
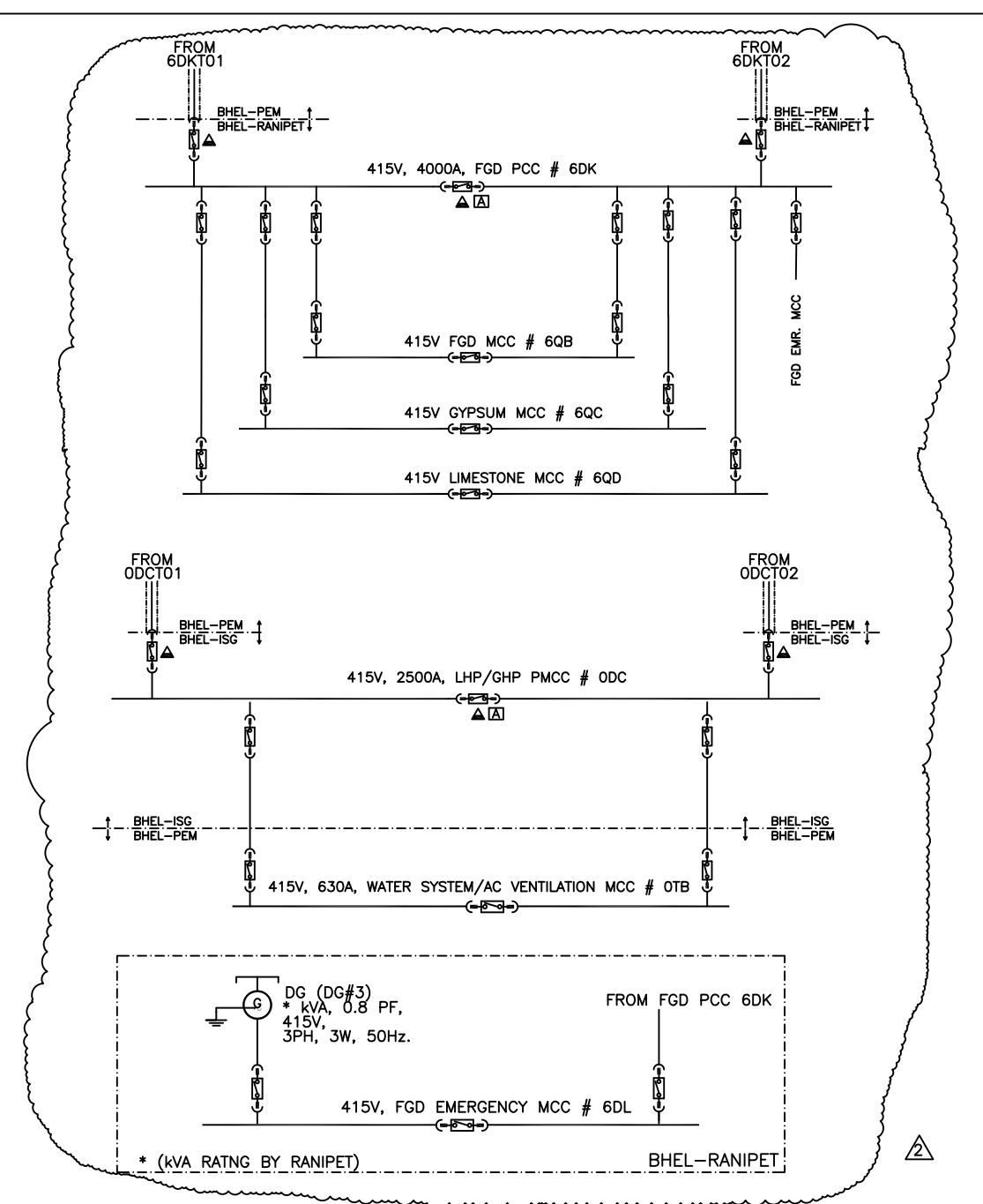
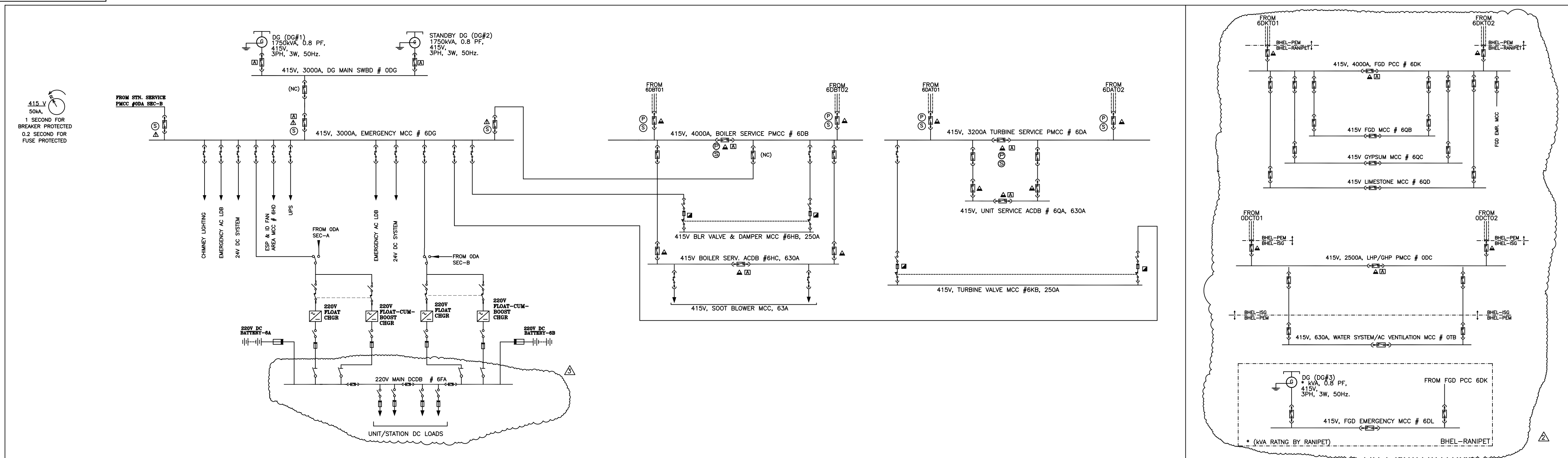
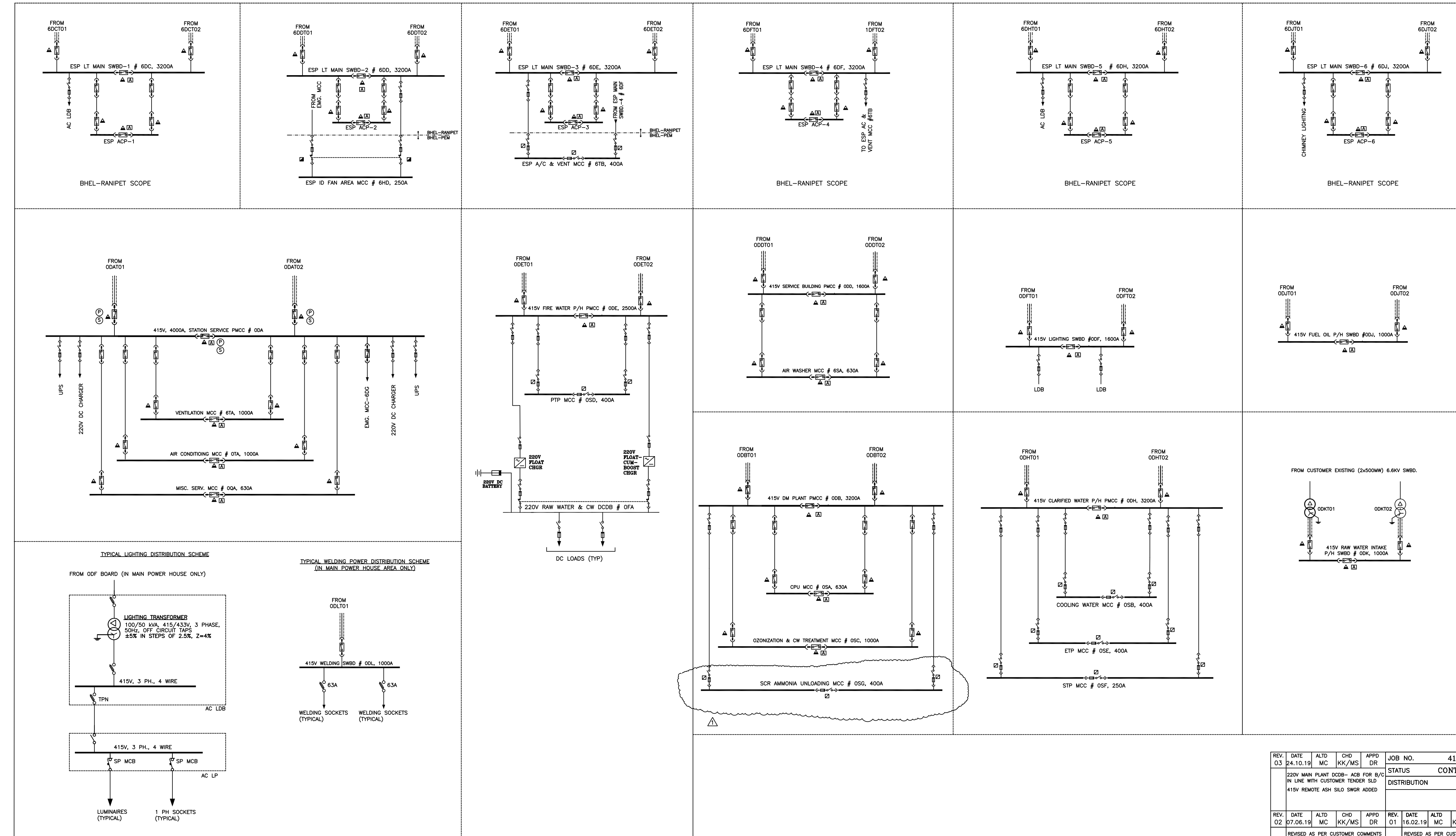


					SIGN		Drawing No. PE-DG-415-565-E	
							SHEET 1 OF 2	REV. 03



S. NO.	BOARD DESCRIPTION	LOCATION
1.	415V TURBINE SERVICE PMCC # 6DA	LV SWITCHGEAR ROOM 12.0MTR
2.	415V STATION SERVICE PMCC # 00A	LV SWITCHGEAR ROOM 12.0MTR
3.	415V TURBINE VALVE MCC # 6KB	LV SWITCHGEAR ROOM 12.0MTR
4.	415V UNIT SERVICE ACDB # 6QA	SWITCHGEAR ROOM 3.5MTR
5.	415V EMERGENCY MCC # 6DG	LV SWITCHGEAR ROOM 12.0MTR
6.	220V MAIN DCDB # 6FA	LV SWITCHGEAR ROOM 12.0MTR
7.	415V MISC. SERVICE MCC # 0QA	SWITCHGEAR ROOM 3.5MTR
8.	415V LIGHTING SWBD # 0DF	LV SWITCHGEAR ROOM 12.0MTR
9.	415V BOILER SERVICE PMCC # 6DB	BOILER MCC ROOM 27.5MTR
10.	415V BOILER VALVE & DAMPER MCC # 6HB	BOILER MCC ROOM 27.5MTR
11.	415V BOILER SERVICE ACDB # 6HC	BOILER MCC ROOM 27.5MTR
12.	415V SOOT BLOWER MCC	BOILER MCC ROOM 27.5MTR
13.	415V VENTILATION MCC # 6TA	BOILER MCC ROOM 27.5MTR
14.	415V WELDING SWBD # 0DL	BOILER MCC ROOM 27.5MTR
15.	415V DG MAIN SWBD # 0DG	DG BUILDING
16.	415V AIR CONDITIONING MCC # 0TA	SWITCHGEAR ROOM 3.5MTR
17.	415V AIR WASHER MCC # 6SA	SWITCHGEAR ROOM 3.5MTR
18.	415V SERVICE BLDG PMCC # 00D	LV SWITCHGEAR ROOM 12.0MTR
19.	415V ESP LT MAIN SWBD # 6DC/6DD/6DE/6DF/6DH/6DJ	ESP CONTROL ROOM
20.	415V ESP ACP-1/2/3/4/5/6	ESP CONTROL ROOM
21.	415V ESP AC & VENT MCC # 6TB 415V ESP ID FAN AREA MCC # 6HD	ESP CONTROL ROOM
22.	415V FIRE WATER P/H PMCC # 0DE 220V RAW WATER & CW DCDB # 0FA	RAW WATER P/H
23.	415V DM PLANT PMCC # 0DB	DM PLANT
24.	415V CLARIFIED WATER P/H PMCC # 0DH	CLARIFIED WATER P/H
25.	415V FUEL OIL SWBD # 0DJ	NEAR FUEL OIL PRESSURIZING P/H
26.	415V RAW WATER INTAKE P/H SWBD # 0DK	RAW WATER INTAKE P/H
27.	415V CPU MCC # 0SA	△ DM PLANT
28.	415V COOLING WATER MCC # 0SB	CW PUMP HOUSE
29.	415V OZONIZATION & CW TREATMENT MCC #0SC	OZONIZATION & CW TREATMENT AREA
30.	415V PTP MCC # 0SD	PT PLANT
31.	415V ETP MCC # 0SE	ETP BUILDING
32.	415V STP MCC # 0SF	△ ETP BUILDING
33.	415V SCR AMMONIA UNLOADING MCC # 0SG	NEAR AMMONIA UNLOADING & STORAGE AREA (FOR SCR)
34.	415V FGD PCC # 6DK 415V FGD MCC # 6GB 415V GYPSUM MCC # 6GC 415V LIMESTONE MCC # 6QD 415V FGD EMERGENCY MCC # 6DL 415V WATER SYSTEM/AC VENTILATION MCC # 0TB	FGD CONTROL ROOM BUILDING
35.	415V LHP/GHP PMCC # 0DC	LHP/GHP AREA



01	06.04.18	Revised as per customer comments	<i>Devendra Singh</i>	<i>HE</i>	<i>Mamish</i>
REV.	DATE	DESCRIPTION	DRN./ DESN	CHD	APPD

PROJECT

1 X 660 MW BHUSAWAL T.P.S. UNIT-6 TPP

OWNER



MAHARASHTRA STATE POWER GENERATION
CO. LTD.

OWNER'S CONSULTANT



BHARAT HEAVY ELECTRICALS LTD
UNIT : PROJECT ENGINEERING MANAGEMENT, NOIDA

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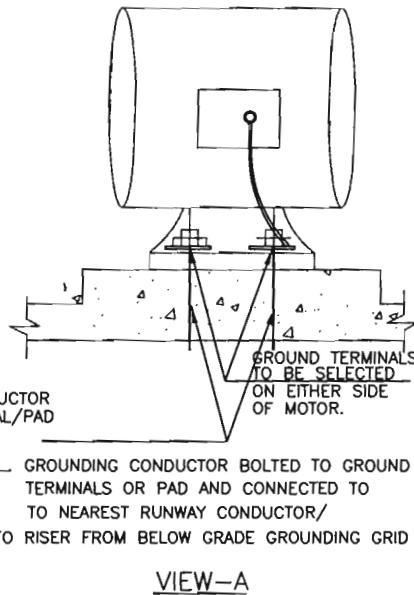
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BHARAT HEAVY ELECTRICAL LIMITED it must not be used directly or
indirectly in any way detrimental to the interest of the company.

DEPT CODE		NAME	SIGN.	DATE
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	DESN	DS	-sd-	23.01.18
	CHD	AKR	-sd-	23.01.18
	APPD	MS	-sd-	29.01.18

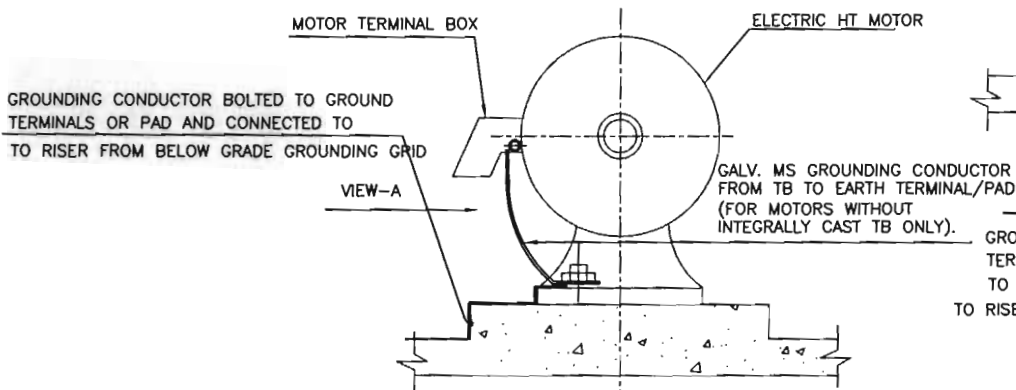
TITLE

TYPICAL ABOVE GROUND EARTHING DETAILS

CV	ME	EL	I&C		DEPT.	SCALE NTS	BHEL DRG NO.
					SIGN		PE-DC-415-509-E004
					DATE		TOTAL SHEETS =
							REV. 01



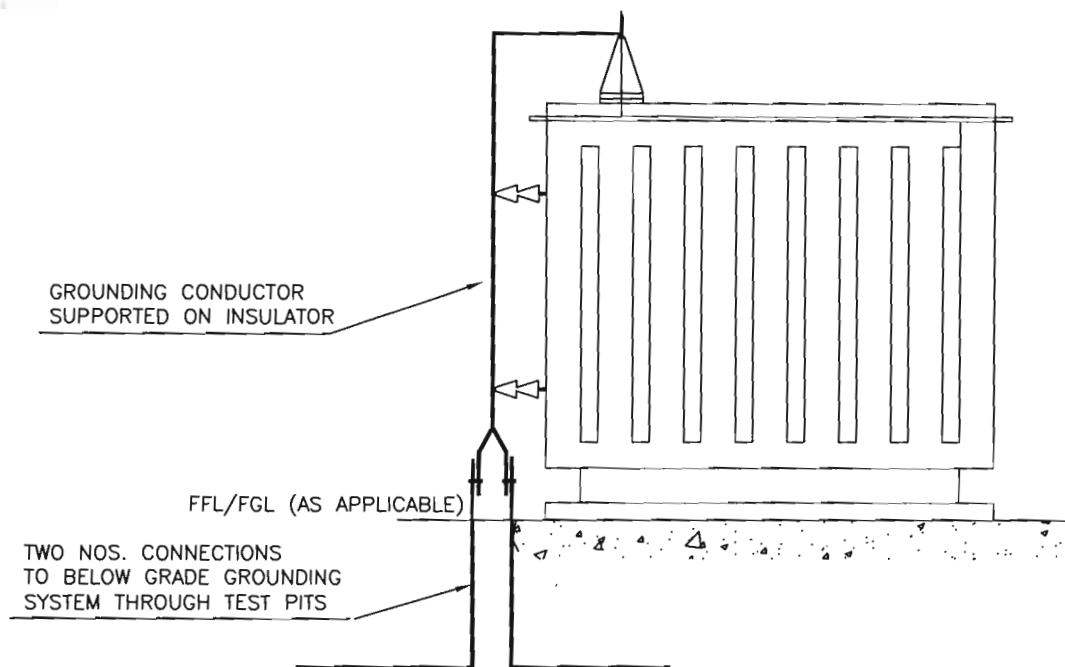
E1A : TYPICAL HT MOTOR GROUNDING DETAILS



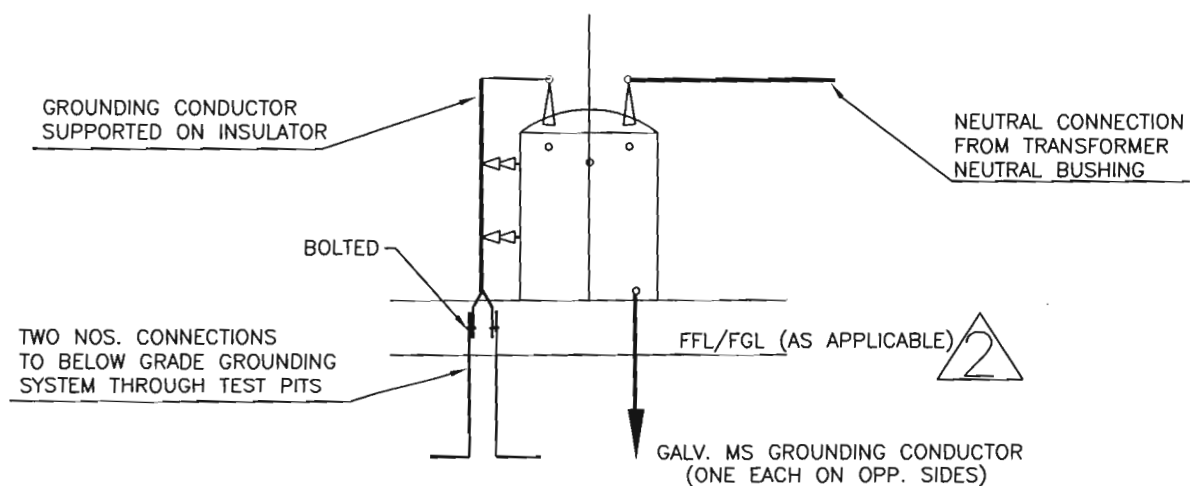
E1A : TYPICAL HT MOTOR GROUNDING DETAILS



SHEET 2 OF 14



E3A : TRANSFORMER NEUTRAL EARTHING (DIRECTLY GROUNDDED)



E3B : NEUTRAL EARTHING (THROUGH RESISTOR)

FOR GENERAL NOTES REFER SHT 12 & 13

TITLE

TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.

PE-DG-415-509-E004

REV. No.

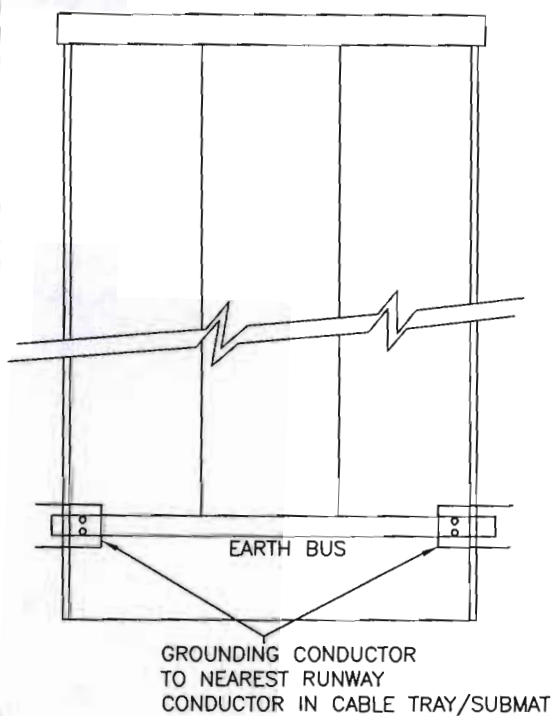
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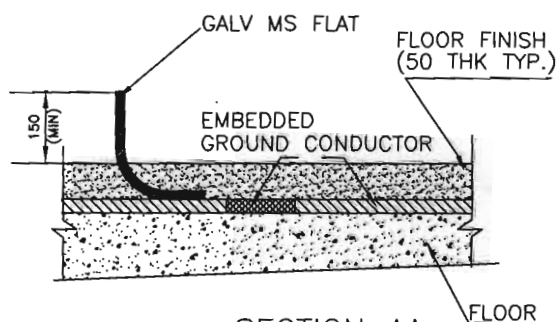
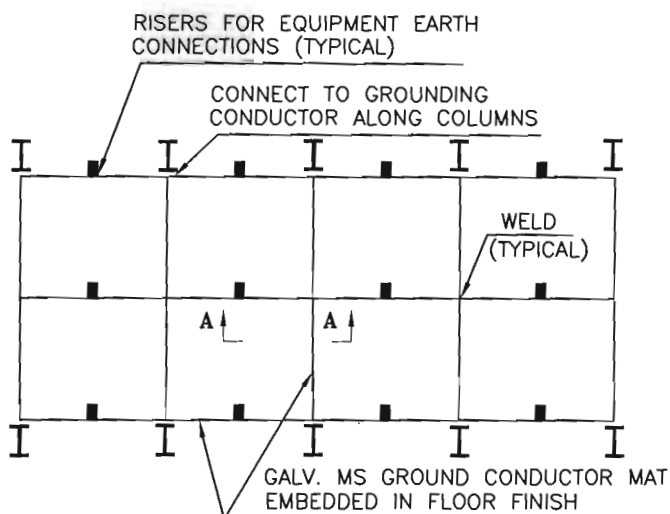
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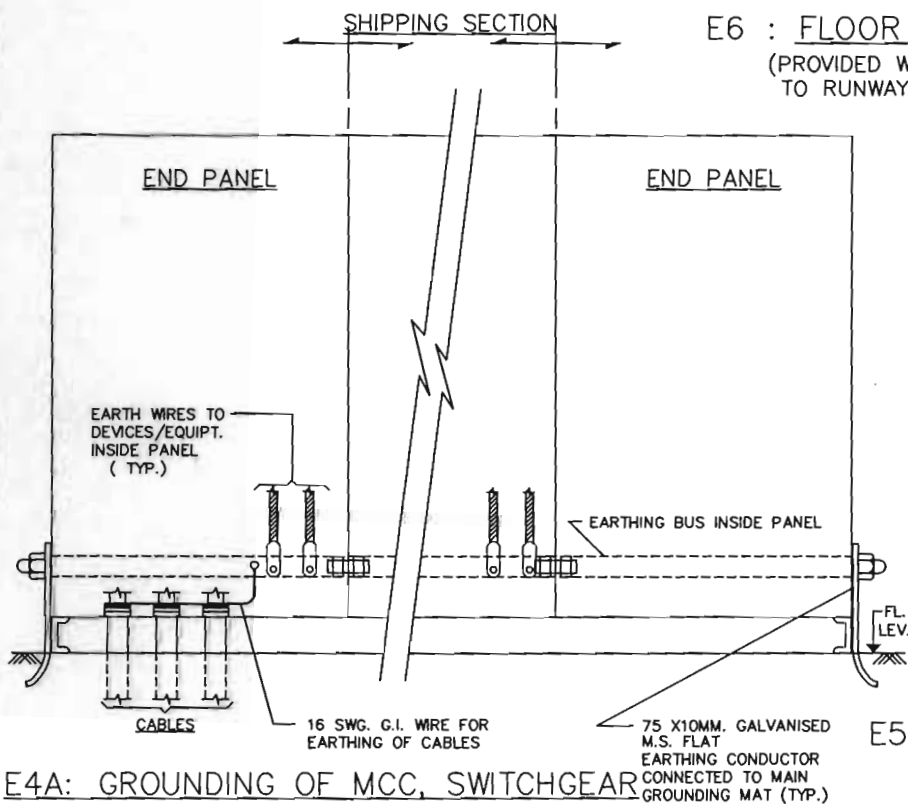


**E4 : FLOOR MOUNTED
PANEL GROUNDING**

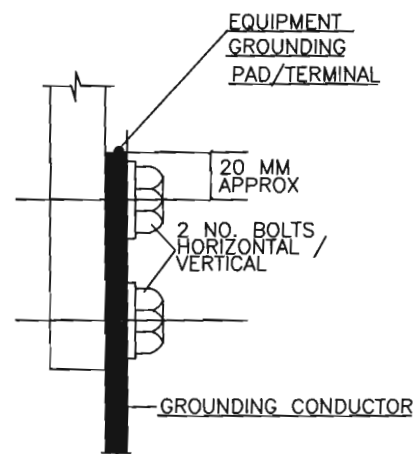


SECTION AA

E6 : FLOOR SUBMAT TYPICAL DETAILS
(PROVIDED WHEREVER DIRECT CONNECTION TO RUNWAY CONDUCTOR IS NOT POSSIBLE)



E4A: GROUNDING OF MCC, SWITCHGEAR



**E5 : TYPICAL ARRANGEMENT
BOLTED JOINT FOR
EQUIPMENT GROUNDING**

FOR GENERAL NOTES REFER SHT 12 & 13

TITLE

TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.

PE-DG-415-509-E004

REV. No.

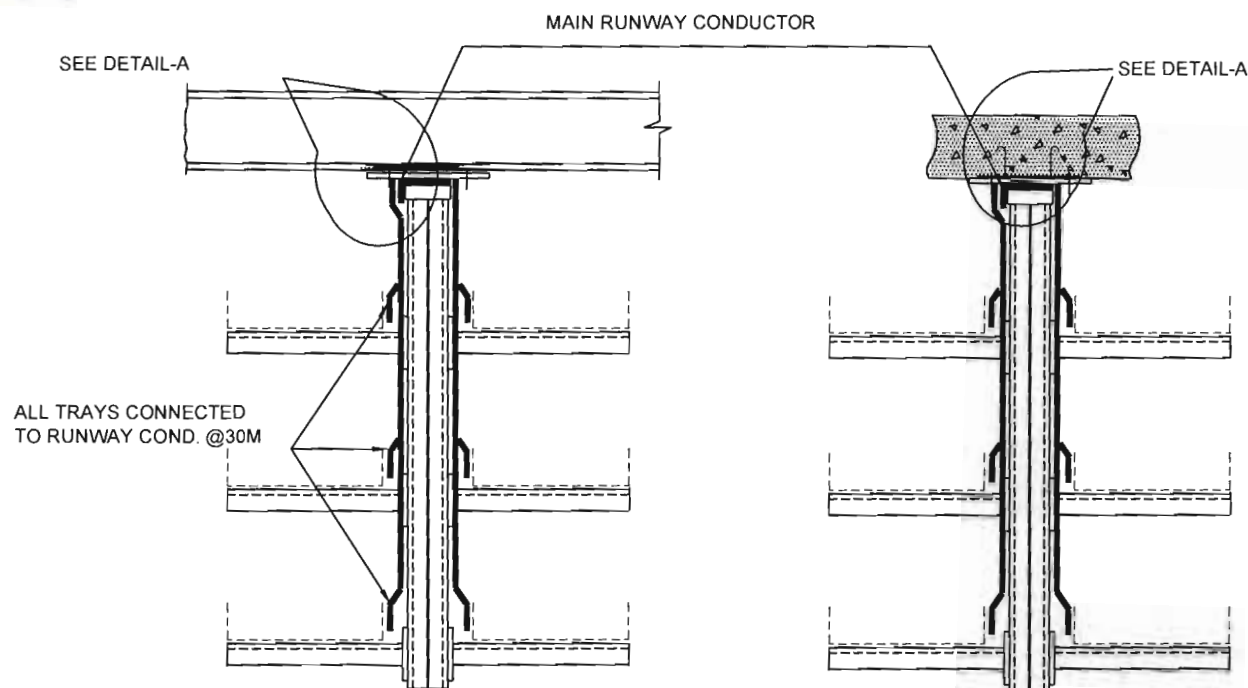
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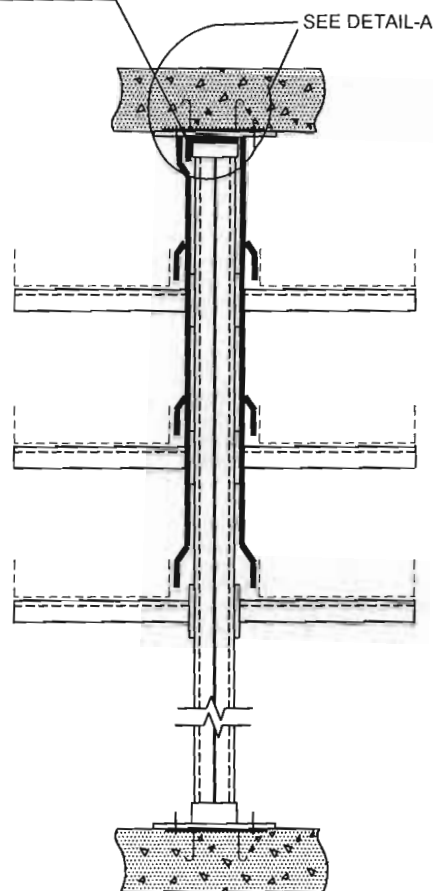
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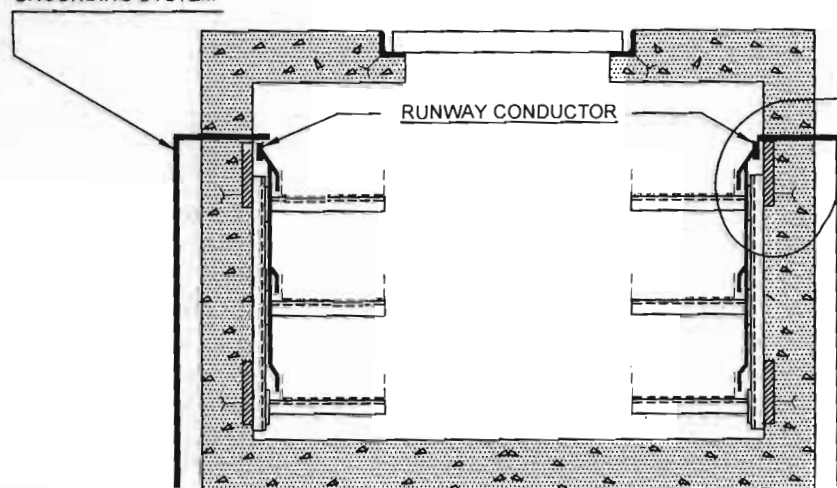


E7 : GROUNDING OF OVERHEAD TRAY STRUCTURE



E8 : GROUNDING OF FLOOR SUPPORTED TRAY STRUCTURE

TO BELOW GRADE
GROUNDING SYSTEM



E9 : GROUNDING OF TRAYS IN CABLE TRENCH

SEE DETAIL-A

MAIN RUNWAY CONDUCTOR
WELDED TO BASE PLATE/EMBDT.

TAP OFF CONDUCTOR

DETAIL-A

FOR GENERAL NOTES REFER SHT 12 & 13

TITLE

TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.

PE-DG-415-509-E004

REV. No.

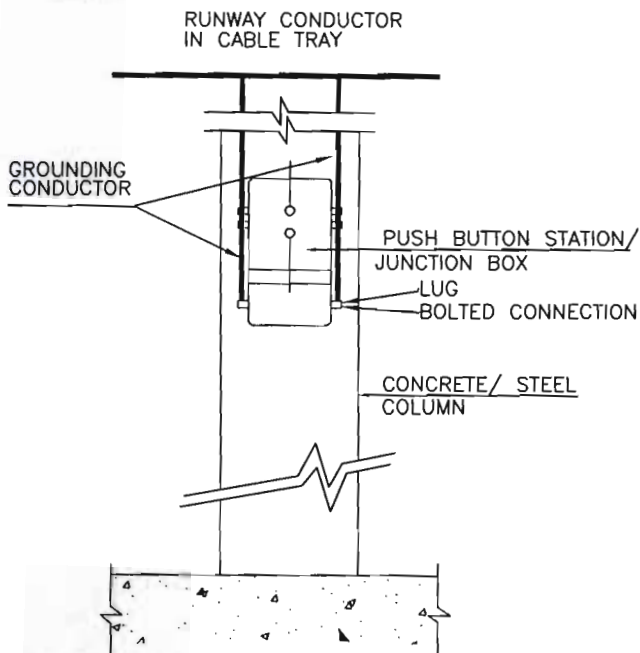
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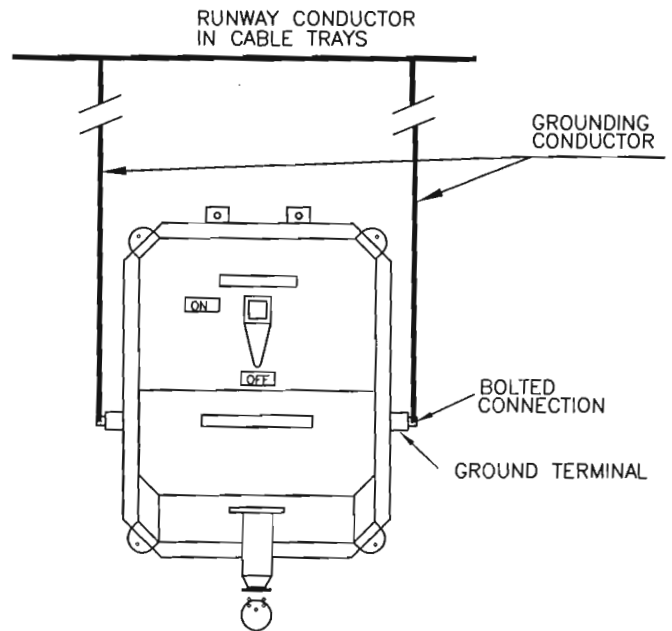
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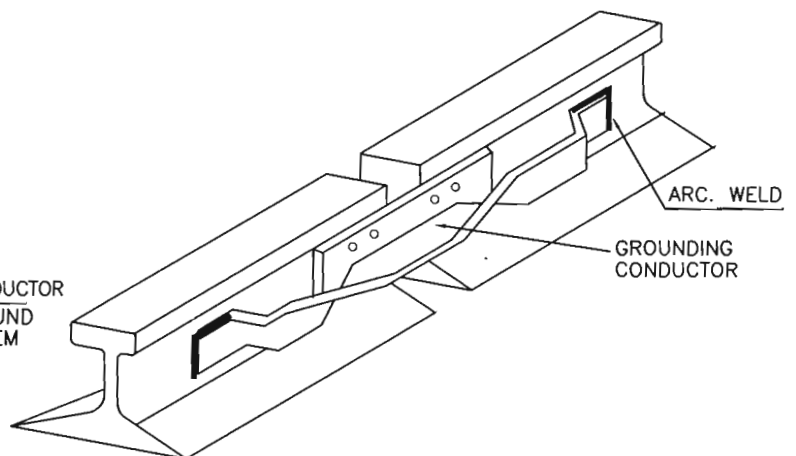
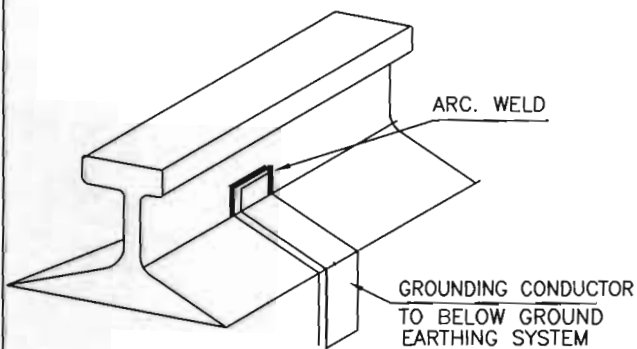
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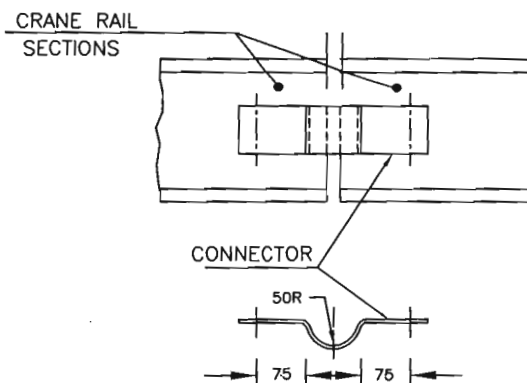
E10 : PUSH BUTTON STATION/
JUNCTION BOX GROUNDING



E11 : 3-PHASE WELDING
RECEPTACLE GROUNDING



E12 : RAIL BONDING/ GROUNDING



E13 : BONDING OF
CRANE RAIL

FOR GENERAL NOTES REFER SHT 12 & 13

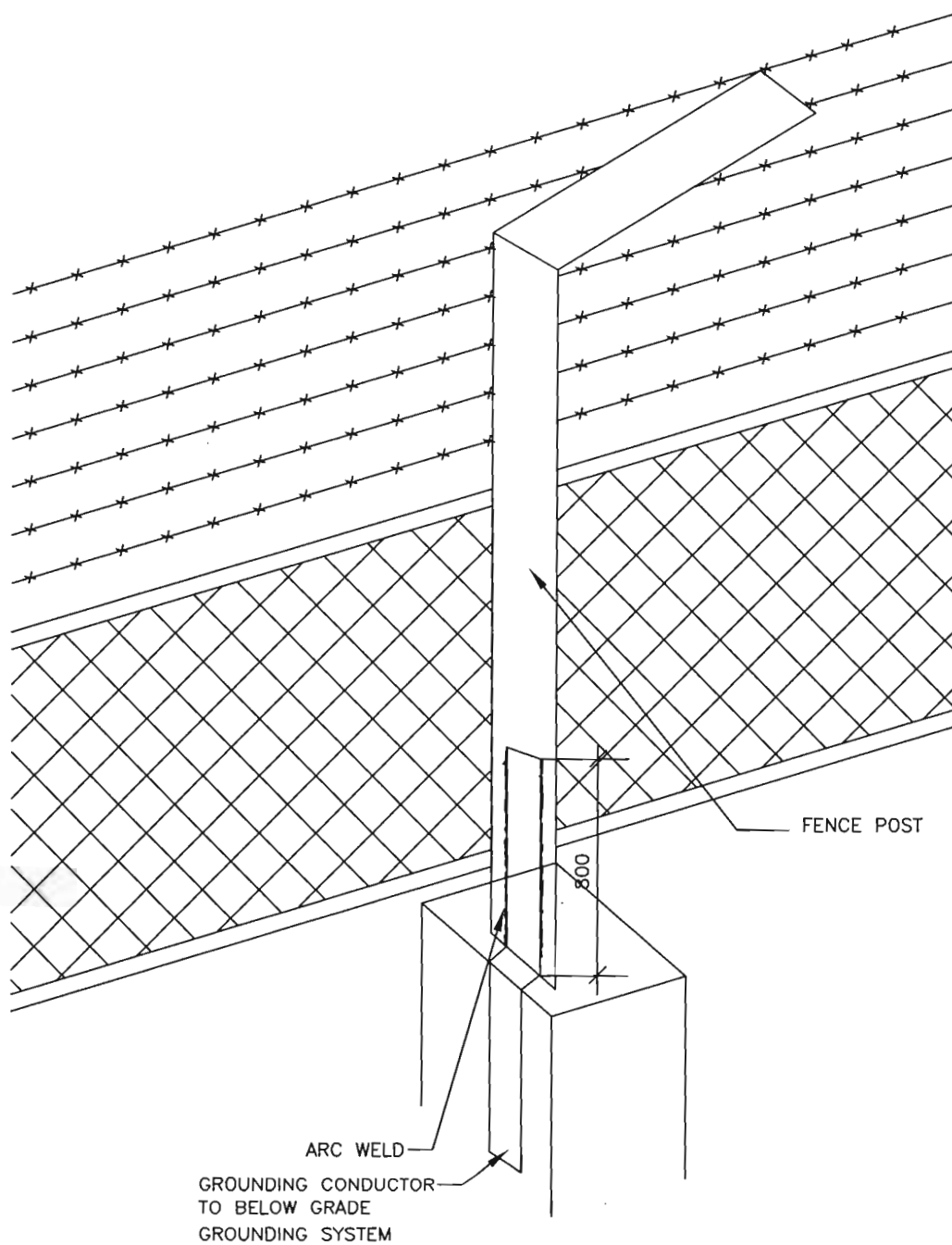
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TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.
PE-DG-415-509-E004

REV. No.
01

SHEET 6 OF 14



E14: FENCE GROUNDING

FOR GENERAL NOTES REFER SHT 12 & 13

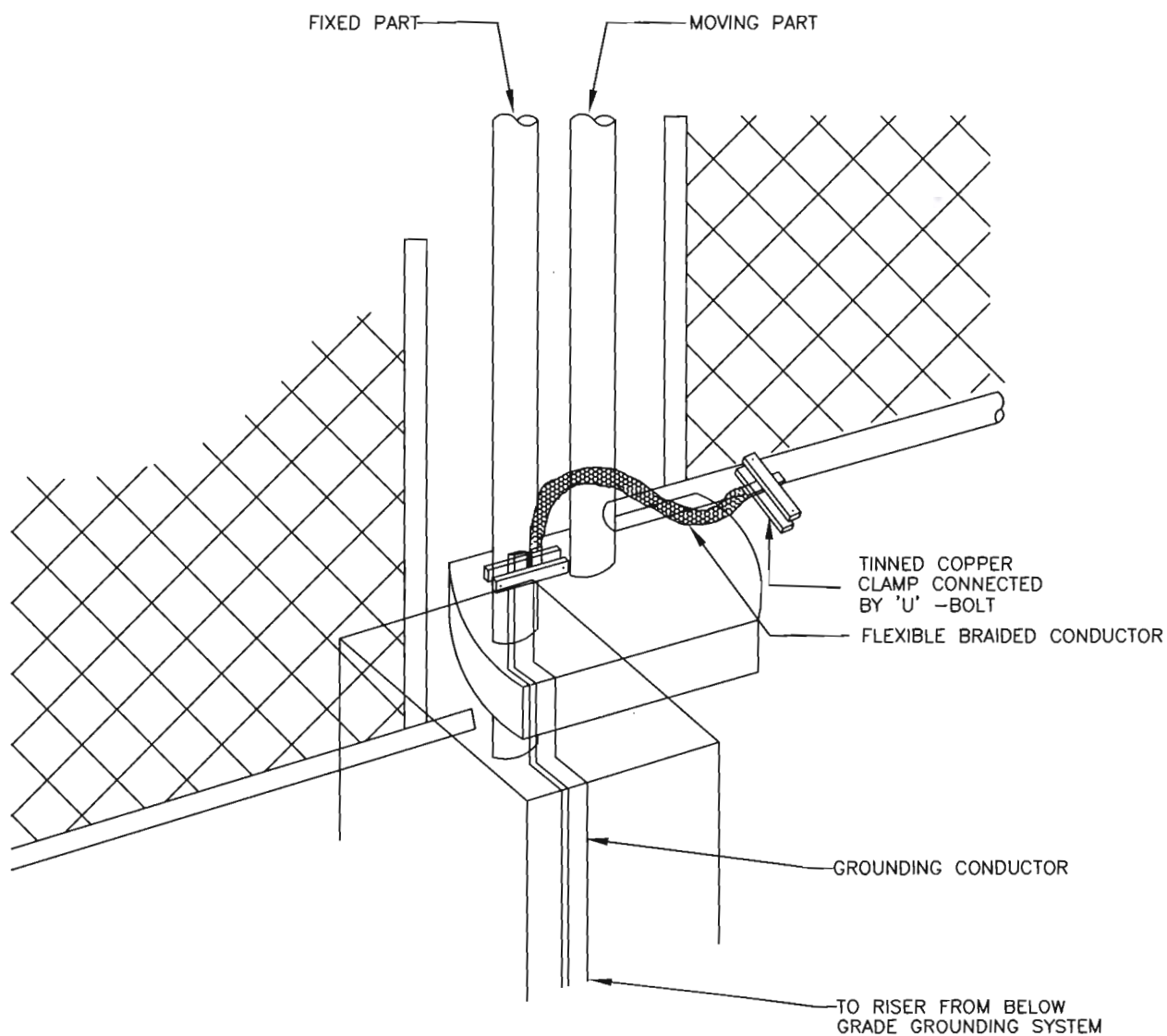
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TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.
PE-DG-415-509-E004

REV. No.
01

SHEET 7 OF 14



E15: FENCE GATE GROUNDING

FOR GENERAL NOTES REFER SHT 12 & 13

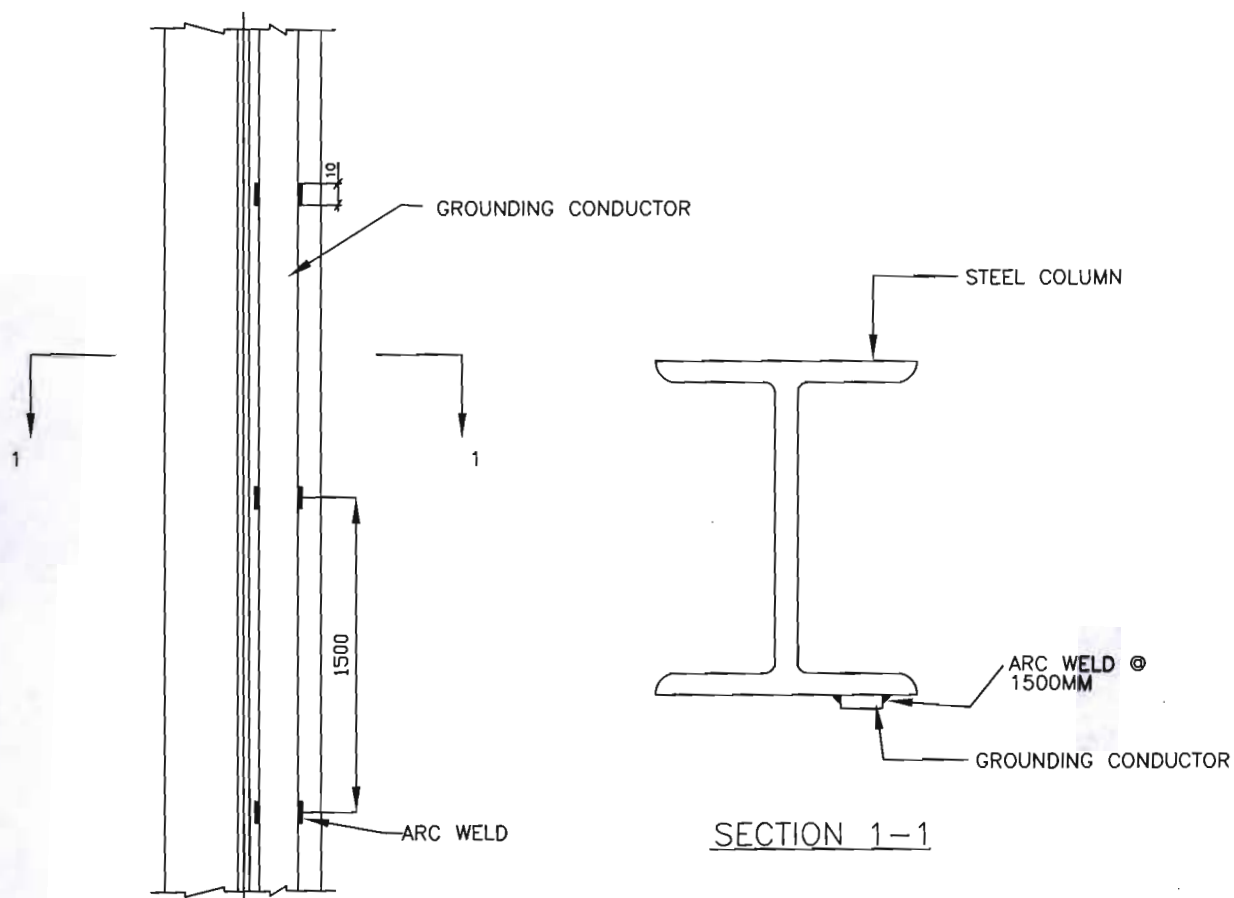
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TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

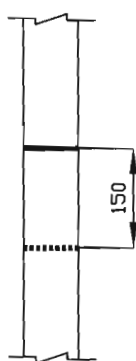
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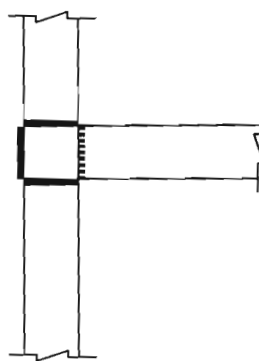
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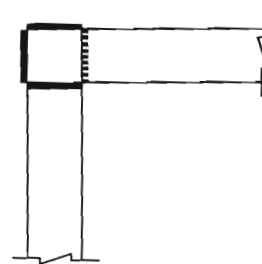
E16: GROUNDING CONDUCTOR
ALONG STEEL COLUMN



STRAIGHT INCONNECTION



T-OFF



90° CHANGE

FOR GENERAL NOTES REFER SHT 12 & 13

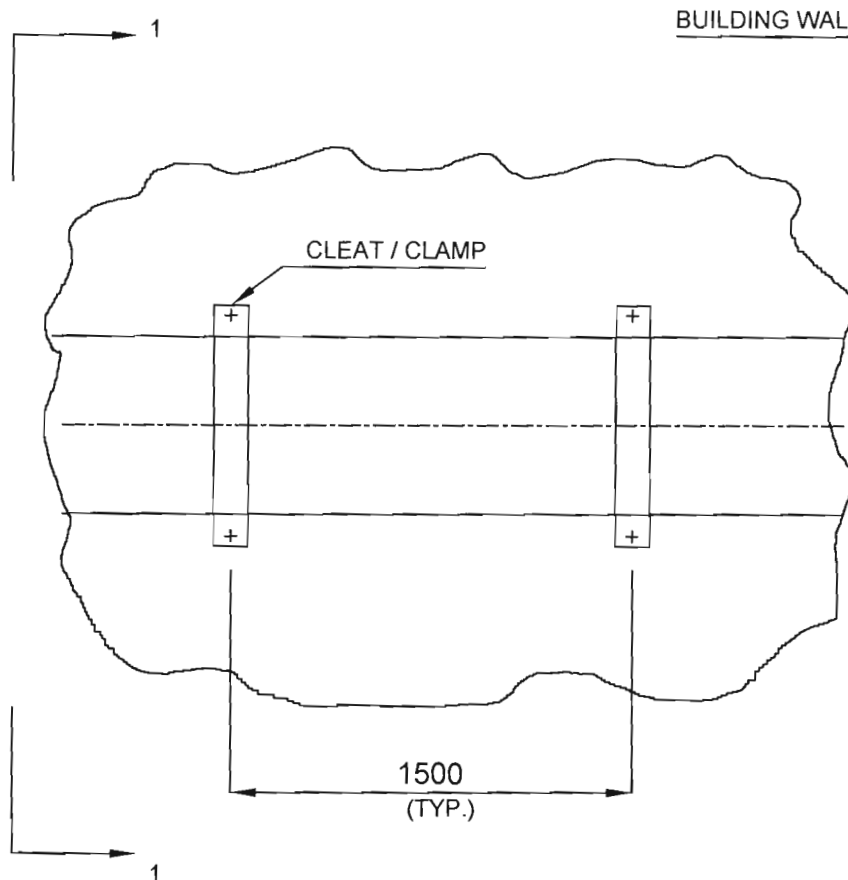
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TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

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PE-DG-415-509-E004

REV. No.
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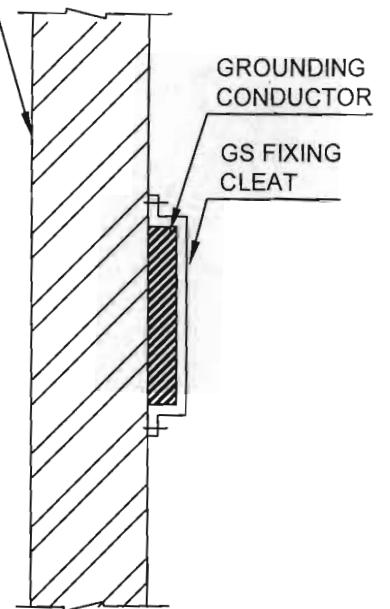
SHEET 9 OF 14



BUILDING WALL

CLEAT / CLAMP

1500
(TYP.)



SECTION - 1

E17: GROUNDING CONDUCTOR
ALONG BUILDING WALL

FOR GENERAL NOTES REFER SHT 12 & 13

TITLE

TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.

PE-DG-415-509-E004

REV. No.

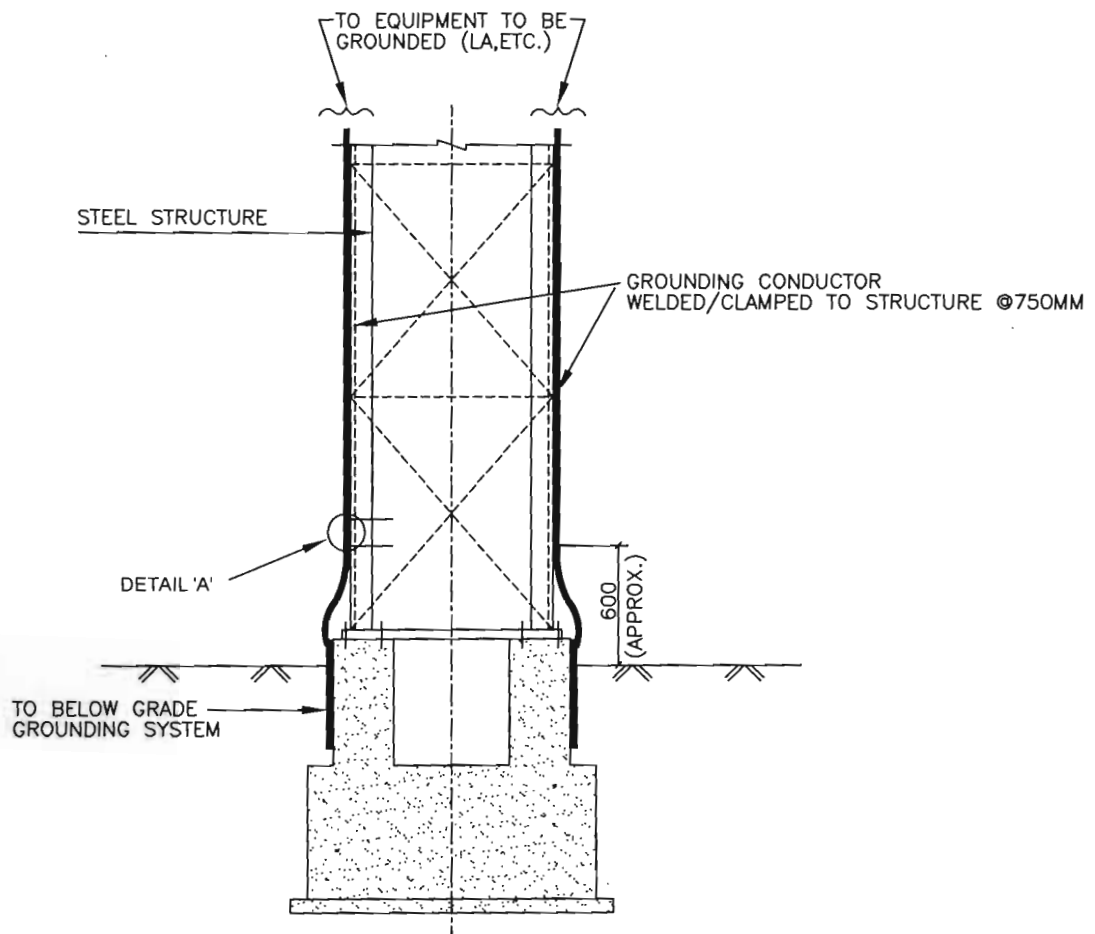
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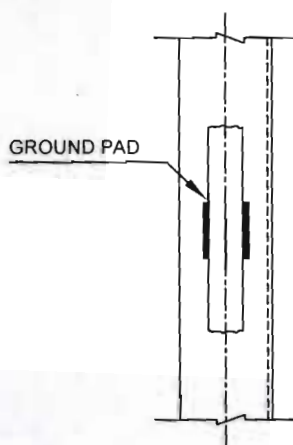
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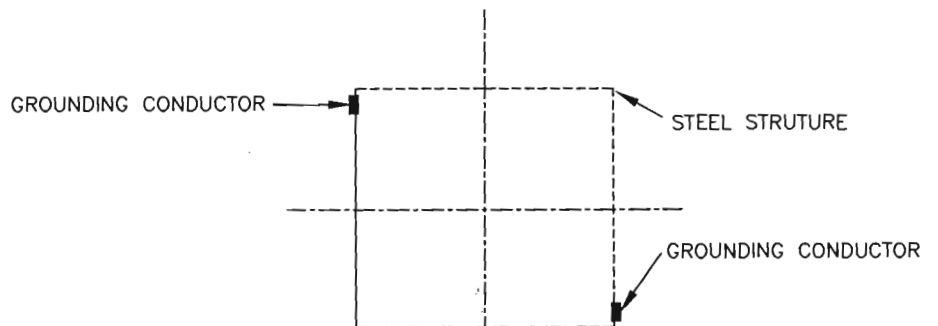
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SECTION



DETAIL - A



PLAN

STRUCTURE AND EQUIPMENT GROUNDING

TITLE

TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.
PE-DG-415-509-E004

REV. No.
01

SHEET 11 OF 14

NOTES:

1. THE DETAILS SHOWN IN THIS DRAWING ARE APPLICABLE TO THE ABOVE GRADE LEVEL GROUNDING FOR MAIN PLANT AREA, AND AUXILIARY PLANTS IN BHEL SCOPE. FOR DETAILS OF EQUIPMENT GROUNDING IN SWITCHYARD AND PLANTS & FACILITIES NOT PART OF MAIN PLANT TURNKEY PACKAGE SEPARATE DOCUMENTS SHALL BE REFERRED.
2. GALVANISED M.S. CONDUCTORS ARE USED FOR EQUIPMENT GROUNDING. SIZE OF GROUND CONDUCTOR SHALL BE AS PER TABLE-1 ON SHEET 14.
3. ALL GROUNDING CONDUCTOR CONNECTIONS AT EQUIPMENT ENDS ARE BOLTED.
4. ALL FASTENERS (NUTS/BOLTS/WASHERS) SHALL BE GALVANISED / ZINC PASSIVATED.
5. FROM BELOW GRADE GROUNDING SYSTEM, RISERS OF 40 MM. DIA. MILD STEEL ROD SHALL BE BROUGHT OUT AND CONNECTED TO MAIN GROUND CONDUCTORS (75x10 MM MS FLAT) RUN ALONG BUILDING COLUMNS/ WALLS & SECURELY FIXED TO THE SAME BY WELDING/ CLAMPING AT INTERVAL OF 750 MM. CONNECTIONS FROM EQUIPMENT GROUND TERMINALS, CABLE RACEWAYS RUNWAY CONDUCTORS, ETC. SHALL BE CONNECTED TO THESE MAIN CONDUCTORS.
6. A CONTINUOUS 75X10 MM. GALVANISED M.S. FLAT GROUND CONDUCTOR (RUNWAY CONDUCTOR) SHALL BE INSTALLED ALONG ALL CABLE RACEWAYS / RACKS, WHICH SHALL SERVE AS THE MAIN GROUNDING CONDUCTOR FOR RECEIVING INDIVIDUAL GROUND CONNECTIONS. ALL TRAY TIERS OF EACH SECTION SHALL BE CONNECTED TO THE RUNWAY CONDUCTOR AT AN INTERVAL OF ABOUT 10 M.
THE RUNWAY CONDUCTORS AT DIFFERENT BUILDING ELEVATIONS SHALL BE INTERCONNECTED BETWEEN THE MAIN RISERS ALONG COLUMNS/WALLS & SHALL ALSO BE CONNECTED TO THE NEAREST RISER/ STRUCTURAL COLUMNS.
7. ALL ELECTRICAL EQUIPMENT AND ASSOCIATED NON CURRENT CARRYING METAL WORKS, SUPPORTING STRUCTURES, ETC. SHALL BE CONNECTED TO MAIN RUNWAY CONDUCTOR OR BELOW GRADE GROUNDING SYSTEM, WHERE AVAILABLE.
8. TWO SEPARATE AND DISTINCT GROUND CONNECTIONS SHALL BE PROVIDED FOR GROUNDING OF EACH ELECTRICAL EQUIPMENT FRAMEWORK.
9. ALL BUILDING STEEL COLUMNS, STRUCTURAL STEEL COLUMNS, METALLIC RAILING DEVICES SUCH AS JUNCTION BOXES, PULL BOXES, PUSH BUTTON STATIONS, LOCKOUT SWITCHES, CABLE END BOXES ETC. SHALL BE GROUNDED WHETHER SPECIFICALLY SHOWN IN THE DRAWING OR NOT.
10. GROUND CONDUCTOR CONNECTIONS ABOVE GRADE LEVEL SHALL BE GENERALLY MADE BY ELECTRIC ARC WELDING EXCEPT AT EQUIPMENT TERMINALS. RESISTANCE OF JOINTS SHALL NOT BE MORE THAN THE RESISTANCE OF EQUIVALENT LENGTH OF CONDUCTOR. M.S. GROUND CONDUCTOR ABOVE GRADE LEVEL SHALL BE TREATED WITH RED LEAD COMPOUND AND AFTERWARDS THICKLY COATED WITH BITUMEN COMPOUND TO PREVENT CORROSION. DAMAGED PORTIONS OF GALVANISED MS SHALL BE COATED WITH TWO COATS OF COLD GALVANISING AND ANTI-CORROSIVE PAINT AFTER WELDING.
11. AT EQUIPMENT ENDS, BOLTED CONNECTION SHALL BE MADE FOR GROUNDING OF EQUIPMENT/DEVICES AND REMOVABLE STRUCTURES. THE CONTACT SURFACE SHALL BE THOROUGHLY CLEANED BEFORE CONNECTION TO ENSURE GOOD ELECTRICAL CONTACT. EQUIPMENT BOLTED CONNECTION AFTER BEING CHECKED AND TESTED SHALL BE PAINTED WITH ANTI-CORROSIVE PAINT COMPOUND.

TITLE

TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.

PE-DG-415-509-E004

REV. No.

01

SHEET

12

OF

14

12. GROUNDING INSTALLATION SHALL CONFORM TO THE FOLLOWING:

- (A) IS:3043
- (B) INDIAN ELECTRICITY RULES
- (C) NATIONAL ELECTRICAL CODE
- (D) IEEE80 & IEEE665
- (E) BHEL DOCUMENT NO. PE-DC-423-509-E001 (GROUNDING SYSTEM DESIGN MEMORANDUM)
- (D) IS:2309

13. GROUNDING CONDUCTORS ON FLOORS (I.E. SUBMATS) SHALL BE PROVIDED AS AN ALTERNATIVE TO THE SYSTEM DESCRIBED AT 5 & 6 ABOVE ONLY WHERE DIRECT CONNECTION OF EQUIPMENT/ PANELS TO RUNWAY CONDUCTOR/ MAIN GROUND LEADS IS NOT POSSIBLE DUE TO LAYOUT CONSTRAINT. IN SUCH CASES GROUND CONDUCTORS ON FLOORS SHALL BE LAID ON RCC SLAB BEFORE FLOOR FINISHING IS DONE AND CONNECTED TO THE BELOW GROUND EARTHING SYSTEM THROUGH TWO RISERS LOCATED PREFERABLY DIAMETRICALLY OPPOSITE TO EACH OTHER. SUITABLE RISER STUBS SHALL BE PROVIDED ABOVE THE FINISHED FLOOR IF THE EQUIPMENT IS NOT AVAILABLE AT THE TIME OF LAYING THE MAIN GROUNDING CONDUCTOR.

14. ABOVE GRADE, GALVANIZED MILD STEEL FLATS SHALL BE RUN AS MAIN GROUND CONDUCTORS ALONG BUILDING STEELS, WALLS AND CABLE TRAYS AND SECURELY FIXED TO THE SAME BY Δ WELDING/ CLAMPING AT INTERVALS NOT EXCEEDING 1500mm. GROUND CONDUCTORS SHALL BE INTERCONNECTED BETWEEN THEM AND TO THE MAIN GROUND GRID THROUGH RISER. COLUMN STEEL SHALL BE GROUNDED AT THE BOTTOM WITH UNDERGROUND STATION GROUND MAT. SUITABLE NUMBERS OF GROUNDING PADS CONNECTED WITH THE COLUMN STEELWORK SHALL BE PROVIDED AT 300mm ABOVE EACH FLOOR LEVEL OF THE COLUMNS FOR EQUIPMENT GROUNDING PURPOSE.

15. FOR TRANSFORMER YARD, GALVANIZED MILD STEEL FLATS SHALL BE RUN AS MAIN GROUND Δ CONDUCTORS ALONG EQUIPMENT FOUNDATIONS AND MOUNTING STEEL STRUCTURE AND SECURELY FIXED TO THE SAME BY CLAMPING AT INTERVALS NOT EXCEEDING 1500mm. THE GROUND CONDUCTORS SHALL BE INTERCONNECTED BETWEEN THEM AND TO THE MAIN GROUND GRID THROUGH RISER.

16. ALL ELECTRICAL EQUIPMENT AND ASSOCIATED NON-CURRENT CARRYING METAL WORKS, Δ SUPPORTING STRUCTURES, BUILDING/ BOILER COLUMNS, FENCE, SYSTEM NEUTRALS, ARRESTERS SHALL BE CONNECTED TO THE PLANT GROUND GRID SYSTEM.

17. CRANES SHALL BE GROUNDED AT BOTH THE ENDS. IN ADDITION, ALL JOINTS SHALL BE Δ BONDED TO PROVIDE ELECTRICAL CONTINUITY.

18. FENCE WITHIN THE GROUND GRID SHALL BE BONDED TO THE PLANT GROUND SYSTEM AT Δ REGULAR INTERVAL NOT EXCEEDING TEN (10) METERS. FENCE GATE SHALL BE SEPARATELY GROUNDED WITH FLEXIBLE CONNECTION TO PERMIT MOVEMENT.

Δ 19. STEEL PIPE RACKS IN THE UNIT AND OFF-SITE AREAS SHOULD BE GROUNDED AT EVERY 25m.

Δ 20. UNLESS ADEQUATELY CONNECTED TO EARTH ELSEWHERE, ALL UTILITY AND PROCESS PIPELINES SHOULD BE BONDED TO A COMMON CONDUCTOR BY MEANS OF EARTH BARS OR PIPE CLAMPS AND CONNECTED TO THE EARTHING SYSTEM AT A POINT WHERE THE PIPELINE ENTER OR LEVEL THE HAZARDOUS AREA EXCEPT WHERE CONFLICTING WITH THE REQUIREMENT OF CATHODIC PROTECTION SYSTEM..

21. TWO NOS. OF DEDICATED EARTH PITS SHALL BE PROVIDED FOR GENERATOR TRANSFORMER Δ NEUTRALS, LIGHTING ARRESTERS. TWO NOS. OF GROUNDING EARTH PITS EACH HAVING ITS SEPARATE AND DISTINCT CONNECTION WITH NEUTRAL SHALL BE SEPARATED BY TWICE THE LENGTH OF THE ELECTRODE.

Δ 22. FOR SHIELDING, THE GROUND CONDUCTORS SHALL BE TAKEN RIGHT UPTO THE TOP ALONG THE STRUCTURE. FOR METALLIC STRUCTURES/ REINFORCED CONCRETE STRUCTURE SEPARATE GROUND CONDUCTOR UP TO TOP SHALL BE CONSIDERED. GROUNDING PAD SHALL BE PROVIDED AT BOTTOM & AT VARIOUS LOCATIONS FOR CONSTRUCTION TO STATION GROUND GRID AND EQUIP. GROUNDING PURPOSE.

23. ALL DIMENSIONS ARE IN MILLIMETER (MM) UNLESS OTHERWISE SPECIFICALLY MENTIONED.

TITLE

TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.



PE-DG-415-509-E004

REV. No.

01

SHEET 13 OF 14

TABLE :1 ABOVE GRADE GROUNDING SYSTEM - CONDUCTOR SIZES

SL. NO.	TYPE OF EQUIPMENT	SIZE (MM)	MATERIAL	NO. OF LEADS
01	RISERS	75 X 10	GALVANISED MS FLAT	N.A.
02	MAIN GROUND CONDUCTOR/ MAIN EARTH LEAD ALONG COLUMNS/WALLS STRUCTURES	75 x 10	GALVANISED MS FLAT	N.A.
03	11KV/3.3KV/415V SWITCHGEAR/ MCC	75 X 10	GALVANISED MS FLAT	TWO
04	SYSTEM NEUTRALS	75 X 10	GALVANISED MS FLAT	TWO
05	415V DISTRIBUTION BOARDS	75 X 10	GALVANISED MS FLAT	TWO
06	FUSE DISTRIBUTION BOARDS	75 X 10	GALVANISED MS FLAT	TWO
07	LT MOTORS:			
(a)	MOTORS: ABOVE 90KW	75 X 10	GALVANISED MS FLAT	TWO
(b)	MOTORS: 30KW TO 90KW	50 X 6	GALVANISED MS FLAT	TWO
(c)	MOTORS: 5KW TO 30KW	25 X 6	GALVANISED MS FLAT	TWO
(d)	UPTO & INCLUDING 5kW	8 SWG	GI WIRE	TWO
8	CONTROL PANEL & CONTROL DESK	50 X 6	GALVANISED MS FLAT	TWO
9	PUSH BUTTON STATION & JUNCTION BOX	8 SWG	GI WIRE	TWO
10	CABLE TRAYS, COLUMNS & STRUCTURES	75X10	GALVANISED MS FLAT	TWO
11	BUSDUCT ENCLOSERS			
12 i)	ISOLATED PHASE BUSDUCT	 75X10	GALVANISED MS FLAT	ONE
ii)	SEGREGATED PHASE / NON SEGREGATED PHASE BUSDUCT	 75X10	GALVANISED MS FLAT	TWO
13	RAILS & METAL PARTS, FENCE & TANKS/VESSEL	75 X 10	GALVANISED MS FLAT	TWO
14	TRANSFORMER TANKS / RADIATORS TRANSFORMER NEUTRAL (EXCEPT DTT)	75 X 10 75 X 10	GALVANISED MS FLAT	TWO
15	GENERATOR ENCLOSURE	75 X 10	GALVANISED MS FLAT	TWO
16	11 kV AND 6.6 kV MOTORS	75 X10	GALVANISED MS FLAT	TWO
18	LIGHTING PANELS	35X6	GALVANISED MS FLAT	TWO
19	LIGHTING FIXTURES, RECEPTACLES, JB's	16SWG	GI WIRE	ONE
20	LIGHTING DISTRIBUTION BOARD, POLES	50X6	GALVANISED MS FLAT	TWO
21	DG EARTHING	75 X10	GALVANISED MS FLAT	TWO

TITLE

TYPICAL ABOVE GRADE LEVEL GROUNDING DETAILS

BHEL DRAWING No.


PE-DG-415-509-E004

REV. No.

01

SHEET

14 OF 14


	1X660MW BHUSAWAL TPS, UNIT-6 TPP CABLE ERECTION PHILOSOPHY	DOCUMENT NO.
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1.0 **Scope**

- 1.1 This document is intended to cover the aspects of cable raceway design and installation, laying and termination of various types of cables for main power house and auxiliary plant areas of the project except for those listed under “Exclusions” below
- 1.2 Design calculations for cable sizing and selection, Design memorandum for Fire Sealing & Coating system, Grounding & Lightning Protection are covered in a separate document.
- 1.3 Latest revisions of all drawings / documents shall be referred.
- 1.4 Reference standards/ documents.
 - 1) IS: 1255 (Code of practice for installation and maintenance of power cables)
 - 2) Drg. No. PE-DG-415-507-E005 (Typical details of Cable Trays And Accessories)
 - 3) Drg. No. PE-DG-415-507-E006 (Installation details for Cable Tray support system)

2.0 **Cable Raceway System**


- 2.1 Inside building cables shall generally be laid on ladder type cable trays either in concrete trenches or overhead supported from building steel/structures. Cables shall be run in concrete trenches in those electrical rooms at ground level, which are without any spreader room below.
- 2.2 For indoor pumps, mechanical equipment areas overhead cable trays shall generally be used. Local concrete trenches shall be used outdoor in transformer yard adjacent to power house A-row and within switchyard bays for cable routing.
- 2.3 For interplant connections, the cables shall be routed through an overhead cable bridge pipe cum Cable Bridge. Cable trench/tunnel shall be provided locally based on site constraints.
- 2.4 Generally, cable trays shall be oriented horizontally in all areas, except in areas subject to coal dust or ash deposition (such as boiler platforms, raceways along C-row of Main Power House area, interconnecting overhead cable tray paths between boiler area and ESP area etc.). Cable trays may be oriented vertically in other areas also if so required due to reasons such as space restriction, accessibility, plant aesthetics, operational clearances, etc. as per approved layout drawings.
- 2.5 Cable trays shall be fixed to the horizontal/vertical arm of supporting structure as per the reference drawings at serial no. 1.4(3) above. Cables can be routed through cable duct bank wherever required.
- 2.6 In excessive coal dust area or mechanical damage prone area will have hot-dip galvanised sheet metal tray cover and in corrosive chemical areas cable tray and covers shall be epoxy painted.
- 2.7 Different voltage grade cables shall be laid in separate trays when trays are arranged in tiers. Power cables shall be on top trays (higher voltage grade cable will be laid at top layer. Next

	<p align="center">1X660MW BHUSAWAL TPS, UNIT-6 TPP</p> <p align="center">CABLE ERECTION PHILOSOPHY</p>	DOCUMENT NO. PE-DC-415-507-E004
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layers will be filled up by the power cables depends on their voltage grade) and control/Instrumentation cables on bottom trays and low level signal cables and other special instrumentation and control cables shall run in separate trays. AC & DC cables shall run in separate cable trays. In general, a minimum of 1500mm clearance shall be maintained between these cables and noise generating equipments.

- 2.8 Cable trays shall be of ladder/ perforated type complete with all necessary coupler plates, elbows, tees, bends, reducers, stiffeners and other accessories. Ladder type trays will have widths 600mm, 450 mm, 300 mm, 150 mm. Perforated type cable trays of width 600mm, 450mm & 300mm, 150mm and below size shall be used locally where required. Cable tray shall be ladder type for power and perforated for control & instrumentation cables.
- 2.9 Cable trays, fittings & accessories as well as elbows, reducers, tees, crosses, etc. shall be fabricated out of 14 gauge (2.0 mm thick) hot rolled mild steel sheets. Tray cover shall be fabricated out of 14 gauge (2.0 mm thick) hot rolled mild steel sheets.
- 2.10 Cable tray shall be ladder type with 250mm rung spacing, 100mm depth and rung width not less than 50mm. All tray support shall be welded type and weld for cable tray supports shall have a minimum throat thickness of 6mm.
- 2.11 Suitable cable tray accessories such as coupler plates, ground continuity connections, nuts, bolts, washers, hangers, clamps, horizontal and vertical bends, cross-pieces, tees, elbows, reducers protective covers etc. shall be used in conjunction with straight runs of cable trays wherever required as per approved layout drawings to ensure a continuous and break-free tray support system for cables & cable tray ground conductor.
- 2.12 Cable tray accessories shall be factory fabricated. However, the same may also be fabricated at site from the straight length of respective sizes if required.
- 2.13 The cable trays & accessories shall be of approved makes, and generally conforming to reference drawing at 1.4 (2). Minor fabrication differences (which do not affect the overall dimensions of the trays) due to specific manufacturing practices of different trays manufacturers shall be acceptable.
- 2.14 Cable trays of width 600 mm shall be subjected to deflection test as under: -

A 2.5 metre straight section of cable trays shall be simply supported at the two ends. A uniformly distributed load of 100 Kg per meter for 600mm tray will be applied along the length of the tray. The maximum deflection at the mid span shall not exceed 7 mm.
- 2.15 The cable tray support system and hardware shall comprise of hot dip galvanised MS channel/ angle as main supports, cable trays shall be directly fixed to galvanised MS angles as per reference drg. at 1.4 (3).
- 2.16 The main supports MS members shall be fixed by welding in any of the following ways:
 - a) Welded to steel inserts available in the concrete surface/wall/floor.
 - b) Welded to steel structural members.


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Support system shall be site fabricated as per requirement from hot dip galvanised MS structural members. All hardware for support system shall be hot-dip galvanized.

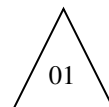
- 2.17 Horizontal runs of cable trays shall be supported at intervals of 1.5 meters approximately. Vertical runs (risers) shall be supported at approximately every 1 meter interval. Spacing between cable trays shall normally be kept 300mm for cable laying convenience and effective heat dissipation. Where direct heat radiation exists, heat isolating barriers shall be adopted.
- 2.18 The cable tray numbering shall be provided at every 30 meter and at each end of cable tray & branch connection floor/wall opening. Cable trays shall be identified in a distinct, permanent manner with identification numbers (stencilled with red/ white paint) at reasonable intervals, prior to the installation of any cables.
- 2.19 All galvanisation damaged due to cutting/ welding operation required to be carried out for the installation of the support system, cable trays & accessories shall be made good with application of two coats of cold galvanisation paint.
- 2.20 Cable trays shall be grounded as per the provisions of the approved grounding document for the project.
- 2.21 For laying cables along concrete walls, ceilings, building steel structures or masonry structures etc., the cables shall be clamped with GI saddles screwed to the GI flats welded to the inserts. Where inserts are not available the saddles may be directly fixed to the walls using anchor bolts.
- 2.22 Local cabling near with cable trays inside equipment shall be done using embedded conduits & cable pits or local cable trenches with proper water drainage for no water accumulation/ waste material as per layout conditions.
- 2.23 Provisions of IS: 1255 shall be followed for cables buried directly in ground. For underground road/rail crossings, Hume Pipes (at a depth of minimum 1000mm) shall be used. Alternatively, concrete encased rigid steel conduits (duct banks) may also be used. Buried cable routes shall have marker projecting 150 mm above ground and shall be spaced at an interval of 30 m along the route and at every bend.
- 2.24 The trays shall be stopped approximately 200mm short of the wall on both sides and cables passed through the opening. This method is adopted for smooth passage of cables and effective sealing of cable openings.
- 2.25 Cables for redundant equipment shall be run in separate trays/ separate route, as per approved cable layout drawings.
- 2.26 Cables from two different services viz. supply from station board and supply from unit board shall be segregated to prevent simultaneous damage due to fire in one of the services.


3.0 **General Philosophy of Cable Installation**

- 3.1 Laying, dressing, clamping and jointing/ termination process of power, control and instrumentation cables shall follow the requirements of IS: 1255.


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- 3.2 All precautions as per IS: 1255 & Field Quality Plan (FQP) shall be taken while handling the cables.
- 3.3 For the purpose of cable laying, the cables are categorised as under:
- HT: Power cables of 11KV, 3.3KV grade
 - LT: Power cables of 415V grade, catering to loads at 415V AC/230V AC/220V DC/24VDC (However, AC and DC Power cables will be laid in separate cable trays)
 - Control: Control cables of 1.1kV grade carrying control signals at 220V DC/ 110VAC.
 - Instrumentation: (Also called screened control cables): Screened cables of cross-sections 0.5 sq.mm generally carrying very low voltage & very low current signals.
- 3.4 All cables shall be provided with identification tags indicating the cable numbers in accordance with the cable circuit schedule. Cable tags shall be fixed at terminal ends, at tray intersection / bend and at each side of floor/ wall/ duct crossings etc and at every 30m in cable trench/tray or buried run.
- 3.5 The HV power cables of 11KV/3.3KV shall be laid in trays or racks as follows:
- In single layer only
 - Single core cables to be laid in trefoil formation and shall be laid with a distance of one diameter of cable between the outer ages of trefoil.
 - 3 core cable to be laid one diameter apart of the largest diameter of adjacent cable.
- 3.6 1100V grade power cables shall be laid in single layer and multi core power cable shall be laid in touching formation to each other. Single core cables for 3-phase circuit will be laid in trefoil formation with a gap of 2D between trefoils.
- 3.7 1100 V grade multi-core power cables carrying continuous current when laid on trays shall be placed in single layer, touching and clamped by means of nylon cable ties. Cables of sizes indicated below, shall be clamped individually.
- Single core cables: 500 sq. mm or higher (when not laid in trefoil formation- e.g. dc circuits)/ neutral cables)
 - Multi-core cables: 95 sq mm or higher
- L.T. power cables of cross sectional area less than 95 sq. mm. and all control and Instrumentation cables shall be clamped in bunches by means of cable nylon ties.
- 3.8 Control and instrumentation cables shall be laid in multi layers, but not exceeding three layers in any section. Special purpose cables (e.g. IPB, WAN etc.) shall be laid as per system manufacturer/ supplier recommendations.



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- 3.9 While power, control and instrumentation cables shall generally be laid in separate trays. In most such cases, the cable sizes shall be 2.5 sq. mm; however, in a few cases higher sizes if required as per approved cable sizing calculations (due to voltage drop criterion) may be used.
- 3.10 Cables shall be placed on trays on the basis of their types and functions as under for horizontal formations:
- HT cables: in the top tier(s) of ladder type trays.
 - LT power cables: in the ladder tray(s) below the HT cable trays.
 - LT Control cables: in the perforated tray(s) next below to the LT power cable tray(s).
 - Instrumentation cables (also called screened control cables): in the bottom most perforated tray(s).
- 3.11 For vertical formations, the outermost tray shall be considered as the topmost tray and the order as indicated shall be followed. In rare cases, where there is no clear distinction of bottom/ top trays, the order convenient for linking the horizontal and vertical formations avoiding criss-crossing, or exit of cables shall be followed.
- Typical examples of tray numbering are given in fig.1.
- 3.12 Wherever it is not possible to accommodate cables as per the criteria indicated in the clauses 3.10 & 3.11 (due to layout constraints) for very short field runs, control cables may be laid in the same tray with the instrumentation cables with clear minimum gap of 100mm between the two types of cables.
- The trays shall be run with a vertical spacing of 300mm for overhead cable trays as well as inside cable trenches. A minimum of 300 mm clearance shall be provided between the top of tray and beams, cold piping, 500mm clearance for hot piping/object to facilitate installation of cables in tray.
- 3.13 To facilitate pulling of cables in conduits, powdered soft stone, plastic soap or other dry inert lubricant may be used where required. However, any material harmful to the cable sheaths shall not be used.

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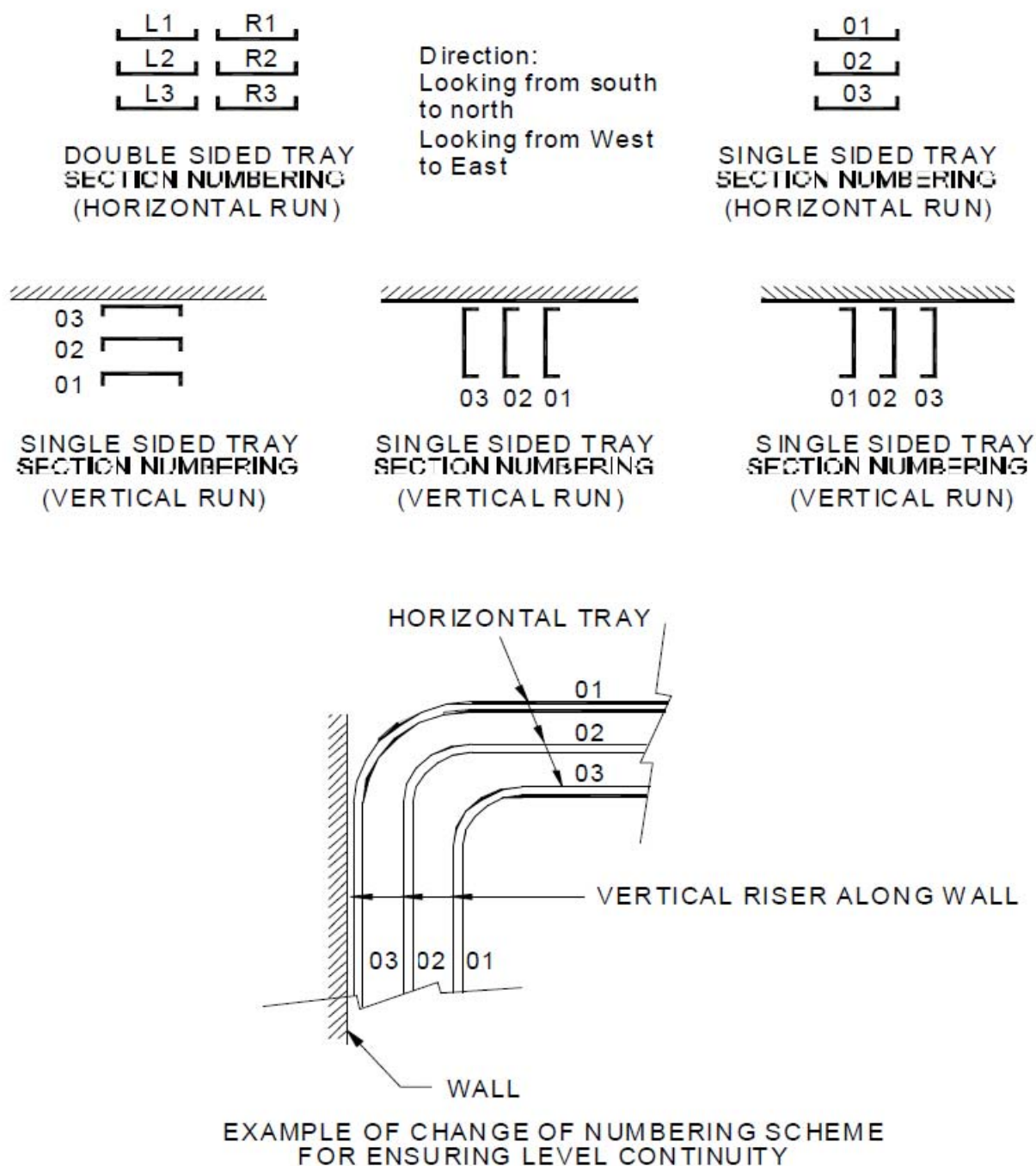



Fig.1

- 3.14 No single core cable shall pass through a GI conduit/ pipe or duct singly except DC single core cables. AC single core cables shall pass through GI conduit/ pipe in trefoil formation only, or through PVC pipes confirming to IS: 4985. Conduit/pipe occupancy shall not exceed 40% of the conduit/pipe cross-section area. Conduit/pipe occupancy (ratio of total cable area to conduit area) shall not exceed the following: -

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- 1) One Cable: 53 %
- 2) Two Cables: 31 %
- 3) Three Cables & Up: 40 %

Exposed pipes/ conduits with min. size 19 mm. if used in corrosive areas shall have anti-corrosive coating both inside & outside.

- 3.15 Conduits with interior coating of silicon epoxy ester shall be of rigid steel, hot dip galvanised, furnished in standard length of minimum 5 metres, which shall be as per IS: 9537. In chemical handling areas, Battery room etc. the exterior surface shall be further coated with chromate and polymer for better resistance to corrosion.
- 3.16 For sizes above 63 mm mild steel pipes with necessary fittings & accessories shall be provided and installed by the contractor. Pipes shall be manufactured by electric welding process. These pipes shall be of heavy duty class as per IS: 1239.
- 3.17 Wherever specific cable routes are not shown in cable schedules, cables may be laid through the shortest route as per the above criteria, as directed by site Engineer.
- 3.18 Flexible conduits shall comply with IS-3480 to be used where vibration is anticipated or equipment that require frequent removal. Aluminium/Nylon cable trefoil clamps shall be fire retardant.
- 3.19 Cable clamping spacing for cables laid in cable trays shall be generally as under:

(a) Trefoil clamps (Nylon clamps):

- 1) Horizontal run spacing: 750 mm (max.)
- 2) Vertical run spacing: 500 mm (max.)


(b) Other Clamps:

1. Power cables of sizes indicated under

- (i) Single core cables: 500 sq. mm or higher (When not laid in trefoil formation- e.g. dc circuits)
- (ii) Multi core cables: 95 sq. mm or higher
 - Horizontal runs: Individually clamped at 750 mm interval (max.)
 - Vertical runs: Individually clamped at 500 mm interval (max.)

2. Power cables of other sizes

- Horizontal runs: Collectively clamped at 750 mm interval (max.)

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Vertical runs: Collectively clamped at 500 mm interval (max.)

3. Control Cables

Horizontal runs: Collectively clamped at 750 interval (max.)

Vertical runs: Collectively clamped at 500 mm interval (max.)

3.20 Clamp spacing for cables supported directly along structure/ ceiling shall be as under:

a) Clamp spacing

1. In horizontal runs: 500 mm (max.)

2. In vertical runs: 500 mm (max.)

b) Spacing between cables: 30 mm (min.)

c) Supports shall also be provided at each bend.

4.0 **Cable Termination & Jointing**

4.1 Termination and jointing of cables shall conform to the requirements of IS: 1255 and shall be carried out as per the recommendations of termination and jointing kit supplier as well as electrical equipment supplier. Cable terminations at various electrical and electronic equipment terminals shall be done as per approved scheme/ interconnection diagrams.

4.2 All cable entries in the equipment shall be sealed by cable glands supplied with the equipment. When the equipment are supplied with undrilled gland plates for cable/ conduit entry into the equipment, all drilling & cutting on the gland plate and any minor modification work required to complete the job shall be carried out at site as per cable glanding requirement. Types of glands to be used are as under.


I. Material: Tinned brass confirming to BS 6121

II. Type: Double compression

4.3 Termination of cables shall be done as per termination drawings & interconnection diagrams furnished. Shorting & looping of cores/ wires at terminals and between the panels if required shall be carried out as per approved scheme.

4.4 Straight through joints of H.T and L.T cables shall be of Pushon/Heat Sinkable/ Tapex/Paracast/Parawrap Type and cable end termination kits for H.T cables shall be tested as per IS: 13573. Cable joint or end terminations on Electrical equipment shall be suitable for Indoor & Outdoor use, as the case may be.

4.5 Termination of aluminium/copper conductor cables shall be done as indicated below:

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i) Aluminium conductor cables: - Aluminium tubular terminal end for solderless crimping.

ii) Copper conductor cables: - Copper tubular terminal end solderless crimping.

4.6 Screened control cables of small cross sectional area, (0.5 sq. mm) shall be terminated by means of cage clamp termination system.

4.7 Lugs for control/instrumentation cables shall be PVC insulated/sleeved type.

4.8 Cables lugs for control cable termination shall be pin type/flat type/ring type/U type.

4.9 Junction boxes of approved design may be used, wherever required, for jointing/ marshalling of control and instrumentation cables.

5.0 Grounding of Cabling System

5.1 Armour grounding:

- a) Armour of the HT cables and LT single core cables shall be grounded only at one end of cable.
- b) Armour of other cables shall be grounded at both ends of cable.

5.2 Screen Grounding:

- a) Screen of multi-core cables shall be grounded at both ends.
- b) Screen of single-core power cables shall be grounded at one end.
- c) Screen of electronic grounding system cables shall be grounded as per the Control System panel manufacturer recommendation.


6.0 Testing Of Cable Installation

6.1 Testing and electrical measurement of cable installations shall conform to the requirement of IS: 1255.

6.2 Prior to installation, cables shall be tested for

- a) Continuity of conductors for all cores of cables.
- b) Insulation resistance between conductors and earth.
- c) Insulation resistance between conductors of multi core cables.

6.3 Pre installation checks for cable tray installation shall be as under:

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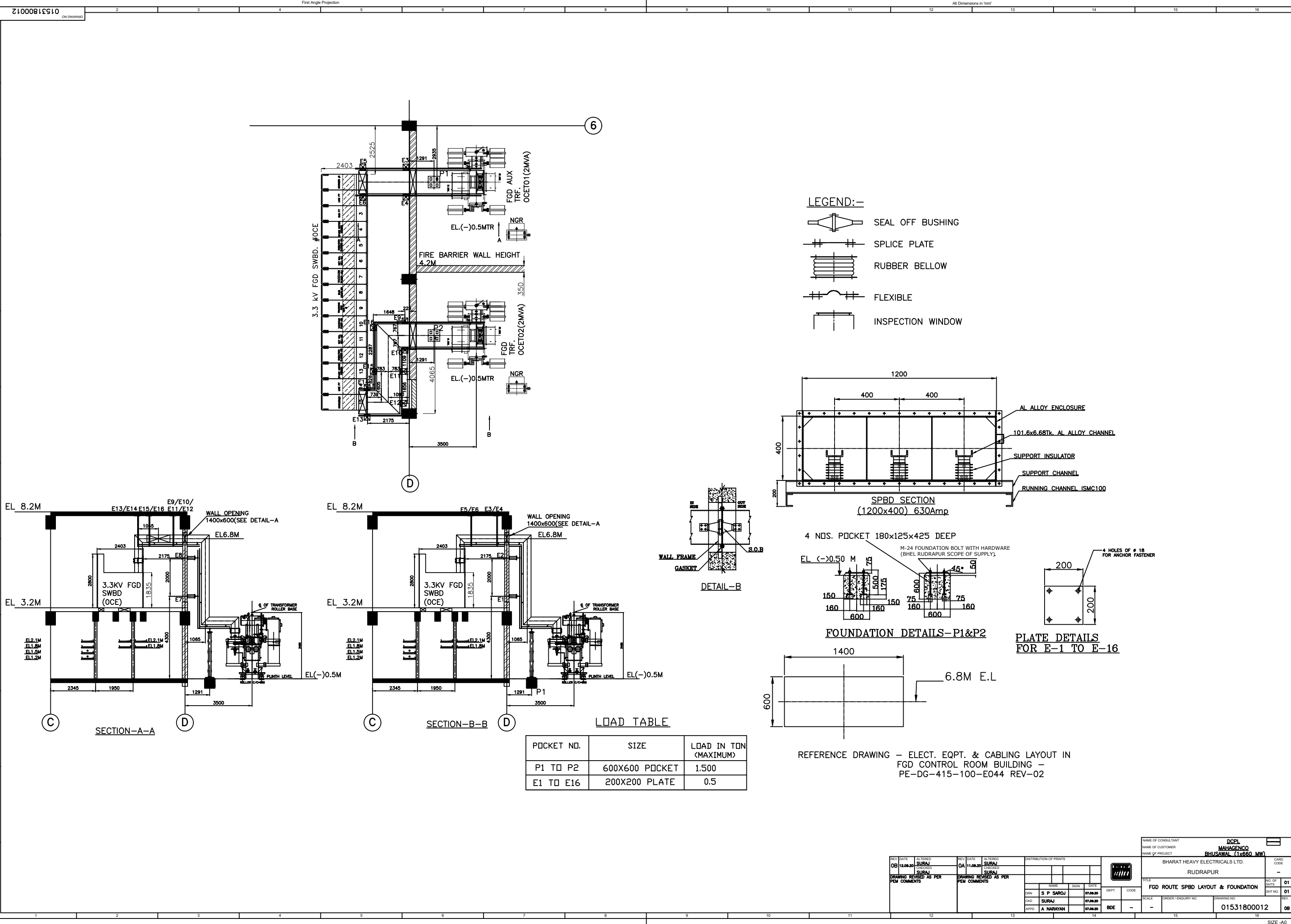
- a) Availability of clear passage/ path for the cable tray network as per approved drawings.
- b) Cold galvanisation / paint treatment for all damaged portions of galvanisation due to cutting / repairs etc.
- c) Correctness of installation of number and type of tray / tray accessories /support material as per approved drawings.
- d) Firmness/ tightness of all bolted joints
- e) Alignment / inter tray separation as per approved layout drawings.
- f) Grounding connections for trays / cable boxes / marshalling boxes

6.4 After installation cables shall be tested for

- a) Continuity of conductors for all cores of cables.
- b) Continuity for grounding connection.
- c) Insulation resistance between conductors.
- d) Insulation resistance between conductors & earth.
- e) Check for earth continuity for armour / screen (where applicable) and proper earth connection for cable glands, cable boxes etc.
- f) DC High voltage test (for all HT cables & LT power cables of sizes 300 sq. mm and above).
- g) Check for correct polarity & phasing of cable connections
- h) Firmness/ tightness of terminations.
- g) For correctness of all connections as per relevant wiring diagram.
- h) For provision of correct cable tags, core ferrules etc.

- 6.6 All documents/ records regarding test data and all other measured values shall be duly vetted by the site Engineer before energizing the circuit and kept for future record and reference. The results of all tests shall conform to the specification requirements as well as any other specific performance guarantee.

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LOAD TABLE		
POCKET NO.	SIZE	LOAD IN TON (MAXIMUM)
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E1 TO E16	200X200 PLATE	0.5

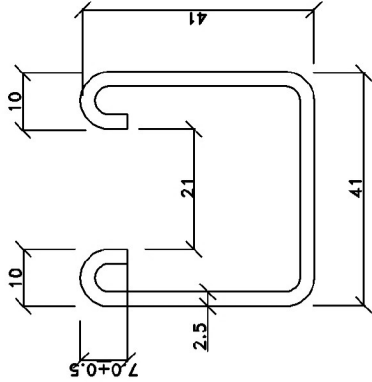
REFERENCE DRAWING - ELECT. EQPT. & CABLING LAYOUT IN
FGD CONTROL ROOM BUILDING -
PE-DG-415-100-E044 REV-02

REV	DATE	ALTERED BY	CHECKED BY	REASON
01	12.08.20	SURAJ	SURAJ	INITIAL
02	11.09.20	SURAJ	SURAJ	REVISION
03	07.08.20	SURAJ	SURAJ	REVISION
04	07.08.20	SURAJ	SURAJ	REVISION
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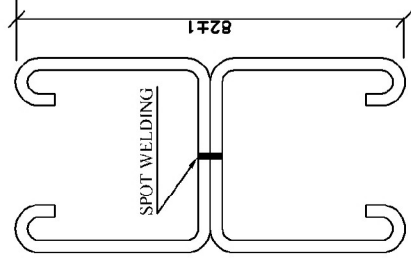
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NAME OF CUSTOMER	MAHAGENCO
NAME OF PROJECT	BHUSAWAL (1x660 MW)
TITLE	RUDRAPUR
SCALE	ORDER / ENQUIRY NO.
DRAWING NO.	01531800012
REV.	01

TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

REVISIONS						
		NAME	DATE			
TITLE:		TYPICAL DETAILS OF BOLTABLE TYPE CABLE TRAY SUPPORT MATERIAL & ACCESSORIES			NAME DDJ	DATE
		DRAWN DSGN	PD			
DRG. NO.	PE-DG-239-507-E051			CHKD RN		
				APPD KKK		
		BHARAT HEAVY ELECTRICALS LTD. PROJECT ENGINEERING MANAGEMENT NEW DELHI			SH 1 OF 11	



SINGLE CHANNEL SC1



DOUBLE CHANNEL DC1

TWO LENGTHS OF SINGLE CHANNEL

SPOT WELDED BACK TO BACK

AT 75MM C/C

NOTE:

- 1. ALL DIMENSIONS ARE IN mm.
- 2. MATERIAL : COLD ROLLED M.S. AS PER IS : 513
- 3. FINISH : HOT DIP GALVANISED AS PER IS 2629
- 4. TOLERANCE ON THICKNESS IS AS PER IS 1852
- 5. PROFILE TOLERANCE ± 0.5 mm

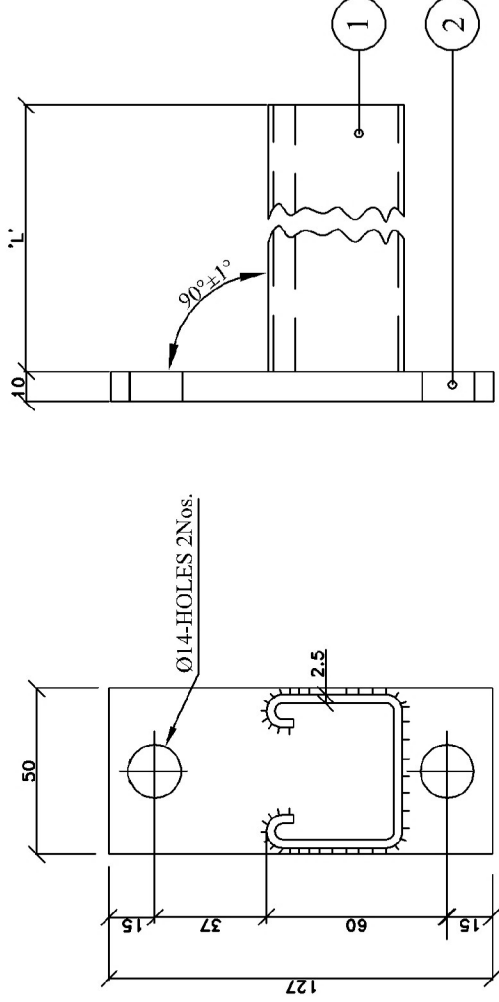


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TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

DRG. NO.

PE-DG-239-507-E051

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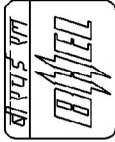


CANTILEVER ARMS

TRAY WIDTH IN MM	CANTILEVER ARM LENGTH (L) IN MM
150	200
300	350
450	500
600	650

NOTES :

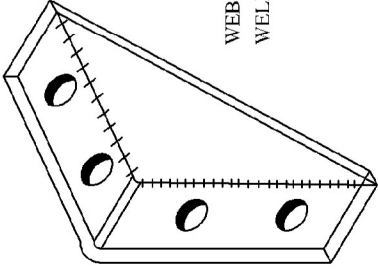
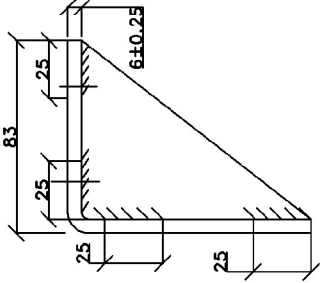
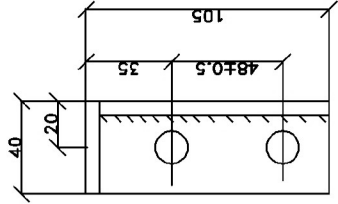
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- 3. ITEM NO.2 MATERIAL : M.S AS PER IS-2062
- 4. FINISH : HOT DIP GALVANISED AS PER IS:2629
- 5. TOLERANCE ON THICKNESS IS AS PER IS:1852
- 5. ALL FABRICATION TOLERANCES ARE ± 1.0mm



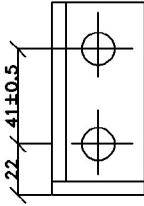
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TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

DRG. NO.
PE-DG-239-507-E051

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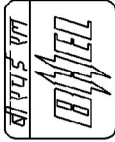
WEB 3 ±0.25mm
WELDED 6mm FILLET



90° ANGLE FITTING HLI

NOTES :

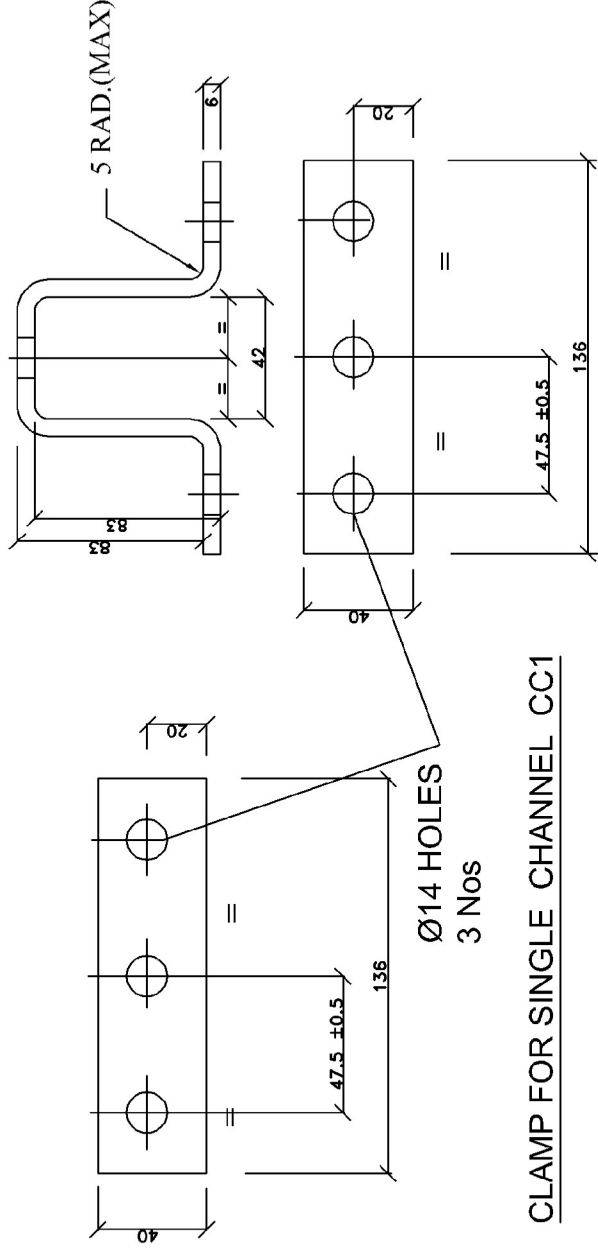
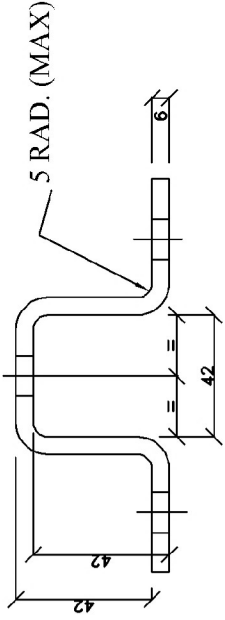
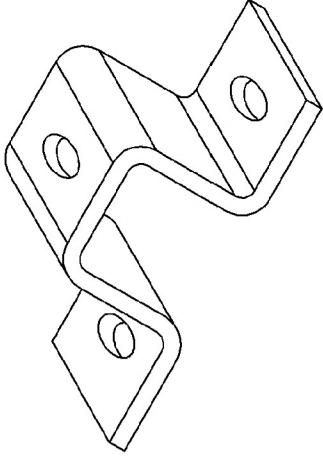
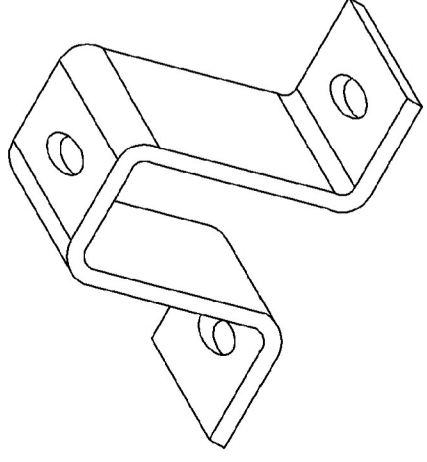
- 1. ALL DIMENSIONS ARE IN mm.
- 2. ALL FABRICATION TOLERANCES ±1.0 mm
- 3. MATERIAL :MILD STEEL AS PER IS-2062
- 4. FINISH : HOT DIP GALVANISED AS PER IS:2629
- 5. TOLERANCE ON THICKNESS AS PER IS:1852



TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

DRG. NO.

PE-DG-239-507-E051



CLAMP FOR SINGLE CHANNEL CC1

CLAMP FOR DOUBLE CHANNEL CC2

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

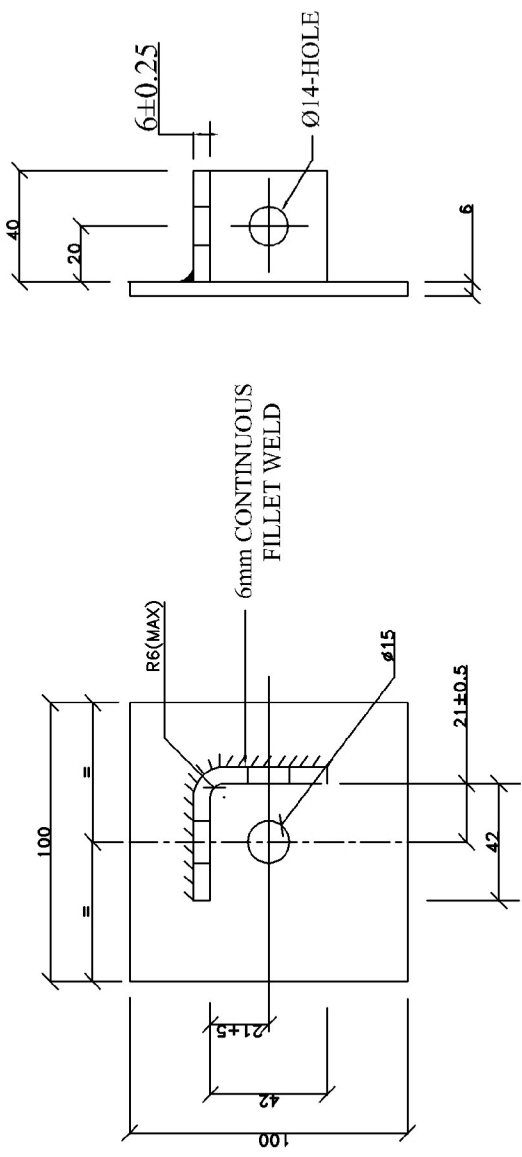
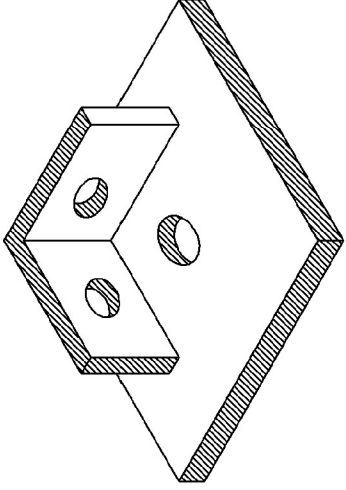


TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

DRG. NO.

PE-DG-239-507-E051

SH 5 OF 11



BASE PLATE FOR SINGLE CHANNEL BP1

NOTE

1. ALL DIMENSIONS ARE IN MM.
2. ALL FABRICATION TOLERANCES ± 1.0 mm.
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

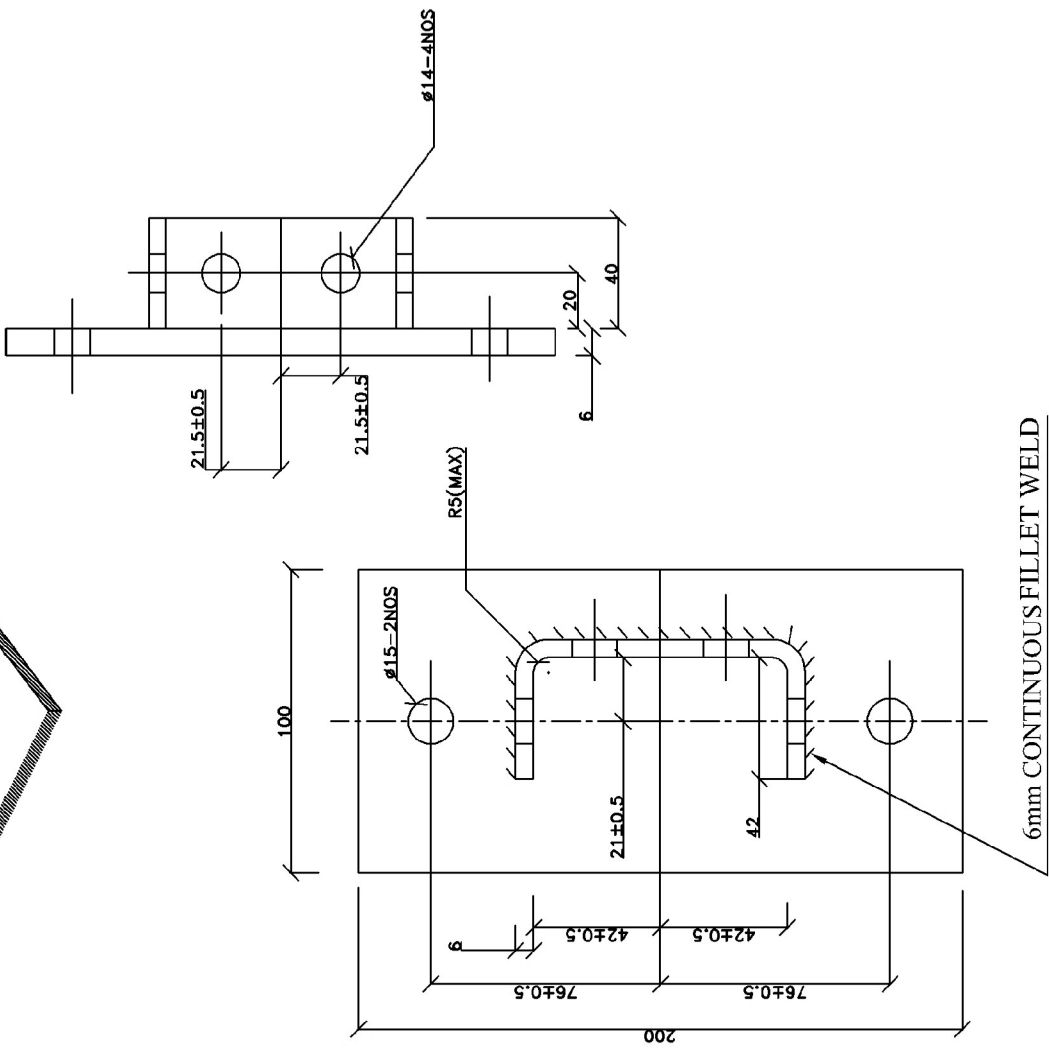
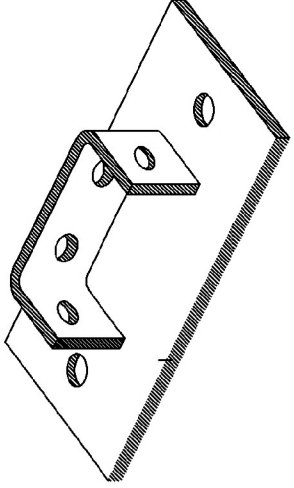


**TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

DRG. NO.

PE-DG-239-507-E051

SH 6 OF 11



BASE PLATE FOR DOUBLE CHANNEL BP2

NOTES

1. ALL DIMENSIONS ARE IN MM
2. ALL FABRICATION TOLERANCES $\pm 1.0\text{mm}$
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

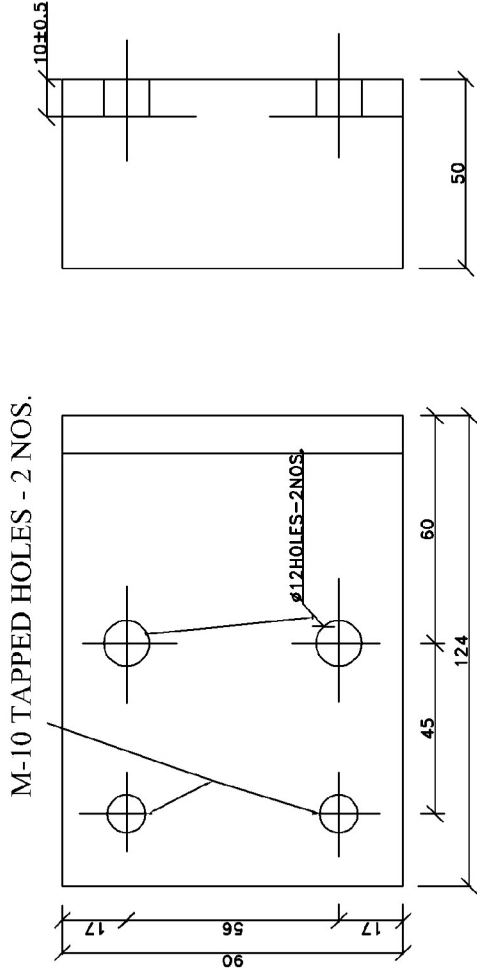


TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

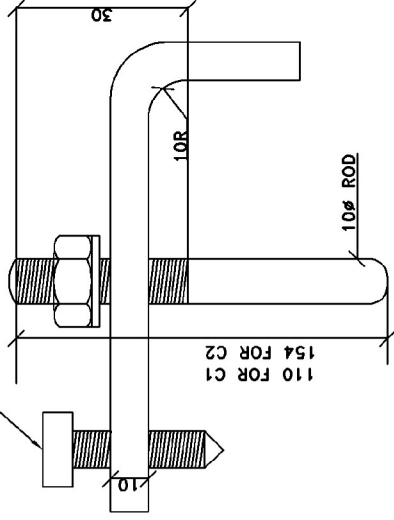
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PE-DG-239-507-E051

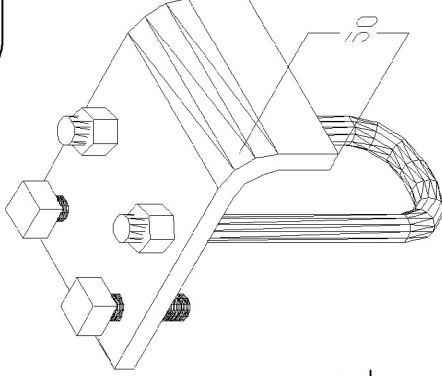
SH 7 OF 11



2 NOS. SET SCREWS M10X40



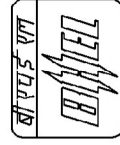
M-10 U-BOLT WITH
2Nos PLAIN WASHERS & NUTS
110 mm FOR SC 1
154 mm FOR DC1



BEAM CLAMP - BC1

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629
5. TOLERANCE ON THICKNESS AS PER IS:1852

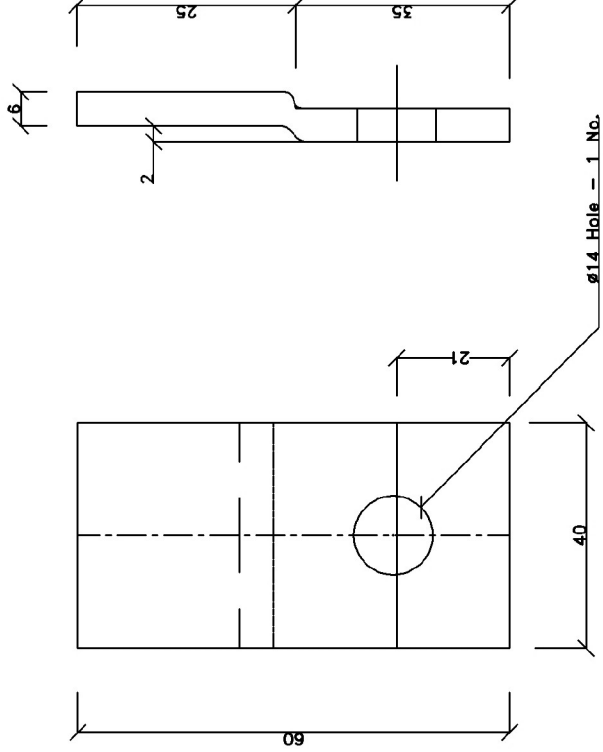
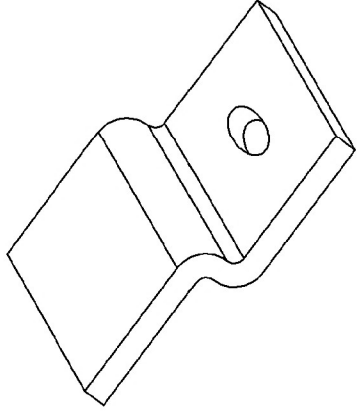


TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

BHEL DRAWING NO.

PE-DG-239-507-E051

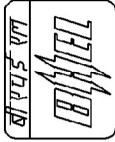
SH 8 OF 11



TRAY FIXING CLAMP - TC1

NOTES

- 1. ALL DIMENSIONS ARE IN mm.
- 2. ALL FABRICATION TOLERANCES : $\pm 1.0\text{mm}$
- 3. MATERIAL : MILD STEEL AS PER IS-2062
- 4. FINISH : HOT DIP GALVANISED AS PER IS:2629
- 5. TOLERANCE ON THICKNESS AS PER IS:1852

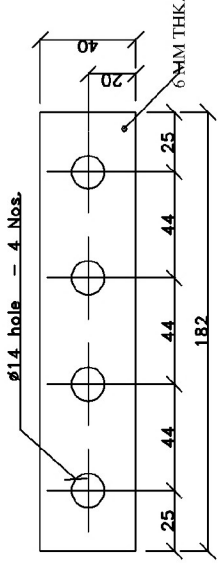


TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

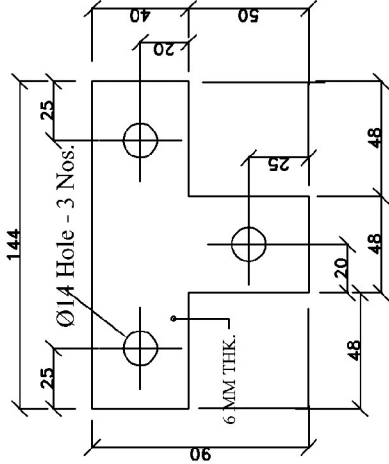
BHEL DRAWING NO.

PE-DG-239-507-E051

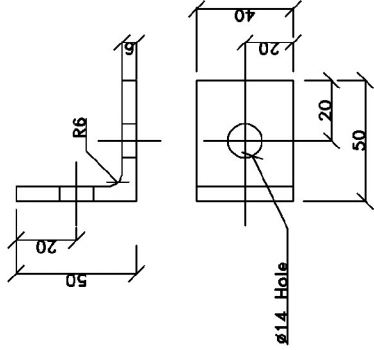
SH 9 OF 11



FLAT PLATE STRAIGHT FITTING PF2



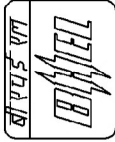
FLAT PLATE TEE FITTING PF1



90° ANGLE FITTING LA1

NOTES

1. ALL DIMENSIONS ARE IN mm.
2. ALL FABRICATION TOLERANCES ± 1.0 mm
3. MATERIAL :MILD STEEL AS PER IS-2062
4. FINISH : HOT DIP GALVANISED AS PER IS:2629

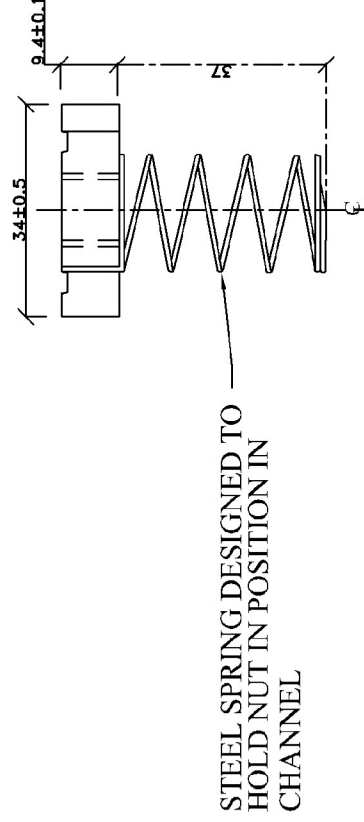
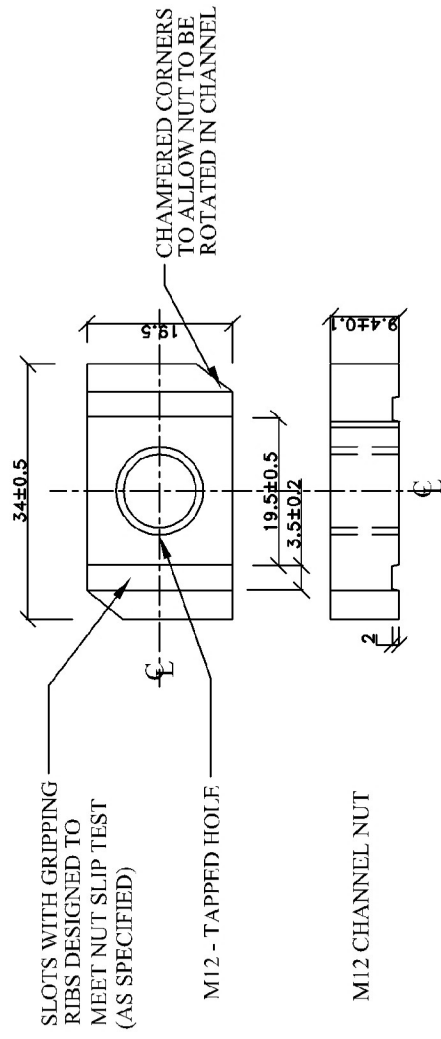


TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES

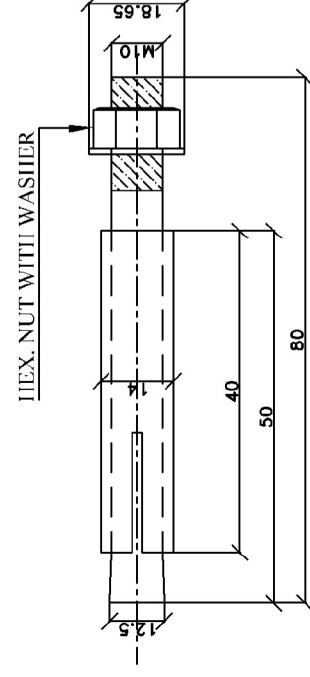
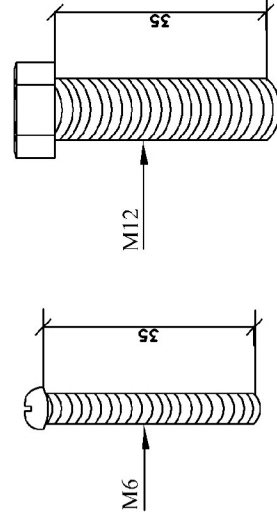
BHIEL DRAWING NO.

PE-DG-239-507-E051

SH 10 OF 11



SPRING NUT ASSEMBLY



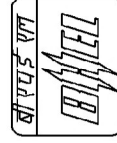
RAN HEAD SCREW

HEX BOLT

ANCHOR BOLT M10

NOTES:

1. MATERIAL - MS AS PER IS - 2062.
2. M6 CHANNEL NUT DIMENSIONAL SIMILAR TO M12.
EXCEPT HOLE DRILLED AND TAPPED TO M6 PAN HEAD SCREWS.
3. TAPPED HOLE THREADING TO MATCH WITH THREADING OF BOLTS.
4. SURFACE PROTECTION ELECTROGALVANISED / CADMIUM PLATED.
5. ALL DIMENSIONS ARE IN MM.



**TITLE: TYPICAL DETAILS OF BOLTABLE
TYPE CABLE TRAY SUPPORT
MATERIAL & ACCESSORIES**

BHEL DRAWING NO.

PE-DG-239-507-E051

SH 11 OF 11

BEST/NEXT PRACTICE

(as the case may be)



Improvement Initiatives through Deployment of IT in Business Process

Team Members

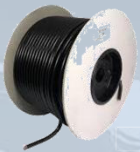
Sandeep Lodh , Sr. DGM (Electrical) , PEM

LEAD WORKSHOP

19-21 December 2019

Cable Management System

..... Consolidation Strategy to enhance Responsiveness.....

[illegible]

Content

- Present Scenario
- Areas For Improvement (AFI) identified
- Improvement Initiatives
- Work Instruction for Implementation

Present Scenario

Present Scenario:

A) Prevailing Practice

- Huge quantum of cabling work is necessary in Power Station for Power Supply & Control of Instruments
- Such cables are generally stored at a common place for laying
- PEM/MUs release Drawings/ **Cable Schedule** for majority of BHEL supplied equipment & also for BOP Packages
- PEM & Other **MUs supply** the cable as per schedule.
- **Records are maintained at site in Legacy formats viz. xl sheets**

B) Shortcomings in Prevailing Practice :

- Lack of structured process orientation(tools) **except xl sheet** at sites for accounting of Package wise status of Cable
- Lack of control on the actual quantity required in course of execution as a result of site constraints-change of lay-out, urgency of customer inter-alia .
- Package wise Shortage cannot be specifically quantified and documented for sourcing from **concerned** MUs or diversion from other sites and vice-versa for Surplus quantity also.

C. Effects:

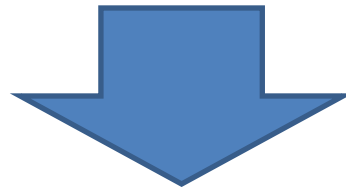
Difficulties in

- Design Optimization
- Restoring control on incurring avoidable expenditure, taking toll on Profit
- Information Sharing on surplus
- Consolidation

Areas For Improvement (AFI) identified

Areas For Improvement Identified :

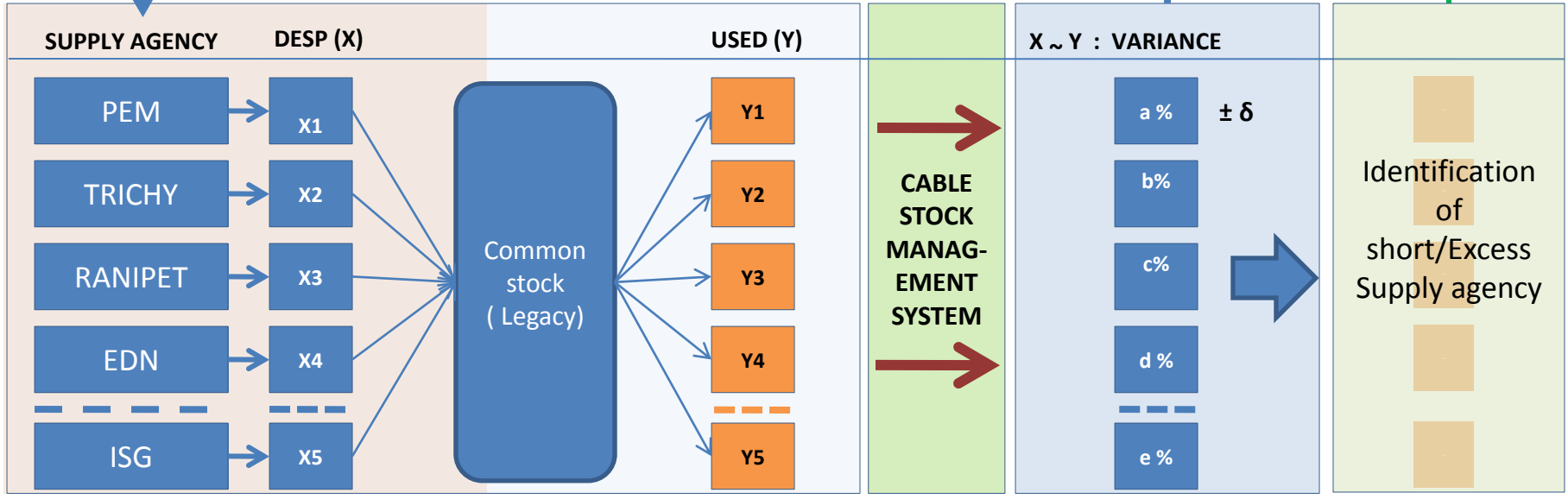
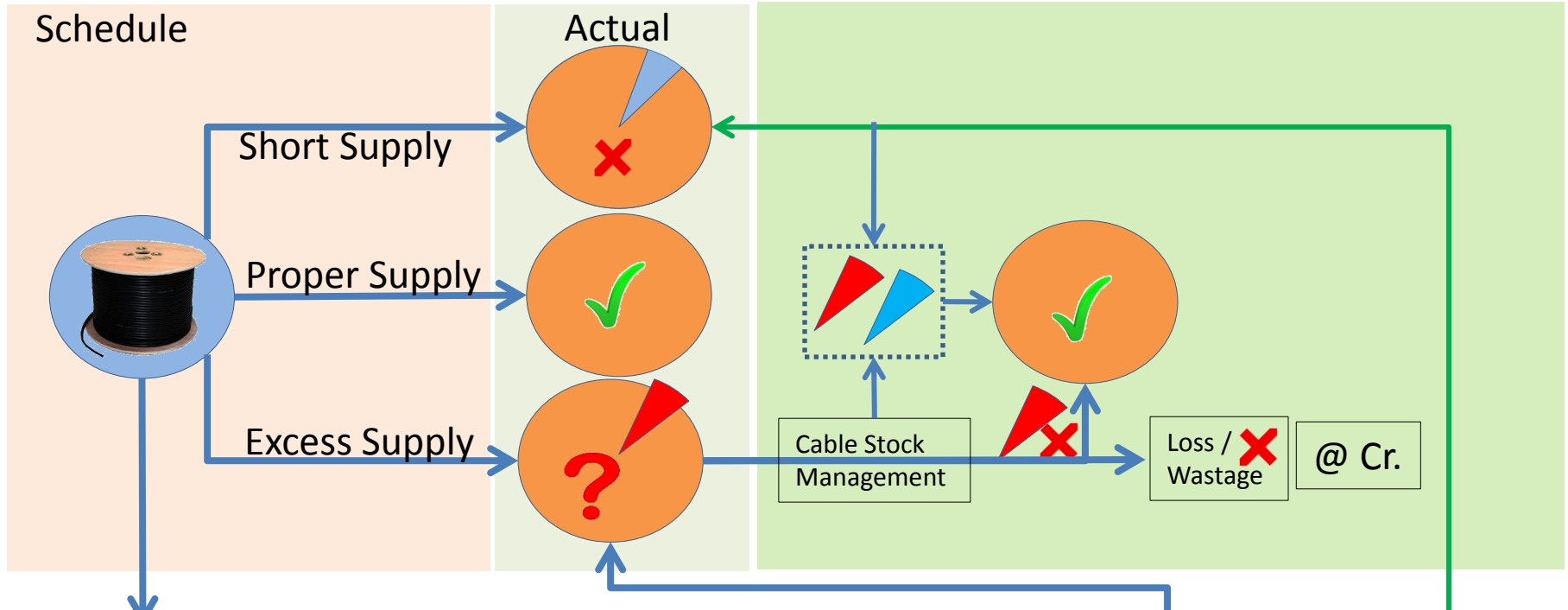
- Measurement of consumption of cable - Supply Unit wise , Schedule wise
- Control & measures of Excess Supply / Short Supply
- Measurement of wastage (limit= 2% of total scope)
- Controls of excess wastage [alert to keep wastage limit with in specified limit]
- Agency wise supply scope and actual supply & implementation (consumption) status.
- Control and measures on re-work
- Control of wastage (Lack of skill / malafide)



Cost Control

Improvement Initiatives

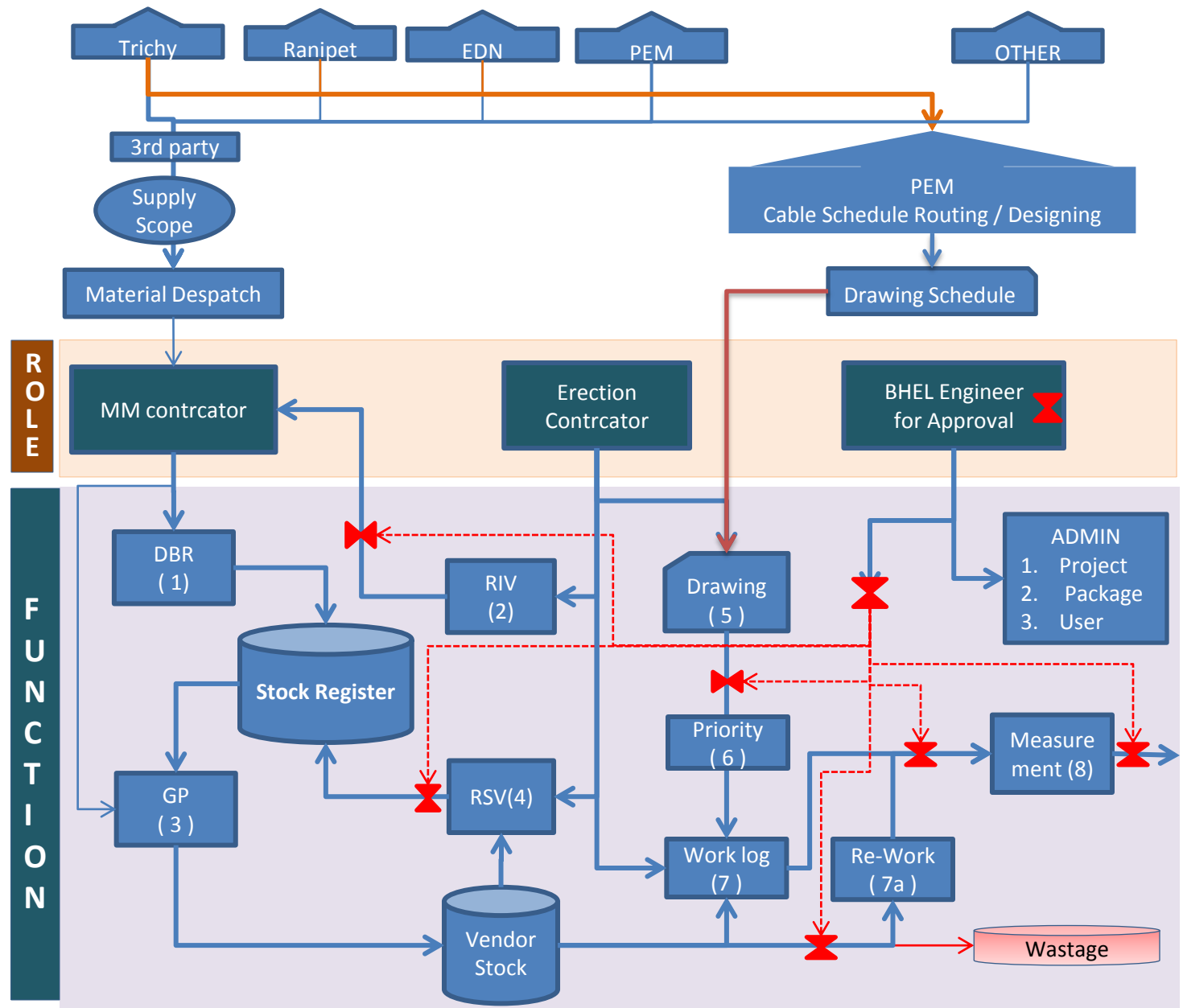
Exploration of Data Flow



Improvement Initiatives through Deployment of IT in Business Process

Exploration of Schematic Work flow (with Applicable functional areas and agencies)

- Priority of schedule
- Capture work log
- Control on re-work
- Actual Use
- Wastage
- Material availability
- MU wise Supply/ use



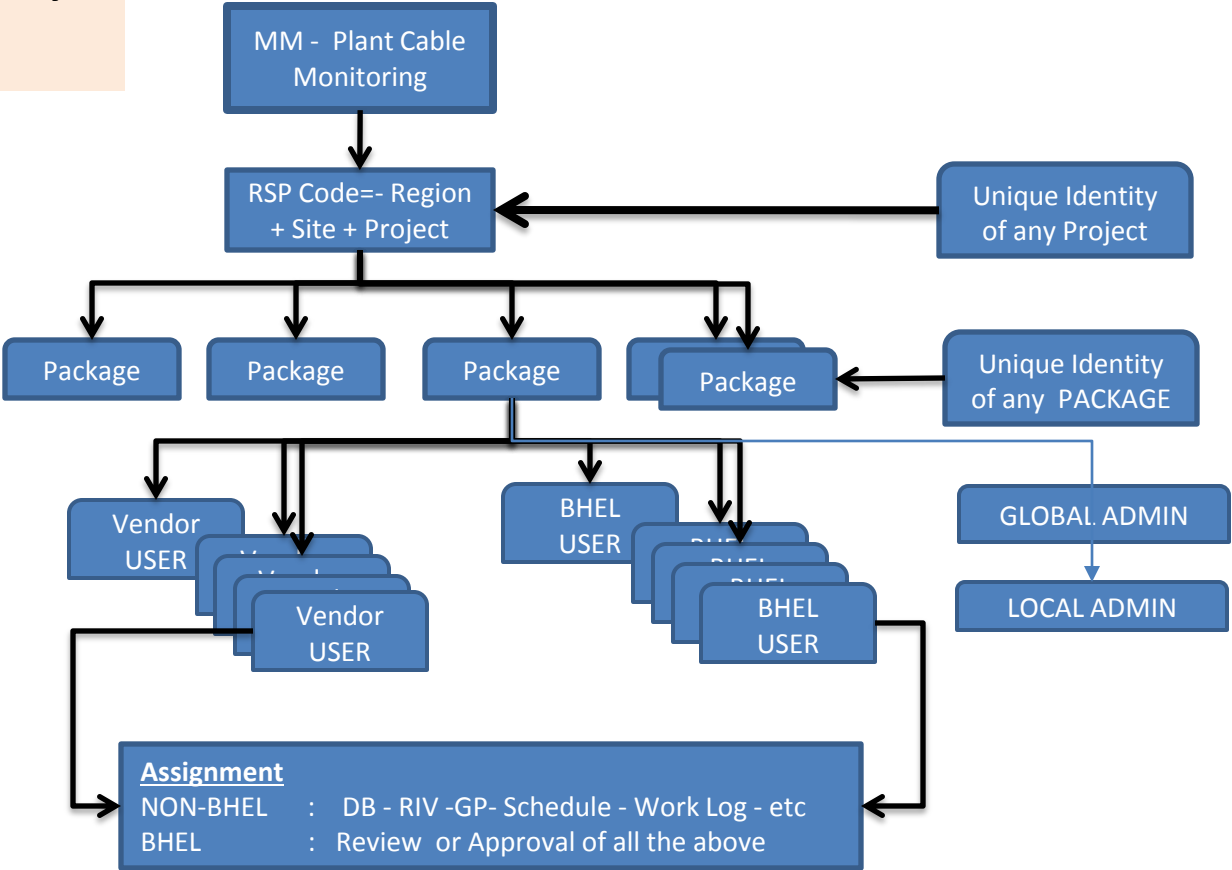
Review and Control By BHEL officials

Improvement Initiatives through Deployment of IT in Business Process

Roadmap :-

Project - Package - User Hierarchy

- Data segregation
- Right restriction



Project, Package & Users of the system are uniquely identified and distinguishable
 Roll based Users are allowed to work in specific functionality accordance to provided rights
 Rights are - Creation , review/approve, Modify, View pertaining to applicable functional areas
 Global Admin – Global Access for System Administration
 Local Admin - Access Restricted within a particular project

Improvement Initiatives through Deployment of IT in Business Process

Roadmap :-

Roles & Responsibilities

Roles	Responsibility Matrix	
<ul style="list-style-type: none"> - Site Engineer(s) - PEM - MM Contractor - Erection Contractor(s) 	Functions	Responsibilities
	Project Creation	BHEL - Global Admin
	Package creation	Local or Global Admin
	User creation	BHEL - Local Admin
	Routing user creation	BHEL - Local Admin
	Creation of day book	MM Contractor
	Material Inspection	MM Contractor
	Inspection Approval	BHEL MM Engineer
	RIV creation	Erection Contractor
	RIV approval	BHEL Erection Engineer
	Gate pass issue / printing	MM Contractor
	Cable schedule uploading	BHEL-PEM/MU
	Cable Schedule Priority	BHEL Erection Engineer
	Work log entry	Erection Contractor
	re-work approval	BHEL Erection Engineer
	Measurement sheet generation	Erection Contractor
	Measurement sheet approval	BHEL Erection Engineer

Standards & Identifications follows:

	Activity	Identity	Information against Identity
01	DayBook	DBR NO	Unique for a project
		Cable Code -	Generated as per unified codification policy issued by R&D Hyd.
			- No of Core
			- Size of cable
			- Cable type
			- Metal etc
		DRUM Number -	Unique Number – provided by OEM – Available in Invoice/Challan
		DRUM Length -	Length (Meter) – Available in Invoice/Challan - Last reading of cable
		Dispatch MU -	Dispatch MU - (MU code directoy)
		FOR Project -	Project Identity (assign during login)
02	RIV	Requisition (RIVNO)	by Contractor DRUM. No. - Fully or Partly - Vendor / Package level
03	ISSUE	Gate Pass (GPNO)	to Contractor with Drum Number as key field - Vendor / Package level
04	USED	Work Log (WLNO)	by Erection Contractor Cable Schedule wise
			Drawing No, Schedule No, DRUM No., (Start Reading – End Reading) , Lead & Wastage
05	RSV	Return to Store (RSVNO)	Return back to Stock - Excess
06	Canibalisation	Borrow (CAN NO)	Inter Site / Unit - Sharing of excess Resources
	NB :	DRUM No.	Carries information– Cable_code (Size/Core etc),DB,RIV,GP etc.
		DRUM No.	Unique Number for a Project
		Project Code (RSP)	Unique Number
		Package Number	Unique Number

Improvement Initiatives through Deployment of IT in Business Process

Roadmap :-

Priorities

- Inclusive work by MU, Erection contractor and BHEL engineers at site.
- Capturing data (cable schedule, dispatch detail, usage) at the lowest possible functional level (task performer).
- Online validation of Function wise work flow.
- Actual use of cable in comparison with schedule Including its identity
- System may be able to summarize the agency wise total consumption, wastage, scrap etc.
- Drum wise link between quantity (received , issued , used) and the area of use
- MU wise reconciliation of design scope & quantity i.e.

Requirement as per Schedule - (Used + WIP)= Balance

Assumptions

- Drum Number and dispatched unit mandatory in stock entry
- Used Cable length = Gland to gland length + lead length at rack end + lead length at equipment end.
- Drum Length = Used Cable length + Wastage length + Scrap + Returned length (RSV)
 - Scrap = Continuous cable not further usable
 - Wastage = Small pieces which are cut during termination
- Un accounted Cable length of a Drum shall be treated as wastage and shall be added to accounted wastage.
- Gland to gland length = Reading at start gland - reading at end gland
- Lead length at rack end = up to a flexed length depending on rack size (Decided by BHEL)
- lead length at equipment end = up to a flexed length depending on machine/equipment size (Decided by BHEL)
- Billable length = Used Cable length
- Punching of reading is not allowed which are lies between (Start reading - lead length at rack) and reading at end gland + lead length at equipment end

Improvement Initiatives through Deployment of IT in Business Process

System Architecture

- Web based three tier application with oracle back end database
- Hosted in window 2008 Web Server (IIS)
- Compatible with commonly used browser
- Available over intranet / internet both
- One user works on one package at a time (mutually exclusive for multiple package)

Output at a Glance

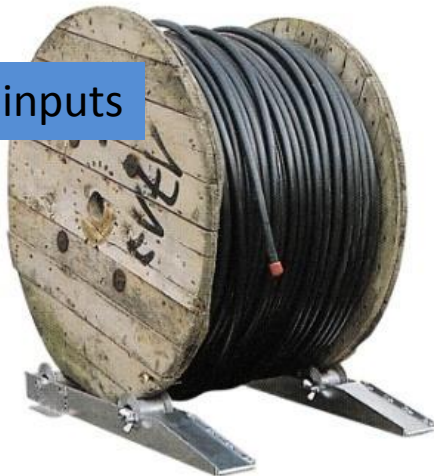
- Stock register
- Stock availability
- Contractor Stock & Availability
- Contractor Consumption
- Contractor Work log
- Mu wise planned quantity
- Mu wise stock, Consumption
- Wastage, Scrap
- Material Requirement Planning =Material requirement as per Schedule – Balanced at site Store - (Consumed + WIP)

SAMPLE CABLE SCHEDULE : PEM SCOPE FOR 2 X 660 MW SURATGARH PROJECT

inputs

Drg.NO:- PE-CS-392-507-E146			Rev.No-1		Desc-CABLE SCHEDULE FOR 415V SSAS PMCC (ODA)				
SL NO	FROMA	TOA	PUREPOSE	CABLE DETAI	ITEM I	REMAR	CABLE NO	ROUTETO	SCH L
				L	D	KS			ENGTH
1	415V STATION SERVICE SWBD #0DA PNL -01A	DDCMIS PANEL- CRE-52	OPEN/CLOSE COMMAND, ACB ON/OFF, 86, ACB IN TEST/SERVICE, S/R	08P X 0.5Paired Screened(O)(1.1 kV)	D08V0.5		0DA01AC01 (0DA01AC0 1)	LA24-R4, LA25-R4, LA26-R4, LA27- R4, LA49-05, LA22-R4, LA56-05, CR90-05, CQ15-L8, CQ16-L8, CQ17- L8, CQ18-L8, CR78-04, CR59-03	70
2	415V STATION SERVICE SWBD #0DA PNL -01A	DDCMIS PANEL- CRE-51	LINE PT W/D, FUSE FAILURE, U/V	04P X 0.5Paired Screened(O)(1.1 kV)	D04V0.5		0DA01AC02 (0DA01AC0 2)	LA24-R4, LA25-R4, LA26-R4, LA27- R4, LA28-R4, LA57-05, CR91-05, CR74-03, CR65-04, CR66-04, CR67- 04, CR68-03, CR59-04	64
3	415V STATION SERVICE SWBD #0DA PNL -01A	DDCMIS PANEL- CRE-50	METERING : A (lr,ly,lb), KW,V(R-Y, Y-B, B-R),KVA	08P X 0.5Paired Screened(I)(1.1 kV)	D08W0. 5		0DA01AC03 (0DA01AC0 3)	CR59-04	63
4	415V STATION SERVICE SWBD #0DA PNL -01A	TRAFO MB	NEUTRAL CT CONNECTION (SEF)	02C X 2.5XLPE- Cu(A) FRLS(1.1 kV)	D02J2.5		0DA01AC05 (0DA01AC0 5)	LA24-R3, LA25-R3, LA26-R3	23
5	415V STATION SERVICE SWBD #0DA PNL -01A	HT PANEL (0BB)	UPSTREAM BREAKER CLOSE/TRIPPED	05C X 1.5PVC- Cu(A) FRLS(1.1 kV)	D05A1.5		0DA01AC06 (0DA01AC0 6)	LA24-R3, LA39-04, TB02-04, TA02- 04, MA83-04, MA82-04, MA81-04, MA80-04, MA35-L4, MA87-04, MA86- 04, MA22-03, MA23-02	53
6	415V STATION SERVICE SWBD #0DA PNL -01A	IRP (CXA06)	SYNC, DB CLOSE, TRIP COMMAND, SYNC SEL., TSS	12C X 1.5PVC- Cu(A) FRLS(1.1 kV)	D12A1.5		0DA01AC07 (0DA01AC0 7)	LA24-R3, LA25-R3, LA26-R3, LA27- R3, LA28-R3, LA57-04, CR91-04, CR74-02, CR65-02, CR66-02, CR67- 02, CR68-02, CR59-01	62
7	415V STATION SERVICE SWBD #0DA PNL -01A	ECP (CWB02- SEC2)	METERING : A (lr,ly,lb), KW,V(R-Y, Y-B, B-R),KVA	08P X 0.5Paired Screened(I)(1.1 kV)	D08W0. 5		0DA01AC08 (0DA01AC0 8)	LA24-R4, LA25-R4, LA26-R4, LA27- R4, LA50-05, TB04-05, TB34-03, CQ23-03	58
8	415V STATION SERVICE SWBD #0DA PNL -01A	ECP (CWB02- SEC2)	BKR ON /OFF STATUS, 86 OPERATED (AUTO TRIP)	10C X 1.5PVC- Cu(A) FRLS(1.1 kV)	D10A1.5		0DA01AC10 (0DA01AC1 0)	LA24-R3, LA25-R3, LA26-R3, LA27- R3, LA50-04, TB04-04, TB34-02, CQ23-02	58
9	415V STATION SERVICE SWBD #0DA PNL -01A	IRP (CXA06)	SYNC CKT	03C X 2.5XLPE- Cu(A) FRLS(1.1 kV)	D03J2.5		0DA01AC12 (0DA01AC1 2)	LA24-R3, LA25-R3, LA26-R3, LA27- R3, LA28-R3, LA57-04, CR91-04, CR74-02, CR65-02, CR66-02, CR67- 02, CR68-02, CR59-01	62
10	415V STATION SERVICE SWBD #0DA PNL -02A	DDCMIS PANEL- CRE-51	BUS U/V,FUSE FAILURE, BUS PT WITHDRAWN	04P X 0.5Paired Screened(O)(1.1 kV)	D04V0.5		0DA02AC01 (0DA02AC0 1)	LA24-R4, LA25-R4, LA26-R4, LA27- R4, LA28-R4, LA57-05, CR91-05, CR74-03, CR65-03, CR66-03, CR67- 03, CR68-03, CR59-04	62

inputs



HAVELLS (Life Line S³)

Single Core FR Round PVC Insulated Industrial Grade Copper Conductor (Unsheathed) Flexible Cables, 1100 Volts, conforming to IS: 694



Nominal area of conductor sq. mm	Basic Code	List Price per 100 mtrs.
10	WHFFDN...B1010	11,680
16	WHFFDN...B1016	18,445
25	WHFFDN...B1025	28,705
35	WHFFDN...B1035	39,560
50	WHFFDN...B1050	56,920
70	WHFFDN...B1070	80,775
95	WHFFDN...B1095	1,08,810
120	WHFFDN...B1120	1,36,395
150	WHFFDN...B1150	1,70,985
185	WHFFDN...B1185	2,08,480
240	WHFFDN...B1240	2,96,140
300	WHFFDN...B1300	3,94,605
400	WHFFDN...B1400	5,23,830

...Fill the colour code i.e. B = Blue ..

Standard Packing: 100 mtrs. coils.




• Colours available: Red, Yellow, Blue, Green & Black.

OEM Identification	Description	Advantage
DRUM Number	OEM provide drum number in each and every cable Drum	Used as it is
Cable description	OEM mentioned a description of the item – emphasizing on some specification, which is not common or unique for all type of cable and nomenclature is differ from OEM to OEM.	Cable Code standardization
Length Marking	OEM punch running length in number at a gap of one meter through out the cable. Starting with zero at the center of Drum. Dum length is readable from the OEM punch mark itself with out measuring.	Used as it is
Wooden Drum	Wooden drum destroyed after some duration	Disadvantage Proposed OEM for STEEL DRUM

Cable Item Identification – Through Unified Coding System

inputs

- Prepared by Unified codification committee
- Issued by **Corporate R&D Hyd. BHEL**


Plant Cable Management

**Power Sector Eastern Region
Bharat Heavy Electricals Limited**


User: ppanja : P PANJA
 REGION: PPSTPSPH2
 Site: LOCSTPS #: 7,8
 Vendor: B134

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Wizard for generating Cable Code

Generated Cable

<=>

Cable Description

3C x 120 sq. mm. (1.1kV) PVC FRLS, Unarmoured Aluminium cable
 Convention : { <Core> X <Size> <Insulation> <Armed> <FRLS> <Metal> Cable
 Ex. 3C x 120 sq. mm. (1.1kV) PVC FRLS, Unarmoured Aluminium cable
 3C x 2.5 sq. mm. (1.1kV) PVC FRLS, Unarmoured Copper cable
 3.5C x 120 sq. mm. (1.1kV) PVC non-FRLS, Armoured Aluminium cable

No of Cores

03

No. of cores (e.g. 01,03,3H, 07) for 0.5 H (half)

Cable Size

120

Cable size(e.g. 035,185,2.5, 0.5)

Cable Voltage (Code)

11KV (Power cables)

A

Cable Code

PVC COPPER ARMoured FRLS
 PVC COPPER ARMoured FRLS
 PVC COPPER ARMoured NON-FRLS
 PVC COPPER UNARMoured FRLS
 PVC COPPER UNARMoured NON-FRLS
 PVC ALUMINIUM ARMoured FRLS
 PVC ALUMINIUM ARMoured NON-FRLS
 PVC ALUMINIUM UNARMoured FRLS

Status

May Save into the Cable Directory

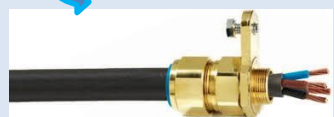
The cables Generation scheme Issued by Corporate R&D for BHEL

A	NN	A	NNN
Cable Voltage Code (see B below)	No. of cores (e.g. 01,03,3H, 07)	Cable code (See C below)	Cable size(e.g. 035,185,2.5, 0.5)
SYSTEM VOLTAGE CODES: (ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V (dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V	CABLE VOLTAGE CODES: A = 11KV (Power cables) B = 6.6KV (Power cables) C = 3.3KV (Power cables) D = 1.1KV (LV & DC system power & control cables) E = 0.6KV (0.5 sq. mm. Control cables)	PVC COPPER A = ARMoured FRLS B = ARMoured NON-FRLS C = UNARMoured FRLS D = UNARMoured NON-FRLS E = ARMoured FRLS F = ARMoured NON-FRLS G = UNARMoured FRLS H = UNARMoured NON-FRLS XLPE COPPER J = ARMoured FRLS K = ARMoured NON-FRLS L = UNARMoured FRLS M = UNARMoured NON-FRLS XLPE ALUMINIUM N = ARMoured FRLS P = ARMoured NON-FRLS Q = UNARMoured FRLS R = UNARMoured NON-FRLS S = FIRE SURVIVAL CABLES T = TOUGH RUBBER SHEATH U = OVERALL SCREENED V = PAIRED OVERALL SCREENED W = PAIRED INDIVIDUAL SCREENED Y = COMPENSATING CABLES I = PRE-FABRICATED CABLES Z = JELLY FILLED CABLE	

The cables Generation scheme Issued by Corporate R&D of BHEL

A	NN	A	NNN
Cable Voltage Code (see B below)	No. of cores (e.g. 01,03,3H, 07)	Cable code (See C below)	Cable size(e.g. 035,185,2.5, 0.5)
SYSTEM VOLTAGE CODES: (ac) A = 11KV, B = 6.6KV, C = 3.3KV, D = 415V, E = 240V, F = 110V (dc) G = 220V, H = 110V, J = 48V, K = +24V, L = -24V	CABLE VOLTAGE CODES: A = 11KV (Power cables) B = 6.6KV (Power cables) C = 3.3KV (Power cables) D = 1.1KV (LV & DC system power & control cables) E = 0.6KV (0.5 sq. mm. Control cables)	PVC COPPER A = ARMoured FRLS B = ARMoured NON-FRLS C = UNARMoured FRLS D = UNARMoured NON-FRLS PVC ALUMINIUM E = ARMoured FRLS F = ARMoured NON-FRLS G = UNARMoured FRLS H = UNARMoured NON-FRLS XLPE COPPER J = ARMoured FRLS K = ARMoured NON-FRLS L = UNARMoured FRLS M = UNARMoured NON-FRLS XLPE ALUMINIUM N = ARMoured FRLS P = ARMoured NON-FRLS Q = UNARMoured FRLS R = UNARMoured NON-FRLS S = FIRE SURVIVAL CABLES T = TOUGH RUBBER SHEATH U = OVERALL SCREENED V = PAIRED OVERALL SCREENED W = PAIRED INDIVIDUAL SCREENED Y = COMPENSATING CABLES I = PRE-FABRICATED CABLES Z = JELLY FILLED CABLES	Preview of Item Directory

Schematic for cable laying & brief Illustration



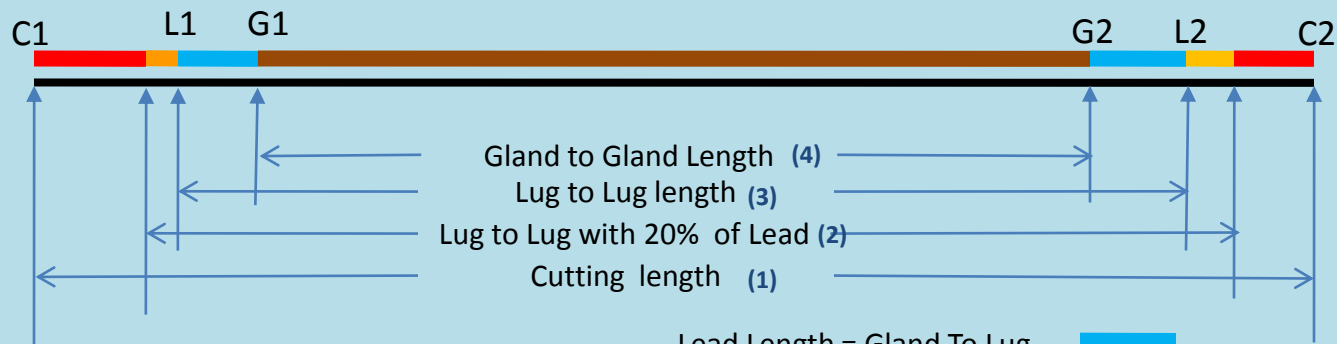
11 KV switch Board

L1 - Lug

G1 - Gland

Equipment end
LT S/W Board / etc.

Note (1) : Pieces of cable cut from drum in the yard (C1-C2).
 Note (2) : Length allowed for uncertainties (this is consider as cable consumption) – Technical Wastage
 Note (3) : Lug to Lug length – Actually used : Payable to vendor
 Note (4) : Gland to Gland length : length as per Reading of punch mark on the cable at both Gland
 Wastage: Remaining length of cable from the cut piece after actually consumed length including length allowed for uncertainties.



Lead Length = Gland To Lug
 20% of Lead=Technical Wastage
 Wastage

Payable = Lug to Lug length (L1-L2)

Consumption = lug to lug with 20 % of Lead length

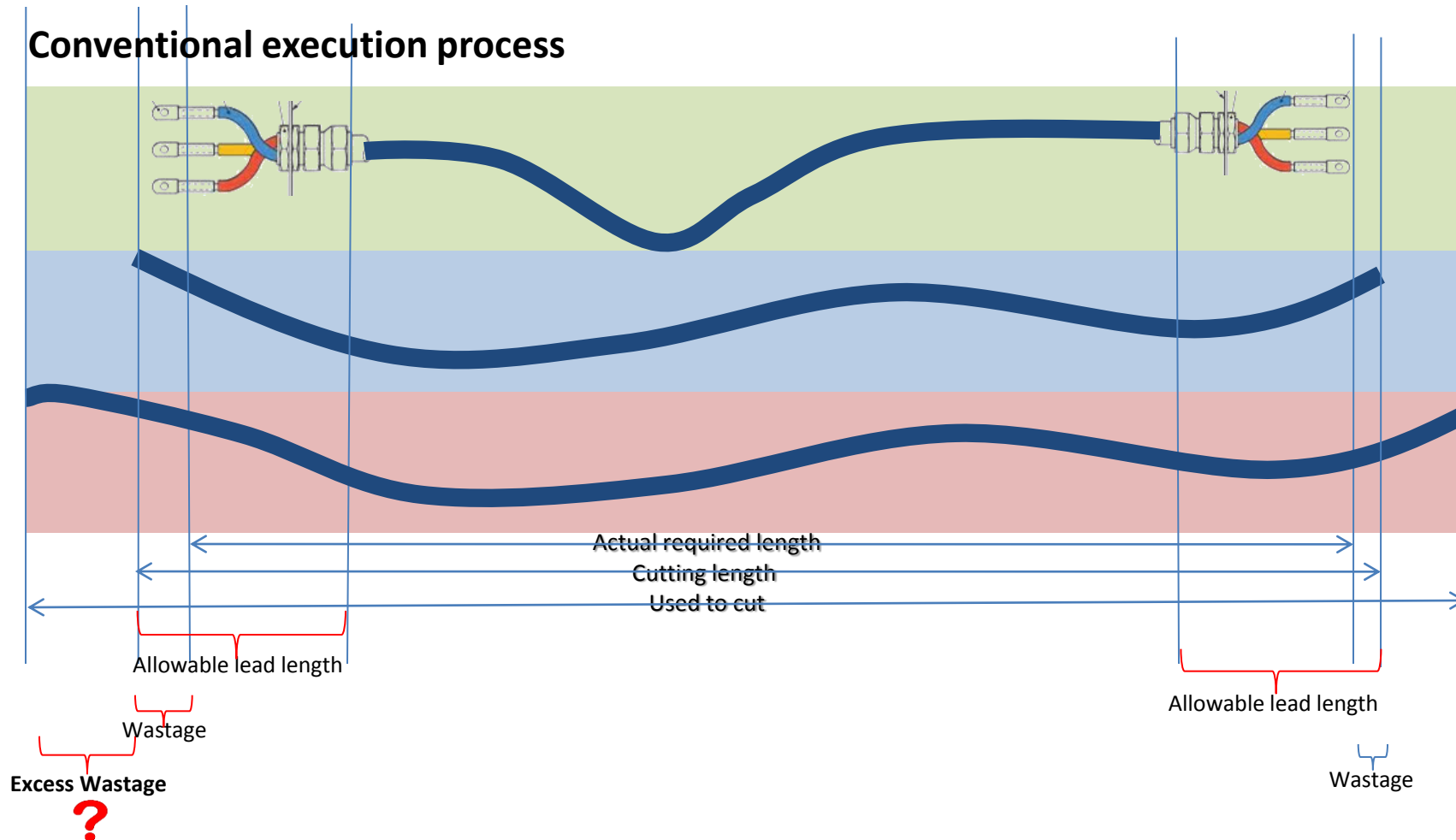
Wastage



Illustration of Wastage During Execution

Allowable wastage + Excess wastage

Conventional execution process



Schematic for cable laying & brief Illustration

The diagram illustrates the components of a cable lay: L1 (red), G1 (blue), G2 (brown), and L2 (yellow). It shows four measurement methods: Gland to Gland Length (blue arrow), Lug to Lug length (blue arrow), Lug to Lug with 20% of Lead (blue arrow), and Cutting length (blue arrow). A legend box defines: Lead Length = Gland To Lug (blue), 20% of Lead=Technical Wastage (yellow), and Wastage (red).

Cutting Length Work log		Drum No	C1	C2	Wastage
C1					C2
Wastage = Loose excess cable at the (end of the drum)					

Diagram illustrating the calculation of W1 (auto) for a pipe with two gland fittings (G1 and G2). The distance between the centers of G1 and G2 is labeled L1. The distance from the center of G2 to the right end of the pipe is labeled L2. The formula for W1 (auto) is: $W1 = \text{Cutting Length} - (\text{Gland length} + \text{lead (s) length})$.

Frequency	Percentage
Never	10%
Sometimes	40%
Often	50%



Implementation

Cutting Length Work log

Plant Cable Management - Work Log Entry page Cutting Length Wise - PPSTSPH2ELE1 Close this Page

DrgNo : aaaaaa

Status

ItemId : D02W0.5

DrumNo : CK-12147 : 1006 0 -0 = 313

Qty : 315

Msg : Bal Qty=315

SL NO	FROM AREA	TO AREA	ITEM ID	SCHE LENG	CABLE NO	START READ	END READ	WASTAGE	TOTAL CONSUMED	AITEM ID	ALT ITEM DESC	DRUM NO	RIV NO	GP NO	DB NO	Edit/Update	Add/Del	Stock	rou L	App L	rou T	App T	Remk
1	3.3kV STN SWGR	MOTOR TB	D02J2.5	628	0CA02AC01(0CA02AC01)	12	90	0	78	D02N2.5	2C-2.5 1.1 KV LT XLPE AL (A) FRLS	14XA014127	CRIV00005	GP00004	DBR05019	Edit	Add	---	N	N	N	N	---
1	3.3kV STN SWGR	DDCMS	D02J2.5	628	0CA02AC01 (0CA02AC01)	12	678	25	691	D02W0.5	2P-0.5 1.1 KV TYPE-F (IO)ARMOURED	CK-12147	CRIV00002	GP00002	DBR04955	Edit	Add	---	Y	Y	Y	Y	---
1	3.3kV STN SWGR	DDCMS	D02J2.5	628	0CA02AC01 (0CA02AC01)	680	993	0	313	D02W0.5	2P-0.5 1.1 KV TY	CK-12147	CRIV00002	GP00002	DBR04955	Update Cancel Delete	stock	N	N	N	N	Remk	
2	3.3kV STN SWGR	LPBS	D12A2.5	628	0CA02AC02 (0CA02AC02)	12	112	1	108	D12V0.5	12P-0.5 1.1 KV TYPE-G (O)ARMOURED	CK-13103	CRIV00006	GP00005	DBR05059			---	Y	Y	Y	Y	---
3	3.3kV STN SWGR	MOTOR TB	D02J2.5	628	0CA02AC03 (0CA02AC03)	480	110	22	402	D01N630	01C X 630XLPE-AL(A) FRLS(11 KV)	14XG014356	CRIV00003	GP00003	DBR05006			---	Y	N	Y	N	---
3	3.3kV STN SWGR	MOTOR TB	D02J2.5	628	0CA02AC03 (0CA02AC03)	3	450	1	461	D02N2.5	2C-2.5 1.1 KV LT XLPE AL (A) FRLS	14XA013981	CRIV00006	GP00005	DBR05019			---	N	Y	Y	Y	---
4	3.3kV STN SWGR	HYDRANT PUMP # C	C03N185	661	0CA02AP01 (0CA02AP01)	70	10	21	83	D01N630	01C X 630XLPE-AL(A) FRLS(11 KV)	14XG014356	CRIV00003	GP00003	DBR05006			---	N	N	Y	N	---
5	3.3kV STN SWGR	DDCMS	D03J2.5	76	0CA03AC01 (0CA03AC01)	12	112	0	100	D02W0.5	2P-0.5 1.1 KV TYPE-F (IO)ARMOURED	CK-12137	CRIV00002	GP00002	DBR04955	Edit	Add	---	Y	N	N	N	---
5	3.3kV STN SWGR	IRP	D03J2.5	76	0CA03AC01(0CA03AC01)					D03J2.5	03C X 2.5XLPE-Cu(A) FRLS(1.1 KV)					Edit	Add	---	N	N	N	N	---
6	3.3kV STN SWGR	DDCMS	D02W0.5	80	0CA03AC02 (0CA03AC02)	---	---	---	---	---	2P-0.5 1.1 KV TYPE-G (O)	---	---	---	---	Edit	Add	---	---	---	---	---	---

Schedule which are yet to lay are enable.
Select Drum No from contractor own stock
Update 3 fields : (1) Start Reading (C1) (2)End reading (C2) (3) Wastage (mtr.)

Gland fittings, Termination Work log

Plant Cable Management - Work Log Entry for Cable Lugging & Termination - PPSTSPH2ELE1 (Child Page) Close this Page

DrgNo : aaaaaa

Status

ItemId : D12V0.5

DrumNo : CK-13103 : 0 4 -3 = 108

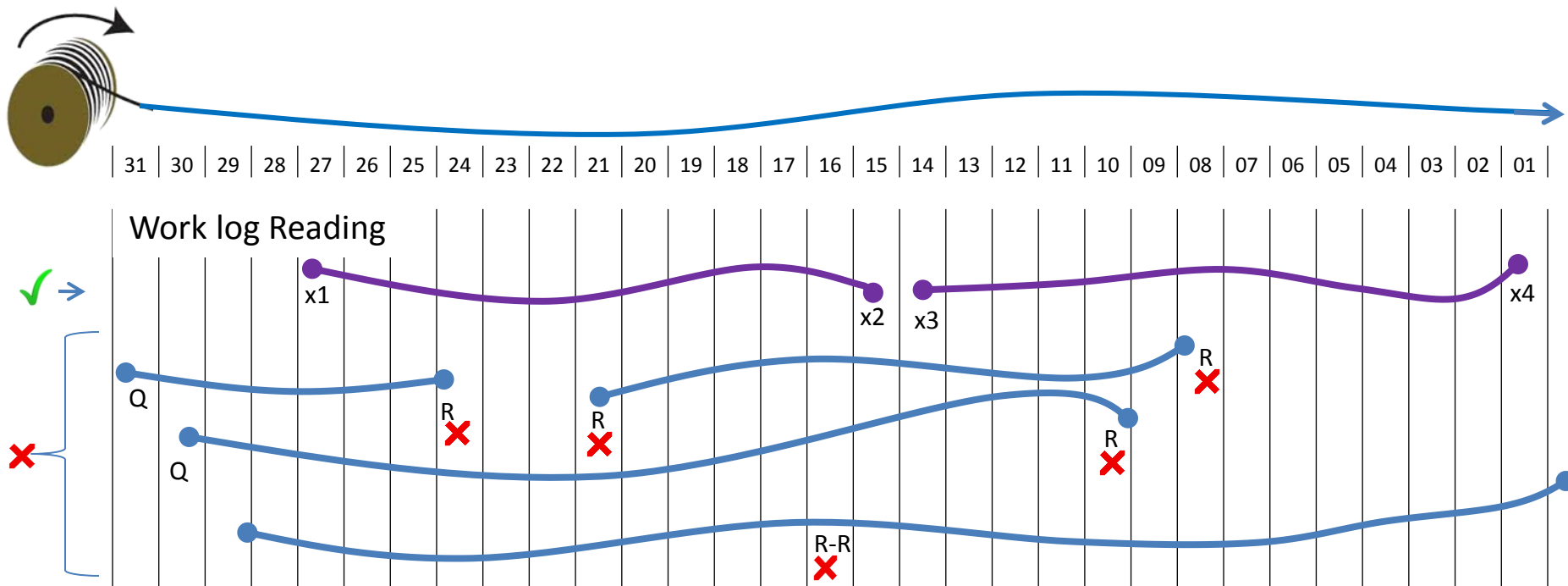
Qty : 0

Msg : Remaining Qty=0 Choose Alternate Item/Drum !!

SL NO	FROM AREA	TO AREA	ITEM ID	SCHE LENG	CABLE NO	START READ	END READ	GLAND START	GLAND END	LEAD START	LEAD END	TECH LEN	W1	WASTAGE	TOTAL CONSUMED	AITEM ID	ALT ITEM DESC	DRUM NO	Edit/Update	rou L	App L	rou T	App T	Remk
1	3.3kV STN SWGR	MOTOR TB	D02J2.5	628	0CA02AC01 (0CA02AC01)	12	90			0	0	78	78	0	78	D02N2.5	2C-2.5 1.1 KV LT XLPE AL (A) FRLS	14XA014127		N	N	N	N	Remk
1	3.3kV STN SWGR	DDCMS	D02J2.5	628	0CA02AC01 (0CA02AC01)	12	678	13	666	1	1	666	11	25	691	D02W0.5	2P-0.5 1.1 KV TYPE-F (IO)ARMOURED	CK-12147	Edit	Y	Y	N	N	Remk
1	3.3kV STN SWGR	DDCMS	D02J2.5	628	0CA02AC01 (0CA02AC01)	680	993			0	0	313	313	0	313	D02W0.5	2P-0.5 1.1 KV TYPE-F (IO)ARMOURED	CK-12147		N	N	N	N	Remk
2	3.3kV STN SWGR	LPBS	D12A2.5	628	0CA02AC02 (0CA02AC02)	12	112	18	108	4	3	107	1	1	108	D12V0.5	12P-0.5 1.1 KV TYPE-G (O)ARMOURED	CK-13103	Update Cancel	Y	Y	N	N	Remk
3	3.3kV STN SWGR	MOTOR TB	D02J2.5	628	0CA02AC03 (0CA02AC03)	480	110			5	5	380	370	22	402	D01N630	01C X 630XLPE-AL(A) FRLS(11 KV)	14XG014356		Y	N	Y	N	Remk
3	3.3kV STN SWGR	MOTOR TB	D02J2.5	628	0CA02AC03 (0CA02AC03)	3	450			3	10	460	447	1	461	D02N2.5	2C-2.5 1.1 KV LT XLPE AL (A) FRLS	14XA013981		N	Y	Y	Y	Remk
4	3.3kV STN SWGR	HYDRANT PUMP # C	C03N185	661	0CA02AP01 (0CA02AP01)	70	10			1	1	62	60	21	83	D01N630	01C X 630XLPE-AL(A) FRLS(11 KV)	14XG014356		N	N	Y	N	Remk

Schedule for which laying is completed are enable to update
Update 4 field : (1)Gland1 Reading (2) Gland 2 Reading (3) Lead 1 (mtr) (4) Lead 2 (mtr.)
W1 – Wastage after termination will be calculated automatically

Illustration of System checks to be measured - used , wastage , Scrap length of a Cable Drum



- No Readings are allowed to entered which are already consumed
 - Start Reading , End Reading including lead length
 - New Reading (cutting point) R is not allowed if it is lies with in consumed cable Start , end reading.
 - Between new reading no existing reading is present
- Enter Reading never allowed beyond the drum length
- Wastage length needs to feed – Accounting of Drum length
- Length does not reflect in work log or RSV considered as wastage

✗ System will not allowed

✓ System will allowed

Worklog Screen - Sample

3HEL Financ...

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Plant Cable ...

WL



File Edit View Favorites Tools Help

http--10.11.1.1208080-Ca... List Of Intranets of Other ... Suggested Sites Calif. couple dies in cr...

Find: amar Previous Next Options

Plant Cable Management - Work Log Entry for Cable Lugging & Termination - PPIBTPH2ELE1 (Child Page)

Close this Page

DrgNo : PE-CS-391-507-E001	Status	ItemId : vitemid	DrumNo : DrumNO : - =	Qty : Qty	Msg :
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SL NO	FROM AREA	TO AREA	ITEM ID	SCH LENG	CABLE NO	START READ	END READ	GLAND START	GLAND END	LEAD START	LEAD END	TECH LEN	W1	WASTAGE	TOTAL CONSUMED	ALTERNATE ID	ALT ITEM DESC	DRUM NO	Edit/Update	Rou L	App L	Rou T	App T	Remk
1	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	GRP	D05A2.5	83	3BA01AC01(3BA01AC01)								0			D05A2.5	SC-2.5 1.1KV LT PVC CU (A) FRLS			N	N	N	N	Remk
1	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	GRP	D05A2.5	83	3BA01AC01(3BA01AC01)								0			D05A2.5	SC-2.5 1.1KV LT PVC CU (A) FRLS			N	N	N	N	Remk
2	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	GRP	D05A2.5	83	3BA01AC02(3BA01AC02)								0			D05A2.5	SC-2.5 1.1KV LT PVC CU (A) FRLS			N	N	N	N	Remk
3	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	GRP	D02J2.5	83	3BA01AC03(3BA01AC03)								0											Remk
4	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	ECP	D04W0.5	93	3BA01AC04(3BA01AC04)	979	890			2	2	93	89	2	95	E04W0.5	04P X 0.5 Paired Screened (I) (0.6 kV)	64	Edit	Y	Y	N	N	Remk
5	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	BTS PANEL	D12A2.5	108	3BA01AC06(3BA01AC06)	130	20			2	2	114	110	1	115	D12A2.5	12C-2.5 1.1KV LT PVC CU (A) FRLS	3121	Edit	Y	Y	N	N	Remk
6	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	GRP	D02J2.5	83	3BA01AC07(3BA01AC07)								0											Remk
7	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	DCS CRE 47	D12V0.5	88	3BA01AC08(3BA01AC08)	416	317			2	2	103	99	1	104	E12V0.5	12P X 0.5 Paired Screened (O) (0.6 kV)	3855	Edit	Y	Y	N	N	Remk
8	11 KV UNT SWGR 3BAPANEL NO 01 MAIN1 C	ECP	D05A2.5	93	3BA01AC09(3BA01AC09)	640	556			2	2	88	84	2	90	D05A2.5	SC-2.5 1.1KV LT PVC CU (A) FRLS	3178	Edit	Y	Y	N	N	Remk
9	11KV UNT SWGR 3BAPANEL NO 02 (MAIN 1 C LINE PT)	ECP	D02J2.5	93	3BA02AC01(3BA02AC01)	638	547			2	2	95	91	2	97	D02A2.5	02C X 2.5 PVC-Cu(A) FRLS (1.1 kV)	XAC-144405	Edit	Y	Y	N	N	Remk
10	11KV UNT SWGR 3BAPANEL NO 02 (MAIN 1 C LINE PT)	BTS	D02J2.5	108	3BA02AC02(3BA02AC02)								0			D02J2.5	02C X 2.5 XLPE-Cu(A) FRLS (1.1 kV)			N	N	N	N	Remk
11	11KV UNT SWGR 3BAPANEL NO 02 (MAIN 1 C LINE PT)	DCS CRE 46	D04V0.5	88	3BA02AC03(3BA02AC03)	620	524			2	2	100	96	2	102	E04V0.5	04P X 0.5 Paired Screened (O) (0.6 kV)	3642	Edit	Y	Y	N	N	Remk
12	11KV UNT SWGR 3BAPANEL NO 02 (MAIN 1 C LINE PT)	BTS	D05A2.5	108	3BA02AC04(3BA02AC04)	301	197			2	2	108	104	1	109	D05A2.5	SC-2.5 1.1KV LT PVC CU (A) FRLS	3168	Edit	Y	Y	N	N	Remk
13	11KV UNT SWGR 3BAPANEL NO 03 (RAT 1 C LINE PT)	ECP	D02J2.5	93	3BA03AC01(3BA03AC01)	733	644			2	2	93	89	2	95	D02A2.5	02C X 2.5 PVC-Cu(A) FRLS (1.1 kV)	XAC-144405	Edit	Y	Y	N	N	Remk
14	11KV UNT SWGR 3BAPANEL NO 03 (RAT 1 C LINE PT)	BTS	D02J2.5	108	3BA03AC02(3BA03AC02)								0											Remk
15	11KV UNT SWGR 3BAPANEL NO 03 (RAT 1 C LINE PT)	DCS CRE 46	D04V0.5	88	3BA03AC03(3BA03AC03)	987	891			2	2	100	96	2	102	E04W0.5	04P X 0.5 Paired Screened (I) (0.6 kV)	43	Edit	Y	Y	N	N	Remk
16	11KV UNT SWGR 3BAPANEL NO 03	BTS	D05A2.5	108	3BA03AC04(3BA03AC04)	1004	900			2	2	108	104	1	109	D05A2.5	SC-2.5 1.1KV LT PVC CU (A) FRLS	3165	Edit	Y	Y	N	N	Remk

SL_NO	FROM_AREA	TO_AREA	ITEM_ID	ITEM DESCRIPTION	SCH LEN	Route To	Cable No	PURPOSE	START READ	END READ	LEAD Start	LEAD End	Gland Start	Gland End	TECH Length	WASTAGE	TOTAL CONSUMED	Alternate ITEM_ID	ALT ITEM_DESC	DRUM_NO	RIV_NO	GP_NO	DB_NO	Edit/Cancel	Add/Del	Stock	Rout_L	App_L	Rout_T	App_T	rem
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Label_Err

 http--10.11.1.1208080-Ca...
 List Of Intranets of Other ...
 Suggested Sites ▾
 Calif. couple dies in cr... ▾

Previous Next Options ▼

Plant Cable Management Preview of Drawing Schdule

(Child page) Close page

	DRAWING NO	REV NO	DRG TITLE	CUSTOMER	PROJECT	ISSUED BY	ISSUED ON	RECEIVED ON	CUSTOMER DRG NO
Select	PE-CS-391-507-E007	02	CABLE SCHEDULE FOR 3.3 KV STATION AUX SWBD #0CA	OPGCL	PPIBTPH2	PE	27/03/2017		na


☐ Approved ☐ Not Routed ☐ Routed Un Approved ☒ All Schedule

DRAWING_NO	REV	SL NO	FROMA	TOA	ITEM_ID	ITEM_DESC	REMARKS	SCH LEN	CABLE_NO	TECH LENGTH	WASTAGE	TOTAL CONSUMED	AITEM_ID	DRUM_NO	RIV_NO	GP_NO	DB_NO	ROUTED	APPROVED	
PE-CS-391-107-E007	02	1	3.3kV STN SWGR OCAPANEL NO 01 1C SEC-A	ECF	D02V0.5	12P-0.5 1.1 KV TYPE-G (O)ARMOURD	OVERALL SCREENED	86	0CA01AC01 (0CA01AC01)	92	1	93	E02V0.5	3593	CRJV00070	GP00070	CDB01602	N	N	
		2	3.3kV STN SWGR OCAPANEL NO 01 1C SEC-A	DCS: CRE59	D12V0.5	12P-0.5 1.1 KV TYPE-G (O)ARMOURD		92	0CA01AC02 (0CA01AC02)	112	0	112	E12V0.5	3848	CRJV00053	GP00053	CDB02253	N	N	
		3	3.3kV STN SWGR OCAPANEL NO 01 1C SEC-A	ECF	D05A2.5	5C-2.5 1.1KV LT PVC CU (A) FRLS	ARMOURD	86	0CA01AC03 (0CA01AC03)											
		4	3.3kV STN SWGR OCAPANEL NO 02 (SEC-A LINE PT)	ECF	D02J2.5	02C X 2.5 XLPE-Cu(A) FRLS (1.1 KV)	ARMOURD (REV 01)	86	0CA02AC01 (0CA02AC01)											
		5	3.3kV STN SWGR OCAPANEL NO 02 (SEC-A LINE PT)	DCS: CRE59	D04V0.5	4P-0.5 1.1 KV TYPE-G (O)ARMOURD	OVERALL SCREENED	92	0CA02AC02 (0CA02AC02)	108	2	110	E04W0.5	43	CRJV00070	GP00070	CDB02629	N	N	
		6	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 04	MOTOR SPACE HEATER	D02J2.5	02C X 2.5 XLPE-Cu(A) FRLS (1.1 KV)		311	0CA04AC01 (0CA04AC01)	338	2	340	D02A2.5	XAC-144401	CRJV00024	GP00024	CDB02212	N	N	
		7	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 04	EMERGENCY PB	D07A2.5	07C X 2.5PVC-Cu(A) FRLS (1.1 KV)		311	0CA04AC02 (0CA04AC02)	338	2	340	D07A0.5	3202	CRJV00024	GP00024	CDB01582	N	N	
		8	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 04	1A COMPRESSOR-1	A03N185	11 KV 3C-185 AL(A) HT XPLE		305	0CA04AP01 (0CA04AP01)	328	3	331	C03N185	DXT-49615	CRJV00020	GP00020	CDB02770	N	N	
		9	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 03	MOTOR SPACE HEATER	D03J2.5	03C X 2.5XLPE-Cu(A) FRLS (1.1 KV)	(CABLE IN CUSTOMER SCOPE) ARMOURD	0	0CA05AC01 (0CA05AC01)											
		10	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 03	EMERGENCY PB	D07A2.5	07C X 2.5PVC-Cu(A) FRLS (1.1 KV)	(CABLE IN CUSTOMER SCOPE) ARMOURD	0	0CA05AC02 (0CA05AC02)											
		11	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 03	PUMP MOTOR FOR MCL-1	C03N185	03C X 185XLPE-AL(A) FRLS (3.3 KV)	(CABLE IN CUSTOMER SCOPE)AL XLPE ARMOURD	0	0CA05AP01 (0CA05AP01)											
		12	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 06	MOTOR SPACE HEATER	D03J2.5	03C X 2.5XLPE-Cu(A) FRLS (1.1 KV)	(CABLE IN CUSTOMER SCOPE) ARMOURD	0	0CA06AC01 (0CA06AC01)											
		13	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 06	EMERGENCY PB	D07A2.5	07C X 2.5PVC-Cu(A) FRLS (1.1 KV)	(CABLE IN CUSTOMER SCOPE) ARMOURD	0	0CA06AC02 (0CA06AC02)											
		14	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 06	PUMP MOTOR FOR MCL-2	C03N185	03C X 185XLPE-AL(A) FRLS (3.3 KV)	(CABLE IN CUSTOMER SCOPE)AL XLPE ARMOURD	0	0CA06AP01 (0CA06AP01)											
		15	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 07	MOTOR SPACE HEATER	D02J2.5	02C X 2.5 XLPE-Cu(A) FRLS (1.1 KV)		305	0CA07AC01 (0CA07AC01)	328	2	330	D02A2.5	XAC-144401	CRJV00024	GP00024	CDB02212	N	N	
		16	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 07	EMERGENCY PB	D07A2.5	07C X 2.5PVC-Cu(A) FRLS (1.1 KV)		305	0CA07AC02 (0CA07AC02)	328	2	330	D07A0.5	3202	CRJV00024	GP00024	CDB01582	N	N	
		17	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 07	5A COMPRESSOR-1	A03N185	11 KV 3C-185 AL(A) HT XPLE		293	0CA07AP01 (0CA07AP01)	318	3	321	C03N185	DXT-49615	CRJV00020	GP00020	CDB02821	N	N	
		18	3.3kV STN SWGR OCAO G TRF FDRPANEL NO 09	TRF MB	D07A2.5	07C X 2.5PVC-Cu(A) FRLS (1.1 KV)	(CABLE IN CUSTOMER SCOPE) ARMOURD (REV 02)	0	0CA09AC01 (0CA09AC01)											
		19	3.3kV STN SWGR OCAO G TRF FDRPANEL NO 09	415V LV SWGR	D03J2.5	03C X 2.5XLPE-Cu(A) FRLS (1.1 KV)	(CABLE IN CUSTOMER SCOPE) ARMOURD (REV 02)	0	0CA09AC02 (0CA09AC02)											
		20	3.3kV STN SWGR OCAO G TRF FDRPANEL NO 09	DCS: CRE59	D12V0.5	12P-0.5 1.1 KV TYPE-G (O)ARMOURD		85	0CA09AC03 (0CA09AC03)	103	0	103	E12V0.5	3848	CRJV00053	GP00053	CDB02253	N	N	
		21	3.3kV STN SWGR OCAO G TRF FDRPANEL NO 09	CW CHLORINATION TRF #CWKST01	C03N185	03C X 185XLPE-AL(A) FRLS (3.3 KV)	(CABLE IN CUSTOMER SCOPE)AL XLPE ARMOURD (REV02)	0	0CA09AP01 (0CA09AP01)											
		22	3.3kV STN SWGR OCAO G TRF FDRPANEL NO 09	CW CHLORINATION TRF #CWKST01	C03N185	03C X 185XLPE-AL(A) FRLS (3.3 KV)	(CUSTOMER SCOPE CABLE) AL XLPE (REV 02)	0	0CA09AP02 (0CA09AP02)											
		23	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 10	MOTOR SPACE HEATER	D02J2.5	02C X 2.5 XLPE-Cu(A) FRLS (1.1 KV)		299	0CA10AC01 (0CA10AC01)	313	2	315	D02A2.5	XAC-144421	CRJV00024	GP00024	CDB02212	N	N	
		24	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 10	EMERGENCY PB	D07A2.5	07C X 2.5PVC-Cu(A) FRLS (1.1 KV)		299	0CA10AC02 (0CA10AC02)	313	2	315	D07A2.5	3208	CRJV00024	GP00024	CDB01582	N	N	
		25	3.3kV STN SWGR OCAO G MOTOR FDRPANEL NO 10	1A COMPRESSOR-3	A03N185	11 KV 3C-185 AL(A) HT XPLE		290	0CA10AP01 (0CA10AP01)	310	3	313	C03N185	DXT-19117	CRJV00026	GP00026	CDB06971	N	N	
		26	3.3kV STN SWGR OCAO G TIE FDR TO BUNKER SWGR PANEL NO 12	DCS: CRE59	D12V0.5	12P-0.5 1.1 KV TYPE-G (O)ARMOURD		85	0CA12AC01 (0CA12AC01)	100	0	100	E12V0.5	3848	CRJV00053	GP00053	CDB02253	N	N	
		27	3.3kV STN SWGR OCAO G FDR PANEL NO 12	3.3kV BUNKAR FDR-1	C01N630	3.3 KV 1C-630 AL(A) HT XPLE	(CUSTOMER SCOPE CABLE) AL XLPE	0	0CA12AP01 (0CA12AP01)											
		28	3.3kV STN SWGR OCAO G FDR	3.3kV BUNKAR FDR-1	C01N630	3.3 KV 1C-630 AL(A) HT	(CUSTOMER SCOPE CABLE) AL	0	0CA12AP02											

Measurement sheet - Sample

http--10.11.1.12080-Ca... List Of Intranets of Other ... Suggested Sites Calif. couple dies in cr...

Find: amar Previous Next Options

		भारत हेवी इलेक्ट्रिकल्स लिमिटेड Bharat Heavy Electricals Limited पावर सेक्टर पूर्वी क्षेत्र Power Sector Eastern Region										Format-No. - Measurement Work Sheet																	
Measurement No.-MB-014										Project - 2x660 MW IB VALLEY TPS UNIT# 3,4										For Unit : 3									
MS DT. - 01/02/2018										Site Address - P.O. BANNHARPALLI, DIST.-JHARSUKUDA , ODISHA-768234										For Package : ELECTRICAL PACKAGE 1 (ELE1)									
MS Period -																				PO.NO.									
VENDOR: P R V CONSTRUCTIONS PRIVATE LIMITED (PP2219)																				PKG_IC Approval:Y									
																				CM Approval : N									

MBOOK_NO	MBOOK_DATE	FROM_DATE	TO_DATE	MBOOK_BY	MBOOK_ON	ROUTED	ROUTED_TO	ROUTED_ON	REVIEW_BY	REVIEWED_ON	APPROVED_BY	APPROVED_ON	REMARKS	APPROVED
MB-014	01/02/2018			IBTELE1	19/02/2018	Y	6082335	12/03/2018			6082335	12/03/2018	reviewed.	Y

Approved WorkLog Detail : [Preview-1](#) [Preview-2](#)

ID	DRAWING_NO	REV_NO	stage	SL_NO	FROMA	TOA	PURPOSE	CABLE_DETAIL	ITEM_ID	SCH_LEN	CABLE_NO	S_R	E_R	LS_L	LE_L	Gland Start	Gland End	Cut Leng	TECH_LEN	WASTAGE	WT	TOT_CON	AITEM_ID	ALT_ITEM_DESC	DRUM_NO	MB_C
1	PE-CS-391-507-E001	02	LAY	19	11 kV UNT SWGR 3BAPANEL NO 04 RAT I/C	BTS PANEL	CLOSE AND TRIP COMMAND TO CB, BKR. ON/OFF STATUS, LOCKOUT RESET, CB IN SERVICE, TC HEALTHY, CLOSE CKT HEALTHY	12C X 2.5PVC-Cu (A) FRLS(1.1 kV)	D12A2.5	108	3BA04AC03 (3BA04AC03)	242	135	2	2			106	0	1	0	107	D12A2.5	12C-2.5 1.1KVLT PVC CU (A) FRLS	3121	111
2			LAY	5	11 kV UNT SWGR 3BAPANEL NO 01 MAIN I/C	BTS PANEL	CLOSE AND TRIP COMMAND TO CB, BKR. ON/OFF STATUS, LOCKOUT RESET, CB IN SERVICE, TC HEALTHY, CLOSE CKT HEALTHY	12C X 2.5PVC-Cu (A) FRLS(1.1 kV)	D12A2.5	108	3BA01AC06 (3BA01AC06)	130	20	2	2			109	0	1	0	110	D12A2.5	12C-2.5 1.1KVLT PVC CU (A) FRLS	3121	114
3	PE-CS-391-507-E002	02	LAY	109	11 kV UNT SWGR 3BBPANEL NO 23 RAT I/C	BTS PANEL	CLOSE AND TRIP COMMAND TO CB, BKR. ON/OFF STATUS, LOCKOUT RESET, CB IN SERVICE, TC HEALTHY, CLOSE CKT HEALTHY	12C X 2.5PVC-Cu (A) FRLS(1.1 kV)	D12A2.5	104	3BB23AC03 (3BB23AC03)	249	367	2	2			117	0	2	0	119	D12A2.5	12C-2.5 1.1KVLT PVC CU (A) FRLS	3121	122
4			LAY	125	11 kV UNT SWGR 3BBPANEL NO 26 MAIN I/C	BTS PANEL	CLOSE AND TRIP COMMAND TO CB, BKR. ON/OFF STATUS, LOCKOUT RESET, CB IN	12C X 2.5PVC-Cu (A) FRLS(1.1 kV)	D12A2.5	104	3BB26AC05 (3BB26AC05)	159	35	2	2			123	0	1	0	124	D12A2.5	12C-2.5 1.1KVLT PVC CU (A) FRLS	3125	128

Summary Measurement sheet - Sample


http://10.11.1.120:8080/Cable_MB_priv_sumD.aspx?id=PPIBTPH2ELE1-005

Employee... BHEL Fin... 10.11.1.38 Plant Cab... 10.11.1.120 10.11....

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http--10.11.1.1208080-Ca... List Of Intranets of Other ... Suggested Sites ▾ Calif. couple dies in cr... ▾

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		भारत हेवी इलेक्ट्रिकल्स लिमिटेड Bharat Heavy Electricals Limited पावर सेक्टर पूर्वी क्षेत्र Power Sector Eastern Region		Format-No. - Measurement Work Sheet Summary	
Measurement No.-MB-014		Project - 2x660 MW IB VALLEY TPS UNIT# 3,4		For Unit : 3	
MS DT. - 01/02/2018 MS Period -		Site Address - P.O. BANNHARPALLI, DIST.-JHARSUKUDA , ODISHA-768234		For Package : ELECTRICAL PACKAGE 1 (ELE1) PO.NO.	
VENDOR: P R V CONSTRUCTIONS PRIVATE LIMITED (PP2219)				PKG_IC Approval:Y CM Approval : N	

MBOOK_NO	MBOOK_DATE	FROM_DATE	TO_DATE	MBOOK_BY	MBOOK_ON	ROUTED	ROUTED_TO	ROUTED_ON	REVIEW_BY	REVIEWED_ON	APPROVED_BY	APPROVED_ON	REMARKS	APPROVED
MB-014	01/02/2018			IBTELE1	19/03/2018	Y	6082335	12/03/2018			6082335	12/03/2018	reviewed.	Y

Approved WorkLog Detail Summary :

STAGE	AITEM_ID	ALT_ITEM_DESC	SCH_LEN	CUT_LENGTH	TECH_LENGTH	WASTAGE	TECH_WASTAGE	TOT_COMSUMED
LAY	D02A2.5	02C X 2.5 PVC-Cu(A) FRLS (1.1 kV)	15005	10581	0	38	0	10619
LAY	D03A2.5	3C-2.5 1.1 KV LT XLPEAL (A) FRLS	152	157	0	1	0	158
LAY	D03J2.5	03C X 2.5XLPE-Cu(A) FRLS(1.1 kV)	1515	1530	0	10	0	1540
LAY	D03N016	3C-16 AL(A) LT XPLE	192	236	0	1	0	237
LAY	D03N025	3C - 25 1.1 KV LT XLPE AL (A) FRLS	91	89	0	1	0	90
LAY	D03N095	3C-95 1.1 KV LT XLPE AL (A) FRLS	172	175	0	3	0	178
LAY	D03N150	3C-150 1.1 KV LT XLPE AL (A) FRLS	411	527	0	6	0	533
LAY	D05A2.5	5C-2.5 1.1KV LT PVC CU (A) FRLS	607	671	0	6	0	677
LAY	D07A2.5	07C X 2.5PVC-Cu(A) FRLS(1.1 kV)	255	333	0	2	0	335
LAY	D12A2.5	12C-2.5 1.1KV LT PVC CU (A) FRLS	424	455	0	5	0	460
LAY	E02V0.5	02P X 0.5Paired Screened(O)(0.6 kV)	3054	3481	0	24	0	3505
LAY	E08V0.5	08P X 0.5Paired Screened(O)(0.6 kV)	14014	16265	0	111	0	16376

	Measurement Submitted By (Contractor's rep. with seal)	Measurement Reviewed By (Authorised BHEL Engineer)	Measurement Approved By (Pkg I/c)
Signature	IBT ELE1 PRV CONSTRUCTION (IBTELE1)	NA ()	ANAND KUMAR MONDAL (6082335) NA ()
Distribution :	1. Contractor's Copy 2. Engineer's Copy NA ()		

Fail ID

Work Instruction for Implementation

Reconciliation report- sample

			SCHEDULE		DESPATCH-RECEIVED			ISSUED	USED	
RSP	DESP_ITEM	ITEM_DESC	SCH_MU	SCH_LEN	DESP_MU	DESP_QTY	RSP_CODE_1	ISSUED_QTY	USED	WASTAGE
PPSTPSPH2	A01N630	1CX630 11 KV XLPE AL(A) XLPE FRLS	PE	18498	PE	88088	PPSTPSPH2	1507		
PPSTPSPH2	A03N240	3CX240 11 KV XLPE AL(A) XLPE FRLS	PE	19220	PE	145656	PPSTPSPH2	5999	424	2
PPSTPSPH2	B03N185	3CX185 6.6 KV XLPE AL(A) XLPE FRLS	PE	13668	PE	54400	PPSTPSPH2	1520	235	0
PPSTPSPH2	D01N006	1C-6 1.1 KV LT XLPE AL (A) FRLS	PE	34890	PE	55986	PPSTPSPH2	5500	2177	4
PPSTPSPH2	D01N006	1CX6 - AL(A) LT XPLE	PE	34890	PE	38500	PPSTPSPH2	5500	2177	4
PPSTPSPH2	D01N025	1C-25 1.1 KV LT XLPE AL (A) FRLS	PE	9908	PE	37389	PPSTPSPH2	4992	1760	2
PPSTPSPH2	D01N035	1C-35 1.1 KV LT XLPE AL (A) FRLS	PE	1212	PE	17042	PPSTPSPH2	4503		
PPSTPSPH2	D01N095	1C-95 1.1 KV LT XLPE AL (A) FRLS	PE	1454	PE	12874	PPSTPSPH2	987		
PPSTPSPH2	D01N185	1C-185 1.1 KV LT XLPE AL (A) FRLS	PE	8378	PE	27928	PPSTPSPH2	2995	421	0
PPSTPSPH2	D01N400	1C-400 1.1 KV LT XLPE AL (A) FRLS	PE	26375	PE	387410	PPSTPSPH2	3486		
PPSTPSPH2	D01N630	1C-630 1.1 KV LT XLPE AL (A) FRLS	PE	46086	PE	5478	PPSTPSPH2	4453		
PPSTPSPH2	D01N630	1C-630 1.1 KV LT XLPE AL (A) FRLS	PE	46086	PE	327052	PPSTPSPH2	4453		
PPSTPSPH2	D01S150	1.1kv Cu EPR-I 1C-150 (A) FS	PE	14988	PE	59712	PPSTPSPH2	1993	1299	0
PPSTPSPH2	D01S400	1.1kv Cu EPR-I 1C-400 (A) FS	PE	2045	PE	9940	PPSTPSPH2	499		
PPSTPSPH2	D02V0.5	2P-0.5 1.1 KV TYPE-G (O)ARMOURED	PE	20375	PE	643104	PPSTPSPH2	1000		
PPSTPSPH2	D02W0.5	2P-0.5 1.1 KV TYPE-F (IO)ARMOURED	PE	44677	PE	1973740	PPSTPSPH2	4050		
PPSTPSPH2	D03N010	3C-10 1.1 KV LT XLPE AL (A) FRLS	PE	59430	PE	387090	PPSTPSPH2	3982		
PPSTPSPH2	D03N010	3C-10 1.1 KV LT XLPE AL (A) FRLS	PE	59430	PE	387060	PPSTPSPH2	3982		
PPSTPSPH2	D03N025	3C - 25 1.1 KV LT XLPE AL (A) FRLS	PE	37586	PE	167960	PPSTPSPH2	1976	312	0
PPSTPSPH2	D03N025	3C - 25- AL(A) LT XPLE	PE	37586	PE	322114	PPSTPSPH2	1976	312	0
PPSTPSPH2	D03N050	3C-50 1.1 KV LT XLPE AL (A) FRLS	PE	24324	PE	143405	PPSTPSPH2	1979	118	0
PPSTPSPH2	D03N050	3C-50 1.1 KV LT XLPE AL (A) FRLS	PE	24324	PE	730713	PPSTPSPH2	1979	118	0
PPSTPSPH2	D03N095	3C-95 1.1 KV LT XLPE AL (A) FRLS	PE	15350	PE	196555	PPSTPSPH2	1481		
PPSTPSPH2	D03N150	3C-150 1.1 KV LT XLPE AL (A) FRLS	PE	6391	PE	23652	PPSTPSPH2	527	451	0
PPSTPSPH2	D03S2.5	3C - 2.5 CU(A) LT XLPE-FS	PE	1347	PE	24651	PPSTPSPH2	984		
PPSTPSPH2	D04V0.5	4P-0.5 1.1 KV TYPE-G (O)ARMOURED	PE	74634	PE	10153920	PPSTPSPH2	1965		
PPSTPSPH2	D04W0.5	4P-0.5 1.1 KV TYPE-F (IO)ARMOURED	PE	55641	PE	4438704	PPSTPSPH2	1991		
PPSTPSPH2	D05A004	5CX4 1.1KV LT PVC CU (A) FRLS	PE	23576	PE	69748	PPSTPSPH2	4982		
PPSTPSPH2	D05A1.5	5C-1.5 1.1KV LT PVC CU (A) FRLS	PE	67101	PE	1186068	PPSTPSPH2	10888	272	0
PPSTPSPH2	D05A2.5	5C-2.5 1.1KV LT PVC CU (A) FRLS	PE	10330	PE	148626	PPSTPSPH2	6939		
PPSTPSPH2	D05S2.5	5C - 2.5- CU(A) LT XLPE-FS	PE	5233	PE	7996	PPSTPSPH2	3998		
PPSTPSPH2	D07A1.5	7C-1.5 1.1KV LT PVC CU (A) FRLS	PE	208695	PE	3573720	PPSTPSPH2	18919	705	0
PPSTPSPH2	D08V0.5	8P-0.5 1.1 KV TYPE-G (O)ARMOURED	PE	42416	PE	5960128	PPSTPSPH2	10826		
PPSTPSPH2	D10A1.5	10C-1.5 1.1KV LT PVC CU (A) FRLS	PE	124121	PE	1436960	PPSTPSPH2	8952		
PPSTPSPH2	D12A1.5	12C-1.5 1.1KV PVC CU ARMOURED	PE	15951	PE	430704	PPSTPSPH2	2011		
PPSTPSPH2	D12A2.5	12C-2.5 1.1KV LT PVC CU (A) FRLS	PE	5717	PE	6956	PPSTPSPH2	1979	102	
PPSTPSPH2	D12V0.5	12P-0.5 1.1 KV TYPE-G (O)ARMOURED	PE	28350	PE	2180140	PPSTPSPH2	9038		

			SCHEDULE		DESPATCH-RECEIVED		ISSUED		USED	
RSP	DESP_ITEM	ITEM_DESC	SCH_MU	SCH_LEN	DESP_MU	DESP_QTY	RSP_CODE_1	ISSUED_QTY	USED	WASTE
PPSTPSPH2	B01N630	1CX630 6.6 KV XLPE AL(A) XLPE FRLS	PE	37596	PE	157446				
PPSTPSPH2	D01N070	1C-70 1.1 KV LT XLPE AL (A) FRLS	PE	13797	PE	17395				
PPSTPSPH2	D02V0.7	1.1kV TYPE G(O) 2P - 0.75D (A)	PE	2650	PE	2994				
PPSTPSPH2	D08W0.5	8P-0.5 1.1 KV TYPE-F (IO)ARMOURED	PE	26137	PE	1202800				
PPSTPSPH2	D3HN025	3.5C-25 1.1 KV LT XLPE AL (A) FRLS	PE	7571	PE	14890				
	D01N120	1C-120 1.1 KV LT XLPE AL (A) FRLS			PE	14400	PPSTPSPH2	996		
	D02N2.5	2C-2.5 1.1 KV LT XLPE AL (A) FRLS			PE	155742	PPSTPSPH2	14029	222	0
	D02S1.5	2C-1.5 Sq.mm YSWY(STD) O/S FRLS- RED			HY	10000	PPSTPSPH2	2000		
	D02V0.5	2P-0.5 1.1 KV TYPE-G (O)ARMOURED			TP	4167	PPSTPSPH2	1000		
	D02W0.5	2P-0.5 1.1 KV TYPE-F (IO)ARMOURED			CE	10755	PPSTPSPH2	4050		
	D02W0.5	2P-0.5 1.1 KV TYPE-F (IO)ARMOURED			TP	3074	PPSTPSPH2	4050		
	D03A2.5	3C-2.5 1.1 KV LT XLPEAL (A) FRLS			PE	113587	PPSTPSPH2	13162		
	D03A2.5	3C-2.5 1.1 KV LT XLPEAL (A) FRLS			TP	67785	PPSTPSPH2	13162		
	D03C2.5	3C X 2.5 PVC Cu(U) FRLS (1.1 kv)			TP	159850	PPSTPSPH2	10991		
	D04U1.3	2Px1.30 sqmm (ATC ,LSZH FLME SCNER CBLE)			TP	23752	PPSTPSPH2	980		
	D04V0.5	4P-0.5 1.1 KV TYPE-G (O)ARMOURED			TP	23031	PPSTPSPH2	1965		
	D04V0.5	4P-0.5 1.1 KV TYPE-G (O)ARMOURED			CE	22379	PPSTPSPH2	1965		
	D04W0.5	4P-0.5 1.1 KV TYPE-F (IO)ARMOURED			TP	18989	PPSTPSPH2	1991		
	D04W0.5	4P-0.5 1.1 KV TYPE-F (IO)ARMOURED			CE	20604	PPSTPSPH2	1991		
	D07A1.5	7C-1.5 1.1KV LT PVC CU (A) FRLS			TP	51903	PPSTPSPH2	18919	705	0
	D08V0.5	8P-0.5 1.1 KV TYPE-G (O)ARMOURED			TP	21039	PPSTPSPH2	10826		
	D08V0.5	8P-0.5 1.1 KV TYPE-G (O)ARMOURED			CE	9093	PPSTPSPH2	10826		
	D10A1.5	10C-1.5 1.1KV LT PVC CU (A) FRLS			TP	71571	PPSTPSPH2	8952		
	D12N1.5	12C-1.5 1.1KV LT PVC CU (A) FRLS			PE	5958	PPSTPSPH2	2993		
	D12V0.5	12P-0.5 1.1 KV TYPE-G (O)ARMOURED			TP	18943	PPSTPSPH2	9038		
	D12W0.5	12P-0.5 1.1 KV TYPE-F (IO)ARMOURED			TP	6958	PPSTPSPH2	1980		
	D19S1.5	19C - 1.5- CU(U) LT XLPE-FS			TP	24861	PPSTPSPH2	4962		
	D20W0.5	20P-0.5 1.1 KV TYPE-F (IO)ARMOURED			PE	14452	PPSTPSPH2	501		
	D3HN240	3C-240 1.1 KV LT XLPE AL (A) FRLS			PE	7437	PPSTPSPH2	3089		
	D3HN300	3.5C-300 1.1 KV LT XLPE AL (A) FRLS			PE	471	PPSTPSPH2	504		
	D3HN300	3.5C-300 1.1 KV LT XLPE AL (A) FRLS			PE	2000	PPSTPSPH2	504		
	B01N185	1C-185 6.6 KV XLPE AL(A) XLPE FRLS			PE	993				
	D02J2.5	02C X 2.5 XLPE-Cu(A) FRLS (1.1 kv)			TP	7078				
	D02L2.5	2C - 2.5- CU(U) LT XPLE			TP	2018				
	D02L2.5	2C - 2.5- CU(U) LT XPLE			PE	38854				
	D02V.75	2P-0.75 1.1 KV TYPE-G (O)ARMOURED			PE	1000				
	D02V1.5	1.1KV G(O) 2P - 1.5 (A)			TP	11944				
	D03L2.5	3C - 2.5- CU(U) LT XPLE			PE	41363				
	D03L2.5	3C - 2.5- CU(U) LT XPLE			RP	28346				
	D03N016	3C-16 AL(A) LT XPLE			TP	4580				
	D03S1.5	3C - 1.5- CU(A) LT XLPE-FS			TP	1998				
	D04N010	4C-10 1.1 KV LT XLPE AL (A) FRLS			PE	22348				
	D08W0.5	8P-0.5 1.1 KV TYPE-F (IO)ARMOURED			TP	26904				
	D10A2.5	10C-2.5,CU.ARMRD PVC (1.1KV)			TP	2002				

Work Instruction for Implementation

System checks to measure used , wastage , Scrap length of any type of cable.

1. MM vendor should enter all LR detail with Drum Number and length of cable received at site and Update the cable Stock.
2. Erection vendor issue material from Stock so that system will keep record the type of cable along with drum number and length of cable.
3. Erection vendor generate work log (Measurement sheet) how much & which cable has consumed for a drawing schedule.
4. What is the erection vendor present stock or WIP
5. During work log generation - vendor has to feed the length of cable . System enforce capturing of drum number during work log generation of a cable schedule.
6. During length capturing in work log system may enforce capturing start reading and end reading of the cable where system will keep track of the reading so that any reading of a drum is not repeated which are already captured in work log.
7. Followings are the system check in Work log (Measurement Sheet to restrict all the above
 - Drum Number and dispatched unit with length of the cable is mandatory in stock entry
 - Used Cable length = Gland to gland length + lead length at rack end + lead length at equipment end.
 - Drum Length = Used Cable length + Wastage length + Scrap + Returned length (RSV)
 - Scrap = Continuous cable not further usable
 - Wastage = Small pieces which are cut during termination
 - Un accounted Cable length of a Drum shall be treated as wastage and shall be added to accounted wastage.
 - Gland to gland length = Reading at start gland - reading at end gland
 - Lead length at rack end = up to a flexed length depending on rack size (Decided by BHEL)
 - lead length at equipment end = up to a flexed length depending on machine/equipment size (Decided by BHEL)
 - Billable length = Used Cable length
 - Punching of reading is not allowed which are lies between (Start reading - lead length at rack) and reading at end gland + lead length at equipment end