Efficienergi Consulting Private Limited.
Summary of Key Risk Factors Observed on Usage of Aluminium Cables
International Copper Association India

Summary of key risk factors observed on usage of Aluminium cables at various commercial buildings :

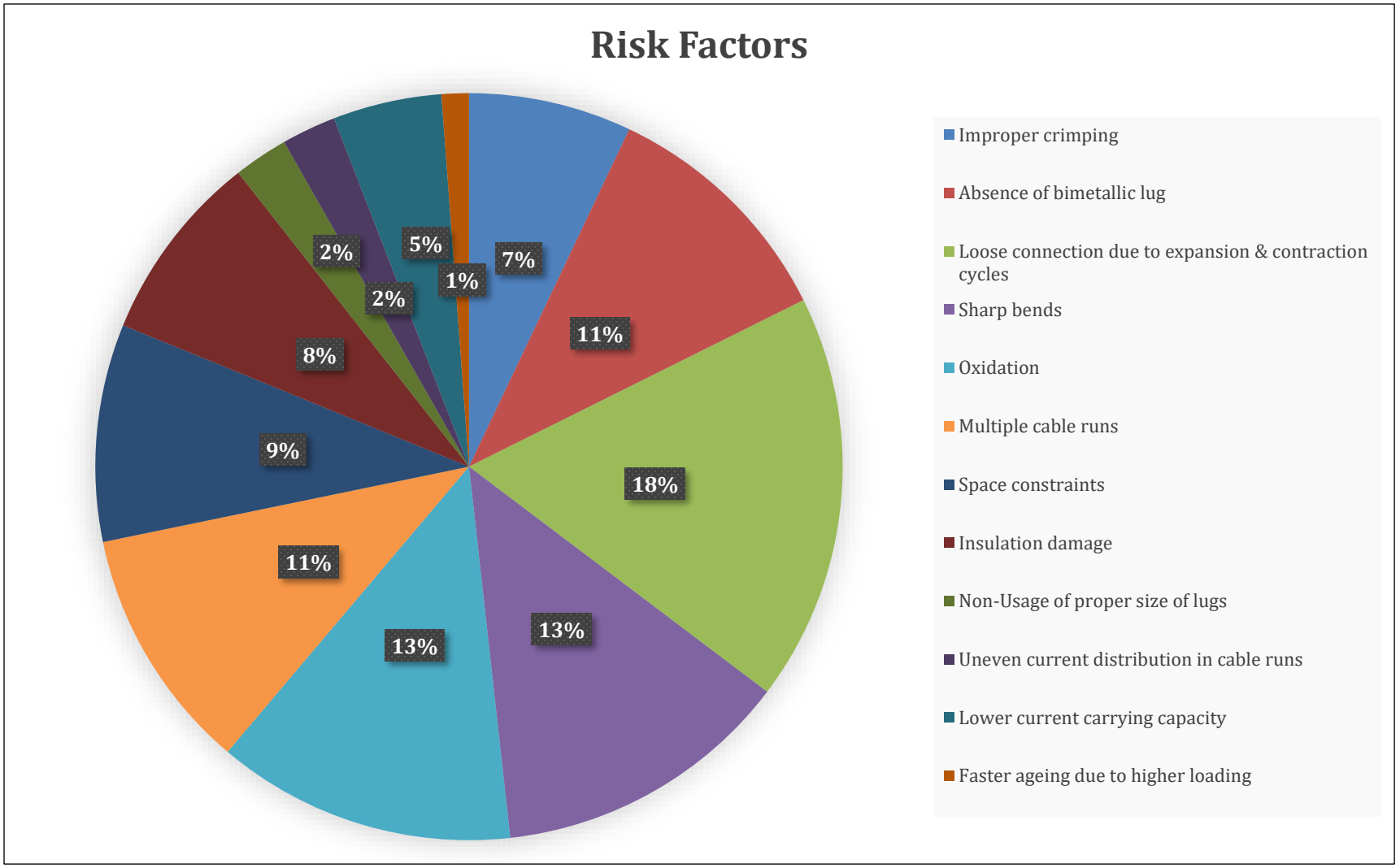
1. Aluminium Conductor breakage during testing/active pull test.
2. Insulation damage over a period of time - brittleness, cracking and subsequently clearance decreases and hence chance of overheating and short circuit.
3. Absence of bimetallic lugs causing overheating and oxidation
4. Due to sharp bending radius stress on the terminations and subsequent overheating or chances of insulation damage
5. Addition of future load capacity becomes limited due to lesser conductivity and ageing
6. Loading capacity on support structure and cable trays increases due to equivalent Aluminium conductor usage.
7. Due to increased lug size of Al conductors, the termination clearances get affected on MCCB/ACB/MCB/Isolator/SFU terminals (E.g. absence of lugs and difficulty of termination of multi-strand conductors on fuse box terminations)
8. Installation of multiple cable runs causes uneven heating as well as load unbalance.
9. Non-Usage of bimetallic lugs with MCCB terminals (of Copper) causes even higher rated aluminium conductors to experience hotspots
10. Due to compulsion of using multi-run cables because of Aluminium's Lower current carrying capacity of Al conductor and further uneven current distribution in these runs most likely due to unequal contact resistances and impedances, localised hotspots are created which are hard to resolve. Further this is a major O&M Issue due to unavailability of space to rectify/replace cables/lug/tightening etc.
11. Expansion and contraction cycles in Aluminium have greater impact compared to use of copper (due to lower coefficient of thermal expansion of Copper). Overtime these cycles can loosen connections. If normal inspections of these connections are not performed and loose connections are not tightened there is an increased risk of fire from arcing

12. Aluminium is susceptible to oxidation. This occurs when it comes into contact with moisture and dissimilar metals. The oxidation increases resistance in the connection. With too much built up resistance the wire can heat up and possibly melt surrounding insulation which could trigger a fire.

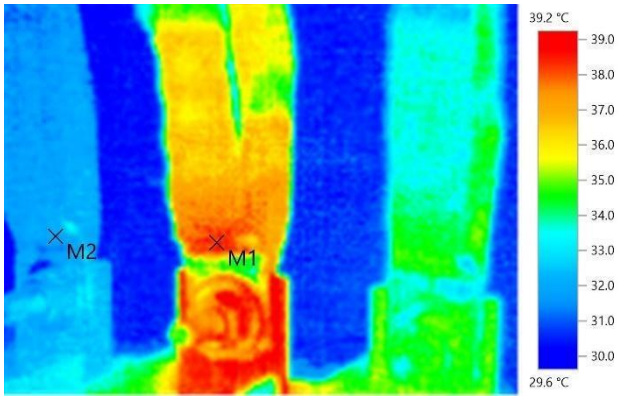
Short Summary of the Report:

Type of Facilities	No of Locations	No. of locations where Al Cables Referred	No. of locations where Cu Cables Referred	Average Temp. of Al Cable (^{0}C)	Max Hotspot Temp. of Al Cable (^{0}C)	Approx. Age of Installation
Data Center	22	22	06	65	102	Approximately 1 to 7 Years
IT sector	17	17	00	51	84	Approximately 6 to 10 Years
Hotel	10	10	00	43	111	Approximately 10 to 12 Years
Manufacturing Plant	02	02	00	38	77	Approximately 8 to 10 Years

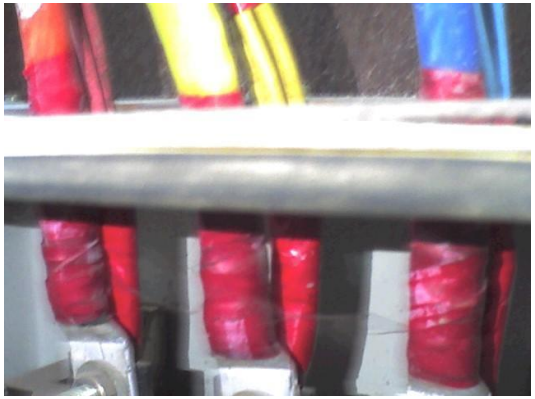
Pie Chart representing various Risk factors:



Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
A Wing 7th Floor Electrical Panel Area	Typical Floor Panel	Main Incomer-125A MCCB TPN	MCCB	125.00	95.00	Al	2	13.5	11.7	8.8	3.7	14950	29	39	31



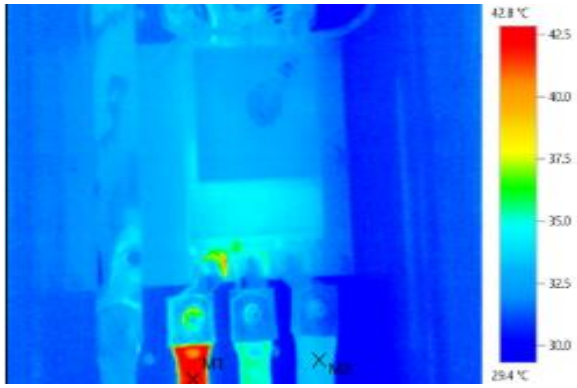
Thermal Image



Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Multiple cable runs & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
3rd Floor Electrical Room B1	TX23 Riser Tap Off box	Incomer	-	630.00	300.00	Al	1	392	395	381	0	1609	27	43	33

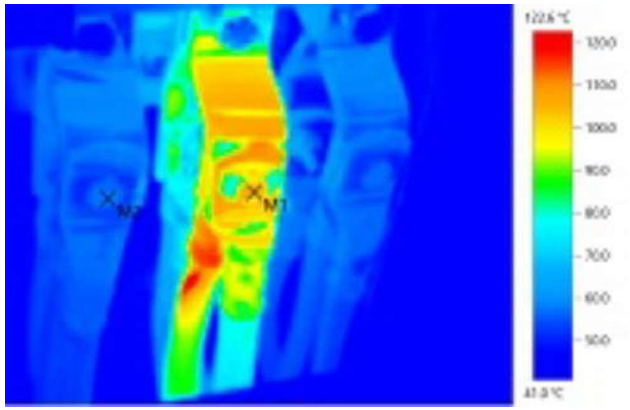


Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 4 to 5 Years
- **Risk Factor:** Absence of bimetallic lugs with MCCB Spreader Link (of Copper) & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
Terrace	Chiller Incomer	Chiller 4 incomer (at chiller end)	MCCB	.00	300.00	Al	4	2	593	552	608	26552	34	115	55

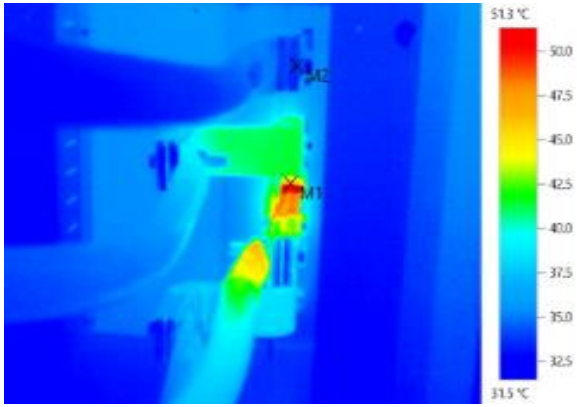


Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Uneven current distribution in the cable runs, Oxidation, Loose connection due to expansion & contraction cycles & Space constraints

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
3rd Floor Electrical Room B1	UPS PANEL3F B11	PDU B2	-	630.00	300.00	Al	1	89	108	88	3	1553	27	48	38

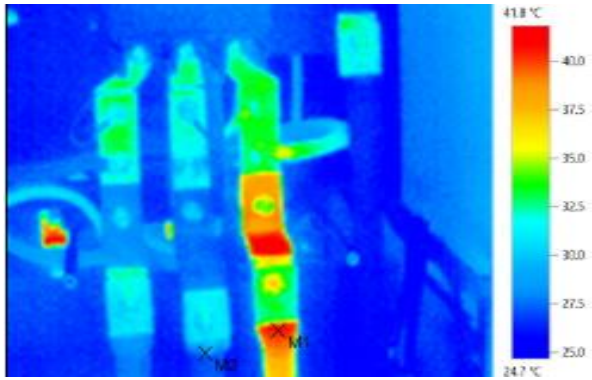


Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 4 to 5 Years
- **Risk Factor:** Loose connection due to expansion & contraction cycles & Sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
3RD FLOOR SERVER HALL	250 KVA-PDU-3F-A14	MAIN INCOMER	-	630.00	300.00	Al	1	169	80.44	139.60	88.74	14621	29	41	30

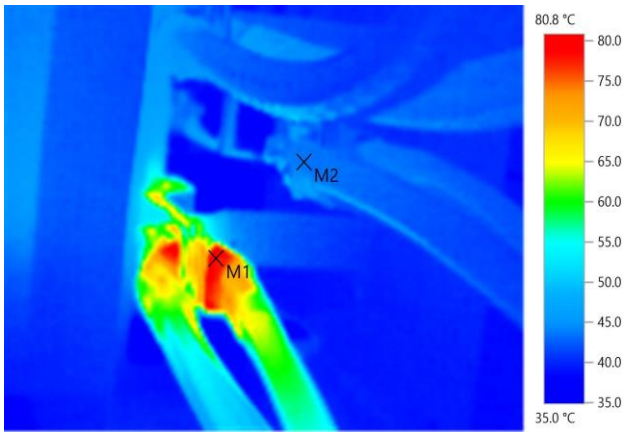


Thermal Image

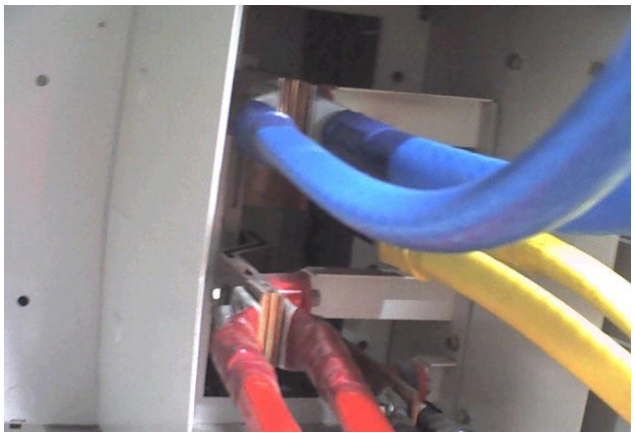
Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 4 to 5 Years
- **Risk Factor:** Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
Electrical Room-1	LT PANEL-11	CHILLER-1	MCCB	800.00	300.00	Al	2	197	208	204	0	30534	26	80	44



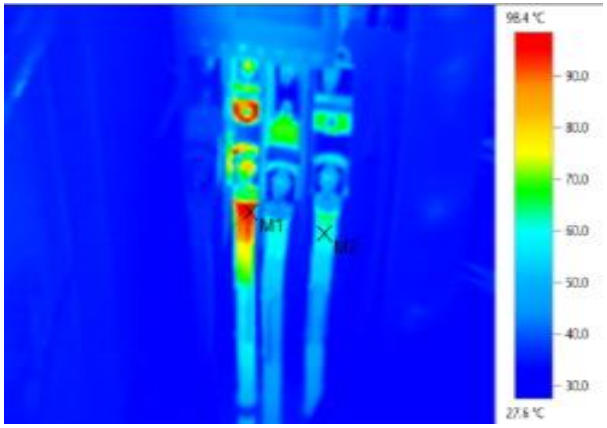
Thermal Image



Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles, Oxidation & Space constraints

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
5F Data Hall	PDU B2	Main Incomer	-	630.00	300.00	Al	1	338	335	338	0	12316	32	99	49

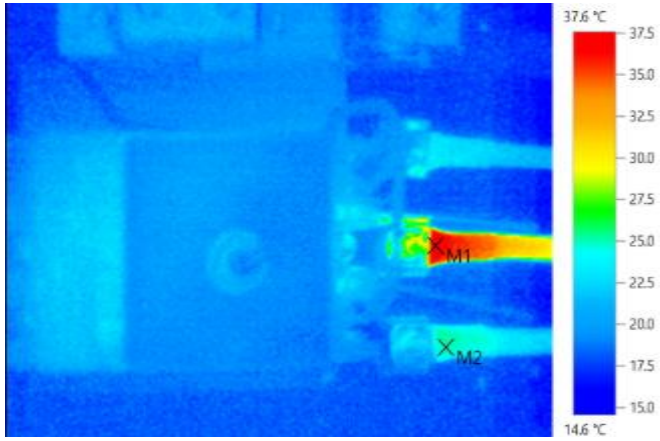


Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 4 to 5 Years
- **Risk Factor:** Loose connection due to expansion & contraction cycles & faster ageing due to higher loading

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
1st Floor Electrical Room	UPS OUTPUT PANEL-1F	UPS DB-1 Mains	-	400.00	120	Al	1	108	130	120	9.00	5670	16	37	25

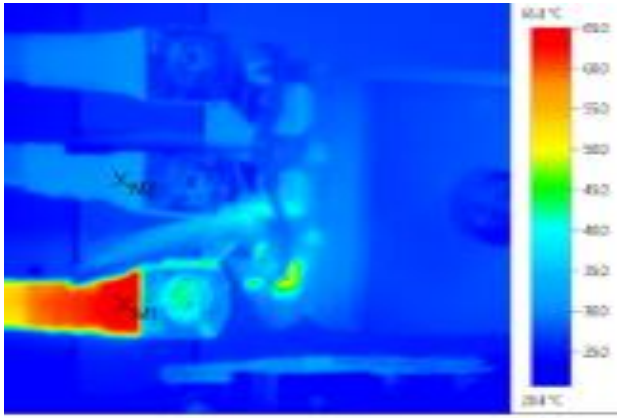


Thermal Image

Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factor:** Absence of bimetallic lugs with MCCB Spreader Link (of Copper)

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
5TH FLOOR A2 ELECTRICAL ROOM	UPS OUTPUT PANEL-5F-A2	PDU A2-5	-	630	300	Al	1	112	107	111	0.21	1909	30	65	31

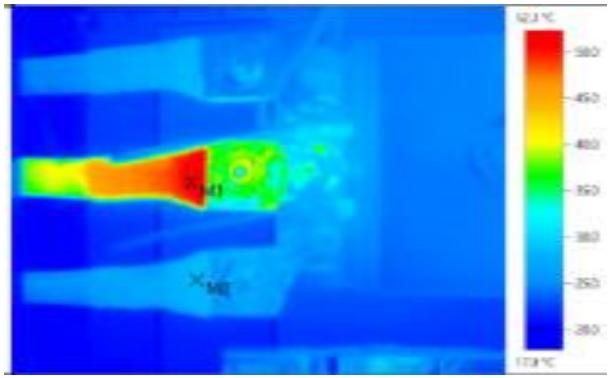


Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 2 to 3 Years
- **Risk Factors:** Improper crimping & Absence of bimetallic lugs with MCCB Spreader Link (of Copper)

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
5TH FLOOR A2 ELECTRICAL ROOM	UPS OUTPUT PANEL-5F-A2	PDU A2-6	-	630	300	Al	1	117	107	90	0.68	1911	20	51	27

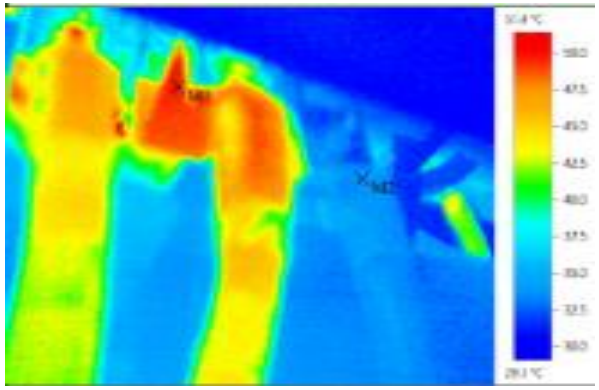


Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 2 to 3 Years
- **Risk Factors:** Improper crimping & Absence of bimetallic lugs with MCCB Spreader Link (of Copper)

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
5TH FLOOR POD-1	PDU	Input MCCB I/C	-	600	300	Al	1	121	160	145	0	5293	25	49	34



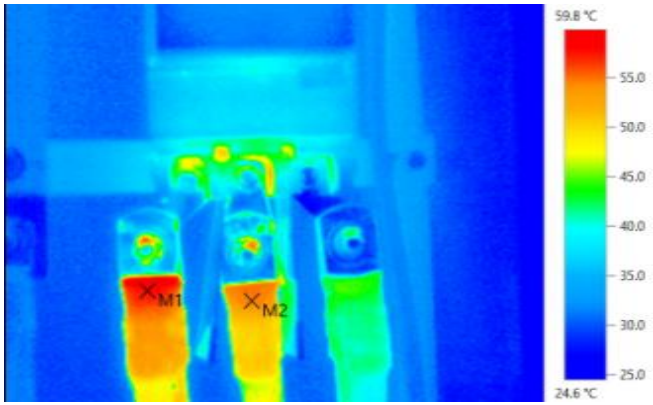
Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 6 to 7 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles

Note: In the above thermal image one can clearly observe that the temperature of Nyvin copper cable (nearly 42^0C) is lesser than Aluminium cable even though both the cables have same current carrying capacity and carry the same current.

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
2nd floor A1 Electrical Room	Pac Panel -A1	Near Lighting & Power panel	-	630	300	Al	2	252	254	240	18.00	5740	17	59	43

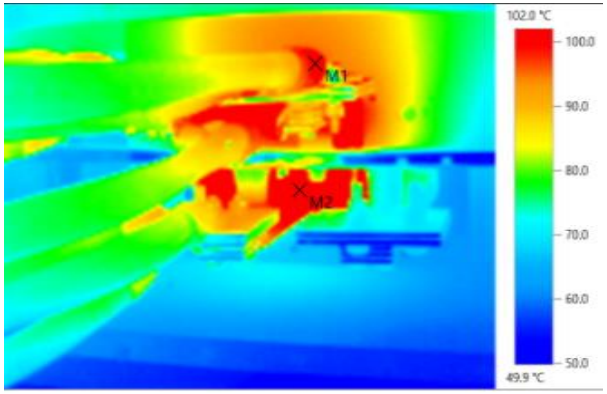


Thermal Image

Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 10 Years
- **Risk Factors:** Absence of bimetallic lug & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
Terrace	CHILLER PANEL-4A	CHILLER -13)	-	1000	300	Al	3	NA	NA	NA	NA	16189	37	102	65

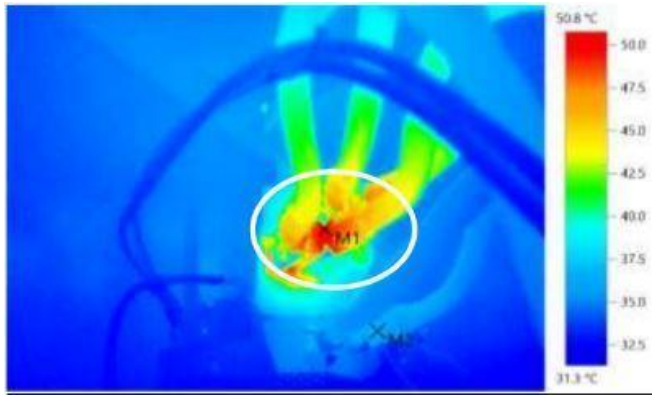


Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 6 to 7 Years
- **Risk Factors:** Multiple Cable runs & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
LT Room	Main LT Panel	AC Plant TNP-A Cable Chamber	-	400	240	Al	2	132	124	136	6	5839	26	50	36

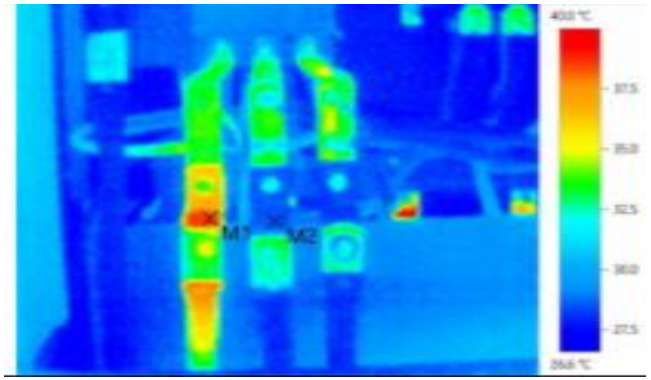


Thermal Image

Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Lower current carrying capacity, Loose connection due to expansion & contraction cycles & Space constraints

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image 1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
5TH FLOOR SERVER HALL	250KVA-PSD-5F-A12	MAIN INCOMER	-	630	300	Al	1	78.10	29.76	101.29	63.64	16292	30	41	28



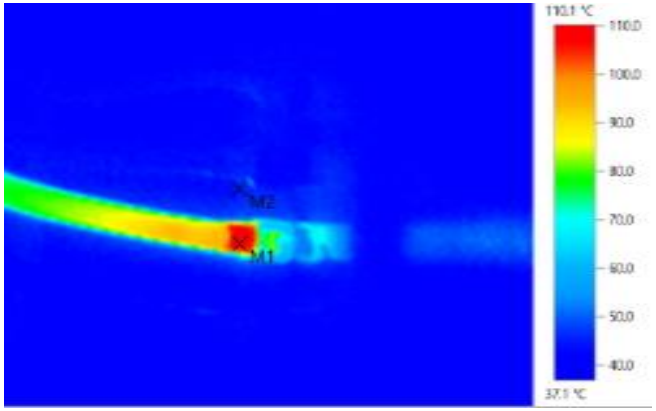
Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 5 to 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles

Note: It can be clearly seen in the image that the copper cables, which have same current rating as Aluminium cables, carry equal amount of current and manage to remain free from any hotspots, while the aluminium conductor has a hotspot.

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
D1 LV	MCC Panel (Section 3)	Sec Pump zone A	-	200	120	Al	1	35	37	37	0	170	31	111	43

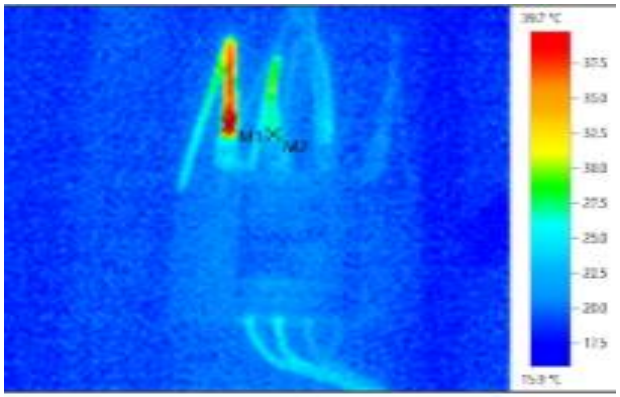


Thermal Image

Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Insulation damage & Oxidation

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
Ground Floor PAC Room	PAC	PAC-1	-	63	25	Al	1	39.60	39.70	26.50	12.30	8594	14	38	25

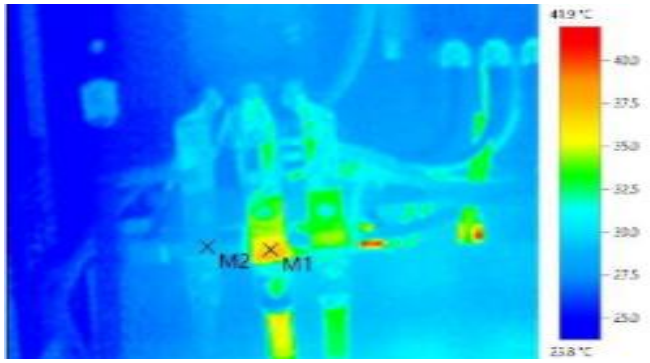


Thermal Image

Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles, Insulation damage & Sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Amper e)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
2nd Floor Server Hall	250KVA-PDU-2F-A11	MAIN INCOMER	-	630	300	-	1	189	146	115	36	16461	24	37	29



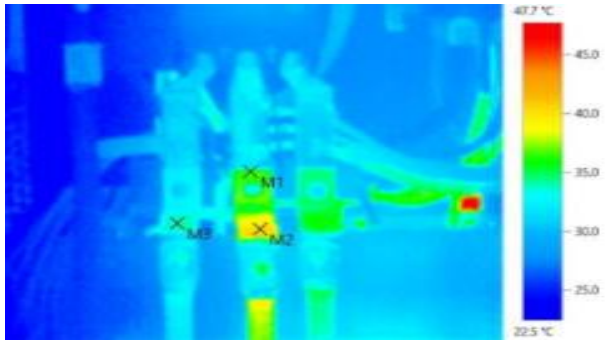
Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 5 to 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles

Note: It can be clearly seen in the image that the copper cables, which have same current rating as Aluminium cables, carry equal amount of current and manage to remain free from any hotspots, while the aluminium conductor has a hotspot.

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
2nd Floor Server Hall	250 KVA-PDU-2F-A1	MAIN INCOMER	-	630	300	-	1	123	132	107	25	16421	24	40	33



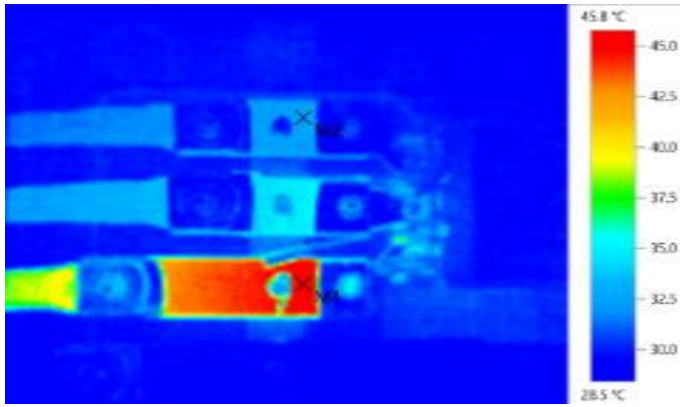
Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 1 to 2 Years
- **Risk Factors:** Improper crimping & Loose connection due to expansion & contraction cycles

Note: It can be clearly seen in the image that the copper cables, which have same current rating as Aluminium cables, carry equal amount of current and manage to remain free from any hotspots, while the aluminium conductor has a hotspot.

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
1st Floor Electrical Room A1	UPSON 1FA11	PDU1	-	630	300	Al	1	156	154	141	0	13881	25	46	32

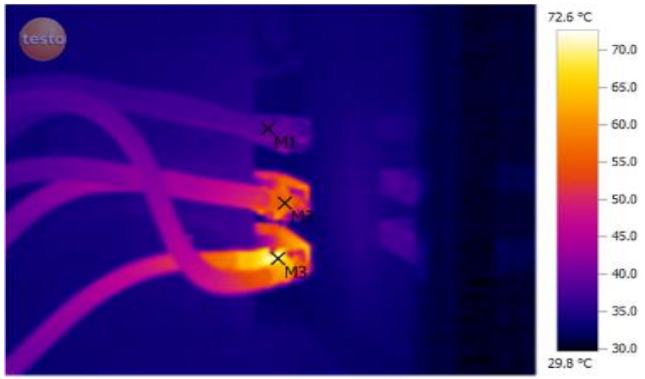


Thermal Image

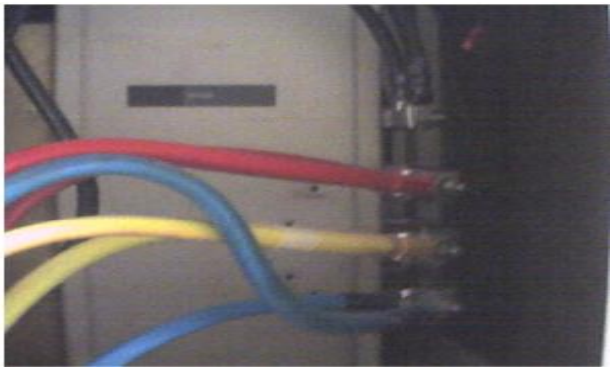
Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Insulation damage & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
GR. Floor	Cooling Tower	Main LT Panel	-	300	120	Al	2	NA	NA	NA	NA	6227	30	72	56



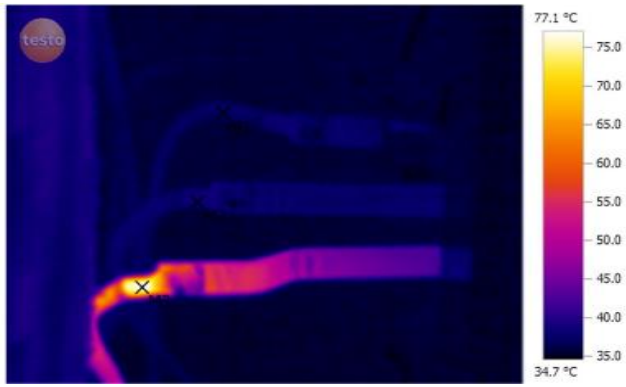
Thermal Image



Visual Image

- **Type of Facility:** Manufacturing Plant
- **Age of Facility:** Approx 8 to 10 Years
- **Risk Factors:** Uneven current distribution in Cable runs and sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
Electrical Room	D-26 Business center	Main LT Panel	-	250	70	Al	1	NA	NA	NA	NA	6363	30	77	38

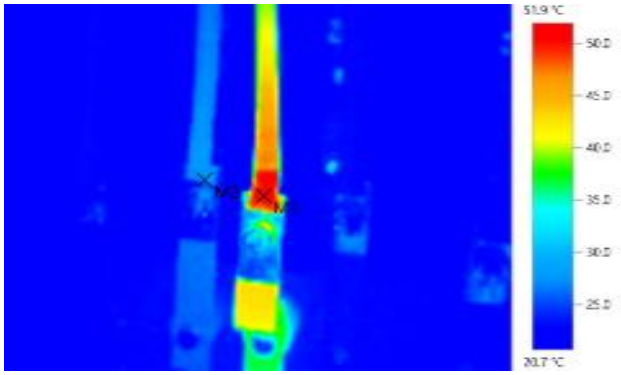


Thermal Image

Visual Image

- **Type of Facility:** Manufacturing Plant
- **Age of Facility:** Approx 8 to 10 Years
- **Risk Factors:** Insulation damage, Oxidation and sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/ Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
4TH FlOOR S/W ELECTRICAL & UPS ROOM	CRITICAL PANEL	ATS-1 (SOURCE -1) I/P	FROM FL. S/W OFFICE	160	70	Al	1	26.30	26.50	26.70	0.30	12045	21	52	25

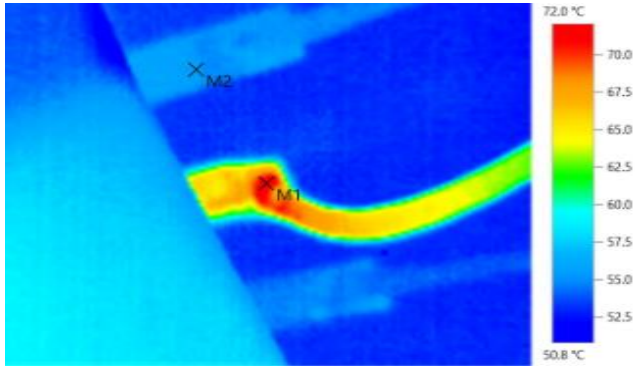


Thermal Image

Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 2 Years
- **Risk Factors:** Improper crimping & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
TERRACE	8TH FLOOR SYSTEM-3	MAIN INCOMER	-	100	35	Al	1	15.30	14.00	15.90	1.30	11987	42	72	46

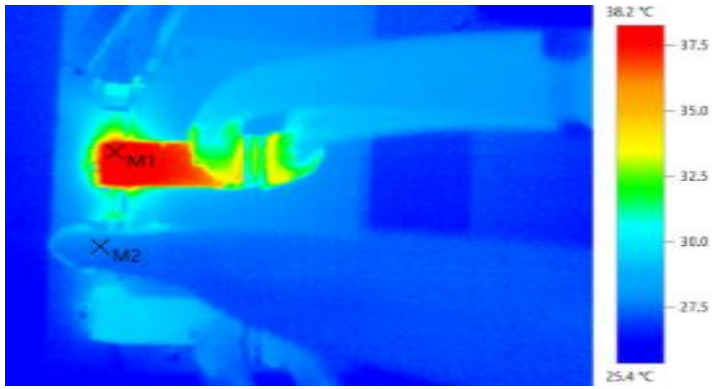


Thermal Image

Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 2 Years
- **Risk Factors:** Improper crimping, Loose connection due to expansion & contraction cycles and Sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Amper e)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
2nd floor Electrical Room A1	Main Power Panel (MPP- 1F-A1)	CRAC Panel-1A	-	630	300	Al	2	126	116	106	19.0	3450	24	37	29

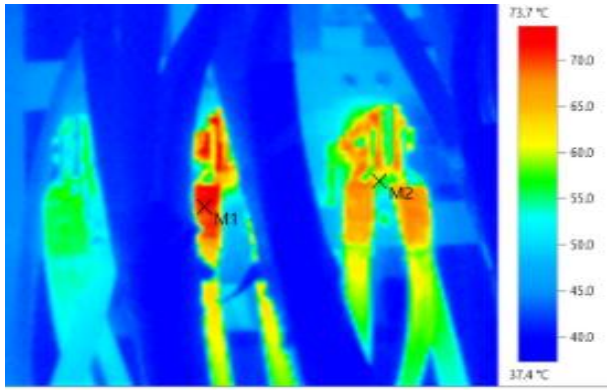


Thermal Image

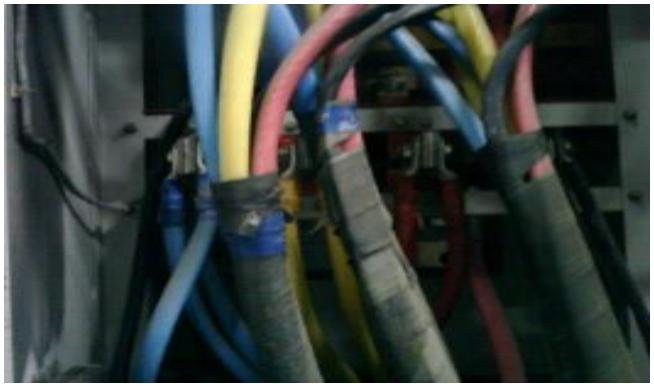
Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 4 to 5 Years
- **Risk Factors:** Multiple cable runs, Loose connection due to expansion and contraction cycles in Aluminium & Space constraints

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Amper e)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
Main LT Panel-1	Main LT Panel-1	400 KVAR capacitor panel	-	800	240	Al	3	NA	NA	NA	NA	127	33	74	54



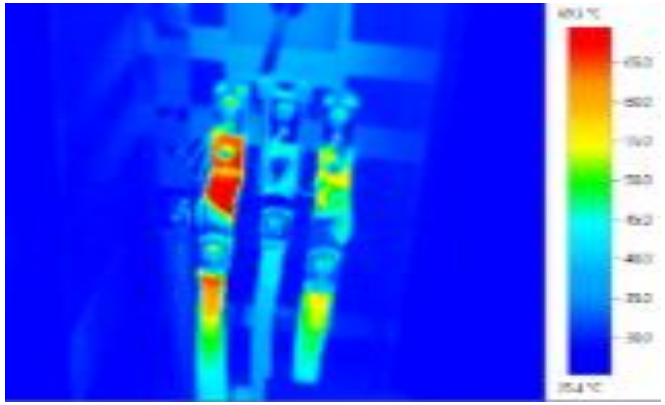
Thermal Image



Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Multiple Cable runs, Lower current carrying capacity of Al conductor & Space constraints

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
4TH FLOOR A1 ELECTRICAL	PAC PANEL-4F-A1	INCOMER	-	630	240	Al	1	288.0	285.50	287.0	3.19	22858	25	69	42

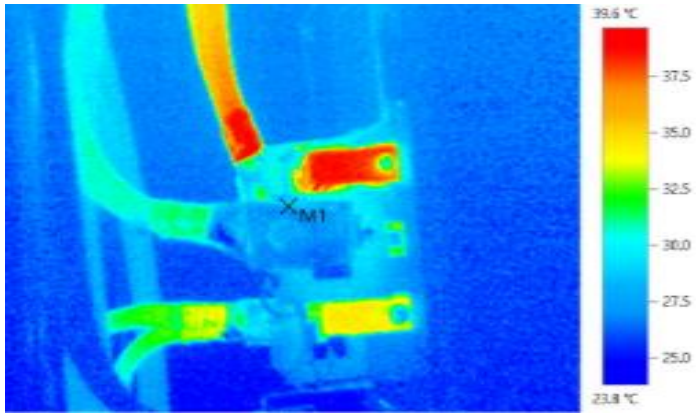


Thermal Image

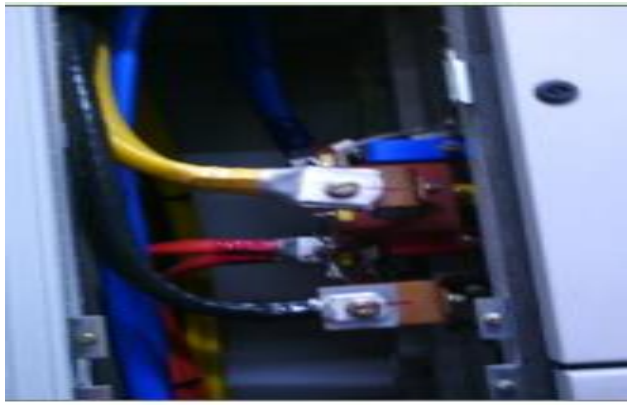
Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 1 to 2 Years
- **Risk Factors:** Improper crimping and Loose connection due to expansion and contraction cycles in Aluminium

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
1st FLOOR B1 ELECTRICAL	FLOOR POWER PANEL-1F-B1	INCOMER-1	-	630	300	Al	2	223.50	254.20	253.90	10.19	1133	25	69	42



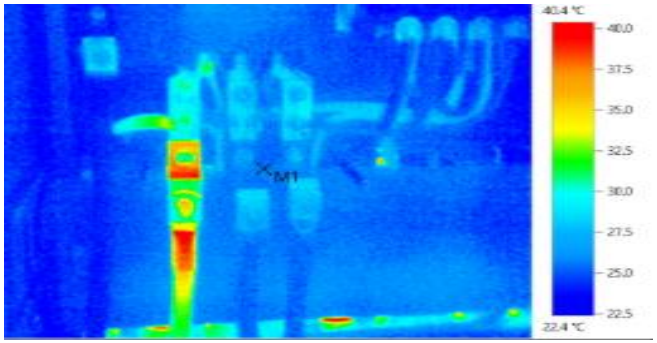
Thermal Image



Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Multiple Cable runs & Sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
1st FLOOR Server Hall	250 KVA-PDU-1F-A4	MAIN INCOMER INCOMING		630	300	Al	2	121.40	117.60	122.90	0.19	1168	23	40	26



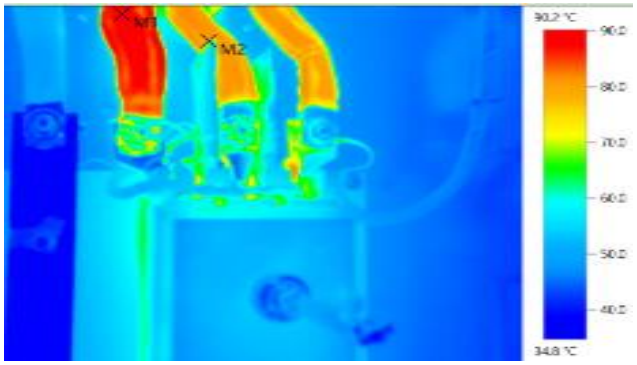
Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 1 to 2 Years
- **Risk Factors:** Improper crimping & Loose connection due to expansion & contraction cycles

Note: It can be clearly seen in the image that the copper cables, which have same current rating as Aluminium cables, carry equal amount of current and manage to remain free from any hotspots, while the aluminium conductor has a hotspot.

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
3rd Floor Room A1	TX11 Riser Tap Off Box	Incoming		630	300	Al	1	392	395	381	0.10	1544	30	90	71

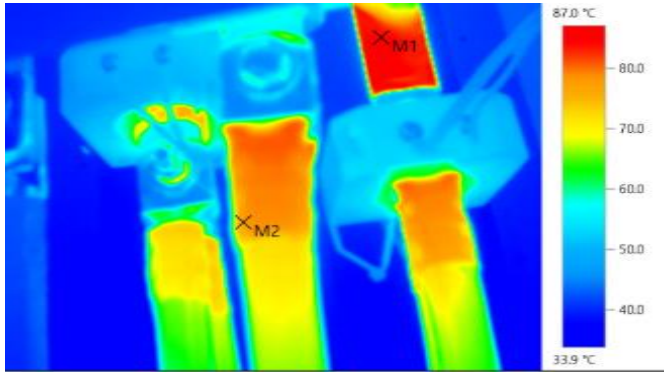


Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 5 to 6 Years
- **Risk Factors:** Absence of bimetallic lug & sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
3rd FLOOR Electrical Room A1	FPP 3F A11	ER INCOMING		630	300	Al	2	384	409	412	27	1529	30	80	70

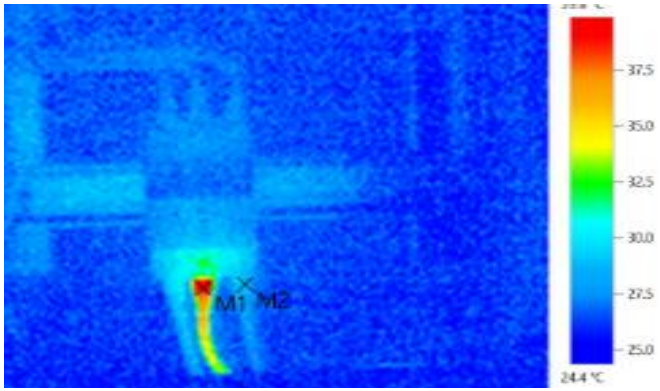


Thermal Image

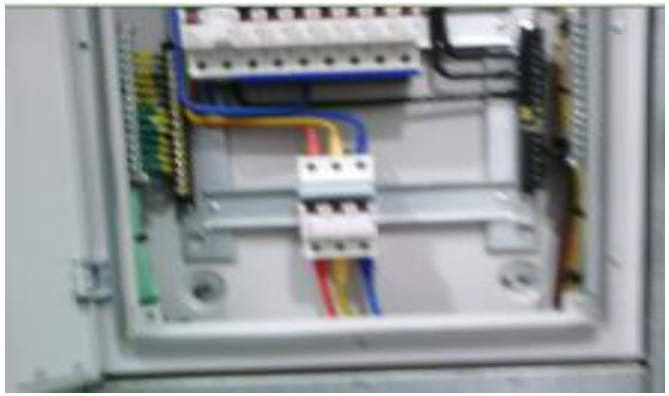
Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 1 to 2 Years
- **Risk Factors:** Uneven current distribution in cable runs & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
S/E DBS	LOCATION-2 S/E DBS (3RD FLOOR)	LDB-2		32	16	Al	1	4.75	5.20	4.74	1.78	19400	24	40	28



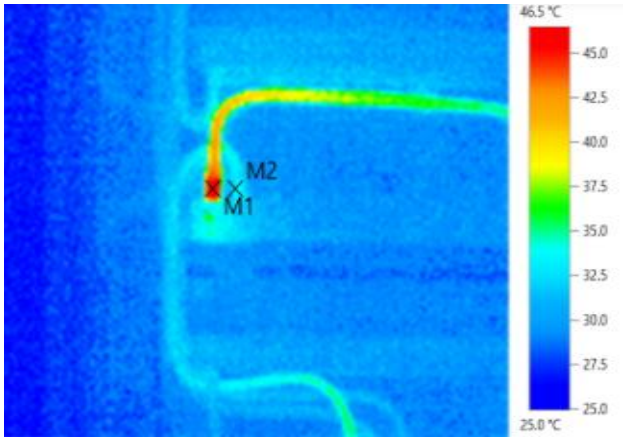
Thermal Image



Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
S/E DBS	LOCATION-4 N/E DBS (4TH FLOOR) LDB-4 (B-Phase	OUTGOING Mains)		40	16	Al	1	4.31	5.40	4.97	3.40	19385	24	40	28

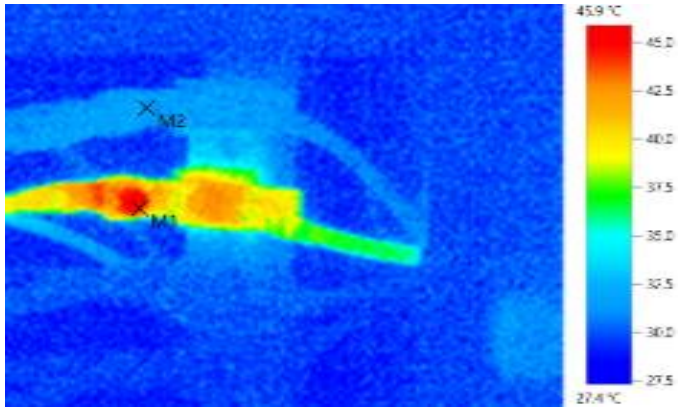


Thermal Image

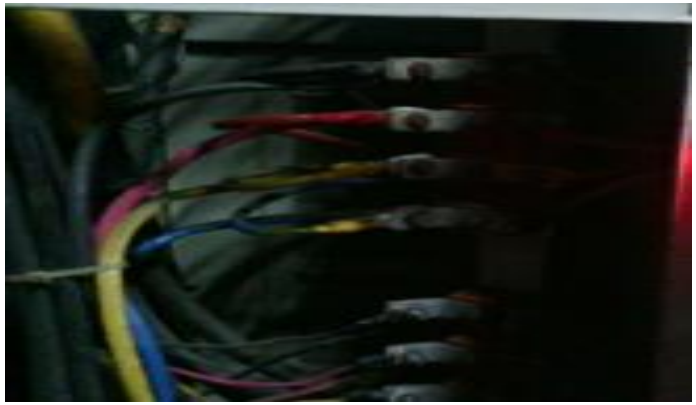
Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles & Sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
PCC -2 Lower Ground	LOWER GROUND FLOOR PANEL-2	JET DB-4 CABLE CHAMBER		100	25	Al	1					7746	28	46	32



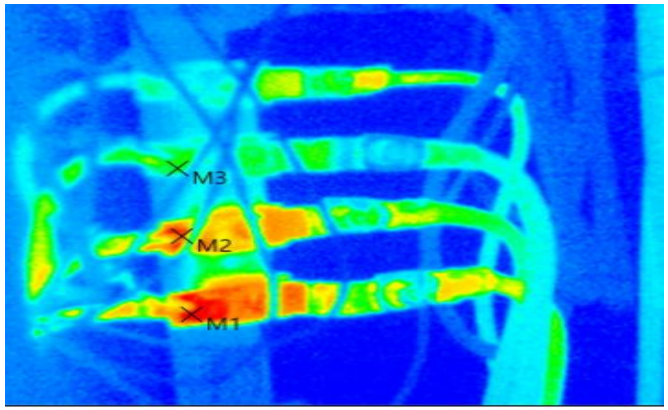
Thermal Image



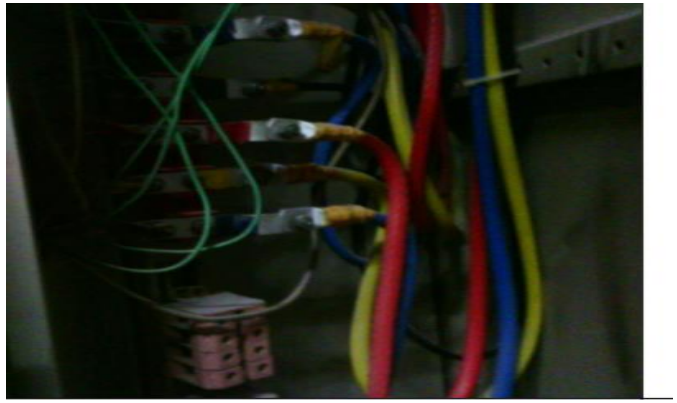
Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Insulation damage, Oxidation & Sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
PCC -2 Lower Ground	PANEL NO-12	F-31 CABLE CHAMBER		160	70	Al	1	75.40	54.00	75.00	12.40	18096	28	57	37



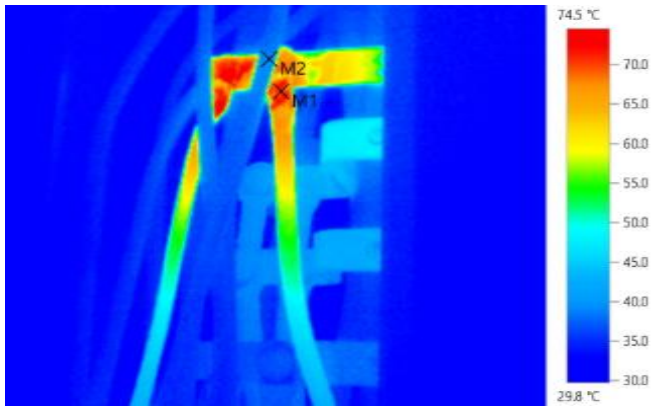
Thermal Image



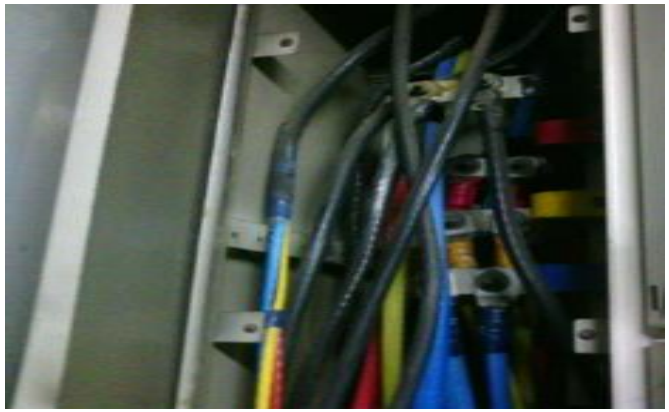
Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Oxidation, Sharp bends & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
PCC -2 Lower Ground	DBs	Inverter DB 3		63	16	Al	1	5.40	3.00	3.50	12.40	18096	28	57	37



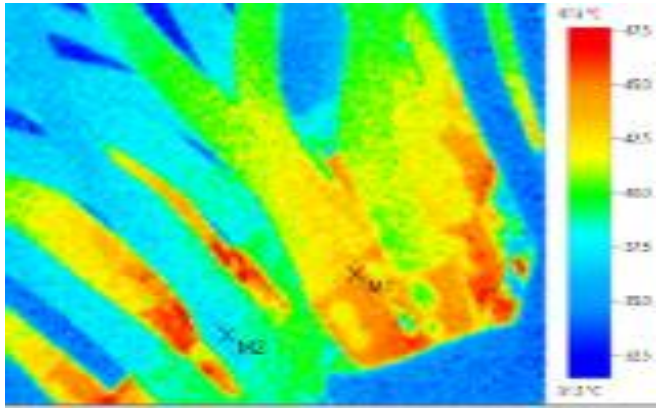
Thermal Image



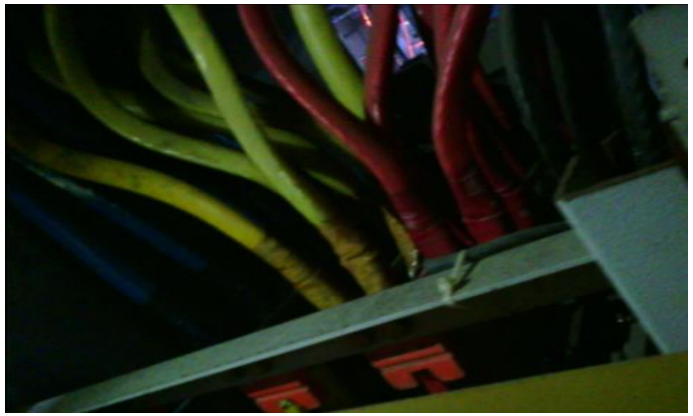
Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Oxidation & Space constraints

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
Plant Room (BASEMENT)	TRANE CHILLER ACB	MAIN INCOMER-		2000	300	Al	7	78	70	74	0.00	7649	29	44	37



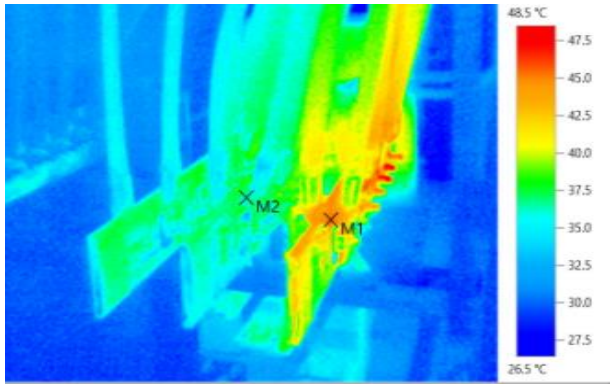
Thermal Image



Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Lower current carrying capacity & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
PCC-1 ROOM	TR-4 MAIN PANEL	O/G SUPPLY	CHILLER INCOMER SIDE	1600	300	Al	7	72	75	76	33.00	17822	26	46	36



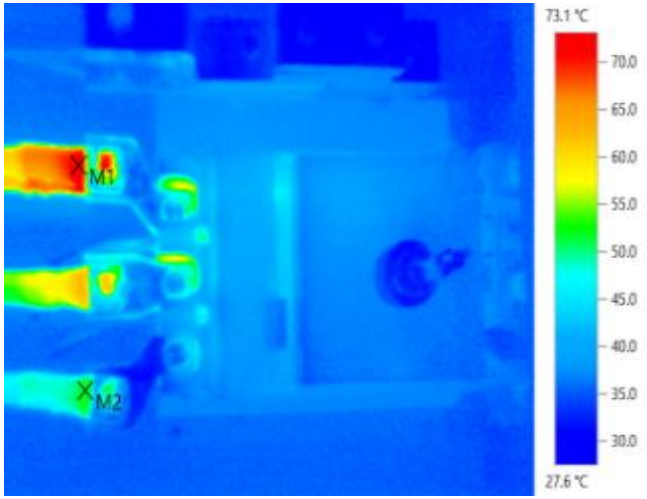
Thermal Image

Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Lower current carrying capacity, Loose connection due to expansion & contraction cycles & Space constraints

Note: It can be observed that even though there are multiple cable runs & lower currents in those cables, they are attaining high temperatures.

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
2nd Floor Electrical Room A2	UPS Output Panel A2-2F-A2	To PDU A8		630	120	Al	2	120	148	136	3.40	5768	20	74	51

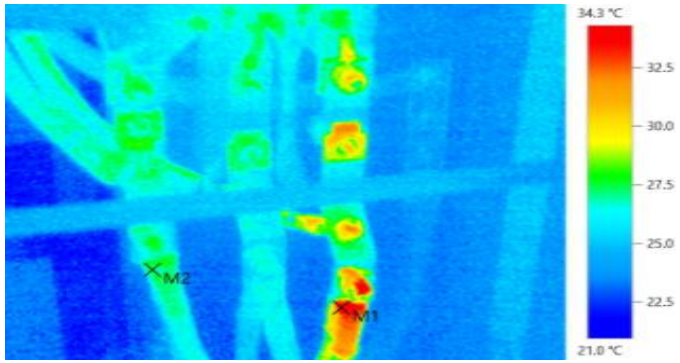


Thermal Image

Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Oxidation, Absence of bimetallic lug & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
2nd Floor POD 2	PDU A2 - 4/8	Input MCCB Incoming		600	120	Al	2	103	119	87	0.50	5923	23	35	27



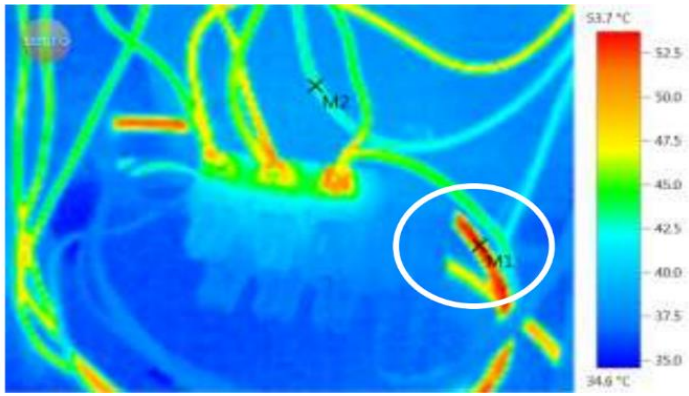
Thermal Image

Visual Image

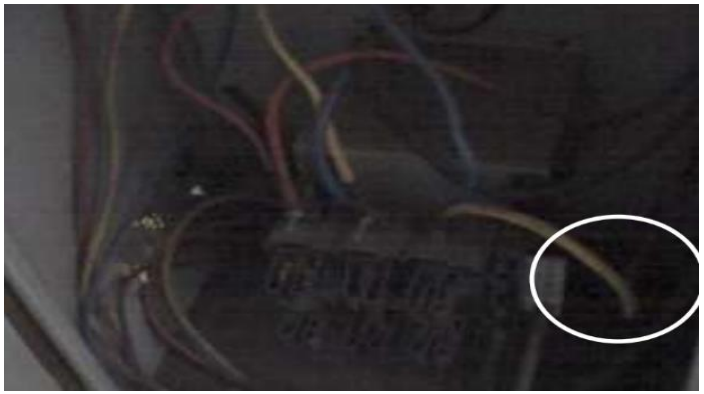
- **Type of Facility:** Data Center
- **Age of Facility:** Approx 5 to 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles

Note: It can be clearly seen in the image that the copper cables, which have same current rating as Aluminium cables, carry equal amount of current and manage to remain free from any hotspots, while the aluminium conductor has a hotspot.

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
AC PLANT ROOM	VFD PANEL FOR COOLING TOWER	VFD PANEL	FOR COOLING TOWER -02	100	25	Al	1	35	36	35	0	13009	35	54	43



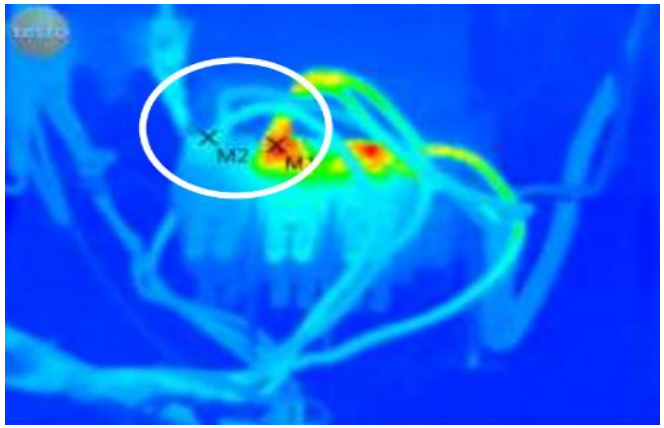
Thermal Image



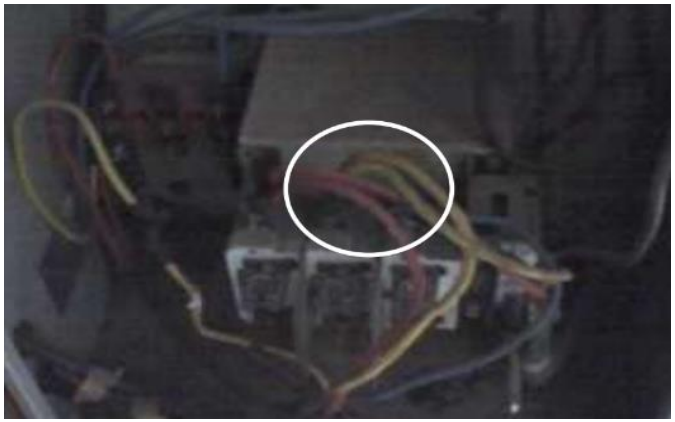
Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Multiple cable runs, Non-Usage of proper size of lugs with fuse box terminals & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
AC PLANT ROOM	VFD PANEL FOR COOLING TOWER	VFD PANEL FOR	COOLING TOWER -01	70	25	Al	1	32	30	32	0	13008	35	77	52



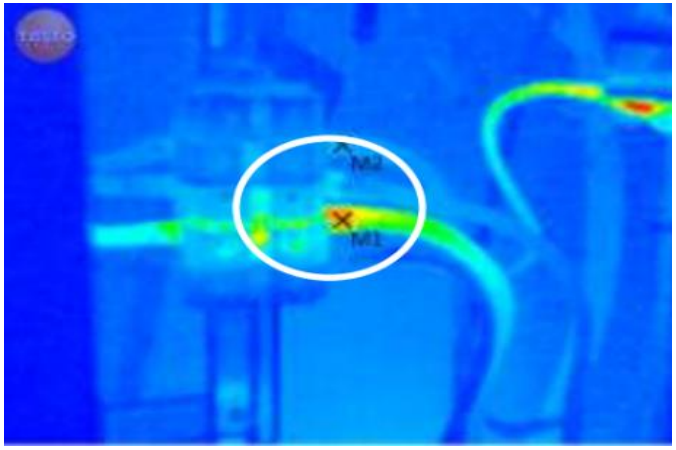
Thermal Image



Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Multiple cable runs, Non-Usage of proper size of lugs with fuse box terminals & Insulation damage

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
CAR PARKING	MDB-B7 PANEL	TYPE-HL+PDB-B7-1		63	25	Al	1	11	10	6	0	13160	26	44	32

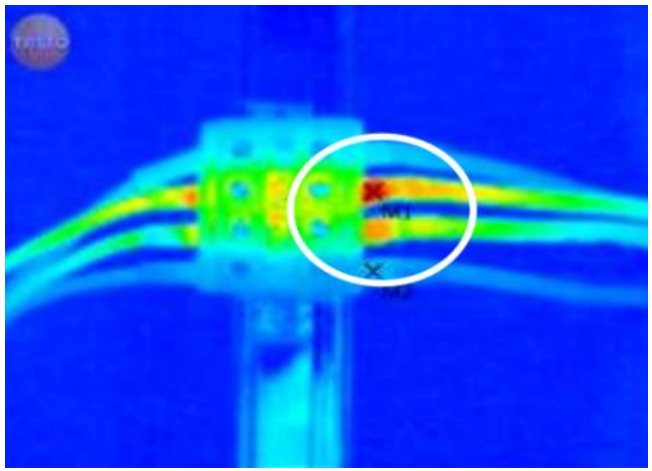


Thermal Image

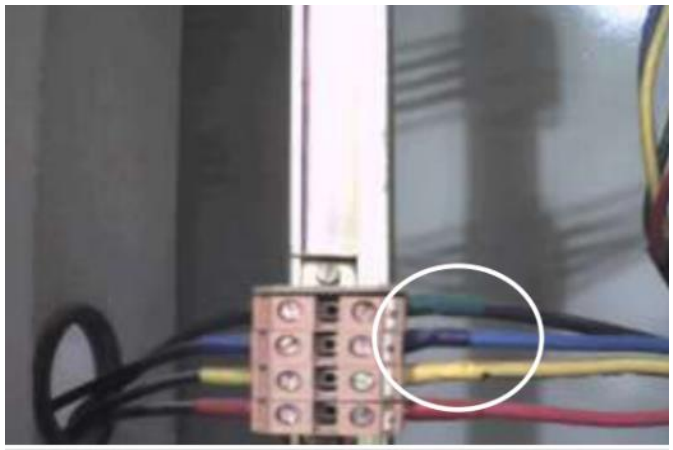
Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Oxidation & Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
FMB OFFICE INSIDE	SDB-BL-6.1 VENTILATION PANEL	AHU-16 MEETING RM-6	CABLE CHAMBER	20	16	Al	1	0	0	0	0	13878	23	46	30



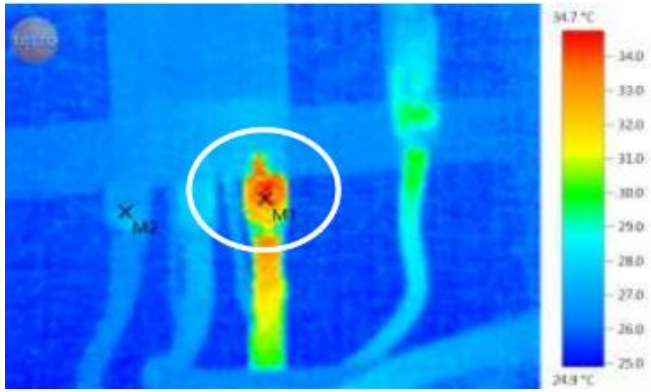
Thermal Image



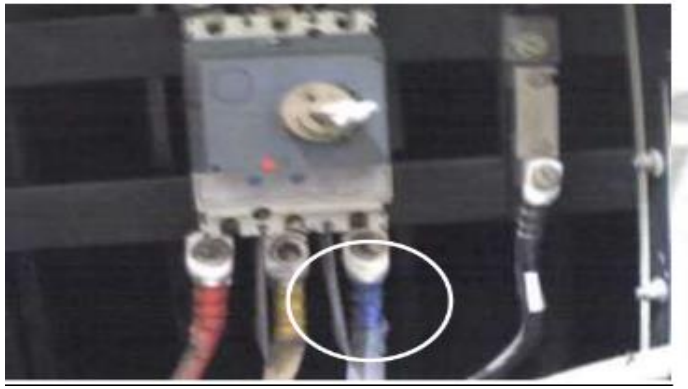
Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
LEVEL 2 TOWER -5B	ELECTRICAL ROOM	MDB RM 2.2 B TAPUP BOX		250	120	Al	1	4.9	1.7	2.9	3.4	14721	28	34	27



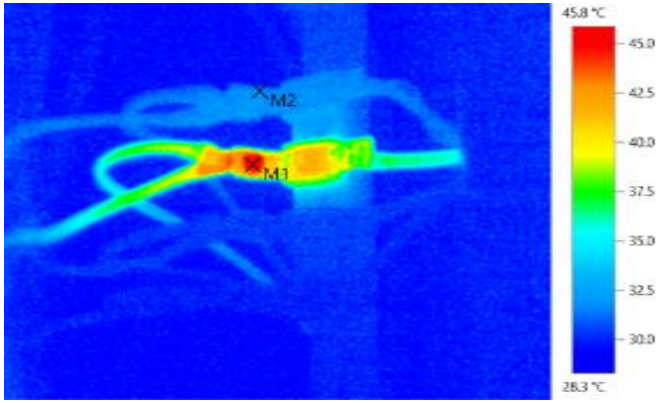
Thermal Image



Visual Image

- **Type of Facility:** Hotel
- **Age of Facility:** Approx 10 to 12 Years
- **Risk Factors:** Absence of bimetallic lug, Loose connection due to expansion & contraction cycles & Insulation damage

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
PCC-2 LOWER GROUND	LOWER GROUND FLOOR PANEL-3	JET DB-7 CABLE CHAMBER		100	25	Al	2	7.60	0.30	1.40	6.80	18101	28	46	30

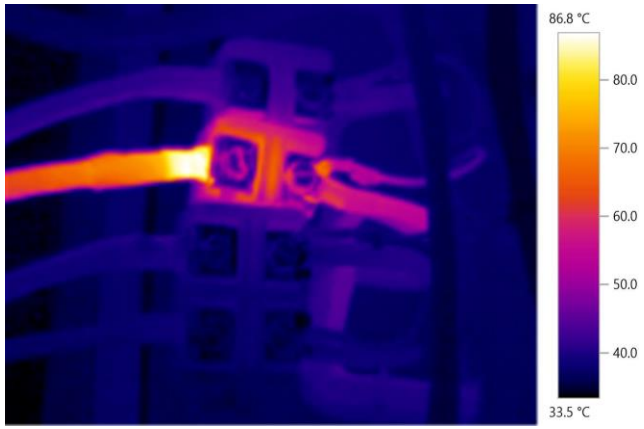


Thermal Image

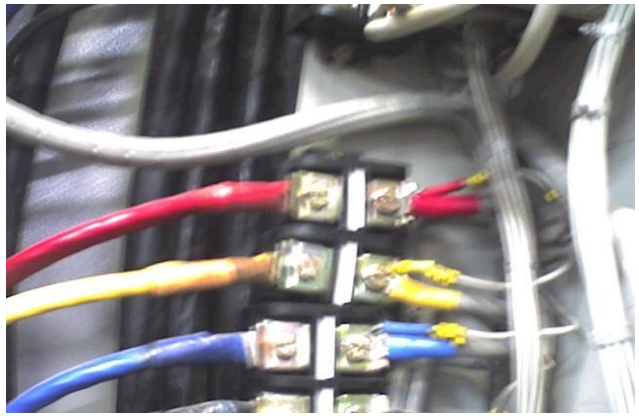
Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Multiple cable runs, Loose connection due to expansion & contraction cycles & Sharp bends

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
1ST Floor Electrical Room	LVL-1 MSB Panel	PAC Unit-3 cable chamber	MCCB	63.00	35.00	Al	1	NA	NA	NA	NA	33448	28	86	42



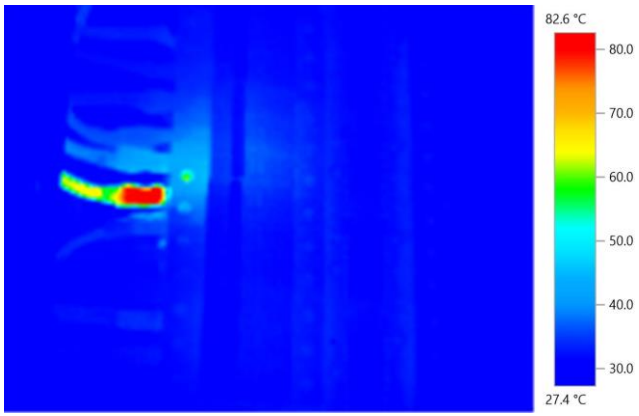
Thermal Image



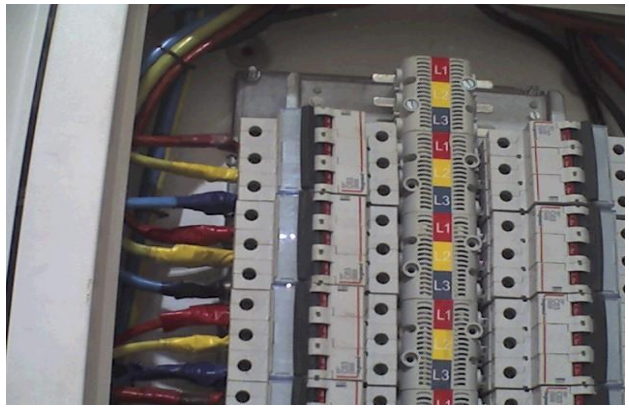
Visual Image

- **Type of Facility:** IT Sector
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles & Space constraints

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
Changing Room Area	VTPN	Main Incomer	MCCB	100.00	120.00	Al	1	1.0	1.0	1.0	8.50	32718	25	81	38



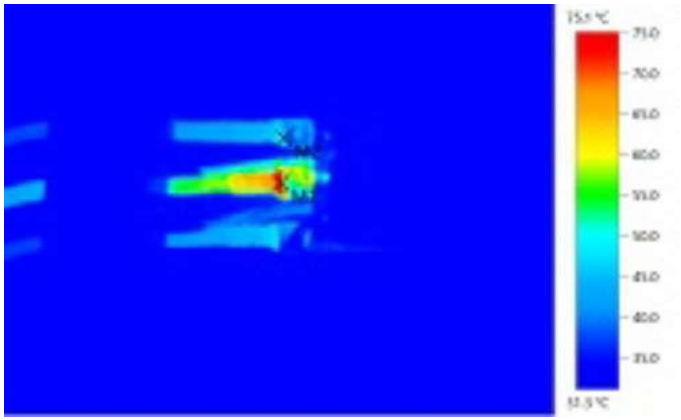
Thermal Image



Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Loose connection due to expansion & contraction cycles & Oxidation

Location Name	Panel Name	Feeder Name	Tech Name of Object	Object Rated Capacity (Ampere)	Conductor Area (Busbar/Cable) (sqmm)	Conductor Material	Conductor Nos of Runs per Phase	Measured Load-R (A)	Measured Load-Y (A)	Measured Load-B (A)	Measured Load-N (A)	Thermal Image1	(T1) Ambient Temperature (°C)	(T2) Hotspot Temperature (°C)	(T3) Reference Temperature (°C) of the same object
GROUND FLOOR	Floor Power Panel	Water & Sewerage Pump Panel (BM)	MCCB	160.00	**95.00**	Al	1	28	21	28	0.8	24999	30	70	44



Thermal Image

Visual Image

- **Type of Facility:** Data Center
- **Age of Facility:** Approx 6 Years
- **Risk Factors:** Absence of bimetallic lugs & Loose connection due to expansion & contraction cycles & Oxidation