

Fixture		Height (mm)
Wash Basin	Floor finish to front top edge - Male	700
	Floor finish to top of mirror - Male	1675
	- Female	1660
Lavatory	Floor finish to front top edge	760
Shelf	Floor finish to top of shelf - Male	1005
	- Female	990
Cistern	Floor finish to bottom of cistern	500
	Floor mounted Japanese type Western type	550
Drinking fountain	Floor to front top edge	765
Flush valve, WC	Floor to center of valve	600
Paper holder	Floor to center of holder - Japanese type	400
	- Western type	750
Faucets		
Sink	Sink floor to top of faucet	300
Lavatory	Lav. top to top of faucet	150
Bath room	Floor finish to top faucet	300



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## 16. PAINTING

### 16.1 Material

All paints shall be approved by the Consultant for colour, quality and type. All painting work shall be carried out in accordance with the paint manufacturer's specifications unless otherwise directed by the Consultant.

All paints and finishes used for the project shall be manufactured by or under license from one of the following manufacturers;

Nippon Paints (Japan)

Imperial Chemical Industries (UK)

Sigma Paints (Saudi Arabia)

Macpherson Paints Limited (UK)

Crown Decorative Products (UK)

Paints from manufacturers not listed above shall only be used with prior written approval of the Consultant

Paint shall be ready mixed and all paints, varnishes, enamels, lacquer stains, paste fillers and similar materials shall be delivered to the site in the original containers with the seals unbroken and labels intact. Each container shall give the manufacturer's name, type of paint, colour of paint and instructions for reducing. Thinning shall be done only in accordance with the manufacturer's directions.

Use of product by the same manufacturer shall be a general rule in each stage of work in this Specification.

Colour, luster, colour scheme, finish shall be decided by the Consultant after checking sample paint test.

The painting shall be performed by experienced and competent painter.

Where walls are specified to be painted, all columns, arches, groove, rough surfaces, reveals, soffits and returns, etc. shall be included and no extra shall be payable.

### 16.2 Definition of Terminology

#### Surface Sealing

Surface to be painted shall be sealed to have uniform suction and prevent lye from oozing out.

#### Spot Puttying

All cracks and depressions shall be filled flush with putty.

#### Puttying

All surfaces to be painted shall be puttied uniformly flat surface.

#### Spot painting

Spot puttied area shall be touched up by paint

#### Touch-up

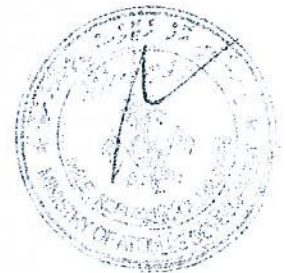
Any damaged area after the prime coat has been applied shall be touched up

#### Drying hour

The drying time of double-coated paint shall be measured at the temperature of 20°C and humidity of 70%.

#### Amount of paint

The amount shall be standard amount of paint itself not including thinner. It shall increase or decrease depending on shape and surface condition in the process of painting.



16.3 Paint Finish Symbols

OP	Synthetic resin mix paint finish
VP	Solvent-polyvinyl chloride resin paint finish
EP	Polyvinyl acetate resin emulsion paint finish
AEP	Synthetic resin emulsion paint finish
CL	Clear lacquer finish
EXP	Epoxy resin paint finish
Stipple (OP)	Stippled finish (oil mix paint finish)
Stipple (EP)	Stippled finish (polyvinyl acetate resin emulsion paint finish)

16.4 Painting in General

16.4.1 Preparation of Paint

- 16.4.1.1 Mixing: Paint content with pigment shall be thoroughly stirred to make a uniform consistency.
- 16.4.1.2 Thinning: Portable water shall be used for thinning of emulsion paint and water-soluble paint. Proper thinner, product of the same manufacturer as paint, as a rule, shall be used for other types of painting. Percentage of thinning and viscosity shall be conducted with direction of manufacturer or catalogue as they vary with the method of paint, temperature, type of material to be painted.
- 16.4.1.3 Allowable period of Use: Paint mixed with more than 2 types shall be used with direction of a manufacturer or catalogue as allowable period of use, mixing ratio and mixing method vary. The paint which has passed allowable period of use shall not be used.

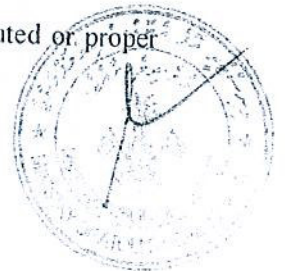
16.4.2 Conditions of Painting

16.4.2.1 Work shall not be executed in the following situations

- 16.4.2.1.1 When humidity is above 85%
- 16.4.2.1.2 When raining or it is forecast
- 16.4.2.1.3 When dusts are present
- 16.4.2.1.4 When temperature of surface is high under hot weather and bubbles are likely to develop on the painted surface.

16.4.2.2 Conditions of Surface to be painted: Work shall not be executed or proper means shall be taken in the following situations.

- 16.4.2.2.1 When surface is damp and wet
- 16.4.2.2.2 When condensation is likely to develop on the surface.
- 16.4.2.2.3 All nail holes on veneer, board, etc., shall be covered with proper rust-proof paint before the subsequent painting is applied in accordance with this specification.



17.4.3 Performance

Paint shall be evenly and uniformed applied on the surface. Areas of difficult application such as pointed part, internal angle, welded part, etc. shall be thoroughly painted and double coated as necessary to deep uniform coating thickness.

Painting shall be properly done by carefully selecting the painting method by the shape of surface and types of paint.

17.4.4 Protection

17.4.4.1 Dangerous material such as paint, thinner, etc., excluding emulsion paint and water-soluble paint shall be kept in accordance with regulations concerned.

17.5 Procedure of Painting

17.5.1 Exterior - Surface of Mortar, Plaster and Concrete

AEP- Synthetic resin emulsion paint.

Coating Process	No. of Coats	Type of Paint	Drying hour	Amount (kg/m <sup>2</sup> )
1. Surface preparation		Dry, clean and free from impurities		
2. Surface sealing	1	Sealer for emulsion paint	longer than 4 hours	
3. Puttying		Putty for emulsion paint		
4. Grinding		Grind with proper grinding tool		
5. Spot painting		Synthetic resin emulsion paint		
6. Second coating	1	Synthetic resin emulsion paint	longer than 4 hours	0.10-0.13
7. Finish coating	2	Synthetic resin emulsion paint	longer than 4 hours	0.10-0.13

Notes:

Degree of dryness on the surface to be painted shall be kept under 6% in water content and below PH 9.5

Puttying and sanding process shall allowed to omit depending on the conditions of the surface.

Drying time of putty shall be long enough for sanding to proceed.

Amount of sealer for surface sealing shall be adjusted with direction of the Consultant as it varies with the surface conditions.

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17.5.2 Exterior - Iron Products in General

OP - Synthetic resin mix paint

Coating Process	No. of Coats	Type of Paint	Drying hour	Amount (kg/m <sup>2</sup> )

1. Surface preparation		Completely remove rust, moisture, oil and other impurities by sander, cleaner and surface.		
2. First Coating 24 hours	1	Rust proof oil paint	longer than 24 hours	0.13-0.15
3. Touch-up		Touch-up rustproof oil paint		
4. First Coating	1	Rustproof oil paint	longer than 24 hrs	0.13-0.15
5. Second coating	1	Synthetic resin mix paint	longer than 15 hrs	0.11-0.15
6. Finish coating	1	Synthetic resin mix paint	longer than 15 hrs	0.11-0.15

Note:

Paint for touch-up painting shall be the same as used for first coat in process No. 2

### 17.5.3 Exterior - Wood

OP - Synthetic resin mix paint finish

Coating Process	No. of Coats	Type of Paint	Drying hour	Amount (kg/m <sup>2</sup> )
1. Surface preparation		Clean and sand to plane surface		
2. Knot treatment	1-2	Lacquer varnish	longer than 24 hours	
3. First coating	1	First coat paint of oil mix paint	longer than 24 hrs	0.13-0.15
4. Second Coating	1	Oil mix paint	longer than 24 hrs	0.11-0.13
5. Finish coating	1	Oil mix paint	longer than 24 hrs	0.11-0.13

Note:

Puttying and sanding shall be done after process No.2 when there are cracks, etc. on the surface putty shall be oil-putty, but drying time shall vary depending on conditions.

### 17.5.4 Interior - Mortar, board, etc.

Stipple (EP) - Polyvinyl acetate resin emulsion paint finish

Coating Process	No. of Coats	Type of Paint	Drying hour	Amount (kg/m <sup>2</sup> )
1. Surface preparation		Dry, clean and free from impurities		
2. Surface sealing	1	Sealer for emulsion paint	longer than 4 hours	
3. Puttying		Putty for emulsion paint		
4. Grinding		Grind with proper grinding tool		
5. Spot painting		Second coating paint of polyvinyl acetate resin emulsion paint		
6. Second Coating	2	Polyvinyl acetate resin emulsion paint	longer than 4 hrs	1.11-0.13
7. Finish Coating	1	Polyvinyl acetate resin emulsion paint for stipple-finish	longer than 4 hrs	0.25-0.35

Notes:

Degree of dryness on the surface to be painted shall be kept under 6% in water content and below PH 9.5

Puttying and sanding process shall allowed to omit depending on the conditions of the surface.

Drying time of putty shall be long enough for sanding to proceed.

Amount of sealer for surface sealing shall be adjusted with direction of the Consultant as it varies with the surface conditions.

17.5.5 Interior - Mortar, plaster, concrete, etc.

VP Solvent - Polyvinyl chloride resin paint finish

Coating Process	No. of Coats	Type of Paint	Drying hour	Amount (kg/m <sup>2</sup> )
1. Surface preparation		Dry, clean and free from impurities		
2. Surface sealing	1	Sealer for emulsion paint	longer than 2 hours	
3. Puttying		Putty for polyvinyl chloride resin paint		
4. Grinding		Grind with proper grinding tool		
5. Spot painting		Solvent-polyvinyl chloride resin enamel emulsion paint		
6. Second Coating	1	Solvent-polyvinyl chloride resin enamel emulsion paint	longer than 4 hrs	0.11-0.14
7. Finish Coating	2	Solvent-polyvinyl chloride resin enamel emulsion paint	longer than 4 hrs	0.11-0.14

Notes:

- (a) Degree of dryness on the surface to be painted shall be kept under 6% in water content and below PH 9.5
- (b) Puttying and sanding process shall allowed to omit depending on the conditions of the surface.
- (c) Drying time of putty shall be long enough for sanding to proceed.
- (d) Amount of sealer for surface sealing shall be adjusted with direction of the Consultant as it varies with the surface conditions.

17.5.6 Interior - Mortar, plaster, concrete, etc.

EP Polyvinyl acetate resin emulsion paint finish

Coating Process	No. of Coats	Type of Paint	Drying hour	Amount (kg/m <sup>2</sup> )
1. Surface preparation		Dry, clean and free from impurities		
2. Surface sealing	1	Sealer for emulsion paint	longer than 4 hrs	
3. Puttying		Putty for emulsion paint		
4. Grinding		Grind with proper grinding tool		
5. Spot painting		Polyvinyl acetate resin emulsion paint		
6. Second Coating	1	Polyvinyl acetate resin emulsion paint	longer than 4 hrs	0.11-0.13
7. Finish Coating	1	Polyvinyl acetate resin emulsion paint	longer than 4 hrs	0.11-0.13

Notes:

- (a) Degree of dryness on the surface to be painted shall be kept under 6% in water content

- and below PH 9.5
- (b) Puttying and sanding process shall allowed to omit depending on the conditions of the surface.
  - (c) Drying time of putty shall be long enough for sanding to proceed.
  - (d) Amount of sealer for surface sealing shall be adjusted with direction of the Consultant as it varies with the surface conditions.

17.5.7 Interior - Iron products, steel.

OP - Synthetic resin mix paint

Coating Process	No. of Coats	Type of Paint	Drying hour	Amount (kg/m <sup>2</sup> )
1. Surface preparation		Completely remove rust, moisture, oil and other impurities by sander, cleaner and surface		
2. First Coating	1	Synthetic resin rust-proof. Red lead-type, lead compound-type	longer than 24 hrs	0.18-0.22 0.13-0.15
3. Touch-up		Touch-up rust proof paint		
4. First Coating	1	Synthetic resin rust-proof paint. Red lead-type, Lead compound-type	Longer than 24 hrs	0.18-0.22 0.13-0.15
5. Second Coating	1	Synthetic resin mix paint	longer than 15 hrs	0.11-0.13
6. Finish Coating	1	Synthetic resin mix paint	longer than 15 hrs	0.11-0.13

Notes:

- (a) Paint for touch-up painting shall be the same as used for first coat in process No.2
- (b) When oil rust-proof paint is used instead of synthetic resin rust proof, its specification shall conform to No. 5 and No.6.

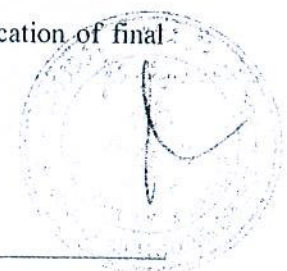
17.5.8 Floor - Concrete and Mortar

EXP - Epoxy resin paint finish

Coating Process	No. of Coats	Type of Paint	Drying hour	Amount (kg/m <sup>2</sup> )
1. Surface treatment		Dry, clean and free from impurities		
2. First coating	1	First coating paint for epoxy	Longer than 24 hrs	
3. Finish Coating	2	Epoxy resin paint	Longer than 24 hrs	

Notes:

- (a) Degree of dryness on the surface to be painted shall be kept under 6% in water content and below PH 9.5.
- (b) Amount of paint and number of paint shall be as directed by the Consultant as they vary with the conditions of surface and required thickness of coating.
- (c) Painted surface shall be kept out of use for more than 7 days after application of final coat.



## 18. ELECTRICAL INSTALLATIONS

### 18.1 General

- 18.1.1 The work shall be carried out strictly in accordance with the standard specifications and shall also conform to the requirements of Electricity Rules in force in Male', Republic of Maldives.
- 18.1.2 All materials to be used in the Works shall be of standard make and shall bear the certification marks of local authorities. All materials shall be approved by the Consultant before use in the Works.
- 18.1.3 Earthing shall invariably be done in the presence of the Consultant or his representative.
- 18.1.4 All the conduits shall be continuously earthed. Check nuts shall be provided at the point where the conduct enter the I.C. box and junction box.
- 18.1.5 The Contractor shall arrange for the inspection of all Medium Pressure Installation by the Electrical inspector of the local electric supply authority from where the electricity connections has to be obtained, and see that they are passed by him.
- 18.1.6 The Contractor shall be responsible for all necessary permits, approvals, fees, deposits etc., required to complete the Electrical works in accordance with the Contract.

### 18.1.7 Scope of work

18.1.7.1 The work consist of furnishing all tools, plants, labour, materials and equipment and performing the internal electrical Works comprising of:

- (a) Light and power wiring
- (b) Fans and fixtures
- (c) Wires and Cables
- (d) Telephone System
- (e) Sub- Station Equipments:
- (f) Distribution Fusegear
- (g) Earthing System
- (h) Lightening Protection System
- (i) Fire Alarm System
- (j) Air Conditioning System
- (k) Computer Network Cabling outlet work



### 18.1.8 Prequalification

18.1.8.1 The Electrification Work shall be carried out only by a licensed contractor authorized to under take such work under the Maldives Electricity Bureau.

### 18.1.9 Qualification

18.1.9.1 A licensed Electrical Contractors should have the following qualifications:

- (a) Must have in his employment a competent Electrical Engineer registered with Maldives Electricity Bureau.
- (b) Must have in its employment an Electrical Consultant having certificate of competency who will exclusively supervise this work.
- (c) Must have necessary tools, plant and instruments.
- (d) Must have adequate experience of similar works.
- (e) If a contractor does not posses the above qualifications he shall be allowed to sublet the Work to a competent Sub-Contractor provided an application for his prequalification is made to the engineer for his approval. Decision of the Engineer in this case shall be binding on the Contractor.



18.1.10 Rules and Regulations

18.1.10.1 The installation in general shall be carried out in conformity with the Electricity Rules, 1937 (UK), and the latest edition of the Regulations for the Electrical Equipment of Buildings issued by the Institution of Electrical Engineers, London (I.E.). However, in case of conflict between these Specifications and the I.E. Regulations, these Specifications shall be followed.

18.1.11 Standards

18.1.11.1 The latest relevant British Specifications, and I.E. recommendations shall be applicable and be followed for the equipment specified herein.

18.1.12 Climatic Conditions

18.1.12.1 All equipment supplied shall withstand, without developing any defect, the following climatic conditions:-

Maximum Ambient Temperature	=	113° F or 45° C
Minimum Ambient Temperature	=	28° F or - 2.2° C
Maximum Humidity	=	98%

18.1.13 Specifications

The Contractor shall furnish all material and equipment at site, conforming fully to the specifications given herein and to the accepted standards, the Institution of Electrical Engineers, London, and the Maldives Energy Resource Unit.

It is not the intent of these Specifications to include all details of design and construction of various material and equipment to be supplied under this contract.

The Contractor shall supply and install all material and equipment specified herein and also all installation and small material such as nuts, bolts, washers, shims angles, leveling material, insulation, tape, solder, etc. and all such required for complete installation as intended by the Specifications.

The contractor shall provide for all the required technical and non - technical personnel, skilled and non - skilled labour, construction equipment, transportation etc., as required for the completion of Work in strict accordance the Technical Specifications laid herein-after.

All material and equipment supplied by the Contractor shall be new and in all respects conforming to the high standard of engineering design and workmanship.

All material and equipment which have to be supplied and installed by the Contractor shall be passed/approved by the Consultant; even if the same is exactly in accordance with the Bill of Quantities and Drawings.

18.1.14 Submittal

18.1.14.1 The Contractor, after the award of work, shall submit for approval of the Consultant all drawings and cuts of equipment, appliances, fixtures and accessories. Cuts, catalogues and drawings shall be clearly marked to indicate, the items furnished.

18.1.15 Approval of Drawings and Data

18.1.15.1 The Contractor shall provide detailed electrical drawings, wire diagrams, etc. for all electrical switchgear, fusegear and all other systems etc. for the Consultant to review and approval. Three sets of equipment drawings shall

be provided for obtaining approval.

18.1.16 Drawings & Data

18.1.16.1 Three sets of drawings and data for each equipment shall be furnished by the Contractor for the Consultant approval before commencement of work. The drawings to be supplied by the Contractor shall be as follows:-

Electrical Drawings showing:-

- (a) Single-Line diagram
- (b) Detailed wiring diagram
- (c) All interconnections
- (d) Relays, their locations, and internal wiring diagrams
- (e) Other electrical devices including meters instruments and their wiring diagram

18.1.17 Shop Drawings

18.1.17.1 The design drawings do not show conduit routes and depict only the position of various fixtures and outlets. All the planning for the conduit routes shall be carried out, well in advance of the actual execution of work, by the Contractor to the satisfaction of the Consultant. For this purpose the Contractor shall prepare shop drawings and obtain prior approval of the Consultant. There prints of each shop drawings shall be submitted for obtaining approval. work.

No piece of work shall be allowed to be executed at site without the availability of these approved shop drawings. These shop drawings shall clearly depict the load balancing chart of each Distribution Board.

Time required for the preparation and approval of shop drawings shall be considered to have been included in the total time allowed for the completion of the work.

18.1.18 Spare Parts list

18.1.18.1 A list of spare parts required for the one year's operation of each equipment where deemed necessary together with unit price of each part, shall be supplied by the contractor.

18.1.19 Guarantee

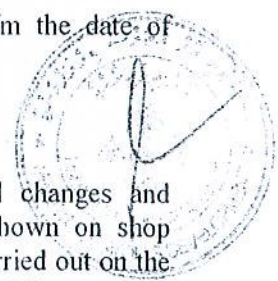
The Contractor shall furnish written guarantee in triplicate of the manufacturer for successful performance of each equipment. Such guarantee shall be for replacement which may be found defective in material or workmanship.

The guarantee shall cover a minimum period of 12 months effective from the date of completion certificate.

18.1.20 As-Built Drawings

The Contractor shall, during the progress of work keep a careful record of all changes and revisions where the actual installation differs from that shown on shop drawings. These changes and revisions shall be accurately carried out on the shop drawings and submitted to the Consultant for approval. After approval these drawings shall become the property of the Owner. These updated and approved shop drawings depicting clearly all changes and revisions made on site shall be called As-Built Drawings.

Reproducible tracings of all these As-Built Drawings shall be handed over to the Consultant. Final payment will be withheld until the receipt of the approved As-Built Drawings.



18.1.21 Test Reports

18.1.21.1 The Contractor shall be responsible for the submitting the test reports/certificates and get the installation inspected passed by the Maldives Electricity Bureau.

18.2 Conduit And Conduit Accessories

18.2.1 Conduit Pipe

18.2.1.1 The conduit for the wiring of lights, socket outlets and other systems shall be made of PVC confirming to BSS 3505/1968 Class-D.

The conduit shall have following wall thickness and standard weights:

Pipe Size	Wt/100Rft.	Wall thickness
20mm dia	3.4 Kg	0.04 to 0.05
25mm dia	4.5 Kg	0.045 to 0.055

18.2.1.2 Steel conduit shall conform to BSS 31/latest. The conduit shall be enameled with good quality non- cracking and non-flaking black paint.

18.2.2 Conduit Accessories

The use of factory made round PVC junction boxes shall be used and should have nipples to receive PVC pipe with force fit, shall be used for ceiling outlets. The wall type junction box shall also be PVC.

Each junction box shall be provided with one piece cover which shall be fitted on the box with screws.

18.2.2.3 Conduit accessories such as switch boxes, socket outlet boxes, pull boxes and inspection boxes shall be made of PVC having dust tight covers. All boxes shall have required number of conduit entry holes. All the rectangular or square shaped boxes shall have nipples to receive PVC conduit force fit.

Manufactured smooth bends shall be used where conduit changes direction. Bending of Conduit by heating or otherwise shall be allowed only at special situations with the permission of the Consultant. Use of sharp 90 degree bends and tees is prohibited.

Bends shall have enlarged ends to receive the conduit without any reduction in the internal diameter of the PVC pipe.

18.2.2.5 All accessories e.g. boxes, coupling, bends, solid plugs, bushes, reducers, checknuts etc. shall be equal in quality to the specified conduit.

18.2.2.6 The drawings do not show conduit routes and all the planning for arranging conduit routes shall be carried out by the Contractor to the satisfaction of the Consultant.

18.2.2.7 The entire conduit system shall be essentially completed before the wiring pulling is taken in hand. Each conduit run shall be tested for continuity and obstructions. All obstructions shall be cleared in an approved manner. Water and moisture that has entered any section of the conduit installation must be dried with suitable swabs to the satisfaction of the Consultant.

18.2.2.8 Adequate expansion joints shall be provided in all conduit runs passing across the expansion joints in the concrete slab of the buildings.

18.2.2.9 All the free ends of conduit shall be solidly plugged till such time as final

and proper terminations are made.

### 18.3 Wires, Cables And Cords

#### 18.3.1 Wires & Cords

The wires & cords for the conduit wiring shall be single core, made of stranded copper conductors, PVC insulated, tested to B.S. 6004, 1975. The voltage grade shall be 300/500 volts or 450/750 V unless otherwise specified on Drawings and Bills of Quantities.

All the wire and cables shall be of the approved standard of Maldives Electricity Bureau.

(a) For light or fan point wiring with 1.5 mm square or as specified in the BOQ.

(b) For light circuit wiring with 2.5 mm square or as specified in the BOQ.

(c) For power plug 15A wiring with 4mm square or as specified in the BOQ.

#### 18.3.2 Installation Instructions

18.3.2.1 All wiring shall be continuous between terminations and use of connectors or joints is not be allowed. Spur and tee connections are strictly prohibited.

18.3.2.2 Manufacturers recommended lubricant shall be allowed to facilitate pulling of wires. Use of any kind of oil and soap is prohibited.

### 18.4 Wiring Accessories

#### 18.4.1 Switches

18.4.1.1 Indoor switches controlling lights and fans shall be single pole, 5A, one or two way, suitable for 250V, 50 Hz. The body of the switches shall be made of moulded plastic, one, two, three or four gang with integral built in moulded plastic face plate.

18.4.1.2 Weatherproof switches shall conform to B.S. standard.

#### 18.4.2 Switch Socket Outlet Units

18.4.2.1 Switch & socket units shall be single, pole, 3 pin rated 5A, 15A or 20A, 250V, 50 Hz. These shall be moulded plastic type with white integral built-in face plate. Each socket shall have its control switch by the side of it on a common face plate. Thus the complete unit specified in BOQ shall be a switch and a socket outlet unit.

#### 18.4.3 Fans

18.4.3.1 All fans shall be capacitor type Deluxe models or equivalent and suitable for operation on 200/220 volts, 50 Hz, A.C Supply. All ceilings fans shall have five speed dimmers. The air displacement shall be 10,000 c.f.m for 48" (1219 mm) Sweep and 12,000 c.f.m. for 56" (1423 mm) Sweep at maximum speed. The fan motor shall be capacitor type and bearings shall be groove type to give noiseless and quiet operation. The noise level relative to a frequency of range 1000 Hz should be within the limits of +3 dB.

#### 18.4.4 Dimmer

18.4.4.1 The dimmer shall be recessed type as required and shall be approved by the Consultant.



18.4.5 Fan Hook

18.4.5.1 The fan hook shall be made of 12 dia mild 5/5 steel rod bent to shape of approved design. It should be in the form of a loop about 3-1/4" (87.5 mm) long and about 2" (50 mm) wide. The rod shall be bent to have at least 8" (200 mm) extension on both sides for tying to the reinforcement steel of the slab. All ceiling fan shall be of one make only.

The fan hook shall be installed in the RCC slab of the ceiling at the time of pouring concrete.

18.5 Light Fixtures

18.5.1 General

The description of light fixtures is given in the Bills of Quantities, and stated on the Drawings, and all relevant material are described in this Section.

The determination of quality is based on certified photometric data covering the coefficient of utilization, light distribution curves, construction material, shape, finish, operation, etc.

18.5.1.3 The Contractor shall submit samples of each and every lighting fixture specified for approval of the Consultant.

18.5.1.4 The type of fixtures with manufacturer catalogue reference are given in Bill of Quantities.

18.5.1.5 The lighting fixtures shall be manufactured by M/s. Philips, M/s.RZB Lighting, M/s Thorn or equivalent as approved by Consultant.

18.5.2 Incandescent Light Fixture

The glass globes/ shades/ diffusers of the incandescent light fixtures shall be first class quality glass free from any air bubbles or voids. The glass shall generally be of opal white colour unless otherwise specified. The shape of the glass may be spherical, hemispherical, flattened bottom or tablet shaped as required.

Surface mounted fixture shall have stove enamelled sheet steel body. It may also be satin brass or aluminium anodised finish as required. The fixing holes shall match the outlet box. Wall bracket light fixtures shall have back plates with matching holes of the outlet box and decorative finish as required.

All the lighting fixtures shall be suitable for local climatic conditions.

18.5.2 Fluorescent Light Fixture

All the light fixtures shall have lamps and electronic ballasts of the wattage specified. The fluorescent lamp shall be either 2 ft - 18 watts or 4 - 35 watts and the colour shall generally be day light, cool day light in the order of preference or as mentioned specifically.

The fluorescent lamps shall be Philips to BSS 1853 but having a minimum useful life of 5000 hours. The new generation of 26mm dia 18 watts and 36 watts energy efficient lamps shall be preferred.

The ballast shall be totally enclosed electronic type suitable for operation on 220 V, 50 Hz single phase supply, a wiring diagram, wattage, voltage and current ratings shall be printed on the body of the ballasts. The power loss shall not more than 10 watts for 36 watts ballast. The ballast shall be noiseless in operation without any whistling sound.

The manufacture shall be called upon to guarantee a trouble free life of 3 years, effective from the date of completion certificate.

- 18.5.2.5 The starters shall have radio-interference suppressers.
- 18.5.2.6 The internal wiring of the light fixtures shall be carried out at manufacturers factory with heat resistance wires of size not less than 1.5 mm square.
- 18.5.2.7 The louvers of light fixtures shall be made of anodized aluminium and/or moulded plastic. The diffusers shall be made of acrylic perspex.
- 18.5.2.8 All the lighting fixtures shall be suitable for local climatic conditions.

18.5.3 Installation Instructions

- 18.5.3.1 The light fitting shall be installed according to manufacturers recommendations or as approved by the Consultant.
- 18.5.3.2 Flexible connecting wires from outlet box to the fixture shall be provided by the contractor; connector made of porcelain or thermoplastic material shall be provided and installed in the outlet boxes for connecting flexible wires to the point wires.
- 18.5.3.3 Outlet boxes or any openings in the ceilings and walls shall be covered with appropriately fabricated accessories to provide an architectural entity to conceal them.

18.5.4 Main L.T. Switchboard

The L.T. switchboard shall be indoor type, free standing, free supporting, floor mounted, totally enclosed, sheet cald, dust and suitable for operation on 3 phase 4 wire system, 415 v , 50 Hz, AC supply .

The board shall be suitable for installation back to the wall and capable of front attendance. The switch board shall be designed to suit service conditions and ensure security and safety during operation , inspection , operation , cleaning and maintenance.

The switch board shall be designed and tested to IEC recommendations. Each panel shall withstand strain of 2000 volts insulation level for one minute power frequency test.

18.5.4.4 The L.T. switch board shall consist of the following:

- Maldives Energy Resource Unit incoming panel.
- KWh meters ( To be approved and checked by MEB )
- Out going distribution feeders.

18.5.5 Distribution Feeder Panel

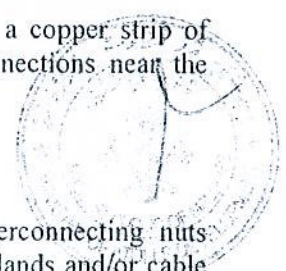
18.5.5.1 Single line diagram of the L.T. switch board shall be approved by the consultant and Maldives Electricity Bureau before placing order for the switch board.

18.5.6 Earthing

18.5.6.1 The switchboard shall be effectively earth by means of a copper strip of 25mm x 3mm (1" x 1/8") cross -section bolted to connections near the bottom of the switchboard.

18.5.7 Accessories

18.5.7.1 Designations labels, lifting lugs , foundation bolts, interconnecting nuts blots, and washers, thimbles, lugs, levelling shims cable glands and/or cable end box for all the sizes of incoming and outgoing cable shall be supplied with the switchboard.



**18.6 Testing**

The following tests shall be conducted on each completed switchboard.

- 18.6.1.1 Type Tests
  - (a) Temperature rise test
  - (b) Mechanical endurance test
  - Making/Breaking Capacity test
- 18.6.1.2 Routing Test
  - High Voltage test

18.6.2 The Switchboard shall be tested to British/Electricity Council Standard 41-5. Preference shall however, be given to Switchboards fabricated from all components manufactured by only one manufacturer.

**18.6 Installation Instruction**

All labour, equipments, tools and plants required to complete the installation shall be provided by the contractor. The Switchboard shall be fixed firmly on the floor in perfect line, plumb and level position.

All incoming and outgoing cable connections shall be made from the bottom including Earth connections.

**18.7 Distribution Board**

18.7.1 The distribution boards shall be either free standing, cubical type or wall mounting type suitable for recessed mounting. Each distribution board (d.b.) shall be tropical in design, fully dust and vermin proof and liquid repellent.

**18.9 Lightning Protection System**

18.9.1 General

18.10.1.1 The Contractor shall be under obligation to supply all labour material, services and skilled supervision necessary. Shop drawing for the lighting system shall be submitted to the Consultant at least 4 weeks before commencing the work.

18.9.2 Workmanship

The installation shall be carried out by skilled and competent workmen so as to achieve high class workmanship.

**18.10 Telephone System**

18.10.1 General

The design drawings do not show conduit routes and depict only the position of various telephone outlets. All the planning for the conduit routes shall be carries out, well in advance of the actual execution of work, by the Contractor to the satisfaction of the Consultant. For this purpose the Contractor shall prepare shop drawings and obtain prior approval of the Consultant. Three prints of each shop drawings shall be submitted for obtaining approval before commencement of work.

No piece of work shall be allowed to be executed at site without the availability of these approved shops drawings. Time required for the preparation and approval of shop drawings shall be considered to have been included in the total time

allowed for the completion of the work.

The contractor shall furnish and install the type of Telephone outlets approved by Dhiraagu. All the floor mounted telephone boxes shall be concealed in a PVC box with opennable cover for easy access.

Both ends of each set of conductors shall be properly identified with durable tags with the same identifications of both ends, at the outlet and the telephone terminal cabinets to facilitate the installations of the telephone instrument in the future and for trouble shouting purposes. Cable used shall be twisted and shielded 3 cables in the office area and the rest as shown in the drawing.

### 18.13 Fire Alarm System

#### 18.13.1 General

The contractor shall be under obligation to, supply, install, test, commission and maintain for the period specified elsewhere, a fire alarm system as specified in the drawings, for this building.

#### 18.13.2 Specifications

The system shall facilitate the detection of fires occurring in any part of the building by subsequent audible and visual indications. The system shall generally comprise of the following:

##### Main Control Panel

The control panel will be perspex fronted panel and will display all screened labelling and indications by block LEDs mounted behind the front hinged cover. The control panel shall be mounted in pressed steel housing and provide the following functions and indications.

Fully monitored two wire circuit for each sensor zone (24V D.C.) as required.

Fully monitored two wire sounded circuit (24V D.C.) as required.

Change over relay contacts each rated 5 amps 240V A.C. (Resistive load).

Full test and isolate functions via a key-board located on the facia of the main termination housing to provide the following:-

Ability to isolate sensor zones.

Ability to isolate sounder zones.

Ability to test automatically zones with an auto reset facility to enable a single person to carry out testing

Full LED display of all functions comprising of:-

System on, system fault, processor fault, alarm, zone supply fault, system supply fault, battery fault, charger/mains fault, sounder fault and sensor fault together with a test mode display which provides zone clears, zone open circuit and zone short circuit indication for individual sensor and sounder (bells) lines.

Sequence of sounder operation- All sounder ( bells ) and relay out-put sequences shall be completely programmable to enable future changes to be carried out with only soft ware changes.

(g) The control panel shall provide the following functions and indications:-

Twin LED display for system on, system fault, sounder fault, alarm, mains/ charger fault, main processor fault, sensor fault, alarm



silenced , battery fault, supply fault and earth fault.

Also five dedicated control functions on illuminated push buttons which are key - isolated. These shall provide Evacuate, Buzzer Mute, Alarm silence, Lamp test and Reset controls.

Battery charger - the battery charger shall be an integral part of the main fire alarm control panel cabinet and shall be capable of fully recharging the stand - by batteries after a main's failure within 12 hours. The capacity of the batteries shall be sufficient to supply the standing load for the least 24 hours and the maximum alarm load for one hour. The system shall be suitable for operation on 220v single phase or 415v , 3- phase 50 hz supply.

Mimic diagram showing all the floors shall be incorporated in the control panel.

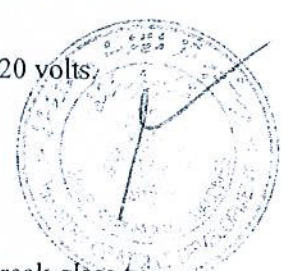
Sensors and Sounders

(a) The main control panel as described in the foregoing shall be capable of working with the following devices having common specification as under :-

- (a) Operating voltage 10-30 volts d.c (two wire system)
- (b) Ambient temperature 10 C to +80 C.
- (c) Humidity range 20 to 90 RH
- (d) Altitude range Sea level to 6000 meters
- (e) Alarm mode Self latching producing a resistance of 680 ohms across the supply line.

(b) Photocell (optical) smoke detectors- the units shall operate on light scattering principle. An internal infra-red light source shall be pulsed , with the light beam ranged so as to by-pass a receiving unit. The presence of smoke shall scatter the light beam, causing it to be reflected on to the receiving photocell. An evaluation circuit shall measure the amount of light and shall compare it to a reference. The detector shall trigger in to an alarm state when the amount of smoke exceeds a pre-set level. To ensure against false alarms several pulse readings shall be taken and compared before the detector shall be triggered into alarm. The detectors shall conform to b.s.s. 5446 part -1 and shall have the following specifications:-

- (a) Quiescent Current Less than 100 microamps at 20 volts.
- (b) Alarm Current Maximum 60 mA
- (c) Maximum Coverage 300 cubic meters
- (d) Weight 250 grams approx.
- (e) Diameter x Height 92 mm x 80 mm



(c) Manual stations - this unit also named call point shall be break glass type that do not require a hammer. The frangible glass is pressed hand to break the glass which shall activate the alarm. The call point shall conform to b.s. 5839 part-2.

(d) Alarm bells - the alarm bells shall be centrifugal type and the gong shall be 100 mm diameter or as specified. The unit shall be suitable for an input of 24 v d.c. And shall provide a normal output of 94 db at 1 meter.

(e) Electronic sounders - the unit shall be primarily designed to operated on 24v.d.c. And arranged easily to generate a variety of sound signals: intermittent, continuous or warble tones.

Wiring

The wiring for the fire alarm system shall be carried out in PVC conduit in accordance with instructions contained herein relevant section. 2x2.5 mm square or 4x2.5 mm square PVC heat resistance insulated single core cable 300/500 volts grade shall be pulled in 1" dia PVC conduit laid for the purpose. Any spurs and tee joints in the wiring are strictly prohibited.

Instructions contained in section -E.2.2 and 2.3 shall be followed.

**Installation**

The installation as a whole shall be tested and commissioned, in accordance with manufacturers instructions, to the entire satisfaction of the Consultant.

**Shop Drawings**

Shop drawing of the fire alarm system layout shall be submitted to the Consultant for approval.

