section v - Scope of the Works

**Table of Contents**

[1. AIRFIELD PAVEMENT DESIGN 3](#_Toc93476046)

[2. AERODROME REFERENCE CODE 3](#_Toc93476048)

[3. BASIC AERODROME PHYSICAL REQUIREMENTS 4](#_Toc93476050)

[4. PAVEMENT STRUCTURE 4](#_Toc93476051)

[5. ASSUMED ELEVATION 5](#_Toc93476052)

[6. DREDGINg, RECLAMATION AND REVETMENT 5](#_Toc93476053)

[7. RUNWAY END SAFETY AREA (RESA) 6](#_Toc93476054)

[8. UPDATED AIRFIELD LIGHTING 6](#_Toc93476055)

[9. UPGRADE OF EMERGENCY GENERATOR 10](#_Toc93476056)

[10. REQUIRED SIGN UPGRADES 11](#_Toc93476057)

[11. REQUIRED AIRFIELD MARKING 11](#_Toc93476058)

[12. REMOVAL OF TREES AND VEGETATION 11](#_Toc93476059)

[13. INSTALLATION OF AIRSIDE BOUNDARY FENCE 12](#_Toc93476060)

# AIRFIELD PAVEMENT DESIGN

# 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.

# AERODROME REFERENCE CODE

# 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>

# 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% |

# 

# 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.

# ASSUMED ELEVATION

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

# 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.

1. Dredging and Reclamation
2. Revetment
   1. 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.
   2. Geobags shall be made of durable synthetic materials such that they conform to the design life stipulated above.
   3. 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.
   4. The EPA permit will be provided.
   5. 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.

# 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.

# 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.

1. Procurement and Installation of High Intensity Bidirectional elevated Runway Edge lights for one halogen lamp – 150W, 6.6A (appx. 20 lights, contractor to verify).
2. 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.

1. 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).
2. 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).
3. 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).
4. 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).

1. Dismantling of the already installed APAPI System (2 sets) each side of the runway.
2. Procurement of PAPI calibration tool box.
3. Relocation, readjustment and addition of Taxiway edge lights as ICAO requirements.
4. Procurement and installation of High Intensity Bi-directional Inset Runway Edge light for two lamps 105W, 6.6A, 12 Inch for Left Side Amber.
5. 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).
6. 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.

1. Procurement of Constant Current Regulator 20KVA for Individual Taxiway Lighting System and LED signage. (Contractor to verify the size of CCR).
2. 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)
3. 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).

1. Modification and extension of the CCR Room inside the Fire Station and installation of an additional Air Conditioning (24,000BTU) unit.
2. Contractor shall include spares for all the above.
3. 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.

1. For the current status of existing low voltage distribution system Please refer to the drawing provided "Maafaru Airport As Built SLD"
   1. From LV Cabinet Power house, 2 runs of 95 sqmm cable are connected to the CCR Room Power cabinet 250 Amp MCB.
   2. Standby 80KVA DG SET, Engine brand Cummins 6BT5.9-G2, Stamford UCI224G, Smartgen HGM6120. Country of origin China.
2. 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:
   1. 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.
   2. 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.
   3. Upgraded AFL system must be designed so as to enable its operations for non- Cat or CAT I conditions as required by the operators.
3. The existing airport facilities do not include the ILS, VOR, DME and other equipment?
4. 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.
5. There are 6 no. runway end lights at each end of the runway.
6. There are no existing centreline lights and Center line lights are not required for extension.
7. The navigation system is not in this scope of works.
8. The product model of equipment and software version for the existing control system of navigation lights is as follows:
   1. Reliance Compact (ADB SAFEGATE), Profibus <10 CCR.
   2. CAT 6 Ethernet connection between CCR Room and the Tower Control Room.
   3. There is one PLC’s of family S7-300 in CCR Room.
   4. 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

* 1. 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.
  1. 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.

1. The existing lights at the 06 end, apron and taxiways may be reused, provided that there is no damage.
2. The level of needed navigation and air navigation aids after the extension works is CAT-I.
3. There are no existing approach and wingbar lights available. Approach lights on 24-06 ends are entirely new circuits.
4. Existing threshold and runway end lights are connected to the runway edge circuit.
5. 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.

# 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.

# 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:

1. Sign board (Taxi B) will be replaced in case taxi B will be relocated.
2. Sign board (24 A) to be added.
3. Sign board (A 24) to be added.
4. Sign Board (24 - 06 B) to be added.
5. Sign Board (B 24 - 06) to be added.
6. Sign Board (Apron) to be added.
7. Sign Board (Stop) to be added.
8. Sign Board (06→) to be added.
9. Sign Board (←Apron A) to be added.
10. Sign Board (↑Apron B A→) to be added.
11. Sign Board (←24 - 06) to be added.

# REQUIRED AIRFIELD MARKING

1. Runway Centre Marking
2. Runway Edge Marking
3. Touchdown Zone Marking
4. Turning Pad Curve Marking
5. Taxiway Centre Line Marking
6. Taxiway Curve Marking
7. Taxiway Edge Marking
8. Runway Holding Position Marking
9. Any additional marking required as per 777 local requirements and best practices.
10. Any and all temporary markings as required to maintain a functioning runway including temporary end lighting.

# REMOVAL OF TREES AND VEGETATION

1. All trees and vegetation to removed inside the airport development to prevent any obstructions to the airport.
2. The only vegetation to remain is grass
3. All areas of the new construction area to be planted with grass.
   1. Grass type, application rates and locations to be submitted for approval prior to commencing seeding.
4. 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.

# INSTALLATION OF AIRSIDE BOUNDARY FENCE

1. Airside fencing to be installed on the 24 end as per the drawings
2. Fencing should match the existing design and specification
   1. Fence design, installation method, materials and location all shall be submitted for approval prior to installation.
3. Fence shall be completed as per Maldives Civil Aviation Regulations (MCAR’s) and Ministry of Defense and Security (AVSEC)