



## Guideline for approval of Single Line Diagrams and Load Calculation

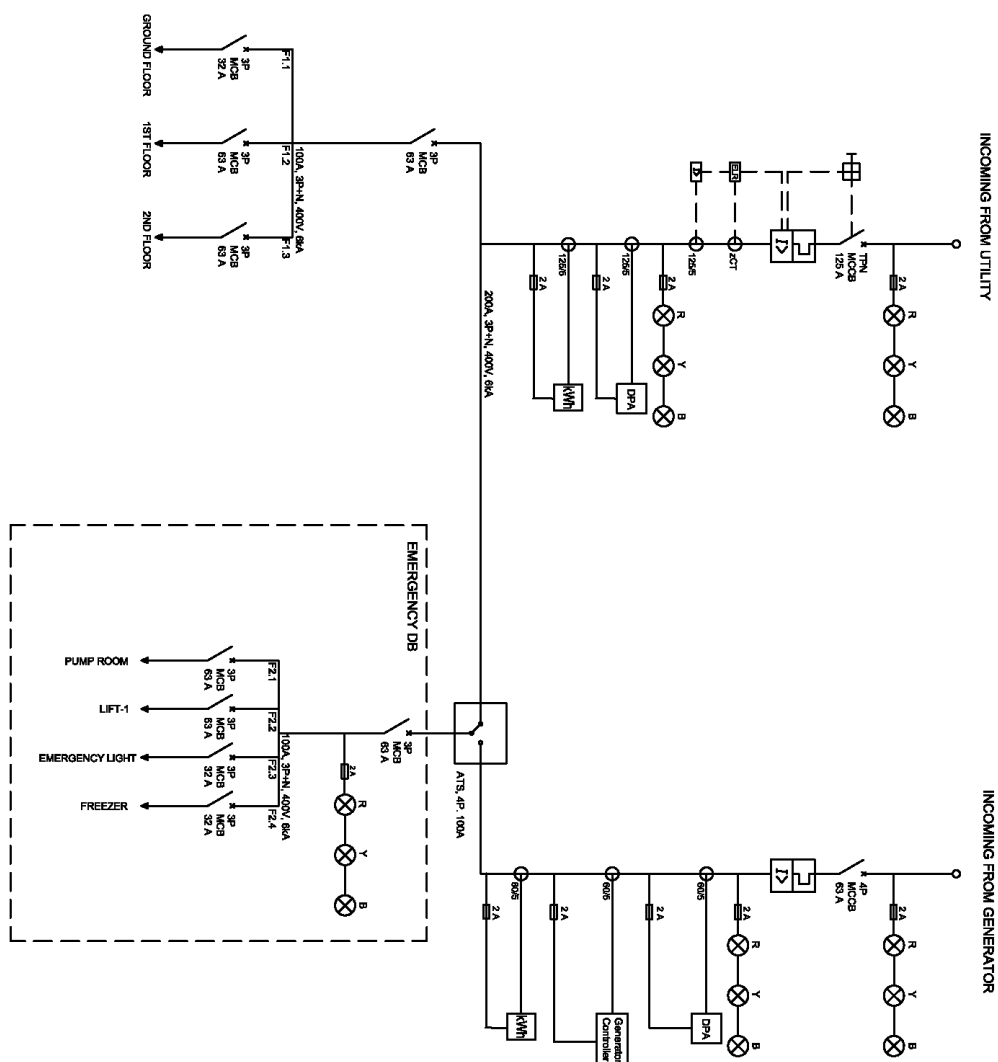
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|-------------------------------|---|--|
| <b>General Information</b>    | 1 | <p>a) This guideline is made under the Energy Act to guide professionals regarding Electric Distribution Panel, Single Line Diagram and Load calculations</p> <p>b) All electric distribution panels installed in buildings/facilities with main incomer rating equal to or above 63 Amps shall be approved by the Utility Regulatory Authority</p>  |
| <b>Submission</b>             | 2 | <p>a) The following documents will be required with the application for Panel and Load calculation</p> <ul style="list-style-type: none"> <li>i. Completed Application</li> <li>ii. Single Line Diagram of the Panel</li> <li>iii. Load Calculation of the Panel</li> <li>iv. ID Card copy of the owner of the installation address</li> <li>v. Property registry copy</li> <li>vi. Letter or Document of Project award to Licensee</li> <li>vii. Transformer and Switchgear documentation for MV Panels</li> </ul> <p>b) The Application mentioned in 2 a) i) will be available online at <a href="http://www.ura.gov.mv">www.ura.gov.mv</a></p> <p>c) The documentation shall be submitted online to <a href="mailto:secretariat@ura.gov.mv">secretariat@ura.gov.mv</a></p> <p>d) Only the owner of the property is permitted to apply</p> <p>e) If a party other than the owner wishes to submit, a Power of Attorney or similar document has to be submitted with clear statement of assigned party and authorities delegated.</p> |
| <b>Modifications</b>          | 3 | <p>a) Previously approved single line diagram and/or load calculation should be submitted along with modifications</p> <p>b) Modifications brought to existing panels shall clearly indicate the change that was brought</p>   |
| <b>Technical Requirements</b> | 4 | <p>a) Over current relay and Earth Leakage relay is required for all panels submitted under this guideline</p> <p>b) The load of the system shall not exceed 80% of the rated capacity of the trip setting of the main incoming breaker</p> <p>c) The busbar of the panel shall be designed to carry at least 125% rated capacity of the main incoming breaker</p> <p>d) Primary turns of the current transformer shall not have a value higher than that of the trip setting of the main incoming breaker</p>   |

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|----------------------------|---|--|
|                            |   | <ul style="list-style-type: none"> <li>e) The panel shall have the function to measure Amps, Voltage and Frequency</li> <li>f) All power sources shall have indicator lights to show incoming and outgoing power</li> <li>g) For Solar PV sources, outgoing indicator lights are not necessary</li> <li>h) In case a changeover switch is used, there shall be an isolator rated not less than the rated value of highest rated breaker of the power sources.</li> <li>i) Changeover switches shall show their default position</li> <li>j) If a generator is used, the usage of the generator shall be measured by a tested revenue grade kWh meter.</li> <li>k) If there are more than one power source, 4 Pole breakers shall be used for all loads that come under the influence of the said source.</li> <li>l) Instances where an extension of the panel is required due to lack of space in the existing panel or otherwise, the busbar should be extended to the auxiliary panel/enclosure</li> <li>m) In instances stated in l), the busbar extension shall have a rating greater or equal to the existing busbar.</li> </ul> |
| <b>Single Line Diagram</b> | 5 | <ul style="list-style-type: none"> <li>a) All writings, symbols and labels in the single line diagram shall be clearly legible</li> <li>b) All pages of the single line diagram shall indicate the page size it is intended for</li> <li>c) All pages of the single line diagram shall indicate the full address of installation</li> <li>d) All pages of the single line diagram shall indicate Name, License Number and Signature of the URA Licensed Power Engineer</li> <li>e) All pages of the single line diagram shall be clearly numbered.</li> <li>f) All feeders shall be clearly named and numbered</li> <li>g) Generator shall be registered and license to operate shall be obtained under Energy Service Operating License Regulation</li> <li>h) Value of the current carrying capacity of the busbar shall be given in standard notation</li> <li>i) Rating of the busbar shall be written in the format [carrying capacity], [busbar arrangement], [voltage], [rated short-circuit current in scientific notation], [material].<br/>Example: 6000A, 3P+N, 400V, 36kA, Copper</li> </ul>                               |
| <b>Load Calculation</b>    | 6 | <ul style="list-style-type: none"> <li>a) All information in the load calculation shall be legible</li> <li>b) Page size for load calculations is ISO A4</li> <li>c) The load calculation shall clearly show parts indicated below</li> <li>d) Feeder               <ul style="list-style-type: none"> <li>i. Feeder Name</li> <li>ii. Feeder Number</li> </ul> </li> </ul>  |

- iii. Power Source
  - iv. Cable Size
  - v. Breaker size
  - vi. Earth fault protection rating
  - e) Load Calculation
    - i. Sequence number
    - ii. Description of load
    - iii. Quantity
    - iv. Power rating
    - v. Load Factor
    - vi. Diversity Factor
    - vii. Power Factor
    - viii. Total Active Power
    - ix. Total Apparent Power
    - x. Total Load in Amps
    - xi. Total Three Phase Load (If 3 Phase Connection)
    - xii. Total Single-Phase Load (If 1 Phase Connection)
  - f) Summary page will be required with all load calculations and the following information shall be available
    - i. Sequence Number
    - ii. Feeder Name
    - iii. Feeder Number
    - iv. Type of connection (Single Phase/Three Phase)
    - v. Single Phase Current
    - vi. Three Phase Current
    - vii. R-Y-B Load Balance
    - viii. Breaker Rating
    - ix. Total Single and Three phase current
    - x. List of Protection equipment used
    - xi. List of Metering Equipment used
    - xii. Cross sectional dimensions of busbar and rating
  - g) All pages of the load calculation shall have the following information
    - i. Full Address of Installation
    - ii. Licensee Name
    - iii. License Number
    - iv. Date
    - v. Page number (Format: Page X of Y)
- Provision of Standby Generator** 7 If the panel has the provision for a generator, then the load catered by the generator shall conform to license conditions permitted under the Energy Service Licensing Regulation.
- Emergency Lighting**
- a) In order to assess the emergency lighting requirement, the lighting floorplan shall be submitted if the panel has the provision for a standby generator
  - b) Escape routes on each floor plan shall be clearly labelled
  - c) The following areas are accepted for emergency lighting
    - i. All exits and emergency exits throughout the building

		<ul style="list-style-type: none"> <li>ii. Stairway</li> <li>iii. Safety signs</li> <li>iv. In place of change in direction and intersections</li> <li>v. Near first aid posts</li> <li>vi. Near firefighting equipment and call points</li> <li>vii. Lifts; Elevators; Escalators and; Motorized walkways</li> <li>viii. Toilet and its facilities</li> <li>ix. Generator room; Panel room; Motor room; Plant room and; Fire engine room</li> <li>x. Motor vehicle parks</li> <li>xi. Security room and Posts</li> </ul>
<b>Emergency Power</b>	<ul style="list-style-type: none"> <li>a) In order to assess the emergency power requirement, the electrical floorplan shall be submitted if the panel has the provision for a standby generator</li> <li>b) The following loads are accepted for emergency power <ul style="list-style-type: none"> <li>i. Medical Equipment</li> <li>ii. Motorized Shutter</li> <li>iii. Water Pump; Fire pump</li> <li>iv. Emergency Lights</li> <li>v. Lifts; Elevators; Escalators and; Motorized walkways</li> <li>vi. Security Systems; CCTV and Alarms</li> <li>vii. Electronically controlled doorways</li> <li>viii. Radio and Communication Devices</li> <li>ix. Freezers and Refrigerators</li> <li>x. Ventilation equipment</li> </ul> </li> </ul>	
<b>Sample Document</b>	8	<ul style="list-style-type: none"> <li>a) Sample document for Single Line Diagram is available at Annex A</li> <li>b) Sample document for Load Calculation is available at Annex B</li> <li>c) Sample document Load Calculation Summary is available at Annex C</li> </ul>
<b>Others</b>	10	<ul style="list-style-type: none"> <li>a) If the design of the panel does not follow this guideline or engineering best practices followed in Maldives, justification shall be provided for it.</li> <li>b) The justification shall include design approach and any applicable standard which corresponds with relevant IEC or BS standard</li> </ul>

## Annex A



Project:	Fabrication and Installation of Sample Project at Sample Venue
Location:	Facility 1, Sample Maqu, Male'
Client:	Utility Regulatory Authority
Engineer:	John Doe 401 10100 0400
Date:	11 November 2022
Page Size:	A3
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## Annex B

Load Calculation  
11 November 2022

Feeder Name/No:		Type	Source:	MDB				Breaker:		
GROUND FLOOR/F1.1		3ph	Cable:	4C x 16 sqmm				Earth Fault:		
#	Description	Qty	Wattage (W)	Total Connected Power (W)	L, F	D, F	P, F	Total Apparent Power (VA)	Total Active Power (W)	Total Load (A)
1	LED Ceiling Lights	26	15	390	1	0.8	0.8	390	312	0.56
2	2.2 x 13A Socket	10	100	1000	1	0.8	0.8	1000	800	1.44
3	9000 BTU AC	4	800	3200	0.8	0.8	0.8	2560	2048	3.7
				0						
		Total		4590					3160	5.7

Feeder Name/No:		Type	Source:	MDB	Breaker:	32A				
1st FLOOR/FL.2		3ph	Cable:	4C X 16 sqmm	Earth Fault:	30mA				
#	Description	Qty	Wattage (W)	Total Connected Power (W)	L, F	D, F	P, F	Total Apparent Power (VA)	Total Active Power (W)	Total Load (A)
1	LED Ceiling Lights	26	15	390	1	0.8	0.8	390	312	0.56
2	2 x 13A Socket	10	100	1000	1	0.8	0.8	1000	800	1.44
3	19000 BTU AC	4	800	3200	0.8	0.8	0.8	2560	2048	3.7
				0						
		Total		4590					3160	5.7

Feeder Name/No:	Type	Source:	MDB	Breaker:	32A					
						2nd FLOOR/F1.3	3ph	Cable:	4C x 16 sqmm	Earth Fault:
#	Description	Qty	Wattage (W)	Total Connected Power (W)	L, F	D, F	P, F	Total Apparent Power (VA)	Total Active Power (W)	Total Load (A)
1	LED Ceiling Lights	26	15	390	1	0.8	0.8	390	312	0.56
2	2 x 13A Socket	10	100	1000	1	0.8	0.8	1000	800	1.44
3	19000 BTU AC	4	800	3200	0.8	0.8	0.8	2560	2048	3.7
				0						
		Total		4590					3160	5.7

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License number: 401 001010 201

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Installed at: Sample Facility, Sample Magu, Male

## Annex C

## Load Summary

11 November 2022

**Site:** Sample Facility  
**Location:** Facility 1, Sample Magu, Male'  
**Client:** Utility Regulatory Authority

Load Summary								
#	Feeder No	Feeder Name	Load 1P (A)	Load 3P (A)	R (A)	Y (A)	B (A)	Protection
1	F1.1	Ground Floor		10	10	10	10	32A - 3P
2	F1.2	1st Floor	10		10			32A - 2P
3	F1.3	2nd Floor	10			10		32A - 2P
4	F1.4	3rd Floor	10				10	32A - 2P
5	F1.5	4th Floor	10		10			32A - 2P
6	F2.1	Ground Floor EDB		10	10	10	10	32A - 3P
7	F2.2	1st Floor EDB	10			10		32A - 2P
8	F2.3	2nd Floor EDB	10				10	32A - 2P
9	F2.4	3rd Floor EDB	10		10			32A - 2P
10	F2.5	4th Floor EDB	10			10		32A - 2P
11	F2.6	5th Floor ELDB	10				10	32A - 2P
		Total	90	20	50	50	50	

Total 3 Ph Load (A)	50
Total Active Power (W)	27,712
Safety Factor	25%
Load (A) with SF	62.5
MCCB Load	63%
Number of Feeders	11
Main Breaker Rating (A)	80
Busbar Dimensions (mm)	20 x 30
Busbar Rating (A)	200
List of Equipment	
MCCB 100 A	1
MCB 32A - 3P	2
MCB 32A - 2P	9
kWh Meter - 3Ph	2
kWh Meter - 1Ph	9

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License number: 401 001010 201

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