific information regarding cost and schedule impacts, if any, shall be provided at the time of notification. A general statement that there are cost and schedule implications shall not be admissible at any time and the Project Manager is not obligated to respond to such statements from the Contractor.

E. The Contractor shall indicate on resubmitted shop drawings or method statements or product data, all revisions not just those requested by the Employer and/or the Supervision Consultant and/or the Project Manager.

F. The Contractor shall remain responsible for any and all inaccuracies in the tabulation of quantities within the shop drawings and all such quantities shall correspond to the layout drawings submitted and shall be computed from the layout drawings using computer software programs. The review and approval of such submittals by the Supervision Consultant does not imply verification of quantities shown on drawings.

G. The shop drawings approved or otherwise, shall not be the basis for measurement of quantities for evaluation of cost variations, unless expressly agreed by the Project Manager.

H. Each submittal will be returned to the Contractor stamped or marked by the Supervision Consultant indicating the appropriate action as follows:

1. **"NO EXCEPTION TAKEN":** is indicated, the Contractor is advised that fabrication, manufacture or construction may proceed, providing it complies with the Contract Documents.
2. **"MAKE CORRECTIONS NOTED"** is indicated, the Contractor is advised that fabrication, manufacture or construction may proceed, providing it complies with the Employer's remarks and the Contract Documents.
3. Incomplete, inadequate, or incorrect submittal not complying with the requirements of the Contract shall require submission. For notification **"REVISE AND RESUBMIT"** or **"REJECTED"** the Contractor shall revise the submittal and resubmit to the Employer's Representative for review and comment. No portion of the Work requiring submission of a shop drawing, product data, or sample shall commence until the submittal has been reviewed and accepted by the Employer. All such portions of the Work shall be executed in accordance with accepted submittals.
4. The Contractor shall not execute any work on the basis of the submittal unless he obtains **"NO EXCEPTIONS TAKEN"** or "**MAKE CORRECTION NOTED"** remark from the Employer's Representatives.
5. The Contractor shall not proceed with the Work if submittals covering such work are returned **REJECTED** or **REVISE AND RESUBMIT.**
6. The Contractor bears full responsibility for the time and financial impact of the resubmittals on the execution of the Works arising from the rejection or

resubmission of inadequate, incorrect, incomplete or non-conforming to Contract submittals. Submittals returned with indication **"NO EXCEPTIONS TAKEN"** or "**MAKE CORRECTIONS NOTED"** shall not relieve the Contractor of his responsibilities stipulated by the Contract. The Contractor bears the responsibility for any errors, omissions, and deviations from the Contract unless such errors, omissions and deviations were specifically called to the attention of the Employer's Representative in the submittal.

I. The Contractor shall bear the cost of all reviews made by the Supervision Consultant/Employer/Project Manager for all submittals made after three (3) repeated reviews, unless they have been made due to reasons beyond the control of the Contractor.

J. Provide for a minimum of twenty-one (21) calendar days turn-around time for each submission for review by the Supervision Consultant. Provide a minimum of forty-five (45) days turn-around time for submittals requiring review by the Supervision Consultant and the Employer. After one re-submission, if the Contractor's submittal is not approved, the Contractor may request for a workshop session with the Supervision Consultant and if required, with the Project Manager, to discuss and resolve the issue in an expeditious manner.

1.14. ADDITIONAL REQUIREMENTS

A. The Contractor shall submit all his submittals such as shop drawings, coordination drawings, catalogues, brochures, technical data, calculations, samples, mock-ups, asset database, etc., at his own cost and in such sequence so as to cause no delay in the Works or in the work of other contractors or subcontractors. No extensions of time will be granted because of the Contractor's failure to have these submitted in ample time to allow for processing and review. Sub-contractors shall submit shop drawings, coordination drawings, catalogues, brochures, technical data, etc., through the Contractor. All submittals shall be sent to the Project Manager.

B. The Contractor shall be responsible for the correct location of his Works, irrespective of approval by the Supervision Consultant and shall pay all costs and expenses incurred by the Employer as a consequence of the improper location of his Works.

C. The Contractor shall be responsible for and shall pay (at no extra cost to the Employer) for any alterations to the Works due to discrepancies, errors or omissions in the drawings and other particulars supplied by him whether such drawings and particulars have been approved by the Supervision Consultant or not.

D. Following approval of the Supervision Consultant, the shop drawings and samples shall not be departed from unless modified by variation order as provided under the Conditions of Contract.

END OF SECTION 01330

Section 01400 – Quality Requirements

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. The sub-sections of Section 01400 contain descriptions and procedures related to the following:

1. Section 01410 - Regulatory Requirements
2. Section 01420 - References
3. Section 01430 - Quality Assurance
4. Section 01450 - Quality Control

END OF SECTION 01400

Section 01410 – Regulatory Requirements

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Information and requirements related to regulations, codes, standards and specifications that are to be confirmed.

1.2. BUILDING CODES

A. All references to codes, specification and standards referred to in the Drawings and Specification shall mean, and are intended to be, the latest edition, amendment or revision of such reference standard in effect as of the date of the Drawings and Specification. The Contractor shall provide a copy, on the request of the Project Manager and/or the Supervision Consultant, of the latest edition of all codes and standards.

B. The Works shall be designed and constructed in accordance with, but not limited to, the following Codes as identified in the relevant Specifications. Other codes, regulations and standards may be deemed applicable to the Works by the authorities having jurisdiction.
   1. Maldivian Standards
   2. International Organization for Standardization (ISO)
   3. British Standards (BS)
   4. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE)
   5. American Society for Testing and Materials (ASTM)
   6. National Fire Protection Association (NFPA)
   7. All local codes and Regulations

C. The standards and codes, in their latest edition unless specified otherwise, shall be applied to the works covered by this Specification. Where no such standard exists, as for example in the case of patents or special materials, all such materials and workmanship shall be of the best quality, and full details of the materials and any tests to which they are subjected shall be submitted to the Supervision Consultant for approval.

D. Where the standards and codes conflict within themselves and/or with local codes, the Contractor shall be obligated to bring it to the attention of the Supervision Consultant for a final resolution. The Contractor shall abide by the decision made by the Supervision Consultant at no additional cost.

1.3. TECHNICAL LITERATURE

A. The Contractor shall have a copy of the latest technical literature referenced in the Drawings and Specification kept on the Project Site and maintained in good order and available to the Employer, the Project Manager and the Supervision Consultant at all times.

END OF SECTION 01410

Section 01420 – References

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Abbreviations and acronyms.

1.2. ABBREVIATIONS AND SYMBOLS

A. Following are abbreviations and codes that may have been used in the Specification and Drawings.

AA	Aluminum Association
AAMA	Architectural Aluminum Manufacturers Association
AAN	American Association of Nurserymen
AASHTO	American Association of State Highway and Transportation Officials
ABMA	American Boiler Manufacturers Association
ACI	American Concrete Institute
ACRI	Air Conditioning and Refrigeration Institute
ADC	Air Diffusion Council
AEIC	Association of Edison Illuminating Companies
AFI	Air Filter Institute
AGA	American Gas Association
AGCA	Associated General Contractors of America, Inc.
AGMA	American Gear Manufacturers Association
AIA	American Institute of Architects
A.I.A	American Insurance Association
AIMA	Acoustical and Insulating Materials Association
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction
ALS	American Lumber Standards
AMCA	Air Moving and Conditioning Association
ANSI	American National Standards Institute, Inc.
APA	The Engineering Wood Association (formerly American Plywood Association)
API	American Petroleum Institute
AREA	American Railway Engineering Association
ARI	Air Conditioning and Refrigeration Institute
ASA	American Standards Association
ASAHC	American Society of Architectural Hardware Consultants
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
ATI	Asphalt Tile Institute
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWPI	American Wood Preservers Institute
AWS	American Welding Society
AWWA	American Waterworks Association
BHMA	Builders Hardware Manufacturers Association
BIA	Brick Institute of America
BRI	Building Research Institute British
BSI	Standards Institution British

BSS	Standard Specification British
BSCP	Standard Code of Practice
CABRA	Copper and Brass Research Association
CAGI	Compressed Air and Gas Institute
CD	Civil Defense
CDA	Copper Development Association
CE	Corps of Engineers (USA Army)
CIBSE	Chartered Institute of Building Services Engineers
CISPI	Cast Iron Soil Pipe Institute
CP	Concrete Reinforcing Steel Institute Code of Practice
CS	Commercial Standards issued by the U.S. Dept. of Commerce
CSA	Canadian Standards Association
CSI	Construction Specifications Institute (USA)
CTI	Cooling Tower Institute
dB	Decibels
DCA	Department of Civil Aviation
DFPA	Douglas Fir Plywood Association
EC	Electrical Code (Canadian and / or American)
EIA	Electronic Industries Association
ES	European Standards
ETL	Electrical Testing Laboratories
FGMA	Flat Glass Marketing Association
FAA	Federal Aviation Administration
FHA	Federal Housing Administration
FIA	Factory Insurance Association
FM	Factory Mutual Engineering Division Association of Factory Mutual Fire Insurance Companies
FPL	Forest Products Laboratories
FS	Federal Specifications
FSIWA	Federation of Sewage and Industrial Waste Association
FTI	Facing Tile Institute
GA	Gypsum Association
GANA	Glazing Association of North America (formerly Flat Glass Marketing Association)
GTA	Glass Tempering Association
HI	Hydronics Institute Incorporated
HI.	Hydraulic Institute
HPMA	Hardwood Plywood Manufacturers Association
HVCA	Heating & Ventilating Contractors Association
Hr	Hour
IAPMO	International Association of Plumbing & Mechanical Officials
IBC	International Building Code
IBRM	Institute of Boiler and Radiator Manufacturers
ICAO	International Civil Aviation Organization
ICC	International Code Council
IEC	International Electro Technical Commission
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society
IGCC	Insulation Glass Certification Council
IMechE	Institute of Mechanical Engineers
IP	Institute of Plumbing
IPCEA	Insulated Power Cable Engineers Association
IPHE	Institute of Public Health Engineers
INSTR	Institute of Refrigeration

IRI	Industrial Risk Insurers
ISO	International Organization for Standardization
JAN	Joint Army-Navy Specifications
Kg	Kilogram
kW	kilo-watt
L	Litre
m	metre
m2	square metre
m3	cubic metre
MAC	Masonry Advisory Council
MIA	Marble Institute of America
MLMA	Metal Lath Manufacturers Association
mm2	square millimetre
Mo.	Month
MS	Military Specifications
MSS	Manufacturers Standardization Society of the Valves and Fittings Industries
MSTD	Military Standard
NAAMM	National Association of Architectural Metal Manufacturers
NACE	International (formerly National Association of Corrosion Engineers)
NAEC	National Association of Elevator Contractors
NAFM	National Association of Fan Manufacturers
NAPM	National Association of Plastic Manufacturers
NBCC	National Building Code of Canada
NBGQA	National Building Granite Quarries Association
NBHA	National Builders Hardware Association
NBS	National Bureau of Standards
NCMA	National Concrete Masonry Association
NEC	National Electric Code (NFPA Pamphlet No. 70)
NELMA	Northeastern Lumber Manufacturers Association, Inc.
NEMA	National Electric Manufacturers Association
NEMI	National Elevator Manufacturing Industry, Inc.
NFC	National Fire Code
NFPA	National Fire Protection Association
N.F.P.A	National Forest Products Association
NHLA	National Hardwood Lumber Association
NHPMA	Northern Hardwood and Pine Manufacturers Association
No.	Number
NOTAM	Notice to Airmen
NPA	National Particleboard Association
NPCA	National Paint and Coatings Association
NRMCA	National Ready Mixed Concrete Association
NSC	National Safety Council
NSF	National Sanitation Foundation
NSSEA	National School Supplies and Equipment Association
NTIS	National Technical Information Service (US Department of Commerce)
NTMA	The National Terrazzo and Mosaic Association, Inc.
NWMA	National Woodwork Manufacturers Association
OSHA	Occupational Safety and Health Administration (USA)
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute
PDI	Plumbing & Drainage Institutes
PEI	Porcelain Enamel Institute, Inc.
PM	Project Manager

PS	Product Standard, U. S. Department of Commerce
RIS	Redwood Inspection Service
RTI	Resilient Tile Institute
s	Second
SA	Standards Australia (Standards Association of Australia)
SAE	Society of Automotive Engineers
SAHM	Sahm Technologies
SBI	Steel Boiler Institute
SCMA	Southern Cypress Manufacturers Association
SDI	Steel Deck Institute
S.D.I	Steel Door Institute
SIGMA	Sealed Insulating Glass Manufacturers Association
SJI	Steel Joist Institute
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SMFMA	Sprayed Mineral Fiber Manufacturers Association, Inc.
SPIB	Southern Pine Inspection Bureau
SPR	Simplified Practice Recommendations, U. S. Department of Commerce
SSPC	Steel Structures Painting Council
SWFPA	Structural Wood Fiber Products Association
TCA	Tile Council of America
TIMA	Thermal Insulation Manufacturers Association
TEMA	Tubular Exchange Manufacturing Association
t	tonne (metric)
TPI	Truss Plate Institute
TR	Ton of refrigeration
UBC	Uniform Building Code
UL	Underwriter's Laboratories, Inc., USA
ULC	Underwriter’s Laboratories of Canada
UPC	Uniform Plumbing Code
USAS	United States of America Standards Institutes
USCGS	US Coast and Geodesic Survey
USGBC	United States Green Building Council
WCLIB	West Coast Lumber Inspection Bureau
WDMA	Window and Door Manufacturers Association (formerly NWWDA)
WRI	Wire Reinforcement Institute
WWPA	Western Wood Products Association

B. Abbreviations occurring in the Drawings, Specification and Schedules are defined in Specifications and/or Drawings included in the Contract documents.

C. The above is not an exhaustive listing of abbreviations used in the Contract Documents. The Contractor shall query any abbreviation or acronym used in the Contract documents, if Its explanation is not found in this Section or in any other documents forming part of the Contract or if there is any conflict in the use of an acronym or abbreviation.

END OF SECTION 01420

Section 01430 – Quality Assurance

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Procedures for Contractor's Quality Management, Quality Planning and Quality Assurance requirements for implementing Quality Control on Site.

1.2. QUALITY MANAGEMENT

A. The Contractor's Quality Management Plan shall include all activities of the overall management function that determine the quality policy, objectives, and responsibilities and implements them by means of quality planning, quality assurance, quality control and quality improvement, within the quality system.

1.3. QUALITY PLANNING AND ASSURANCE

A. The Contractor's Quality planning shall identify the quality standards that are relevant to the Project and determine the ways to satisfy them. The Quality planning shall identify the inspection and testing needs of materials and construction.

B. The Contractor's Quality Assurance shall enable evaluation of the overall performance on a regular basis.

1.4. CONTRACTOR'S QUALITY MANAGEMENT PLAN

A. The Contractor shall establish a Project specific Quality Management Plan based on proven systems and standard procedures in conformance with ISO 9001 requirements.

B. The Contractor shall furnish to the Project Manager and the Supervision Consultant as soon as practicable and in no event later than fifteen (15) days after receiving the Letter of Acceptance, a Project specific Quality Management plan which shall include the procedures, instructions, and records to be used.

C. Prior to submittal of the Quality Management plan for acceptance, the Contractor shall meet with the Supervision Consultant and the Project Manager to discuss the Quality system. The meeting shall develop mutual understanding relative to details of the system, including the forms to be used for recording the QC operations, inspection, administration of the system, and the interrelationship of Contractor and Supervision Consultant's inspection.

D. The Contractor's Quality Management Plan shall include the following:
   1. Introduction addressing the Quality statement, policy, scope, purpose, references, definitions, etc.
   2. Contractor's organization and responsibilities. Specific QA/QC organization relating to the Project.
   3. Project specific Quality Planning, Assurance and Control.
   4. The ISO 9001:2000 - 20 point Project Quality System requirements.

E. The elaborated Project Quality System requirements shall include as a minimum, the following:
   1. The QA/QC organization and qualification requirements of personnel.
   2. Authority and area of responsibilities of the Contractor's personnel.
   3. Plan for accomplishing Quality Control inspections including that for his subcontractor's work. (How, what, where, when and why).
   4. Detailed listing and designation of all tests to be performed, list of Inspection and Test Plans to be generated to cover all inspection and test activities. (Include specimens of inspection and test formats). The Supervision Consultant will

indicate which tests may be performed by technicians employed by the Contractor and those that must be performed by an approved independent testing laboratory.

5. Documentation procedures for Quality Control operations, inspections and testing.
6. A copy of a letter of direction to each Contractor's representative responsible for QA/QC, outlining his duties and responsibilities and signed by a responsible officer of the Contractor.
7. A narrative discussion of how the Contractor's QA/QC staff will accomplish their assigned tasks.
8. An explanation as to how the Contractor's QA/QC Plan relates to other staff elements with regards to the shop drawing submittals, as-built drawings, revisions to the Contract.

F. Subcontractors shall not have a separate Project quality plan. The Contractor shall include any specific requirement of his subcontractor in his QA/QC Plan. In doing so, the Contractor shall ensure that he fully coordinates with his subcontractors.

G. Construction operations will not commence until the Quality Management plan has been accepted by the Project Manager and the Supervision Consultant. However, at the instruction of The Supervision Consultant and/or the Project Manager, the Contractor may be allowed to proceed on a specific phase of construction for which the plan has been submitted and accepted.

H. Not Used.

I. The Contractor's staff shall be sufficiently staffed to perform the following tasks:
   1. Prepare detailed inspection and test plans for approval of Supervision Consultant.
   2. Conduct phased inspections (preparatory, initial and follow-up) and approve inspection and test plans.
   3. Perform all testing required under the technical paragraph CQC reports explained in section 01450.
   4. Review and approve all shop drawings and submittals.
   5. Inspect materials as they are delivered on site to insure compliance with approved shop drawings and Contract Specification.
   6. Conduct off-site Inspections of supply items fabricated or assembled and services to be incorporated into the work. Provide monthly report of off-site QC activities. The Contractor's QC representative at the fabricating plant shall be responsible for the release of the fabricated items for shipment to the job site.
   7. Maintain record of all QC activities. These records shall be available for the Project Manager's and Supervision Consultant's use.

1.5. QUALITY ASSURANCE – REVIEWS AND AUDITS

A. The Contractor shall establish processes for Quality reviews and audits.

B. Not Used

C. The Contractor shall arrange and perform internal quality audits within their organization at regular period and copies of such audit results shall be forwarded to the Supervision Consultant and the Project Manager for information. The internal audits shall be performed by the Contractor's trained in-house personnel, not forming part of the Site organization that is involved in the Project.

1.6. QA / QC ORGANIZATION AND PERSONNEL

A. The Contractor shall have a QA/QC Manager who shall have an experience of at least fifteen (15) years in the field.

B. The QA/QC Manager shall as a minimum be a qualified engineer with additional qualifications and training pertaining to Quality Management.

C. The Contractor's QA/QC Manager shall have prior approval of the Project Manager and the Supervision Consultant.

D. The QA/QC Manager shall report directly to the Contractor's top management in Dubai and in no case come under the hierarchy of the Contractor's Project Manager's team.

E. The team of QA/QC personnel under the QA/QC Manager shall not report to the Contractor's Project Manager.

F. The Project Manager and Supervision Consultant have the authority to ask the Contractor to remove any staff in the Contractor's QA/QC team if in the opinion of the Project Manager and/or the Supervision Consultant the performance of the said staff is not satisfactory. The replacement of such staff shall take place within ten (10) days of the Project Manager and/or Supervision Consultant's notice.

G. No staff shall be changed without the Project Manager's written consent. The Contractor's and sub-contractor senior site Staff shall be fluent in technical English.

H. The Contractor shall have the full responsibility to ensure implementation of his subcontractors' Quality Management system.

I. The QA/QC personnel employed by the subcontractors to the Contractor shall not communicate directly with the Project Manager and / or the Supervision Consultant.

J. The QA/QC teams of the subcontractors shall perform their functions directly under the authority of the Contractor's QA/QC Manager.

K. No QA/QC personnel, either of the Contractor or his subcontractors shall take any direction from the Contractor's Site team that works under the authority of the Contractor's Project Manager.

END OF SECTION 01430

Section 01450 – Quality Control

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Contractor's quality control, inspection and testing requirements.

1.2. GENERAL

A. The Contractor's Quality Control Resources shall commensurate with the requirements of the Project at any time, including provision for necessary mitigation measures to counter own delays to any direct/subcontract activity. The Contractor shall retain overall responsibility for this important coordination and shall be deemed to have allowed for this in his Accepted Contract Amount.

B. The Contractor shall ensure that all technical documentation are properly produced, reviewed, controlled and submitted in accordance with the Project specific requirements.

C. The Contractor shall ensure that the work is completed in accordance with the quality requirement and in a safe manner.

D. The Contractor shall provide, in a timely manner, access to the inspection area, instruments to carry out the tests, etc., for inspection of works, as well as copies of relevant submittals and shop drawings, to the Supervision Consultant and/or Project Manager.

E. The Contractor shall perform re-testing of materials or system where tests do not meet the project specification. Any re-testing shall be done by the Contractor at no additional cost to the Employer and any time lost shall be mitigated at his own cost.

F. The Contractor shall arrange for internal and external training as required for their staff to carry out the individual's scope of works to meet the quality standards required on this Project.

G. The Contractor shall provide for quality control by the employment of skilled and competent management, supervisors and operatives. Only fully compliant work shall be offered for inspection unless prior written (specific) approval of the Project Manager and/or the Supervision Consultant has been obtained and in all such cases, relevant documentation shall be presented during those inspections.

1.3. CONTRACTOR QUALITY CONTROL

A. The Contractor shall provide and maintain an effective Quality Control system that complies with the Conditions of Contract and as further described herein. The Contractor shall be responsible for ensuring that his subcontractors and suppliers conform to the quality requirements as provided in the Contract Documents.

B. The Contractor shall establish a "Quality Control" (hereinafter referred to as QC) system to perform sufficient inspection and tests of all items of work, including that of his Sub-contractors, to ensure construction, finish, functional performance, and identification. This control shall be established for all construction work performed pursuant to the Contract except where the technical provisions of the Contract provide for specific control by inspections, test, or other means. The "Contractor's Quality Control" (hereinafter referred to as CQC) system shall specifically include the surveillance and tests required in the technical provisions of the Specification.

C. The CQC system is the means by which the Contractor assures himself that his construction complies with the requirements of the Drawings and Specification. The

controls shall include as a minimum at least three phases of inspection for all definable phases of construction as follows:

1. Preparatory Inspection: This inspection shall be performed prior to beginning any work on any definable phase of construction and as shown in the Contractor's schedule. It shall include a review of Contract requirements; a check to assure that all materials and/or equipment have been tested, submitted, and approved; a check to assure that provisions have been made to provide required control testing; and plan mock ups when appropriate; examination of work area to ascertain that all preliminary work has been completed; and a physical examination of materials and equipment to assure that they conform to approved shop drawings or submittal data and that all materials and/or equipment are on hand. The Supervision Consultant's representative shall be notified at least twenty four (24) hours in advance of the preparatory inspections and such inspections shall be made a matter of record in the CQC documentation as required by paragraph hereinafter in this section, entitled CQC reports.
2. Initial Inspection: This inspection shall be performed as shown in the Contractor's Schedule and as soon as a representative portion of the particular phase of construction has been accomplished and shall establish the acceptable standard of workmanship, including a review of control testing for compliance with Contract requirements, review of mock up, use of defective or damaged materials, omissions, and dimensional requirements. The Supervision Consultant's representative shall be notified at least twelve (12) hours in advance of the initial inspection and such inspection shall be made a matter of record in the CQC documentation as required by paragraph CQC Reports of this section.
3. Follow-up inspections: These inspections shall be Performed daily to assure continuing compliance with contract requirements, including control testing, until completion of the particular phase of construction. The Contractor shall give a notice period of at least twelve (12) hours in advance of each inspection. Such inspections shall be made a matter of record in the CQC documentation as required by paragraph CQC Reports of this section.

D. The Contractor shall give not less than one (1) working day notice to the Supervision Consultant before covering up any works.

E. The Contractor shall, within fourteen (14) days of Letter of Acceptance, report to the Consultants, the names and qualifications of the QA/QC representative. The named personnel shall prepare the QC program and remain as the basis of the QC staff until a QC program has been submitted and accepted.

F. If at any time during the life of the Contract the Project Manager or Supervision Consultant determines the CQC staff is not capable of performing all the tasks listed above, the Project Manager may direct the Contractor to revise and/or supplement the present organization structure at no additional cost to the Employer.

G. The Contractor shall not remove or relocate key CQC staff either within the Site or to somewhere else, without the express approval of the Supervision Consultant.

H. CQC Reports: The Contractor shall submit monthly QC report in triplicate not later than the end of the following Saturday. The report shall contain a record of inspections and tests for all work accomplished subsequent to the previous report and shall include the following information:

1. Phase(s) of construction underway during the time frame of the report (i.e. earthwork, concrete work, structural steel erection, etc.).

2. Phase inspection (preparatory, initial, or follow-up), phase of construction and location of inspections and/or tests that were made.
3. Results of inspection, including nature of deficiencies observed and corrective actions taken or to be taken.
4. Report of tests performed, including those specified, with the results of the tests, including failures and remedial action to be taken. Test results, including all computations shall be attached to the report form. Where test results cannot be completed by the time the report is submitted, a notation shall be made that the test was performed and the approximate date test results will be available. Delayed test results shall be submitted with the report form on the date received.
5. Results of inspection of materials and equipment upon arrival at the Site and prior to incorporation into the work for compliance with submittal approvals, damage and proper storage.
6. Instructions received from the Supervision Consultant's representative or inspector.
7. In all cases, the report must be verified and signed by the one person delegated this responsibility by the Contractor. The verification is to contain the statement that all supplies and materials incorporated in the work are in compliance with the terms of the Contract except as noted.

I. The Contractor shall establish and maintain Quality records filing system, which shall include, but not limited to the following:
   1. Quality Control Plan
   2. Inspection and Test Plans
   3. Work and Material Inspection records
   4. Test certificates, Mill certificates, Calibration certificates etc.
   5. Concrete records, reinforcement records and structural steel erection records.
   6. Non-conformance reports, daily QC reports
   7. Training records, on or off Site inspection records etc.

J. Not used

K. The Supervision Consultant or Project Manager reserves the right to utilize the Contractor's control testing laboratory and equipment to make spot tests and to check the Contractor's testing procedures, techniques, and test results at no additional cost to the Employer.

L. If recurring deficiencies indicate that the CQC system, personnel, inspections, tests and/or records are not providing adequate control, the Contractor shall take corrective action as deemed necessary and directed by the Project Manager or Supervision Consultant. The Contractor shall, after receipt of such notice, immediately take corrective action.

M. The Contractor shall notify the Supervision Consultant in writing of any proposed change to the CQC system. No such change shall be implemented prior to concurrence in writing by the Supervision Consultant.

1.4. LATEST DOCUMENTS

A. The CQC program shall provide for procedures, which will ensure that the applicable portions of the Contract (and any variations thereto made in accordance with the Conditions of Contract) and the latest and approved shop drawings and samples are used for fabrication.

1.5. TESTING AND INSPECTION DEVICES

A. All measuring and testing devices shall be Calibrated periodically against certified standard equipment. Copies of certified calibration reports issued by relevant authorities / agencies shall be available for review by the Supervision Consultant.

1.6. TEST METHODS

A. The tests shall include typical, routine and sample tests specified in the necessary local or International Standards relating thereto and those corresponding to any special requirements or change contained in the Specification. In addition, the Supervision Consultant may direct special tests to be made to prove that the equipment and materials supplied comply with the Specification. The methods of tests for equipment and materials not covered by a recognized standard and for which tests have not been specified herein, shall be as directed by the Supervision Consultant.

B. Materials shall be tested before leaving the manufacturer's premises as well as after delivery on the Works and the Supervision Consultant shall be at liberty to reject materials after delivery notwithstanding the preliminary test at the manufacturer's premises.

C. Should the Supervision Consultant and/or the Project Manager decide not to send an inspector to the manufacturer's Works, the Contractor shall obtain from the manufacturer certificates of test, etc., showing that the materials have been tested in accordance with the requirements of the Specification, but the omission of the Supervision Consultant and/or the Project Manager to send an inspector nor the submission of manufacturer's certificates of test as aforesaid shall not relieve the Contractor from his contractual responsibilities and commitments or shall affect the right of the Employer or the Project Manager or the Supervision Consultant to reject after delivery, materials found to be not suitable or not in accordance with the Specification. The Contractor shall meet all expenses in connection with the testing and inspection.

D. DEFINITIONS All references to:
   1. "Tests" shall also refer to the inspection and selection of samples.
   2. "Point of manufacture" shall include the point of origin or supply.
   3. "Samples" shall include mock-ups.

1.7. PROJECT SITE SAMPLES AND MOCK-UPS

A. Erect on the Site, sample of work as directed by the Supervision Consultant. If accepted, such sample may be incorporated in and made part of the Work. See Specification sections for each trade for detailed list of Site samples required for the Project.

B. Prepare mock-up works as required by different Sections of the Specifications. Remove mock-up not suitable to be incorporated in work as and when directed by the Supervision Consultant and/or Project Manager.

C. The Contractor shall initiate mock-ups for typical installations for acceptance of visual and/or performance parameters prior to progressing with such installations in other areas. These mock-ups are intended to establish quality benchmarks, minimize abortive work and resolve coordination issues. The installation of mock-ups shall supplement the shop drawing and coordination drawing requirements and precede the continuous progress of such installations. Such mock-ups can be instructed by the Supervision Consultant or the Project Manager during the course of work progress, for which no additional cost shall be payable to the Contractor

1.8. CONTRACTOR'S ASSISTANCE TO EMPLOYER

A. Assistance for Employer's Testing Laboratory: The Employer may engage, at its own expense, qualified testing laboratories to monitor the Contractor's Quality Control Program. The activities of the Employer's testing laboratories are solely at the discretion of the Employer and in no way relieve the Contractor of sole responsibility for maintaining the Quality Control Program. The Employer's testing laboratories will perform independent inspections and tests, interpret and evaluate the results for compliance with the Contract Documents, record observations and submit reports. The Contractor is responsible for the following items.
   1. Notify the Employer's Testing Laboratory and the Consultant at least one (1) day in advance before installing Work to be tested.
   2. Furnish casual labor required to facilitate testing
   3. Furnish material samples and access materials as required for testing
   4. Furnish storage facilities for material test samples
   5. Furnish full and ample means of assistance for monitoring the Contractor's Quality Control

1.9. MANUFACTURER'S REVIEW

A. Contractor and Installer shall review the Consultant's Drawings and Specifications, the shop drawings, and product data, with qualified representative(s) of the materials manufacturers for the projects and systems to be used in the Works. The review of the documents and conditions shall confirm that all of the parties are in agreement the selected materials and systems are proper and adequate for the applications shown, especially with respect to compatibility with adjacent systems and materials.

END OF SECTION 01450

Section 01500 – Temporary Facilities and Controls

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. This section and sub-sections detail requirements for installation, maintenance and removal of temporary utilities, controls, facilities, construction aids, barriers, security measures, access, etc., during construction.

B. The sub-sections of Section 01500 contain descriptions and procedures related to the following:

1. Section 01510 - Temporary Utilities
2. Section 01520 - Construction Facilities
3. Section 01540 - Construction Aids
4. Section 01545 - Scaffolding
5. Section 01550 - Vehicular Access and Parking
6. Section 01560 - Temporary Barriers and Enclosures
7. Section 01570 - Temporary Controls
8. Section 01580 - Project Identification
9. Division 15 - Mechanical systems
10. Division 16 - Electrical systems

1.2. RESPONSIBILITIES

A. Unless specifically indicated otherwise, the Contractor shall provide temporary facilities, utilities and controls as necessary to support the construction process that are not an integral part of the final construction. The scope of works to be performed consists of all engineering, drawings, materials, labor, supervision, maintenance and services necessary for the installation of temporary facilities and controls for the Project as per specifications and drawings, in compliance with the requirements of the Contract Documents. As a minimum, the facilities thus provided shall be as specified herein.

B. Any subcontractor requiring any of the temporary services, before it can be made available, if indicated herein as being provided by others, shall provide such service suitable to his needs, at his own expense, and in a manner satisfactory to the Project Manager.

C. The Contractor shall be responsible for temporary drainage measures and shall employ adequate equipment such as skimmers, trash pumps, vacuum cleaners, and/or other necessary elements as required to afford satisfactory working conditions for the execution and completion of the Project. Each contractor shall be responsible to install all work in a fashion to prevent water to pass through from floor to floor; as an example, permanent and temporary piping or items such as concrete pump line shall be installed in extended steel sleeves. In addition, each contractor shall avoid at all times operations that cause water flow into the Project excavation. The Contractor shall assure himself that equipment to handle emergencies is available for his use when required.

D. The Contractor shall submit shop drawings and calculations performed by licensed professional engineers for all temporary services and utilities in his scope of work to the Supervision Consultant and Project Manager for approval within 45 days from date of award.

E. The Contractor shall prepare and submit to the Project Manager for his approval a site layout organization plan showing the Contractor's proposed layout of the facilities on the Site (including all subcontractors' facilities) and shall resubmit the plan, if necessary, to

show any subsequent modifications to the layout. Space available for the Contractor's Site facilities will be determined by the Project Manager.

1. The plan shall provide clear and complete details of location, capacity etc., for the temporary facilities including Site office accommodation, plant, temporary utilities, sanitary facilities, materials storage areas fabrication/assembly yards and access routes.
2. The above information shall be submitted within fourteen (14) days of receiving the Letter of Acceptance.

F. Relocation of Temporary facilities, utilities and controls: The Contractor shall be responsible for the relocation necessitated by ongoing construction and eventual removal of the temporary facilities installed by him, as required, at no additional cost.

G. Maintenance of Temporary facilities, utilities and controls: The Contractor shall maintain all temporary works as long as needed for the safe and proper execution of the work, not limited to the duration of the Contract, or until such time that the permanent facilities can support the remaining construction work or where the removal of temporary facilities is required to complete the permanent work, all as approved by the Project Manager.

H. Removal of Temporary facilities, utilities and controls: Unless otherwise indicated, the contractor installing the temporary works shall remove all such temporary facilities, utilities and controls as soon as possible after the completion of the permanent work or as directed by the Project Manager.

I. Should a change in the location of any temporary facility herein specified become necessary in order to progress the work properly, each contractor charged with the responsibility for such work shall remove and relocate such items as directed without additional cost to the Employer. The decision of the Project Manager in this regard is final.

J. If the foundations, base pads, anchorage, service trenches, cabling, bolts and the like installed by the Contractor need to be removed (if required, as per on-site conditions and as directed by the Project Manager), then the Contractor shall remove the same to the satisfaction of the Project Manager at no extra cost to the Contract.

K. The Contractor is responsible to insure all temporary facilities and utilities, applicable in this Section 01500 and all its sub-sections, to the requirements of the Contract and in conformance to local regulations.

1.3. RELATED WORK

A. All clauses and articles in this Section are particularly applicable for all sub-sections of Section 01500. Discrepancies, if any, between the various sub-sections to this Section shall be brought to the attention of the Project Manager at the time of tender. The Project Manager shall be sole judge in case of discrepancies and/or interpretations in this Section and its sub-sections.

B. Documents affecting the work of this section include, but are not necessarily limited to, the Conditions of Contract and other sections in Division 01 of these requirements.

C. The equipment and facilities employed by the Contractor for the temporary construction facilities shall comply with pertinent local safety regulations and Project Safety procedures.

D. The Contractor shall refer to the project specifications for different works and materials such as concrete, steel, mechanical and electrical systems.

E. The Contractor shall also refer to the following documents and conform compliance:
   1. Local Authority Standards
   2. Local Authority Rules and Regulations
   3. Occupational Safety and Health Administration (OSHA)
   4. Section 01735 – Safety
   5. Section 01400 – Quality Requirements
   6. National Fire Protection Agency (NFPA)
   7. British Standard IEE Regulations B.S.7671 1992 Section 604 "Construction Site Installation."
   8. British Standard Code of Practice for distribution of electricity on construction and building sites (B.S.7375)
   9. Applicable codes of good practice

1.4. REQUIREMENTS OF REGULATORY AGENCIES

A. Provide and maintain all temporary facilities in strict accordance with governing rules, regulations, codes, ordinances and laws of agencies and utility companies, and authorities having jurisdiction over work involved in the project.

B. The Contractor shall provide and be responsible for all temporary work provided, and at his own cost, obtain necessary permits and inspections for such work for authorities having jurisdiction.

C. Do not interfere with normal use of roads and highways in the vicinity of Project Site except as Indicated or as absolutely necessary to execute required work, and then only after proper arrangements have been made with authorities having jurisdiction, including traffic control as applicable.

1.5. SPECIAL PRECAUTIONS AND REQUIREMENTS

A. The Contractor is responsible, in the performance of his work, for protection of existing active utility services or utility lines installed under other phases, including both permanent and temporary systems.

B. Notification of any proposed interruption of services must be made two (2) weeks in advance, to the Project Manager. Accidental interruptions of services shall be reported to the Project Manager immediately. Any contractor causing any interruption shall be responsible to take all necessary action to restore the utility on an emergency basis including work on a twenty four (24) hour basis.

C. Specific obligations for protection requirements of the Contractor are as follows:
   1. Protection of Works throughout the Contract period
   2. Protection of work of others adjacent below and above during construction
   3. Protection of own personnel and other personnel working below
   4. Protection of own plant, equipment and tools
   5. Protection of existing facilities and personnel

1.6. USE OF PERMANENT SYSTEMS

A. When the permanent systems are in operating condition, they may be used during the construction period provided that the Contractor
   1. Obtains the approval of the Employer through the Project Manager
   2. Assumes the responsibility for each entire system the Contractor will be using
   3. Thoroughly cleans the entire system prior to final acceptance of the Works.

END OF SECTION 01500

Section 01510 – Temporary Utilities

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. General requirements and specifications for the supply, installation, operation, maintenance and removal of temporary utilities.

B. The temporary utilities covered in this section include electric power, lighting, telephone, water, drainage, fire protection and ventilation and air conditioning.

1.2. SUMMARY

A. Not Used.

B. Temporary Power and Lighting Requirements: Unless Specifically indicated otherwise, the Contractor shall provide temporary power and lighting in all areas of work during construction, installation, testing and commissioning, including any additional requirements as deemed necessary, as directed by the Project Manager. Each contractor is responsible for his electrical requirements within his office/facilities.

C. Temporary I.T. / Telephone / Data Requirements: Unless specifically indicated otherwise, the Contractor shall provide IT/telephone/data services, as detailed in this document. Each contractor is responsible for his own requirements within his office/facilities.

D. Temporary Fire Alarm Requirements: Unless specifically indicated otherwise, the Contractor shall be responsible for fire alarm system during construction.

E. Not Used

F. Potable water for all contractors' personnel: Unless specifically indicated otherwise, the Contractor shall provide adequate provisions for potable water for all contractors and subcontractors' personnel. The Contractor shall provide coolers in convenient locations and maintained clean.

G. Fire Protection: Unless specifically indicated otherwise, the Contractor shall provide any and all services and equipment for full and proper fire-protection during execution of the Works. Additional fire protection for specific requirements and locations of each contractor and/or subcontractor shall be provided by the contractor requiring the fire protection.

H. Tools: Each contractor and/or subcontractor shall provide his own tools as appropriate to perform his Works.
   1. Each contractor's tools must use grounding system or be double insulated and compatible with the system being used. Where temporary power is difficult to achieve or where associated power leads may cause safety hazards the contractors shall use portable battery operated tools.
   2. Each contractor shall use only those tools that are suitable for their purpose. All tools shall be fully tested prior to use and at routine intervals. Logs of the tool tests shall be kept on Site and be available for inspection.

I. The Contractor shall include for the applications, related fees, deposits, etc., payable to the appropriate authorities for all utilities; for obtaining the connections for all temporary utilities for construction.

1.3. GENERAL REQUIREMENTS

A. Temporary work shall be installed in such a manner as not to interfere with permanent construction. If such interference does occur, it will be the responsibility of each contractor to make such changes as may be required to overcome the interference. The cost of these changes will be included as part of the Accepted Contract Amount.

B. The Contractor shall provide any temporary holes or sleeves required to install the temporary utilities and shall be responsible to fill the same upon removal of utilities.

C. The temporary facilities for construction purposes shall comply with all local authority requirements. Each contractor installing temporary facilities shall obtain and pay for any required permits or inspections pertaining to this work.

D. Materials used for temporary utilities shall be of minimum cost, consistent with material and workmanship, which shall satisfactorily meet conditions of the job and shall have a life of at least seven (7) years.

E. Unless otherwise indicated, each contractor providing temporary facilities shall include the maintenance of the temporary facilities that are installed by him, and the existing facilities referred to in this section throughout the duration of the Contract or until such time that the permanent facilities can support the remaining construction work or where the removal of the temporary facilities is required to complete the permanent work, all as approved by the Project Manager.

F. All temporary facilities shall be removed upon completion of the permanent installation. Unless otherwise indicated, each contractor responsible for the installation of the temporary facilities shall salvage the material and the salvage value shall be included in his Accepted Contract Amount.

G. Not Used.

H. Not Used

I. Temporary Power: The Contractor shall arrange to provide Temporary Power, Lighting (Access, Emergency and General) as detailed in the Contract Documents either from connection from local Authority mains or by provision of generators. Any additional equipment/ extensions/ services required by any other contractor over and above that provided by the Contractor shall be provided by the contractor for whom the additional services are required. All costs of energy for electrical services shall be included by the Contractor.

J. Temporary Water: The Contractor shall arrange to provide Temporary Water supply as detailed in the Contract Documents either from piped connection from local authority mains or sourced from other locations and brought to the Site in tankers. Any additional equipment/ extensions/ services required by any other contractor over and above that provided by the Contractor shall be provided by the contractor for whom the additional services are required. All costs of water consumption shall be included by the Contractor.

K. Not Used.

L. Not Used.

M. The Contractor shall be responsible for repairing any damage caused by his or his subcontractors' operations to temporary facilities. Such repair shall be performed on a

priority basis and services returned to normal as quickly as possible but no later than twenty-four (24) hours of the occurrence of such damage.

N. Not Used.

O. Each contractor shall note that he will have to share the facilities provided, with other contractors on the Project and coordinate his requirements with others on the Site. The Contractor shall have the overall coordination responsibility. In case of any disputes in this matter the Project Manager's decision shall be final.

P. All temporary utilities installations shall be performed by qualified and skilled tradesmen under the direct supervision of qualified engineers and supervisors. All systems shall be tested and commissioned by qualified and experienced professional engineers. Certifications shall be prepared prior to the intended use of the systems and records shall be maintained. All temporary services shall carry tags and labels with initials of the personnel responsible for the installations and the dates of testing, commissioning, and periodic verification and maintenance.

Q. The Employer will not be held responsible for any loss of any temporary utilities (i.e. power outages) and the Contractor is to allow for any temporary loss of temporary utilities within their Contract Sum.

1.4. SPECIFICATION FOR TEMPORARY ELECTRICAL FACILITIES

A. GENERAL ELECTRICAL SYSTEM

1. This section details the work to be performed by the Contractor. Any special electrical requirements beyond those described here shall be provided by contractors requiring the same.
2. 380/400 V – 3 phase, 220 Volts and 110 Volts electrical supply shall be made available as indicated in this section.
3. The scope of work to be performed by the Contractor shall include, but not be limited to, pocket substations, ring main units, 11 KV cabling, power disconnects, circuit breakers, outlets, low voltage cabling, lighting fixtures, road lighting columns, lamps, feeders, installation, maintenance and removal service as required. This includes the provision of all materials, tools and equipment, labor, and miscellaneous accessories necessary to properly install and maintain in perfect working order power and lighting for construction purposes as described in this section.
4. The Contractor is responsible to provide any and all builders work such as trenching, concrete, fencing, etc. in regard to distributing power on the Site for his own use and that of his subcontractors and for construction works. The Contractor shall be responsible to take over the installation and hook up for all his and his subcontractors' and other contractors' power requirements which shall include and not be limited to power for his site offices, Site office of the Project Manager / Supervision Consultant, subcontractors' and other contractors' site offices, construction power for equipment, temporary lighting for construction etc.
5. The Contractor shall provide adequate temporary lighting as required for the execution of his works and necessary inspection afterwards. After completion of the Works, the Contractor shall remove the lights and associated cabling, distribution boards etc., and make good any damages caused to permanent works per the approval of the Supervision Consultant.
6. The scope of work to be performed by the Contractor shall include, but not be limited to, power disconnects, transformers, circuit breakers, receptacles, power outlets/sockets, lighting fixtures, lamps, feeders, installation,

maintenance and removal service. This includes the provision of all materials, tools and equipment, labor, and miscellaneous appurtenances necessary to properly install and maintain in perfect working order power and lighting for construction purposes as described in this section.

7. The Contractor shall bear all costs for all works that he shall perform to provide power up to and including the meters that shall be installed in the site offices of the Contractor. The contractor shall provide necessary MDBs and SMDBs to their own disconnect switches. The cost of all equipment and devices downstream of the sub-main distribution board shall be borne by the Contractor. The Contractor shall coordinate all his requirements for 3 phase power requirements for his equipment and for other Subcontractors.
8. The Contractor shall provide all cabling for power to his and his subcontractors' equipment (cranes, hoists, compressors, etc.) required for construction work; and cost of connection shall be paid by the Contractor. The cost of utilities for the temporary power shall be borne by the Contractor.
9. The Contractor shall pay the cost of actual power consumption in their respective Site offices, laydown yards and storage facilities. The cost of power consumed in the construction areas shall be borne by the Contractor. The cost of power consumed in the Site office of the Project Manager/Supervision Consultant shall also be borne by the Contractor.
10. All temporary electrical supply systems shall be installed in compliance with:
    a) Local Authority Regulations and Codes
    b) Any other Local Authority Requirements.
    c) IEE Regulations - B.S7671: 1992 (Incorporating 1994 Amendment) Section 604 "Construction Site Installation" including references to B.S IEN publications.
    d) Supplies for welding equipment in accordance with B.S638.
    e) Code of practice for distribution of electricity on construction and building sites.
    f) Chartered Institute Building Services Engineers (CIBSE) code for lighting requirements of building construction sites.
    g) Construction Health & Safety published by the Construction Confederation of the U.K., Section 10, Electricity.
11. The Contractor must use compatible plugs and sockets as directed by the Contractor. Any non-complying extension cords are forbidden on Site and are subject to Safety Fines. (See safety requirements specified in section 01735 of Division 01).

B. POWER

1. The minimum power requirement to be provided by the Contractor is indicated below. Sufficient capacity shall be provided to ensure that he and his subcontractors working in the Project have power of sufficient rating and quantity for their construction tools and equipment as well as testing and commissioning needs.
    a) Power Facilities
        - Power for Site office of the Project Manager/Supervision Consultant
        - Power for Site offices of the Contractor and subcontractors
        - Power for temporary laydown areas, storage yards and similar
        - Lighting Installation (general, access, task and emergency lighting)
        - Power for tools
        - Power for water pumps
        - Power for fire pumps
        - Power for toilet blocks

- Power for satellite field offices, toilets, canteen/messing, etc.

b) Other Facilities
Not Used

2. Power Supplies: The recommended distribution voltages shall be as follows:

a) Fixed and moveable plant above 3.75 kW	380/400 V – 3 phase
b) Fixed flood lights	220 V – 1 phase
c) Overhead secured general lighting	220 V – 1 phase
d) Small mobile plant up to 3.75kW	110 V – 3 phase
e) General or area lighting through mobile units	110 V – 1 phase
f) Portable hand-lamps	110 V – 1 phase
g) Portable hand-held tools	110 V – 1 phase
h) Local lighting up to 2 kW	110 V – 1 phase
i) Portable hand lamps in damp and confined areas or	25 V – 1 phase: SELV 50 V – 1 phase center-point earthed

C. MV / LV DISTRIBUTION ARRANGEMENTS AND POWER
Not Used

D. LIGHTING

1. The Contractor shall provide general temporary lighting in accordance with Chartered Institute of Building Services Engineering (CIBSE) code for lighting requirements of building sites.
2. The Contractor shall provide general area lighting. Any further lighting for craftwork or task lighting will be the responsibility of the particular contractor or subcontractor either from the common lighting transformer or from other sources, as available.

The general lighting levels shall be:

Area	Standard Maintained Luminance (LUX)
General Movement Areas	40
Interior Work Areas	100
Cranes / Hoists	150
Finish trade work areas	200

3. It is required that the general area lighting is carried out using fluorescent light fixtures. In small areas and rooms incandescent festoon lighting can be adopted. In large open areas floodlighting can be adopted.
4. Lighting shall be installed so that all rooms will have at least one lighting point when walls and partitions are installed.
5. The temporary lighting shall cover all areas including open plan areas, rooms, corridors and temporary toilet facilities.
6. The general area lighting provided by the Contractor shall also include elevator shafts and service cores.
7. Light fixtures shall comply with the relevant British or EN Standard and be of reputable quality and type.
8. Stairwell lighting between full and half landings circuits shall be interleaved to ensure that two (2) number circuits are available at any point in the staircase.
9. The lighting shall be evenly distributed over each phase of the electrical system.

10. Circuits shall be interleaved to ensure that all circulation routes and large areas are provided with alternative circuits.
11. All lighting circuits shall be provided with switching in addition to circuit breakers. Switches shall be located adjacent to the power source. Each contractor shall also give consideration to means of egress when the general lighting is to be switched off i.e. access routes to stairwells and general corridors shall be switched at exist points.
12. Switches shall also be arranged to control lights in a logical manner/groups and shall be assigned to enable lights to be switched off when not required or daylight is adequate.
13. Provide and maintain a 70 watt metal halide lighting fixture suitable for outdoor use at each of the hoist platforms for each floor level. Provide manual weatherproof switches adjacent to each hoist platform landing to control these lights.
14. Temporary lighting circuits shall be installed overhead from the distribution boards.
15. Small power in the construction areas shall be run using 110V. A mobile unit with the following configuration is recommended for this purpose:
    a) Size: 50 KV
    b) Breaker Size: 63 A
    c) Capacity: 10 x 20 Amp outgoing
    d) Integral Fire Alarm bell, charger, break-glass and battery unit.
16. Each contractor shall be responsible for taking additional precautions where portable hand- lamps are used in damp and confined situations.
17. Temporary emergency lighting shall be provided by the Contractor to offer safe exit from the buildings under mains failure conditions.
18. Emergency lighting shall be carried out using self-contained compact fluorescent bulkheads with minimum battery duration of one hour. The units shall be the maintainable type.
19. Emergency light fixtures shall be provided as a minimum adjacent to each stair exit and on all stair landings in main corridors and access routes.
20. Generally, illumination points shall be provided at 20 meter intervals and change of direction.
21. In addition perimeter lighting shall be provided every fifteen meters using 500 W halogen lamps mounted on poles.
22. Floodlighting associated with the tower cranes shall be the responsibility of the Contractor. Supplies for this lighting shall be derived from the dedicated sub distribution panels/boards.
23. Lighting columns and light fittings, including all concrete supports, low voltage wiring and controls to illuminate the access road around the Site shall be provided.

E. FIRE ALARM SYSTEM

1. A simple self-contained fire-alarm device shall be mounted on to each mobile power supply unit to be used in all work areas. The configuration of the mobile power supply unit is detailed in Clause 1.04 D above.
2. The fire-alarm device shall have a bell, charger, break-glass and a battery connected to a 110V power supply. The fire-alarm shall be activated manually by break-glass. The fire-alarm shall also act as a warning bell when power supply to the fire-alarm device is cut off.
3. The Contractor shall have marshals or designated supervisors who shall be responsible for emergency announcements and evacuation.
4. The Supervisors shall have portable loud speakers in their possession for such announcements.

5. The Contractor and ALL sub-contractors' personnel and operatives shall be responsible for understanding and implementing the agreed fire policy and procedures during construction.
6. The Contractor shall provide full details of their design for the temporary fire alarm facilities to the Engineer and Project Manager for review.
7. All contractors shall have their Site offices installed with building fire-alarm system consisting of automated fire alarm panels and smoke detectors. The Contractor shall install a fire-alarm system in the Site office of the Project Manager / Engineer.

F. TELECOM NETWORK

1. The Contractor is responsible for the provision of telecom connections to serve the Site, including the Site offices of the Project Manager/ Engineer, Site offices of the Contractor and his sub-contractors', temporary storage areas, satellite field offices and similar.
2. The existing Project office of the Employer/Project Manager/Engineer and other consultants has been provided with telephone / data network by the Employer.
3. The Contractor is required to liaise with the required bodies to establish GSM facilities to support the construction process. These facilities shall comprise equipment, cabling, splitter and antennae installation and all necessary small power works.
4. All costs that may be incurred for establishing the telephone network and GSM facilities shall be borne by the Contractor.

1.5. SPECIFICATION FOR TEMPORARY PLUMBING AND FIRE PROTECTION FACILITIES

A. GENERAL

1. Any special plumbing/fire protection requirements beyond those described here will be the responsibility of each contractor requiring the same. This section details, at a minimum, the work to be performed by the Contractor.
2. The scope of work to be performed by the Contractor shall include, but not be limited to water and drainage pipelines, valves, storage tanks, pumps, pressure reducing valves, fixing connections. This includes the provision of all materials, tools and equipment, labor, and miscellaneous appurtenances necessary to properly install and maintain in perfect working order temporary services for construction purposes as described in this section
3. All trenching, backfilling, and other builders work shall be provided by the Contractor including further extension throughout the work area of the respective contractor.
4. The Contractor shall provide temporary water storage tanks, (1-day capacity) on structures with pumps and fittings suitable for their respective area at a location agreed with the Project Manager. The cost of utilities for the temporary water shall be borne by the Contractor. The Contractor is to allow for all metering of water services as per local authority requirements.
5. The Contractor shall obtain temporary water supply for his works and for his subcontractors and other contractors. The Contractor is responsible to provide any and all builders work including all distribution network to distribute water on the Site. The Contractor shall provide all water required for testing and commissioning purposes for all systems not limited to mechanical systems and arrange for flushing and drainage of water.
6. The Contractor shall indicate in his Tender, water requirements for both construction and firefighting purpose on site. Distribution of lines inside the building is by the Contractor. The Contractor shall pay for all connections from the points of distribution.

7. The Contractor shall bear all costs for all works that he shall perform to provide water supply up to and including the meters that shall be installed in the Site offices of the Contractor.
8. The cost of water consumed in the construction areas shall be borne by the Contractor. The cost of water consumed in the Site office of the Project Manager/Consultant shall also be borne by the Contractor.
9. The existing Project office of the Employer/Project Manager/Engineer/other consultants has water and drainage connections arranged by the Employer. Running costs for water to this existing office shall be borne by the Employer.
10. The Contractor shall install comprehensive distribution system for the Site. All other subcontractors shall be responsible for flexible hose connections from the valves installed by the Contractor, to facilitate their requirements.

B. DISTRIBUTION NETWORK

1. Facilities to be installed by the Contractor. Temporary Water supply network to serve the site, from a central point provided by the Employer.
2. Water for firefighting is to be made available by the Contractor, providing water pressure and flow in sufficient capacities.

C. TEMPORARY PLUMBING

1. Generally the temporary plumbing shall consist of a suitable system to serve the contractor's site offices, sub-contractors' site offices, , prayer room, toilet blocks, etc.
2. All temporary plumbing construction work must be installed and maintained in compliance with applicable mechanical specifications.
3. All temporary plumbing, toilets, wash stations, tanks, pumps, etc. are to be removed as directed by the Project Manager.
4. The Contractor shall be responsible for the installation, maintenance, cleaning and removal of the above after completion of the Works.
5. Pressure reducing valves or inserts shall be provided to ensure controlled flow to fittings within the normal comfort range.
6. Temporary wet stacks and headers shall be sized to accommodate the volume of rain / waste water associated with Maafaru, Maldives rainfall.
7. Power system for the temporary water system pump must follow the construction site's temporary power system scheme i.e. 400V 50 Hz. All pumps, water pressure tanks, and controls must use an automatic refill system including the water supply for the water tanks.
8. The Contractor shall provide adequate number of water coolers (3 tap industrial) for workmen around the Site. Contractor shall indicate typical layout and locations on the logistic plan and submit to the Project Manager for review and approval. The Contractor shall be responsible to ensure that location of temporary facilities shall not interfere with permanent services. In case of interference the Contractor shall relocate as necessary at no additional cost.

D. FIRE PROTECTION

1. Fixed fire hose reels, landing valves and hoses suitable for quick connections, 30m long, 65 mm diameter and adjustable nozzle shall be provided adjacent to the site. Fire hoses shall be stored in suitable containers and designated for "Fire Use Only". Spanner wrenches for hoses shall be provided.
2. Connections for the Fire Department shall satisfy the Local Regulations and requirements. Periodically, a review of the site firefighting facilities may be made with the relevant authorities to familiarize them with the equipment and status of construction, as approved by the Engineer/Project Manager.

3. Provide any temporary fire/water pumps as may be required in order to ensure adequate water flow throughout the temporary standpipe riser. A flow rate of 32 l/s shall be available at the terminal nozzle of a 30m long 65 mm diameter hose.
4. Coordinate the location of the temporary riser and fire department connection, with the Project Manager to avoid interference with permanent construction. Location of connection to be accessible to fire department equipment.
5. Temporary fire/water intermediate tanks in the mechanical plant rooms to be minimum 15000 litres capacity. All main pipes must be galvanized iron pipe and design must maintain water pressure between a minimum of 1.7 Kg/sq.cm and max. 5 Kg/sq.cm. for each system. Pressure reducing valves or inserts shall be provided to ensure controlled flow to fittings within the normal comfort range.
6. Power system for the temporary fire/water system pump sets must follow the construction site's temporary power system scheme i.e. 400v 50 Hz. All pumps, water pressure tanks, and controls must use an automatic refill system including the water supply for the water tanks.
7. Fire extinguishers not less than 2A (NFPA) shall be provided for each 300m^2 of protected building area or major fraction thereof. Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 30 metres. The fire-extinguishers are preferably mounted to theft-stopping devices that sound alarms when misused.
8. One 250 litre open drum of water with two fire pails shall also be provided at appropriate locations. Drums and pails shall be “fire red” and suitably worded.
9. When more than twenty litres of flammable or combustible liquids or two kilograms of flammable gas are being used, a fire extinguisher rated not less than 10B shall be provided within fifteen metres unless required otherwise.
10. Portable fire extinguishers shall be inspected periodically and maintained in accordance with Maintenance and Use of Portable Fire Extinguisher, NFPA No. 10A.
11. Fire Extinguishers which have been listed or approved by a nationally recognized testing laboratory shall be used to meet the requirements herein.
12. The Contractor shall supply 2 each 10 Kg. chemical and 2 each CO2 fire extinguishers to supplement fire water dip stations. The Contractor shall inspect each extinguisher weekly and replace any discharged or missing extinguishers. The Contractor will relocate fire extinguishers as necessary where they interfere with construction.

END OF SECTION 01510

Section 01520 – Construction Facilities

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Requirements for facilities used on Site during construction such as site offices, telecom/data services, first aid, sanitary facilities, etc.

1.2. RELATED SECTIONS

A. Related work specified under other sections within Section 01500.

1.3. REQUIREMENTS

A. Unless specifically indicated otherwise, the Contractor shall provide all construction facilities and temporary controls needed for the work.

B. GENERAL REQUIREMENTS for Field offices, satellite offices, security centre/first aid facility, gatehouse and prayer room portacabin for the Contractor and each sub-contractor's personnel:

1. Note that there is a designated limited space available on the Site for setting up the main field offices. The Contractor shall make his own arrangements for erecting the field offices to satisfy Site requirements.
2. Provide the field offices with ventilation, light, power outlets, data/ telephones and fire extinguishers as required. Maintain a complete set of current contract drawings and specifications and maintain a file with all approved shop drawings, permits and other documents/data pertinent to the work.
3. All contractors' Site offices shall have fire-alarm systems installed.
4. The Contractor shall be responsible for picking up temporary services from the utilities suppliers. This will involve external services runs to pick up mains, existing switchgear and stub connections. The Contractor shall bear the costs for all work that he performs to provide power, up to and including the meters that shall be installed in their field offices and the sub- contractors' field offices.
5. The Contractor shall bear his own costs of water and energy and those consumed by his subcontractors.
6. The cost of power and water consumed in the construction areas shall be borne by the Contractor.
7. The Contractor's and sub-contractors field offices shall be maintained until final acceptance of their respective works. Provide detailed calculations and demand estimates to the Supervision Consultant relating to the use of electricity and water.
8. All facilities are to be provided in accordance with local laws and regulations.
9. The Contractor is to allow for the removal and/or relocation of his site office and other site facilities, including those provided to his subcontractors, the Employer of his agents, as and when required by the progress of the works or at the request of the Employer or Project Manager.

C. NOT USED

D. SITE OFFICES FOR PROJECT MANAGER / SUPERVISION CONSULTANT

1. It is envisaged that the current project offices of the Project Manager will be handed over to The Contractor and the area surrounding provided as additional lay down area for the Contractor on the proviso that the Contractor will provide Site Offices for the Project Manager and Supervision Consultant.
2. The Contractor shall provide fully equipped and functional Site office for the use of six (6) personnel employed by the Project Manager/Supervision Consultant.
3. Not Used.

4. The Site offices shall be constructed to the same standard as the existing, fully air-conditioned, well-furnished and shall have adequate space and areas for meetings to be held.
5. Storage room of adequate sizes shall be provided to store approved drawings. A drawing of the proposed layout is attached to the Scope of Works.
6. The Site office shall have the following indicative arrangement:
    a) Washrooms
    b) Pantry (equipped with refrigerator, water dispenser, microwave oven, kettle, hot plate)
7. The Contractor shall equip the Site offices with the following:
    a) Pin-up boards shall be installed in all office rooms and in addition, white boards shall be mounted in all offices of the managers.
    b) One A3 size photocopier
8. The Contractor shall allow for building and utility maintenance as required. The Employer's Facility Management Company will provide housekeeping, cleaning and all other Facilities Management of the offices.
9. The Contractor shall provide all consumables for the use of personnel stationed in the Site offices. These consumable include, but not limited to the following:
    a) Office stationary
    b) Pantry supplies
    c) Washroom consumables
10. The cost for connection to Temporary utilities and the cost of power and water consumed in the Site office of the Project Manager / Supervision Consultant shall be borne by the Contractor.
11. Provide security personnel for 24 hours coverage.

E. CONTRACTOR'S SITE / FIELD OFFICES:

1. Each contractor is responsible for setting up of site offices for his field operations and for the use of his sub-contractors and suppliers.
2. The Contractor shall set up his field office only in the location and space designated by the Project Manager.
3. Provide the office with ventilation, air-conditioning, light, power outlets, telephone(s) and fire extinguishers as required.
4. Where required by the Project Manager, the Contractor's Site establishment may be fenced off. The Site fence must be of a standard approved by the Employer and/or the Project Manager.
5. Maintain a complete set of latest Contract Drawings and Specifications and maintain a file with all approved shop drawings, permits and other documents/data pertinent to the work.
6. Each contractor, except as otherwise noted in Section 01510, is responsible for the supply, installation, maintenance, operation and de-commissioning of all services for his Site offices. All permits, fees, charges and monthly bills for water, electricity, telephone, internet and other services shall be borne by the Contractor. Each contractor's field office shall be maintained until final acceptance of their respective works.
7. Proper sanitation facilities shall be provided within the Site offices.
8. The Site offices shall be constructed to a good standard, with a fully air-conditioned, well-furnished and shall have adequate space and areas for meetings to be held. Storage rooms of adequate sizes shall be provided to store approved drawings, submittals and samples.
9. Upon completion of Works, the Contractor shall remove his site offices and facilities, clean the area, reinstate the area to the satisfaction and acceptance of the Project Manager.

F. TELEPHONE / FAX FACILITIES:

1. Not used.
2. The Contractor shall provide telephone PABX exchange, internal intercom telephones and a facsimile machine for the Site offices of the Project Manager / Supervision Consultant. Two telephones and the fax shall have International Direct Dialing facility.
3. Each contractor shall install his own telephone PABX exchange within his Site office and facilities. All intercom facilities shall be provided by each contractor.
4. The running cost of telephone/fax services shall be borne by the Contractor for his installed facilities and each contractor shall bear similar costs based on their individual billing for their offices and facilities.
5. The running cost of telephone/fax services for the Site offices of the Project Manager/ Supervision Consultant shall be borne by the Contractor.

G. I.T. / DATA FACILITIES:

1. Each contractor is responsible for I.T. / LAN system in his office. The Contractor shall arrange interfacing his I.T. / LAN network with that of his subcontractors and that installed in the Employer/Project Manager/Supervision Consultant Project Office.
2. The Contractor shall install I.T. / LAN system for the Site offices of the Project Manager / Supervision Consultant. A Wi-Fi connection is also required to be provided.
3. The Contractor shall be responsible for obtaining 2 Mbps access speed from a local telecommunications utility provider for the Site office of the Project Manager / Supervision Consultant and the Contractor's Site office.
4. The Contractor shall provide internet access from the Site office of the Project Manager / Supervision Consultant connected through the LAN server installed in the Project Manager's Site office.
5. All costs including the connection and periodic rental charges shall be borne by the Contractor for this service.
6. Each contractor shall arrange for Internet services for his respective Site office; and pay all costs thereof.
7. In addition, the Contractor shall give free access to his installed "Dedicated Access" lines to all of his subcontractors by providing interfacing of his LAN system to the systems installed by his subcontractors.

H. SANITARY FACILITIES:

1. The Contractor shall provide sanitary facilities in all areas of work in line with local laws and regulations.
2. The Contractor shall connect the sanitary facilities to the connection points identified on the logistics plans, to the sewer line to the City mains. All costs thereof shall be borne by the Contractor. In the event the Employer manages to progress certain parts of this work, the costs incurred by the relocation shall be borne by the Contractor.
3. The Contractor shall provide toilets consisting of one (1) toilet for each 25 personnel. Connections to the same shall be provided by the Contractor. Also included in the scope of the Contractor is the installation of appropriate facilities for ablution/cleaning.
4. The Contractor shall provide toilets, holding tanks, ablution and drainage facilities for all workmen. The holding tanks of sufficient capacity shall be provided for sewage at each location and arrangements be made for emptying the same on a daily basis. Flushing of urinals and toilets to be by the use of flush valves. Provide extract fans in each cubicle for ventilation. Supply a single source distribution board for electrical supply. Provide floor drains, clean-outs etc., for

cleaning purposes. The material and construction quality shall be capable of rough usage for a period of at least five years. The Contractor shall be responsible for the maintenance and HOURLY cleaning of the toilet facilities and holding tanks for the duration of the Contract. Include all costs associated with connections to potable water.

5. Not Used.
6. The Contractor must maintain on Site sufficient portable trash pumps and hoses to remove accumulated water from the work areas on a daily basis if required. On-site pumping equipment should be sized to handle heavy downpours of rainfall.
7. Not Used

I. FIRST AID FACILITY:

1. The Contractor shall provide first aid facilities for their workmen and those of his subcontractors and other contractors, as required by the local authorities. The Employer has made provision of clinic which is manned and maintained during working hours.
2. The Contractor shall establish a working relation with the Maafaru medical clinic to deal with medical and accidental emergencies.
3. The Contractor shall arrange for the removal by ambulance or by other suitable vehicle of injured or sick employees to hospitals or to their homes, if necessary.
4. First aid stations shall be provided by each contractor at his site offices and workshops.
5. The first-aid facilities shall be adequately stocked with medical supplies of quality approved by the local health authorities and any local regulations.
6. Sufficient number of First-aid stations shall be maintained in the work areas under the responsibility of designated supervisors. The Safety Coordinator of each contractor shall have the overall responsibility to install and maintain the first aid stations.
7. The Safety Coordinator and sufficient number of supervisory personnel shall be trained and qualified first-aid personnel.

J. STORAGE:

1. Materials stored by each contractor on site shall be secured properly and shall have adequate protection. They should not present hazard to traffic, public, workmen or actual construction.
2. Storage areas will be as agreed with the Project Manager. Materials at upper floors of the substructure liable to be blown away are to be adequately tied down at all times.
3. There will be limited storage space available at the Site. Each contractor shall arrange for off-site storage and schedule deliveries of the materials on an as-needed basis. The mode, routing and time of delivery of materials shall be reviewed with the Project Manager, prior to actual deliveries. Each contractor is responsible for marshalling and staging his materials. All costs associated with a storage yard including receiving, unloading, shake-out, reloading and delivery to the site are to be included in the Accepted Contract Amount.
4. Materials stored off site by the contractors shall be secured properly and shall have adequate protection. They should be tagged and fully insured. Storage areas will be as agreed with the Project Manager. No payment will be made for materials stored off site.
5. Air-conditioned and secure storage rooms shall be constructed by the contractors for storage of materials that require being stored in controlled environmental condition.

6. Should any contractor's materials stored on site interfere with the permanent construction, he shall promptly move these materials when directed by the Project Manager at no additional cost.

K. MESSING:
1. Not Used
2. Each contractor shall be responsible for arranging meals for his workmen and personnel, either through the canteen operator or by any other means.
3. Not Used.
4. Not used.
5. The Contractor shall install messing areas where provision for drinking water and ablution shall be made.
6. Not Used.
7. Mess areas shall be maintained clean and tidy at all times. The Contractor shall allow for cleaning and garbage disposal including wet wastes generated by the canteen, on a daily basis. Adequate fire protection shall be provided by the Contractor.
8. The Contractor's Site personnel shall be required to eat only in designated locations. Messing outside of the designated areas shall be strictly prohibited and the contractors shall be liable for punitive action, if found violating.

L. PRAYER ROOM:
1. The Contractor shall construct temporary Prayer room(s) of adequate capacity for his workmen and personnel if required.
2. The adjoining area to the Prayer room(s) shall have suitable ablution facilities and the Prayer room(s) shall be maintained cleaned at all times by the Contractor

M. SMOKING AREAS:
1. SMOKING shall not be allowed within the construction areas regardless of the state of construction.
2. The Contractor shall designate certain SMOKING AREAS that are away from construction activities, free from any materials storage and with adequate provision for fire extinguishers, water and sand buckets.
3. The SMOKING AREAS may be located adjacent to the rest area of the Contractor. The Contractor shall propose the SMOKING AREAS in his logistics plan and obtain the approval of the Project Manager, prior to use.
4. Smoking shall be strictly prohibited from all other areas within the Project Site. Any person, staff or workman, regardless of his position, if found violating the No Smoking rule shall be expelled from the Project without any further warning.

N. Relocation of Temporary Facilities: Each contractor shall be responsible for the relocation necessitated by ongoing construction and eventual removal of the temporary facilities installed by him, as required, at no additional cost. The Contractor shall be responsible to implement this requirement.

O. Contractor shall not use any portions of the Site or completed work areas as living accommodation, without taking permission beforehand. He shall make his own arrangements away from the Site for the housing of his personnel, unless approved by the client.

END OF SECTION 01520

Section 01540 – Construction Aids

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Specification for the proposed temporary hoists and cranes that would be used as deemed necessary by the Project Manager.

B. The design, fabrication, installation, testing, commissioning, operation, maintenance and eventual removal of the temporary hoists and cranes shall be performed by the Contractor.

C. The Contractor shall note that the requirements of construction aids detailed in this section are a minimum to be supplied, installed and operated by the Contractor. Any other hoisting and craneage that may be required for the performance of the work shall be provided by each contractor. The applicability of this section will be approved by the Project Manager.

1.2. SUMMARY

A. Provide all labor, material, equipment and services required for the supply, installation, maintenance and operation of temporary hoists and accessories as indicated in the Drawings and as specified herein; this is inclusive of but not limited to:
   1. Combination personnel and material hoists
   2. Material hoists
   3. Landing platforms with adjustments where required for raised floors, protective floor gates and fencing, guard rails, etc. Gates to be complete with fail-safe interlocks.
   4. Hoist base enclosure.
   5. Communication system.
   6. Loading deck, overhead protection, etc.
   7. Installation, maintenance, operation, removal and salvage value of the above.
   8. Any associated testing, permits for operation, etc. as required by the local authorities and safety requirements in section 01735 of this Division 01. Testing and certification of the same by internationally recognized agencies will also be required.
   9. All necessary engineering by a licensed engineer.
   10. All necessary temporary construction and modification that may be required to the permanent structure.

B. Provide all labor, material, equipment and services required for the supply, installation, maintenance and operation of cranes and accessories as indicated in the Drawings and as specified herein; this is inclusive of but not limited to:
   1. All types of Tower cranes (self-climbing, luffing jib, etc.)
   2. Loading platforms with adequate protection
   3. Tower crane foundations and tie-backs.
   4. Communication system to tie-in with the respective Contractor.
   5. Loading deck, overhead protection, etc.
   6. Installation, maintenance, operation, removal and salvage value of the above.
   7. Any associated testing, permits for operation, etc. as required by the local authorities and safety requirements in section 01735 of these General Requirements. Testing and certification of the same by internationally recognized agencies will also be required.
   8. All necessary engineering by a licensed engineer.
   9. All necessary temporary construction and modification that may be required to the permanent structure.

1.3. RELATED WORK

A. Documents affecting the work of this section include but are not limited to the Conditions of Contract, General Requirements Division 01 and Scope of Works.

B. The Contractor shall refer to the project specifications for different works and materials such as concrete, structural steel, cladding / curtain wall systems, mechanical and electrical systems, conveying systems, etc.

1.4. QUALITY ASSURANCE

A. Provide products of same manufacturer for each type of unit.

B. Coordinate the installation with other trades.

C. Reference Standards: Comply with applicable provisions of the following reference standards, except as otherwise indicated.
   1. AISC - American Institute of Steel Construction
   2. AWS - American Welding Society
   3. OSHA - Occupational Safety and Health Administration
   4. ANSI - American National Standards Institute, Inc.
   5. Local Authority Requirements

D. Other international codes and standards will be acceptable subject to the approval of the Project Manager. Notwithstanding the requirements of this specification, the Contractor providing the hoists shall be responsible for the safe and adequate operation of the same until removal from the Site.

1.5. SUBMITTALS

A. Submit the following in accordance with the Conditions of Contract and Section 01300 of General Requirements - Division 01.
   1. All shop drawings shall be certified by a licensed structural engineer in the Maldives.
   2. The shop drawings shall contain all detailed information such as hoist arrangements, platforms, loading deck, mast sections, hoist equipment, details of attachment to building, gates, fences, wiring diagrams, safety devices, overload protection, etc.
   3. Similar details as above for tower cranes.
   4. Indicate all load reactions at the base of the equipment, tiebacks, etc. Indicate modifications required, if any, to the permanent building construction to accommodate all such reactions.
   5. Submit at least one high quality reproducible drawing and four prints for coordination.
   6. Not Used.
   7. All submittals shall be reviewed and approved by the Supervision Consultant.

1.6. PERFORMANCE CRITERIA

A. The equipment manufactured shall be designed to withstand all the dead loads, live loads, wind loads, etc., normal to the region, including but not limited to the seismic conditions and that are normal to the area.

PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Hoists:
   1. Alimak
   2. U.S.A. Hoist Corporation
   3. Universal Builders Supply Incorporated
   4. Or approved equal

B. Tower Cranes:
   1. Liebherr
   2. Potain
   3. FavelleFavco
   4. Or approved equal

2.2. MATERIALS

A. The Contractor shall provide hoisting equipment. The Contractor, with his Tender, shall detail his proposal for supply, installation, operation and maintenance of hoists with details of number, type, capacities, speed, duration of operation, etc., with a detailed analysis of movement of material and manpower during the period of construction. The Contractor shall explain the requirement of construction use elevators with periods of operation and progressive removal of hoists in relation.

B. The Contractor shall ensure that adequate hoisting facilities are provided for his own use and subcontractors. The Contractor shall take into consideration certain amount of redundancy and contingency due to break-downs, maintenance periods, etc.

C. Hoist services include all levels with the bases for material and personnel hoists located on level. The size and capacities of Hoists shall be determined by the Contractor based on the expected heaviest load to be carried (for example: largest cladding panels)

D. Landing platforms shall be designed to accommodate not less than 200% of maximum capacity of largest single hoist unit which it serves or as recommended as a minimum standard by the hoist supplier, or as required by applicable codes, whichever is greater. Finish elevation of landing platform shall be level with the floor finish. Platforms to have smooth surface and OSHA approved handrail as required.

E. Floor gates and fences shall be made of light gauge steel and wire mesh per code requirements. Floor gates and / or doors to have positive latch or bolt and electrical and mechanical interlock (fail-safe) to prevent accidental opening of gates.

F. Loading dock at grade to accommodate 13kg/m^2 loading. Docks shall have access stairs, handrails and overhead protection. Overhead protection to be double plank construction.

G. Personnel and material hoists to be fitted with wood plank protection in addition to normal cab roof plate construction.

H. Each twin-cage hoist shall provide for one cage to have gates at every floor and one cage to have gates at alternate floors only.

I. The number and capacities of tower cranes proposed to be installed by the Contractor shall be adequate to achieve the requirements of the Works. The Contractor shall submit his proposal for installation of tower cranes for the review and approval of the Project Manager.

J. The Contractor shall obtain information of the maximum gross weights of equipment and major materials from the Employer and ensure that his proposed cranes have adequate capacities as required.

K. Cranes shall not be located inside elevator shafts and MEP service shafts. The Contractor shall have trained additional crane operators to make them available for operation on a 24-hour basis if the needs of the Project so requires.

L. Irrespective of the number of hoists and tower cranes proposed or prescribed to be installed, it is the Contractor's responsibility to ensure adequacy of the number, types and capacities of hoists and cranes.

M. The Contractor shall be responsible to install, operate and maintain sufficient hoists and tower cranes to serve his requirements and that of other contractors, subcontractors, and suppliers.

PART 3 - EXECUTION

3.1. SITE CONDITIONS

A. Examine area where work of this section is to be carried out and advise the Project Manager about conditions which may affect the timely and proper execution of the work. Do not proceed with the work until unsatisfactory conditions have been addressed.

3.2. INSTALLATION

A. Coordinate the installation schedule, frequency of jumps, etc.

B. All work shall be performed by experienced, qualified, hoist and crane erectors using skilled craftsmen in a plumb, level and secure manner.

C. The site installation shall be supervised by an authorized hoist and crane supplier's representative familiar with the equipment being erected.

D. All other materials and equipment required to remove the hoist will be with the hoist (i.e. the tower cranes will be dismantled before the hoists).

E. All warning lights and instructions for operation and routine maintenance of the equipment shall be in English.

F. Hoist and tower crane mast sections required after initial installation shall be stored off site and delivered and erected as required for each jump.

G. Installation shall be on a phased basis as determined by the Project Manager.

H. Installation shall also include all the associated testing and demonstration as well as operator training.

I. The location of the tower crane foundation and any sacrificial foundation and sections of tower crane mast shall be decided only upon prior approval of the Project Manager and Supervision Consultant.

J. The Contractor shall allow in his Accepted Contract Amount for any additional structural support and modifications to the structure as may be required for the installation of hoists and tower cranes. It is the Contractor's responsibility for the design and engineering of such modifications and support structure. The Contractor shall employ a qualified and

licensed engineer to perform the design and all design calculations and drawings are to be submitted to the Engineer for review and approval.

K. Any temporary openings that need to be left out in the structure for the installation and/or operation of tower cranes and hoists (including any for access and loading) shall be engineered by the Contractor. The calculations shall be forwarded to the Supervision Consultant for approval.

3.3. MAINTENANCE AND OPERATION

A. The Contractor shall include within the Accepted Contract Amount for recommended spare parts and maintenance.

B. The Contractor shall provide an adequate number of operators to ensure twenty-four (24) hour service if required.

C. Each hoist and tower crane operator must be capable of being contacted during any emergencies.

D. The Contractor shall arrange to provide men and materials hoists and associated hoisting facilities. The Contractor shall be responsible for the installation, maintenance and operation of the hoists and hoist platforms, including the installation of integral temporary 'wet' services.

E. The hoists shall be operational as required but be available twenty four (24) hours per day, every day excepting approved holidays. Material hoist time shall be programmed by the Contractor and coordinated with the Project Manager. Material hoist schedule will be strictly followed, and no unscheduled deliveries will be permitted.

F. The hoists will be left in place at least until the elevators are available for construction use at which time the hoists can be removed. Project Manager. The schedule for removal of hoists shall be approved by the

G. The Contractor is required to schedule placement of all major equipment and materials prior to the removal of the hoists and tower cranes. All contractors shall coordinate this requirement with the Contractor.

END OF SECTION 01540

Section 01545 – Scaffolding

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. This section includes the requirements for installation of scaffolding by the Contractor and/or his subcontractors.

1.2. GENERAL

A. This section is applicable to all contractors who install scaffolding to perform their work in the Project.

B. The Contractor shall supply, install, maintain, relocate and remove scaffolding for his Works and to facilitate installations carried out by his subcontractors.

C. The Contractor shall provide all scaffolding, work platforms, access platforms, gondolas, cradles, etc., for his work and for the work of his subcontractors, unless specifically excluded in this section. It is the responsibility of the Contractor to coordinate the requirements for scaffolding, access platforms and the like of his subcontractors and ensure provisions.

D. The Contractor shall provide free and unlimited usage of special scaffolding (such as the ones for high level, exterior surfaces, etc.) by his subcontractors. The Contractor shall schedule such usage with his subcontractors and other contractors.

1.3. DEFINITIONS AND OTHER EXPLANATORY NOTES

A. The following are the terms and definitions that are used in this Section:

1. Base plate: A metal plate with a spigot for distributing the load from a standard or raker or other load bearing tube.
2. Bay: The space between the center lines of two adjacent standards along the face of a scaffold.
3. Brace: A tube placed diagonally with respect to the vertical or horizontal members of a scaffold and fixed to them to afford stability.
4. Brace Coupler: A coupler used for fixing braces, which may be a right angle coupler or any other coupler capable of sustaining a safe working load of 5 kN.
5. Brick Guard: A metal or other fender filling the gap between the guardrail and toe-board and sometimes incorporating one or both of these components.
6. Check Coupler or Safe Coupler: A coupler added to a joint under load to give additional security to the coupler(s) carrying the load.
7. Competent Scaffolder: An operative assigned duties in the erection, alteration, maintenance or dismantling of a scaffolding or staging who has undergone a scaffolding training course by an approved training establishment.
8. Coupler: A component used to fix scaffolding tubes together.
9. Foreman Scaffolder: Foreman assigned as in-charge in the erection, alteration, maintenance or dismantling of a scaffold or staging who has undergone an advanced scaffold training course by an approved training establishment and has at least five years' experience as a scaffolder.
10. Guardrail: A member incorporated in a structure to prevent the fall of a person from a platform or access way.
11. Joint Pin: An expanding fitting placed in the bore of a tube to connect one tube to another coaxially.
12. Ledger: A longitudinal tube normally fixed parallel to the face of a structure in the direction of the larger dimensions of the scaffolding. It acts as a support for the putlogs and transoms and frequently for the tie tubes and ledger braces and is usually jointed to the adjacent standards.

13. Lift: The assembly of ledgers and transoms forming each horizontal level of scaffold.
14. Parallel Coupler: A coupler used to join two tubes in parallel.
15. Putlog: A horizontal tube with a flattened end, to rest in of on part of the brickwork or structure.
16. Putlog Coupler: A coupler used for fixing a putlog or transom to a ledger, to connect a tube used only as a guardrail to a standard.
17. Reveal Pin: A fitting used for tightening a reveal tube between two opposite surfaces.
18. Right Angle Coupler: A load-bearing coupler used to join tubes at right angles.
19. Sleeve Coupler: An external coupler used to join one tube to another coaxially.
20. Sole Plate: A timber, concrete or metal spreader used to distribute the load from a standard or base plate to the ground.
21. Standard: A vertical or near vertical tube, which carries the scaffolding's weight and loads imposed to the supporting structure.
22. Swivel Coupler: A coupler used for joining tubes at an angle other than a right angle.
23. Tie or Tie Assembly: The components attached to an anchorage, or to the structure, or framed around a part of it, or wedged or screwed into it with a tie tube. Used to secure the scaffold to the structure.
24. Toe-board: An upstand at the edge of a platform, intended to prevent materials or operatives feet from slipping off of the platform.
25. Transom: A tube spanning across ledgers to form the support for boards or units forming the working platform, or to connect the outer standards to the inner standards.
26. Universal Coupler: A load-bearing coupler used for connecting two tubes together at right angles or in parallel.
27. Working Platform: The deck from which operations are carried out.

1.4. QUALITY ASSURANCE

A. Provide products of same manufacturer for each type of unit.

B. Co-ordinate the installation with other trades.

C. American or British codes and standards will be acceptable subject to the approval of the Project Manager. Notwithstanding the requirements of this specification, the contractor providing the scaffolding shall be responsible for the safe and adequate operation and use of the same until removal from the Site.

1.5. SUBMITTALS

A. All scaffolding drawings shall be certified by a licensed structural engineer in the Maldives.

B. Indicate all load reactions at the base of the scaffolding, bracing/tiebacks, etc. Indicate modifications required, if any, to the permanent building construction to accommodate all such reactions.

C. Submit at least one high quality reproducible drawings and four prints for co-ordination.

1.6. PERFORMANCE CRITERIA

A. The scaffolding material manufactured shall be designed to withstand all the dead loads, live loads, wind loads, etc., normal to the region.

PART 2 - PRODUCTS

2.1. ACCEPTABLE MANUFACTURERS

A. Reputed manufacturers such as Doka, Peri, SGB, etc., shall be used.

2.2. MATERIAL STANDARD, INSPECTION AND RECORDING

A. Steel Tubes and Fittings
   1. All steel tubing, couplers and fittings used for scaffolding shall conform to British Standard Specification No. BS 1139.
   2. Tubes shall be free from cracks, splits, surface flaws and other defects. The ends of the tubes shall be cut clean and square.
   3. All couplers and fittings shall be properly oiled and maintained. Nuts shall have a free running fit on their bolts. Bolts with worn or damaged threads shall be replaced.

B. Aluminum Tubing
   1. Aluminum tubing shall not be mixed with steel tubing or steel fittings due to different loadings and the fact that steel fittings could crush aluminum tube.
   2. Aluminum tube shall not be used if bent more than 15 mm in any 3 m length.
   3. Aluminum tube shall not be straightened; the straight parts of the tube may be cut out and re- used, but the remainder shall be disposed of.
   4. Aluminum tubes shall not be heated by welding or flame cutting, etc.

C. Scaffold Boards
   1. All scaffold boards shall comply with British Standard Specification No. BS 2482.
   2. Standard boards are nominally 225 mm wide and 37 mm thick, but 50 mm and 63 mm are available.
   3. Boards shall not be painted or treated in any way, which shall conceal defects in them.
   4. The ends of all scaffold boards shall be bound and protected by metal hoops.
   5. Boards shall not be split up more than 300 mm from the end with the metal hoop fixed and shall not be decayed or warped by more than 12 mm. The parts affected may be cut out to obtain shorter boards that shall also comply with BS 2482.

PART 3 – EXECUTION

3.1. STANDARD SCAFFOLD

A. Unsheeted scaffolds up to 50m high may be constructed without being specifically designed, provided they comply with the requirements outlined below and do not carry greater loads, or have greater bay lengths than those specified in BS 5973.

B. Where sheets are to be added to a scaffold to afford protection to operatives or the work, the scaffold shall be specifically designed with consideration given to the wind forces to which it will be subjected.

C. When a temporary roof is to be fixed to the top of an access scaffold, the scaffold and its attachments shall be specifically designed.

D. Firm Foundation
   1. All scaffolds shall be erected on a firm level and consolidated base.
   2. Base plates shall be used below each standard on surfaces where there is the possibility of standards deforming the surface.
   3. On surfaces which shall be penetrated by base plates which support standards, sole plates of timber shall be used beneath the base plates in order to achieve a greater distribution of the load.

4. Sole plates shall be at least 35 mm thick and 219 mm wide. The sole plate area beneath any one standard shall be at least 1,000 cm^2, but if the ground is soft or has been disturbed, this area shall be increased to 1,700 cm^2.

E. Jointed Standards and Ledgers
1. A mixture of longer and shorter tubes shall be used when constructing long ledgers or tall standards.
2. Joints in completed scaffolds shall not occur in adjacent standards in the same lift and joints in adjacent ledgers shall not occur in the same bay.
3. Joints in standards shall be made either with joint pins or with sleeve couplers, and shall be positioned near ledgers.
4. Joints in ledgers shall be made with sleeve couplers and shall be positioned at a distance not more than one third of the span between adjacent standards.

F. Fixing of Ledgers to Standards and Transoms, or Putlogs to Ledgers
1. Ledgers shall be fixed to standards with right angle couplers.
2. A transom shall be fixed adjacent to every standard in every lift for a scaffold by means of right angle couplers.
3. Intermediate board-bearing tubes may be fixed to ledgers by putlog couplers.

G. Bracing
1. Bracing shall be in the form of ledger or cross-bracing and longitudinal or facing bracing.
2. Ledger bracing shall be positioned at alternative standards in a scaffold and each brace shall run from a ledger in one lift to the diagonally opposite ledger the lift above.
3. Longitudinal bracing shall be in the form of a zigzag arrangement of tubes running from the bottom to the top of the scaffolding between a pair of adjacent standards; or:
4. A continuous tube running from the bottom to the top of the scaffold at an angle of between 35º and 55º to the horizontal; or:
5. Individual tubes running from the bottom to the top of the scaffold between a pair of adjacent standards, all sloping the same way.
6. Bracing assemblies shall be fixed along the face of the scaffold at intervals not exceeding 30 m.

H. Stability
1. The prevention of inward and outward movement of a scaffold shall be achieved with ties to the facade at a number of points.
2. Only one tie shall be temporarily removed and this shall be replaced before removing another.
3. Ties shall be staggered in location wherever the building surface permits.
4. A two-lift 'tied' raker tube from the scaffold and bridles with right angle couplers.
5. Tie working loads:
   a) Box, Lip or Through ties: 6.25 kN
   b) Reveal ties: 3.50 kN
   c) Drilled-in anchor ties: 6.25 kN or as recommended by manufacturer
6. Each tie assembly for sheeted scaffolds shall have at least a 12.5 kN capacity.

I. Safe Working Platform
1. All boards, which make up the platform shall rest squarely and evenly on correctly spaced transoms, and be secured to prevent accidental displacement.
2. All board shall be of the same thickness.

3. Each board shall have at least three supports unless its thickness or span is enough to prevent sagging under load.
4. No board shall overhang its end support by more than four times its thickness, the minimum overhang shall be at least 50 mm.
5. Where men have to sit at the edge of the platform between the structures, the gap between the platform and structure shall not exceed 300 mm.
6. Guardrails and toe-boards shall be positioned at every edge from which a person is liable to fall more than 2 m.
7. Guardrails shall be fixed on the inside of standards at a height of between 910 mm and 1150 mm above the level of the platform.
8. Toe-boards shall be fixed on the inside of standards and shall be at least 150 mm high.
9. The distance between guardrails and toe-boards shall not exceed 765 mm.

Table 1: Maximum Span of Scaffold Boards

Normal Thickness of Board (mm)	Maximum Span between Transoms (m)	Minimum Overhang (mm)	Maximum Overhang (mm)
38	1.50	50	150
50	2.60	50	200
63	3.25	50	250

Table 2: Widths of Access and Working Platforms

Purpose	Minimum Width	Practical Width using 225mm Boards
Work on spherical or cylindrical metal structures; work from ladder, folding trestle, slung or suspended scaffolds. Access only	600 mm	3 Boards
Working platform for persons and for deposit of material	800 mm (there must be 430 mm passage or persons, clear of materials	4 Boards
For support of a trestle or other higher platform	1.05 m	5 Boards
Use by masons for dressing or shaping stone	1.30 m	6 Boards
Use by masons to support trestles or other higher platforms	1.50 m	7 Boards

J. Safe Ladder Access
1. Access ladders shall stand on firm and level bases at an angle of 4 vertical to 1 horizontal (that is 75º to the horizontal). They shall be secured by their stiles to the platforms to which they give access to prevent movement.
2. Ladder clamps and lashings shall be used to secure ladders in place.

3. Ladders shall project at least 1 m above the landing place, having one rung level with or slightly above the landing.
4. Ladders shall be placed inside a scaffold wherever possible and landing places shall be provided at vertical intervals of no more than 9.0 m.
5. The edges of landing place shall be provided with guardrails and toe-boards.
6. The opening in landings, through which the ladders pass, shall not exceed 500 mm in width.

3.2. ERECTION, ALTERATION AND DISMANTLING

A. Erection, alteration and dismantling of a scaffold shall only take place by Competent Scaffolders under the supervision of the Contractor's Foreman Scaffolder.

B. Erection
1. The erection sequence of a scaffold shall ensure that at no time does the scaffold reach an unstable condition.
2. Ties shall be fixed in place as erection proceeds, not when the scaffold is complete.
3. Warning notices stating 'Danger Scaffold incomplete - Do Not Use' (see Tagging System, Clause 3.04) shall be fixed to those parts of a scaffold that are incomplete and not for use.

C. Alteration
1. All modifications to existing scaffolding shall be carried out in such a way that the stability of the scaffolding is not impaired.
2. Supplementary components shall be added before those that have to be removed are taken away.
3. If standards are to be removed in order to provide access, additional standards shall first be Fixed to both sides of the proposed opening so that the total number of standards in the scaffolding is never reduced.

D. Dismantling
1. Prior to dismantling a scaffold, the scaffold shall be inspected and a safe procedure for dismantling shall be established by the Contractor's Foreman Scaffolder.
2. During dismantling, no component, the removal of which would endanger the scaffold, shall be removed until steps have been taken to compensate for its removal.
3. If dismantling has reached the stage at which a critical member has to be removed, the stability of the scaffold shall be ensured by fixing a similar component in place lower down the scaffold.

3.3. INSPECTION, MAINTENANCE AND REGISTERS

A. Prior to erection, the Contractor's Foreman Scaffolder in charge of the Works, shall inspect the ground area upon which the scaffold is to be positioned and shall inspect all equipment which shall form any part of the scaffolding staging, means of access, work platform and lifting.

B. The Contractor's Foreman Scaffolder shall appoint a competent Scaffolder(s) to be solely responsible for maintenance works on the scaffolds or staging.

C. Prior to persons being allowed to use the scaffold or staging, or where the scaffold or staging are altered, adjusted or subjected to rain or heavy winds, and thereafter at least every seven days, the Contractor's Foreman Scaffolder shall inspect the scaffold inclusive of peripheral equipment.

3.4. TAGGING SYSTEM

A. The Contractor's Foreman Scaffolder shall place a weather proof plastic-coated or equivalent label at each access point and at the boundary of each scaffold section from the initial erection stage until the final dismantling, which shall state clearly if the scaffold is 'ready for use' or 'not to be used'. In addition, the label shall state:
   1. Date Erected, with name and initials of Scaffolder
   2. Maximum Loading [in kN/m^2]
   3. Date Inspected, with name and initials of Foreman Scaffolder
   4. Date Modified, with name and initials of Scaffolder
   5. Date Re-inspected, with name and initials of Foreman Scaffolder
   6. Expiry Date of label
   7. Dismantling Date

B. All entries onto the tag shall be made using a permanent ink pen.

C. The Contractor shall ensure that all personnel under his control who come in contact with scaffolding are trained in the use of the scaffold tagging system.

3.5. TOWER SCAFFOLD

A. Scaffold tower shall only be erected and used on firm level ground.

B. Static towers shall have metal base plates under the standards and, unless the foundation is concrete, the load shall be spread by timber sole plates.

C. Wheels, or castors, on mobile towers shall not be less than 125 mm in diameter. Castors shall be fixed into the base of the standards and be fitted with brakes which cannot accidentally be released.

D. Where joints in standards are necessary, they shall be made with sleeve or parallel couplers.

E. Ledgers and transoms, at right angles to the standards, shall commence not more than 150 mm from the bottom to provide a firm base clear of the castors.

F. Except at working platform level, ledgers and transoms shall be fixed to the standards with right angle couplers.

G. Lifts shall not exceed 2.7 m on static or mobile towers.

H. Bracing shall be fixed to ledgers and transoms with right angle couplers in the form of:
   1. Plan bracing, i.e. diagonally at the base and working platform and also at alternative lifts;
   2. Diagonal bracing in zigzag fashion to the full height of the tower on all four sides.

I. The maximum height to which a static or mobile tower shall be erected is calculated below. The second figure in each ratio represents the smaller of the two base dimensions of the tower.

Table 3: MAXIMUM HEIGHT OF TOWER SCAFFOLDS

Type of Tower	Height/Base Ratio
Static Tower used indoors	4 : 1
Static Tower used outdoors	3.5 : 1
Mobile Tower used indoors	3.5 : 1
Mobile Tower used outdoors	3 : 1

J. The maximum height established shall be the height to the working platform, not the guardrail.

K. The maximum freestanding height for mobile towers shall be 9.6m and for static towers, 12m.

L. Where the maximum free-standing height or the maximum recommended height to least base ratio requires to be exceeded, or the tower is likely to be exposed to appreciable wind loading, the scaffold shall be tied to the structure it is serving, or shall be designed to ensure stability by means of ground anchors, guys or kentledge.

M. A ladder for access purposes shall be lashed vertically to one of the narrow sides inside the base area, with the foot resting on the additional truss.

N. The ladder shall extend at least 1.05 m above platform level to provide handhold at the stepping off point.

O. A ladder or trestle shall not be placed on the top platform to extend the height of the tower.

P. Mobile towers shall have their castors turned outwards to provide maximum base dimensions and the brakes locked 'on' when the scaffold is in use.

Q. Mobile towers shall be moved only by pulling or pushing at the base. Working platforms shall be clear of persons and materials before towers are moved.

3.6. ADDITIONAL REQUIREMENTS

A. All scaffolds and all sheeted scaffolds, together with Hanging, Bridging, Birdcage, Truss-out, Slung and Cantilever Scaffolds, Hoist Towers, Loading Bays and Protection Fans, shall be designed by a professional engineer, as specified in Section 01300, in accordance with the requirements of British Standard Specification No. BS 5973. Submit design calculations to the Supervision Consultant for review prior to erecting scaffolding.

B. The Contractor's engineer shall provide a written erection and dismantling procedure, together with the scaffolding drawing and his design calculations, for the Supervision Consultant's review.

C. After erection and prior to work commencing upon the scaffold, the Contractor's engineer shall inspect and approve the scaffold. The Contractor's engineer shall record his inspection in the 'Scaffold Inspection Register' and the Contractor's Foreman Scaffolder shall 'tag' the scaffold.

D. Periodic review and certification of Third Party inspectors is compulsory for all scaffolding.

END OF SECTION 01545

Section 01550 – Vehicular Access and Parking

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Requirements and restrictions for access and parking of vehicles.

1.2. RELATED SECTIONS

A. Related work specified under other sections within Section 01500.

1.3. REQUIREMENTS

A. The Contractor shall construct and maintain temporary access roads to the Site, access roads to the construction areas and to the Site offices, laydown areas. The temporary access roads shall be formed by proper roller compacted earth with compacted granular material topping. The granular course shall be at least 150mm thick and shall last for the period of construction of the Works.

B. The access to Site shall at least be through two access points, in addition to the access to the Site offices.

C. The access shall be through designated access roads and entry gates only. The Contractor shall install manual control barricades. The Contractor shall be fully responsible for all access related issues as detailed in Section 01560.

D. The construction vehicles and equipment shall not enter areas designated for site offices.

E. All vehicular entries and exits shall be through security outposts and gates. Only authorized vehicles and equipment are allowed entry to Site.

F. The Contractor shall submit to the Project Manager, a list of all vehicles and equipment he intends to use for construction purposes. Prior permission is to be obtained from the Project Manager for entry of all his vehicles and equipment.

G. Passenger vehicles are not allowed entry to construction areas. Limited number of 'four wheel drive' passenger vehicles may be allowed in the construction areas, subject to the approval of the Project Manager.

H. NOT USED

I. All security procedures as detailed by the Project Manager shall be followed for entry, parking and exit of vehicles from and to the Site, including the areas designated for site offices. Violation of security procedures shall result in barring future entry of the violated vehicle to the Site.

J. The Contractor shall provide for sufficient number of guards, barricades, etc. to direct traffic and public as required for carrying out works in his Contract.

K. The Contractor shall be responsible for dust control. All access roads to Site shall be watered on a regular basis and as directed by the Project Manager. The Contractor shall also keep the surrounding roads, and sidewalks free from construction debris.

L. Ready mix concrete trucks shall not be allowed to discharge any leftover concrete at the Site. Any discharge from the concrete pump should be disposed of in a manner acceptable to the Project Manager.

M. TRAFFIC REGULATION:

1. The Contractor shall ascertain from the relevant Authorities what restrictions and regulations exist concerning the flow of traffic to and from the Site, and shall pay all charges in connection therewith. The Contractor shall provide all temporary diversions, traffic signals, signs and the like as required. The Contractor shall ensure that all vehicles abide by the restrictions and regulations imposed by the relevant Authorities.
2. The Contractor shall obtain at his cost all permits required for oversize loads, over-weight vehicles, and shall arrange for all necessary police escorts.
3. Movement of materials and workmen to and around the Site shall be scheduled and coordinated with the Project Manager.

END OF SECTION 01550

Section 01560 – Temporary Barriers and Enclosures

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Requirements for temporary barriers, security measures, noise and pollution control, etc.

1.2. RELATED SECTIONS

A. Related work specified under other sections within Section 01500.

1.3. REQUIREMENTS

A. SITE SECURITY:

1. The Contractor shall make necessary arrangements to secure his belongings, materials, installations, vehicles, etc., within the Site. Any loss or damage of materials and/or installed works shall be replaced and/or rectified by the Contractor at his own cost.
2. The Contractor shall ensure that entry to his site offices and construction Site are restricted to bona-fide employees.
3. The Contractor shall not entertain any visitors to enter or access the construction Site and work areas.
4. It shall be understood that the Employer and/or the Project Manager and/or the Supervision Consultant are not responsible for any stolen and or damaged equipment, materials or tools or any criminal or wanton acts.
5. The Contractor shall be responsible for the safety and security of his materials (permanent and temporary), equipment, personnel and other resources.
6. Not Used.
7. Not Used.

B. NOISE CONTROL:

1. The Contractor shall employ the best practical means to minimize noise and vibration produced by his operations.
2. All plant and equipment supplied by the Contractor for use on the Works shall be effectively "sound reduced" by means of silencers, mufflers, acoustic linings or shields, acoustic sheds or screens, etc., as necessary to fulfil the requirements of the current editions of all the Acts and Regulations applicable to noise control on construction sites.

C. POLLUTION CONTROL:

1. The Contractor shall employ the best practical means to minimize dust pollution due to his operations.
2. The Contractor shall keep clean all roads and access ways to his construction area. Preventive measures such as dampening the earth roads may be required to control pollution to a certain extent.
3. While working on building exteriors, dust screens shall be installed by the Contractor, as required by the Project Manager.

D. BARRIERS AND ENCLOSURES:

1. The Contractor shall supply and install all barriers and enclosures as required.
2. Unless otherwise directed by the Project Manager and/or the Supervision Consultant, all open excavations, and other hazardous areas, which in the opinion of the Project Manager and/or the Supervision Consultant are resultant from or due to the Contractor's operations, shall be enclosed by temporary hard barrier fencing to ensure that the unauthorized personnel cannot gain access.

END OF SECTION 01560

Section 01570 – Temporary Controls

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Requirements for garbage, dust, pest and environmental controls.

1.2. RELATED SECTIONS

A. Related work specified under other sections within Section 01500 and Section 01740.

1.3. REQUIREMENTS

A. GARBAGE REMOVAL:

1. The Contractor shall be responsible for cleaning and garbage removal of all areas within the Site under his control.
2. Each contractor is required to keep his work area clean on a daily basis. The Contractor shall remove all debris from the Site for disposal.
3. Each contractor is responsible to ensure that areas designated for tea-breaks, lunch etc. for his workers are kept clean and hygienic at all times.
4. Those items considered to be too heavy or big for the trash bins shall be removed from the Site directly by each contractor. Cleaning of areas around each contractor's site office shall be performed by themselves.
5. The Contractor shall place skips around the construction areas and near the Site offices at locations to be approved by the Project Manager. The Contractor shall at the end of each day's work, empty out the skips and haul out the garbage and debris off Site.
6. The Contractor shall, on a daily basis, clean and remove all garbage, waste and debris from his work areas.
7. The Contractor shall store construction waste and debris in a workman like manner, so as not to cause any fire hazard or any other encumbrances. Disposal of waste and debris should be done in a timely manner as permissible by the Site logistics and schedule.
8. The Contractor shall be responsible for the general clean-up of the job site including miscellaneous debris such as lunch boxes, cans, etc. Also provide for DAILY cleaning of debris generated from construction / construction personnel in the public roads around the Site.
9. Not Used
10. Temporary trash chutes shall be provided by the Contractor. They may require to be relocated as the work progresses. In this event, the costs associated with such relocation works shall be borne by the Contractor.
11. Cleanliness is of paramount importance; the Contractor shall be responsible for maintaining the entire Site in a clean and safe condition until the issuance of the Final Taking Over Certificate. Provide for all types of cleaning equipment as required to fulfill this responsibility.

B. PEST CONTROL

1. The Contractor is entirely responsible for the pest control of the Site. Every effort shall be made by each contractor to prevent vermin, rodents, mosquitoes and other pests on Site and within the building space.
2. The Contractor shall be responsible to keep stray animals such as cats away from the Site.
3. Not Used.
4. Not Used.

5. The Contractor shall be responsible to provide pest control services to all common areas such as the canteen, messing area, toilets, first-aid center, etc., and to his Site offices, laydown areas, storage yards and the like.

C. ENVIRONMENTAL CONTROL:

1. The Contractor shall comply with all local authority regulations and ordinances concerning the protection of the environment.
2. The Contractor shall take all precautions, which, in the opinion of the Project Manager, are necessary to minimize nuisance arising from noise, dust, etc.
3. The Contractor shall keep all roads free from mud, dirt, debris and dust at all times to the satisfaction of the Project Manager and the relevant Authorities, using mechanical or other means as necessary. A wheel wash is to be provided for trucks leaving the site.
4. Dust control shall be provided by the Contractor by watering by tanker vehicles with spray attachments or by other methods approved by the Project Manager.
5. The Contractor must regularly, or as directed by the Project Manager, remove all debris attributable to his work, and maintain his work area in a neat and tidy manner, thereby minimizing access and safety problems.
6. The Contractor shall not dispose of any hazardous materials or substances, dump oil or diesel fuel, and bury any toxic containers or contaminants at the Site.

END OF SECTION 01570

Section 01580 – Project Identification

PART 1 – GENERAL

1.1. SECTION INCLUDES

A. Details and requirements for Project Sign boards.

1.2. RELATED SECTIONS

A. Related work specified under other sections within Section 01500.

1.3. PROJECT IDENTIFICATION

A. If required by the Employer, the Contractor shall design, supply, install, maintain and remove (after the Works are complete) one (1) Project signboards at locations indicated by the Employer.

B. The Project signboards shall be Constructed of approved materials and of sturdy and robust construction. The design life of the Project signboards shall be minimum five (5) years.

C. The signboards shall be of coated steel construction on concrete foundations designed to withstand all loading conditions.

D. Each signboard shall be four (4) meters wide by six (6) metres high, the bottom edge of the sign approximately four (4) meters above ground level.

E. The graphics shall be as approved by the Employer.

F. The contents of the sign shall consist, as a minimum, names of the Project, Employer, Project Manager, Design Consultant and the Supervision Consultant.

G. A graphics of the Project may be needed above the names of the Project and the Project Team.

H. The sign shall be of heat and weather resistant material.

I. Adequate external illuminations shall be provided for the signboard; the required power supply shall be provided by the Contractor.

J. The Contractor shall keep clean and maintain the signboards throughout the duration of the Project.

K. The Contractor shall remove the signboards along with the foundations on completion of Works.
The Contractor shall include in his Contract Price for any possible relocation of signboards during the duration of the Project.

L. Not Used

END OF SECTION 01580

Section 01600 – Product Requirements

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Requirements relating to the various products, systems and assemblies are explained in the technical specifications.

B. In addition to that specified elsewhere, the articles contained in the following sub-sections briefly describe the Contractor's obligations relating to materials and equipment:

1. Section 01610 – Basic Product Requirements
2. Section 01650 – Product Delivery Requirements
3. Section 01660 – Product Storage and Handling Requirements

END OF SECTION 01600

Section 01610 – Basic Product Requirements

PART 1 – GENERAL

1.1. SECTION INCLUDES

A. Basic requirements for products supplied by the Contractor for use on the Project.

1.2. SOURCE OF MATERIALS

A. The Contractor shall use local materials and products whenever possible providing they comply with the Drawings and Specification.

B. There may be restrictions imposed by the Municipality, Government Authorities, etc. on the importation of certain products, which are also manufactured locally or elsewhere. The Contractor shall be responsible for finding out what, if any, these restrictions are and for checking with the companies concerned to ensure that the Contract requirements can be satisfied.

C. The Contractor shall submit within twenty-eight (28) days of the Commencement Date, a complete and detailed list of the source of all materials and articles proposed for use in the Works together with the names and addresses of manufacturers and suppliers.

D. Copies of the orders for imported materials together with the supplier's confirmation of such orders shall be deposited with the Project Manager as soon as they are available.

E. Where the source of a particular material is not stated, samples of the materials specified shall be submitted to the Supervision Consultant for approval before the placing of bulk orders.

F. The Contractor will be held responsible to ensure that all proprietary articles and materials incorporated in the Works are fixed and used in strict compliance with the particular manufacturer's instructions.

G. The Contractor must ensure that all materials purchased will be from a reliable source which will ensure continuity of supply in case of additional work and if any damage occurs at all times throughout the period of the Contract to ensure regular supply and progress of the Works.

1.3. NOT USED.

1.4. QUALITY

A. Products shall be new, unless otherwise specified. The Contractor shall ensure that the whole quantity of each product and material required to complete the Works is of consistent kind, size, quality and overall appearance, comparable with the specifications, for the purpose intended. If requested, furnish evidence as to type and source and quality of products provided.

B. Defective products whenever identified prior to the completion of work will be rejected regardless of previous inspections. Inspection does not relieve the Contractor of defective products, but is a precaution against oversight or error. Remove and replace defective products at no additional cost to the Employer and be responsible for delay and expense caused by rejection. Should any dispute arise as to the quality or fitness of products, the decision strictly rests with the Supervision Consultant and/or the Project Manager.

C. Not Used.

1.5. NOT USED MANUFACTURER AND REFERENCE

A. Where used in this combination:

1. 'Manufacturer' means the firm under whose name the particular product is marketed.
2. 'Reference' means the proprietary brand name and/or reference by which the particular product is identified.

1.6. SUBCONTRACTORS, MANUFACTURERS AND VENDORS

A. The Tenderer shall submit the list of names of sub-contractors, manufacturers and vendors whom he proposes to enter into agreement with on the express understanding that this will be subject to evaluation and approval by the Employer and/or the Project Manager and/or the Supervision Consultant and not subject to change by Contractor following award of Contract unless rejected by the Employer or Project Manager.

B. The Contractor shall submit all details pertaining to the subcontractors, manufacturers and vendors including but not limited to their capabilities, capacities, organization, experience, employer and project references, etc., for review of the Project Manager and the Supervision Consultant.

C. The Contractor shall detail the exact scope of work that is proposed to be subcontracted to each of his proposed subcontractors.

1.7. EXPEDITING

A. The Contractor shall be required to submit copies of agreements, sub-contracts and purchase orders for the materials and sources that he obtained from others after blanking out pricing information, as soon as such agreements are entered into.

B. The Contractor shall ensure that the representatives of the Employer and/or the Project Manager and/or the Supervision Consultant are given free access to the manufacturing, fabrication facilities of the various vendors to witness any test, of materials and to monitor the progress of work. The Contractor shall make all arrangements for such provisions.

C. The Project Manager and/or the Supervision Consultant may have expeditors or inspectors posted at various fabrication facilities of the Contractor, his subcontractors or suppliers, either full-time or part-time during the fabrication period. Such posting of expeditors, if in the opinion of the Project Manager, is necessitated to expedite delivery or to assist the Contractor in inspections, all costs Incurred by the Project Manager and/or the Supervision Consultant shall be borne by the Contractor.

D. The Contractor shall be responsible for all additional costs incurred by the Project Manager and the Employer in expediting delivery of any material that falls behind schedule.

1.8. COLORS OF FACTORY- FINISHED EQUIPMENT

A. Special Colors: When the colors of factory-finished equipment are specified to be selected by the Supervision Consultant, the colors will be selected from the manufacturer's standard colors unless special colors are specified. Submit samples of all colors for the Supervision Consultant's review.

1.9. MANUFACTURERS' INSTRUCTIONS

A. Compliance: Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the manufacturer's written instructions.

B. Conflicts: In case of any differences or conflicts between the requirements of the manufacturer's instructions and the technical sections of the Specifications, the instructions or Specifications having the more detailed and precise requirements which are specifically applicable to the work in question, as determined by the Supervision Consultant, shall govern.

1.10. NOT USED

1.11. NOT USED

END OF SECTION 01610

Section 01650 – Product Delivery Requirements

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Delivery requirements for products supplied by the Contractor for use on the Project.

1.2. DELIVERY OF MATERIALS

A. Generally, materials shall be delivered to the Site at the most suitable times for schedule requirements and in advance of construction requirements. They shall be carefully stored by the Contractor in order to prevent damage prior to incorporation into the Works.

B. The materials shall be delivered by carriers suitable for the type of product or equipment.

C. The Contractor shall conform with the procedures related to entry permits, authorization, etc., as prescribed in the Contract documents and/or by the Employer or the Project Manager.

D. The time of delivery of materials to the Site shall not be disruptive to other ongoing works of the Contractor or other contractors employed on the Project.

E. The Contractor shall conform to the security procedures, rules and regulations prescribed for the Project.

F. Delivery of materials and equipment to occupied facilities shall be coordinated with the Project Manager and respective Security In-charge.

G. The Contractor shall arrange for off-site storage as required and schedule all deliveries with the Project Manager.

END OF SECTION 01650

Section 01660 – Product Storage and Handling Requirements

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Storage and handling requirements for products supplied by the Contractor for use on the Project.

1.2. TRANSPORTATION AND HANDLING

A. The Contractor shall use extreme care in the transportation and handling of materials to and within the Site. The materials shall be transported in a manner that does not hinder progress of other contractors' work at the Site, and that inconvenience is avoided to any occupied tenants. Depending on the availability of storage areas within the Site, it may be necessary for the Contractor to store his materials elsewhere, outside the Project limits, until they are needed for immediate installation. The Contractor shall obtain prior approval of the Project Manager for arranging all storage areas on and off Site.

B. All contractors and subcontractors shall provide his own craneage / fork lifts for unloading of their materials in their storage yards and Site.

C. The Contractor shall provide craneage and hoisting to move materials and equipment to the building for the materials and equipment supplied by him and his subcontractors and suppliers.

D. The Contractor shall provide reasonable craneage, loading/unloading and moving facilities for any Employer supplied materials.

1.3. STORAGE AND PROTECTION

A. The Contractor shall use only designated spaces in the Site for storage of his materials, as Approved by the Project Manager. The Contractor shall arrange for any off-site storage and schedule deliveries of the materials on an as-needed basis. The mode, routing and time of delivery of materials shall be reviewed with the Project Manager, prior to actual deliveries.

B. The Contractor is responsible for marshalling and staging his materials. All costs associated with a storage yard including receiving, unloading shake-out, reloading and delivery to the Site are to be included in the Accepted Contract Amount.

C. The Contractor shall provide covered and secured storage of samples as may be required on the Project from time to time. Should the Contractor's materials stored on Site interfere with the permanent construction, he shall promptly move these materials when directed by the Project Manager; all related costs shall be borne by the Contractor.

D. The Contractor shall handle, store and fix products to manufacturer's instructions with care to ensure that they are not damaged when incorporated into the work, to the Supervision Consultant's approval.

E. The Contractor shall furnish the Supervision Consultant with copies of manufacturing test certificates and quality control certificates.

F. The Contractor shall provide air-conditioned storage rooms for materials that require being stored in a controlled environment.

G. The Contractor shall be responsible for protection of stored materials from weather, negligence and other trades, until their installation in the Works and hand over of the completed facilities to the Employer.

H. The Contractor's materials may require to be relocated from time to time as directed by the Project Manager, to accommodate construction by other trades, at no additional cost to the Employer.

I. The Contractor shall take delivery of any Employer supplied materials, put them in proper storage and be responsible for protection of the materials. The materials are to be handled in accordance with the specification and Section 01660 of the General Requirements.

END OF SECTION 01660

Section 01700 – Execution Requirements

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Requirements relating to the various products, systems and assemblies, and their preparation, fabrication, installation and construction procedures are explained the technical specifications and drawings.

B. In addition to that specified elsewhere, the sub-sections of Section 01700 contain descriptions and procedures related to the following:

1. Section 01720 - Preparation
2. Section 01730 - Execution
3. Section 01735 - Safety
4. Section 01740 - Cleaning
5. Section 01780 - Close-out Submittals

1.2. RELATED SECTIONS

A. Section 01500 and its subsections.

END OF SECTION 01700

Section 01720 – Preparation

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. General requirements relating to survey, field engineering and other preparatory works prior to construction.

1.2. GRADES, LINES, AND LEVELS

A. The Contractor shall verify all measurements and be responsible for their correctness. No extra charge or compensation will be allowed on account of differences between actual measurements and the dimensions given in the Drawings and Specification. Any differences that may be found shall be submitted to the Supervision Consultant in writing for consideration and directives before proceeding with the works.

B. Irrespective of availability of any survey markers on the Site, the Contractor shall be responsible to perform his own survey and establish survey markers and/or verify the authenticity and accuracy of the existing survey markers. The Contractor shall establish a number of permanent setting out stations from which Works shall be set out. The details of the survey performed by the Contractor shall be submitted to the Supervision Consultant for review and approval. The Contractor shall also verify his survey data with the local authorities.

C. The number and location of temporary benchmarks shall be such that the maximum distance from a temporary benchmark to any construction activity shall be 150 metres. Temporary benchmarks shall be formed by concreting steel pins into the ground and shall be of sturdy construction.

1.3. SETTING OUT

A. After the Contractor is handed the Drawings and after noting all the survey markers, he shall carry out at his own responsibility and expense the setting out of the work, definition of levels and setting out lines, axes and slopes, all in accordance with the Drawings.

B. The Contractor shall be responsible for the true and proper setting out of the work in relation to original points, lines and levels of references given in the Drawings and for the accuracy of the positions, levels, dimensions and alignment of all parts of the work, and for any delay or loss resulting from errors made in completing the setting out of the work. The Contractor shall protect, preserve and be responsible for all existing bench marks, pegs and boundary marks and shall keep them in place or replace them when necessary or as directed by the Supervision Consultant either in their original positions or in some other approved positions.

C. The Contractor's survey crew shall co-operate with the Supervision Consultant's survey personnel and/or those designated by the Supervision Consultant and shall verify the survey control points, benchmarks, existing ground levels, etc. The Contractor shall immediately notify the Supervision Consultant of any disagreements or discrepancies.

D. Setting out shall be approved by the Supervision Consultant before commencing the works, but such approval shall in no way relieve the Contractor of his responsibility for the correct execution of the work.
   1. Set out the works using methods and necessary instruments described in BS 5606 'Code of Practice for Accuracy in Building' section 5. All survey, setting out and leveling shall be carried out in accordance with BS 5964 unless otherwise noted in the Specification.
   2. Use auto-plumb equipment to achieve verticality.

3. Check the levels and dimensions of the Site against those shown on the Drawings and record the results on a copy of the Drawings.
4. Notify the Supervision Consultant in writing of any discrepancies and obtain written instruction before proceeding.
5. Inform the Supervision Consultant and obtain his approval when overall setting out is complete and before commencing construction.

1.4. SYSTEM OF HORIZONTAL COORDINATES

A. The Contractor shall establish an internal Site grid of horizontal coordinates, based on the grid shown on drawings.

B. The grid shall be accurately set-out by transferring the coordinates from the approved bench- mark(s) established at the Site by the Contractor.

1.5. APPEARANCE AND FIT

A. The Contractor shall arrange the setting out, erection, juxtaposition of components and application of finishes (working within the practical limits of the design and Specification) to ensure that there is a satisfactory fit at junctions and that the finished work has a well aligned true and regular appearance.

B. It shall be the responsibility of the Contractor to verify work installed by others that may have an impact on the appearance, quality and fit of his work or that of any Sub Contractors, and notify the Project Manager sufficiently in advance of any potential problems or conflicts, so as not to impact the Schedule. The Contractor shall obtain resolution from the Project Manager in respect of such Problems or conflicts prior to proceeding with further work. Failure to do so shall constitute acceptance of the installed work and the Contractor shall assume responsibility for any corrective work that may be required as a result.

1.6. NON-COMPLIANCE

A. Where work fails to meet the specified levels of accuracy the Contractor shall not rectify such work without approval of the Supervision Consultant.

B. The Contractor shall:
   1. Submit proposals for such rectification and meet all costs arising, including effects on other work.
   2. Allow for the possibility that approval will not be given necessitating removal and replacement of the work.

1.7. SURVEY PERSONNEL AND EQUIPMENT

A. The Contractor shall provide surveying assistants as required on site, for the use of and as requested by the Employer or the Supervision Consultant or the Project Manager, at no additional cost to the Employer.

B. The assistants shall have a minimum of three (3) years' experience, fluent in English and shall be subject to Supervision Consultant's approval. The assistants shall be available to the Project Manager and the Supervision Consultant for eight (8) hours per day and six (6) days per week, or more if the Contractor works outside of these hours.

C. The Contractor shall employ modern and accurate survey equipment for the works.

D. The Contractor shall also provide his survey equipment for the use of the Supervision Consultant or Employer or the Project Manager, as required, at no additional cost to the Employer.

END OF SECTION 01720

Section 01730 – Execution

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. Procedures for execution of works including application, cutting and patching, erection, installation and protection of finished works.

1.2. GENERAL REQUIREMENTS

A. The Contractor's scope of work includes provision of all engineering, fabrication, supply, installation, construction, completion and hand over of the Works. The Contractor shall include all labor, supervision, materials, tools, equipment, vehicles and other items and services necessary for the scope of work shown and/or implied in the Specifications, Drawings and other Tender documents.

B. Notwithstanding any minimum requirements included in this Specification regarding quantity, output and adequacy of plant or outline of methods, the attaining of the specified standards of quality of work shall be the sole responsibility of the Contractor.

C. All temporary works, materials, tools, equipment, plant and vehicles as necessary to execute the Works are included in the Contractor's scope.

D. Not Used

E. The Contractor shall execute the Works in accordance with the Specification and Drawings. The technical specification sections explain the technical requirements of each element of the Works, which shall be strictly adhered to by the Contractor.

1.3. CUTTING AND PATCHING

A. Cutting, coring and patching shall be kept to the minimum necessary and the Contractor shall obtain prior approval from the Supervision Consultant. All such work must be done in accordance with the regulations of the service authorities and/or the requirements of the Supervision Consultant.

B. Schedule and co-ordinate work to minimize cutting and patching.

C. Cut, patch and make good to accommodate work of various sections and to leave work in finished condition. Cutting in this sense shall mean actual cutting of components to allow new components to pass through or to provide new openings. Cutting shall not mean mere drilling of holes to accommodate screws, anchors, bolts or other fasteners as such. Such drilling is part of each section's installation function.

D. Use tradesmen qualified in work being cut and patched to ensure that it is correctly done.

E. Do not cut, drill or sleeve load-bearing members without obtaining written approval from Supervision Consultant.

F. Obtain written approval from the Supervision Consultant for each condition where load-bearing members are cut, drilled, or sleeved.

G. Cut, drill and core drill holes carefully, using only equipment and methods approved by the Supervision Consultant, leaving clean holes no larger than required, after they are located by sections required them.

H. Make cuts with clean, true, smooth edges to tolerances required and in conformance with industry practice for applicable class of work. Make patches indistinguishable from finished work.

1.4. RESPONSIBILITY FOR CUTTING AND PATCHING

A. Perform any type of work which may be required to make its several parts come together properly to fit into, receive, or be received by work of each trade, as show on, or which may reasonably inferred from, contract documents, and make good as directed. Any cost caused by omission of or ill-timed or uncoordinated performance of work shall be borne by party responsible therefore as determined by the Project Manager. Do not endanger any installed work by cutting, digging or otherwise altering, and do not cut or alter work of any separate contractor without written authorization.

B. Cut-work shall be corrected by trades performing original work. Where adjustments must be made to surfaces, elements or equipment due to errors, omissions or late coordination data from a trade or separate contractor, the original specialist trades shall make adjustment at the expense of the trade or separate contractor causing the change.

C. Unless specifically indicated in the Scope of Works forming part of the Contract Documents, all cutting and patching in architectural and structural members and components including, but not limited to, columns, beams, walls, slabs, etc., shall be carried out by the Contractor to the requirements identified by various sub-contractors and trade disciplines. The Contractor shall also be responsible for any cutting and patching required by suppliers or contractors that are directly employed by the Employer.

D. The Contractor is responsible for cutting, coring, chasing, drilling, patching, filling and finishing works as per the requirements of the Contract documents.

E. The Contractor shall not cut, drill, core, chase or alter the installation without written authorization from the Project Manager / Supervision Consultant. Cut structural concrete, steel, and any supporting members only according to written permission issued by the Supervision Consultant. Perform cutting in a manner so as to avoid damaging or endangering any portion of work.

F. In case of cutting through reinforced concrete members, the Contractor must determine the as-built location of reinforcing steel by non-destructive means and submit details of the as-built location of holes in respect to the reinforcement for the Supervision Consultant's approval.

G. The Contractor shall provide detailed method statements for review and approval by the Supervision Consultant before any builders' work (such as holes and chases) is performed. The method statements shall describe the Contractor's approach to avoid damaging or endangering any portion of installed work (such as waterproofing) and must be inclusive of all necessary temporary supports and protection together with proposal to dispense generated water spillage during core drilling activities and the like.

H. Cut, patch and make good to leave work in a finished condition where new work connects with existing and where existing work is altered.

I. All cutting, chasing and isolated demolition shall be the responsibility of the Contractor, who shall either perform these operations with his own forces under this section of work, or in some cases as later set out, engage particular sub-trade responsible at the Contractor's cost, for material affected.

1.5. EXECUTION

A. The Contractor shall provide temporary shoring, reinforcing, etc., to support the construction loads imposed during the execution of the Works. All temporary works used on the Project shall be backed by adequate calculations performed by professional and licensed engineer(s).

B. Materials arising from Site clearance, soil stripping and excavations shall not be removed from the Site without the consent of the Project Manager and/or the Supervision Consultant. The Contractor shall use such materials obtained as the Supervision Consultant may approve for use in construction of the Works or shall dispose of the materials as directed.

C. Except where underwater construction is required the Contractor shall execute all works in the dry, and shall construct any temporary drains, watercourses, pumping, and other works that may be necessary for the purpose.

1.6. NOT USED

1.7. PROTECTION OF FINISHED WORK

A. The Contractor shall take all necessary measures to protect finished work from weather including the naturally aggressive nature of the work environment, negligence and other trades, until final acceptance by the Employer.

B. The Contractor shall take sufficient measures to protect other contractor's work from damages.
The Contractor shall include all costs associated with repair work, required due to any damage of finished work / partly finished work and also bear the cost for protection of finished work.

C. The Contractor shall be responsible for the protection of works until hand over of the Works and issue of Taking over Certificate for the whole of the Works or Sections thereof.

D. The Contractor shall establish procedures and strictly implement a system by involving all his subcontractors. There shall be no claim for additional cost arising out of replacement and/or remedy; any and all costs, direct, indirect, associated, or consequential, shall be borne by the Contractor.

END OF SECTION 01730

Section 01735 – Safety

PART 1 – GENERAL

1.1. SECTION INCLUDES

A. General requirements for planning and implementation of safety on the Site.

1.2. APPLICABILITY OF THE SECTION

A. It is entirely the responsibility of the Contractor to implement all safety precautions and procedures to the requirement of each task performed on the Site. Approval, agreement, endorsement or the like if provided by the Employer and/or the Project Manager and/or the Supervision Consultant shall not limit or absolve any responsibility of the Contractor and no other party except the Contractor is liable for any mishaps at the Site during the period of construction.

B. This section shall act as guidelines only for implementation by the Contractor a proper safety program during the construction of the Works. This section describes certain minimum safety requirements for the Contractor to employ on the Project. The responsibilities of the Contractor are not limited to the provision of requirements identified in this document.

C. The Contractor shall strictly adhere to all safety rules, regulations and requirements of local authorities having jurisdiction. The Contractor shall follow all safety procedures prescribed in the AGC (American General Contractors) Manual of Accident Prevention in Construction, Occupational Safety and Health Administration (OSHA) of USA and all other local codes and regulations.

D. Where any requirement explained in this section varies from that prescribed in any rules, regulations and requirements of authorities having jurisdiction, more stringent of the requirement shall apply.

E. Where any requirement explained in this section varies from that prescribed in the AGC Manual of Accident Prevention in Construction and/or OSHA manual, more stringent of the requirement shall apply.

1.3. SAFETY

A. Within twenty-eight (28) days of issue of Letter of Acceptance, the Contractor shall submit, for the Project Manager's review, his "Safety Program" (hereinafter referred to as Safety Program), naming the key person in his organization who will be responsible for administering the program. This Safety Program shall incorporate in it all the requirements for Project safety and accident prevention and in particular the safety requirements listed in the safety checklist.

B. The program shall indicate how the Contractor's workers, subcontractor personnel and others working at the Site and equipment and materials will be protected. This plan should address, but not be limited to, organization, personnel, inspections, items such as temporary flooring, handrails, personnel and safety equipment's, netting, fire-watch, etc.

C. All employees shall be physically qualified for performing the duties to which they are assigned. Operators of equipment and vehicles shall be able to read and understand the signs, signals and operating instructions in use.

D. Prior to start of work, arrangements shall be made for assistance from medical services in existence in the vicinity of the Site.

E. Communication and transportation to effectively care for injured workers shall be provided as necessary. First aid kits, in the ratio of one (1) unit for each twenty-five (25) persons or less, shall be provided on the Site. They shall be easily accessible to all the workers.

F. The Contractor shall integrate an overall Safety Program incorporating all his subcontractors' specific safety requirements. All subcontractors shall support the Contractor by providing their input and requirements, fully detailed. The Safety personnel detailed in this section shall be provided by the Contractor and also by all subcontractors.

G. The Contractor shall organize a "Site Crisis Management Team" that shall be headed by the Contractor's Safety Manager. The Contractor's Safety Manager shall be suitably qualified and shall have extensive experience (at least twenty (20) years) in managing safety on high-rise building construction projects. The Site Crisis Management Team shall comprise Safety Engineers from all contractors and subcontractors. In addition, a number of foremen shall be identified, to liaise and coordinate with the Safety Engineers. The foremen shall be suitably trained by the Safety Engineers, who shall be responsible for clearly identified tasks, during emergencies. The Contractor shall submit a detailed organization and tasks of each individual forming the Site Crisis Management Team for the review of the Project Manager.

1.4. SAFETY PROGRAM

A. The Safety Program established and maintained on the Project shall incorporate the requirements of safety and health of the local authorities, the American AGC Manual of Accident Prevention in Construction, Occupational Safety and Health Administration (OSHA) of USA, and all other local codes and regulations.

B. The purpose of the Safety Program is to elicit the interest and efforts of all personnel, both management and supervisory, required for the prevention of injuries and accidents, through proper and thorough training and instructions to employees.

C. All contractors and their supervisors/foremen are responsible for the administration of a comprehensive Safety Program.

D. The Safety Program shall embody the prevention of accidental injury, occupational illness and property damage. Each contractor shall provide and maintain a safe, hazard free workplace for their employees, for fellow workers and the general public. As a minimum, the Contractor's Safety Program shall incorporate all of the principles of this section. In addition the Contractor shall comply with any additional safety requirements suggested by the Project Manager.

E. The Safety Program shall ensure the involvement and active participation of all project employees by requiring safety training, which will promote recognition of unsafe acts, potential and actual hazards and the immediate corrective action to be taken. All employees shall be constantly aware of their responsibility to work in a safe manner.

F. Each contractor, and his sub-contractors, has a contractual obligation to perform their work using safe methods and to comply with the Project Safety Program.

G. Subcontractors to the Contractor shall not have a separate safety program. The Contractor's Safety Program shall incorporate any special requirements of his subcontractors' safety program. The Contractor shall fully coordinate such requirements with his subcontractors.

H. Specific principles for protection requirements of each contractor are as follows:
   1. Protection of Works until issue of Taking Over Certificate
   2. Protection of work of others adjacent and below during construction
   3. Protection of own personnel and other personnel working below

1.5. MANAGEMENT ORGANIZATION

A. A Safety Manager shall be employed by the Contractor who shall have the overall responsibility to implement all safety measures on Site.

B. A Safety Engineer from each contractor will be designated at the Site. He will have full authority to direct work stoppages and to expend funds, as necessary, to eliminate hazards and imminent danger conditions on the Site.

C. The Contractor's Safety Engineer is responsible for the implementation and further development of the Safety Program. His duties will include the following:
   1. Conduct monthly safety meeting with Site personnel and Sub-contractors.
   2. Inspect the Project daily, and record all visible safety hazards, including identification of violators.
   3. Follow through on timely correction of safety hazards, making immediate corrections as necessary.
   4. Monitor on Site safety meetings and report same on his Daily Report.
   5. Foster 'Safety Awareness' in all tradesmen and supervisors on the Project.
   6. Follow up, for insurance purposes, all relevant safety reports.
   7. Check all areas at least once a day for housekeeping and cleanup. Take immediate action to ensure compliance with requirements.
   8. Submit job hazard analysis for each major phase or element of work as necessary.
   9. Post safety signs on the Project.
   10. Conduct employee indoctrination for all new personnel.
   11. Ensure training is carried out for specific tasks, especially work of a "nonstandard" nature.

D. The Safety Engineer will be a member of the Site Crisis Management Team organized to deal with emergencies.

E. The Contractor's Safety Engineer shall have an experience of at least fifteen (15) years in the field.

F. The Safety Engineer shall as a minimum be a qualified engineer with additional qualifications and special training duly accredited to internationally recognized bodies pertaining to Safety implementation.

G. The Safety Engineer shall report directly to the Contractor's top management in and in no case come under the hierarchy of the Contractor's Project Manager's team.

H. The team of Contractor's Safety personnel under the Safety Engineer shall not report to the Contractor's Project Manager and/or the Contractor's Construction Manager.

I. The Project Manager and the Supervision Consultant have the authority to ask the Contractor to remove any staff in the Contractor's Safety team if in the opinion of the Project Manager and/or the Supervision Consultant the performance of the said staff is not

satisfactory. The replacement of such staff shall take place within ten (10) days of the Project Manager's notice.

J. The Contractor shall have the full responsibility to ensure implementation of his subcontractors' Safety Management system.

K. No Safety personnel, either of the Contractor or his subcontractors shall take any direction from the Contractor's Site team that works under the authority of the Contractor's Project Manager and/or the Contractor's Construction Manager.

L. Any staff of the Contractor's construction or site team shall abide by the instructions of the Contractor's Safety personnel, without any approval or direction from the Contractor's Construction Manager.

M. The authority of the Safety personnel shall not be overruled by any of the Contractor's staff including the Contractor's Construction Manager and the Contractor's Project Manager. Violation of this rule shall have serious implications on the Contractor.

1.6. SUBCONTRACTOR PARTICIPATION

A. The officers and personnel of all subcontractors shall be responsible for compliance with this Safety Program. This will entail indoctrinating their Site representatives with a working knowledge of the Safety Program on the Site. They are further responsible to have their firms represented at all Project safety meetings.

1.7. SAFETY MEETINGS

A. The Contractor shall host Safety meetings at least once a month at the Site. Such meetings will be convened and conducted by the Safety Manager. All Safety Engineers, supervisors and foremen are expected to be in attendance. Each subcontractor will have a responsible representative present to follow through on information and resolutions discussed and adopted at these meetings. The Project Manager may choose to attend any or all of these meetings. Minutes of meetings shall be issued by the Contractor and distributed to the Project Manager and Supervision Consultant.

B. The agenda for the safety meetings will generally include inter alia:
   1. Development of timely topics for discussion and dissemination of safety bulletins signs and notices.
   2. A review of the Contractor's Safety Engineer's inspections.
   3. Identification of potential safety hazards in the coming month and discussion and implementation of steps to be taken to avoid the same.
   4. Appointment of safety representatives for sub-contractors.
   5.

1.8. SAFETY REPORTS

A. The Contractor shall submit weekly Safety reports to the Project Manager. The format and contents of the report shall be agreed with the Project Manager. As a minimum, the Safety report shall include:
   1. Average number of men / day during the week.
   2. Number of man-hours during the week.
   3. Total number of man-hours until the date of reporting
   4. Number of lost-time injuries
   5. Number of accidents
   6. Workmen indoctrination statistics
   7. Safety bulletins / topics issued

1.9. ACCIDENT PREVENTION RESPONSIBILITY

A. All supervisors and foremen are responsible to plan and accomplish their work with due regard for the safety of all individuals on the Site. They will be expected to eliminate all possible accident hazards when planning the work under their control. It is expected that all contractors and sub- contractors will observe and correct any accident producing practices before injury occurs. If an accident does occur, they will investigate to determine the cause and take the required corrective action to prevent a recurrence. All accidents shall immediately be reported to the Contractor's representative and to the Project Manager.

1.10. ACCIDENT REPORTING

A. All lost time injuries, property damage accidents (excluding off Project vehicle accidents) and material losses in which the property damage exceeds USD$ 500/- will be reported in writing to the Project Manager within forty-eight (48) hours of the accident or incident. Immediate notification will be provided in advance of the written report.

B. In the event of any employee being sent to a doctor for treatment, a release will be obtained from the doctor stating whether:
   1. the employee is not fit for duty;
   2. the employee is fit for light duty; Or,
   3. The employee is fit for duty.

C. A copy of this release will accompany the accident report.

1.11. PERSONNEL PROTECTIVE EQUIPMENT

A. Minimum requirements for protective equipment shall be the wearing of hard hats and safety shoes at all times, by all Contractor's and subcontractors' personnel, as well as protective clothing for workmen, as warranted. Supplemental requirements for protective equipment shall be developed to cover specific areas of the work for such items as eye protection, protective clothing, life safety harnesses and lifelines as per the requirements of this safety specification. No sandals will be permitted on the Site. Closed footwear with heavy-duty side and steel toecap must be worn by all personnel. Provide adequate protection to the personnel and equipment adjacent to the Contractor's area of work as well as those working below at all times.

B. While the Contractor provides, at his cost, all personnel protective equipment to the workers under his employ, all subcontractors shall provide, at their cost, similar equipment to their workmen. However, it is the responsibility of the Contractor to strictly implement the rules set out for all parties.

C. Each worker shall sign receipt indicating that he has received hard hat and safety shoes from the Contractor's stores. Copy of these receipts shall be provided to the Project Manager if specifically requested.

D. The Contractor's and his subcontractors' workmen shall wear uniforms or overalls that are suitable for construction sites with clear identification of the company with whom he works for. The subcontractors' workmen shall have identification of the Contractor's company worn on their uniform. All hard hats shall bear the identification of the Contractor.

E. The Safety Engineer and other safety personnel shall wear Red colored hard hats and OSHA Orange colored safety jackets with the Contractor's identification. (Safety Jacket shall be constructed with a shell of windproof/water resistant/ fire-resistant cotton based material and shall feature 2" reflective tapes for high-visibility- shall meet ANSI/ISEA

107-1999 Standards, Class 3/Level 2). Other personnel wearing safety jackets, as required, such as banksmen, and workers performing road works, pipelines, etc., shall wear Lime Green colored safety jackets.

1.12. FIRE PREVENTION

A. SMOKING shall be allowed only in designated SMOKING AREAS.

B. No burning of rubbish or debris will be permitted.

C. All fuel storage tanks shall be properly grounded and vented, provided with proper type fire extinguishers, placed on posts, 3.00 m to 5.00 m from tanks. DANGER or NO SMOKING signs shall be prominently placed at these tanks. Storage tanks above ground shall be diked or kerned to prevent the spread of liquids, in the event of leakage in tanks and located at a safe distance from the construction area.

D. A PERMIT TO WORK system shall be operated by the Contractor for all hot works including welding and brazing. Pro-forma permits shall be issued by the Contractor confirming the work to be undertaken and that screens, protection and suppressant devices are in place. The Safety Manager shall inspect the work area and affix his signature to endorse his satisfaction to the arrangements in place. A copy of such permit shall be issued to the Project Manager twelve (12) hours prior to work commencing. No work shall be carried out without a permit prepared by the responsible Foreman of the Contractor. Adequate fire extinguishing equipment shall be provided in the immediate vicinity of welding operations whenever combustible material is exposed. Workmen will be shielded from welding rays, sparks, slag and the like.

E. All compressed gas cylinders and acetylene cylinders shall comply with the requirements of the American AGC Manual of Accident Prevention in Construction as to requirements for construction, use and storage. All oxygen and acetylene cylinders will be kept separately in the storage area, stored upright, tied off, and capped. The storage area shall be designated as a NO SMOKING zone.

F. Fire protection is required for all materials and equipment on the site. Protection gear including suitably rated goggles, gloves & shields shall be used by each of the Contractor's personnel carrying out operations such as welding, etc.

G. Twenty-four (24) hour fire-watch shall be provided as part of the Contractor's scope. The fire-watch inspections shall be carried out in all areas, including shafts, openings, concealed areas, non-work areas, etc. Provide for fire protection and dedicated fire watch in the service tunnels. Special fire- watch is required during any cutting, burning and/or welding performed at the Site.

H. The Contractor shall provide adequate temporary lighting and identify escape routes within the Site buildings and structure under construction.

1.13. GENERAL CONSTRUCTION

A. The Contractor shall provide good quality safety, location, directional, traffic and warning signage on Site. Provide signs to identify Employer, Project Manager and Supervision Consultant offices, Contractor premises, substations, site laboratory, first aid center etc. on the Site.

B. The Contractor shall be responsible for temporary construction for the safe execution of the works including barricades, warning signs, scaffolding, etc. General perimeter cable or

rail protection, with toe boards, at slab edges as well as safety fans to protect personnel working below will be provided by the Contractor. Temporary removal and replacement or repair resulting from damage caused by any subcontractor shall be the respective subcontractor's responsibility.

C. The Contractor shall, prior to starting and during the progress of his work, be responsible for the prevention of hazards to personnel and property including that of the Employer, Project Manager, the Supervision Consultant, Contractor, other sub-contractors, the neighborhood and the public.

D. The Contractor shall set up and operate a permit-to-access/ permit-to-work system for all 'live' electrical works, temporary and permanent. The Contractor's Safety Manager shall inspect the work area and satisfy himself of the arrangements in place and affix his signature as endorsement prior to commencement of work in that area. Up-to-date logs of the 'permit to access / permit to work shall be kept on Site and be available for inspection, at any time

1.14. SCAFFOLDS AND ACCESS WAYS

A. Scaffolds shall be provided by the Contractor for any work that cannot be accomplished safely from the ground. Refer to section 01545 Scaffolding of General Requirements Division 01.

B. The Contractor shall ensure that safe and defined access is provided to all work areas. Ladders and scaffolding shall conform to applicable standards and be inspected on a monthly basis and recorded. Details for erection and use of scaffolds will be worked out by the Contractor, with all calculations and drawings approved by the Contractor employed licensed engineer, and submitted to the Supervision Consultant for review. The Supervision Consultant's review comments, if any, shall not remove any responsibility for scaffolding from the Contractor.

C. Positive fall prevention will be employed by the Contractor when workers of any trade are working on elevated platforms 1.20 m or greater from the ground and other permanent or substantial footing.

1.15. EXCAVATION

A. All excavation shall comply with requirements for trenching and shoring, as established by the Contractor's Safety Program, with special attention to the following:
   1. Excavations over one and half (1.50) meters deep must be shored, benched or battered.
   2. Excavated material must be stored at least two (2.00) meters from the sides of excavations.
   3. Guard rails or barricades must be provided.
   4. Access/egress facilities will be provided.

B. The Contractor shall be responsible for providing, maintaining and removing safe and stable working ramps, in and out of the excavated areas.

1.16. CONFINED AREAS

A. Care must be exercised when working in or near live sewers, and tests must be made to verify that no hydrogen supplied or other poisonous gases are present, before anyone enters an existing Manhole or confined space. The Contractor shall install adequate ventilation system prior to performing any work in confined areas.

B. Particular attention is drawn to the dangers of poisoning, asphyxiation or explosion while working in or near, or inspecting, sewers, manholes, chambers, treatment units, pumping stations or any confined space. In this connection, the Contractor shall obtain appropriate safety equipment and acquaint all personnel of the dangers involved and precautions to be taken. The Contractor's Safety Manager shall be the sole authority for approval of established safety precautions.

1.17. WORKING ON HEIGHTS

A. The Contractor shall identify and develop a fall protection system to prevent any injury to the personnel or damage to materials and it shall be submitted to the Project Manager for review.

B. Not Used.

C. The Contractor shall be responsible for providing all perimeter protection, protection of work and workmen adjacent to and below his work and protection around openings until such time that their need is eliminated by permanent construction. The perimeter safety protection shall be installed at all times and at all floors including, roofs and setbacks and openings. Such protection shall be removed only after the installation of the permanent protection, in the form of parapets, walls, etc. Toe-boards shall be installed along with perimeter guard rails at all times.

D. The Contractor shall submit all information regarding the materials that he intends to use for the safety measures such as netting, railing, planking, etc., to the Project Manager who shall have the right to reject the proposed materials if they are found unacceptable, in which case the Contractor shall propose alternate materials.

E. Not Used.

F. Any safety cables or guard rails removed by the Contractor to facilitate construction shall be re- installed promptly after completion of the work.

1.18. Not Used

1.19. HAND TOOLS AND POWER TOOLS

A. All hand tools and portable power tools to be used by the Contractor shall be of good order and shall be used for the purpose intended. All electric power tools shall be grounded and will be inspected and recorded on a monthly basis. Where temporary power is difficult to achieve or where associated power leads may cause safety hazards, the contractors shall use portable battery operated tools.

B. Circular saws shall be equipped with guards that automatically enclose cutting edges. Radial arm power saws shall be equipped with automatic brakes. Explosive actuated tools must have prior written approval of the Contractor's Safety Manager BEFORE DELIVERY by the Contractor to the Project. Only trained operatives shall be operating such tools to ensure safe and proper usage of the same. All parties involved with the Project shall be informed prior to use of such tools.

1.20. MACHINERY & MECHANIZED EQUIPMENT

A. All machinery and mechanized equipment to be used for this Project by the Contractor shall be inspected for compliance with safety requirements and proper reports, certifications, etc. shall be completed and submitted, as required.

B. Supplemental requirements covering operating rules shall be established prior to start of work using mechanized equipment and machinery.

C. The machinery and mechanized equipment are inclusive of and not limited to cranes, derricks, hoists, etc.

D. All construction machinery, plant and equipment shall be fitted with spark arrestors and silencers.
Air compressors shall be fitted with "whisperers". Air hose couplings shall have safety ties on each coupling to prevent their separation.

E. All material handling equipment shall have rubber-tired wheel and rubber-tired protection at the front end, rear ends and protruding corners.

F. Wind velocity meter, aircraft warning lights and Lightning arrestors are to be included on cranes, and maintained in good working order until all cranes are removed

G. The Contractor shall perform the entire engineering, have all the hoisting equipment inspected as required by local and government regulations as well as any agency having jurisdiction and obtain all required permits. Copies of all inspection reports and crane certifications must be transmitted to Project Manager as soon as possible. Weekly inspection of all hoisting equipment and cranes is necessary and the corresponding checklists shall be forwarded to the Project Manager.

H. The Contractor shall arrange with an independent testing company for testing of all cranes, hoists and other lifting equipment, at frequencies dictated or suggested by the manufacturers or in shorter frequencies if required by regulations. In addition, the Contractor shall provide the following for cranes:
    1. Torque crane masts. Forward inspection checklist to the Project Manager.
    2. Adequate fire protection
    3. Annual certification from manufacturer of crane or independent inspection firm.

I. The Project Manager reserves the right to have all hoisting equipment periodically inspected by an independent agency at the Contractor's cost. Corrections must be made within three days of receiving the report. Project Manager will not assume any responsibility for the safe operation of the cranes or any other equipment by exercising this right. The Contractor shall co-operate with the inspecting agency by allowing time for inspection. The Contractor will be notified 48 hours prior to the time of actual inspection.

1.21. WORKER INDUCTION

A. Minimum protective clothing for all personnel on the Site shall be:
    1. Hard hats are required at all times.
    2. Protective eye covering will be worn when welding, hammering metal, stone, or concrete, grinding or cutting metal units.
    3. Safety footwear shall be worn by all personnel and operatives at all times.
    4. Safety overalls.

B. Minimum safety observances:
    1. Work areas and access ways are to be free of debris, materials, and all tripping hazards.
    2. Temporary electrical wiring will be protected from damage by traffic, be in good condition and protected by ground fault circuit interrupters.
    3. All portable containers for gas and other inflammable liquids shall be appropriate for the liquid or gas with self-closing lids. No plastic containers are allowed.

4. Maximum speed for automobiles and vehicles on the Site is twenty-five (25) kilometers per hour.

C. All accidents are to be reported directly to supervisors, and the Project Manager. If serious injury is apparent or suspected, utilize pre-established emergency hospital service. The telephone number shall be prominently displayed at all Site telephone locations. For small cuts, scratches, etc. first aid kits are to be available from each subcontractor and the Contractor.

D. In the event of fire, if it cannot be immediately contained, sound the fire alarm, notify the nearest Fire Brigade and evacuate all personnel. The telephone number shall be prominently displayed at all Site telephone locations. Then attempt to put out the fire with available fire extinguishers and water hoses until help arrives. Do not endanger personnel in fighting the fire.

E. Use of heavy equipment must have prior clearance of the Contractor's Safety Manager before commencement of their work.

F. All equipment must meet the safety standards, described in the Specification.

G. No Site visiting during nights, week-ends or holidays without prior permission.

H. The following will NOT be permitted on site including but not limited to:
   1. Radios
   2. Cassette players
   3. CD players
   4. Music systems
   5. Walkman's
   6. Televisions

1.22. SAFETY CHECK LIST

A. The Contractor shall, within thirty (30) days of commencing work on the Site, prepare a checklist incorporating the following items and submit the same to the Project Manager after it has been signed off signifying completion of the related activities. The check list shall be updated monthly and be available for Project Manager's review every month as the Contractor's work area changes and additional subcontractors are employed.
   1. Prepare safety program.
   2. Post safety program on Site bulletin board.
   3. Prepare and post Fire Prevention Program.
   4. Analyze Site for potential hazards and hazardous procedures.
   5. Establish plan for location of shanties, material storage, personal facilities and traffic flow.
   6. Arrange for sanitary facilities.
   7. Arrange for debris removal.
   8. Establish procedure to obtain Sub-contractor safety program.
   9. Arrange for doctor.
   10. Arrange for hospital.
   11. Arrange for ambulance service.
   12. Post phone numbers for police, fire, medical and ambulance service at each of the on Site telephone locations.
   13. Obtain claims forms.
   14. Contact loss prevention department of insurance carrier.
   15. Arrange for exposure checks by insurance carrier.

16. Obtain approval from the Project Manager of a report format for reporting accidents and injuries.
17. Establish adequate first aid kit and stretcher facilities.
18. Post chart to signify weekly checks of first aid kits.
19. Hire qualified first aid personnel, if more than ten minutes from a medical facility with which an emergency medical service has been established.
20. Prepare and post at each on Site telephone location "off hours emergency notification list".
21. Arrange for watchman service, if required.
22. Prepare a watchman's log.
23. Obtain any required local authority forms and posters.
24. Verify insurance coverage for Subcontractors, prior to starting work at the Site and also prior to execution of sub-contracts.
25. Procure and issue safety equipment appropriate to operations:
    a) Hard hats
    b) Safety harness
    c) Goggles
    d) Ear protection
    e) Carbon monoxide tester
    f) Safety shoes

26. Post sketch and signs showing locations of fire alarm boxes, hydrants and first aid facilities.
27. Arrange for and post, safety posters and warning signs.
28. Establish weekly toolbox safety talks.
29. Set up an accident control chart.
30. Establish monthly safety meetings.
31. Appoint a safety supervisor and set date for the first safety meeting.
32. Establish Assembly Points in the Site for Contractor's personnel to meet in case of emergencies. Conduct fire drill and roll call to ensure all employees of Contractor have been accounted for. This shall be done at least once in a month.

1.23. NON-COMPLIANCE WITH SAFETY REQUIREMENTS

A. GENERAL

1. Where the Contractor violates any of the safety provisions described within this division, the Employer shall take the appropriate remedial action, and all costs associated therewith shall be at the Contractor's expense.
2. On the occurrence of the first violation, the Contractor shall be warned in writing by the Project Manager, and shall be instructed to remedy the violation within a specified time. Where the Contractor fails to remedy the violation within the time stipulated, the Contractor shall be prohibited from carrying out any further work within the affected area until the specific exposure has been corrected.
3. On the occurrence of all further violations, the severity of each violation shall be considered by The Project Manager and the Contractor instructed accordingly. Where the Contractor unreasonably ignores the Project Manager's instructions, then the foreman responsible for operations in the area where the safety violations are occurring shall be dismissed from the site.

B. SAFE WORKING CONDITIONS

1. The Contractor's Safety Plan shall address scaffolding, guard rails, ladders, appropriate connections for power tools, grounding of temporary electrical system, safety provisions, such as safety switches and cover guards for blades of saws, including other similar items which are required to ensure that the Site working area is safe for carrying out the works without risk to human life.

2. Where any of the Contractor's employees violate any of the safety provisions within this category, the offending employee shall be warned and prevented from continuing working until he is properly attired. Should the same employed person be caught a second time, he shall be dismissed from the Site. In each case of a warning or dismissal, the responsible foreman shall be notified. Should more than two (2) employees be sent off the Site during any week, then the responsible foreman shall also be dismissed from the Site.

C. FACILITIES
1. The Contractor shall provide all emergency facilities such as first aid equipment, fire-fighting equipment within work and material storage areas, and accessible sanitation facilities for employees in compliance with municipal requirements.
2. All these facilities are required prior to the commencement of work on Site by the Contractor. Should these facilities not be provided within the time specified by the Project Manager, then the Employer shall provide these facilities and the costs incurred by the Employer may be deducted by the Employer from any monies due or to become due to the Contractor or be recoverable as a debt.

D. CONTINUOUS BREACH
1. Should the Contractor persistently breach the safety requirements with undue reason, then the principal of the Contractor shall be summoned to the Site and instructed to take the appropriate action to ensure that his employees comply with the safety requirements of the Contract. In the event of continuous breach, the Employer shall also notify the insurance companies who have provided the insurance policies under the Contract.

1.24. SUMMARY OF EMPLOYER/ PROJECT MANAGER ACTION IN THE EVENT OF THE CONTRACTOR'S NON-COMPLIANCE WITH SAFETY REQUIREMENTS

A. GROUP 1:
1. Items: Scaffolding
   a) Guard Rails
   b) Excavation Protection
   c) Safe Hand & Power Tools
   d) Temporary Electric Grounding
   e) Machinery & Mechanical Equipment
2. Action:
   a) Contractor warned to rectify.
   b) If Contractor fails to rectify, Contractor is barred from working in exposed area.
   c) In the case of continuous breach, employees and foreman responsible for exposed area shall be dismissed from Site.

B. GROUP 2:
1. Items: Personnel Protection
   a) Head Protection
   b) Eye Protection
   c) Hearing Protection
   d) Protective Garments
   e) Respiratory Protection
   f) Foot Protection
   g) Body Protection
2. Action:
   a) Responsible employee prevented from continuing work until properly attired.

b) When same employee is in breach a second time, he will be dismissed from the Site.
c) When more than two (2) employees are dismissed per week, then responsible foreman shall be dismissed.

C. GROUP 3:
1. Items:
a) First Aid
b) Sanitation Facilities
c) Material Storage
d) Fire Protection
2. Action:
a) Contractor warned to supply.
b) If Contractor fails to supply, Employer shall supply and deduct the cost from the Contractor.

END OF SECTION 01735

Section 01740 – Cleaning

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. General requirements for job Site cleaning during construction and prior to handover of completed facilities.

1.2. RELATED SECTIONS

B. Related work specified under other sections within Section 01700 and Section 01570.

1.3. JOB SITE CLEANING

A. The overall responsibility for maintaining the job Site clean at all times rest with the Contractor. The Contractor shall ensure implementation of all measures detailed in this document by his subcontractors.

B. As the work progresses, the Contractor shall be responsible to maintain the work areas clean and pollution free. Throughout the period of construction of the Works, the Contractor shall maintain the whole area of his operations in a clean, tidy and safe condition by arranging his materials in an orderly manner.

C. Each contractor is required to keep his work area clean on a daily basis and center pile construction debris at designated locations in the Site. The Contractor shall remove all debris from the Site for disposal.

D. Each contractor shall clean up his own debris as the work progresses.

E. The Contractor shall be responsible for dust control and pollution control. The Contractor shall carry out regular cleaning of all areas of construction site including all access roads within and around the Site. The areas shall be kept clear of dust, mud, water, silt and other materials.

F. The Contractor shall clean all vehicles and plant before they leave the Site to ensure that no earth, mud or other objectionable matter is deposited by them on roads.

G. If earth, mud or other objectionable matter is deposited on public or private rights of way as a result of the Works, the Contractor shall provide sufficient labor, plant, equipment, etc., as is necessary and as required by the Project Manager to ensure that deposits are immediately removed.

H. The Contractor shall ensure that material is stored and kept in a manner that does not create any fire hazard or any other encumbrances. All rubbish, waste materials, debris, and the like shall be systematically cleared off the working areas as it accumulates. Disposal should be done in a timely manner, as a minimum, on a daily basis in order to maintain a clean and safe work area.

I. The Contractor shall dispose all demolition and construction debris, waste, excess excavated earth/ Soil per Municipality requirements including transportation to designated Municipality dumping grounds. Any cost associated with the disposal is to be borne by the Contractor.
The Contractor shall be responsible for providing broom cleaning, machine vacuuming and/or street sweeping to ensure a safe and clean work environment.

J. The Contractor shall specifically be responsible for cleaning, garbage removal and pest control.

K. The Contractor shall arrange and provide for trash chutes, skips for debris collection and identify suitable locations to place them. The disposal of debris and construction waste including reinforcement steel etc. shall be carried out regularly. The Contractor at the end of each day's work shall empty out the skips and haul out the garbage and debris off site.

L. If the Project Manager and/or the Employer and/or the Supervision Consultant find that cleaning is not satisfactory, instructions will be issued to the Contractor for taking appropriate actions immediately. On failure to conform to the issued instructions, the Project Manager shall deploy an outside agency or third party to carry out the necessary tasks for which the costs shall be payable by the Contractor. The incurred costs shall be deducted from the monies due to the Contractor.

M. All materials, products, assemblies and installed works and finishes shall be kept clean and protected, during the course of work. Non-conformance by the Contractor to the instructions of the Project Manager and/or the Supervision Consultant to clean the installed work items may result in those items being rejected from Site.

N. Not Used.

1.4. FINAL CLEANING

A. Prior to request for a Taking Over Certificate for the Works and final hand-over the Contractor shall have thoroughly cleaned all finished surfaces forming the permanent Works. Each contractor is responsible for cleaning the materials, equipment, products and installations forming part of his Contract. This cleaning shall be carried out by specialists and include but not be limited to the following:

1. Removal of stains, spots, marks, dust, paint, grease, oil, mortar splashes and dirt from decorated work or finished surfaces.
2. Removal of all temporary protective coverings, fixtures or any other surfaces, including adhesive residue.
3. Clean (and polish where required) all metallic materials.
4. Cleaning of all finished surfaces will be done using only cleaning material approved by the manufacturer or supplier of the item and in a manner approved by the Supervision Consultant.
5. Damage done to any surfaces, equipment during the process of cleaning operations will be made good by the Contractor at his own expense.

B. The Contractor shall form dedicated teams comprising men from his employ and from his subcontractors to perform final cleaning operations under the supervision of responsible engineers/ foremen of the Contractor.

C. All spaces and other areas will be inspected by the Supervision Consultant upon receipt of a written request from the Contractor.

D. Dirt and debris shall be completely removed from the Site in accordance with the relevant section of the Specification.

END OF SECTION 01740

Section 01780 – Closeout Submittals

PART 1 - GENERAL

1.1. SECTION INCLUDES

A. General requirements regarding contract closeout submittals. In addition, specific requirements are given in other sections of Division 01 and project specifications.

1.2. SUMMARY

A. The close-out requirements are inclusive of and not limited to the following:
   1. As-Built Drawings
   2. Operation and Maintenance Manuals
   3. Spare Parts and Maintenance Products
   4. Warranties/Guarantees
   5. Maintenance Service, as and if called for elsewhere in the Contract Documents
   6. Asset Database
   7. The Contractor shall be responsible for obtaining "clearance", "approvals" and/or "Occupancy permits" from authorities having jurisdiction confirming that the building may be used for the purpose intended prior to the request of the Taking over Certificate for the whole of the Works or Sections thereof.

1.3. AS BUILT DRAWINGS

A. As the Works progress the Contractor shall maintain a complete and accurate record of all changes and deviations from the Drawings, shop drawings and Specification, indicating the Works actually installed. This record set of prints of Drawings, shop drawings and Specification shall be kept at the Site for inspection by the Employer, the Project Manager and Supervision Consultant.

B. Towards the completion of the Works the Contractor shall certify that each of the revised prints for the Drawings and documents stated above is complete and accurate and shall submit them to the Supervision Consultant for review and approval.

C. At least sixty (60) days prior to request for a Taking Over Certificate for the Works, or for Sections thereof, the Contractor shall submit one (1) high quality reproducible drawing and five (5) printed sets of the record "As Built" (hereinafter referred to as As-Built) drawings and three (3) copies of manufacturer's descriptive data for materials, equipment and fixtures including performance characteristics, capacities, technical information and operating manuals and other pertinent data necessary to enable the Employer to operate, maintain, dismantle, reassemble and adjust all parts of the Works. A comprehensive index of all As-Built drawings shall be included.

D. As Built drawings show all approved changes. The As-Built drawings shall be in hard copies as well as electronic copies. As-Built drawings shall have all revision clouds and revision triangles removed and the words "As Built" shall be written in the revision box above the title block. The latest revision and date shall be indicated in the appropriate spaces.

E. The Contractor shall also supply three (3) full document sets on Compact Disks (CD). The CD's to be from reputable, acceptable and single manufacturer, containing all drawings in ".dwg" and "dwf" (latest AutoCAD and Architectural Desktop (ADT) software from AutoDesk, as approved by the Supervision Consultant) formats. Certain drawings may need to be in ".dgn (Microstation format per the requirements of local authorities).

F. Drawings shall be grouped as per the agreed structure of hard copy sets, each group contained within an appropriately named folder. No folder shall be split between CD's. File structure and nomenclature system shall be submitted for separate approval.

G. All CD's shall be provided in plastic case of acceptable quality. Graphics and Title inserts to be submitted for approval, showing as a minimum, the following:

Project Name	
Employer	
Project Manager	
Design Consultant	
Supervision Consultant	
Contract Number & Title	
Contractor	
Index of Contents	

H. Each CD and case shall be clearly and indelibly marked by title referred to in the index. CD's shall be collated and delivered to the Supervision Consultant in purpose made containers of approved material and design. Each container shall have a hinged top with locking devices to ensure a secure and dust tight seal to the main body of the container. The containers shall be labeled as above on the outside of the lids.

I. All As-Built drawings, copies (on film and paper) and each copy of CD's shall be subject to the approval of the Supervision Consultant. The Contractor, at his own cost, shall replace any item that is not approved by the Supervision Consultant.

1.4. OPERATIONS & MAINTENANCE MANUALS

A. At least sixty (60) days prior to request for a Taking Over Certificate for the Works, the Contractor shall submit for the Supervision Consultant approval one draft copy of all operation and maintenance manuals which shall provide all necessary information for the proper upkeep of all the installed works by the Contractor, including but not limited to:

1. List of all shop-drawings with description.
2. Relevant Specification number.
3. Description of material or equipment including tag number, if applicable.
4. Quantity and location.
5. Catalogue cuts, if applicable.
6. Manufacturer's preventive maintenance procedures.
7. Methods and materials to be used in above (e.g. cleaning).
8. Parts list.
9. List of recommended spare parts.
10. Name and address of supplier.
11. Expiration date of warranty.
12. Name and address of manufacturer.

B. After review and approval by the Supervision Consultant, the Contractor shall submit a minimum of four (4) bound copies in a format acceptable to the Employer.

C. The Contractor shall also submit two (2) soft copies on Compact disks (CD) of Operations and Maintenance Data in a contemporary version of Adobe Portable Reader format (.pdf) or similar approved, including all graphics, catalogue cuts, etc., scanned at A4 size and

included as high resolution '.jpg' (JPEG) files. Resolution of scan shall be minimum 300dpi. CD manufacturer, labeling and file structure shall be similar to that described for As-Built drawings.

D. The Contractor shall undertake the training of the Employer's Facility Management and Maintenance teams to ensure that the Operations and Maintenance Manual, and the equipment are familiar and understood. Notes of the training sessions shall be incorporated into the final manuals.

1.5. ASSET DATABASE

A. At least seventy-five (75) days prior to request for a Taking Over Certificate for the Works, the Contractor shall submit for the approval of the Supervision Consultant, one draft copy of the Asset Database in soft and hard copies.

B. The Asset database shall be comprehensive and accurate. Refer to Section 01320 for periodic submission of Asset database. As a closeout submittal, the database shall be updated with full and final details, with all fields accurately filled-in and reference documents (drawings, specifications, O&M manual, warranty certificates, etc.) identified.

C. After review and approval by the Supervision Consultant, the Contractor shall submit a minimum of six (6) bound copies of the hard copy of database and two (2) sets of soft copies in CD's.

1.6. WARRANTIES

A. Warranty for any equipment, material, product or system shall be submitted by the Contractor as required by the Contract.

B. Warranty period, as noted in the specifications, for any equipment, material, product or system shall be calculated from the next day of the completion of the Defects Liability Period. Until the Defects Liability Period is complete, the Contractor shall hold necessary warranties from their subcontractors, suppliers, and manufacturers as required by him. In effect, it is the Contractor's responsibility to obtain warranties that shall be valid throughout the duration and time as calculated in this clause.

C. The Contractor shall provide warranties durations indicated in the project specification section.

D. All package subcontractors shall obtain and/or provide warranties under their scope as joint or multi-party warranties to the Contractor. The Contractor shall provide warranties to the Employer wherein he shall be one of the parties, who shall be jointly and severally be obliged to provide the required assurance. All warranties shall be in the format provided by the Project Manager or the Employer.

E. The warranty for all trades shall cover the materials supplied and installed and the workmanship. Samples of warranties shall be obtained from subcontractors and vendors immediately upon placement of orders with them for submission to the Supervision Consultant and the Project Manager for approval. The Project Manager and the Supervision Consultant shall verify the contents of the warranty, seek modifications if required and return it back to the Contractor. The Contractor shall then prepare Final Warranty document in the same format and words as approved by the Project Manager and the Supervision Consultant. Payment for the completed work shall not be released completely without the approval of the Final "Original" warranties.

1.7. MAINTENANCE

A. Where maintenance of any system is called for in the Contract, unless specifically detailed, all maintenance shall be comprehensive that shall include preventive maintenance, breakdown maintenance and emergency maintenance.

B. Maintenance period shall commence the day after the issue of Taking Over Certificate.

END OF SECTION 01780

SECTION VII - PROJECT SPECIFICATIONS

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1. GENERAL

1.1. BRITISH STANDARDS

Some or all of the following British Standards and Codes of Practice are referred to in this Specification and are deemed to form part thereof, but approved equivalent foreign standards may be complied with instead. The list is included here for convenience, but may not be exhaustive. The Contractor should refer to the text of the project specific Specification.

Copies of the publications listed below can be obtained from-

British Standards Institution Information,
Services and Marketing
Linford Wood
Milton Keynes
MK14 6LE
England
Telephone: 01908 320033

For brevity, some titles are not reproduced in full.

BS4	Structural steel sections
BS12	Portland cement
BS63	Road aggregates
BS65	Vitrified clay pipes, fittings, joints and ducts
BS76	Tars for road purposes
EN124	Gully tops and manhole tops for vehicular and pedestrian areas. Design requirements, type testing, marking, quality control
EN146	Portland blast furnace cements
DD21 3	Method for determination of the indirect tensile stiffness modulus of bituminous mixtures
EN295	Vitrified clay pipes and fittings and pipe joints for drains and sewers
BS381C	Colours for identifying, coding and special purposes
BS397	Industrial safety helmets
BS410	Test sieves
BS434	Bitumen road emulsions (anionic and cationic)
BS443	Testing zinc coatings on steel wire and for quality requirements
BS476	Fire tests on building materials and structures
BS594	Rolled asphalt for roads and other paved areas
BS718	Density hydrometers
BS729	Hot dip galvanized coatings on iron and steel articles
BS743	Materials for damp proof courses
BS8I2	Testing aggregates
BS873	Road traffic signs and internally illuminated bollards
BS882	Aggregates from natural sources for concrete
BS890	Building limes
BS903	Physical testing of rubber
BS1047	Air-cooled blast furnace slag, aggregate for use in construction
BS1142	Fibre building boards
BS1199	Building sands from natural sources

2. MOBILIZATION AND DEMOBILIZATION

2.1 SCOPE OF WORKS

a) This includes mobilization and demobilization of all constructional plant, and equipment, including testing equipment deemed necessary to complete the Works

b) The Contractor shall mobilize and deliver all constructional plant and equipment required to undertake the works and all the materials for any temporary facilities required.

c) Mobilization shall include the importation and transportation to the job-site of all equipment, constructional plant and all necessary items for the execution and completion of the works. Mobilization shall also be deemed to include any site clearance work that is necessary.

d) It is the responsibility of the Contractor to ensure that all plant and equipment brought for the project are in working condition. In the event of a breakdown of constructional plant/equipment when it is beyond the ability of the personnel or when there are insufficient tools or materials at site to affect a repair in a reasonable time, the Contractor will be instructed to provide a replacement for the same at no additional cost (including mobilization) to the Owner. In such a case, no extension will be given for completion of Works. The Contractor may also be required to remove the broken plant from the Site if it is hindering the completion of any components of the Project.

e) Demobilization shall include the removal from site of all constructional plant and equipment and the removal of all temporary facilities erected by the Contractor for his convenience.

f) Mobilization costs of plant and equipment referred to herein shall be paid after the Consultant / Engineer has certified and accepted that all equipment listed for the Project and material for Temporary Works have been delivered to site or part three off, as the requirement deemed necessary.

g) Mobilization and demobilization costs have been specified for each Airport separately. The contractor may be required to provide a breakdown for the mobilization costs if in the opinion of the Consultant / Engineer, the item appears to be unbalanced or for any budgetary constraints that may have by the Owner.

h) Demobilization costs shall be paid after the Consultant / Engineer has certified and accepted that all equipment listed or as agreed has been removed form site and all temporary facilities dismantled and removed from the Site.

3. TEMPORARY FACILITIES

3.1 SCOPE OF WORKS

This item consists of the following:

a) Furnishing, erection and maintenance of all site facilities such as Contractor's camp and yard, temporary utilities and services, safety provisions, temporary roads and temporary navigations aids required for the execution of the Works as specified below;

b) Erection of all construction plant and equipment after being delivered to site; and,

c) Disassembly and removal of all site facilities, construction plant and equipment from the site for de-mobilization.

d) The accomodation has been removed from the site. There is no accomodation. Contractor is responsible for their own accomodation and any costs associated with it.

e) based on the EIA report, all garbage must be removed from the site or burned, and is not allowed to be buried. There is no defined disposal area as this is a "fill" project. The trees need to be removed and can be burned or cut up for fire wood. Please refer to the EIA report.

f) There are no current project offices. The previous campsite has been removed.

3.2 PROVISIONS AND REQUIREMENTS

a) The Contractor shall be responsible for temporary facilities, utilities, services and safeguards as required under the Contract.

b) Temporary and permanent utility facilities used for the construction work shall be adequate for the intended use and not be overloaded or otherwise used or arranged in any manner, which will endanger persons, premises or the works themselves.

c) The contractor needs to price their own power, water and sewage for the staff and employees.

d) Upon completion of the Works, unless otherwise directed or required, all site facilities, installations, utility services, constructional plant and equipment shall be disconnected, disassembled and removed from the Site.

e) The camp area shall be kept in a clean and tidy condition throughout the construction period. The Consultant / Engineer shall have the authority to order periodical clearings at the Contractor's cost, provided that the site for disposing of Garbage / Debris allocated by the owner and is within the stipulated distance from the work site.

f) All accommodation, latrine and shower facilities and canteen, shall conform in every respect with regulations imposed by local health authorities.

g) The Contractor shall provide and maintain the necessary equipment as specified in contract and accessories, for construction use for the entire construction period.

h) The Contractor shall be responsible to arrange their own independent water, electricity etc. as required executing the work throughout the project. Hookups to the Airport networks will not be permitted.

i) The Contractor shall provide and maintain a temporary electricity service and distribution lines of adequate capacity for power, lighting and other construction needs.

i. All utility systems shall conform to local codes and regulations.
ii. All costs associated with the provision of utilities shall be borne by the Contractor.
iii. The Contractor shall maintain appropriate safety measures on site and around the work areas.
iv. The Contractor shall adhere to all local codes and regulations with respect to work-safety.
v. The Contractor shall maintain appropriate notices and safety measures to warn public of dangers on site.
vi. The Contractor shall provide and maintain any temporary roads and access ways Project Site when required.

4. SITE EXPENSES

4.1 SCOPE OF WORKS

This item shall cover all expenses for the staff related to the management of the site and office.

4.2 PROVISIONS AND REQUIREMENTS

a) The site costs shall include but not be limited to the following:
b) Site office costs, including basic staff salary, overtime payments, bonuses, travel, medical fees, overseas and other allowances. Costs should also allow for stationery and office equipment.
c) Communication Facilities, to include the costs telephone, as well as walkie-talkie communication between the job site proper and the site office. Communication costs for the Contractor's site office shall also be included here.
d) Site safety costs to include all matters related to workplace health and safety issue.
e) Site security costs.
f) First aid, to include all reasonable first aid supplies and equipment.
g) Insurance, costs of insuring the works and temporary facilities as required.
h) Waste management, to include all costs incurred in keeping the site clean.

5. ENVIRONMENTAL REQUIREMENTS

5.1 INTRODUCTION

Environmental Impact Assessment shall be prepared to the requirements of The Ministry of Environment by the Employer. It is Employer's requirement to prepare all documentation to the requirement of The Ministry of Environment including any monitoring that maybe required and to obtain all necessary permits. The contractor shall follow all Environmental laws and regulations of Maldives in design and during implementation of the project.

The proposed construction works are, under conditions given below, expected to have only minor impact on the surrounding coastal zone.

However, this is to be expected only if relevant mitigation measures are incorporated during the construction phase as well as during the long-term operational period. In this section the objectives, obligations and criteria of such mitigation measures will be outlined.

5.2 FEEDBACK MONITORING

During the period of dredging and reclamation, working activities may have adverse effects on the coral reef community and the terrestrial coastal zone. One of the main activities will be the dredging of basin for the reclamation.

The most widespread and visible consequence of dredging and excavation is the generation of suspended sediments and turbidly, both of which affect the corals adversely.

Other main activities with possible adverse effects are the disposal of the dredge spoils, site clearance on land and transport on land and at sea.

The Contractor shall during the construction period carry out an environmental control programme following a feedback design in order to ensure that adverse effects are detected before they become irreversible; The basic concept of a feedback monitoring program is that selected environmental key criteria, for instance live coral coverage or sedimentation rates, are observed regularly during the construction phase. If response, based on impact criteria indicating thresholds severe but not irreversible levels of impact, are crossed, steps of avoidance shall be enforced.

A metrology description for the environmental migration measures proposed for the environmental control programme shall be prepared by the Contractor for the Owners approval prior to the implementation of the environmental control programme and prior to any construction works on site.

The environmental key criteria and possible response thresholds are specified in the following sections.

5.3 OPERATIONAL KEY CRITERIA FOR ACCEPTABLE ENVIRONMENTAL IMPACT

During construction, the response on the following operational key criteria for acceptable environmental impact shall be measured at the perimeter of the construction zone. The perimeter of the construction zone shall be clearly identified at site and shall be approved by the Consultant / Engineer before taking of the measurements.

The Response Threshold (RT) for the operational key criteria shall be:

a) Live coral coverage; No significant decrease shall occur at selected sites, representative of the coral reef community in the area, compared to likewise representative reference sites.
b) Concentration of suspended solids in surface waters over reef slope: less than 10 mg/l above ambient concentration during daylight hours and less than 20 mg/l at night.
c) Sedimentation rate on coral reef slope (5-10 m depth zone): less than 10 mg/cm^2 day.

5.4 ENVIRONMENTAL OBLIGATIONS

The Contractor has the obligations mentioned below. He shall address the issues in the methodology description for his environmental mitigation measures designed to meet the criteria mentioned in section 4.3 and the subjects listen in section 4.5:

a) To describe methodology of, carry out, an appropriate feedback-monitoring programme, and see that the response thresholds given above are not surpassed. For this programme detailed and currently updated dredging schedules should be given currently calculate the amount of spill.
b) To describe, how possible adverse impacts related to subjects listed in section 4.5 are planned to be migrated.
c) Establish emergency measures and procedures for accidental spills of hazardous substances during the construction period.
d) Make an assessment of the possible impact of any temporary physical structure on the hydraulic situation and any possible erosion following this, and take mitigation constructions into the planning of the dredging and reclamation.
e) Report to the Owner.

5.5 SUBJECT OF ENVIRONMENTAL CONCERNS

The following list included subjects considered of environmental relevance for the construction or part thereof. The list shall be considered as guideline for the contractor in his selection of mitigating measures of relevance for his selected construction methods and they shall be subject to adjustment when experience obtained during the environmental feedback-monitoring program should call for this.

a) Dredged material. Dredged material to be used for consumption purposes must not be deposited on the reef flats or on landsides areas outside the limit of working areas. The excavation scheme should be set up in such a way that slurry plumes are minimized as much as possible on and in the vicinity of the reefs.
b) Surface run off. During the construction period, surface Water caused by heavy rainfall may carry larger amounts of sediment to the reefs. Such surface run off shall be minimized.
c) Fresh water supplies for any construction purpose or Labor force are to be brought in by the Contractor.
d) Solid waste and sewage: as a main principle, all waste is to be removed from the island before any nuisance of dust, smell or visibility is generated.

e) Waste: waste oil from machinery, bilge pumping or other use as well as any waste of hazardous substances connected to the construction activities is to be collected and transported as directed by the Consultant / Engineer.
f) Dumping: No dumping of any kind from support vessels are allowed on the reef or in the upstream waters of the island (and should otherwise follow any national regulations on dumping.
g) Dust nuisance: Activities creating dust nuisance are to be conducts under wind conditions that can the dot out to sea.
h) Anchoring of carrier and supporting ships and vessels: anchor is not allowed to be dropped on the reef crest or reef slope outside the working areas limit.

6. SURVEY AND SETTING OUT

6.1 THE CONTRACTOR'S SETTING OUT

Ground markers shall be established for the above-mentioned main reference lines. The Contractor shall protect, and maintain these permanent pound markers during the period of the Contract. The Contractor shall install, protect, and maintain during the period of the Contract, such additional permanent and/or temporary pound markers as are necessary for the execution of the Works, or as required by the Consultant / Engineer.

Sufficient working space shall be available around each pound marker to enable the Survey instruments to be erected and operated.

Further requirements regarding setting out, survey, etc. of the structures are stated in the specifications of the structures.

6.2 SURVEY OF SEA BED – "IN SURVEY"

Initial surveying of the seabed are required prior to any dredging or reclamation works.

The areas in connection with in- and out-surveys, will extend to cover at least 100m of the seabed beyond all dredging and reclamation limits in addition to the actual dredging/reclamation area.

The Contractor shall provide all necessary equipment, instruments, Labor and crew necessary. The survey shall be made in a grid of maximum 10m spacing between the survey lines in both directions. The survey shall be detailed sufficiently for the recording of any major irregularities in the surveyed surface.

The Contractor shall shortly before the execution of any substantial survey work carry out calibration of is survey equipment in order to document that his setup can meet the specified requirements to surveys.

7. DREDGING, RECLAMATION AND EARTH WORKS

7.1 SCOPE OF WORKS

The works decided in this section of the specifications comprise dredging for:

Dredging areas, dredging depths and dredging limits are specified in the approved drawing layouts & Cross Section of Reclamation.

The specified works comprise in addition use of dredged materials for fill in reclamation areas and other parts of the stockpile area specified by the Consultant / Engineer for utilization elsewhere on the island.

The dredging works consists of excavation of coral materials below the existing seabed regardless of the nature of the materials encountered during the course of dredging. Disposal of dredged material at either Stockpile or as fill, backfill, reclamation filling or core and filter materials in Runway structures, shall be carried out in accordance with these specifications and in compliance with the drawings as directed by the Consultant / Engineer.

The works include supply of all materials and the provision of all Labor, plant and equipment required for the actual dredging, reclamation and other reuse of dredged materials as well as for all preparatory works surveys and testing required for the proper execution and completion of the works. In addition, the works shall include all required measures for reduction of the environmental impact of the dredging and be included in the Contractors Environmental Control Programme according to EIA report.

Maafaru has an existing harbor that is disconnected from the airport. Materials may be delivered at this harbor, however any damage to the existing harbor facilites will need to be repaired at contractors cost. Also, any damage to the roads leading to the airport from the harbor will need to be maintained and repaired as needed. Also, most importantly, the village has pedestrian traffic and motorbikes frequently using the roads. Any material trucks from the harbor will need to be monitored when coming to the airport to ensure safety.

The internal road inside the airport are ashphalt with curbs. The island road network is dirt. Before work begins, we will require a report showing the condtion of these roads before construction starts. The only available roads are the frontage road next to the fence and the main road coming from the harbor. Even when using these roads, spotters must be deployed to ensure nobody drives out from the cross streets when construction equipment is present. The internal streets (dirt) will not be allowed for transportation without the express written consent of the island council. There are many pedestrians and small motorbikes and these roads cannot be used. While the internal roads are of substantial strength they are not designed for heavy loads only small pickups and personnel vehicles.

Note: The EIA report was produced for an expanded scope. The quantities in the EIA report are based on this expanded scope. The current tender has a smaller reclaimation quantity than the EIA report. Contractor to verify exact quanity for their proposal. Use the RWA-MAP-SKT-066 for the current quantities and location of the scope in question.

The EIA report has all the available Bathymetric surveys. If any additional studies are required, the contractor shall make appropriate arrangements to investigate.
The only studies that have been performed are in the EIA report. Any additional studies required will be the responsibility of the contractor such as, Meterological and hydrological conditions: wind, wave, current and design water level.

7.2 REFERENCES

The following Standards and Codes of Practice are referred to in this specification and fully or partly incorporated herein as specified:

a) Designation Title of Standards / Code of Practice
b) BS 812 Sampling and Testing of Mineral Aggregates, Sand and Fillers
c) BS 6349, Part 5 Maritime structures. Code of Practice for dredging and land reclamation
d) CIRIA/CUR: Manuel on the use of rock in coastal and shoreline Consultant / Engineering. Report no. 83/154
e) Second Addendum to the EIA for the proposed International Airport Development Project at Mafaaru, Noonu Atoll, prepared by CDE

7.3 UTILIZATION OF DREDGED MATERIALS

All suitable material removed from the dredging areas shall, subject to the approval by the Consultant / Engineer, either be initially sorted by excavator and manual Labor or by means of grizzly plant and/or hauled to a stockpile for screening, or shall be used for reclamation, subgrade for paving work, backfill for structures, or for other purposes shown on the drawings or as directed. Materials, which are otherwise suitable but contain excess moisture shall be processed and utilized for fill.

Material from the dredging determined by the Consultant / Engineer as suitable for slope protection in revetments, filter or core material or other purposes shall be conserved and utilized as directed.

Materials from the dredging, as determined by the Consultant / Engineer, to be used in the Works shall be disposed of at the designated stockpile areas or other areas as approved by the Consultant / Engineer. Unless otherwise specified, compaction will not be required. However, the materials taken to disposal areas shall be levelled and shaped attractively to the approval by the Consultant / Engineer.

All excess material shall be delivered for other utilization on the island or disposed of as directed. It is the Contractor's responsibility to determine if sufficient material is available for the completion of the works before delivering or disposing of any materials.

7.4 MATERIALS

The density of coral sand may be ranging from 23 to 26 kN/m^3. It is estimated that the average density for coral sand and gravel from Lagoon is 24 kN/m^3. The density for coral varies considerably with the type and quality of the coral. It is estimated to 22 kN/m^3. The maximum dry density of dredged materials shall not be less than 1.7 g/cm^3 for reclamation of land. Actual geotechnical parameters including specific

gravity and density of dredged materials reused in the reclaimed structures shall be verified according to the function of the materials used in the structures and the specified quality requirements.

7.5 TESTING OF MATERIALS

Testing of dredged material used as fill for general reclamation and as backfill shall be in accordance with the Specification for Highway Works: 1994 - Department of Transport, London.

Testing will further be required when the dredged material is reused in the construction works. This testing shall provide sufficient documentation of the material quality and ensure fulfilment of all requirements specified for the material when used in the actual structures.

7.6 WORKMANSHIP

7.6.1 SETTING OUT OF DREDGING WORKS

All boundaries of dredging areas shall be established on the site by installation of marked in the appropriate reference lines or electronically established subject to the Consultant / Engineer's approval.

Markers shall be robust and clearly visible from all parts of the repairing area. All setting out of dredging works shall be carried out by the Contractor.

7.6.2 EXECUTION OF DREDGING

All dredging sort and earthworks shall be carried out in compliance with the criteria and environmental mitigating measures outlined in EIA Report.

Prior to dredging or disposal of materials in any area, such area shall be cleared and its surface level shall be surveyed in the presence of the Consultant / Engineer. The survey shall be made sounding in a grid of maximum 10m spacing between the surrey lines in both directions.

The survey shall be detailed sufficiently for the recording of any major irregularities in the surveyed surface.

All materials dredged as specified on the drawings or as directed by the Consultant / Engineer shall be utilized as specified in 1.2.2

Dredging shall be carried out by using a backhoe, cutter suction dredger or other dredging equipment with sufficient capacity to dredge the dredging classes 1 thorough 3.

If the Contractor decides upon using a cutter suction dredger or similar equipment, he shall be obligated to familiarize himself with the local conditions on shore to prepare for the necessary arrangements of the spoiling area. Reference is moreover made to the environmental requirements as described in EIA report.

Pre-splitting methods for dredging in soils of class 4 shall be subject to the Consultant / Engineers acceptance. The Contractor is required to provide detailed dredging plans and adequate descriptions of solution and mitigating measures when it is found that pre-splitting is require; for the dredging. It shall be noted that blasting is not encouraged from an environmental point of view and it shall only be allowed after specify permission from the Government of the Maldives has been obtained.

The Consultant / Engineer may order the method of pre-splitting to be stopped if the materials encountered no longer warrant it.

The supply, placement and compaction of fill and backfill specified on Drawing No. shall be in accordance with the Specification for Highway Works: 1994 - Department of Transport, London, unless otherwise permitted, fills and backfill materials from dredging work shall contain no organic or other deleterious matter. Rock or other solid matter may be placed in a reclamation area subject to the Consultant / Engineer's approval. Bulky materials shall not be used as reclamation materials.

For reclamation below HIGHEST WATER LEVEL, dredged materials shall be placed directly in reclamation areas as shown on the Drawings. Large pieces of coral deposited in reclamation areas shall be spread over the full width of the reclamation area with sufficient small coral pieces or other fine material used to fill the voids in order to produce a dense, compact reclamation.

For reclamation above the HIGHEST WATER LEVEL, coral material shall be placed in level, horizontal layers not exceeding 0.25 meter (loose measurement) thick and be compacted as specified before the next layer is placed. Effective spreading equipment shall be used on each lift to obtain a uniform thickness prior to compacting. As the compaction of each layer progresses, levelling and adjustments shall be performed continuously to ensure uniform density. The degree of compaction shall not be less than 95%.

Material containing more than 25 per cent of large pieces of coral with the greatest diameter of more than 150 mm, and which cannot be placed in layers of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, shall be removed and used for Some other purpose.

The contractor, at their discretion may use A TSHD or CSD. If a TSHD is desired then alternate borrow sites may be used other than what was described in the EIA. However, if the contractor wishes to use another borrow site, the contractor is responsible for any additional EIA studies, surveys and testing.

7.7 TOLERANCES

Dredging shall be carried out to the designated depths in all parts of dredging areas with a maximum permissible over dredging of 0.3 m below the specified level (Maximum Depth) unless noted otherwise by or as agreed with the Consultant / Engineer.

Excess dredging below Maximum Depth is not accepted unless approved by the Consultant / Engineer and shall be replaced by suitable material at no cost to the Owner.
The tolerances relative to the Specified Depth for dredging of areas in general is +0mm to 300mm.

The natural unprotected profile of slopes resulting from the dredging has in general been indicated as 1:3 reflecting the expected result of dredging in sand and gravel exposed to moderate wave impact only.

7.8 INSPECTION

7.8.1 GENERAL

The Contractor shall, prior to commencement and after completion of dredging works carry out surveys of the respective areas (in-survey and out-survey)

7.8.2 IN-SURVEY OF EXISTING BOTTOM OR GROUND

An area covering the entire working area, as shown in ref dwg shall be surveyed.

Maps and "raw" data shall be submitted to the Consultant / Engineer not later than one week after the scheduled execution of the in-survey.

8. BREAKWATERS AND REVETMENTS

8.1 SCOPE OF WORKS

The works specified in this Chapter of the Specifications compromises the construction of Breakwaters and revetments.

The works include supply or dredging of all materials required. According to Drawings, the specifications and the instructions from the Employer, the Contractor shall furnish all materials, equipment, tools, and Labor which are required for the construction, testing, measurement and completion of the works.

References: The following Standards and Codes of Practice are referred to in this specification:
Designation Title of Standards/Codes of Practice

a) BS 812 Parts 100-103 Sampling and Testing of Mineral Aggregates, Sand and Fillers
b) BS 6349 Part 1, Part 2 Maritime Structures
c) ISO 5081 Textiles- Woven Fabrics – Determination of Breaking Strength and Elongation (Strip Method)
d) CEM Coastal Engineering Manual. U.S. Army Corps of Engineers.

8.2 MATERIALS

8.2.1 GENERAL

All stone materials specified in the following as stone class I, II and III shall be of granite, basalt or equal igneous rock. The material shall have an apparent specific gravity of not less than 26KN/m^3 with 90% of the stones having a density of at least 25KN/m^3 when saturated and surface dry, according to BS 812.

The average water absorption of quarry stone must be less than 2% and the water absorption of nine of the individual stones less than 2.5%.

The loss for magnesium sulphate soundness test must be less than 12% for all rock.

Deleterious secondary minerals shall not be present. For all rock types, this is taken to be indicated by Methylene Blue absorption values of less than (0.7 g/100g).

Average point load index in the planar direction of the most pronounced layering should any visible anisotropy exist and for sampling, testing and reporting in accordance with the ISRM 1986 recommended method must be at least 4.0 Mpa with the average minus the standard deviation of the point load index of at least 3.0 Mpa.

The mill abrasion resistance index must be less than 0.004.

Quarried rock shall not contain visually observable or chemically detectable impurities or foreign matters in such quantities that these are damaging for the constructive application of the quarried stone or for the environment in which the quarried stone is applied.

All stone materials specified in the following as stone class IV, V, VI and VII may as an alternative to the above-mentioned rock be obtained from sound coral rock or beach rock. The material shall have an apparent specific gravity of not less than 24KN/m^3 when saturated and surface dry.
The stone materials shall be sound, compact, hard, durable and resistant to action of seawater and free of cracks and fissures determined for the proper performance of the material in quest on.

All fill material shall be dredge and stored to suit the specific demands in the structure.

8.2.2 SOURCE OF STONE MATERIALS

The contractor shall select the source or sources of rock and shall be responsible for quarrying, supply and transport to the Site of suitable rock in sufficient quantities.

The suitability of the source or sources of rock selected by the Contractor shall be subject to the approval of the Employer. Approval of the quarry is only supplementary to other requirement of the rock.

The Contractor shall submit for the approval of the Employer an experiences geologist's determination of the type of stones based on visual inspection of 10 respective samples.

The coral rock or beach rock dredged may be used for stone classes IV, V, VI and VII if the testing shows it comply with these specifications.

8.2.3 CLASSIFICATION OF STONE MATERIALS

Armor layer in the break waters and filters overlaying sand fill and unspecified coral rock fill shall be constructed from the following stone classes specifying the minimum mean weight (or size) and the lower and the upper limit.
<u>Granite:</u>

a) Weight range: 2t to 8t
b) Mean weight: Min. 4t
c) Weight range: 1t to 4t
d) Mean weight: Min. 2t
e) Weight range: 350 kg to 1400 kg
f) Mean weight: 700 kg.

<u>Granite or coral rocks.</u>

a) Weight range: 100 kg to 400 kg
b) Mean weight: 200 kg
c) V (filter): 150 – 300 mm
d) VI (filter): 75 – 150 mm
e) VII (filter): 50 – 100 mm

Stone materials shall be well graded between the specified limit and comply with the following filter criteria

d85 ≥ D15/4
d15 ≥ D15/7
d50 ≥ D50/7

In which d represents the finer material and D represents the coarser material. Dnn means that nn% of the material by weight passes a sieve having a square mesh width of D.

For stones used as Armor stones or filter stones, the following additional requirements shall apply:

a) The stones shall be rough and angular in shape
b) The maximum stone dimension (length) shall not exceed 2.5 times the minimum dimension (thickness) of the stone.

8.2.4 TESTING OF MATERIALS

Inspection and testing of rock materials shall be carried out as an integral part of the Contractor's quality control programme with the objective to ensure the quality of all parts of the work. The requirement in the following subsection shall be understood as minimum requirements. Extended testing of properties shall always be when opening new quarry fronts and in connection with any significant change in the material properties from an existing quarry front.

The test specifications given in the following subsections shall be understood as 'State of art' specifications. Other test standards may, subject to the Engineers acceptance, be introduced for compliance with the Contractor's test procedures or procedures used by existing procedures. Test procedures related to possible stockpiling of rock materials near the construction site and in connection with placement of materials in the permanent works are not covered by this section of the Specification.

8.2.5 BASIC PROCEDURES

From each quarry front the following properties shall be tested and fully documented prior to commencement of any production, in connection with any significant change of materials in the opinion of the engineer and as a minimum for every 5,000 m3 of delivery (all classifications) from the quarry front should be tested for the following:

a) Density
b) Water absorption
c) Resistance to weathering
d) Resistance to impact
e) Resistance to abrasion

The tests shall be carried out in accordance with the test specification accepted by the Engineer.

8.2.6 TESTING OF STONE WEIGHTS AND STONE GRADATION

The Contractor shall at any time during working hours at the direction of the Engineer carry out test weighing of stones and the determination of the gradation of stones as indicated below:

Stone Class I, II and III

Test weighing of Armor stones will be carried out at random. The Contractor shall include in his unit prices one control weighing per 80m3 of Armor stones. Stones, which do not meet the weight requirements shall not count.

Stone Class IV and V

A test of the weight distribution of stone classes IV and V will be carried out on a representative sample of not less than 3.0 m3, which is spread out on a clean, hard surface (e.g. a floor of wooden boards or a concrete floor), provided by the Contractor. The Engineer selects 10 largest and the 20 smallest stones are then weighed/measured individually.

The remaining stones are then weighed and counted and the mean weight determined. The Contractor shall include in his unit prices the cost of one weight distribution test as the one described above per 1,000 m3 of stones. Tests, which do not meet the requirements, shall not be counted.

Stone Classes VI and VII

A test of the weight distribution of the stones in classes VI and VII shall be carried out as described under Stone Classes IV and V above, except the sample shall not be less than 1.5 m3.

8.2.7 TESTING OF CORAL ROCK AND BEACH ROCK DURABILITY

One durability test shall be made for each 1,000 m3 of coral rock and beach rock to be used as Stone Classes IV, V, VI and VII.
The test result shall be made available for the Engineer's immediate approval.

8.3 WORKMANSHIP

8.3.1 PLACING OF STONE MATERIALS

Placing of stones shall take place in a manner which will not damage the under laying layers of stones. When placing stones up to a theoretical boundary as defined by lines in the cross sections the Drawing, the Contractor shall aim at having the stones protrude the theoretical boundary over one third of its area.

The construction of rubble mound structures must be planned and carried out with due regard to the weather and sea conditions. The responsibility for the stability of the breakwaters and revetments under the various stages of completion rests solely with Contractor.

Construction of filters shall not commence prior to the Engineer's acceptance of the fill and the filter materials. The responsibility for the stability and integrity of the breakwaters and revetments under the various stages of completion tests solely with Contractor. To protect the structures against the wave action the Contractor shall place a shield of stone material in front of the structures. The individual filter

layers shall be built up and trimmed from the bottom in such a manner, that the underlying layer is completed before commencing the overlying layer. The filter materials shall be placed with caution in order to ensure that the underlying layers already completed will not by disturbed. All materials shall be placed and compacted firmly in such a manner that the filter materials will remain fixed at the site.

8.3.2 ARMOR STONES

When completed the Armor layer shall be in a thoroughly stable condition and with the exposed surfaces reasonably uniform in appearance.

Haphazard dumping of Armor stones will not be permitted. Above level of –0.5m Armor stones shall be carefully place by crane. Below this level Armor stones – one piece at the time- may be dumped at the waterline immediately over their final position and care shall be taken to produce as dense and stable layer as possible.

Elongated stones shall be placed with their long axis perpendicular to the slope.

Voids in Armor layers shall not be filled with small rocks.

8.3.3 OTHER STONES AND CORE MATERIAL

All materials not forming part of the Armor layers may be dumped, but undue segregation shall be prevented.

8.3.4 TOLERANCES

At the time for completion, the following tolerances shall be respected unless otherwise indicated or directed by the Engineer.

Slope of core/fill ±0.1

Filter layer, thickness of individual layer +100/-50 mm

The surface of each layer shall be leveled before construction of the next layer in order to ensure that excess thickness of one layer shall not reduce the thickness of the next beyond the tolerance.

8.3.5 GEOTEXTILES

Geotextiles shall be porous, carpet-like materials, made from synthetic fibres. Geotextiles are used as a separation layer and shall be in the form of a thin permeable membrane.

The geotextile shall be of polypropylene filter fabric and shall be resistant to air, water, chemical and bacteriological attacks. The geotextile shall fulfill the International Classification (DIN 54307) Class 4. The fabric shall be manufactured with and preserve the following mechanical properties according to DIN 54307.

Description	**Property**
Weight of Cloth Min.	300g/m^2
Tensile strength in:	
a) warp: Min.	20 kN/m

b) weft: Min.	20 kN/m
Elongation at break:	50%
a) warp: Min.	50%
b) weft: Min.	Min. 3.3 kN
Penetration	

9. TACK COAT

9.1 DESCRIPTION

This work shall consist of furnishing and applying slow setting emulsified asphalt tack coat to a previously placed asphaltic base course, an existing road surface, the surface of concrete bridge decks, approach slabs and other concrete surfaces receiving asphaltic concrete wearing course, to provide bond for a superimposed course, in accordance with these Standard Specifications and to the full width indicated on the Drawings or as directed by the Engineer.

9.2 MATERIAL REQUIREMENTS FOR TACK COAT

9.2.1 EMULSIFIED ASPHALT.

Emulsified asphalt shall be of the slow-setting Cationic or Anionic type of the CSS-1h or SS-1h grades respectively and shall comply with the requirements of British Standards and the FAA, Liquid and Emulsified Asphalt. The approved emulsion will be diluted with approximately an equal quantity of water and thoroughly mixed as directed by the Engineer. The diluted emulsion shall be applied at a maximum rate of 0.50 kg/M^2 as indicated on the Drawings or as directed by the Engineer.

Specific gravity of asphaltic material shall be determined by ASTN D3142 standard which shall establish the kilograms per liter based on the specific gravity at 15.5°C for the material furnished.

9.3 CONSTRUCTION REQUIREMENTS FOR TACK COAT

9.3.1 WEATHER LIMITATIONS

Tack coat shall not be applied when the ambient temperature is less than 13°C nor during rain, fog, dust-storms or other unsuitable weather.

9.3.2 APPLICATION TEMPERATURE

The application temperature for the diluted emulsified asphalt shall be between 10°C and 60°C as directed by the Engineer.

9.3.3 EQUIPMENT REQUIRED

The equipment used by the Contractor shall include an asphalt distributor in accordance with British Standards and the FAA, Asphalt Distributor, as well as a power broom and a power blower. The power broom shall be self-propelled and equipped with a cylindrical, rotating nylon bristle brush of not less than 76 cm in diameter and not less than 1.82 m in length.

The brush shall be capable of being angled to the right and left with adjustable ground pressure. In addition, the Contractor shall supply and utilize efficient and approved equipment for diluting the emulsified asphalt with water.

9.3.4 SURFACE PREPARATION

The full width of the surface to be treated shall be cleaned with a power broom or power blower to remove dust, dirt or other objectionable materials. All fatty or unsuitable patches, excess cracks or joint filler and all surplus bituminous material shall be corrected in accordance with the instructions of the Engineer. The surface shall be dry when treated.

9.3.5 METHOD OF OPERATION

Immediately after cleaning the surface, the diluted emulsified asphalt shall be applied by means of the distributor at the temperature and rate directed by the

Engineer. Hand spraying of restricted, inaccessible areas is permitted, subject to the approval of the Engineer.

The mixing and placing of the asphaltic material shall progress at a rate so that contamination of previous lifts by dust and dirt and/or loss of bond capability shall not occur. If, in the opinion of the Engineer, loss of bond capability has taken place, an additional tack coat shall be applied to the surface of the previous lifts as directed by the Engineer.

The surface of structures, curbstones and other appurtenances adjacent to areas being treated shall be protected in such a manner as to prevent their being spattered or marred.

After application, the surface shall be allowed to dry until it is in a proper condition of tackiness to receive the superimposed course. Tack coat shall be applied only so far in advance of the superimposed course placement as is necessary to obtain this proper condition of tackiness. Until the superimposed course is placed, the Contractor shall protect the tack coat from damage.

The tack coat shall be uniformly applied with the distributor within twenty-four (24) hours preceding the placement of the covering course.

If the tack coat is unavoidably damaged by rain or dust, or paving operations delayed longer than twenty-four (24) hours, it shall be allowed to dry, shall be cleaned again by a power broom or power blower and, when directed by the Engineer, a subsequent light application of tack coat applied to the surface. No additional payment will be made by the Department for this work.

Where, in the opinion of the Engineer, a tack coat is not necessary between layers of freshly placed courses, he may by written direction eliminate the tack coat, in which case there will be no payment for tack coat for the areas concerned. Any cleaning required in these areas shall be considered to be included in the overlaying asphaltic concrete course and no separate payment will be made.

9.3.6 MEASUREMENT AND PAYMENT

Measurement of tack coat will be by the net number of kilograms acceptably placed in accordance with the Drawings and these Standard Specifications or as directed by the Engineer.

Measurement for the tack coat will be for the total number of kilograms actually incorporated, determined by measuring devices (meters), and by accurately determining and controlling the amount of bituminous material being applied.

The number of kilograms furnished will be determined by weighing the material on scales furnished by and at the expense of the Contractor.

Payment for the Item, Tack Coat, will be incidental to the asphalt item in the Bills of Quantities, which shall be full compensation for materials, tools, equipment and labor necessary for the proper completion of the work.

When each lift in each course of asphaltic material is not placed expeditiously and the previous lift is exposed to dust and dirt and/or loses its bonding capability, the Engineer shall direct the Contractor to apply a tack coat to the surface of each lift, and no separate payment will be made.

10. PRIME COAT

10.1 DESCRIPTION

This work shall consist of furnishing and applying liquid asphalt prime coat and blotter material, if required, to previously prepared and approved absorbent surfaces (subgrade or granular base/subbase courses) immediately prior to placing superimposed construction in accordance with these Standard Specifications and to the full width indicated on the Drawings, or as required by field conditions. Such work shall be performed as specified herein or as directed by the Engineer.

10.2 MATERIAL REQUIREMENTS FOR PRIME COAT

10.2.1 LIQUID ASPHALT

Liquid asphalt shall be of the medium curing type MC-70 grade and shall comply with the requirements of the specifications given in British Standards and the FAA, Liquid and Emulsified Asphalts. The application rate shall be between 0.25 and 0.50 kg/M^2 as indicated on the Drawings or as directed by the Engineer.

Specific gravity of asphaltic material shall be determined by ASTM D3142 standard which shall establish the kilograms per liter based on the specific gravity at 15.5°C for the material furnished.

10.2.2 BLOTTER MATERIAL

Blotter material, if required, shall be clean natural sand and shall comply with the requirements of the specifications given in British Standards and the FAA, Fine Aggregate for Asphalt Works.

10.3 CONSTRUCTION REQUIREMENTS

10.3.1 WEATHER LIMITATIONS

Prime coat shall not be applied when the ambient temperature is less than 13°C nor during rain, fog, dust-storms or other unsuitable weather.

10.3.2 APPLICATION TEMPERATURE

The application temperature for the MC-70 liquid asphalt shall be between 60°C and 85°C as directed by the Engineer.

10.3.3 EQUIPMENT REQUIRED

The equipment used by the Contractor shall include an asphalt distributor in accordance with British Standards and the FAA, Asphalt Distributor, as well as a power broom and a power blower. The power broom shall be self-propelled and equipped with a cylindrical, rotating nylon bristle brush of not less than 76 cm in diameter and not less than 1.82 m in length.

The brush shall be capable of being angled to the right and left with adjustable ground pressure. Where necessary for the proper preparation of the surface, motor graders, rollers, water trucks, and other related equipment shall also be provided.

10.3.4 SURFACE PREPARATION

Immediately before applying the prime coat, all loose dirt, earth and other objectionable material shall be removed from the surface with a power broom of approved design and/or a power blower as required, and any ruts, soft spots or unacceptable irregularities in the surface shall be repaired in accordance with the instructions of the Engineer.

If the Engineer so requires, the surface shall be lightly bladed and rolled immediately prior to the application of the prime coat, in which case brooming or blowing may not be required. The Engineer may direct that a light application of water be made just prior to the application of liquid asphalt to facilitate penetration. Priming will not be permitted by the Engineer when there is free water present on the surface.

10.3.5 METHOD OF OPERATION

After preparing the road surface as above, the liquid asphalt shall be applied by means of the distributor at the temperature and rate directed by the Engineer. Hand-spraying of restricted, inaccessible areas is permitted, subject to the approval of the Engineer.

The prime coat shall usually be applied to one half or one third of the road width at a time. When applied in two or more lanes, there shall be a slight overlap of asphalt material along adjoining edges of the lanes. It should be noted that no overlapping is allowed at the transverse joints and that thick paper shall be used at the joint to protect the previous application and the joining application shall begin on the paper. After use, the paper shall be removed and satisfactorily disposed of by the Contractor. Care shall be taken that the application of bituminous material at the junctions of spreads is not in excess of the specified amount. Excess bituminous material shall be removed from the surface.

The prime coat shall be uniformly applied with the distributor within a maximum of forty-eight (48) hours preceding placement of asphaltic concrete paving.

10.3.6 MAINTENANCE AND TRAFFIC

Traffic shall not be permitted on the primed surface until the asphaltic material has penetrated and dried and, in the judgment of the Engineer, will not be picked up under traffic. If it becomes necessary to permit traffic prior to that time, but in no case sooner than twenty-four (24) hours after the application of the asphaltic material, blotter material shall be applied as directed by the Engineer and traffic shall be permitted to use the lanes so treated. Blotter material shall be spread from trucks operated backward so that the wheels will not travel in uncovered wet asphaltic material. When applying blotter material to an asphalt treated lane that adjoins a lane that has not been treated, a strip at least 20 cm wide along the adjoining edge shall be left devoid of blotter material in order to permit an overlap of asphalt material.

The Contractor shall maintain the primed surface in a good clean condition and prior to the application of the next course, any surface irregularities shall be corrected and all excessive blotter material, dirt or other objectionable materials shall be removed.

10.3.7 MEASUREMENT AND PAYMENT

Measurement of prime coat shall be by the net number of kilograms acceptably placed in accordance with the Drawings and these Standard Specifications or as directed by the Engineer.

Measurement for the prime coat will be for the total number of kilograms actually incorporated, determined by measuring devices (meters), and by accurately determining and controlling the amount of bituminous material being applied.

The number of kilograms (kg) furnished will be determined by weighing the material on scales furnished by and at the expense of the Contractor.

Payment for the Item, Prime Coat, will be included in asphalt prices in the Bills of Quantities and is incidental to this item, which shall be full compensation for materials, tools, equipment and labor necessary for the proper completion of the work.

11. ASPHALT PAVING

11.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO)

AASHTO M 156 (2013) Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures

AASHTO T 308 (2010) Standard Method of Test for Determining the Asphalt Binder Content of Hot Mix Asphalt (HMA) by the Ignition Method

AASHTO T 329 (2013) Standard Test Method for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method

ASPHALT INSTITUTE (AI)

AI MS-2 (1997 6th Ed) Mix Design Methods

ASTM INTERNATIONAL (ASTM)

ASTM C117 (2013) Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing

ASTM C1252 (2006) Standard Test Methods for Uncompacted Void Content of Fine Aggregate (as Influenced by Particle Shape, Surface Texture, and Grading)

ASTM C127 (2012) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate

ASTM C128 (2012) Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate

ASTM C131/C131M (2014) Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

ASTM C136 (2006) Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates

ASTM C142/C142M (2010) Standard Test Method for Clay Lumps and Friable Particles in Aggregates

ASTM C29/C29M (2009) Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate

ASTM C566 (2013) Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying

ASTM D140/D140M (2014) Standard Practice for Sampling Bituminous Materials

ASTM D1461 (2011) Moisture or Volatile Distillates in Bituminous Paving Mixtures

ASTM D2172/D2172M (2011) Quantitative Extraction of Bitumen from Bituminous Paving Mixtures

ASTM D2419 (2014) Sand Equivalent Value of Soils and Fine Aggregate

ASTM D242/D242M (2009; R 2014) Mineral Filler for Bituminous Paving Mixtures

ASTM D2489/D2489M (2008) Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures

ASTM D2726/D2726M (2014) Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures

ASTM D3665 (2012) Random Sampling of Construction Materials

ASTM D3666 (2013) Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

ASTM D4125/D4125M (2010) Asphalt Content of Bituminous Mixtures by the Nuclear Method

ASTM D4791 (2010) Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate

ASTM D4867/D4867M (2009; R 2014) Effect of Moisture on Asphalt Concrete Paving Mixtures

ASTM D5444 (2008) Mechanical Size Analysis of Extracted Aggregate

ASTM D6307 (2010) Asphalt Content of Hot Mix Asphalt by Ignition Method

ASTM D6925 (2009) Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the Superpave Gyratory Compactor

ASTM D6926 (2010) Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus

ASTM D6927 (2006) Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures

ASTM D979/D979M (2012) Sampling Bituminous Paving Mixtures

ASTM E1274 (2003; R 2012) Standard Test Method for Measuring Pavement Roughness Using a Profilograph

U.S. ARMY CORPS OF ENGINEERS (USACE)

COE CRD-C 171 (1995) Standard Test Method for Determining Percentage of Crushed Particles in Aggregate

Note: Under the final conditions there would be a height limitation as shown in the drawing (pg.218/578, Volume II), The location of the proposed asphalt plant station does not meet

the height requirement, Those height limitation are based on the final configuration of the new airstrip. The existing airstrip is 70 meters from the centerline. Nevertheless, based on a temporary basis, your asphalt plant may still be erected there. In your technical submission, a drawing or sketch showing the location and height of the asphalt plant be shown. If the contractor wants to propose another location, that is fine but should be shown in the technical submission for review and is subject to approval from the authorities.

11.2 FULL PAYMENT

11.2.1 METHOD OF MEASUREMENT

The amount paid will be the percentage complete of hot-mix asphalt mixture used in the accepted work. .

11.2.1.1 BASIS OF PAYMENT

Quantities of hot-mix asphalt, determined as specified above, will be paid for at respective contract unit prices or at reduced prices adjusted in accordance with paragraphs PERCENT PAYMENT and QUALITY ASSURANCE. Payment will constitute full compensation for furnishing all materials, equipment, plant, and tools; and for all labor and other incidentals necessary to complete work required by this section of the specification.

11.3 PERCENT PAYMENT

When a lot of material fails to meet the specification requirements for 100 percent pay as outlined in the following paragraphs, that lot shall be removed and replaced, or accepted at a reduced price which will be computed by multiplying the unit price by the lot's pay factor. The lot pay factor is determined by taking the lowest computed pay factor based on laboratory air voids, in-place density, grade or smoothness (each discussed below).

Pay factors based on different criteria (i.e., laboratory air voids and in-place density) of the same lot will not be multiplied together to get a lower lot pay factor. At the end of the project, an average of all lot pay factors will be calculated. If this average lot pay factor exceeds 95.0 percent and no individual lot has a pay factor less than 75.1 percent, then the percent payment for the entire project will be 100 percent of the unit bid price. If the average lot pay factor is less than 95.0 percent, then each lot will be paid for at the unit price multiplied by the lot's pay factor. For any lots which are less than 2,000 short tons, a weighted lot pay factor will be used to calculate the average lot pay factor.

11.4 MAT AND JOINT DENSITIES

The average in-place mat and joint densities are expressed as a percentage of the average theoretical maximum density (TMD) for the lot. The average TMD for each lot will be determined as the average TMD of the two random samples per lot. The average in-place mat density and joint density for a lot are determined and compared with Table 1 to calculate a single pay factor per lot based on in-place density, as described below.

First, a pay factor for both mat density and joint density are determined from Table 1. The area associated with the joint is then determined and will be considered to be 3 m wide times the length of completed longitudinal construction joint in the lot. This area will not exceed the total lot size. The length of joint to be considered will

be that length where a new lane has been placed against an adjacent lane of hot-mix asphalt pavement, either an adjacent freshly paved lane or one paved at any time previously. The area associated with the joint is expressed as a percentage of the total lot area.

A weighted pay factor for the joint is determined based on this percentage (see example below). The pay factor for mat density and the weighted pay factor for joint density are compared and the lowest selected. This selected pay factor is the pay factor based on density for the lot. When the TMD on both sides of a longitudinal joint is different, the average of these two TMD will be used as the TMD needed to calculate the percent joint density. Rejected lots shall be removed and replaced.

Rejected areas adjacent to longitudinal joints shall be removed 100 mm into the cold (existing) lane. All density results for a lot will be completed and reported within twenty-four (24) hours after the construction of that lot.

Table 1: Pay Factor Based on In-place Density

Average Mat Density (4 cores)	Pay Factor, percent	Average Joint Dens (4 cores)
94.0 - 96.0	100.0	Above 92.5
93.9	100.0	92.4
93.8 or 96.1	99.9	92.3
93.7	99.8	92.2
93.6 or 96.2	99.6	92.1
93.5	99.4	92.0
93.4 or 96.3	99.1	91.9
93.3	98.7	91.8
93.2 or 96.4	98.3	91.7
93.1	97.8	91.6
93.0 or 96.5	97.3	91.5
92.9	96.3	91.4
92.8 or 96.6	94.1	91.3
92.7	92.2	91.2
92.6 or 96.7	90.3	91.1
92.5	87.9	91.0
92.4 or 96.8	85.0	90.9
Below 92.3 or above 96.	Reject	Below 90.9

11.5 PAY FACTOR BASED ON IN-PLACE DENSITY

An example of the computation of a pay factor (in I-P units only) based on in-place density, is as follows: Assume the following test results for field density made on the lot: (1) Average mat density = 93.2 percent (of lab TMD). (2) Average joint

density = 91.5 percent (of lab TMD). (3) Total area of lot = 30,000 square feet. (4) Length of completed longitudinal construction joint = 2000 feet.

- Step 1: Determine pay factor based on mat density and on joint density, using Table 1:

Mat density of 93.2 percent = 98.3 pay factor.
Joint density of 91.5 percent = 97.3 pay factor.

- Step 2: Determine ratio of joint area (length of longitudinal joint x 10 ft.) to mat area (total paved area in the lot): Multiply the length of completed longitudinal construction joint by the specified 10 ft. width and divide by the mat area (total paved area in the lot).

(2,000 ft. x 10 ft.)/30,000 sq.ft. = 0.6667 ratio of joint area to mat area (ratio).

- Step 3: Weighted pay factor (wpf) for joint is determined as indicated below:

wpf = joint pay factor + (100 - joint pay factor) (1 - ratio) wpf = 97.3 + (100-97.3) (1-.6667) = 98.2 percent

- Step 4: Compare weighted pay factor for joint density to pay factor for mat density and select the smaller:

Pay factor for mat density: 98.3 percent. Weighted pay factor for joint density: 98.2 percent

Select the smaller of the two values as pay factor based on density: 98.2 percent

11.6 PAYMENT ADJUSTMENT FOR SMOOTHNESS

11.6.1 STRAIGHTEDGE TESTING

Location and deviation from straightedge for all measurements shall be recorded. When between 5.0 and 10.0 percent of all measurements made within a lot exceed the tolerance specified in paragraph Smoothness Requirements below, after any reduction of high spots or removal and replacement, the computed pay factor for that lot based on surface smoothness, will be 95 percent. When more than 10.0 percent of all measurements exceed the tolerance, the computed pay factor will be 90 percent. When between 10.0 and 15.0 percent of all measurements exceed the tolerance, the computed pay factor will be 85 percent.

When 15.0 percent or more of the measurements exceed the tolerance, the lot shall be removed and replaced at no additional cost to the Government. Regardless of the above, any small individual area with surface deviation which exceeds the tolerance given above by more than 50 percent shall be removed and replaced at no additional cost to the Government.

11.6.2 PROFILOGRAPH TESTING

Location and data from all profilograph measurements shall be recorded. When the Profile Index of a lot exceeds the tolerance specified in paragraph Smoothness Requirements by 16 mm/km, but less than 32 mm/km, after any reduction of high spots or removal and replacement, the computed pay factor for that lot based on surface smoothness will be 95 percent. When the Profile Index exceeds the tolerance by 32 mm/km, but less than 47 mm/km, the computed pay factor will be 90 percent. When the Profile Index exceeds the

tolerance by 47 mm/km, but less than 55 mm/km, the computed pay factor will be 80 percent. When the Profile Index exceeds the tolerance by 55 mm/km or more, the lot shall be removed and replaced at no additional cost to the Owner. Regardless of the above, any small individual area with surface deviation which exceeds the tolerance given above by more than 70 mm/km or more, shall be removed and replaced at no additional cost to the Government.

11.7 LABORATORY AIR VOIDS AND THEORETICAL MAXIMUM DENSITY

Laboratory air voids will be calculated in accordance with ASTM D3203/D3203M by determining the Marshall density of each lab compacted specimen using the laboratory-prepared, thoroughly dry method in ASTM D2726/D2726M and determining the theoretical maximum density (TMD) of two of the sub-lots using ASTM D2041/D2041M. Laboratory air void calculations for each lot will use the average theoretical maximum density values obtained for the lot.

The mean absolute deviation of the four laboratory air void contents (one from each sub-lot) from the JMF air void content will be evaluated and a pay factor determined from Table 2. All laboratory air void tests will be completed and reported within 24 hours after completion of construction of each lot. The TMD is also used for computation of compaction, as required in paragraph: Mat and Joint Densities above.

11.8 MEAN ABSOLUTE DEVIATION

An example of the computation of mean absolute deviation for laboratory air voids is as follows: Assume that the laboratory air voids are determined from 4 random samples of a lot (where 3 specimens were compacted from each sample). The average laboratory air voids for each sub-lot sample are determined to be 3.5, 3.0, 4.0, and 3.7. Assume that the target air voids from the JMF is 4.0. The mean absolute deviation is then:

Mean Absolute Deviation = (|3.5 - 4.0| + |3.0 - 4.0| + |4.0 - 4.0| + |3.7 - 4.0|)/4

= (0.5 + 1.0 + 0.0 + 0.3)/4 = (1.8)/4 = 0.45

The mean absolute deviation for laboratory air voids is determined to be 0.45. It can be seen from Table 2 that the lot's pay factor based on laboratory air voids, is 100 percent.

Table 2: Pay Factor Based on Laboratory Air Voids

Mean Absolute Deviation of La Voids from JMF	Pay Factor, Percent
0.60 or less	100
0.61 - 0.80	98
0.81 - 1.00	95
1.01 - 1.20	90
Above 1.20	reject (0)

11.9 PAY ADJUSTMENT BASED ON GRADE

Within 5 working days after completion of a particular lot incorporating the final wearing course, test the final wearing surface of the pavement for conformance with specified plan grade requirements. All testing shall be performed in the

presence of the Project Manager/Consultant. The final wearing surface of pavement shall conform to the elevations and cross sections shown and shall vary not more than 9 mm for runways or 15 mm for taxiways and aprons from the plan grade established and approved at site of work. Finished surfaces at juncture with other pavements shall coincide with finished surfaces of abutting pavements. Deviation from the plan elevation will not be permitted in areas of pavements where closer conformance with planned elevation is required for the proper functioning of drainage and other appurtenant structures involved.

The grade will be determined by running lines of levels at intervals of 7.6 m, or less, longitudinally and transversely, to determine the elevation of the completed pavement surface. Detailed notes of the results of the testing shall be kept and a copy furnished to the Project Manager/Consultant immediately after each day's testing. When more than 5 percent but less than 10 percent of all measurements made within a lot are outside the 9 or 15 mm tolerance, the pay factor based on grade for that lot will be 95 percent.

When more than 10.0 percent but less than 20.0 percent of all measurements are outside the tolerance, the pay factor shall be 85 percent. In areas where the grade exceeds the tolerance by more than 20.0 percent, remove the surface lift full depth; and replace the lift with hot-mix asphalt to meet specification requirements, at no additional cost to the Government. Diamond grinding may be used to remove high spots to meet grade requirements. Skin patching for correcting low areas or planeing or milling for correcting high areas will not be permitted.

11.10 SYSTEM DESCRIPTION

Perform the work consisting of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. Hot-mix asphalt (HMA) designed and constructed in accordance with this section shall conform to the lines, grades, thicknesses, and typical cross sections shown on the drawings.

Construct each course to the depth, section, or elevation required by the drawings and rolled, finished, and approved before the placement of the next course. Submit proposed Placement Plan, indicating lane widths, longitudinal joints, and transverse joints for each course or lift.

11.11 ASPHALT MIXING PLANT

Plants used for the preparation of hot-mix asphalt shall conform to the requirements of AASHTO M 156 with the following changes:

a. Truck Scales. Weigh the asphalt mixture on approved scales furnished by the Contractor, or on certified public scales at the Contractor's expense. Scales shall be inspected and sealed at least annually by an approved calibration laboratory.
b. Testing Facilities. Provide laboratory facilities at the plant for the use of the Project Manager/Consultant's acceptance testing and the Contractor's quality control testing.
c. Inspection of Plant. The Project Manager/Consultant shall have access at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant; verifying weights, proportions, and material properties; checking the

temperatures maintained in the preparation of the mixtures and for taking samples. Provide assistance as requested, for the Government to procure any desired samples.

d. Storage Bins. The asphalt mixture may be stored in non-insulated storage bins for a period of time not exceeding 3 hours. The asphalt mixture may be stored in insulated storage bins for a period of time not exceeding 8 hours. The mix drawn from bins shall meet the same requirements as mix loaded directly into trucks.

11.12 HAULING EQUIPMENT

Trucks used for hauling hot-mix asphalt shall have tight, clean, and smooth metal beds. To prevent the mixture from adhering to them, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material. Petroleum based products shall not be used as a release agent. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers (tarps) shall be securely fastened.

11.13 MATERIAL TRANSFER VEHICLE (MTV)

Material transfer Vehicles shall be required due to the improvement in smoothness and decrease in both physical and thermal segregation. To transfer the material from the hauling equipment to the paver, use a self-propelled, material transfer vehicle with a swing conveyor that can deliver material to the paver without making contact with the paver. The MTV shall be able to move back and forth between the hauling equipment and the paver providing material transfer to the paver, while allowing the paver to operate at a constant speed. The Material Transfer Vehicle will have remixing and storage capability to prevent physical and thermal segregation.

11.14 ASPHALT PAVERS

Mechanical spreading and finishing equipment shall consist of a self-powered paver, capable of spreading and finishing the mixture to the specified line, grade, and cross section. The screed of the paver shall be capable of laying a uniform mixture to meet the specified thickness, smoothness, and grade without physical or temperature segregation, the full width of the material being placed. The screed will be equipped with a compaction device and it will be used during all placement.

11.14.1 RECEIVING HOPPER

The paver shall have a receiving hopper of sufficient capacity to permit a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed without segregation. The screed shall effectively produce a finished surface of the required evenness and texture without tearing, shoving, or gouging the mixture.

11.14.2 AUTOMATIC GRADE CONTROLS

If an automatic grade control device is used, the paver shall be equipped with a control system capable of automatically maintaining the specified screed elevation. The control system shall be automatically actuated from either a reference line and/or through a system of mechanical sensors or sensor-directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. The transverse slope controller shall be capable of maintaining the screed at the desired slope within

plus or minus 0.1 percent. A transverse slope controller shall not be used to control grade. The controls shall be capable of working in conjunction with any of the following attachments:

a. Ski-type device of not less than 9.14 m in length.
b. Short ski or shoe for joint matching.
c. Laser control.

11.14.3 ROLLERS

Rollers shall be in good condition and shall be operated at slow speeds to avoid displacement of the asphalt mixture. The number, type, and weight of rollers shall be sufficient to compact the mixture to the required density while it is still in a workable condition. Equipment which causes excessive crushing of the aggregate shall not be used.

11.15 SUBMITTALS

SD-02 Shop Drawings
Placement Plan

SD-03 Product Data
Mix Design
Contractor Quality Control

SD-04 Samples
Asphalt Cement Binder
Aggregates

SD-06 Test Reports
Aggregates
QC Monitoring

SD-07 Certificates
Asphalt Cement Binder
Testing Laboratory

11.16 QUALITY ASSURANCE

The Project Manager/Consultant's quality assurance (QA) program for this project is separate and distinct from the Contractor's quality control (QC) program specified in Part 3. Testing for acceptability of work will be performed by the Project Manager/Consultant or by an independent laboratory hired by the Government Representative or Engineer, except for grade and smoothness testing which shall be performed by the Contractor.

Acceptance of the plant produced mix and in-place requirements will be on a lot to lot basis. A standard lot for all requirements will be equal to 2,000 metric tons. Where appropriate, adjustment in payment for individual lots of hot-mix asphalt will be made based on in-place density, laboratory air voids, grade and smoothness in accordance with the following paragraphs.

Grade and surface smoothness determinations will be made on the lot as a whole. Exceptions or adjustments to this will be made in situations where the mix within one lot is placed as part of both the intermediate and surface courses, thus grade

and smoothness measurements for the entire lot cannot be made. In order to evaluate laboratory air voids and in-place (field) density, each lot will be divided into four equal sub-lots.

11.16.1 SUB-LOT SAMPLING

One random mixture sample for determining laboratory air voids, theoretical maximum density, and for any additional testing the Project Manager/Consultant desires, will be taken from a loaded truck delivering mixture to each sub-lot, or other appropriate location for each sub-lot. All samples will be selected randomly, using commonly recognized methods of assuring randomness conforming to ASTM D3665 and employing tables of random numbers or computer programs. Laboratory air voids will be determined from three laboratory compacted specimens of each sub-lot sample in accordance with ASTM D6926. The specimens will be compacted within 2 hours of the time the mixture was loaded into trucks at the asphalt plant. Samples will not be reheated prior to compaction and insulated containers will be used as necessary to maintain the temperature.

11.16.2 ADDITIONAL SAMPLING AND TESTING

The Project Manager/Consultant reserves the right to direct additional samples and tests for any area which appears to deviate from the specification requirements. The cost of any additional testing will be paid for by the Government. Testing in these areas will be treated as a separate lot. Payment will be made for the quantity of HMA represented by these tests in accordance with the provisions of this section.

11.16.3 IN-PLACE DENSITY

For determining in-place density, one random core (100 mm or 150 mm in diameter) will be taken at locations identified by the Project Manager/Consultant from the mat (interior of the lane) of each sub-lot, and one random core will be taken from the joint (immediately over joint) of each sub-lot, in accordance with ASTM D979/D979M. Fill all core holes with hot-mix. The core holes shall be dry and tack coated before filling. Each random core will be full thickness of the layer being placed. When the random core is less than 25 mm thick, it will not be included in the analysis. In this case, another random core will be taken. After air drying to meet the requirements for laboratory-prepared, thoroughly dry specimens, cores obtained from the mat and from the joints will be used for in-place density determination in accordance with ASTM D2726/D2726M.

11.16.4 SURFACE SMOOTHNESS

Use one of the following methods to test and evaluate surface smoothness of the finished surface of the pavement final grade. All testing shall be performed in the presence of the Project Manager/Consultant. Detailed notes of the results of the testing shall be kept and a copy furnished to the Project Manager/Consultant immediately after each day's testing. The profilograph method shall be used for all longitudinal and transverse testing, except where the runs would be less than 60 m in length and the ends where the straightedge shall be used. Where drawings show required deviations from a plane surface (crowns, drainage inlets, etc.), the surface shall be finished to meet the approval of the Project Manager/Consultant.

11.16.4.1 SMOOTHNESS REQUIREMENTS

a. Straightedge Testing: The finished surfaces of the pavements shall have no abrupt change of 3 mm or more, and all pavements shall be within the tolerances specified in Table 3 when checked with an approved 4 m straightedge.

Table 3: Straightedge Surface Smoothness—Pavements

Pavement Category	Direction of Testing	Tolerance, mm
Runways and taxiway	Longitudinal	3
	Transverse	6
Shoulders (outside edge stripe)	Transverse	6
	Longitudinal	Not Required
Calibration hardstands and compass swinging bases	Longitudinal	3
	Transverse	3
All other airfields and helicopter paved areas	Longitudinal	6
	Transverse	6

b. Profilograph Testing: The finished surfaces of the pavements shall have no abrupt change of 3 mm or more, and all pavements shall have a Profile Index not greater than specified in Table 4 when tested with an approved California-type profilograph. If the extent of the pavement in either direction is less than 60 m, that direction shall be tested by the straightedge method and shall meet requirements specified above.

Table 4: Profilograph Surface Smoothness--Pavements

Pavement Category	Direction of Testing	Maximum Specified Profile Index (mm/km)
Runways	Longitudinal	110
	Transverse	(Use Straightedge)
Taxiways	Longitudinal	140
	Transverse	(Use Straightedge)
Shoulders (outside edge stripe)	Transverse	(Use Straightedge)
	Longitudinal	Not Required
Calibration Hardstands and Compass Swinging Bases		(Use Straightedge)
All Other Airfield and Helicopter Paved Areas	Longitudinal	140
	Transverse	140

11.16.5 TESTING METHOD

After the final rolling, but not later than 24 hours after placement, the surface of the pavement in each entire lot shall be tested in such a manner as to reveal all surface irregularities exceeding the tolerances specified above. Separate testing of individual sub-lots is not required. If any pavement areas are diamond ground, these areas shall be retested immediately after grinding. The area corrected by grinding shall not exceed 10 percent of the total area of the lot.

The entire area of the pavement shall be tested in both a longitudinal and a transverse direction on parallel lines. The transverse lines shall be 4.5 m or less apart, as directed. The longitudinal lines shall be at the centerline of each paving lane for lines less than 6.1 m and at the third points for lanes 6.1 m or greater. Other areas having obvious deviations shall also be tested. Longitudinal testing lines shall be continuous across all joints.

a. Straightedge Testing. The straightedge shall be held in contact with the surface and moved ahead one-half the length of the straightedge for each successive measurement. The amount of surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between these two high points.

b. Profilograph Testing. Profilograph testing shall be performed using an approved California profilograph and procedures described in ASTM E1274. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate "must-grind" bumps and the Profile Index for the pavement. The "blanking band" shall be 5 mm wide and the "bump template" shall span 25 mm with an offset of 10 mm. The profilograph shall be operated by an approved, factory-trained operator on the alignments specified above. A copy of the reduced tapes shall be furnished to the Project Manager/Consultant at the end of each day's testing.

c. Bumps ("Must Grind" Areas). Any bumps ("must grind" areas) shown on the profilograph trace which exceed 10 mm in height shall be reduced by diamond grinding until they do not exceed 7.5 mm when retested. Such grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. The following will not be permitted:

   i. skin patching for correcting low areas,

   ii. planeing or milling for correcting high areas. At the Contractor's option, pavement areas, including ground areas, may be rechecked with the profilograph in order to record a lower Profile Index.

11.17 ENVIRONMENTAL REQUIREMENTS

The hot-mix asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 5. The temperature requirements may be waived by the RSAF Representative or Engineer, if requested; however, all other requirements, including compaction, shall be met.

Table 5: Surface Temperature Limitations of Underlying Course

Mat Thickness, mm	Degrees C°
75 or greater	4
Less than 75	7

11.18 AGGREGATES

Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand and mineral filler, as required. The portion of material retained on the 4.75 mm sieve is coarse aggregate. The portion of material passing the 4.75 mm sieve and retained on the 0.075 mm sieve is fine aggregate. The portion passing the 0.075 mm sieve is defined as mineral filler. Submit sufficient materials to produce 90 kg of blended mixture for mix design verification. All aggregate test results and samples shall be submitted to the Project Manager/Consultant at least fourteen (14) days prior to start of construction. Aggregate testing shall have been performed within 90 days of performing the mix design.

11.18.1 COARSE AGGREGATE

Coarse aggregate shall consist of sound, tough, durable particles, free from films of material that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. The coarse aggregate particles shall meet the following requirements:

a. The percentage of loss shall not be greater than 40 percent after 500 revolutions when tested in accordance with ASTM C131/C131M.
b. At least 75 percent by weight of coarse aggregate shall have at least two or more fractured faces when tested in accordance with COE CRD-C 171. Fractured faces shall be produced by crushing.
c. The particle shape shall be essentially cubical and the aggregate shall not contain more than 20 percent, by weight, of flat and elongated particles (3:1 ratio of maximum to minimum) when tested in accordance with ASTM D4791.
d. Slag shall be air-cooled, blast furnace slag, and shall have a compacted weight of not less than 1200 kg/cubic meter when tested in accordance with ASTM C29/C29M.
e. Clay lumps and friable particles shall not exceed 0.3 percent, by weight, when tested in accordance with ASTM C142/C142M.

11.18.2 FINE AGGREGATE

Fine aggregate shall consist of clean, sound, tough, durable particles. The aggregate particles shall be free from coatings of clay, silt, or any objectionable material and shall contain no clay balls. The fine aggregate particles shall meet the following requirements:

a. The quantity of natural sand (noncrushed material) added to the aggregate blend shall not exceed 15 percent by weight of total aggregate.
b. The individual fine aggregate sources shall have a sand equivalent value greater than 45 when tested in accordance with ASTM D2419.
c. The fine aggregate portion of the blended aggregate shall have an uncompacted void content greater than 45.0 percent when tested in accordance with ASTM C1252 Method A.
d. Clay lumps and friable particles shall not exceed 0.3 percent, by weight, when tested in accordance with ASTM C142/C142M.

11.18.3 MINERAL FILLER

Mineral filler shall be nonplastic material meeting the requirements of ASTM D242/D242M.

11.18.4 AGGREGATE GRADATION

The combined aggregate gradation shall conform to one of the gradations specified in Table 6, when tested in accordance with ASTM C136 and ASTM C117, and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa, but grade uniformly from coarse to fine. The JMF shall be within the specification limits; however, the gradation can exceed the limits when the allowable deviation from the JMF shown in Tables 9 and 10 are applied.

Table 6: Aggregate Gradations

	Gradation 1 (Intermediate Cou Only)	**Gradation 2 (Intermediate and S Courses Only)**	**Gradation 3 (Shoulders and Le Courses Only)**
Sieve Size, mm	Percent Passing by	Percent Passing by	Percent Passing by
25.0	100	---	---
19.0	90-100	100	---
12.5	68-88	90-100	100
9.5	60-82	69-89	90-100
4.75	45-67	53-73	58-78
2.36	32-54	38-60	40-60
1.18	22-44	26-48	28-48
0.60	15-35	18-38	18-38
0.30	9-25	11-27	11-27
0.15	6-18	6-18	6-18
0.075	3-6	3-6	3-6

11.19 ASPHALT CEMENT BINDER

Asphalt cement binder shall conform to AASHTO M 320 Performance Grade (PG) 76-22. Test data indicating grade certification shall be provided by the supplier at the time of delivery of each load to the mix plant. Copies of these certifications shall be submitted to the Project Manager/Consultant. The supplier is defined as the last source of any modification to the binder. The Project Manager/Consultant may sample and test the binder at the mix plant at any time before or during mix production. Samples for this verification testing shall be obtained in accordance with ASTM D140/D140M and in the presence of the Project Manager/Consultant.

These samples shall be furnished to the Project Manager/Consultant for the verification testing, which shall be at no cost to the Contractor. Submit 20 L sample of the asphalt cement specified for mix design verification and approval not less than fourteen (14) days before start of the test section.

11.20 MIX DESIGN

Develop the mix design. The Job Mix formula (JMF) shall have been developed and aggregates tested no earlier than 6 months before contract award. The asphalt mix shall be composed of a mixture of well-graded aggregate, mineral filler if required, and asphalt material. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of Table 6. No hot-mix asphalt for payment shall be produced until a JMF has been approved. The hot-mix asphalt shall be designed using hand-held hammer procedures contained in AI MS-2 and the criteria shown in Table 7. Samples shall be prepared at various asphalt contents and compacted in accordance with ASTM D6925.

Laboratory compaction temperatures for Polymer Modified Asphalts shall be as recommended by the asphalt cement manufacturer. If the Tensile Strength Ratio (TSR) of the composite mixture, as determined by ASTM D4867/D4867M is less than 75, the aggregates shall be rejected or the asphalt mixture treated with an anti-stripping agent. The amount of anti-stripping agent added shall be sufficient to produce a TSR of not less than 75. If an antistrip agent is required, it shall be provided at no additional cost to the Government. Sufficient materials to produce 90 kg of blended mixture shall be provided to the Project Manager/Consultant for verification of mix design at least fourteen (14) days prior to construction of test section.

11.20.1 JMF REQUIREMENTS

Submit the proposed JMF in writing, for approval, at least 14 days prior to the start of the test section, including as a minimum:

i. Percent passing each sieve size.
ii. Percent of asphalt cement.
iii. Percent of each aggregate and mineral filler to be used.
iv. Asphalt viscosity grade, penetration grade, or performance grade.
v. Number of blows of hammer per side of molded specimen.
vi. Laboratory mixing temperature.
vii. Lab compaction temperature.
viii. Temperature-viscosity relationship of the asphalt cement.
ix. Plot of the combined gradation on the 0.45 power gradation chart, stating the nominal maximum size.
x. Graphical plots and summary tabulation of stability, flow, air voids, voids in the mineral aggregate, and unit weight versus asphalt content as shown in AI MS-2. Summary tabulation shall include individual specimen data for each specimen tested.
xi. Specific gravity and absorption of each aggregate.
xii. Percent natural sand.
xiii. Percent particles with two or more fractured faces (in coarse aggregate).
xiv. Fine aggregate angularity.
xv. Percent flat or elongated particles (in coarse aggregate).
xvi. Tensile Strength Ratio and wet/dry specimen test results.

xvii. Antistrip agent (if required).
xviii. List of all modifiers.

xix. Percentage and properties (asphalt content, binder properties, and aggregate properties) of RAP in accordance with paragraph RECYCLED HOT-MIX ASPHALT, if RAP is used.

Table 7: Marshall Design Criteria

Test Property	75 Blow Mix
Stability, N minimum	9560(1)
Flow, 0.25 mm	8-16(2)
Air voids, percent	4(4)
Percent Voids in mineral aggregate (minimum)	See Table 8
Dust Proportion(3)	0.8-1.2
TSR, minimum percent	75
TSR Conditioned Strength (minimum kPa)	415
(1) This is a minimum requirement. The average during construction shall be significantly higher than this number to ensure compliance with the specifications.	
(2) The flow requirement is not applicable for Polymer Modified Asphalts	
(3) Dust Proportion is calculated as the aggregate content, expressed as a percent of mass, passing the 0.075 mm sieve, divided by the effective asphalt content, in percent of total mass of the mixture.	
(4) Select the JMF asphalt content corresponding to an air void content of 4 percent. Verify the other properties of Table 7 meet the specification requirements at this asphalt content.	

Table 8: Minimum Percent Voids in Mineral Aggregate (VMA)(1)

Aggregate (See Table 6)	Minimum VMA, percent
Gradation 1	13
Gradation 2	14
Gradation 3	15
(1) Calculate VMA in accordance with AI MS-2, based on ASTM D2726/D2726M bulk specific gravity for the aggregate.	

11.20.2 ADJUSTMENTS TO JMF

The JMF for each mixture shall be in effect until a new formula is approved in writing by the Project Manager/Consultant. Should a change in sources of any

materials be made, a new mix design shall be performed and a new JMF approved before the new material is used. The Contractor will be allowed to make minor adjustments within the specification limits to the JMF to optimize mix volumetric properties. Adjustments to the original JMF shall be limited to plus or minus 4 percent on the 4.75 mm and coarser sieves; plus or minus 3 percent on the 2.36 mm to 0.30 mm sieves; and plus or minus 1 percent on the 0.15 mm sieve. Adjustments to the JMF shall be limited to plus or minus 1.0 percent on the 0.075 mm sieve. Asphalt content adjustments shall be limited to plus or minus 0.40 from the original JMF. If adjustments are needed that exceed these limits, a new mix design shall be developed.

11.21 EXECUTION

11.22 CONTRACTOR QUALITY CONTROL

11.22.1 GENERAL QUALITY CONTROL REQUIREMENTS

Submit the approved Quality Control Plan. Hot-mix asphalt for payment shall not be produced until the quality control plan has been approved. The plan shall address all elements which affect the quality of the pavement including, but not limited to:

a) Mix Design and unique JMF identification code
b) Aggregate Grading
c) Quality of Materials
d) Stockpile Management and procedures to prevent contamination
e) Proportioning
f) Mixing and Transportation
g) Correlation of mechanical hammer to hand hammer. Determine the number of blows of the mechanical hammer required to provide the same density of the JMF as provided by the hand hammer. Use the average of three specimens per trial blow application.
h) Mixture Volumetrics
i) Moisture Content of Mixtures
j) Placing and Finishing
k) Joints
l) Compaction, including HMA-PCC joints
m) Surface Smoothness
n) Truck bed release agent

11.22.2 TESTING LABORATORY

Provide a fully equipped asphalt laboratory located at the plant or job site. It shall be equipped with heating and air conditioning units to maintain a temperature of 24 plus or minus 2.3°C. Laboratory facilities shall be kept clean and all equipment shall be maintained in proper working condition. The Project Manager/Consultant shall be permitted unrestricted access to inspect the Contractor's laboratory facility, to witness quality control activities, and to perform any check testing desired.

The Project Manager/Consultant will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are corrected.

11.22.3 QUALITY CONTROL TESTING

Perform all quality control tests applicable to these specifications and as set forth in the Quality Control Program. The testing program shall include, but shall not be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, moisture in the asphalt mixture, laboratory air voids, stability, flow, in-place density, grade and smoothness. A Quality Control Testing Plan shall be developed as part of the Quality Control Program.

11.22.3.1 ASPHALT CONTENT

A minimum of two tests to determine asphalt content will be performed per lot (a lot is defined in paragraph QUALITY ASSURANCE) by one of the following methods: extraction method in accordance with ASTM D2172/D2172M, Method A or B, the ignition method in accordance with the AASHTO T 308, ASTM D6307, or the nuclear method in accordance with ASTM D4125/D4125M, provided each method is calibrated for the specific mix being used. For the extraction method, the weight of ash, as described in ASTM D2172/D2172M, shall be determined as part of the first extraction test performed at the beginning of plant production; and as part of every tenth extraction test performed thereafter, for the duration of plant production. The last weight of ash value obtained shall be used in the calculation of the asphalt content for the mixture.

11.22.3.2 AGGREGATE PROPERTIES

Aggregate gradations shall be determined a minimum of twice per lot from mechanical analysis of recovered aggregate in accordance with ASTM D5444 or ASTM D6307. For batch plants, aggregates shall be tested in accordance with ASTM C136 using actual batch weights to determine the combined aggregate gradation of the mixture. The specific gravity of each aggregate size grouping shall be determined for each 18,000 metric tons in accordance with ASTM C127 or ASTM C128. Fractured faces for gravel sources shall be determined for each 18,000 metric tons in accordance with COE CRD-C 171. The uncompacted void content of manufactured sand shall be determined for each 18,000 metric tons in accordance with ASTM C1252 Method A.

11.22.3.3 TEMPERATURES

Temperatures shall be checked at least four times per lot, at necessary locations, to determine the temperature at the dryer, the asphalt cement in the storage tank, the asphalt mixture at the plant, and the asphalt mixture at the job site.

11.22.3.4 AGGREGATE MOISTURE

The moisture content of aggregate used for production shall be determined a minimum of once per lot in accordance with ASTM C566.

11.22.3.5 MOISTURE CONTENT OF MIXTURE

The moisture content of the mixture shall be determined at least once per lot in accordance with AASHTO T 329.

11.22.3.6 LABORATORY AIR VOIDS, VMA, MARSHALL STABILITY AND FLOW

Mixture samples shall be taken at least four times per lot and compacted into specimens, using 75 blows per side with the Marshall hand-held hammer as described in ASTM D6926. After compaction, the laboratory air voids and VMA of

each specimen shall be determined, as well as the Marshall Stability and flow, as described in ASTM D6927. The VMA shall be within the limits of Table 8.

11.22.3.7 IN-PLACE DENSITY

Conduct any necessary testing to ensure the specified density is achieved. A nuclear gauge or other non-destructive testing device may be used to monitor pavement density.

11.22.3.8 GRADE AND SMOOTHNESS

Conduct the necessary checks to ensure the grade and smoothness requirements are met in accordance with paragraph QUALITY ASSURANCE.

11.22.3.9 ADDITIONAL TESTING

Any additional testing, which the Contractor deems necessary to control the process, may be performed at the Contractor's option.

11.22.3.10 QC MONITORING

Submit all QC test results to the Project Manager/Consultant on a daily basis as the tests are performed. The Project Manager/Consultant reserves the right to monitor any of the Contractor's quality control testing and to perform duplicate testing as a check to the Contractor's quality control testing.

11.22.4 SAMPLING

When directed by the Project Manager/Consultant, sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

11.22.5 CONTROL CHARTS

For process control, establish and maintain linear control charts on both individual samples and the running average of last four samples for the parameters listed in Table 9, as a minimum. These control charts shall be posted as directed by the RSAF Representative or Engineer and shall be kept current at all times. The control charts shall identify the project number, the test parameter being plotted, the individual sample numbers, the Action and Suspension Limits listed in Table 9 applicable to the test parameter being plotted, and the Contractor's test results.

Target values (JMF) shall also be shown on the control charts as indicators of central tendency for the cumulative percent passing, asphalt content, and laboratory air voids parameters. When the test results exceed either applicable Action Limit, take immediate steps to bring the process back in control. When the test results exceed either applicable Suspension Limit, halt production until the problem is solved. When the Suspension Limit is exceeded for individual values or running average values, the Project Manager/Consultant has the option to require the Contractor to remove and replace the material represented by the samples or to leave in place and base acceptance on mixture volumetric properties and in place density.

Use the control charts as part of the process control system for identifying trends so that potential problems can be corrected before they occur. Decisions concerning mix modifications shall be made based on analysis of the results provided in the control charts. The Quality Control Plan shall indicate the appropriate action which shall be taken to bring the process into control when certain parameters exceed their Action Limits.

Table 9: Action and Suspension Limits for the Parameters to be Plotted on Individual and Running Average Control Charts

	Individual Samples		**Running Average of Last Four Samples**	
Parameter to be Plotted	Action Limit	Suspension Limit	Action Limit	Suspension Limit
4.75 mm sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	6	8	4	5
0.6 mm sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	4	6	3	4
0.075 mm sieve, Cumulative Percent Passing, deviation from JMF target; plus or minus values	1.4	2.0	1.1	1.5
Asphalt content, percent deviation from JMF target; plus or minus value	0.4	0.5	0.2	0.3
Laboratory Air Voids, percent deviation from JMF target value	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Mat Density, percent of TMD	No specific action and suspension limits set since this parameter is used to determine percent payment			
In-place Joint Density, percent of TMD	No specific action and suspension limits set since this parameter is used to determine percent payment			
VMA				
Gradation 1	13.3	13.0	13.5	13.0
Gradation 2	14.3	14.0	14.5	14.0
Gradation 3	15.3	15.0	15.0	15.0
Stability, N (minimum)				
75 blow JMF	7,830	7,290	9,560	9,030
50 blow JMF	4,230	3,690	6,000	5,470
Flow, 0.25 mm				

75 blow JMF	8 min.	7 min.	9 min.	8 min.
	16 max.	17 max.	15 max.	16 max.
50 blow JMF	8 min.	7 min.	9 min.	8 min.
	18 max.	19 max.	17 max.	18 max.

11.23 PREPARATION OF ASPHALT BINDER MATERIAL

The asphalt cement material shall be heated avoiding local overheating and providing a continuous supply of the asphalt material to the mixer at a uniform temperature. The temperature of unmodified asphalts shall be no more than 160°C when added to the aggregates. Performance Graded (PG) asphalts shall be within the temperature range of 141 to 168°C when added to the aggregates.

11.24 PREPARATION OF MINERAL AGGREGATE

The aggregate for the mixture shall be heated and dried prior to mixing. No damage shall occur to the aggregates due to the maximum temperature and rate of heating used. The temperature of the aggregate and mineral filler shall not exceed 175°C when the asphalt cement is added. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

11.25 PREPARATION OF HOT-MIX ASPHALT MIXTURE

The aggregates and the asphalt cement shall be weighed or metered and introduced into the mixer in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a thorough and uniform coating of asphalt binder (testing in accordance with ASTM D2489/D2489M may be required by the Project Manager/Consultant) and is thoroughly distributed throughout the mixture. The moisture content of all hot-mix asphalt upon discharge from the plant shall not exceed 0.5 percent by total weight of mixture as measured by ASTM D1461.

11.26 PREPARATION OF THE UNDERLYING SURFACE

Immediately before placing the hot mix asphalt, the underlying course shall be cleaned of dust and debris. A prime coat and/or tack coat shall be applied in accordance with the contract specifications.

11.27 TEST SECTION

Prior to full production, place a test section for each JMF used. Construct a test section consisting of a maximum of 250 tons and two paver passes wide placed in two lanes, with a longitudinal cold joint. The test section shall be of the same depth as the course which it represents. The underlying grade or pavement structure upon which the test section is to be constructed shall be the same as the remainder of the course represented by the test section.

The equipment used in construction of the test section shall be the same equipment to be used on the remainder of the course represented by the test section. The test section shall be placed as part of the project pavement as approved by the Project Manager/Consultant.

11.27.1 SAMPLING AND TESTING FOR TEST SECTION

One random sample shall be taken at the plant; triplicate specimens compacted, and tested for stability, flow, and laboratory air voids. A portion of the same sample shall be tested for theoretical maximum density (TMD), aggregate gradation and asphalt content. An additional portion of the sample shall be tested to determine the Tensile Strength Ratio (TSR). Adjust the compactive effort as required to provide TSR specimens with an air void content of 7 plus/minus 1 percent. Four randomly selected cores shall be taken from the finished pavement mat, and four from the longitudinal joint, and tested for density. Random sampling shall be in accordance with procedures contained in ASTM D3665. The test results shall be within the tolerances or exceed the minimum values shown in Table 10 for work to continue. If all test results meet the specified requirements, the test section shall remain as part of the project pavement. If test results exceed the tolerances shown, the test section shall be removed and replaced at no cost to the Government and another test section shall be constructed.

Table 10. Test Section Requirements for Material and Mixture Properties

Property	Specification Limit
Aggregate Gradation-Percent Passing (Individual Test Result)	
4.75 mm and larger	JMF plus or minus 8
2.36, 1.18, 0.60, and 0.30 mm	JMF plus or minus 6
0.15 and 0.075 mm	JMF plus or minus 2.0
Asphalt Content, Percent (Individual Test Result)	JMF plus or minus 0.5
Laboratory Air Voids, Percent (Average of 3 specimens)	JMF plus or minus 1.0
VMA, Percent (Average of 3 specimens)	See Table 8
Tensile Strength Ratio (TSR) (At 7 percent plus/minus 1 percent air void content)	75 percent minimum
Conditioned Strength	415 kPa minimum
Mat Density, Percent of TMD (Average of 4 Random Cores)	92.0 - 96.0
Joint Density, Percent of TMD (Average of 4 Random Cores)	90.5 minimum
Stability, N (Average of 3 specimens)	9,560 minimum
Flow, 0.25 mm (Average of 3 specimens)	8 - 18

11.27.2 ADDITIONAL TEST SECTIONS

If the initial test section should prove to be unacceptable, the necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made. A second test section shall then be placed. Additional test sections, as required, shall be constructed and evaluated for conformance to the specifications. Full production shall not begin until an acceptable section has been constructed and accepted.

11.28 TESTING LABORATORY

The laboratories used to develop the JMF, perform Contractor Quality Control testing, and for Government acceptance testing shall meet the requirements of ASTM D3666. All required test methods shall be performed by an accredited laboratory. Submit a certification of compliance signed by the manager of the laboratory stating that it meets these requirements to the Project Manager/Consultant prior to the start of construction. The laboratory shall maintain this validation for the duration of the project. The certification shall contain as a minimum:

A. Qualifications of personnel; laboratory manager, supervising technician, and testing technicians.
B. A listing of equipment to be used in developing the job mix.
C. A copy of the laboratory's quality control system.
D. Evidence of participation in the AASHTO Materials Reference Laboratory (AMRL) program.

11.29 TRANSPORTING AND PLACING

11.29.1 TRANSPORTING

The hot-mix asphalt shall be transported from the mixing plant to the site in clean, tight vehicles. Deliveries shall be scheduled so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Adequate artificial lighting shall be provided for night placements. Hauling over freshly placed material will not be permitted until the material has been compacted as specified, and allowed to cool to 60°C.

11.29.2 PLACING

The mix shall be placed in lifts of adequate thickness and compacted at a temperature suitable for obtaining density, surface smoothness, and other specified requirements. Upon arrival, the mixture shall be placed to the full width by an asphalt paver; it shall be struck off in a uniform layer of such depth that, when the work is completed, it shall have the required thickness and conform to the grade and contour indicated. Waste mixture shall not be broadcast onto the mat or recycled into the paver hopper. Collect waste mixture and dispose off-site. The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the mixture shall begin along the centerline of a crowned section or on the high side of areas with a one-way slope. The mixture shall be placed in consecutive adjacent strips having a minimum width of 3 m. The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least 300 mm; however, the joint in the surface course shall be at the centerline of the pavement. Transverse joints in one course shall be offset by at least 3 m from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 3 m. On isolated areas where irregularities or

unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

11.30 COMPACTION OF MIXTURE

11.30.1 GENERAL

11.30.1.1 AFTER PLACING, THE MIXTURE SHALL BE THOROUGHLY AND UNIFORMLY COMPACTED BY ROLLING. THE SURFACE SHALL BE COMPACTED AS SOON AS POSSIBLE WITHOUT CAUSING DISPLACEMENT, CRACKING OR SHOVING. THE SEQUENCE OF ROLLING OPERATIONS AND THE TYPE OF ROLLERS USED ARE AT THE DISCRETION OF THE CONTRACTOR, WITH THE EXCEPTION THAT APPLICATION OF MORE THAN THREE PASSES WITH A VIBRATORY ROLLER IN THE VIBRATING MODE IS PROHIBITED. THE SPEED OF THE ROLLER SHALL, AT ALL TIMES, BE SUFFICIENTLY SLOW TO AVOID DISPLACEMENT OF THE HOT MIXTURE AND BE EFFECTIVE IN COMPACTION. CORRECT AT ONCE ANY DISPLACEMENT OCCURRING AS A RESULT OF REVERSING THE DIRECTION OF THE ROLLER, OR FROM ANY OTHER CAUSE.

11.30.1.2 FURNISH SUFFICIENT ROLLERS TO HANDLE THE OUTPUT OF THE PLANT. CONTINUE ROLLING UNTIL THE SURFACE IS OF UNIFORM TEXTURE, TRUE TO GRADE AND CROSS SECTION, AND THE REQUIRED FIELD DENSITY IS OBTAINED. TO PREVENT ADHESION OF THE MIXTURE TO THE ROLLER, KEEP THE WHEELS PROPERLY MOISTENED, BUT EXCESSIVE WATER WILL NOT BE PERMITTED. IN AREAS NOT ACCESSIBLE TO THE ROLLER, THOROUGHLY COMPACT THE MIXTURE WITH HAND TAMPERS. REMOVE THE FULL DEPTH OF ANY MIXTURE THAT BECOMES LOOSE AND BROKEN, MIXED WITH DIRT, CONTAINS CHECK-CRACKING, OR IS IN ANY WAY DEFECTIVE, REPLACE WITH FRESH HOT MIXTURE AND IMMEDIATELY COMPACT TO CONFORM TO THE SURROUNDING AREA. THIS WORK SHALL BE DONE AT THE CONTRACTOR'S EXPENSE. SKIN PATCHING WILL NOT BE ALLOWED.

11.30.2 SEGREGATION

11.30.2.1 THE PROJECT MANAGER/CONSULTANT CAN SAMPLE AND TEST ANY MATERIAL THAT LOOKS DEFICIENT. WHEN THE IN-PLACE MATERIAL APPEARS TO BE SEGREGATED, THE PROJECT MANAGER/CONSULTANT HAS THE OPTION TO SAMPLE THE MATERIAL AND HAVE IT TESTED AND COMPARED TO THE AGGREGATE GRADATION, ASPHALT CONTENT, AND IN-PLACE DENSITY REQUIREMENTS IN TABLE 10. IF THE MATERIAL FAILS TO MEET THESE SPECIFICATION REQUIREMENTS, THE EXTENT OF THE SEGREGATED MATERIAL WILL BE REMOVED AND REPLACED THE FULL DEPTH OF THE LAYER OF ASPHALT MIXTURE AT NO ADDITIONAL COST TO THE GOVERNMENT. WHEN SEGREGATION OCCURS IN THE MAT, TAKE APPROPRIATE ACTION TO CORRECT THE PROCESS SO THAT ADDITIONAL SEGREGATION DOES NOT OCCUR.

11.31 JOINTS

The formation of joints shall be made ensuring a continuous bond between the courses and to obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

11.31.1 TRANSVERSE JOINTS

The roller shall not pass over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. The cutback material shall be removed from the project. In both methods, all contact surfaces shall be given a light tack coat of asphalt material before placing any fresh mixture against the joint.

11.31.2 LONGITUDINAL JOINTS

Longitudinal joints which are irregular, damaged, uncompacted, cold (less than 80°C at the time of placing the adjacent lane), or otherwise defective, shall be cut back a maximum of 75 mm from the top edge of the lift with a cutting wheel to expose a clean, sound, near vertical surface for the full depth of the course. All cutback material shall be removed from the project. Cutting equipment that uses water as a cooling or cutting agent shall not be permitted. All contact surfaces shall be given a light tack coat of asphalt material prior to placing any fresh mixture against the joint.

11.31.3 HMA-PORTLAND CEMENT CONCRETE JOINTS

Joints between HMA and PCC will require specific construction procedures for the HMA. The following criteria are applicable to the first 3 m or paver width of HMA adjacent to the PCC.

11.31.3.1 PAVE THE HMA SIDE OF THE JOINT IN A DIRECTION PARALLEL TO THE JOINT.

11.31.3.2 PLACE THE HMA SIDE SUFFICIENTLY HIGH SO THAT WHEN FULLY COMPACTED THE HMA WILL BE GREATER THAN 3 MM BUT LESS THAN 6 MM HIGHER THAN THE PCC SIDE OF THE JOINT.

11.31.3.3 COMPACTION SHALL BE PROVIDED WITH STEEL WHEEL ROLLERS AND AT LEAST ONE RUBBER TIRE ROLLER. THE RUBBER TIRE ROLLER SHALL BE AT LEAST 18 METRIC TONS IN WEIGHT AND HAVE TIRES THAT ARE INFLATED TO AT LEAST 620 KPA. AVOID SPALLING THE PCC DURING PLACEMENT AND COMPACTION OF THE HMA. STEEL WHEEL ROLLERS SHALL BE OPERATED IN A WAY THAT PREVENTS SPALLING THE PCC. ANY DAMAGE TO PCC EDGES OR JOINTS SHALL BE REPAIRED AS DIRECTED BY THE PROJECT MANAGER/CONSULTANT. IF DAMAGE TO THE PCC JOINT OR EDGE EXCEEDS A TOTAL OF 1 M, THE PCC PANEL SHALL BE REMOVED AND REPLACED AT NO ADDITIONAL EXPENSE TO THE GOVERNMENT.

11.31.3.4 AFTER COMPACTION IS FINISHED THE HMA SHALL BE LEVELED BY GRINDING SO THAT THE HMA SIDE IS LESS THAN 3 MM HIGHER THAN THE PCC SIDE. THE HMA IMMEDIATELY ADJACENT TO THE JOINT SHALL NOT BE LOWER THAN THE PCC AFTER THE GRINDING OPERATION. TRANSITION THE GRINDING INTO THE HMA IN A WAY THAT ENSURES GOOD SMOOTHNESS AND PROVIDES DRAINAGE OF WATER. THE JOINT AND ADJACENT MATERIALS WHEN COMPLETED SHALL MEET ALL OF THE REQUIREMENTS FOR GRADE AND SMOOTHNESS. MEASURE SMOOTHNESS ACROSS THE PCC-HMA JOINT USING A 4 M STRAIGHTEDGE. THE ACCEPTABLE TOLERANCE IS 3 MM.

11.31.3.5 CONSIDER THE HMA NEXT TO THE PCC AS A SEPARATE LOT FOR EVALUATION. LOTS ARE BASED ON INDIVIDUAL LIFTS. DO NOT COMINGLE CORES FROM DIFFERENT LIFTS FOR DENSITY EVALUATION PURPOSES. TAKE FOUR CORES FOR EACH LOT OF MATERIAL PLACED ADJACENT TO THE JOINT. THE SIZE OF LOT SHALL BE 3 M WIDE BY THE LENGTH OF THE JOINT BEING PAVED. LOTS ARE BASED ON INDIVIDUAL LIFTS AND SHALL NOT BE COMINGLED FOR DENSITY EVALUATION PURPOSES. LOCATE THE CENTER OF EACH OF THE FOUR CORES 150 MM FROM THE EDGE OF THE CONCRETE. TAKE EACH CORE AT A RANDOM LOCATION ALONG THE LENGTH OF THE JOINT. THE REQUIREMENTS FOR DENSITY FOR THIS LOT, ADJACENT TO THE JOINT, ARE THE SAME AS THAT FOR THE MAT SPECIFIED EARLIER.

11.31.3.6 ALL PROCEDURES, INCLUDING REPAIR OF DAMAGED PCC, SHALL BE IN ACCORDANCE WITH THE APPROVED QUALITY CONTROL PLAN.

12. AIRFIELD PAINTING

12.1 GENERAL

12.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

ICRI 03732 (1997) Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS TT-B-1325 (Rev D; Notice 1) Beads (Glass Spheres) Retro-Reflective (Metric)

FS TT-P-1952 (Rev E) Paint, Traffic and Airfield Markings, Waterborne

12.3 SUBMITTALS

SD-03 Product Data

- Reflective media for airfields
- Reflective media for roads and streets
- Paints for airfields
- Paints for roads and streets
- Equipment
- Lists of proposed equipment, including descriptive data, and notifications of proposed Contractor actions as specified in this section. List of removal equipment shall include descriptive data indicating area of coverage per pass, pressure adjustment range, tank and flow capacities, and safety precautions required for the equipment operation.

SD-06 Test Reports

- Reflective media for airfields
- Reflective media for roads and streets
- Paints for airfields
- Paints for roads and streets
- Certified reports from sampling and testing made in accordance with paragraph entitled "Sampling and Testing" prior to the use of the materials at the jobsite. Testing shall be performed in an approved independent laboratory.

SD-07 Certificates

- Qualifications
- Reflective media for airfields
- Reflective media for roads and streets
- Paints for airfields
- Paints for roads and streets
- Volatile Organic Compound, (VOC)

- Certificate stating that the proposed pavement marking paint meets the VOC regulations of the local Air Pollution Control District having jurisdiction over the geographical area in which the project is located.
- Construction equipment list

SD-08 Manufacturer's Instructions

- Paints for airfields
- Paints for roads and streets
- Submit manufacturer's Material Safety Data Sheets.

12.4 DELIVERY AND STORAGE

Deliver paints and paint materials in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer. Provide storage facilities at the job site, only in areas approved by the Project Manager/Consultant or authorized representative, for maintaining materials at temperatures recommended by the manufacturer.

12.5 WEATHER LIMITATIONS

Apply paint to clean, dry surfaces, and unless otherwise approved, only when the air and pavement surface temperature is at least 2.7°C above the dew point and the air and pavement temperatures are above 5°C and less than 35°C for oil-based materials; above 10°C and less than 43°C for water-based materials. Maintain paint temperature within these same limits.

12.6 EQUIPMENT

Machines, tools, and equipment used in the performance of the work shall be approved by the Project Manager/Consultant and maintained in satisfactory operating condition. Submit construction equipment list for approval by the Project Manager/Consultant.

12.6.1 MOBILE AND MANEUVERABLE

Application equipment shall be mobile and maneuverable to the extent that straight lines can be followed and normal curves can be made in a true arc.

12.6.2 PAINT APPLICATION EQUIPMENT

a) Hand-Operated, Push-Type Machines

Provide hand-operated push-type applicator machine of a type commonly used for application of paint to pavement surfaces. Paint applicator machine shall be acceptable for marking small street and parking areas. Applicator machine shall be equipped with the necessary paint tanks and spraying nozzles, and shall be capable of applying paint uniformly at coverage specified. Applicator for water-based markings shall be equipped with non-stick coated hoses; metal parts in contact with the paint material shall be constructed of grade 302, 304, 316, or equal stainless steel.

b) Self-Propelled or Mobile-Drawn Pneumatic Spraying Machines

Provide self-propelled or mobile-drawn pneumatic spraying machine with suitable arrangements of atomizing nozzles and controls to obtain the specified results. Provide machine having a speed during application

capable of applying the stripe widths indicated at the paint coverage rate specified herein and of even uniform thickness with clear-cut edges. Provide equipment used for marking streets and highways capable of placing the prescribed number of lines at a single pass as solid lines, intermittent lines, or a combination of solid and intermittent lines using a maximum of three different colors of paint as specified. The equipment for applying the paint for airfield pavements shall be a self-propelled or mobile-drawn pneumatic spraying machine with an arrangement of atomizing nozzles capable of applying a width of line at any one time in multiples of 102 mm from 102 mm to 1 m at a speed of at least 5 miles per hour. Provide paint applicator with paint reservoirs or tanks of sufficient capacity and suitable gages to apply paint in accordance with requirements specified. Equip tanks with suitable air-driven mechanical agitators. Equip spray mechanism with quick-action valves conveniently located, and include necessary pressure regulators and gages in full view and reach of the operator. Install paint strainers in paint supply lines to ensure freedom from residue and foreign matter that may cause malfunction of the spray guns. The paint applicator shall be readily adaptable for attachment of an air-actuated dispenser for the reflective media approved for use. Provide pneumatic spray guns for hand application of paint in areas where the mobile paint applicator cannot be used. Applicator for water-based markings shall be equipped with non-stick coated hoses; metal parts in contact with the paint material shall be constructed of grade 302, 304, 316, or equal stainless steel.

12.6.3 REFLECTIVE MEDIA DISPENSER

The dispenser for applying the reflective media shall be attached to the paint dispenser and shall operate automatically and simultaneously with the applicator through the same control mechanism. The dispenser shall be capable of adjustment and designed to provide uniform flow of reflective media over the full length and width of the stripe at the rate of coverage specified in paragraph APPLICATION, at all operating speeds of the applicator to which it is attached.

12.6.4 SURFACE PREPARATION EQUIPMENT

a) Sandblasting Equipment

Sandblasting equipment shall include an air compressor, hoses, and nozzles of proper size and capacity as required for cleaning surfaces to be painted. The compressor shall be capable of furnishing not less than 70.8 L/sec of air at a pressure of not less than 620 kPa at each nozzle used, and shall be equipped with traps that will maintain the compressed air free of oil and water.

b) Waterblast Equipment

The water pressure shall be specified at 17.9 MPa at 60°C in order to adequately clean the surfaces to be marked. The Contractor shall install a gate valve and a back-flow prevention device on the fire hydrant tap as designated by the Project Manager/Consultant. The Contractor shall furnish all equipment, material, and labor required to obtain and deliver water from the designated fire hydrant to the work area(s).

c) Marking Removal Equipment
Equipment shall be mounted on rubber tires and shall be capable of removing markings from the pavement without damaging the pavement surface or joint sealant. Waterblasting equipment shall be capable of producing an adjustable, pressurized stream of water. Sandblasting equipment shall include an air compressor, hoses, and nozzles. The compressor shall be equipped with traps to maintain the air free of oil and water.

d) Chemical Equipment
Chemical equipment shall be capable of application and removal of chemicals from the pavement surface, and shall leave only non-toxic biodegradable residue.

e) Traffic Controls
Suitable warning signs shall be placed near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Small markers shall be placed along newly painted lines to control traffic and prevent damage to newly painted surfaces. Painting equipment shall be marked with large warning signs indicating slow-moving painting equipment in operation.

12.7 WEATHER LIMITATIONS FOR REMOVAL

Pavement surface shall be free of snow, ice, or slush. Surface temperature shall be at least 5°C and rising at the beginning of operations, except those involving shot or sand blasting. Operation shall cease during thunderstorms. Operation shall cease during rainfall, except for waterblasting and removal of previously applied chemicals. Waterblasting shall cease where surface water accumulation alters the effectiveness of material removal.

12.8 QUALIFICATIONS FOR AIRFIELD MARKING

Submit certification of qualifications in resume format showing airfield pavement marking personnel have experience working on airfields, operating equipment and performing airfield pavement marking work a minimum of fourteen (14) days before pavement marking work is to be performed. Include with resume a list of references complete with points of contact and telephone numbers.

12.8.1 AIRFIELD PAVEMENT MARKING QUALIFICATIONS

Provide certification for pavement marking machine operator and Foreman demonstrating experience working on a minimum of two (2) airfield pavement marking projects of similar size and scope. Provide resume demonstrating airfield pavement marking personnel have a minimum of two (2) years of experience operating marking equipment to be used on project and performing pavement marking work.

The Project Manager/Consultant reserves the right to require additional proof of competency or to reject personnel and call for alternate airfield pavement marking personnel.

12.9 PRODUCTS

12.9.1 MATERIALS

Provide materials conforming to the requirements specified herein.

Paints for Airfields FS TT-P-1952, color as indicated.
Paints for Roads and Streets FS TT-P-1952, color as indicated or selected.
Reflective Media for Airfields FS TT-B-1325, Type I, Gradation A.
Reflective Media for Roads and Streets FS TT-B-1325, Type I, Gradation A.

12.10 EXECUTION

12.10.1 SURFACE PREPARATION

Allow new pavement surfaces to cure for a period of not less than thirty (30) days before application of marking materials. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required. Remove rubber deposits, residual curing compounds, and other coatings adhering to the pavement by water blasting.

For Portland Cement Concrete pavement, grinding, light shot blasting, and light scarification, to a resulting profile equal to ICRI 03732 CSP 2, CSP 3, and CSP 4, respectively, can be used in addition to water blasting, to either remove existing coatings or for surface preparation on most pavements: shot blasting shall not be used on airfield pavements due to the potential of Foreign Object Damage (FOD) to aircraft.

Scrub affected areas, where oil or grease is present on old pavements to be marked, with several applications of trisodium phosphate solution or other approved detergent or degreaser and rinse thoroughly after each application. After cleaning any oil-soaked areas, seal with shellac or primer recommended by the manufacturer to prevent bleeding through the new paint. Do not commence painting in any area until pavement surfaces are dry and clean.

12.10.2 APPLICATION

a) Testing for Moisture

Apply pavement markings to dry pavement only. The Contractor shall test the pavement surface for moisture before beginning work after each period of rainfall, fog, high humidity, or cleaning, or when the ambient temperature has fallen below the dew point.

Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the CO or authorized representative. Employ the "plastic wrap method" to test the pavement for moisture as follows: Cover the pavement with a 300 mm by 300 mm (12 inch by 12 inch) section of clear plastic wrap and seal the edges with tape. After 15 minutes, examine the plastic wrap for any visible moisture accumulation inside the plastic. Do not begin marking operations until the test can be performed with no visible moisture accumulation inside the plastic wrap.

b) Rate of Application

i. Reflective Markings
Apply paint evenly to the pavement area to be coated at a rate of 2.5 plus or minus 0.10 square meter per liter. Apply glass spheres uniformly to the wet paint on airfield pavement at a rate of (1,198) and on road and street pavement at a rate of (719) plus or minus (60) g of glass spheres per liter. Collect and record readings for white and yellow retroreflective markings at the rate of one reading per 300 linear meters. The minimum acceptable average for white markings is 200 millicandelas per square meter per lux (mcd/m2/lx) (measured with Mirolux 12 Retroreflectometer or similar instrument as agreed). The minimum acceptable average for yellow markings is 175 millicandelas per square meter per lux (mcd/m2/lx). Readings shall be computed by averaging a minimum of 10 readings taken within the area at random locations. Areas not meeting the retroreflective requirements stated above shall be re-marked.

ii. Nonreflective Markings
Apply paint evenly to the pavement surface to be coated at a rate of 2.5 plus or minus 0.10 square meter per liter.

iii. Painting
Apply paint pneumatically with approved equipment at rate of coverage specified herein. Provide guidelines and templates as necessary to control paint application. Take special precautions in marking numbers, letters, and symbols. Manually paint numbers, letters, and symbols. Sharply outline all edges of markings. The maximum drying time requirements of the paint specifications will be strictly enforced, to prevent undue softening of bitumen, and pickup, displacement or discoloration by tires of traffic. Discontinue painting operations if there is a deficiency in drying of the markings until cause of the slow drying is determined and corrected.

iv. Reflective Media
Application of reflective media shall immediately follow the application of paint. Accomplish drop-on application of the glass spheres to ensure even distribution at the specified rate of coverage. Should there be malfunction of either paint applicator or reflective media dispenser, discontinue operations until deficiency is corrected.

12.11 FIELD TESTING, INSPECTION, AND DEMONSTRATIONS

12.11.1 SAMPLING AND TESTING

As soon as the paint and reflective materials are available for sampling, obtain by random selection from the sealed containers, two quart samples of each batch in the presence of the Project Manager/Consultant. Accomplish adequate mixing prior to sampling to ensure a uniform, representative sample. A batch is defined as that quantity of material processed by the manufacturer at one time and identified by number on the label. Clearly identify samples by designated name, specification number, batch number, project contract number, intended use, and quantity involved. At the discretion of the Project Manager/Consultant, samples provided may be tested by the Government for verification.

12.11.2 INSPECTION

Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance. A certificate of compliance shall be accompanied by test results substantiating conformance to the specified requirements.

12.11.3 SURFACE PREPARATIONS AND APPLICATION PROCEDURES

Surface preparations and application procedures will be examined by the Government Engineer to determine conformance with the requirements specified. Approve each separate operation prior to initiation of subsequent operations.

12.11.4 SURFACE PREPARATION DEMONSTRATION

Prior to surface preparation, demonstrate surface preparation using the proposed materials, methods and equipment according to the procedures outlined. Prepare areas large enough to determine cleanliness, adhesion of remaining coating and rate of cleaning.

12.11.5 TEST STRIPE DEMONSTRATION

Prior to paint application; demonstrate test stripe application within the work area using the proposed materials and equipment. Apply separate test stripes in each of the line widths and configurations required herein using the proposed equipment. The test stripes shall be long enough to determine the proper speed and operating pressures for the vehicle(s) and machinery, but not less than 15 meters long.

12.11.6 APPLICATION RATE DEMONSTRATION

During the Test Stripe Demonstration, demonstrate compliance with the application rates specified herein. Document the equipment speed and operating pressures required to meet the specified rates in each configuration of the equipment and provide a copy of the documentation to the Project Manager/Consultant or authorized representative 30 days prior to proceeding with the work.

12.11.7 RETROREFLECTIVE VALUE DEMONSTRATION

After the test stripes have cured to a "no-track" condition, demonstrate compliance with the average retroreflective values specified herein. Take a minimum of ten readings on each test stripe with a Mirolux 12 Retroreflectometer, or similar instrument with the same measuring geometry and direct readout in millicandelas per square meter per lux (mcd/m2/lx).

12.11.8 LEVEL OF PERFORMANCE DEMONSTRATION

The Project Manager/Consultant will be present the application demonstrations to observe the results obtained and to validate the operating parameters of the vehicle(s) and equipment. If accepted by the Project Manager/Consultant, the test stripe shall be the measure of performance required for this project. Work shall not proceed until the demonstration results are satisfactory to the Project Manager/Consultant.

12.12 TRAFFIC CONTROL AND PROTECTION

Place warning signs near the beginning of the work site and well ahead of the work site for alerting approaching traffic from both directions. Place small markers

along newly painted lines to control traffic and prevent damage to newly painted surfaces. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation. Do not use foil-backed material for temporary pavement marking because of its potential to conduct electricity during accidents involving downed power lines.

12.13 QUALITY ASSURANCE

Demonstrate success of bond of reflective media, new paint marking and the pavement surface, vacuum cured surface of new marking after a seven (7) day dry time. Inspect newly applied markings for signs of bond failure based on visual inspection and comparison to results from Test Stripe Demonstration paragraph.

12.13.1 REFLECTIVE MEDIA AND COATING BOND VERIFICATION

Within seven (7) days after pavement marking application, use industrial vacuum to sweep new markings. Visually inspect the pavement markings and the material captured by the vacuum. Verify that no significant loss of reflective media has occurred to the pavement marking due to the vacuum cleaning.

12.13.2 REFLECTIVE MEDIA AND COATING APPLICATION VERIFICATION

Use a wet film thickness gauge to measure the application of wet paint.

Use a microscope or magnifying glass to evaluate the embedment of glass beads in the paint. Verify the glass bead embedment with approximately 50 percent of the beads embedded and 50 percent of the beads exposed.

13. BOUNDARY FENCING

13.1 GENERAL

This part of the Specification shall cover all items related to security and other fence installation works for the Project. Works shall include all items required for the tendered Project, as well as all auxiliary works.

All works shall further be carried out in full compliance with all local rules and regulations and the Specification shall further be read, if applicable for the Project.

13.2 TECHNICAL DESCRIPTION

13.2.1 GENERAL GUIDELINE

All fence posts and struts shall be anchored in rigid concrete foundations (concrete grade C 40), and reaching at least 80 cm below and 10 cm above ground level. The depth of foundations shall be statically computed by the Bidder/Contractor and shall be approved by ADWEA/ADDC/AADC. In the vicinity of gates, adequate provisions to fix the fences shall be provided. Gate foundations shall also be of reinforced concrete.

Fencing mesh of external perimeter and security fences shall have at least 20 cm encasement into a continuous, reinforced concrete ground beam of 20 x 40 cm.

If required fencing, gates, doors, etc., have to be properly connected to an earthing/ grounding system.

The Bidder/Contractor shall supply references for the plastic coating to be used on the galvanized wire demonstrating suitability and longevity in the Maldives's harsh climatic environment. In addition, the Bidder/Contractor shall furnish a guarantee bond on all fencing materials, covering a period of ten years.

13.2.2 STEEL FENCING POSTS

The posts for fencing shall be of high grade steel of tubular or conical triangular hollow sections of the required size and shape. The posts shall be hot dip galvanized internally and externally. Before hot-dip galvanizing of the posts, strong T-shaped flanges to receive fixing brackets shall be welded.

Corner posts shall be equipped with corner turnbuckles for bracing wires and joint clamps for horizontal bracing rails and reverse bracing. All components shall be plastic-coated to increase the corrosion protection properties.

Application : Height of internal fence shall be 3.40m.

13.2.3 WIRE-MESH

Chain link wire-mesh shall be of minimum 4 mm diameter wires, opening size of not more than 50 x 50 mm. Mesh shall be hot-dip galvanized and provided with plastic coating, color to the discretion of ADWEA/ADDC/AADC.

The wire mesh shall be new and unused, and in single length between the posts. The plastic coating shall be thick and elastic, durable and should be able to withstand a temperature up to + 90°C.

Alternative fence systems utilizing welded mesh may be proposed for approval.

13.2.3.1 BARBED WIRE

The barbed wire shall be of stainless steel with two strands twisted and four pinned barbs.

The strands of the barbed wire shall be of required gauge three. Four rows shall be provided above the wire-mesh or as instructed by ADWEA/ADDC/AADC.

In case of flat tape, the tape shall be of stainless steel with a minimum thickness of 0.6 mm and with a bond length of not less than 20 mm.

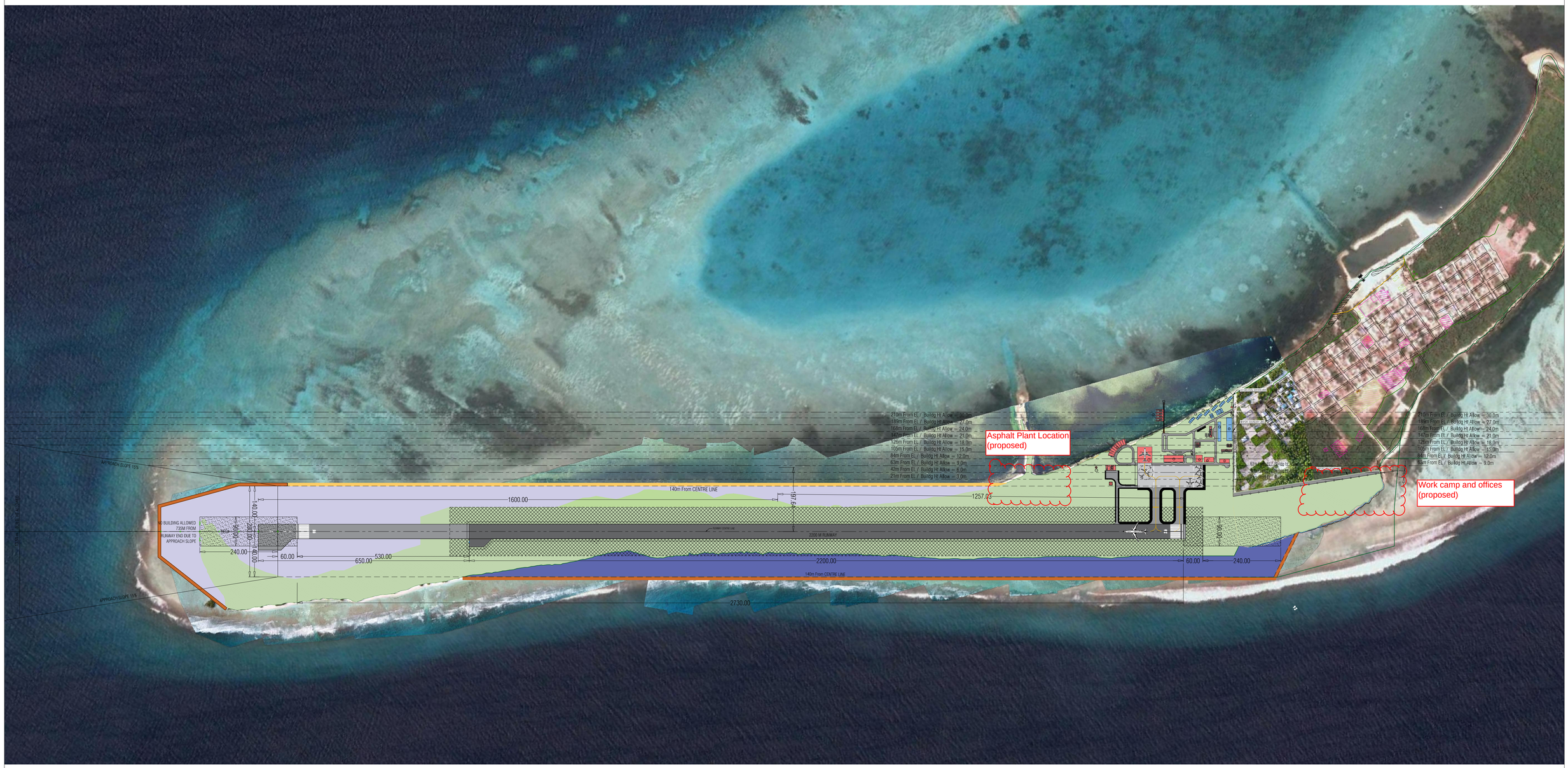
13.2.3.2 GATES

Gates for areas fenced with chain link fence shall be made of frames from trapezoidal or triangle hollow steel sections according to the fence design may be proposed. These gates shall be fitted with adjustable hinges and bronze bushes with greasing points. The in-fill of such gates may be of chain link wire mesh or welded mesh as used for the fence.

Gates shall be lockable and the drop-bolts of inactive leafs shall be locked in the closed position by the active gate to prevent opening.

The corrosion protection shall be provided by hot dip galvanizing and subsequent plastic coating of the gates.

SECTION VIII - DRAWINGS



MAAFARU AIRPORT RUNWAY EXPANSION

SCALE NTS

RECLAMATION A
TOTAL AREA = 156,179 SQM

RECLAMATION B
TOTAL AREA =264,357 SQM

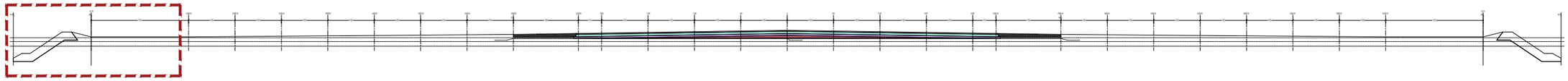
REVETMENT TYPE A
TOTAL LENGTH =3,326 M

REVETMENT TYPE B
TOTAL LENGTH =2,215 M

RWA-MAP-SKT-066	20-DEC-2020

0 100 200 300 400 500 600m

1 : 6000 @ A1



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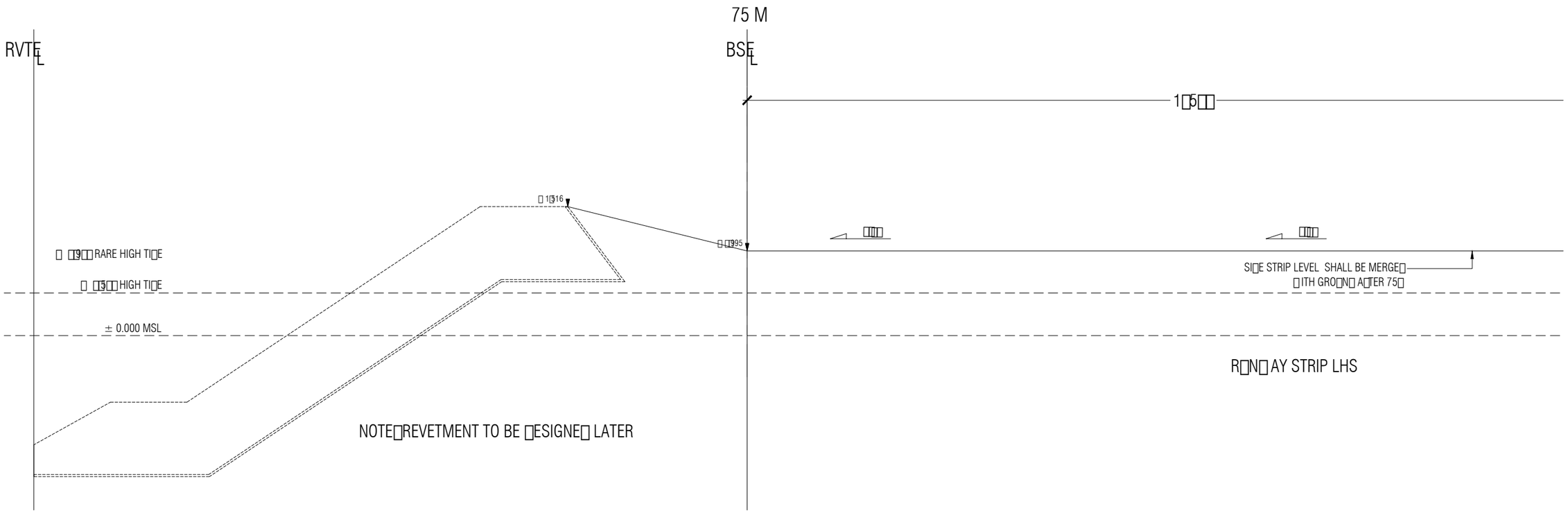

TYPICAL CROSS SECTION 1 OF RUNWAY STRIP (CH 7.00 - 22.00) RHS & LHS, CH 0.00 - 7.00 LHS

SCALE 1:50

0 1 2 3 5

NOTE

REVISIONS		
NO.	DESCRIPTION	DATE
REV A	ISSUED FOR REVIEW	20-04-2021
REV A1	ISSUED FOR REVIEW	24-04-2021

NAMAA AIRPORT
GENERAL CROSS SECTIONS

DRAWING TITLE
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EMIRATE
REGIONAL AIRPORTS
MINISTRY OF TOURISM

FUNDING
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ABU DHABI FUND FOR DEVELOPMENT

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ARMSTRONG

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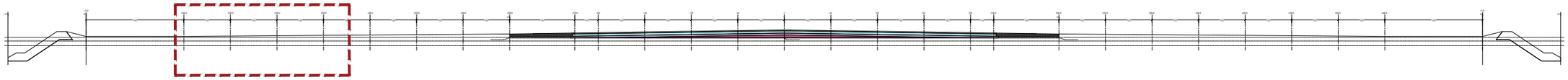
DWG T1713-TOS-953-CV-DWG-001



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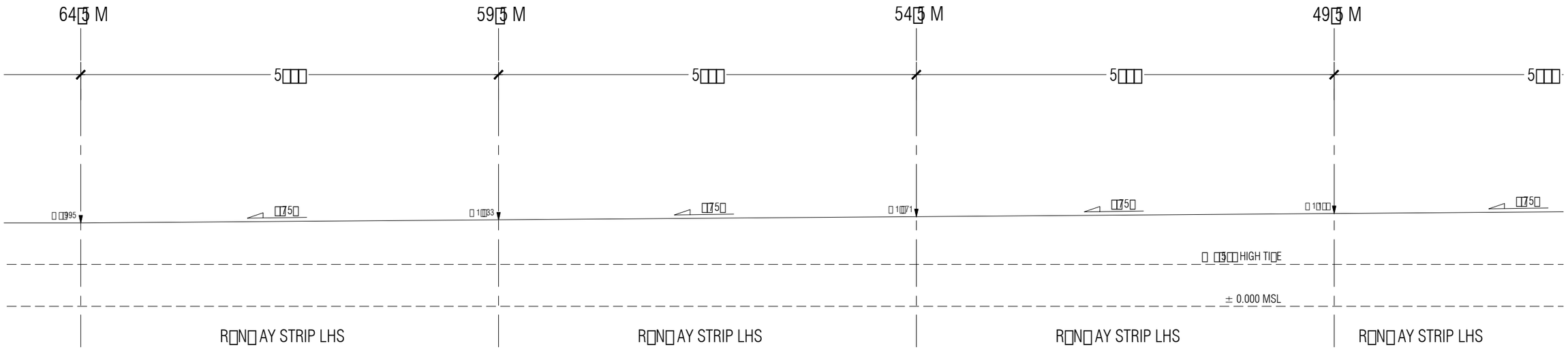

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SCALE [illegible]1[illegible]5[illegible]

[illegible] 1[illegible] 2[illegible] 3[illegible] 5[illegible]

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N[illegible]	[illegible]	[illegible]
R[illegible]A[illegible]	ISS[illegible]E[illegible] [illegible]OR REVIE[illegible]	[illegible]2[illegible]4[illegible]2[illegible]0[illegible]
R[illegible]A1	ISS[illegible]E[illegible] [illegible]OR REVIE[illegible]	24[illegible]4[illegible]2[illegible]0[illegible]

N[illegible]MAA[illegible]AR[illegible] AIRPORT
GENERAL CROSS SECTIONS

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REGIONAL AIRPORTS
MINISTRY O[illegible]TO[illegible]RISM

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صندوق أبوظبي للتنمية
ABU DHABI FUND FOR DEVELOPMENT

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TUFF

EPC P[illegible]C[illegible]
india aviation
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ARMSTRONG

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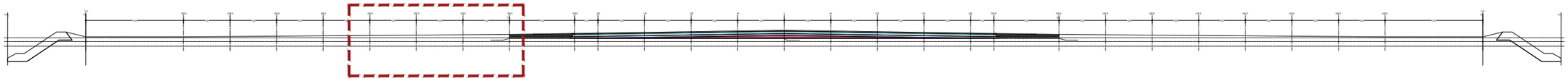

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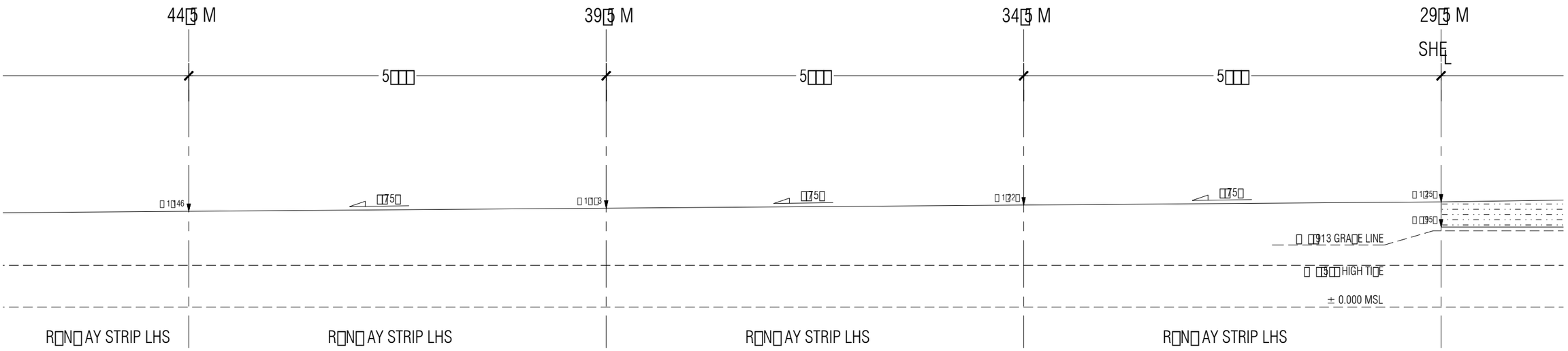

NOTE 1 [illegible]LLING SHOULD BE DONE UPTO [illegible]913 MSL ALL ALONG THE RUNWAY
2 [illegible]LLING IN SHOULDER AREA UPTO [illegible]95 MSL ALL ALONG THE SHOULDER ON BOTH SIDES
3 COMPACTING IN THE SHOULDER AREA FROM [illegible]95 MSL UPTO TOP LVL OF THE SHOULDER
4 SUBBASE FOR RUNWAY PAVEMENT STARTS FROM [illegible]913 MSL TO [illegible]25 MSL

1		40 MM THICK DENSE ASPHALT CONCRETE (TOP LAYER) 60 MM THICK SEMI DENSE ASPHALT CONCRETE (LOWER LAYER)
2		250 MM THICK COMPACTED AGGREGATE BASE COURSE (2 LAYERS) CBR [illegible]
3		100 MM THICK COMPACTED SUB BASE MATERAL (FREE GRADED SAND) CBR [illegible] 30
4		COMPACTED SUB GRADE CBR [illegible] 15

NO	LAYERS	EDGE PROTECTION
1	BEARING COURSE	MINIMUM 100 MM SHALL BE PROVIDED TO BOTH SIDES OF 60 MM THICK SEMI DENSE ASPHALT CONCRETE (LOWER LAYER)
2	BASE COURSE	MINIMUM 300 MM SHALL BE PROVIDED TO BOTH SIDES
3	SUB BASE	MINIMUM 500 MM SHALL BE PROVIDED TO BOTH SIDES

TYPICAL CROSS SECTION [illegible]3 OF RUNWAY [illegible] STRIP (CH 7[illegible] [illegible] 22[illegible] RHS [illegible] LHS, CH [illegible] 7[illegible] LHS)

SCALE [illegible]1:5[illegible]

[illegible] 1[illegible] 2[illegible] 3[illegible] 5[illegible]

NOTES

REVISIONS		
NO	DESCRIPTION	DATE
REV A	ISSUED FOR REVIEW	20 APR 20[illegible]
REV A1	ISSUED FOR REVIEW	24 APR 20[illegible]

NUMAA AIRPORT
GENERAL CROSS SECTIONS

PROJECT TITLE
AS SHOWN

EMPLOYER
REGIONAL AIRPORTS
MINISTRY OF TOURISM

[illegible]

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SUB CONTRACTOR MATERIAL CONTRACTOR
ARMSTRONG

ISSUE FOR	APR 20[illegible]	PAGE 20
SCALE	1:50	PAPER A3
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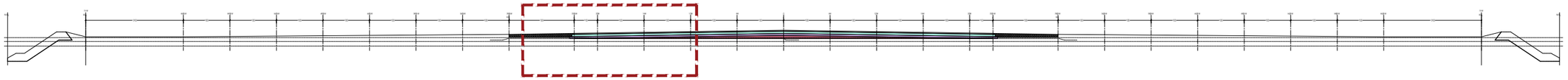

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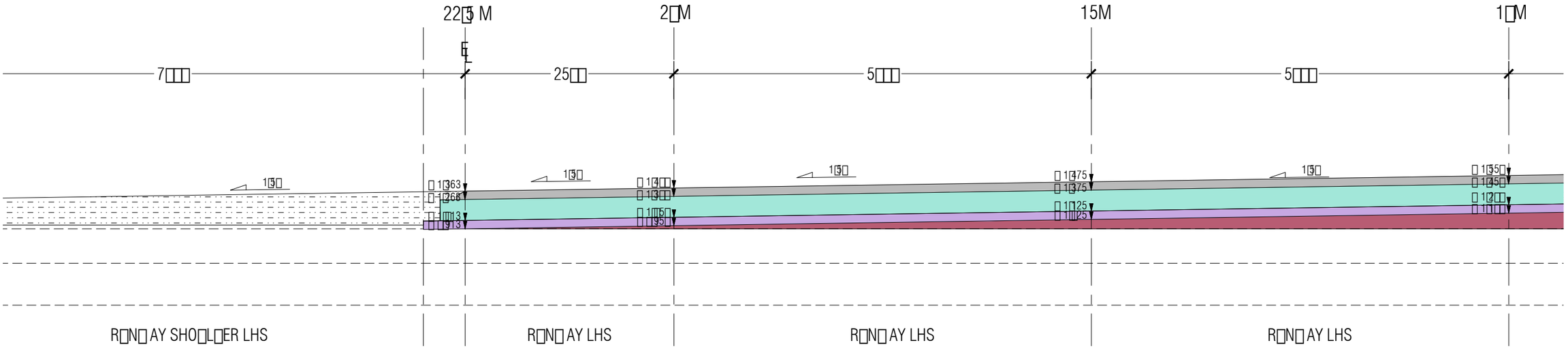

NOTE:
1. WIDENING SHOULD BE DONE UPTO 1.913 MSL ALL ALONG THE RUNWAY
2. WIDENING IN SHOULDER AREA UPTO 1.995 MSL ALL ALONG THE SHOULDER ON BOTH SIDES
3. COMPACTING IN THE SHOULDER AREA FROM 1.995 MSL UPTO TOP LVL OF THE SHOULDER.
4. SUBBASE FOR RUNWAY PAVEMENT STARTS FROM 1.913 MSL TO 1.225 MSL

1		40MM THICK DENSE ASPHALT CONCRETE TOP LAYER 60MM THICK SEMI DENSE ASPHALT CONCRETE BLOWER LAYER
2		250MM THICK COMPACTED AGGREGATE BASE COURSE (2 LAYERS) CBR 100
3		100MM THICK COMPACTED SUB BASE MATERAL (GREDED SAND) CBR 30
4		COMPACTED SUB GRADE CBR 15

NO	LAYERS	EDGE PROTECTION
1	BEARING COURSE	MINIMUM 100 MM SHALL BE PROVIDED TO BOTH SIDES OF 60MM THICK SEMI DENSE ASPHALT CONCRETE BLOWER LAYER
2	BASE COURSE	MINIMUM 300 MM SHALL BE PROVIDED TO BOTH SIDES
3	SUB BASE	MINIMUM 500 MM SHALL BE PROVIDED TO BOTH SIDES

TYPICAL CROSS SECTION 04 OF RUNWAY STRIP (CH 700 TO 2200) RHS & LHS, CH (0 TO 700) LHS

SCALE 1:500

0 10 20 30 50

N/A

REVISION		
NO	DESCRIPTION	DATE
REV A	ISSUED FOR REVIEW	20-04-2010
REV A1	ISSUED FOR REVIEW	24-04-2010

NUMAA AIRPORT
GENERAL CROSS SECTIONS

PROJECT TITLE
AS SHOWN

EMPLOYER
REGIONAL AIRPORTS
MINISTRY OF TOURISM

PROJECT
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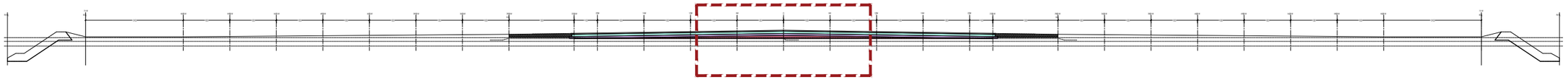
ISSUE STATUS	IFR	DATE APR 2010	PAGE 20
SCALE	1:500	PAPER A3
DWG T1713-TOS-953-CV-000-004		



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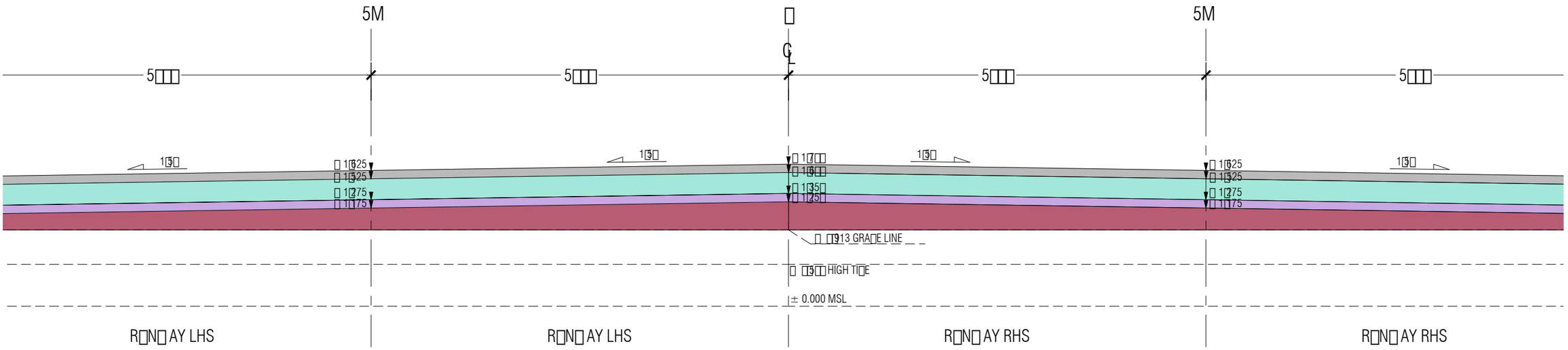

NOTE:
1. FILLING SHOULD BE DONE UPTO + 19.913 MSL ALL ALONG THE RUNWAY
2. FILLING IN SHOULDER AREA UPTO + 19.500 MSL ALL ALONG THE SHOULDER ON BOTH SIDES
3. COMPACTING IN THE SHOULDER AREA FROM + 19.500 MSL UPTO TOP LVL OF THE SHOULDER
4. SUBBASE FOR RUNWAY PAVEMENT STARTS FROM + 19.913 MSL TO + 12.250 MSL

1		40MM THICKENSE ASPHALT CONCRETE (TOP LAYER) 60MM THICK SEMI DENSE ASPHALT CONCRETE (LOWER LAYER)
2		250MM THICK COMPACTED AGGREGATE BASE COURSE (2 LAYERS) CBR > 100
3		100MM THICK COMPACTED SUB BASE MATERIAL (GRADED SAND) CBR > 30
4		COMPACTED SUB GRADE CBR > 15

NO	LAYERS	EDGE PROTECTION
1	BEARING COURSE	MINIMUM 100MM SHALL BE PROVIDED TO BOTH SIDES OF 60MM THICK SEMI DENSE ASPHALT CONCRETE (LOWER LAYER)
2	BASE COURSE	MINIMUM 300MM SHALL BE PROVIDED TO BOTH SIDES
3	SUB BASE	MINIMUM 500MM SHALL BE PROVIDED TO BOTH SIDES

TYPICAL CROSS SECTION FOR 50 OF RUNWAY & STRIP (CH 7000 TO 22000) RHS & LHS, CH (0000 TO 7000) LHS

SCALE 1:500

0 10 20 30 50

NOTES	
REVISION	DESCRIPTION	DATE
R00	ISSUED FOR REVIEW	20-04-2020
R01	ISSUED FOR REVIEW	24-04-2020

NOMAAD ARU AIRPORT
GENERAL CROSS SECTIONS

DRAWING TITLE
AS SHOWN

EMPLOYER
REGIONAL AIRPORTS
MINISTRY OF TOURISM

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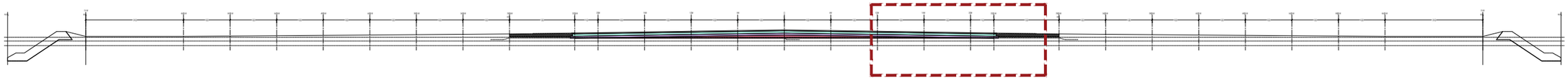
SUBCONTRACTOR
ARMSTRONG

ISSUE FOR	APR 2020	PAGE 20
SCALE	1:50	PAPER A3
DWG T1713-TOS-953-CV-000-5		



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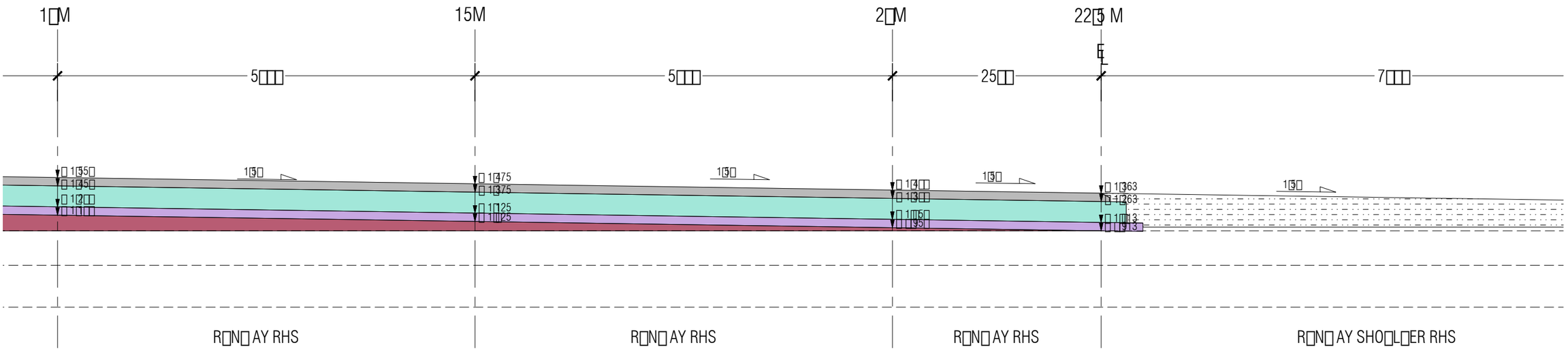

NOTE:
1. SHOULD BE ONE UPTO 1:113 MSL ALL ALONG THE RUNWAY
2. SHOULDER AREA UPTO 1:95 MSL ALL ALONG THE SHOULDER ON BOTH SIDES
3. COMPACTING IN THE SHOULDER AREA FROM 1:95 MSL UPTO TOP LVL OF THE SHOULDER
4. SUBBASE FOR RUNWAY PAVEMENT STARTS FROM 1:113 MSL TO 1:25 MSL

1		40MM THICK DENSE ASPHALT CONCRETE (TOP LAYER) 60MM THICK SEMI DENSE ASPHALT CONCRETE (LOWER LAYER)
2		250MM THICK COMPACTED AGGREGATE BASE COURSE (2 LAYERS) CBR > 100
3		100MM THICK COMPACTED SUB BASE MATERAL (GRADED SAND) CBR > 30
4		COMPACTED SUB GRADE CBR > 15

NO	LAYERS	EDGE PROTECTION
1	WEARING COURSE	MINIMUM 100 MM SHALL BE PROVIDED TO BOTH SIDES OF 60MM THICK SEMI DENSE ASPHALT CONCRETE (LOWER LAYER)
2	BASE COURSE	MINIMUM 300 MM SHALL BE PROVIDED TO BOTH SIDES
3	SUB BASE	MINIMUM 500 MM SHALL BE PROVIDED TO BOTH SIDES

TYPICAL CROSS SECTION FOR RUNWAY STRIP (CH 700 TO 2200) RHS & LHS, CH (700 TO 700) LHS

SCALE 1:50

0 10 20 30 50

NO	DESCRIPTION	DATE
REV A	ISSUED FOR REVIEW	20-04-2021
REV A1	ISSUED FOR REVIEW	24-04-2021

NOMAAD ARU AIRPORT
GENERAL CROSS SECTIONS

PROJECT TITLE
AS SHOWN

EMPLOYER
REGIONAL AIRPORTS
MINISTRY OF TOURISM

PMC
صندوق أبوظبي للتنمية
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ISSUE FOR	APR 2021	PAGE 2
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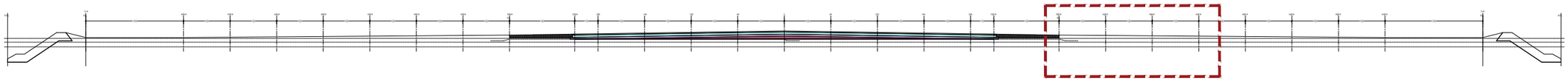

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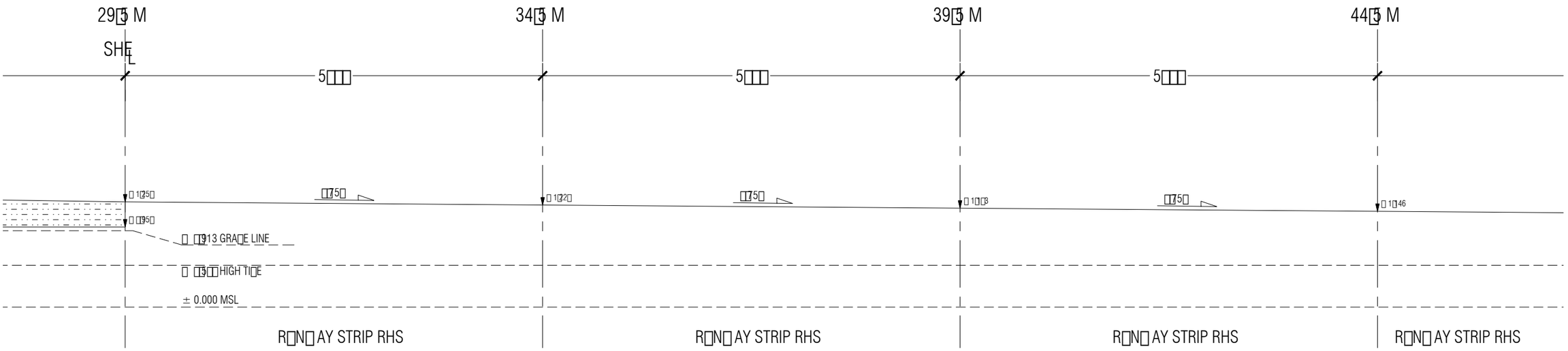

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SCALE [illegible]1[illegible]5[illegible]

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N[illegible]MAA[illegible]AR[illegible] AIRPORT
GENERAL CROSS SECTIONS

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REGIONAL AIRPORTS
MINISTRY O[illegible]TO[illegible]RISM

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صندوق أبوظبي للتنمية
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S[illegible]	1[illegible]5[illegible]	P[illegible] A3
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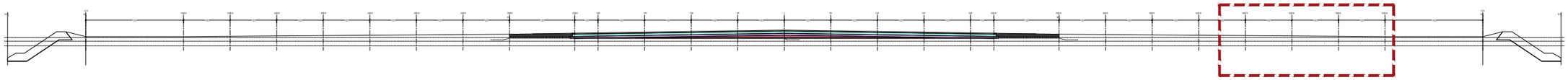

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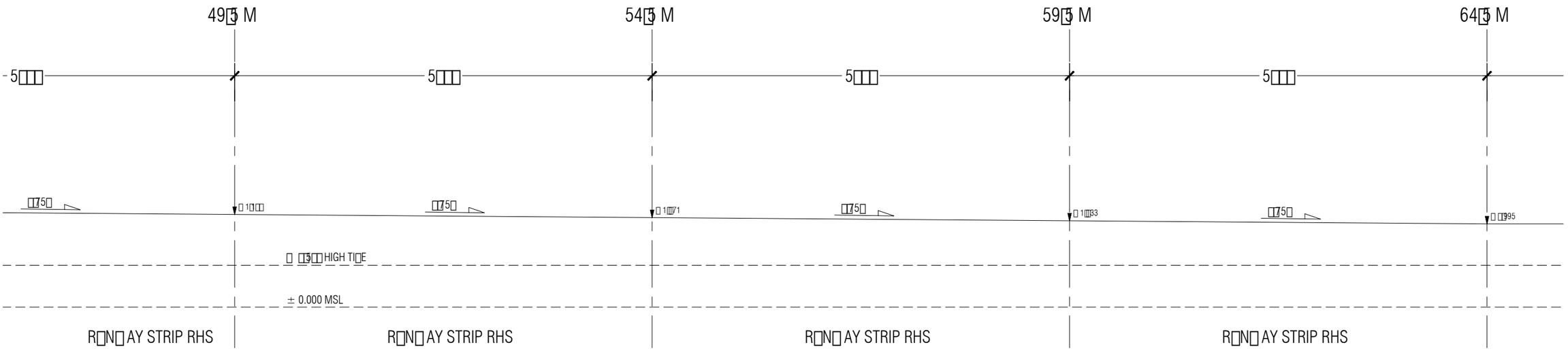

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SCALE [illegible]1[illegible]5[illegible]

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N[illegible]

R[illegible]		
N[illegible]	[illegible]	[illegible]
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R[illegible]A1	ISS[illegible]E[illegible] [illegible]DR REVIE[illegible]	24[illegible]4[illegible]2[illegible]1[illegible]

N[illegible]MAA[illegible]AR[illegible] AIRPORT
GENERAL CROSS SECTIONS

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REGIONAL AIRPORTS
MINISTRY O[illegible]TO[illegible]RISM

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ARMSTRONG

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S[illegible]	1[illegible]5[illegible]	P[illegible] A3
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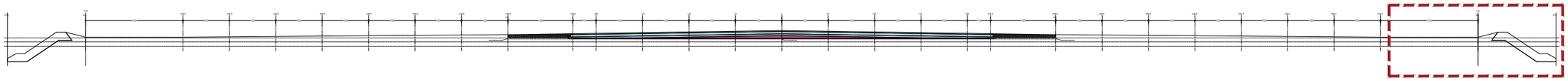

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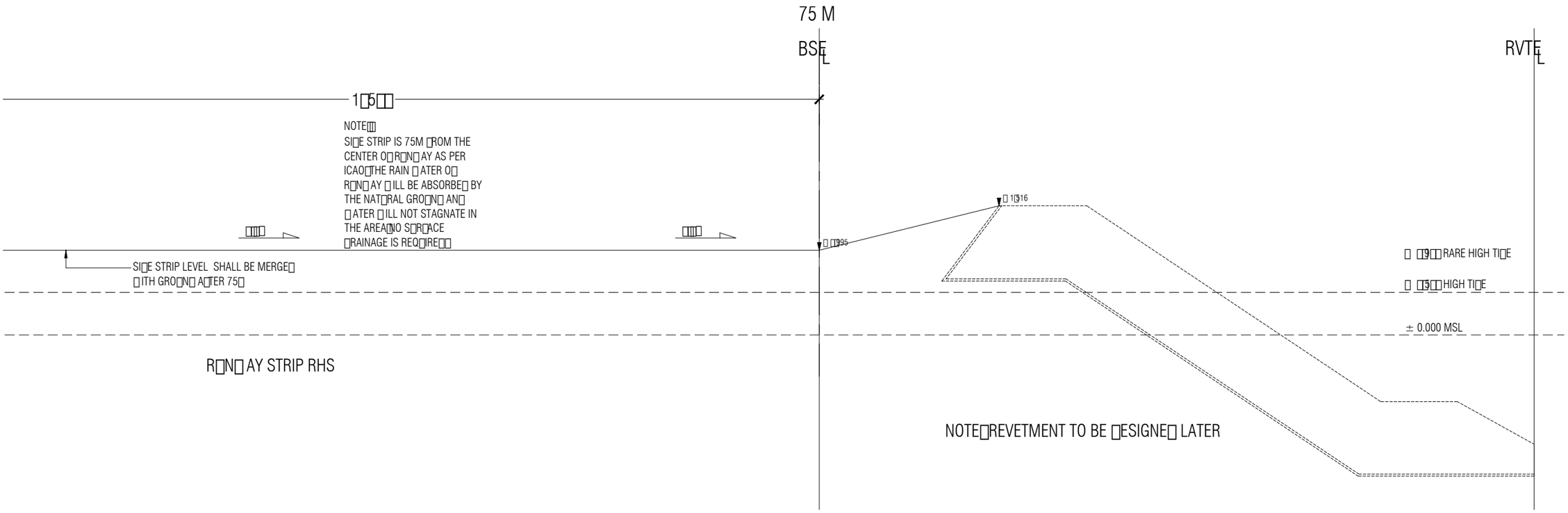

TYPICAL CROSS SECTION: 9.0 RUNWAY & STRIP (CH 7.00 - 22.00) RHS & LHS, CH (0.00 - 7.0) LHS

SCALE 1:50

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NOTES

REVISIONS		
NO.	DESCRIPTION	DATE
REV A	ISSUED FOR REVIEW	24-03-2021
REV A1	ISSUED FOR REVIEW	24-03-2021

NUMAA'AR AIRPORT
GENERAL CROSS SECTIONS

DRAWING TITLE
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EMIRATE
REGIONAL AIRPORTS
MINISTRY OF TOURISM

FUNDING
صندوق أبوظبي للتنمية
ABU DHABI FUND FOR DEVELOPMENT

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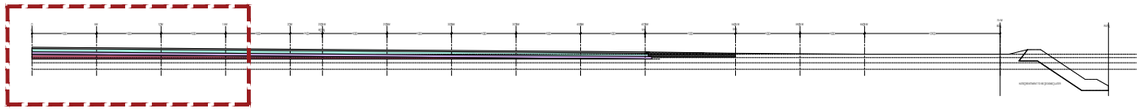
SUPERVISION MANAGEMENT CONSULTANT
ARMSTRONG

ISSUE DATE	APR 2021	PAGE 2
SCALE	1:50	PAPER A3

DWG NO T1713-OS-953-CV-000-9



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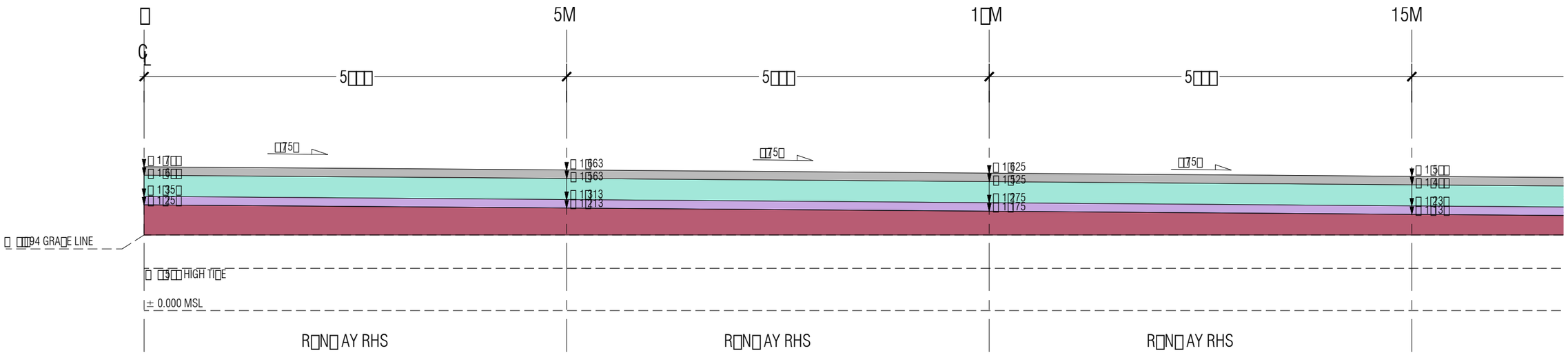

NOTES:
1. ALLING SHOULD BE DONE UPTO 10.194 MSL ALL ALONG THE RUNWAY
2. ALLING IN SHOULDER AREA UPTO 10.939 MSL ALL ALONG THE SHOULDER IN GIVEN CHAINAGE.
3. COMPACTING IN THE SHOULDER AREA FROM 10.939 MSL UPTO TOP LVL OF THE SHOULDER.
4. SUBBASE FOR RUNWAY PAVEMENT STARTS FROM 10.194 MSL TO 11.225 MSL

1		40MM THICKNESS ASPHALT CONCRETE (TOP LAYER) 60MM THICKNESS SEMI DENSE ASPHALT CONCRETE (LOWER LAYER)
2		250MM THICKNESS COMPACTED AGGREGATE BASE COURSE (2 LAYERS) CBR 80
3		100MM THICKNESS COMPACTED SUB BASE MATERIAL (GRADED SAND) CBR 30
4		COMPACTED SUB GRADE CBR 15

NO	LAYERS	EDGE PROTECTION
1	BEARING COURSE	MINIMUM 100MM SHALL BE PROVIDED TO BOTH SIDES OF 60MM THICKNESS SEMI DENSE ASPHALT CONCRETE (LOWER LAYER)
2	BASE COURSE	MINIMUM 300MM SHALL BE PROVIDED TO BOTH SIDES
3	SUB BASE	MINIMUM 500MM SHALL BE PROVIDED TO BOTH SIDES

TYPICAL CROSS SECTION 01 0 RUNWAY, TURNING PAD 6 END 0 STRIP WIDTH 00 70 RHS

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NO	DESCRIPTION	DATE
REV A0	ISSUED FOR REVIEW	20 MAR 2010
REV A1	ISSUED FOR REVIEW	24 MAR 2010

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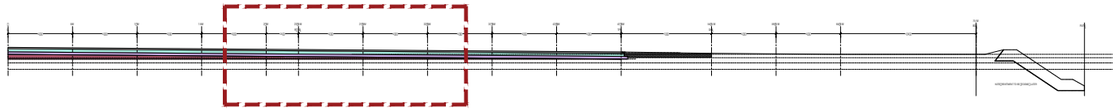

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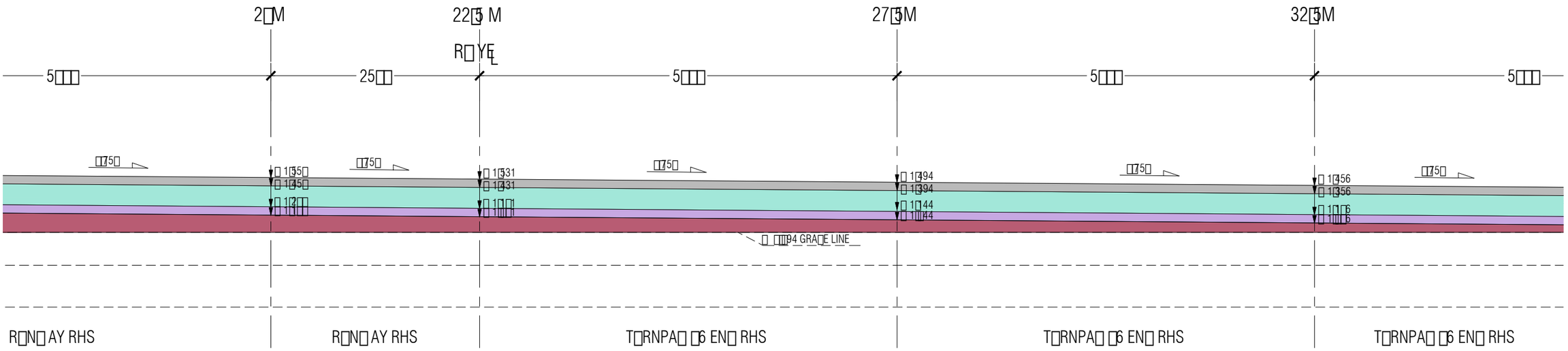

NOTE 1 LLING SHOLD BE DONE UPTO 94 MSL ALL ALONG THE RNWAY
2 LLING IN SHOLDER AREA UPTO 939 MSL ALL ALONG THE SHOLDER IN GIVEN CHAINAGE
3 COMPACTING IN THE SHOLDER AREA FROM 939 MSL UPTO TOP LVL OF THE SHOLDER
4 SUBBASE FOR RNWAY PAVEMENT STARTS FROM 94 MSL TO 1125 MSL

1		4 MM THICKNESS ASPHALT CONCRETE TOP LAYER 6 MM THICKSEMI DENSE ASPHALT CONCRETE LOWER LAYER
2		25 MM THICKCOMPACTED AGGREGATE BASE COURSE 2 LAYERS CBR
3		1 MM THICKCOMPACTED SUB BASE MATERAL GRADE SAND CBR 3
4		COMPACTED SUB GRADE CBR 15

NO	LAYERS	EDGE PROTECTION
1	BEARING COURSE	MINIMUM 1 MM SHALL BE PROVIDED TO BOTH SIDES OF 6 MM THICKSEMI DENSE ASPHALT CONCRETE LOWER LAYER
2	BASE COURSE	MINIMUM 3 MM SHALL BE PROVIDED TO BOTH SIDES
3	SUB BASE	MINIMUM 5 MM SHALL BE PROVIDED TO BOTH SIDES

TYPICAL CROSS SECTION 2 0 RNWAY, TURNING PAK 6 EN STRIP CH 7 RHS

SCALE 15

NOTES

PROJECT

NO	DESCRIPTION	DATE
R A	ISSUED FOR REVIEW	2 APR 2
R A1	ISSUED FOR REVIEW	24 APR 2

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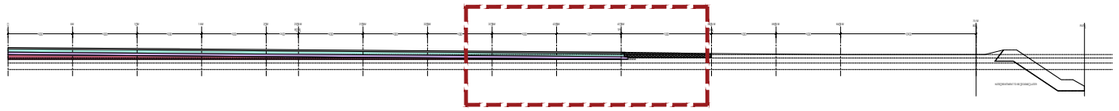

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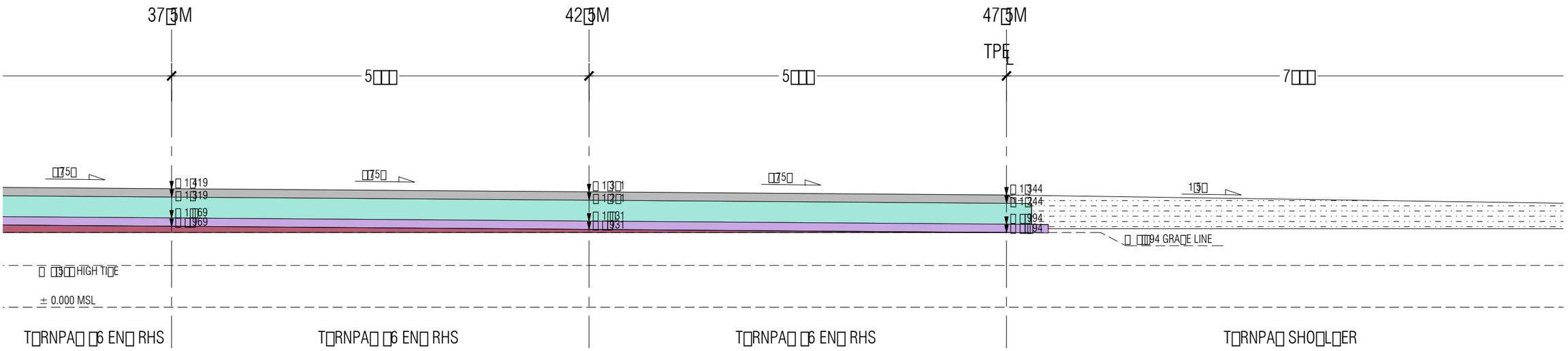

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2. ILLING IN SHOULDER AREA UPTO 939 MSL ALL ALONG THE SHOULDER IN GIVEN CHAINAGES
3. COMPACTING IN THE SHOULDER AREA FROM 939 MSL UPTO TOP LVL OF THE SHOULDER
4. SUBBASE FOR RUNWAY PAVEMENT STARTS FROM 94 MSL TO 1.25 MSL

1		40MM THICKNESS ASPHALT CONCRETE (TOP LAYER) 60MM THICKNESS SEMI-DENSE ASPHALT CONCRETE (LOWER LAYER)
2		250MM THICKNESS COMPACTED AGGREGATE BASE COURSE (2 LAYERS) CBR 80
3		100MM THICKNESS COMPACTED SUB BASE MATERIAL (GRADED SAND) CBR 30
4		COMPACTED SUB GRADE CBR 15

NO	LAYERS	EDGE PROTECTION
1	BEARING COURSE	MINIMUM 100MM SHALL BE PROVIDED TO BOTH SIDES OF 60MM THICKNESS SEMI-DENSE ASPHALT CONCRETE (LOWER LAYER)
2	BASE COURSE	MINIMUM 300MM SHALL BE PROVIDED TO BOTH SIDES
3	SUB BASE	MINIMUM 500MM SHALL BE PROVIDED TO BOTH SIDES

TYPICAL CROSS SECTION 3 OUTER RUNWAY, TURNING PAD 6 END STRIP 3 CH 00 7 RHS

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NO	DESCRIPTION	DATE
REV A	ISSUED FOR REVIEW	20 APR 2011
REV A1	ISSUED FOR REVIEW	24 APR 2011

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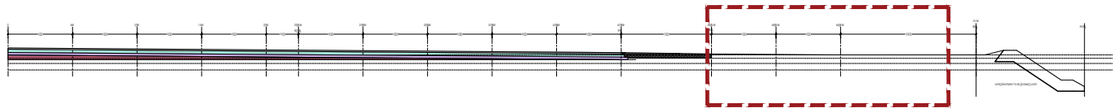

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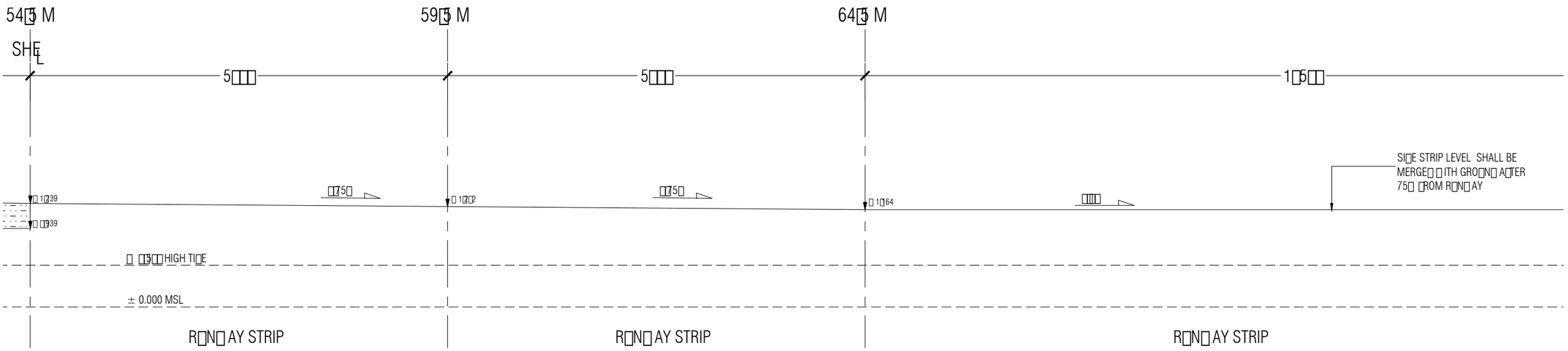

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REV A1	ISSUED FOR REVIEW	24[illegible]4[illegible]2[illegible]

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GENERAL CROSS SECTIONS

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ISSUE DATE	APR 2[illegible]	PAGE 2[illegible]
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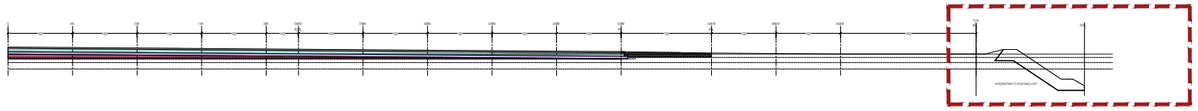

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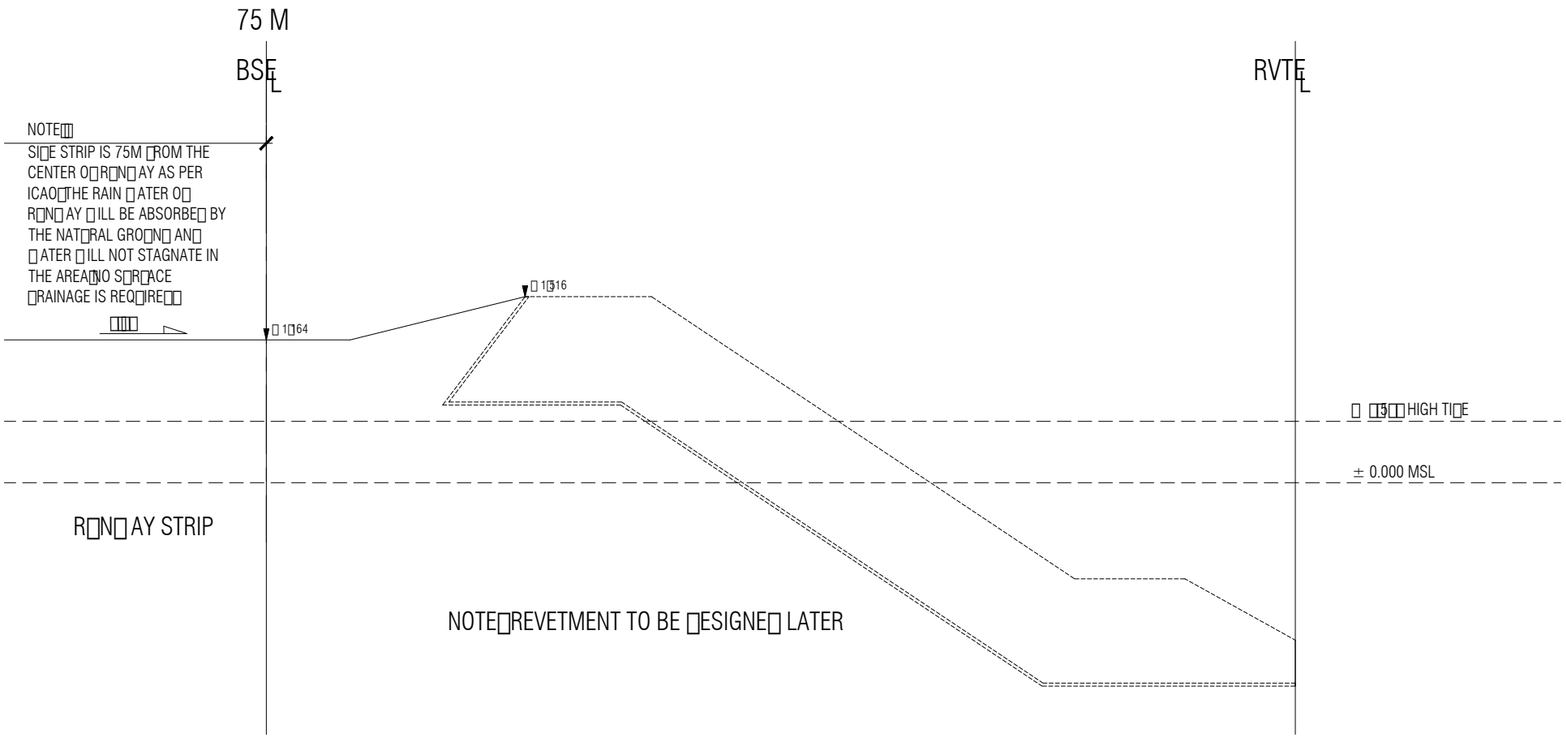

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NO.	DESCRIPTION	DATE
REV A	ISSUED FOR REVIEW	20-04-2011
REV A1	ISSUED FOR REVIEW	24-04-2011

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SECTION IX - SUPPLEMENTARY INFORMATION
MAAFARU AIP, EIA REPORT & EPA PERMIT

AD 2 AERODROMES

VRDA AD 2.1 AERODROME LOCATION INDICATOR AND NAME

VRDA - MAAFARU INTERNATIONAL AIRPORT

VRDA 2.2 AERODROME GEOGRAPHICAL AND ADMINISTRATIVE DATA

1	*ARP coordinates and site at AD*	054907N 0732811E Centre of runway
2	*Direction and distance from City*	200M from airport main entrance to the city
3	*Elevation / Reference temperature*	1.7M (5.5FT) / 31.4°C
4	*MAG VAR/Annual change*	3° W (2018) / Nil
5	*AD Operator* *Address* *Telephone* *E- mail Address* Website:	Island Aviation Services Limited Corporate Head Office Ground Floor, Dar Al-Eiman Building Majeedhee Magu Male', 20345 Republic of Maldives Tel: (960) 333 5566 Telefax: (960) 331 4806 Email: info@iasl.aero Website: www.maldivian.aero
6	*Types of traffic permitted (IFR/VFR)*	IFR/VFR
7	*Remarks*	Nil

VRDA 2.3 OPERATIONAL HOURS

1	*AD Administration*	H24
2	*Customs and Immigration*	HO
3	*Health and sanitation*	Nil
4	*AIS Briefing office*	Nil
5	*ATS Reporting Office (ARO)*	Nil
6	*Met Briefing Office*	Nil
7	*ATS*	H24
8	*Fuelling*	Nil
9	*Handling*	H24
10	*Security*	H24
11	*De-Icing*	Not applicable
12	*Remarks*	ATS - Flight Information Service available

VRDA 2.4 HANDLING SERVICES AND FACILITIES

1	*Cargo handling facilities*	Yes
2	*Fuel/oil types*	Nil
3	*Fuelling facilities/capacity*	Nil
4	*De-icing facilities*	Not applicable
5	*Hanger space available for visiting aircraft*	Yes
6	*Repair facilities for visiting aircraft*	Nil
7	*Remarks*	Nil

VRDA 2.5 PASSENGER FACILITIES

1	*Hotels*	In Maafaru Island
2	*Restaurants*	In Maafaru Island
3	*Transportation*	N/A
4	*Medical facilities*	Maafaru health center 400m away from the airport and limited first aid facility available at Maafaru Int'l Airport
5	*Bank/post*	Nil
6	*Tourist Office*	Nil
7	*Remarks*	Nil

VRDA 2.6 RESCUE AND FIRE- FIGHTING SERVICES

1	*AD category for fire fighting*	CAT 7
2	*Rescue equipment*	Adequately provided as recommended by ICAO
3	*Capabilities for removal of disabled aircraft*	Equipped to remove light to medium aircraft
4	*Remarks*	Nil

VRDA 2.7 SEASONAL AVAILABILITY – CLEARING

1	*Types of clearing equipment*	Nil
2	*Clearance priorities*	Nil
3	*Remarks*	Aerodrome available throughout the year

VRDA 2.8 APRONS, TAXIWAYS AND CHECK LOCATIONS DATA

1	*Apron surface and strength*	Surface: Concrete Strength: PCN 48/R/B/W/T
2	*Taxiway width, surface and strength*	Width: 18M Surface: Asphalt - Concrete Strength: PCN 42/F/B/W/T
3	*Altimeter Checkpoint Location and Elevation*	Location: Center of Apron Elevation: 1.7M (5.5FT)
4	*VOR/INS checkpoint*	VOR: Nil INS: Nil
5	*Remarks*	Nil

VRDA 2.9 SURFACE MOVEMENT GUIDANCE AND CONTROL SYSTEM AND MARKINGS

1	*Use of aircraft stand ID signs, TWY guide lines and visual docking/parking guidance system of aircraft stands*	N/A
2	*RWY/TWY markings and LGT*	RWY: Designations, THR, TDZ, Aiming point and centerline markings Edge lights, THR and End lights TWY: Centerline, holding positions marking and TWY edge lights
3	*Stop bars*	Nil
4	*Remarks*	Nil

VRDA 2.10 AERODROME OBSTACLES

In approach/TKOF areas			*In circling area and at AD*		*Remarks*
1			*2*		*3*
RWY/Area affected	*Obstacle type elevation markings/LGT*	*Coordinates*	*Obstacle type elevation markings/LGT*	*Coordinates*	
a	*b*	*c*	*a*	*b*	*c*
			Windsock 4M	054923.5N 0732830.6E	
			Apron Mast 1 14M	054930.4N 0732834.1E	
			Apron Mast 2 14M	054931.0N 0732835.0E	
			Apron Mast 3 14M	054931.8N 0732836.2E	
			Apron Mast 4 14M	054932.5N 0732837.2E	
			Lightening Arrester 15M	054927.2N 0732830.0E	
			Control Tower 13M	054926.8N 0732829.7E	
			Hangar 16M	054929.9N 0732833.4E	
			Ooredoo Tower (Island) 30M	054941.8N 0732847.5E	
			Dhiraagu Tower (Island) 45M	054953.8N 0732850.2E	

VRDA 2.11 METEOROLOGICAL INFORMATION PROVIDED

1	*Associated MET Office*	Nil
2	*Hours of Service* *MET Office outside hours*	Nil
3	*Office responsible for TAF preparation* *Periods of validity*	Nil
4	*Type of landing forecast* *Interval of issuance*	Nil
5	*Briefing / consultation provided*	Consultation with Maldives Meteorological Services Centre at VIA
6	*Flight documentation* *Language(s) used*	English
7	*Charts and other INFO AVBL*	Yes
8	*Supplementary EQPT AVBL for INFO for briefing or consultation*	Nil
9	*ATS Units Provided with information*	Yes. Wind & QNH
10	*Additional Information*	Nil

VRDA 2.12 RUNWAY PHYSICAL CHARACTERISTICS

Designation RWY NR	***True BRG***	***Dimensions of RWY (M)***	***Strength (PCN) And surface of RWY and SWY***	***THR coordinates***	***THR elevation and highest elevation of TDZ of precision APP RWY***
1	**2**	**3**	**4**	**5**	**6**
06	055.68°	2200 x 45	PCN 42/F/B/W/T Asphalt - Concrete	054846.72N 0732741.49E	THR 1.7M / 5.5FT
24	235.68°	2200 x 45		054927.01N 0732840.42E	THR 1.7M / 5.5FT

Slope	***SWY***	***CWY***	***Strip***	***RESA***	***Location and***	***OFZ***	***Remarks***

of RWY-SWY	Dimensions (M)	Dimensions (M)	Dimensions (M)	Dimensions (M)	description of ARST system		
7	**8**	**9**	**10**	**11**	**12**	**13**	**14**
0%	-	300 x 150	2320 x 140	90 X 60	Nil	Nil	Nil
0%	-	300 x 150	2320 x 140	90 X 60	Nil	Nil	Nil

VRDA 2.13 DECLARED DISTANCES

RWY	TORA(M)	TODA(M)	ASDA(M)	LDA(M)	Remarks
1	**2**	**3**	**4**	**5**	**6**
06	2200	2500	2200	2200	Nil
24	2200	2500	2200	2200	Nil

VRDA 2.14 APPROACH AND RUNWAY LIGHTING

RWY Designator	APP LGT type LEN INTST	THR LGT color WBAR	VASIS (MEHT) PAPI	TDZ LGT LEN	RWY center line LGT Length spacing color INTST	RWY edge LGT LEN spacing color INTST	RWY End LGT Color WBAR	SWY LGT LEN (M) color	Remark
1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
06	-	Green	APAPI Left/3deg 50FT	Nil	Nil	2200M 60M White IH	Red	Nil	Nil
24	-	Green	APAPI Left/3deg 50FT	Nil	Nil	2200M 60M White IH At	Red	Nil	Nil

VRDA 2.15 OTHER LIGHTING, SECONDARY POWER SUPPLY

1	*ABN/IBN location characteristics and hours of operation*	ABN – on top of the tower Alternate W & G EV minute
2	*LDI location and LGT Anemometer location and LGT*	Nil
3	*TWY edge and centre line lighting*	TWY edge lights / TWY A & B
4	*Secondary power supply /switch-overtime*	Back up generator of 80KW / 10-15 seconds
5	*Remarks*	Nil

VRDA 2.16 HELICOPTER LANDING AREA

Nil

VRDA 2.17 ATS AIRSPACE

1	*Designation and lateral limits*	Maafaru AFIS Area A circle, radius of 10NM centered at 054906.86N 0732810.95E (ARP)
2	*Vertical limits*	SFC to 3500FT MSL
3	*Airspace classification*	G
4	*ATS Unit* *Language(s)*	Maafaru Tower English
5	*Transition Altitude*	11000FT
6	*Remarks*	Nil

VRDA 2.18 ATS COMMUNICATION FACILITIES

Services Designation	*Call sign*	*Channel (s)*	*Hours of operation*	*Remarks*
1	*2*	*3*	*4*	*5*
Maafaru AFIS	Maafaru Information	118.6 MHz	HO	Separate frequency available to communicate from tower to ground

VRDA 2.19 RADIO NAVIGATION AND LANDING AIDS

Nil

VRDA 2.20 LOCAL TRAFFIC REGULATIONS

Nil

VRDA 2.21 NOISE ABATEMENT PROCEDURE

Nil

VRDA 2.22 FLIGHT PROCEDURES

Aerodrome Flight Information Services (AFIS) at Maafaru

1. General

ATS provided at Maafaru include only Flight Information Service and Alerting Service. AFIS is available during operational hours and will provide information useful for the safe and efficient conduct of flights within Maafaru AFIS Area. The pilot in command is responsible to maintain proper separation in conformity with the rules of the air.

2. Arrivals

2.1 Aircraft inbound to land at Maafaru should contact the Maafaru AFIS (Maafaru Information) on 118.6 MHz at least 15 NM prior to landing.

2.2 As soon as the aircraft has established communication with Maafaru Information, the following elements of information will be transmitted to the aircraft:

a) Runway-in-use;

b) Surface wind direction and speed, including significant variations;

c) Visibility;

d) Present weather;

e) QNH*; and

f) Any available information on significant meteorological phenomena in the approach area.

*(Note: *If QNH is not available, Tower will not issue altimeter setting information.)*

2.3 Descend to land at Maafaru Airport

2.3.1 During daylight hours:

a) Subject to clearance from Male' ATC, descend to 7000 feet.
b) Descent below 7000 feet shall be in VMC on pilot's discretion.

(*Note: cancel IFR and change to VFR before leaving 7000 feet.)*

c) From 7000 feet until within Maafaru AFIS Area, pilot shall monitor and transmit position information on advisory frequency (128.8 MHz) as specified in Maldives AIP ENR 1.2, paragraph 12, Traffic Information Broadcast by (VFR) Aircraft, while operating VFR.
d) On VFR, aircraft may descend to 1500 feet, join standard left-hand pattern and proceed to land.
e) On pilot's discretion, pilot may fly a published instrument approach procedure after informing the AFIS.

2.3.2 During night hours:

a) Subject to clearance from Male' ATC, descend to the initial approach altitude and execute a published instrument approach procedure to land; or

b) Subject to clearance from Male' ATC, descend to 1500 feet, and once aerodrome is in sight, execute visual approach to land.

3. Departures

Pilots shall contact Maafaru AFIS (Maafaru Information) on 118.6 MHz for ATC route clearance.

(Note: The officer at Tower will coordinate with Male' for ATC route clearance.)

As soon as the aircraft has established communication with the Maafaru Information, the following elements of information will be transmitted to the aircraft:

a) Runway-in-use;

b) Surface wind direction and speed, including significant variations;

c) QNH*;

d) Temperature and dew point; and

e) Any available information on significant meteorological phenomena in the takeoff area.

*(Note: *If QNH is not available, Tower will not issue altimeter setting information).*

During day light hours, aircraft shall be on VFR from departure until passing 6000 feet. Pilots shall monitor and transmit position information on advisory frequency as specified in Maldives AIP ENR1.2, paragraph 12, Traffic Information Broadcast by (VFR) Aircraft, while on VFR.

4. Seaplanes operating within Maafaru AFIS Area

Pilot shall contact and maintain communication with Maafaru AFIS (Maafaru Information) on 118.6 MHz, and provide position information as required.

The pilot in command is responsible to maintain proper separation and shall lookout for aircraft landing and taking off at Maafaru airport.

If AFIS is closed, pilot shall monitor and transit position information on 118.6 MHz.

VRDA 2.23 ADDITIONAL INFORMATION

Nil

VRDA 2.24 CHARTS RELATED TO MAAFARU INTERNATIONAL AERODROME

Chart Title	Page
Aerodrome Chart	VRDA AD 2-7
Aerodrome Lighting	VRDA AD 2-9
Aerodrome Marking	VRDA AD 2-11
Instrument Approach Chart – ICAO, RNP RWY 06	VRDA AD 2-13
Instrument Approach Chart – ICAO, RNP RWY 24	VRDA AD 2-15

AERODROME CHART

RWY	DIRECTION (TRUE)	THRESHOLD	BEARING STRENGTH
06	56°	05° 48' 46.72 ' N 73° 27' 41.49" E	RWY 06/24 PCN 42/F/B/W/T TWY A,B PCN 42/F/B/W/T APRON PCN 48/R/B/W/T
24	236°	05° 49' 27.01" N 73° 28' 40.42" E	

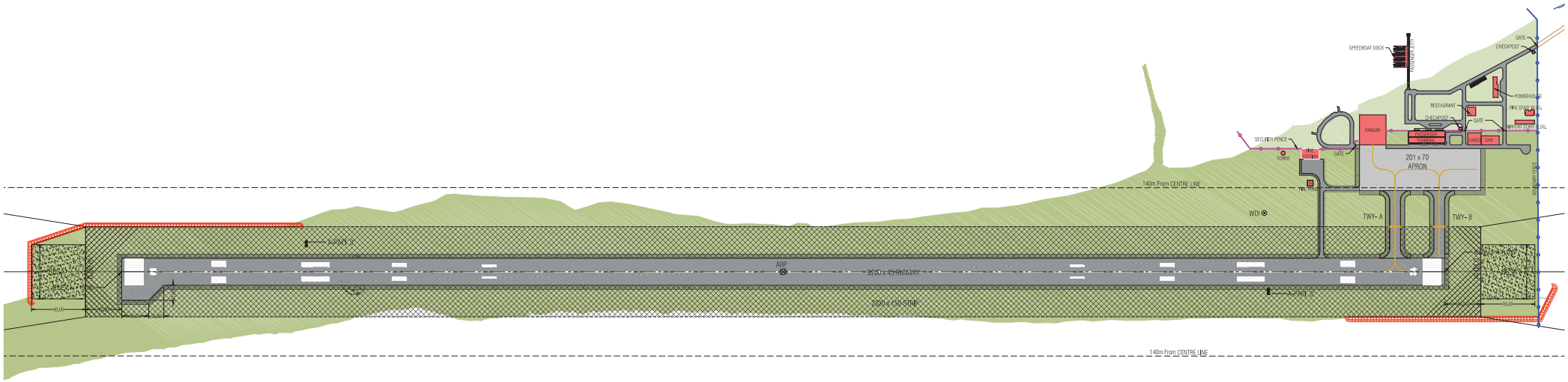
AERODROME REFERENCE POINT: 05° 49' 06.86" N
73° 28' 10.95" E

VAR 3° W
(2018)

N

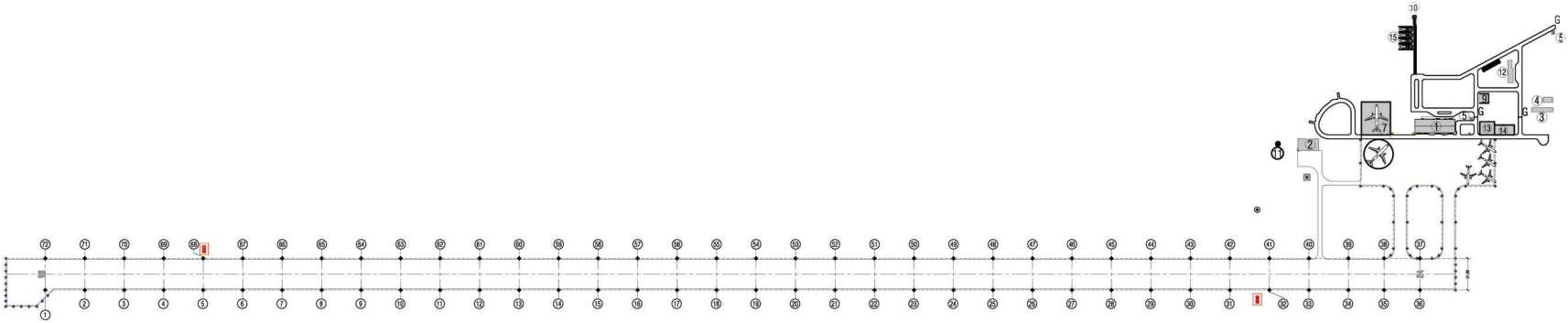
AIRPORT AIRSIDE BOUNDARY

AIRPORT LANDSIDE BOUNDARY



BUILDING LEGEND

#	NAME
1	PASSENGER TERMINAL
2	FIRE STATION
3	AIRPORT STAFF ACCOMMODATION
4	FIRE STAFF ACCOMMODATION
5	SECURITY CHECKPOST
7	HANGAR
9	PUBLIC RESTAURANT
10	PASSENGER JETTY
11	ATC
12	POWER HOUSE WITH RO PLANT ROOM
13	CARGO WAREHOUSE
14	GROUND HANDLING BASE
15	SPEED BOAT DOCKING PLATFORM
G	GATE
W	FIRE POND



NOTE:
ALL LIGHTS ARE INSTALLED IN SHOULDER, 3M FROM PAVEMENT EDGE.

RUNWAYEDGE LIGHTS IN 06 END, GRID 01 – 13 & GRID 60 – 72 IS ILLUMINATED IN YELLOW COLOR
RUNWAY EDGE LIGHTS IN 24 END, GRID 27 – 36 & GRID 37 – 46 IS ILLUMINATED IN YELLOW COLOR

AIRFIELD LIGHTING LAYOUT

Scale 1:7000

0 50m 100m 150m 200m 250m

SYMBOL	DESCRIPTION	LOCATION	QTY
	EDGE LIGHTS	RUNWAY EDGE	73
	EDGE LIGHTS	TAXIWAY, APRON & TURNING PAD EDGE	40
	END LIGHTS	RUNWAY END	12
	INSET LIGHTS	RUNWAY (GRID-1)	01
	FLOOD LIGHTS/ MAST	APRON LANDSIDE EDGE	04
	APAPI	300M FROM RUNWAY PHYSICAL ENDS	02
	WIND CONE / WDI	AS SHOWN	01

RUNWAY:

RUNWAY CENTERLINE MARKING:	WHITE
TOUCHDOWN/ TOUCHDOWN ZONE MARKING:	WHITE
RUNWAY DESIGNATOR MARKING:	WHITE
THRESHOLD MARKINGS:	WHITE
TURNING PAD MARKING:	YELLOW

TAXIWAY:

TAXIWAY CENTERLINE MARKING:	YELLOW
RUNWAY HOLDING POSITION MARKING:	YELLOW

APRON:

APRON CENTERLINE MARKING:	YELLOW
APRON/ROAD EDGE LINES MARKING:	RED LINE & WHITE LINE

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AIRFIELD MARKING LAYOUT

Scale 1:7000

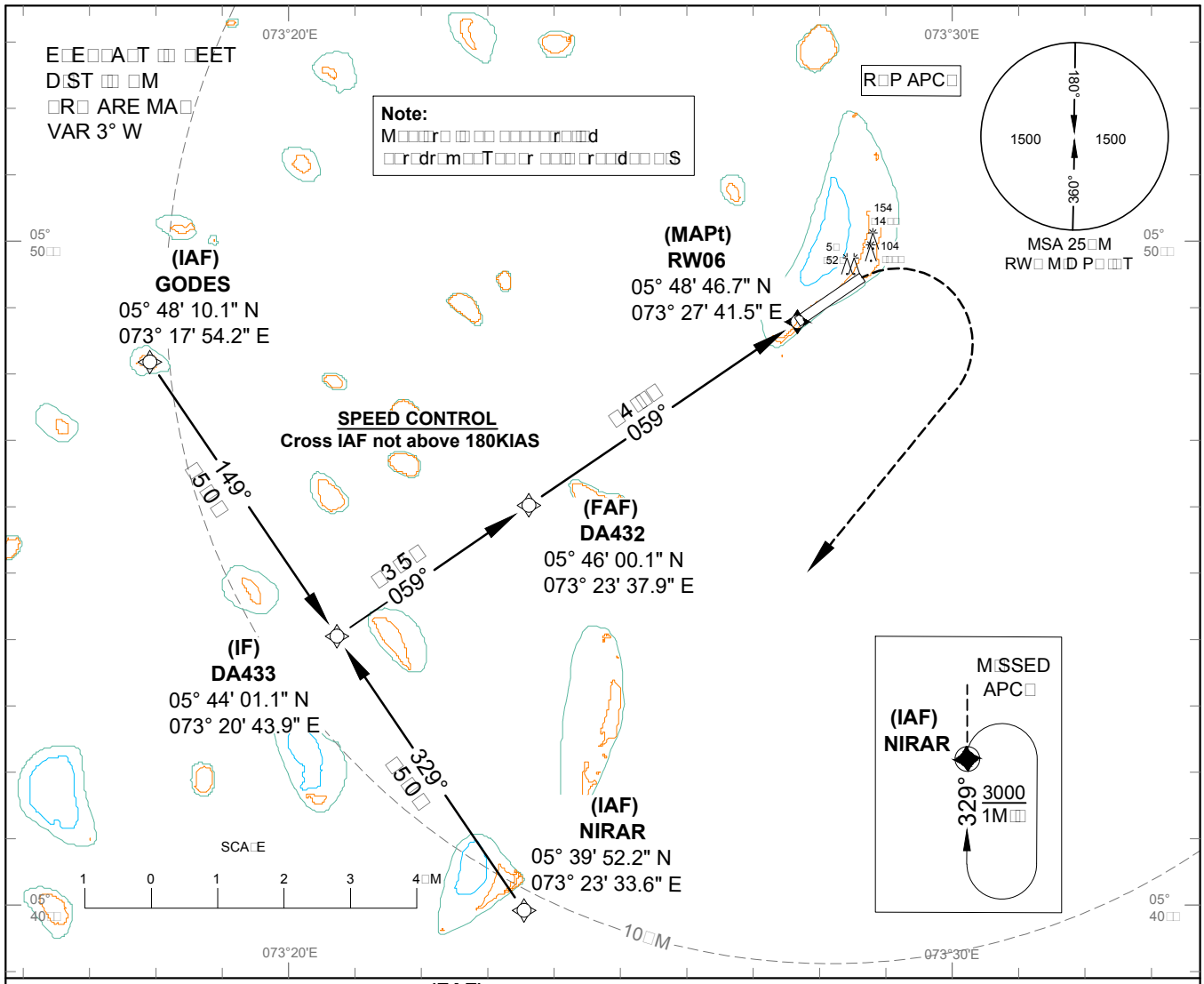
0 50m 100m 150m 200m 250m

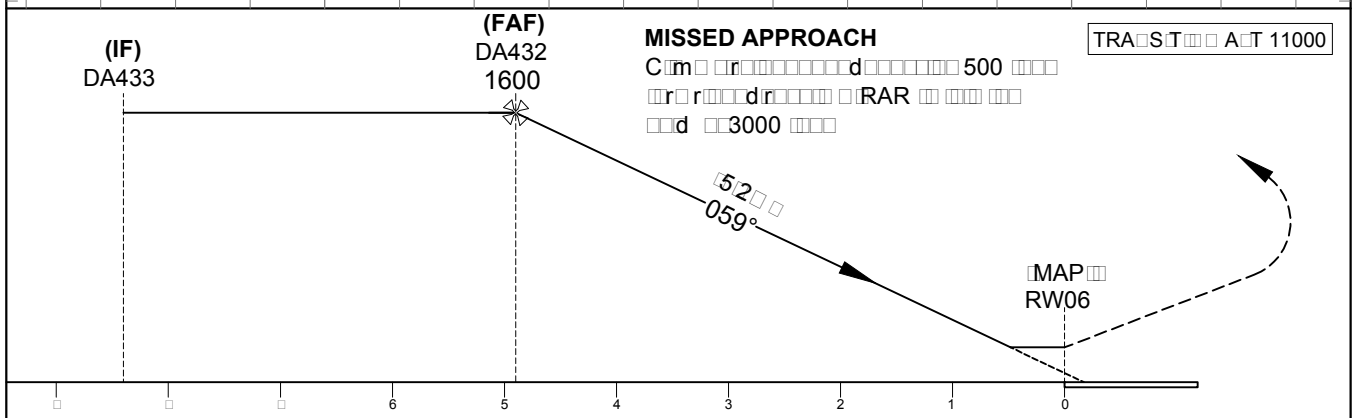
INSTRUMENT APPROACH CHART - ICAO

AER DR ME E E 6 T
E T RE ATED T
T R RW 06 - E E 6 T

TWR 11 6

MAAFARU Intl (VRDA)
R P RW 06





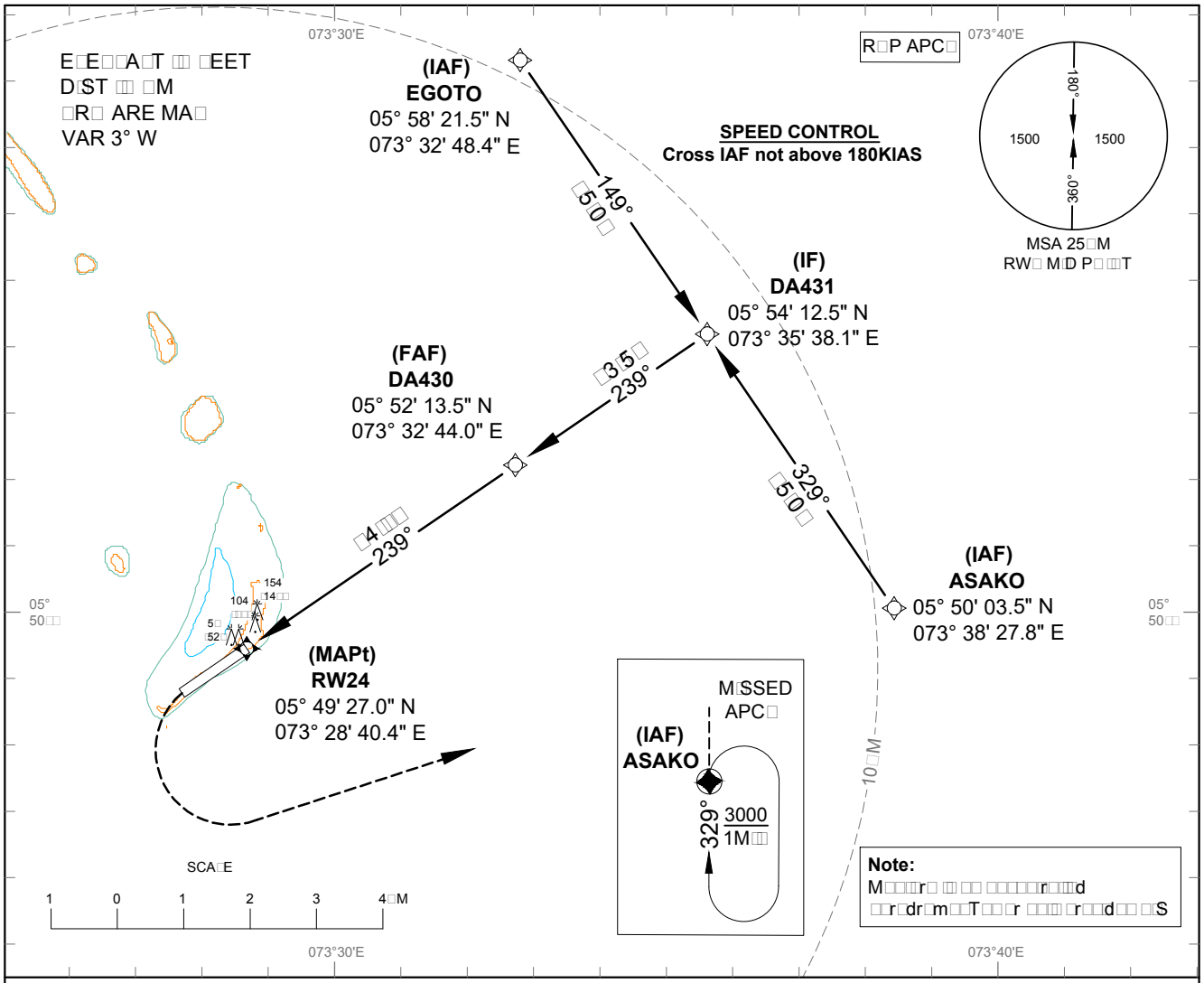
AIRCRAFT CATEGORY	A		C
LNAV MDA (MDH)	310 304		
DISTANCE TO THRESHOLD	4	3	2	1
ALTITUDE (HEIGHT)	1320 1314	1000 4	6 0 6 4	MDA

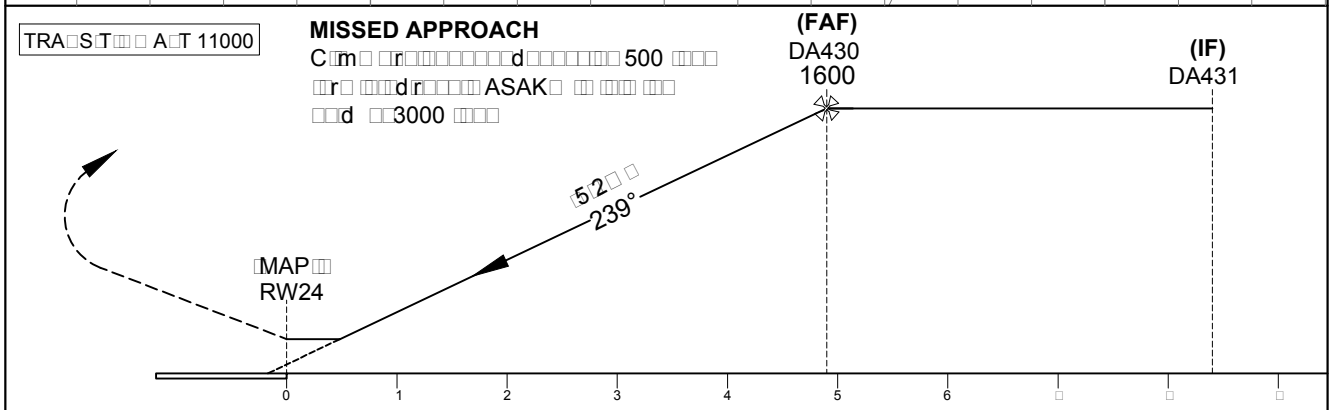
INSTRUMENT APPROACH CHART - ICAO

AER DR ME E E 6 T
E T RE ATED T
T R RW 24 - E E 6 T

TWR 11 6

MAAFARU Intl (VRDA)
R P RW 24





AIRCRAFT CATEGORY	A			C
LNAV MDA (MDH)	400 3 4			
DISTANCE TO THRESHOLD	4	3	2	1
ALTITUDE (HEIGHT)	1320 1314	1000 4	6 0 6 4	MDA

MA D ES A RP RTS C MPA TD
REP C MA D ES