

Guideline of Panel Single Line Diagrams and Load Calculation

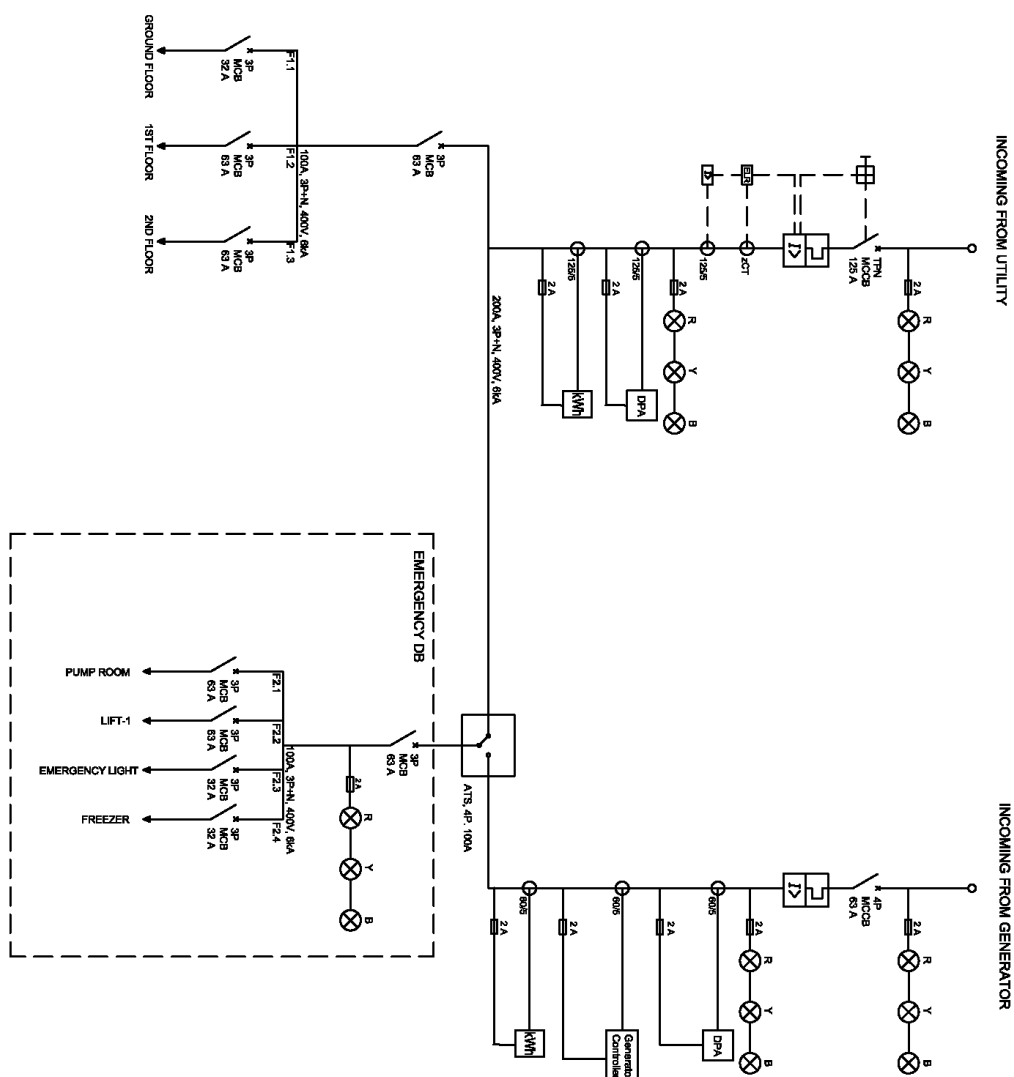
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|------------------------|---|--|
| General Information | 1 | <p>a) This guideline is made under the Energy Act to guide professionals regarding Electric Distribution Panel and Load calculations</p> <p>b) All electric distribution panels installed in buildings/facilities with main incomer rating equal to or above 63 Amps will be approved by the Utility Regulatory Authority according to this guideline</p> |
| Modifications | 2 | Modifications brought to existing panels shall clearly indicate the change that was brought |
| Technical Requirements | 3 | <p>a) Over current relay and Earth Leakage relay is required for all panels approved 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> <p>e) The panel shall have the function to measure Amps, Voltage and Frequency</p> <p>f) The panel shall have indicator lights to show incoming and outgoing power</p> <p>g) In case there is a changeover switch, ATS, AMF or similar switches, there shall be an isolator between the transfer switch and load</p> <p>h) The changeover switch, ATS, AMF or similar switches shall be rated 125% of the common isolator</p> <p>i) Changeover switch, ATS, AMF or similar switches shall show their default position</p> <p>j) If a generator is used, the usage of the generator shall be measured by a tested revenue grade kWh meter.</p> <p>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.</p> |

- Single Line Diagram 4
- a) All writings, symbols and labels in the single line diagram shall be clearly legible
 - b) All pages of the single line diagram shall indicate the page size it is intended for
 - c) All pages of the single line diagram shall indicate the address of installation
 - d) All pages of the single line diagram shall indicate Name, License Number and Signature of the URA Licensed Power Engineer
 - e) All pages of the single line diagram shall be clearly numbered.
 - f) All feeders shall be clearly named and numbered
 - g) Generator shall be connected to feeders to cater the load allowed by the Generation Distribution and Supply license.
 - h) Value of the current carrying capacity of the busbar shall be given in standard notation
 - i) Rating of the busbar shall be written in the format [carrying capacity], [busbar arrangement], [voltage], [rated short-circuit current in scientific notation].
Example: 6000A, 3P+N, 400V, 36kA
 - j) The single line diagram shall occupy 75% of the free space available on the page on either axis.
 - k) The font used for text shall be a minimum of 3 mm in height
 - l) Font height between labels and annotations shall not vary by more than 50%
 - m) If multiple sources of energy are being used, the synchronization controller shall be shown
- Load Calculation 5
- a) All information in the load calculation shall be legible
 - b) Page size for load calculations is ISO A4
 - c) The load calculation shall clearly show parts indicated below
 - d) Feeder
 - i. Feeder Name
 - ii. Feeder Number
 - 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 dimension 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 6 If the panel has the provision for a generator, then the load catered by the generator shall conform to loads allowed by regulation 2015/R-143
- Emergency Lighting 7
- 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
 - ii. Stairway
 - iii. Safety signs
 - iv. In place of change in direction and intersections
 - v. Near first aid posts
 - vi. Near firefighting equipment and call points

			<ul style="list-style-type: none">vii. Lifts; Elevators; Escalators and; Motorized walkwaysviii. Toilet and its facilitiesix. Generator room; Panel room; Motor room; Plant room and; Fire engine roomx. Motor vehicle parksxi. Security room and Posts
Emergency Power	8	<ul style="list-style-type: none">a) In order to assess the emergency power requirement, the electrical floorplan shall be submitted if the panel has the provision for a standby generatorb) The following loads are accepted for emergency power<ul style="list-style-type: none">i. Medical Equipmentii. Motorized Shutteriii. Water Pump; Fire pumpiv. Emergency Lightsv. Lifts; Elevators; Escalators and; Motorized walkwaysvi. Security Systems; CCTV and Alarmsvii. Electronically controlled doorwaysviii. Radio and Communication Devicesix. Freezers and Refrigeratorsx. Ventilation equipment	
Sample Document	9	<ul style="list-style-type: none">a) Sample document for Single Line Diagram is available at Annex Ab) Sample document for Load Calculation is available at Annex Bc) Sample document Load Calculation Summary is available at Annex C	
Others	10	<ul style="list-style-type: none">a) If the design of the panel does not follow this guideline or engineering best practices followed in Maldives, justification shall be provided for itb) The justification shall include design approach and any applicable standard which corresponds with relevant IEC or BS standard	

Annex A



Project:	Fabrication and Installation of Sample Project at Sample Venue
Location:	Facility 1, Sample Magu, Male'
Client:	Utility Regulatory Authority
Engineer:	John Doe 401.10100 0400
Date:	11 November 2022
Page Size:	A3
Page:	1 of 1

Utility Regulatory Authority
Handhuvaree Hingun, Maafannu, Male', 20392,
Male', Republic of Maldives.

Installed at: Sample Facility, Sample Magu, Male

Feeder Name/No:	Type	Source:		MDB			Breaker:		Earth Fault:	
		Cable:	4C x 16 sqmm	L F	D F	P F	32A	30mA		
2nd FLOOR/F1.3	3ph									
#	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	12 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						
				4590					3160	5.7

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

John Doe
License number: 401 001010 201

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