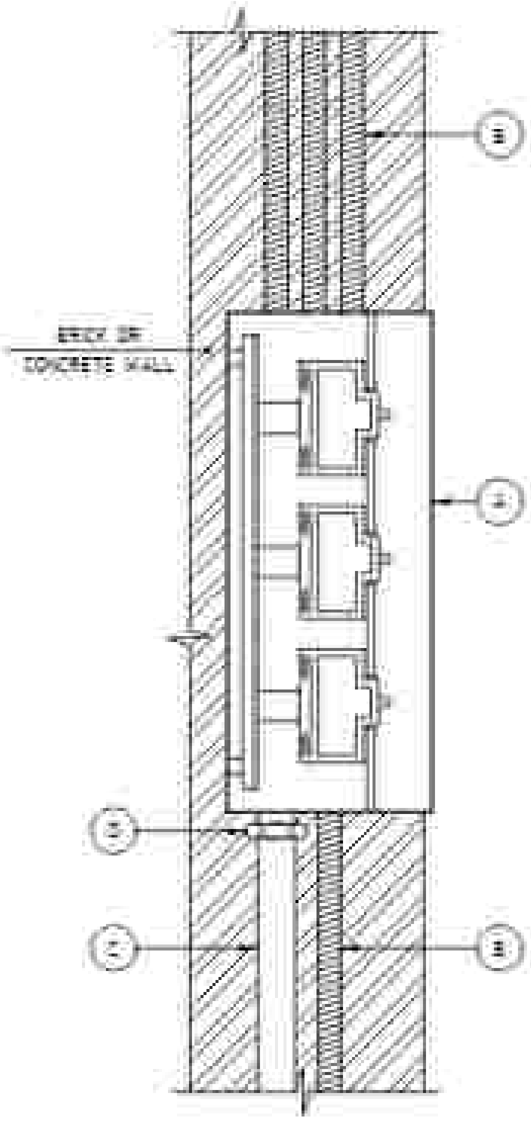


DETAIL E-100

FLUSH MOUNTED ELECTRICAL PANEL

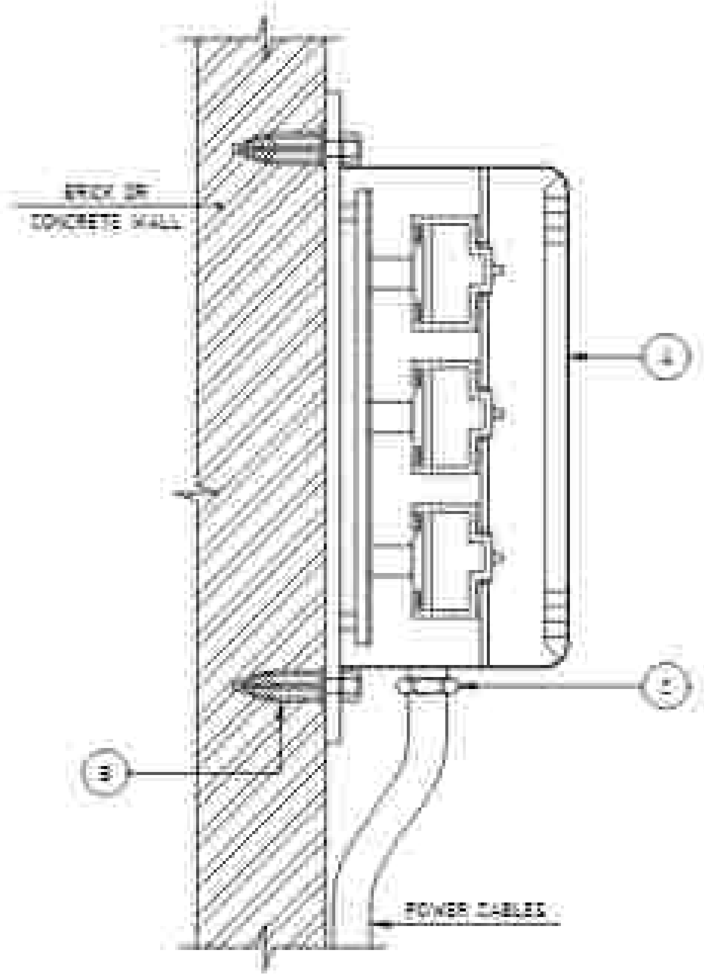
ITEM	DESCRIPTION	QTY	REMARKS
A	FLUSH MOUNTED ELECTRICAL PANEL	1	
B	PVC CONDUITS	AS REQ.	SIZE VARIES
C	PVC OR STEEL CONDUIT FOR POWER CABLE INLET	AS REQ.	SIZE VARIES
D	COUPLING FLANGED FOR STEEL CONDUIT ONLY	1	SIZE VARIES

NOTE :

1- INSTALLATION HEIGHT : 140 cm ABOVE FINISHED FLOOR

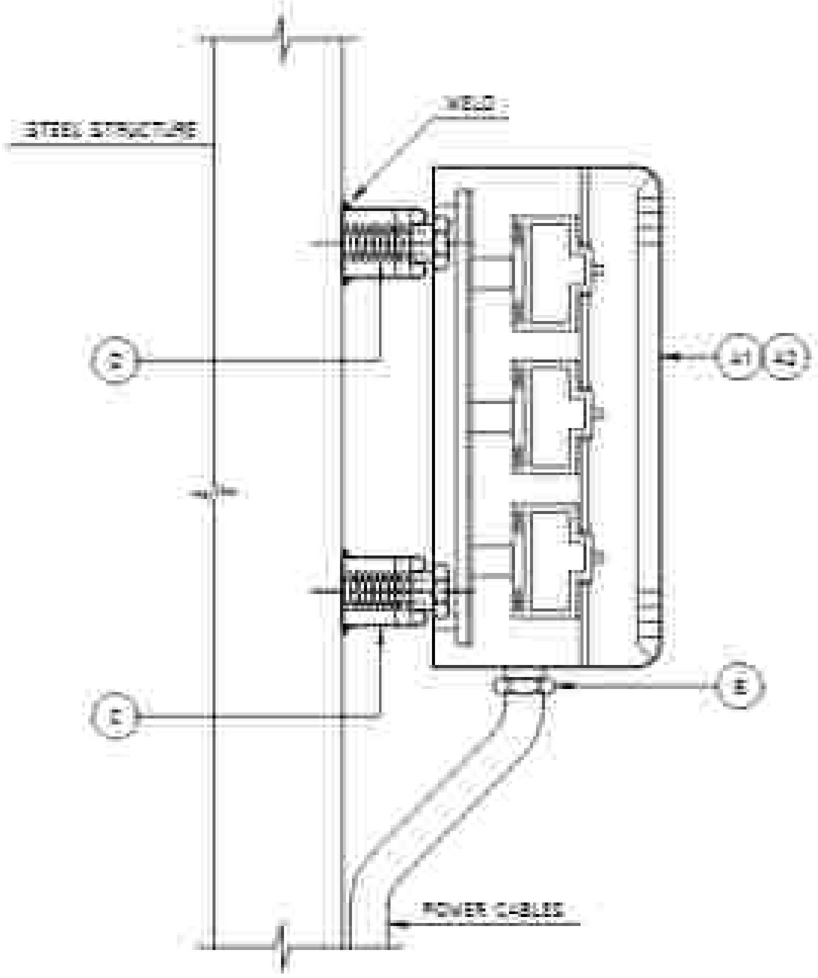
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. / CHECKED BY:	DATE: / DATE:	TITLE: FLUSH MOUNTED ELECTRICAL PANEL INSTALLATION
DETAIL No.: E-100	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



DETAIL E-101A

SURFACE MOUNTED ELECTRICAL PANEL
ON CONCRETE OR BRICK WALL



DETAIL E-101B

SURFACE MOUNTED ELECTRICAL PANEL
ON STEEL STRUCTURE

ITEM	DESCRIPTION	QTY	REMARKS
A	**SURFACE MOUNTED ELECTRICAL PANEL**	1	
B	BOLT PROJECTING RAWLBOLT AS 1519	4	
C	CABLE GLAND	AS REQ.	

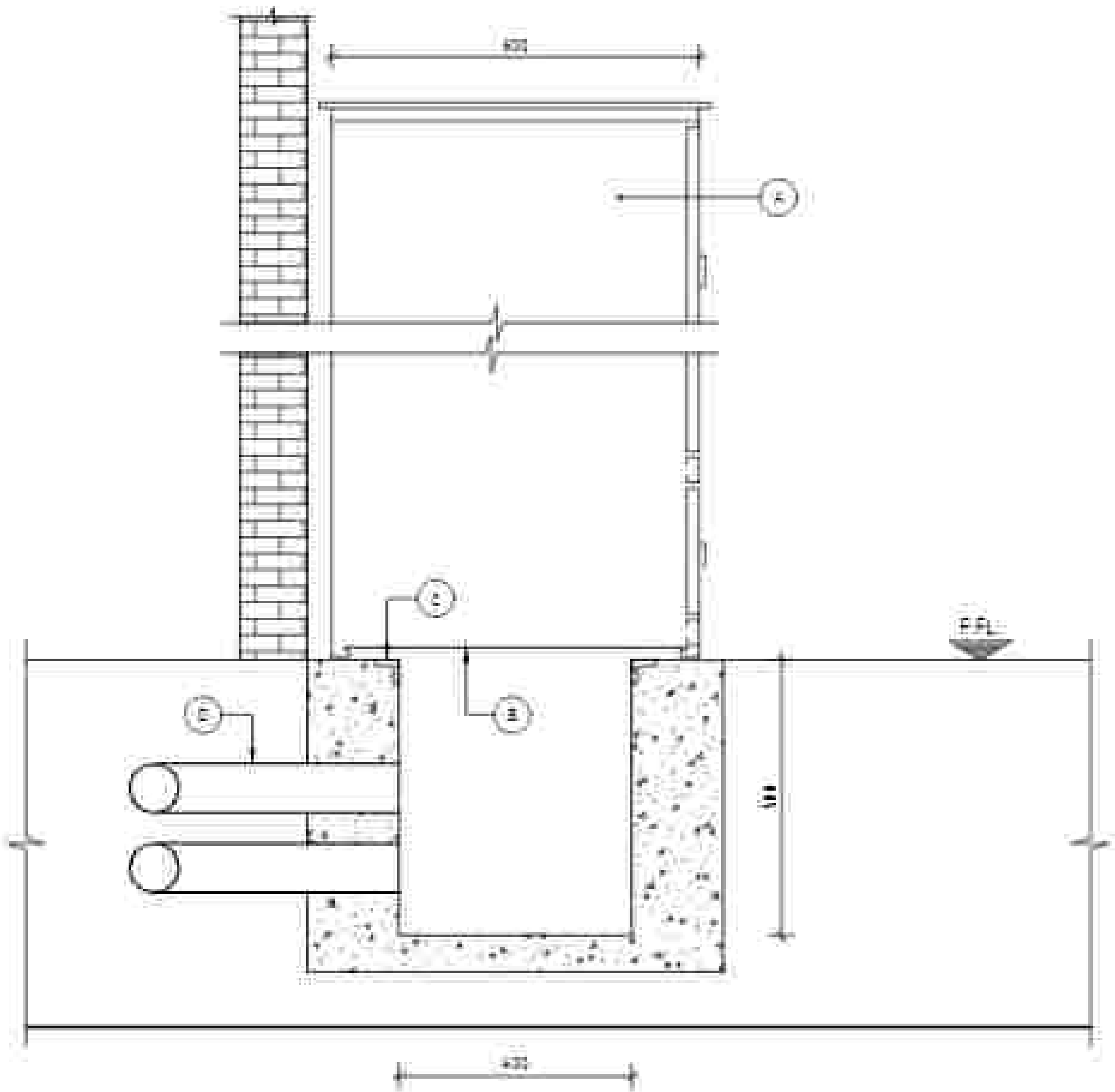
ITEM	DESCRIPTION	QTY	REMARKS
A1	SURFACE MOUNTED ELECTRICAL PANEL , OUTDOOR	1	
A2	SURFACE MOUNTED ELECTRICAL PANEL , INDOOR	1	
B	CABLE GLAND	AS REQ.	
C	STRUT CHANNEL , AS/102	AS REQ.	
D	STRUT BOLT/NUT WITH SPRING & SQUARE WASHER AS 108A	4	

NOTE :

1- INSTALLATION HEIGHT : 140 cm ABOVE FINISHED FLOOR.

TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: SURFACE MOUNTED ELECTRICAL PANEL INSTALLATION
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: E-101	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



SIDE VIEW

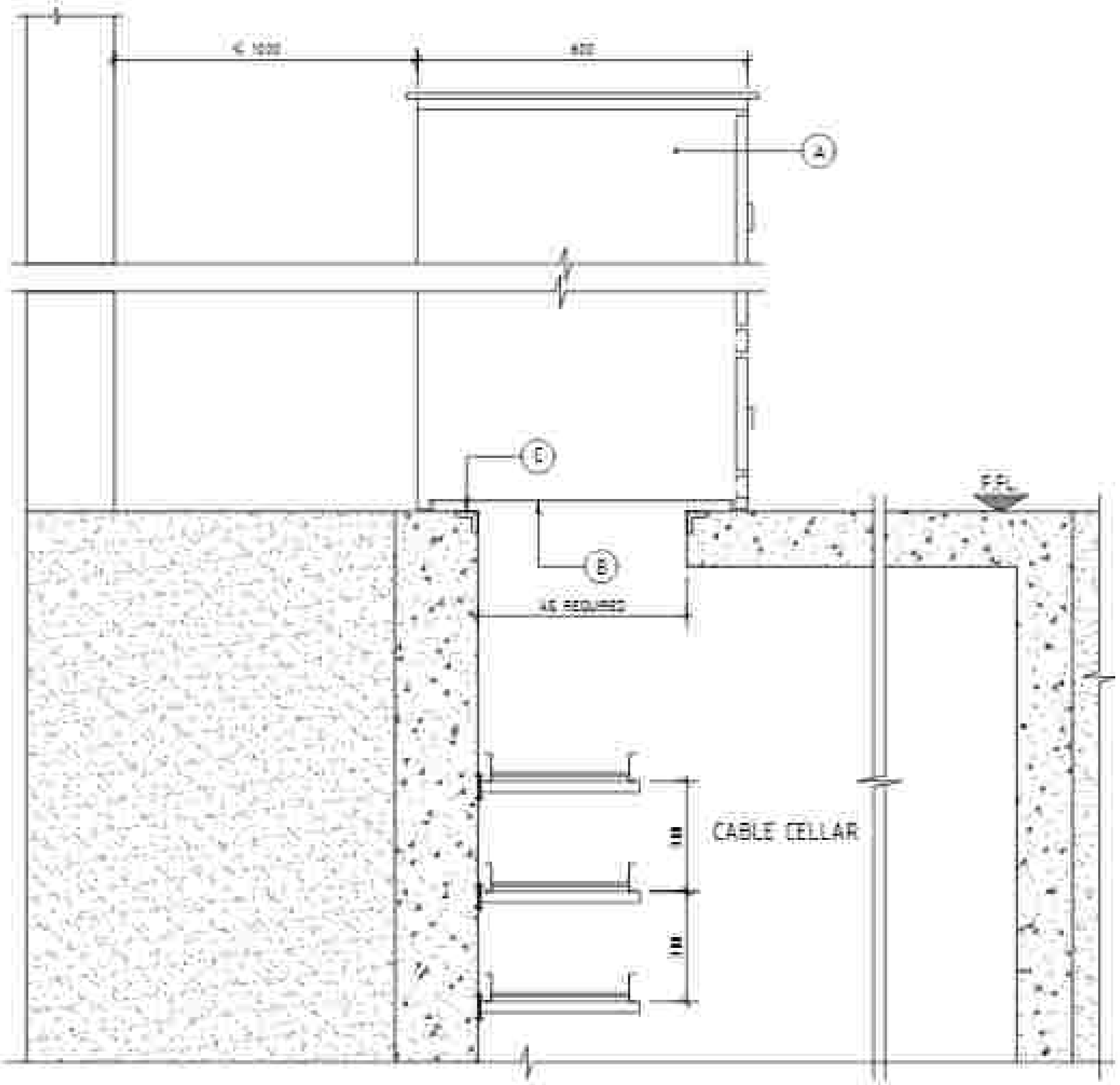
DETAIL E-102

INDOOR SELF-MOUNTED DISTRIBUTION PANEL INSTALLATION ON CABLE TRENCH

ITEM	DESCRIPTION	QTY.	REMARKS
A	ELECTRICAL PANEL	1	
B	CABLE GLAND PLATE	AS REQ.	
C	SUPPORTING STEEL FRAME	AS REQ.	
D	HARD P.V.C. (OR GALV. ST.) PIPE SLEEVE AS NOTED IN PLAN DRAWINGS	AS REQ.	

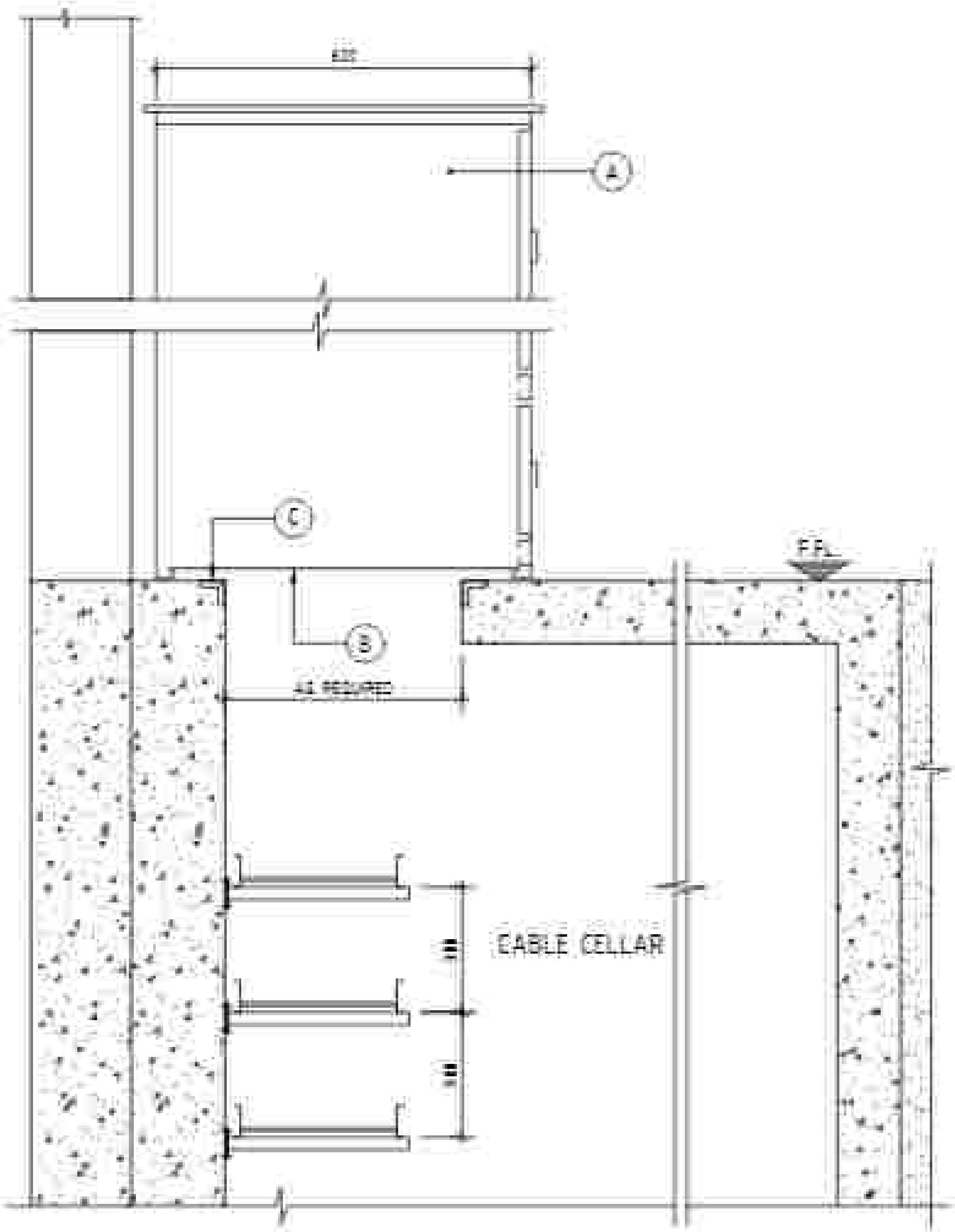
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: INDOOR SELF-MOUNTED DISTRIBUTION PANEL INSTALLATION ON CABLE TRENCH
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: E-102	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



DETAIL E-103A

INDOOR SELF-MOUNTED DISTRIBUTION PANEL
INSTALLATION ON CABLE CELLAR



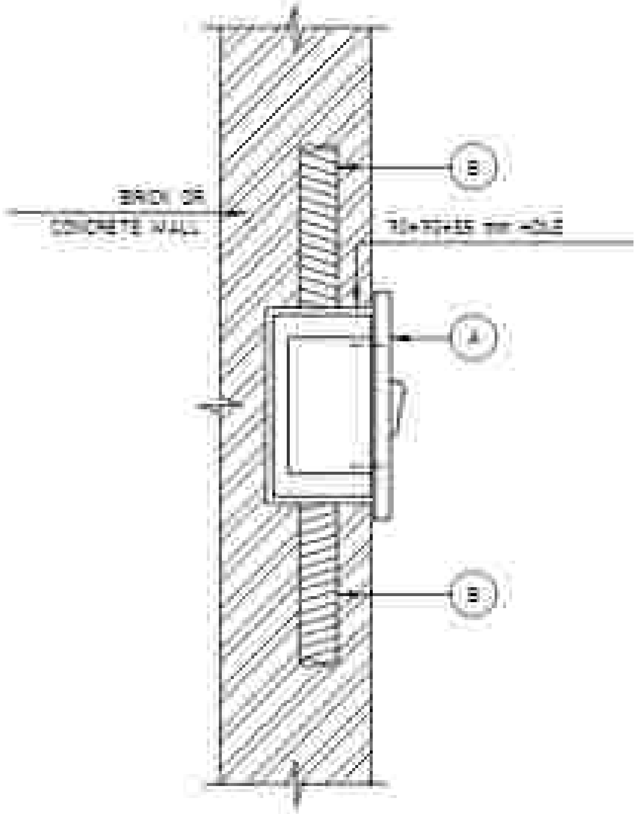
DETAIL E-103B

INDOOR SELF-MOUNTED DISTRIBUTION PANEL
INSTALLATION ON CABLE CELLAR

ITEM	DESCRIPTION	QTY	REMARKS
A	ELECTRICAL PANEL	1	
B	CABLE GLAND PLATE	AS REQ	
C	SUPPORTING STEEL FRAME	AS REQ	

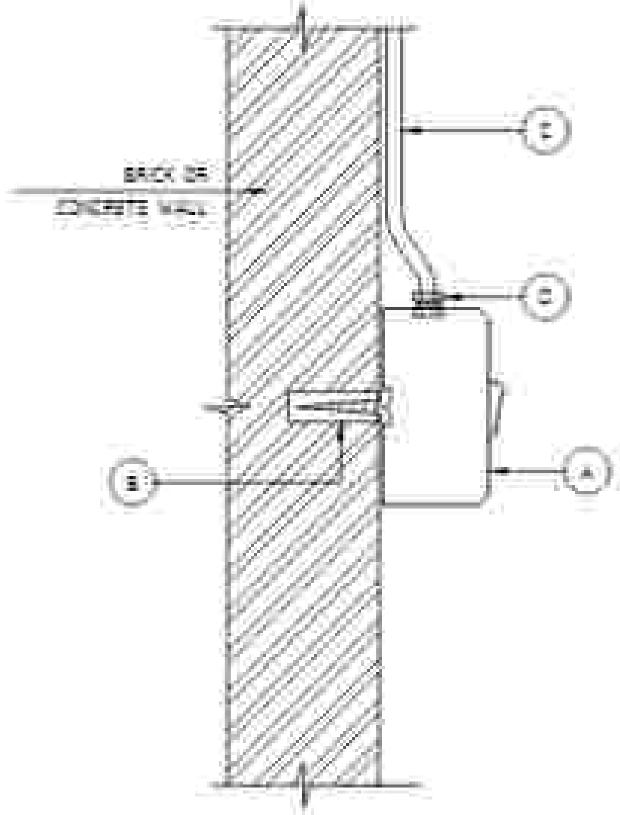
FILE NAME :

TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: INDOOR SELF-MOUNTED DISTRIBUTION PANEL INSTALLATION ON CABLE CELLAR
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: E-103	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE



DETAIL E-104A

LIGHTING SWITCH , FLUSH MOUNTED



DETAIL E-104B

LIGHTING SWITCH , SURFACE MOUNTED

ITEM	DESCRIPTION	QTY	REMARKS
A	FLUSH MOUNTED LIGHTING SWITCH , INDOOR FOR TYPE SEE PLAN DRAWING	1	
B	20 mm DIA. HEAVY GAUGE PVC CONDUIT	1	
C			

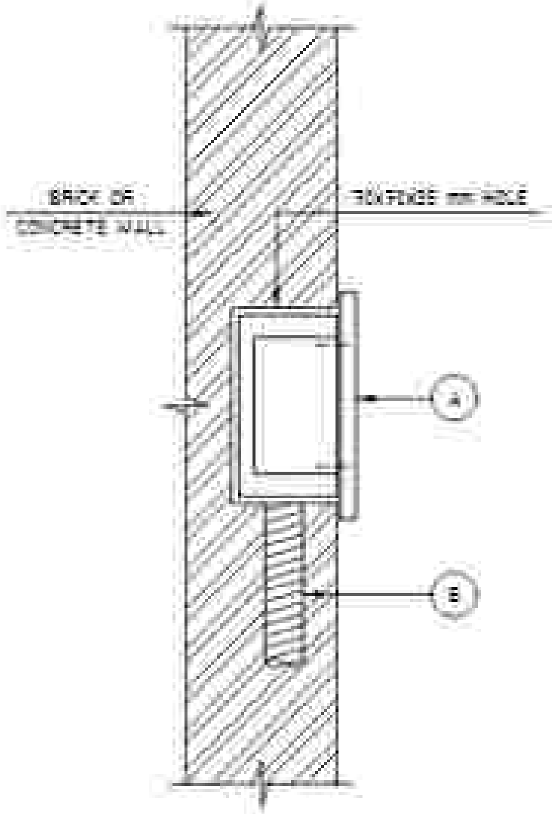
ITEM	DESCRIPTION	QTY	REMARKS
A	SURFACE MOUNTED LIGHTING SWITCH , INDOOR FOR TYPE SEE PLAN DRAWING	1	
B	WOOD SCREW WITH RAWL PLUG	2	
C	20 mm DIA. GALV. STEEL CONDUIT	AS REQ.	
D	GALV. RIGID STEEL CONDUIT FLANGED COUPLING SET 20 mm DIA	1	

NOTE :

1- INSTALLATION HEIGHT : 110 cm ABOVE FINISHED FLOOR

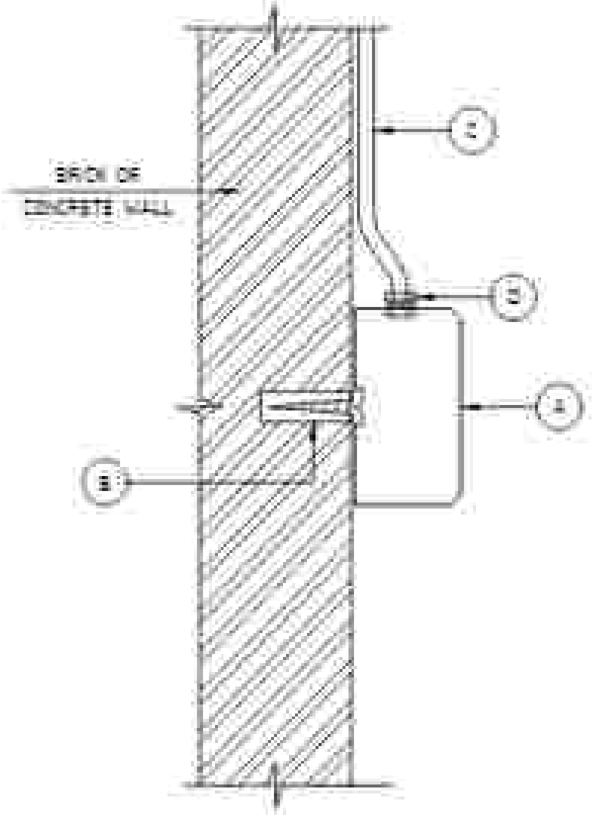
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: FLUSH & SURFACE MOUNTED LIGHTING SWITCH INSTALLATION	
	M.A.			
	CHECKED BY:	DATE:		
DETAIL No.: E-104	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE	

FILE NAME :



DETAIL E-105A

SOCKET OUTLET , FLUSH MOUNTED



DETAIL E-105B

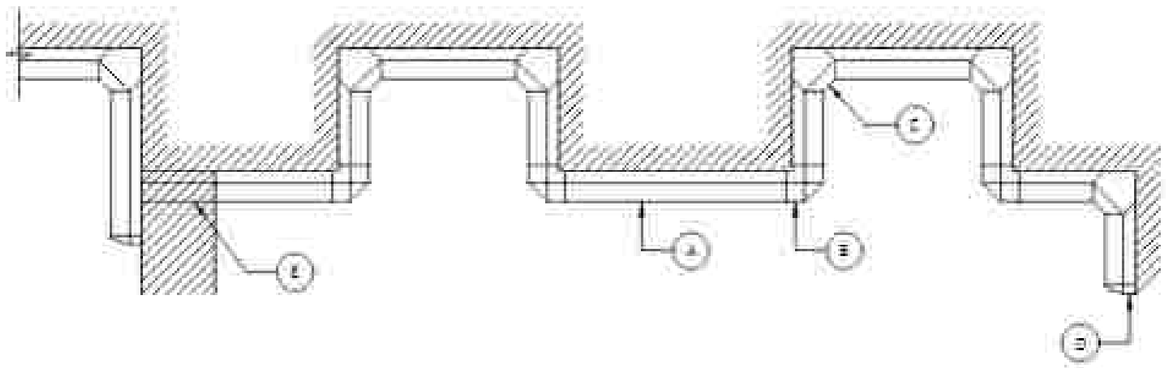
SOCKET OUTLET , SURFACE MOUNTED

ITEM	DESCRIPTION	QTY	REMARKS
A	FLUSH MOUNTED SOCKET OUTLET , INDOOR FOR TYPE SEE PLAN DRAWING	1	
B	20 mm DIA. HEAVY GAUGE PVC CONDUIT	1	
C			

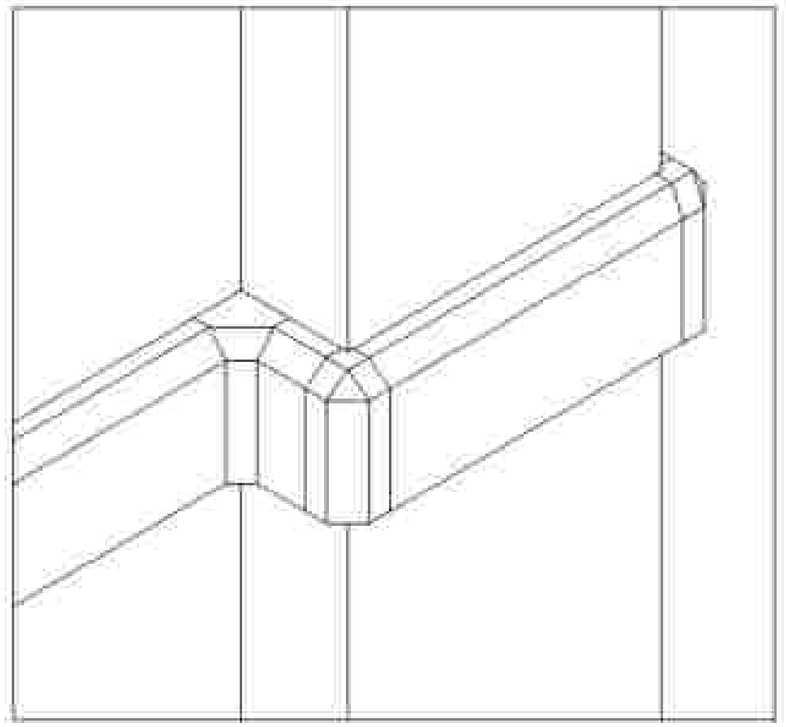
ITEM	DESCRIPTION	QTY	REMARKS
A	SURFACE MOUNTED SOCKET OUTLET , INDOOR FOR TYPE SEE PLAN DRAWING	1	
B	WOOD SCREW WITH RAWL PLUG M6x50	2	
C	20 mm DIA. GALV. STEEL CONDUIT	AS REQ.	
D	GALV. RIGID STEEL CONDUIT FLANGED COUPLING SET 20 mm DIA	1	

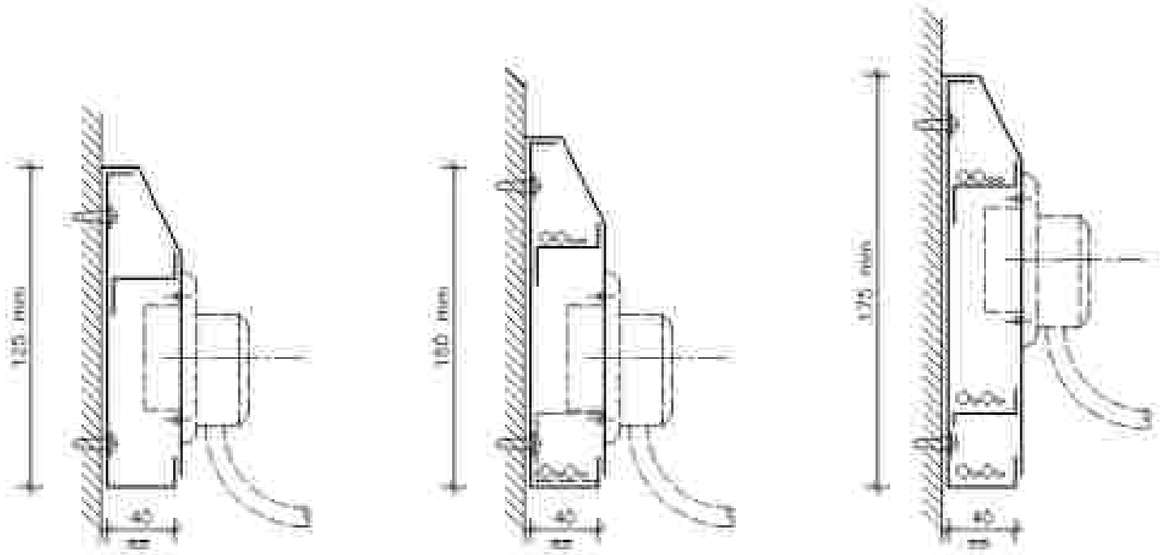
TARA TARH Engineering & Technological Co.	DRAWN BY M.A. CHECKED BY	DATE DATE	TITLE: FLUSH & SURFACE MOUNTED SOCKET OUTLET INSTALLATION
DETAIL No.: E-105	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



WALL MOUNTED TRUNKING INSTALLATION ARRANGEMENT



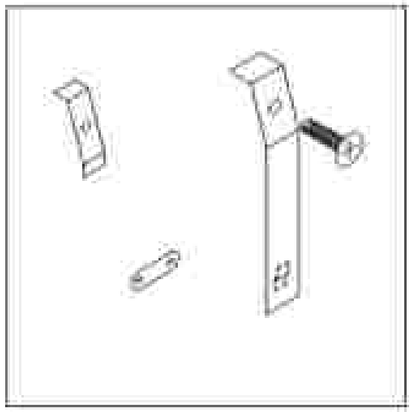


ONE , TWO & THREE COMPARTMENT WALL MOUNTED TRUNKING
CROSS SECTIONS

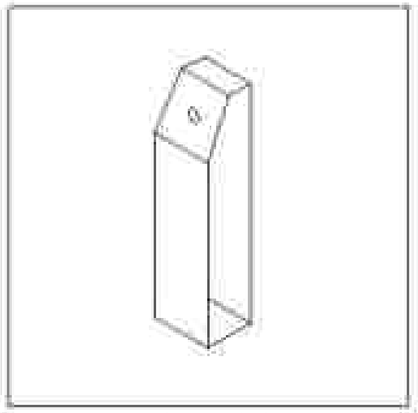
NOTES :
FOR MATERIALS TABLE SEE DETAIL E-1075

TARA TARH	DRAWN BY	DATE	TITLE: WALL MOUNTED TRUNKING INSTALLATION
	P.A.		
	CHECKED BY	DATE	
DETAIL No. E-1074	SHEET NO. 1 OF 1		SCALE: NOT TO SCALE

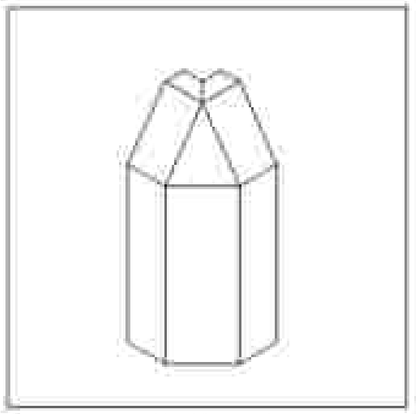
FILE NAME :



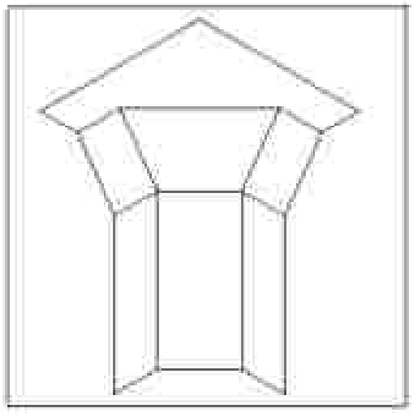
TRUNKING COVER
FIXING MATERIALS



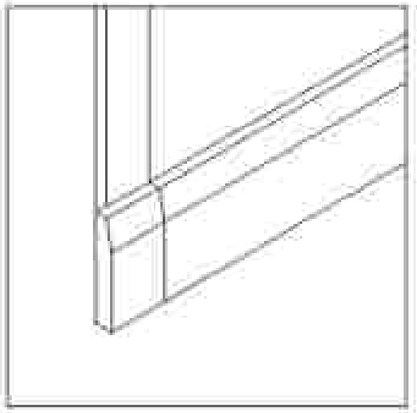
COVER JOINT



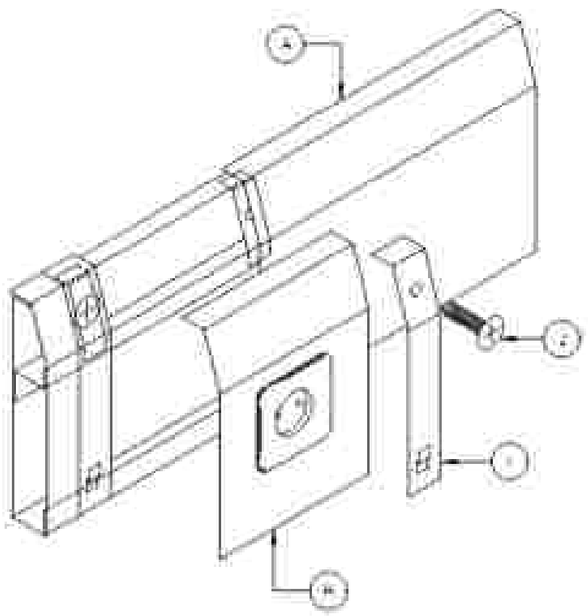
CHANGEABLE
EXTERNAL ANGLE

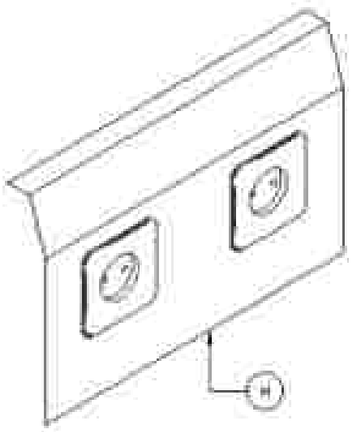


CHANGEABLE
INTERNAL ANGLE



CHANGEABLE
FLAT ANGLE



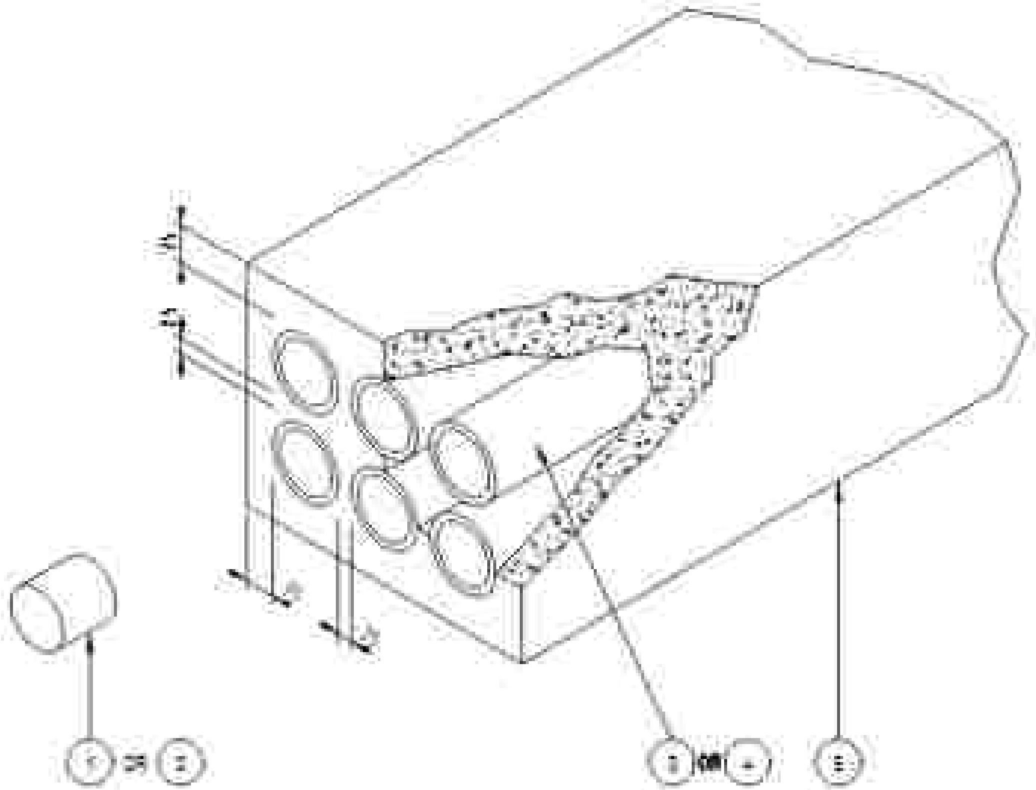


SOCKET OUTLET FIXING

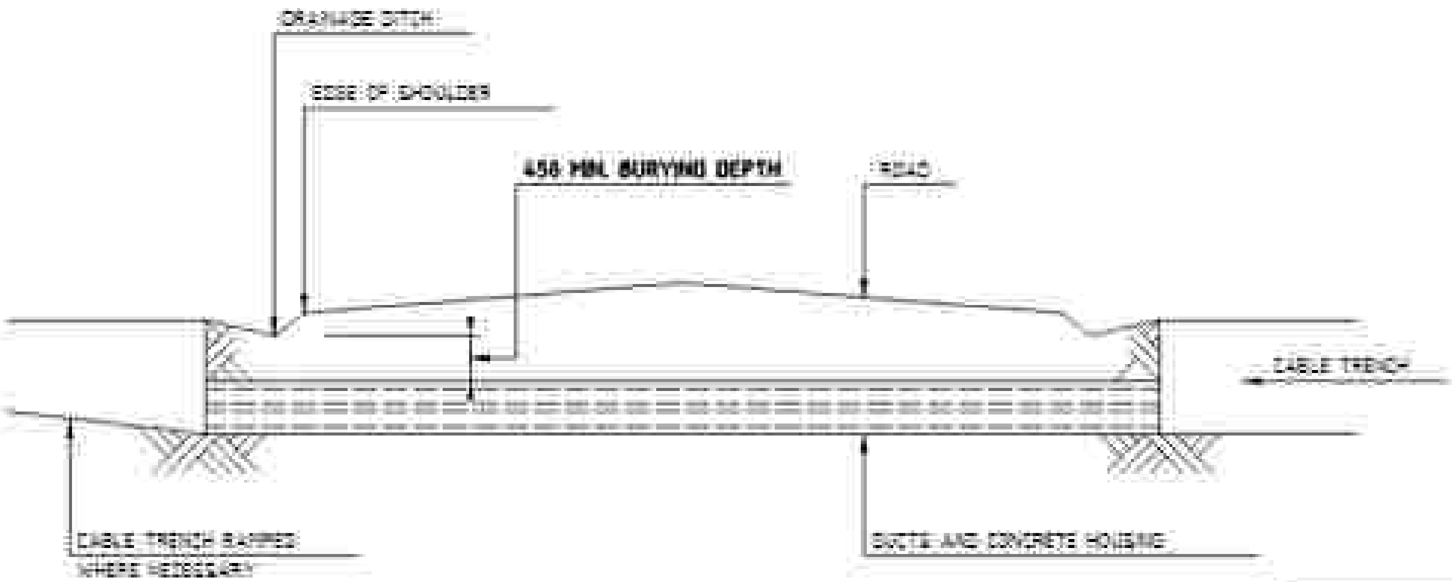
ITEM	DESCRIPTION	QTY	REMARKS
A	THREE COMPARTMENTS GALV. STEEL WALL MOUNTED TRUNKING	AS REQ.	
B	TRUNKING CHANGEABLE EXTERNAL ANGLE	AS REQ.	
C	TRUNKING CHANGEABLE INTERNAL ANGLE	AS REQ.	
D	TRUNKING END CAP	AS REQ.	
E	PVC CONDUIT WITH SUITABLE SIZE	AS REQ.	
F	6×60 mm ROUND HEAD WOOD SCREW & FLAT WASHER	AS REQ.	
G	PLASTIC WALL PLUG	AS REQ.	
H	TRUNKING COVER WITH SOCKET OPENING	AS REQ.	
I	TRUNKING COVER FIXING STRIP	AS REQ.	
J	6×60 mm COUNTER SUNK SET SCREW	AS REQ.	

TARA TARH	DRAWN BY: R.A.	DATE:	TITLE: WALL MOUNTED TRUNKING INSTALLATION
	CHECKED BY:	DATE:	
DETAIL No.: E-107B	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



TYPICAL DUCT INLAY



TYPICAL CABLE ROAD CROSSING

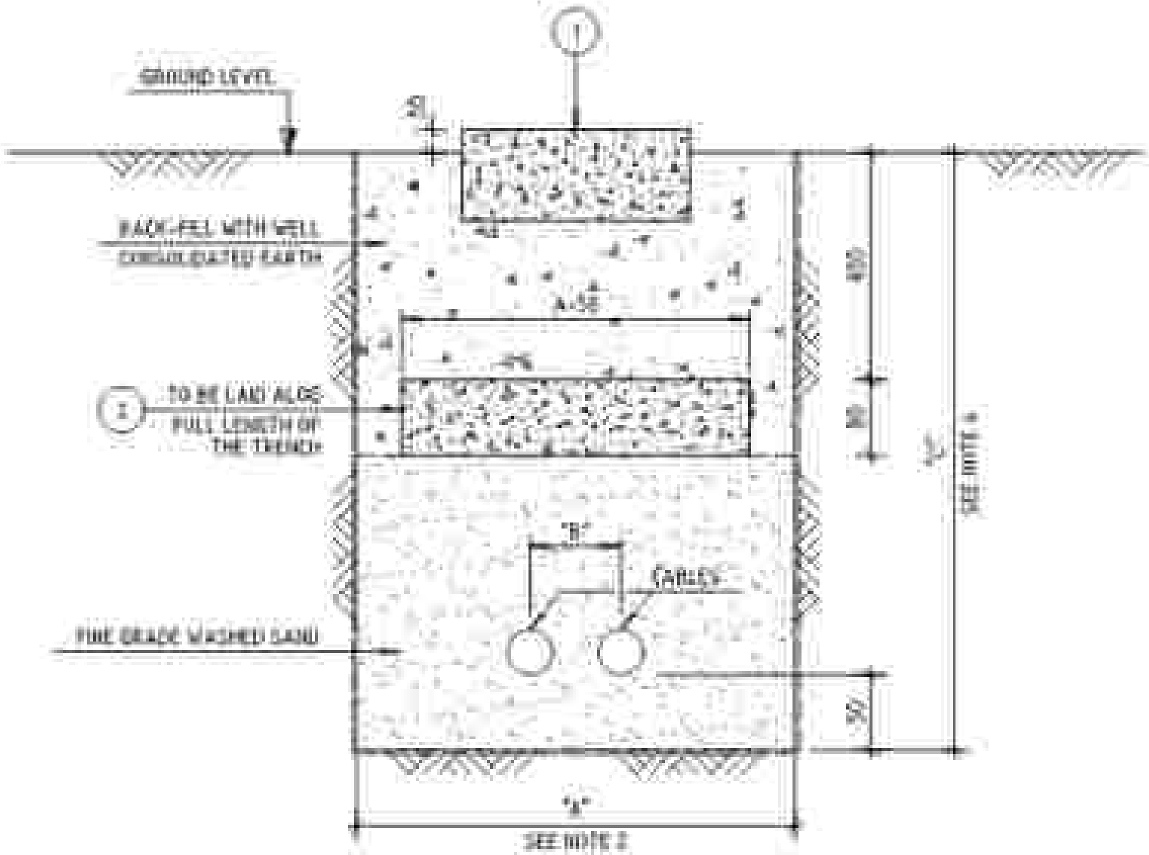
ITEM	DESCRIPTION	QTY.	REMARKS
1	WOODEN PLUG , 100 mm DIA.		
2	WOODEN PLUG , 150 mm DIA.		
3	HARD PVC DUCT , 100 mm INTERNAL DIA.		
4	HARD PVC DUCT , 150 mm INTERNAL DIA.		
5	CONCRETE HOUSING , PAINTED RED		

NOTES :

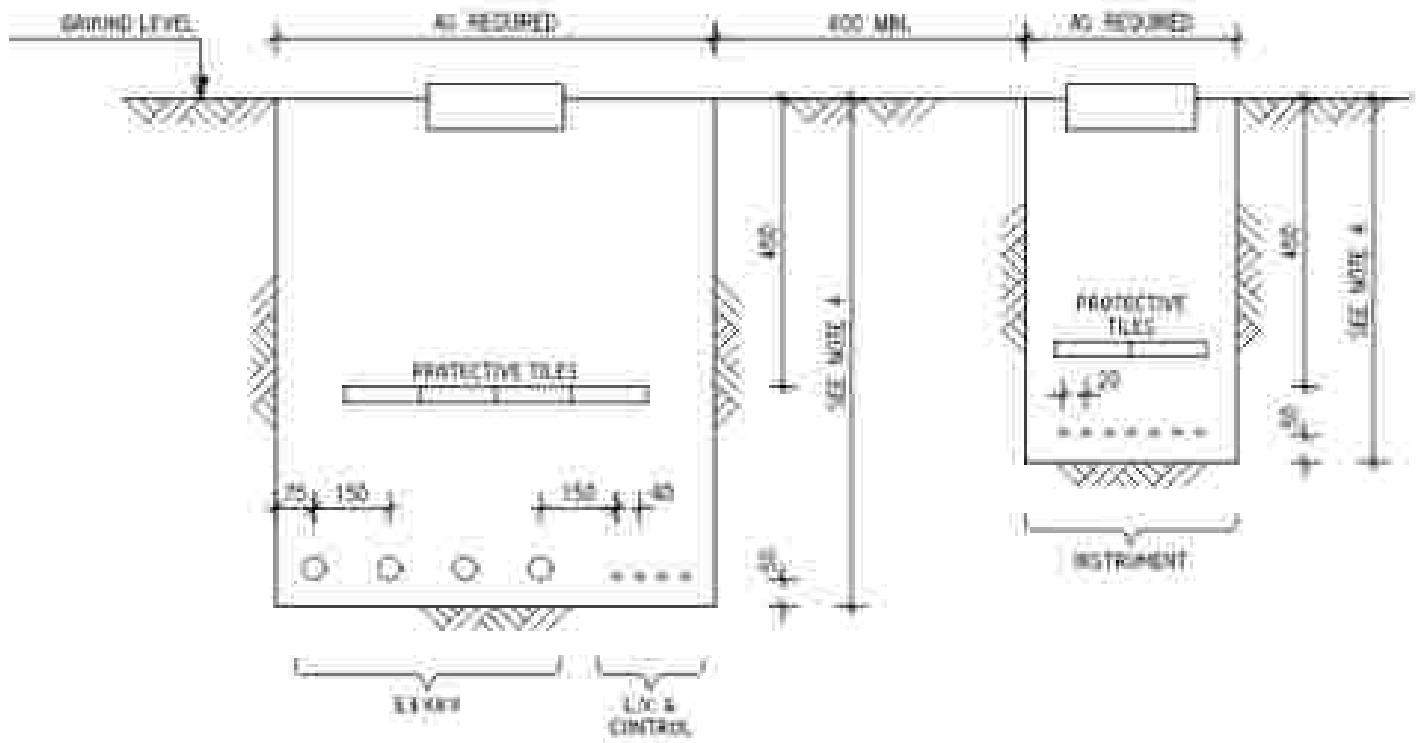
1- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.
2- DUCTS TO BE SEALED AFTER INSTALLATION OF CABLES.
3- ALL SPARE DUCTS SHALL BE PLUGGED BEFORE THE CABLE TRENCH IS SAND FILLED.
4- ALL SHARP EDGES ON DUCT ENDS SHALL BE ROUNDED BEFORE PULLING THE CABLES.

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. / CHECKED BY:	DATE: / DATE:	TITLE: TYPICAL CABLE ROAD CROSSING
DETAIL No.: E-116	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



DETAIL OF EARTH TRENCH



CABLE TRENCH SECTION

RELATION OF DIFFERENT TRENCHES SHOWN

ITEM	DESCRIPTION	QTY	REMARKS
1	CABLE MARKER , SEE DWG	AS REQ.	CONTRACTOR SUPPLIED
2	CONCRETE TILE OR BRICK	AS REQ.	
3			
4			

NOTES :

1- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE STATED.

2- DIMENSION "A" DEPENDS ON NUMBER OF CABLES , MINIMUM TO BE 300 mm.

3- FOR DETAILS OF CONCRETE TRENCHES SEE DWG. K2P-4306R.

4- FOLLOWING MINIMUM CLEARANCES AND DEPTHS SHALL BE ADHERED TO FOR CABLE LAID IN EARTH TRENCHES.

VOLTAGE	MIN. SPACING(B)	MIN DEPTH OF TRENCH(C)	MIN. DEPTH OF CABLE BURIAL
INSTRUMENT CABLES	20	700	650
LOW VOLTAGE & CONTROL CABLES	40	700	650
MEDIUM VOLTAGE CABLES	150	1000	950

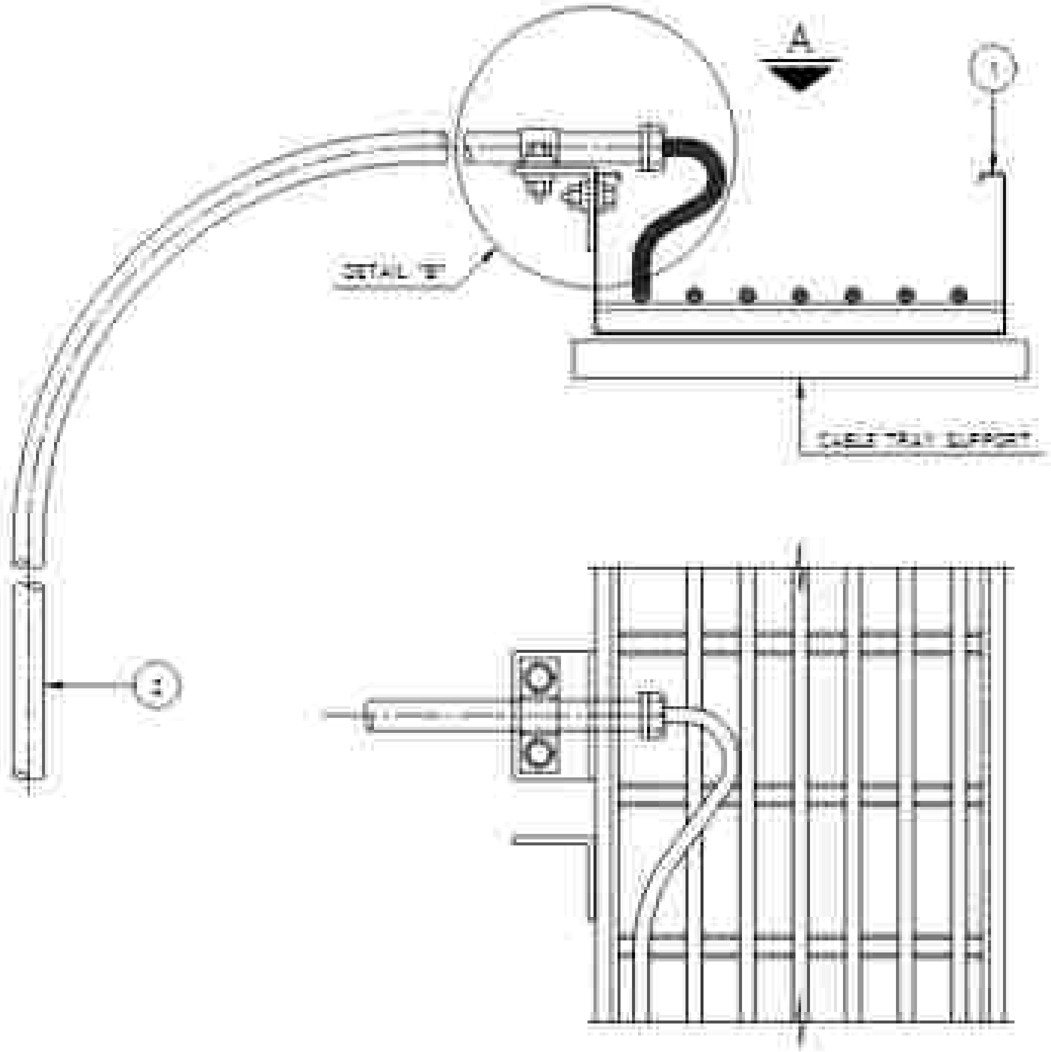
5- CABLES LAID DIRECT IN GROUND SHALL BE LAID IN ONE LAYER ONLY. IN CASES WHERE THE CABLES ARE NUMEROUS , SUBJECT TO APPROVAL BY THE ENGINEER , THE CABLES MAY BE LAID IN TWO LAYERS WITH A MIN. VERTICAL SPACING OF 300 mm. THE MINIMUM DEPTH FOR THE TOP LAYER SHALL BE AS GIVEN IN THE TABLE ABOVE.

6- IN TWO LAYER INSTALLATIONS , POWER CABLES SHALL PREFERABLY BE LAID IN LOWER LAYER AND CONTROL CABLES IN UPPER LAYER.

7- WHERE EARTH TRENCHES CROSSING ONE ANOTHER , MINIMUM SEPRATION OF 500 mm SHALL BE MAINTAINED BETWEEN THE NEAREST CROSSING CABLES AND THE ELECTRICAL TRENCH SHALL UNDER PASS THE INSTRUMENT TRENCH.

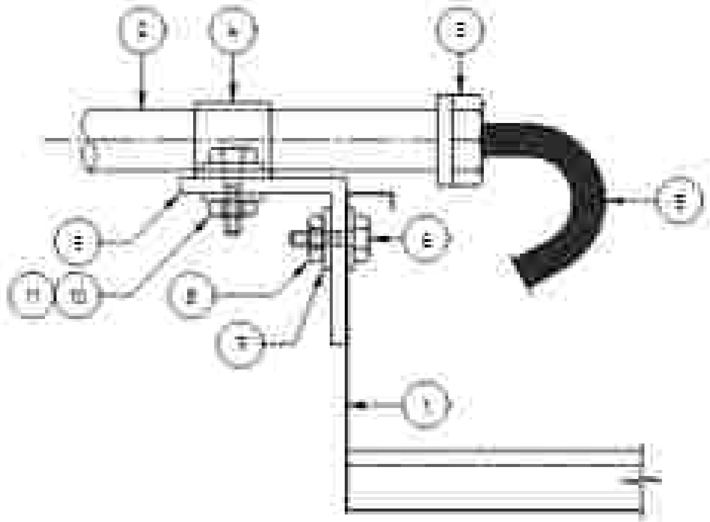
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: CABLE TRENCH SECTION
	CHECKED BY:	DATE:	
DETAIL No.: E-117	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



VIEW "A"

ITEM	DESCRIPTION	UNIT	ITEM QTY	REMARKS
1	HOT DIP GALV. STEEL HEAVY DUTY STRAIGHT SEGMENT ... X100mm WITH PERFORATED REINFORCED MEMBERS	M	LAYOUT	
2	HOT DIP GALVANIZED RIGID STEEL CONDUIT Ø ...	M	LAYOUT	
3	GALVANIZED STEEL BUSHING Ø ...	N	1	
4	GALVANIZED TWO STRAP SADDLE CLAMP Ø ...	N	1	
5	PVC OR ARMOURED CABLE	N	[illegible]	
6	GALVANIZED STEEL BOLT M8X30	N	2	
7	GALVANIZED STEEL SPRING WASHER Ø8 mm	N	4	
8	GALVANIZED STEEL NUT M8	N	2	
9	GALVANIZED STEEL SUPPORT L 50X50X5	N	1	
10	GALVANIZED STEEL BOLT WITH TWO WASHER , M6X30	N	2	
11	GALVANIZED STEEL SPRING WASHER , M6X30	N	2	



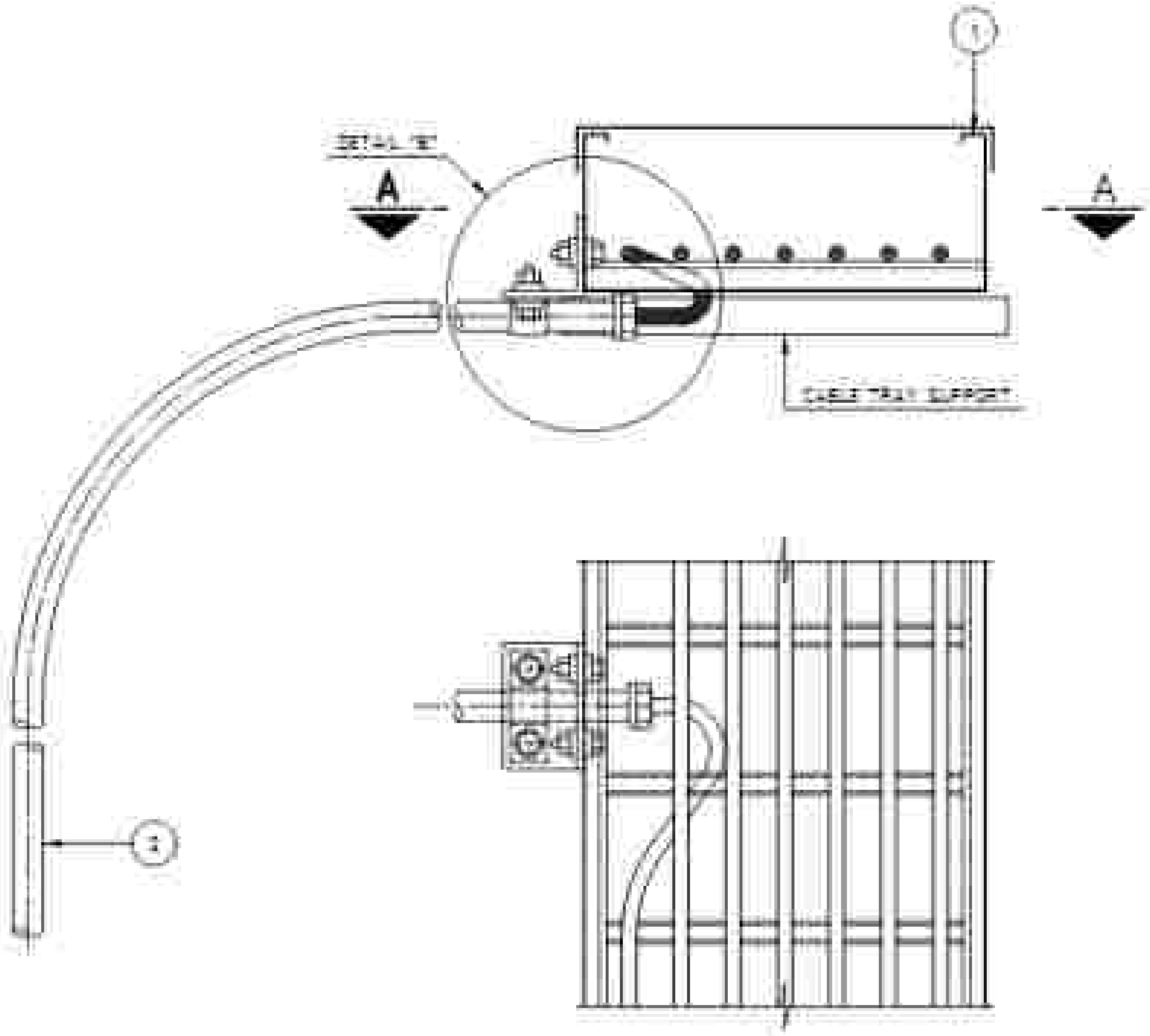
DETAIL "B"

DETAIL E-118A

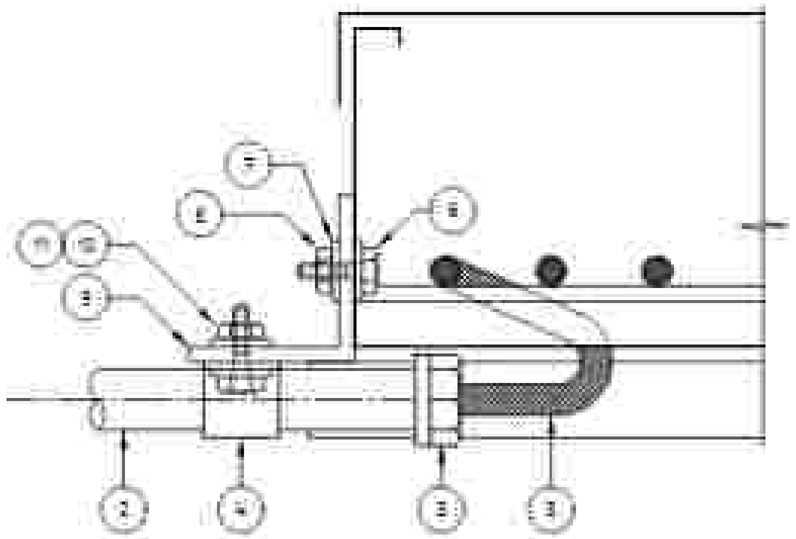
TYPICAL CABLE RUN OUT FROM CABLE TRAY

TARA TARH Engineering & Technological Co.	DRAWN BY: P.A.	DATE:	TITLE: TYPICAL CABLE RUN OUT FROM CABLE TRAY	
	CHECKED BY:	DATE:		
DETAIL No.: E-118A	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE	

FILE NAME :



SECTION A-A



DETAIL "B"

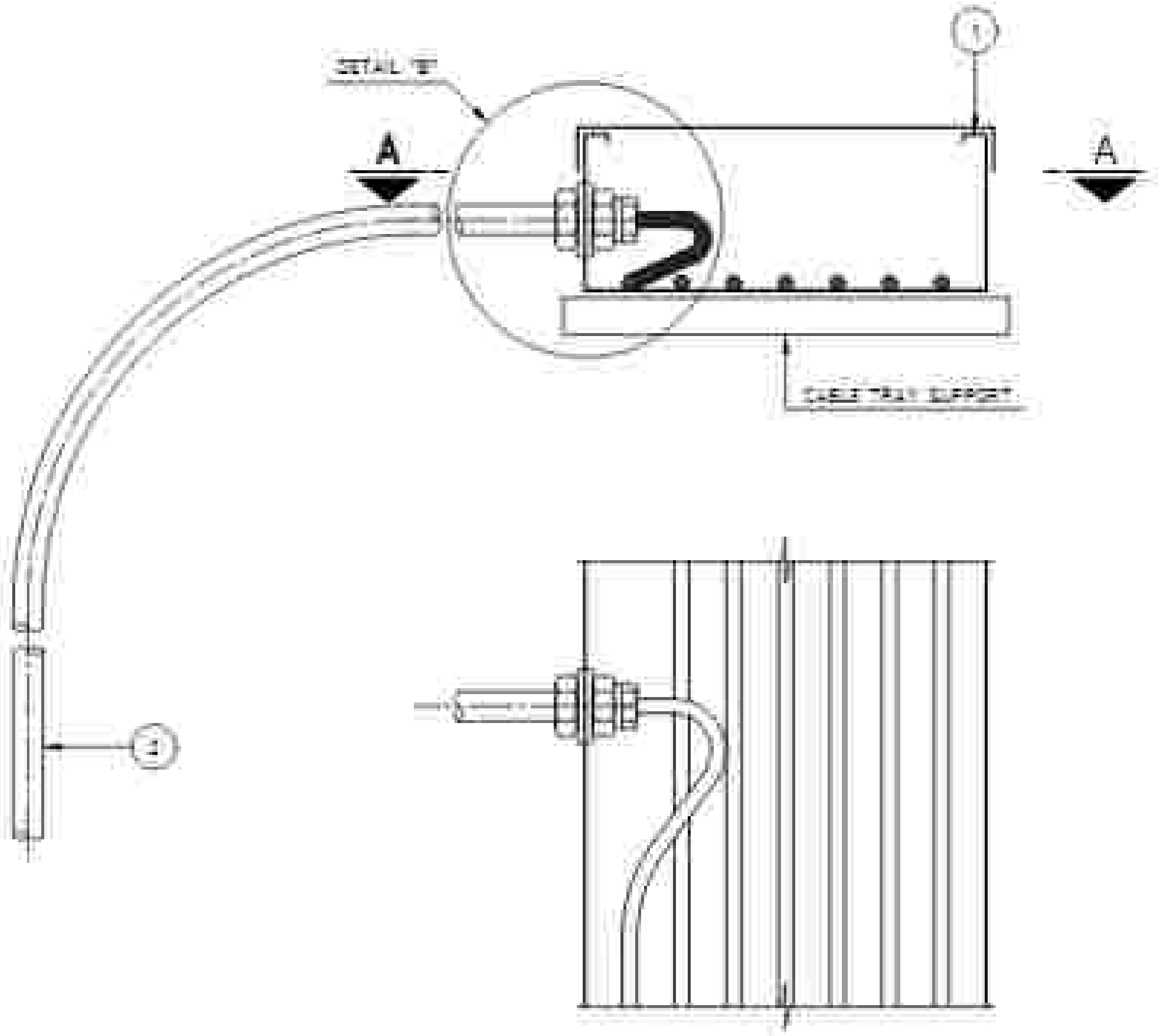
ITEM	DESCRIPTION	UNIT	ITEM QTY	REMARKS
1	HOT DIP GALV. STEEL HEAVY DUTY STRAIGHT SEGMENT ... X100mm WITH PERFORATED REINFORCING MEMBERS	M	LAYOUT	
2	HOT DIP GALVANIZED RIGID STEEL CONDUIT Ø ...	M	LAYOUT	
3	GALVANIZED STEEL BUSHING Ø ...	N	1	
4	GALVANIZED TWO STRAP SADDLE CLAMP Ø ...	N	1	
5	PVC OR ARMOURED CABLE	M	-	
6	GALVANIZED STEEL BOLT M8X30	N	2	
7	GALVANIZED STEEL SPRING WASHER Ø8 mm	N	4	
8	GALVANIZED STEEL NUT M8	N	2	
9	GALVANIZED STEEL SUPPORT L 50X50X5	N	1	
10	GALVANIZED STEEL BOLT WITH TWO WASHER/NUT .. M6X40	N	2	
11	GALVANIZED STEEL SPRING WASHER , M6X40	N	2	

DETAIL E-118B

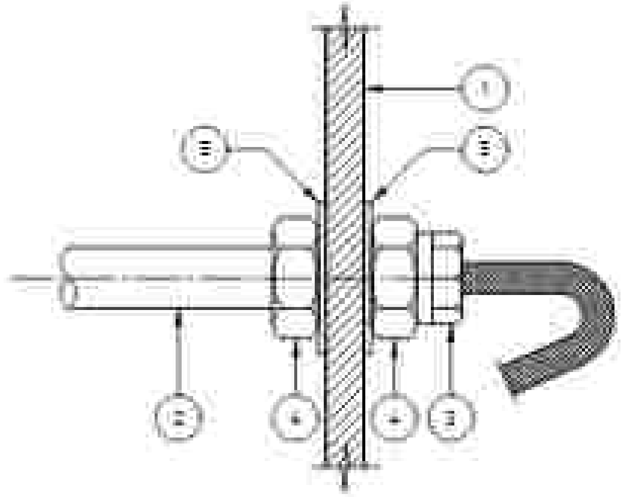
TYPICAL CABLE RUN OUT FROM CABLE TRAY

TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE:
	M.A.		TYPICAL CABLE RUN OUT FROM CABLE TRAY
	CHECKED BY:	DATE:	
DETAIL No.: E-118B	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



SECTION A-A



DETAIL "B"

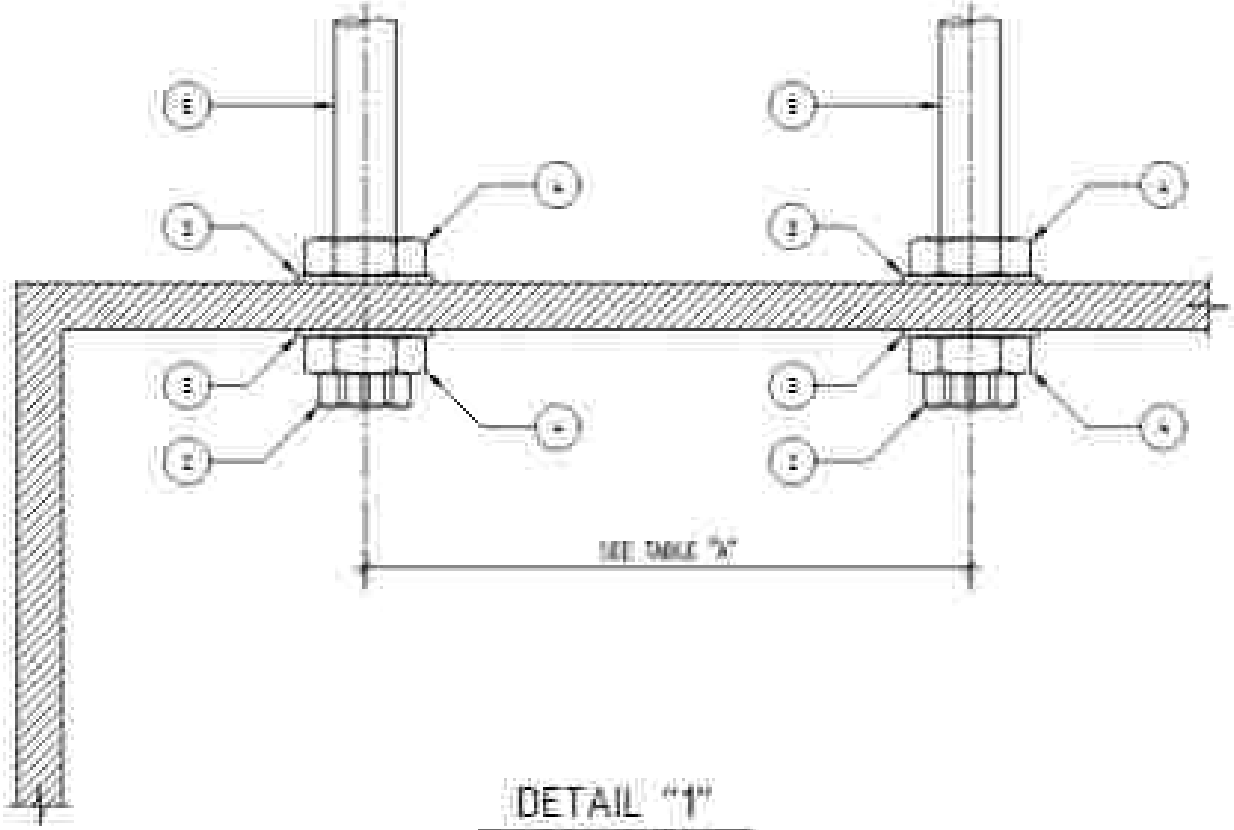
ITEM	DESCRIPTION	UNIT	ITEM QTY	REMARKS
1	HOT DIP GALV. STEEL HEAVY DUTY STRAIGHT SEGMENT ... X100mm WITH PERFORATED REINFORCING MEMBERS	M	LAYOUT	
2	HOT DIP GALVANIZED RIGID STEEL CONDUIT Φ ...	M	LAYOUT	
3	GALVANIZED STEEL BUSHING Φ ...	N	1	
4	GALVANIZED STEEL LOCK NUT Φ ...	N	2	
5	GALVANIZED STEEL SPRING WASHER Φ ...	N	2	

DETAIL E-118C

TYPICAL CABLE RUN OUT OF CABLE TRAY

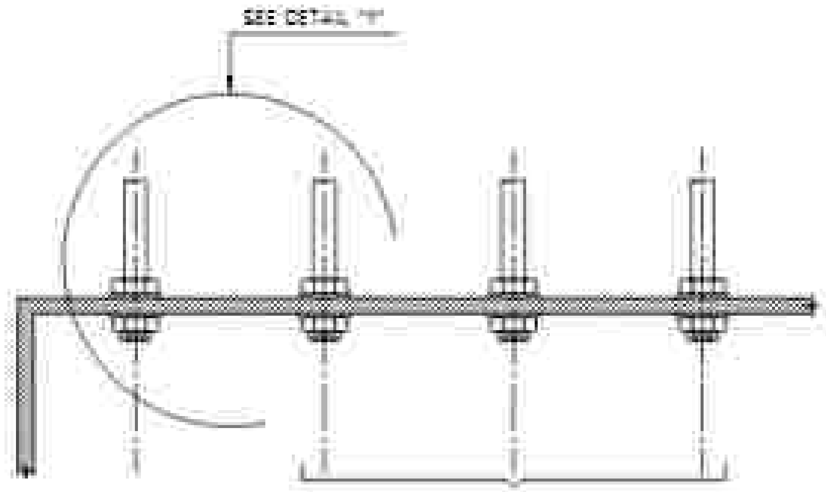
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: TYPICAL CABLE RUN OUT OF CABLE TRAY
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: E-118C	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



DETAIL "1"

UPPER ENTRY



DETAIL E-126

CONDUIT RUN OUT OF LOCAL PANELS

ITEM	DESCRIPTION	UNIT	ITEM QTY	REMARKS
1	LOCAL PANEL	N	1	
2	GALVANIZED STEEL BUSHING # ...	N	"	
3	GALVANIZED STEEL SPRING WASHER # ...	N	"	
4	GLAVANIZED STEEL LOCK NUT # ...	N	"	
5	HOT DIP GALVANIZED RIGID STEEL CONDUIT # ...	M	LAYOUT	

TABLE "A"

MINIMUM DISTANCE BETWEEN CONDUITS

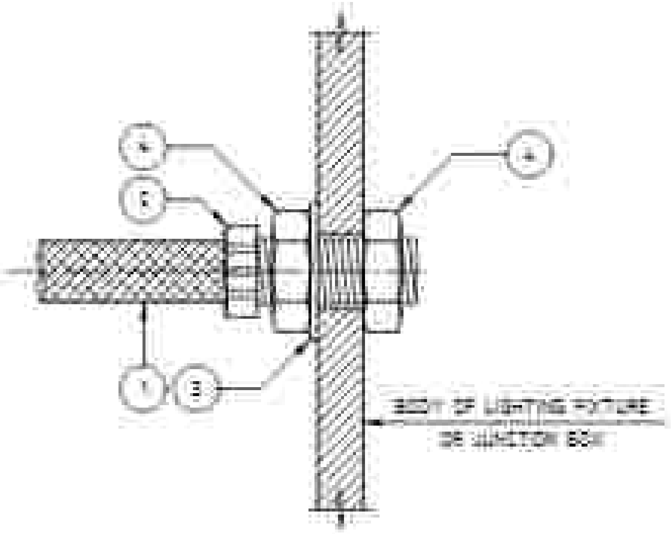
Φ	3/4"	1"	1 1/2"	2"	2 1/2"	3"	4"
3/4"	50	55	70	80	100	110	140
1"	55	60	75	85	105	115	155
1 1/2"	70	75	80	95	115	125	165
2"	80	85	95	100	120	130	170
2 1/2"	100	105	115	120	125	140	180
3"	110	115	125	130	140	150	185
4"	140	155	165	170	180	185	200

NOTE :

THIS DETAIL IS VALID FOR HVAC SUB-DISTRIBUTION PANELS AND LOCAL CABINETS , TOO .

TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: CONDUIT RUN OUT OF LOCAL PANELS
	P.A.		
	CHECKED BY:	DATE:	
DETAIL No.: E-126	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



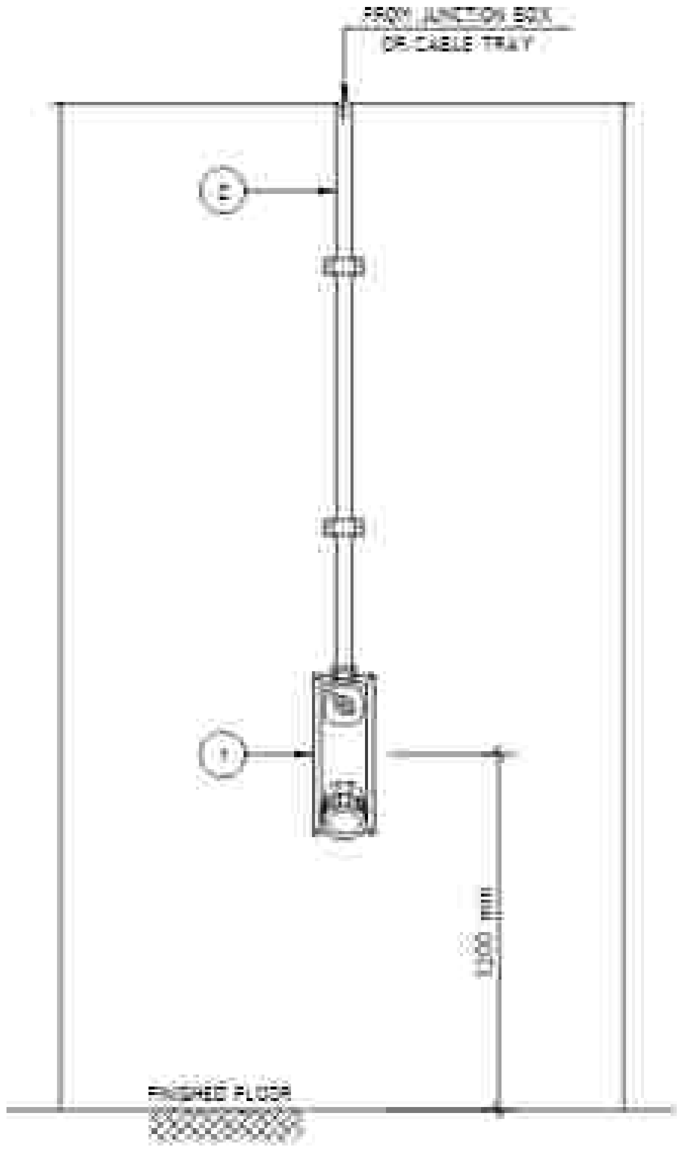
ITEM	DESCRIPTION	UNIT	ITEM QTY	REMARKS
1	GALV. STEEL FLEX PIPE LIQUID TIGHT WITH PVC COVERING 19.9 mm	M	AS REQUIRED	
2	STRAIGHT FITTING FOR FLEXIBLE PIPE WITH SWIVELLING MALE 19.9 mm	N	1	
3	GALVANIZED STEEL SPRING WASHER 19.9 mm	N	1	
4	GLAVANIZED STEEL LOCK NUT 19.9 mm	N	2	

DETAIL E-127

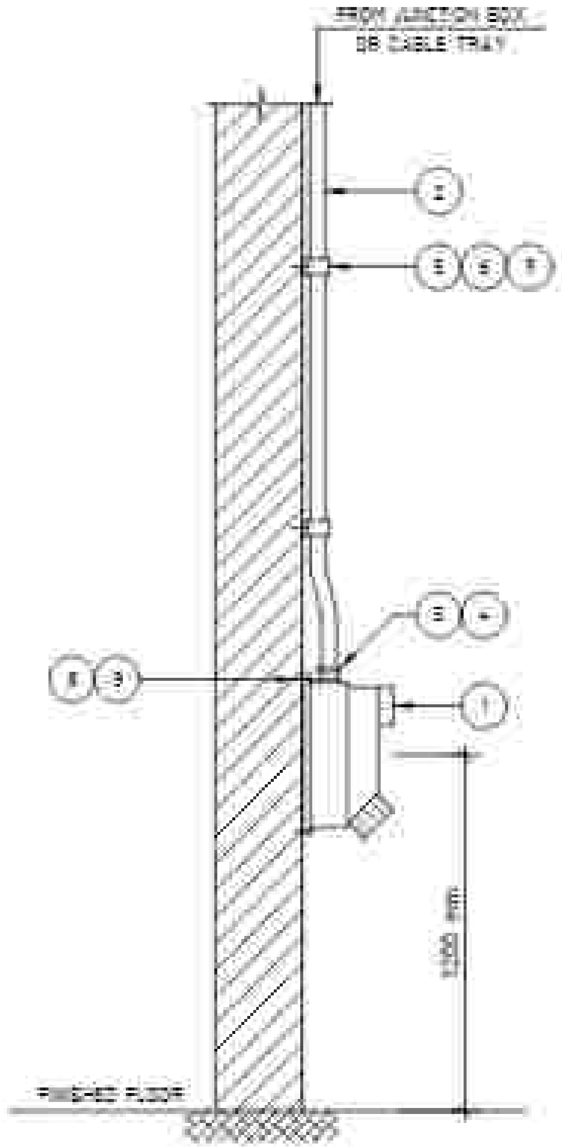
TYPICAL DETAIL FOR FIXING OF FLEX. PIPE
TO LIGHTING FIX. OR JUNCTION BOX

TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: TYPICAL DETAIL FOR FIXING OF FLEX. PIPE TO LIGHTING FIX. OR JUNCTION BOX
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: E-127	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



FRONT VIEW



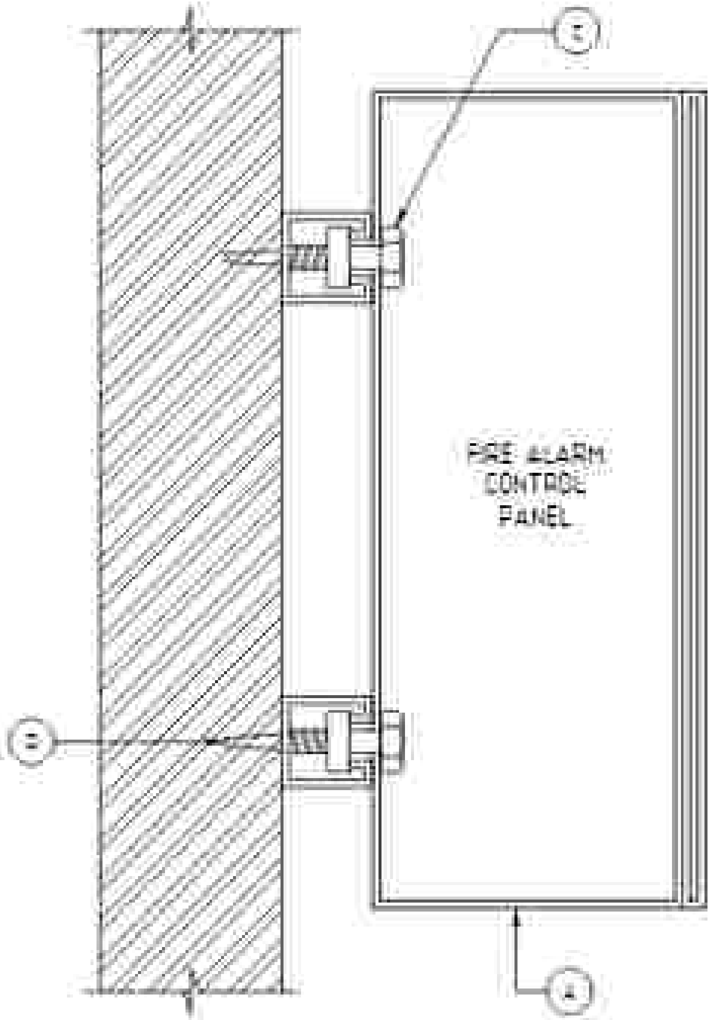
SIDE VIEW

ITEM	DESCRIPTION	UNIT	QTY
1	THREE PHASES INTERLOCKED SOCKET OUTLET 63A-400V-3PH+N+E IP44 , STEEL METALLIC BOX WITH FLANGE ONE HOLE Ø 19.5 mm	N	1
2	GALVANIZED STEEL RIGID CONDUIT Ø PG36	M	LAYOUT
3	GALVANIZED STEEL 3 PIECES UNION Ø 42 mm	N	1
4	GALVANIZED STEEL REDUCER SIZE 42-29.5 mm	N	1
5	GALVANIZED STEEL CLAMP Ø 42 mm WITH HOLE Ø 8 mm	N	1
6	GALVANIZED STEEL EXPANSION BOLT TYPE 14-M8	N	1
7	M8 GALVANIZED STEEL SPRING WASHER	N	1
8	GALVANIZED STEEL EXPANSION BOLT TYPE 10-M6	N	4
9	M6 GALVANIZED STEEL SPRING WASHER	N	4

INDOOR 63A POWER SOCKET , SURFACE MOUNTED

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: TYPICAL DETAIL FOR INDOOR 63A POWER SOCKET SURFACE MOUNTED
	CHECKED BY:	DATE:	
DETAIL No.: E-128	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



ITEM	DESCRIPTION	QTY	REMARKS
A	FIRE ALARM CONTROL PANEL FOR LOCATION SEE PLAN DRAWING	1	
B	STRUT CHANNEL AS 102	AS REQ	
C	STRUT NUT & BOLT WITH SPRING & SQUARE WASHER AS 1030	4	
D	BOLT PROJECTING RAWLBOLT AS 1018	4	

DETAIL F-101

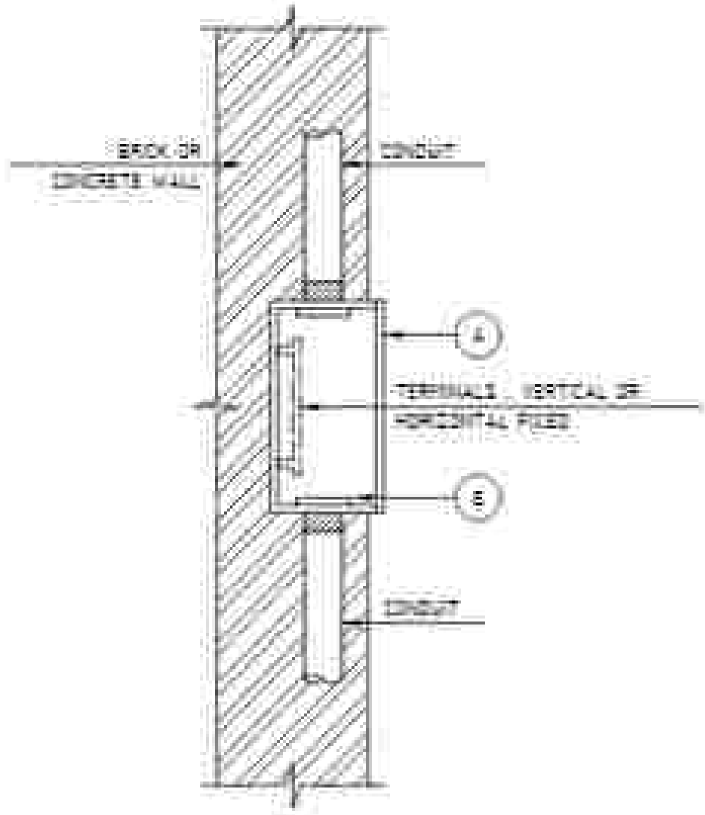
FIRE ALARM CONTROL PANEL

NOTE :

1- IN CASE OF INSTALLATION ON STEEL STRUCTURE , ITEM "D" IS DELETED AND STRUT CHANNEL SHALL BE WELDED TO THE STEEL STRUCTURE.
2- INSTALLATION HEIGHT : 140 cm ABOVE FINISHED FLOOR.

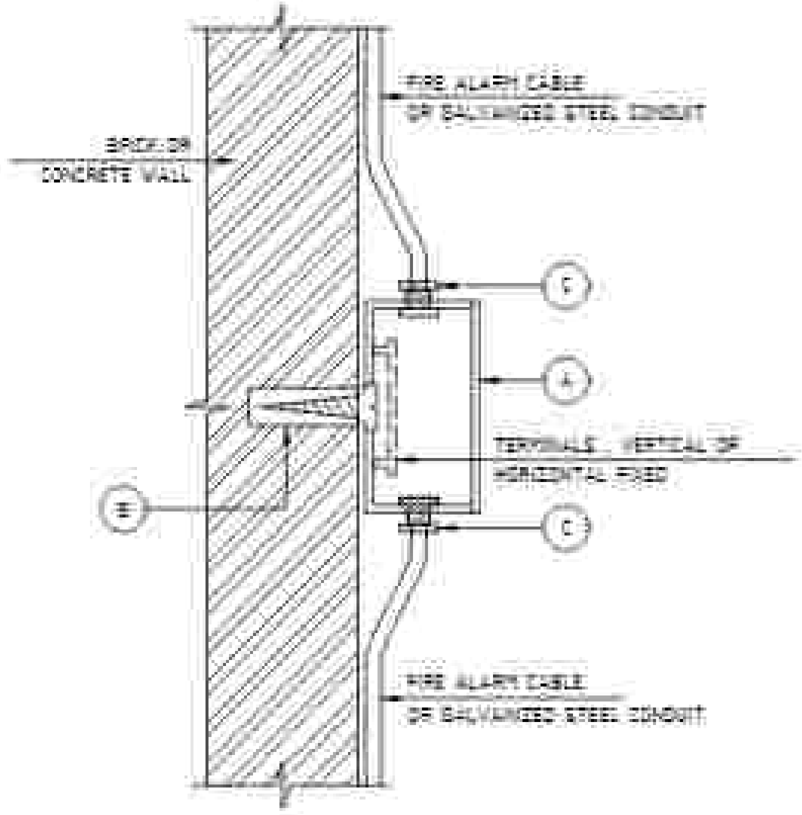
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. CHECKED BY:	DATE: DATE:	TITLE: FIRE ALARM CONTROL PANEL INSTALLATION
DETAIL No.: F-101	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



DETAIL F-102 A

INDOOR FIRE ALARM JUNCTION BOX , FLUSH MOUNTED



DETAIL F-102 B

INDOOR FIRE ALARM JUNCTION BOX , SURFACE MOUNTED

ITEM	DESCRIPTION	QTY	REMARKS
A	FIRE ALARM JUNCTION BOX , FLUSH MOUNTED INDOOR	1	
B	BRASS BUSHING	AS REQ.	ONLY FOR STEEL CONDUIT
C			

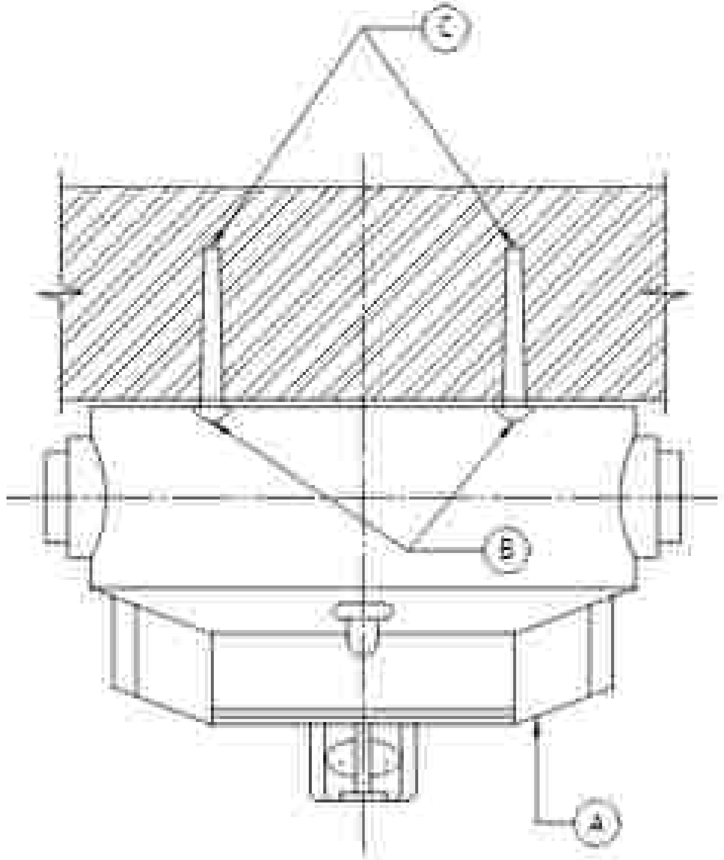
ITEM	DESCRIPTION	QTY	REMARKS
A	FIRE ALARM JUNCTION BOX , SURFACE MOUNTED INDOOR	1	
B	PAN SCREW WITH RAWL PLUG M6x50	2	
C	CABLE GLAND OR GALV. RIGID STEEL CONDUIT COUPLING SET	AS REQ.	

NOTE :

1- INSTALLATION HEIGHT : 220 cm ABOVE FINISHED FLOOR.

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE:	FIRE ALARM JUNCTION BOX INSTALLATION
	CHECKED BY:	DATE:		
DETAIL No.: F-102	SHEET NO.:	1 OF 1	SCALE:	NOT TO SCALE

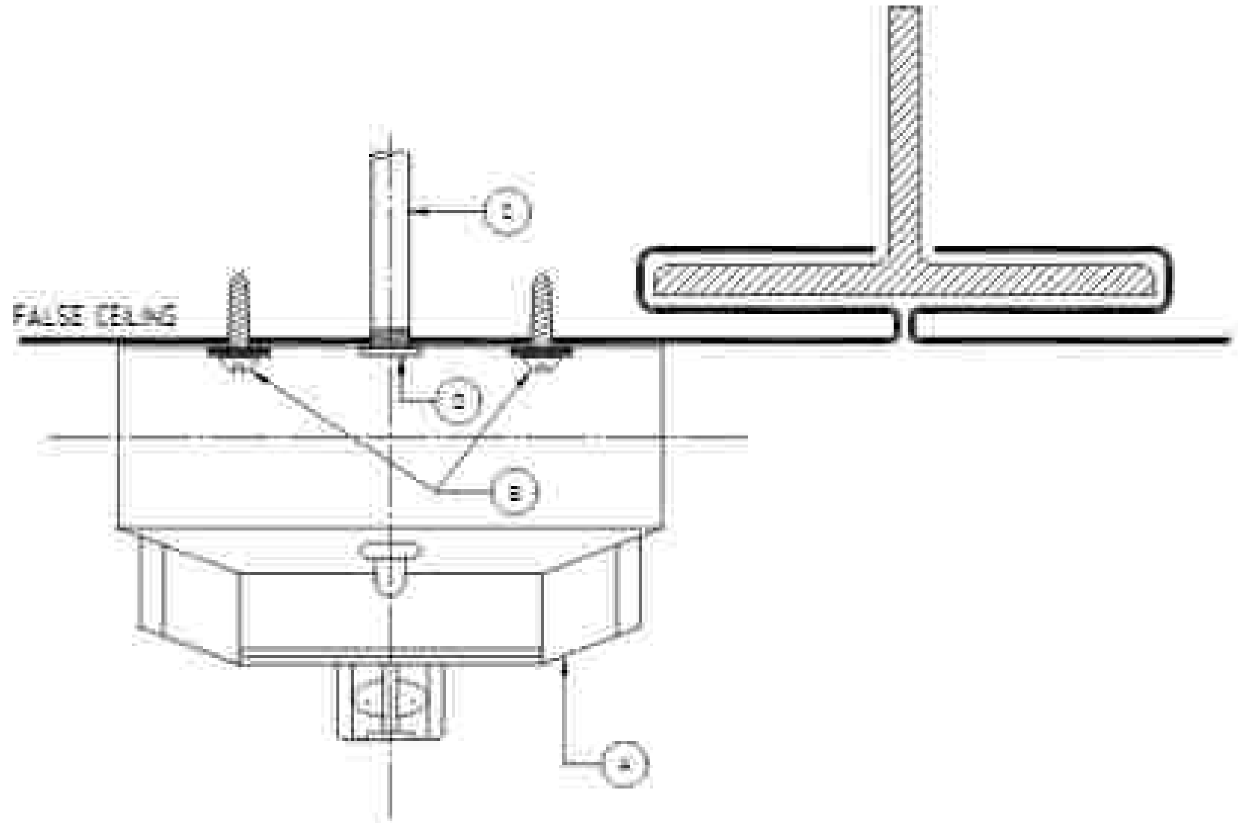
FILE NAME :



ITEM	DESCRIPTION	QTY	REMARKS
A	SURFACE MOUNTED FIRE DETECTOR FOR TYPE SEE PLAN DRAWING	1	
B	WOOD SCREW , GALVANIZED M6 × 35	2	
C	PLASTIC RAWLPLUG FOR M6	2	

F-103A

FIRE DETECTOR INSTALLED ON BRICK OR CONCRETE CEILING



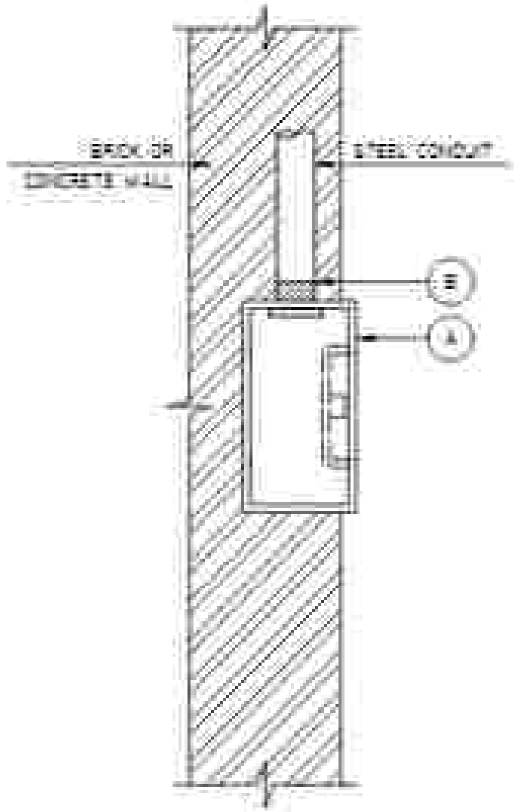
ITEM	DESCRIPTION	QTY	REMARKS
A	SURFACE MOUNTED FIRE DETECTOR FOR TYPE SEE PLAN DRAWING	1	
B	SELF TAPPING SCREW , M6×30 WITH FLAT WASHER	2	
C	16 mm DIA. GALV. STEEL CONDUIT	AS REQ.	
D	16 mm DIA. BRASS BUSHING	1	

F-103B

FIRE DETECTOR INSTALLED ON FALSE CEILING

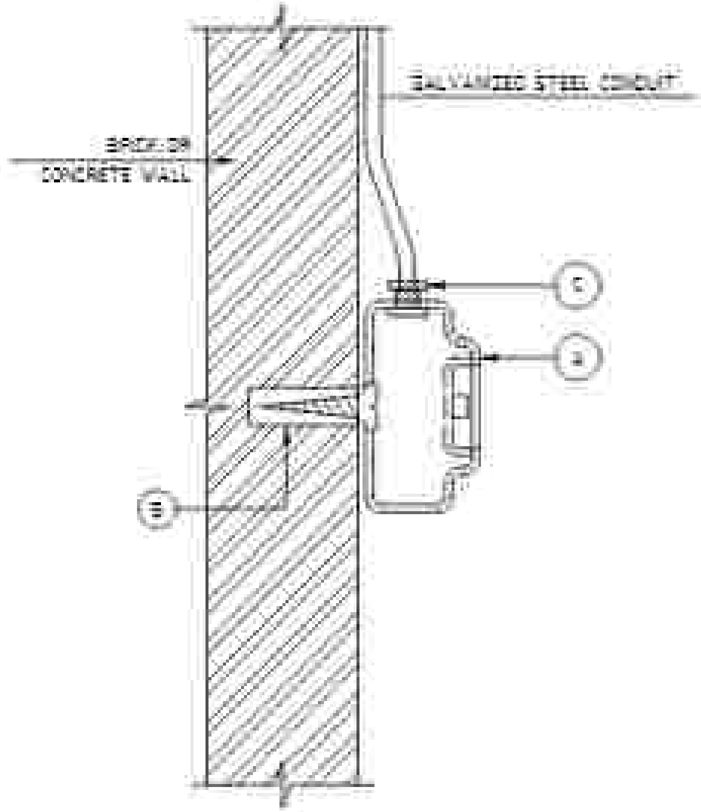
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: FIRE DETECTOR INSTALLATION
	P.A.		
	CHECKED BY:	DATE:	
DETAIL No.: F-103	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



DETAIL F-104A

MANUAL CALL POINT , FLUSH MOUNTED



DETAIL F-104B

MANUAL CALL POINT , SURFACE MOUNTED

ITEM	DESCRIPTION	QTY	REMARKS
A	MANUAL CALL POINT , FLUSH MOUNTED	1	
B	16 mm DIA. BRASS BUSHING	AS REQ.	
C			

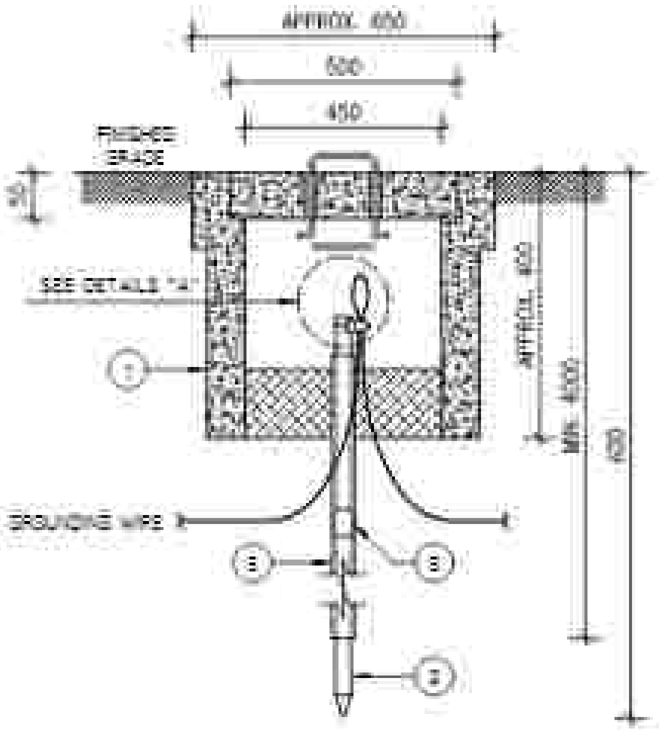
ITEM	DESCRIPTION	QTY	REMARKS
A	MANUAL CALL POINT , SURFACE MOUNTED	1	
B	FAN SCREW WITH RAWL PLUG M6x50	2	
C	GALV. RIGID STEEL CONDUIT COUPLING SET	AS REQ.	

NOTE :

1- INSTALLATION HEIGHT : 140 cm ABOVE FINISHED FLOOR.

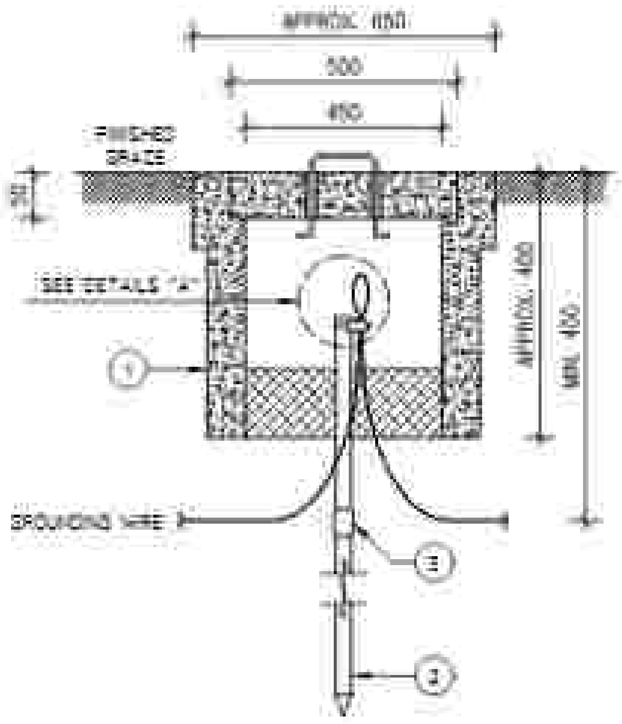
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: MANUAL CALL POINT INSTALLATION
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: F-104	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



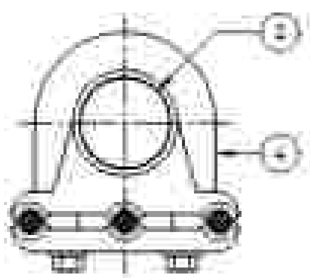
SECTION "A-A"

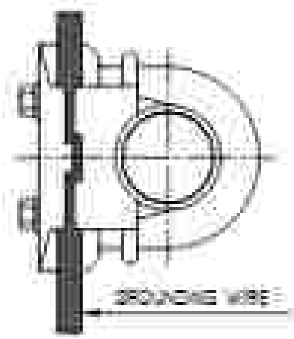
INSTRUMENT CLEAN EARTH

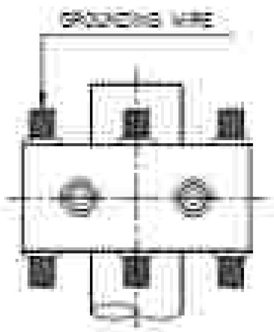


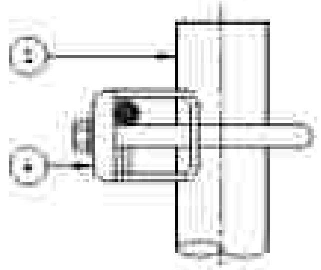
SECTION "A-A"

ELECTRICAL EARTH





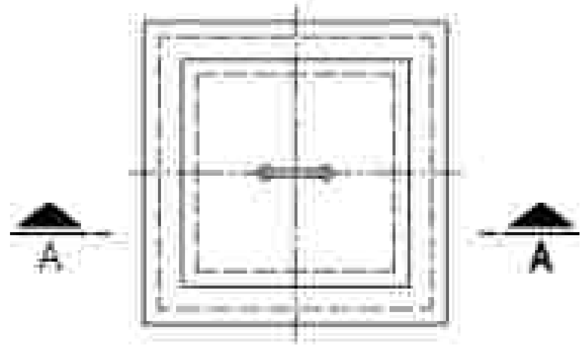




THREE CONDUCTOR TYPE

SINGLE CONDUCTOR TYPE

GROUNDING WIRE CONNECTION DETAILS "A"



GROUND BED

TOP VIEW

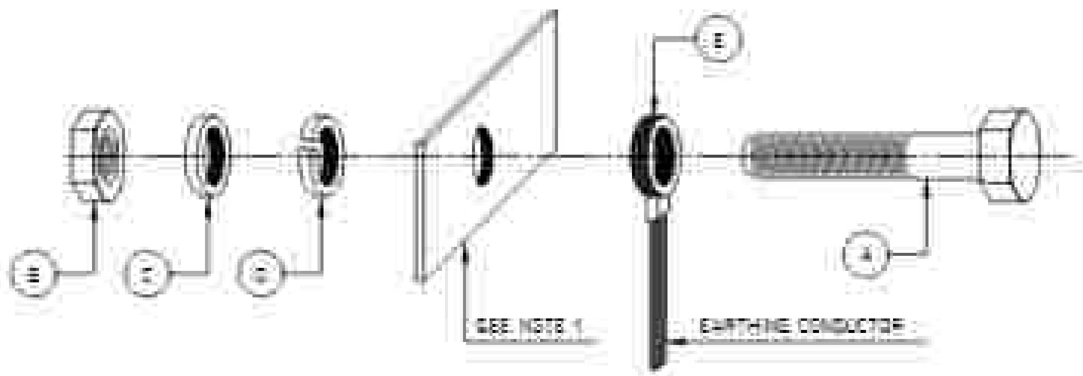
NOTES

1. FOR LOCATION AND NUMBER OF ELECTRODES , REFER TO GROUNDING LAYOUT DRAWINGS .
2. GROUNDING SYSTEM RESISTANCE TO GROUND SHALL NOT EXCEED DESIGN VALUE .
3. ALL DIMENSIONS ARE IN MILLIMETERS .

No.	DESCRIPTION	QTY.
1	REINFORCED CONCRETE HOUSING UNIT	
2	ELECTRODE , 16mm DIA. 3M LENGTH COPPER ROD	NOTE 1
3	COUPLING FOR ELECTRODE	1-EA
4	EARTH CLAMP	1-EA
5	80mm DIA. PVC PIPE 4m LENGTH	NOTE 1
6		
7		
8		
9		
10		

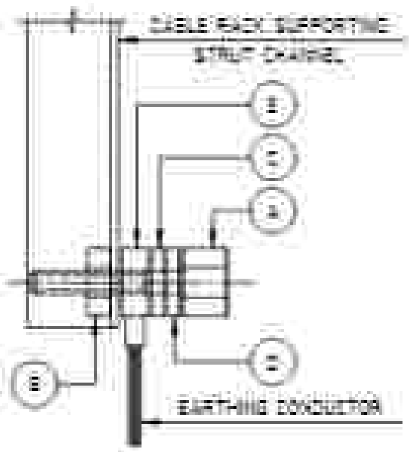
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: GROUNDING INSTALLATION DETAILS : GROUNDING ROD
	CHECKED BY:	DATE:	
DETAIL No.: G-100	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



DETAIL G-101A

STRUCTURE / EQUIPMENT EARTHING



DETAIL G-101B

CABLE RACK EARTHING

ITEM	D E S C R I P T I O N	QTY	REMARKS
A	PHOSPHER-BRONZE HEXAGON HEAD BOLT 10mm DIA. & 35mm LONG	1	
B	PHOSPHER-BRONZE HEXAGON NUT FOR 10mm DIA. BOLT	4	
C	PHOSPHER-BRONZE FLAT ROUND WASHER FOR 10mm DIA. BOLT	1	
D	PHOSPHOR-BRONZE ROUND SPRING WASHER FOR 10mm DIA. BOLT	1	
E	CRIMP TYPE COPPER CABLE LUG (FOR SIZE SEE PLAN DWG)	1	

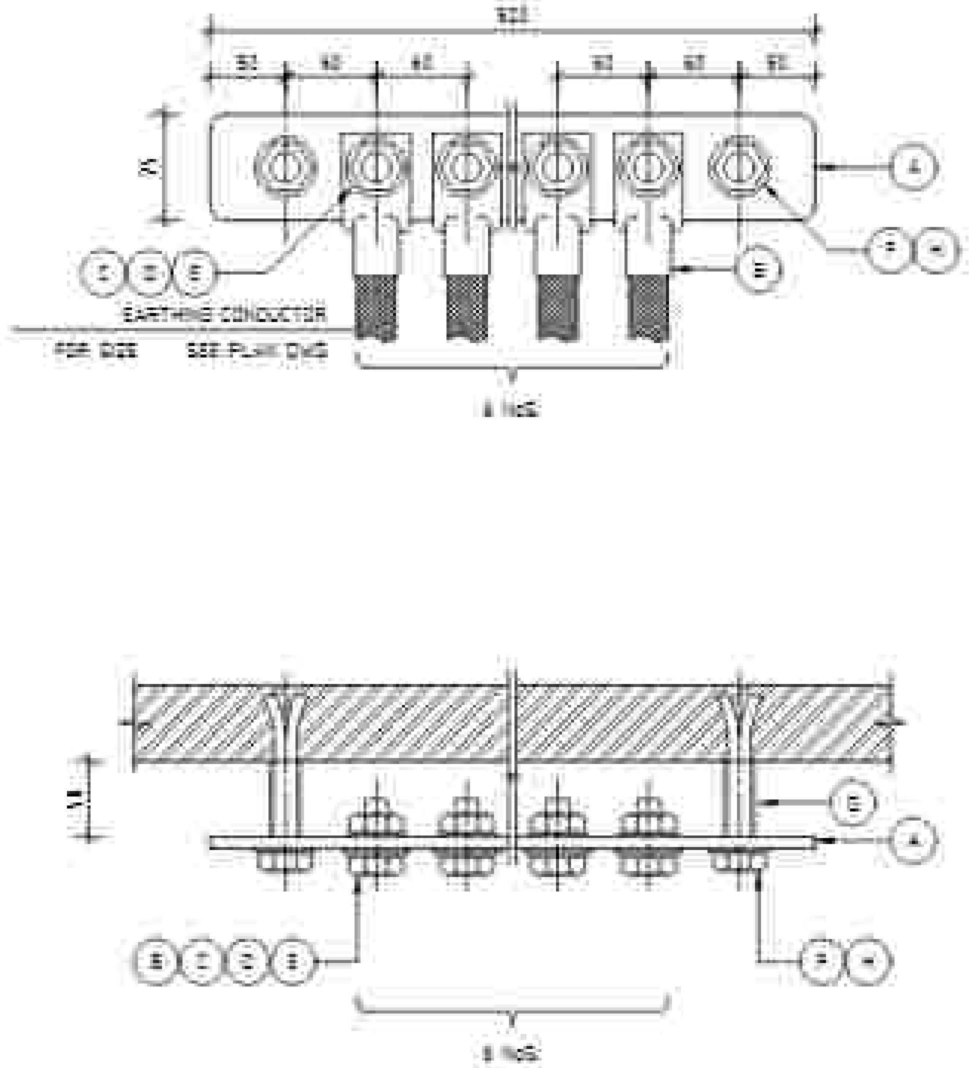
ITEM	D E S C R I P T I O N	QTY	REMARKS
A	PHOSPHER-BRONZE HEXAGON HEAD BOLT 10mm DIA. & 35mm LONG	1	
B	PHOSPHER-BRONZE HEXAGON NUT FOR 10mm DIA. BOLT	1	
C	PHOSPHER-BRONZE FLAT ROUND WASHER FOR 10mm DIA. BOLT	1	
D	PHOSPHOR-BRONZE ROUND SPRING WASHER FOR 10mm DIA. BOLT	1	
E	CRIMP TYPE COPPER CABLE LUG (FOR SIZE SEE PLAN DWG)	1	

NOTE

1. IF THE EARTH TERMINAL IS NOT EXISTING ON THE EQUIPMENT BODY OR IF THE SHAPE OF STRUCTURE IS NOT SUITABLE FOR DRILLING (EG PIPES) THEN 50×40×4mm GALVANIZED STEEL PLATE SHALL BE WELDED TO THE STRUCTURE FOR THIS PURPOSE.

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: GROUNDING INSTALLATION DETAILS EARTH CONNECTION
	CHECKED BY:	DATE:	
DETAIL No.: G-101	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



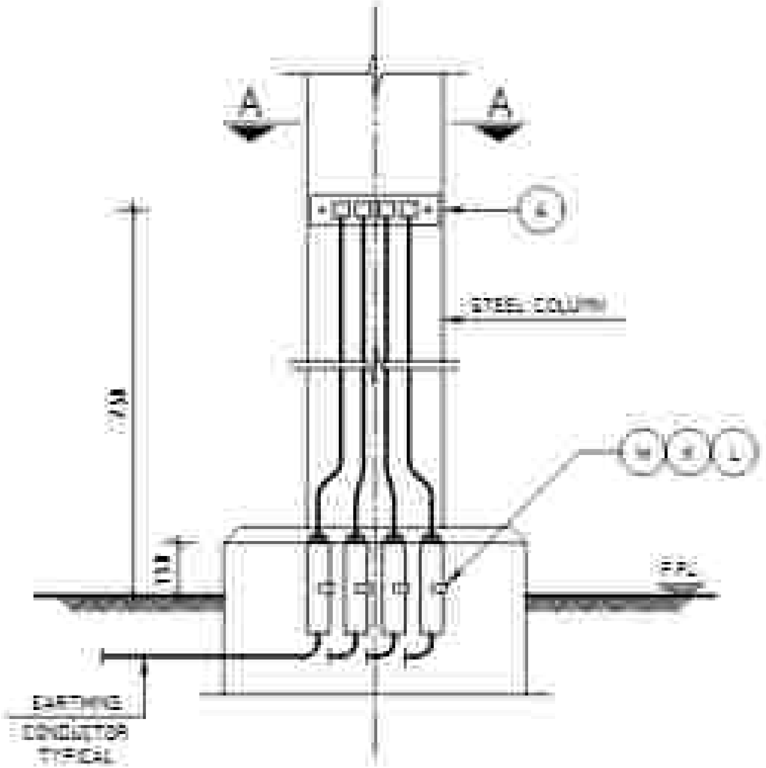
DETAIL G-102

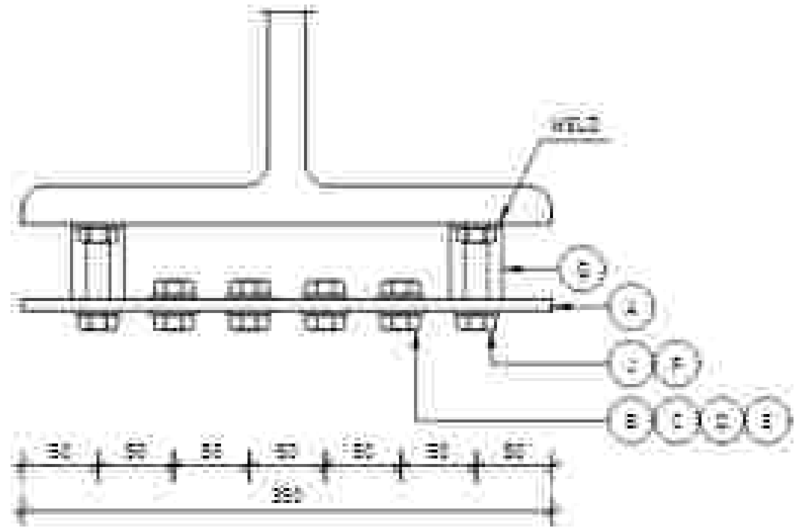
WALL MOUNTED EARTH BUSBAR

ITEM	DESCRIPTION	QTY	REMARKS
A	SOLID COPPER EARTHING BAR (520x75x6)mm	1	
B	CRIMP TYPE COPPER CABLE LUG (FOR SIZE SEE PLAN DWG)	AS REQ	
C	PHOSPHOR-BRONZE HEXAGON HEAD BOLT 10mm DIA AND 35mm LONG	6	
D	PHOSPHOR-BRONZE HEXAGON NUT FOR 10mm DIA BOLT	6	
E	PHOSPHOR-BRONZE FLAT ROUND WASHER FOR 10mm DIA BOLT	12	
F	PHOSPHOR-BRONZE ROUND SPRING WASHER FOR 10mm DIA BOLT	2	
G	RIGID HEAVY DUTY GALV. STEEL CONDUIT 20mm DIA	3.m	
H	BOLT PROJECTING RAWLBOLT AS 1618	2	

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. / CHECKED BY:	DATE: / DATE:	TITLE: GROUNDING INSTALLATION DETAILS WALL MOUNTED EARTH BUSBAR
DETAIL No.: G-102	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :





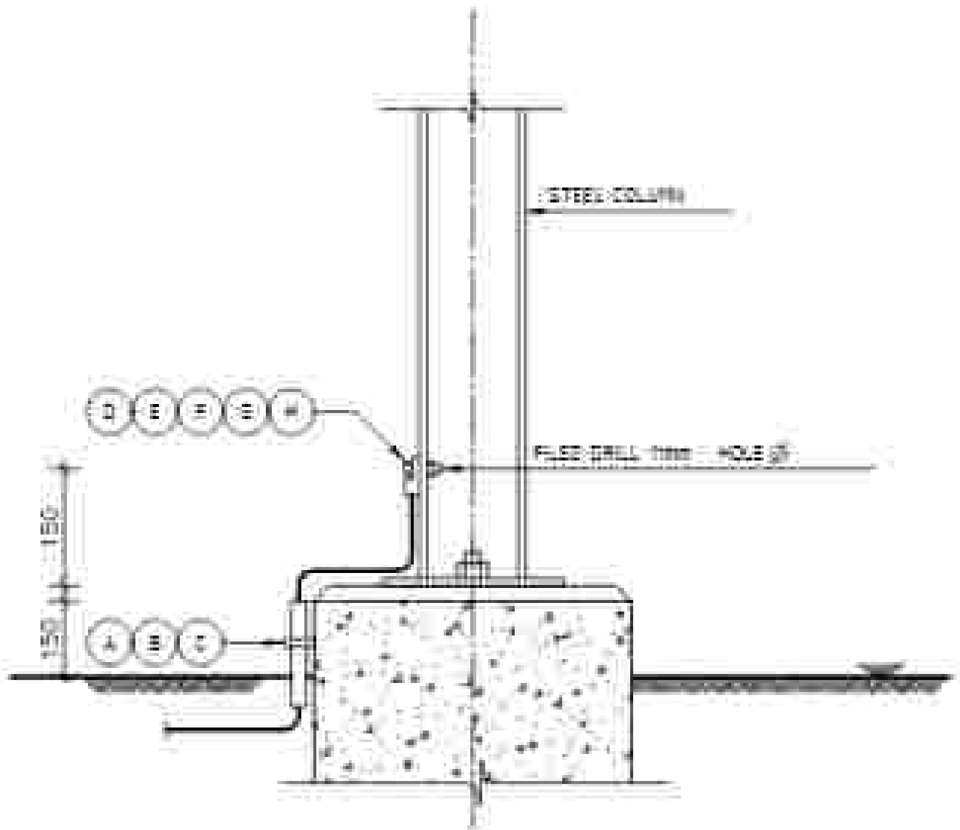
DETAIL G-103

STEEL STRUCTURE MOUNTED EARTH BUSBAR

ITEM	DESCRIPTION	QTY	REMARKS
A	SOLID COPPER EARTHING BAR (350x15x6)mm	1	
B	CRIMP TYPE COPPER CABLE LUG (FOR SIZE, SEE PLAN DRAWING)	AS REQ	
C	PHOSPHOR-BRONZE HEXAGON HEAD BOLT 10mm DIA. AND 35mm LONG	4	
D	PHOSPHOR-BRONZE HEXAGON NUT FOR 10mm DIA. BOLT	4	
E	PHOSPHOR-BRONZE FLAT ROUND WASHER FOR 10mm DIA. BOLT	8	
F	PHOSPHOR-BRONZE ROUND SPRING WASHER FOR 10mm DIA. BOLT	2	
G	RIGID HEAVY DUTY GALVANIZED STEEL CONDUIT 20mm DIA.	0.1m	
H	BOLT PROJECTING RAMLBOLT AS 16A	4	
J	GALV. STEEL BOLT & NUT 10mm DIA & 75mm LONG	2	
K	RIGID HEAVY DUTY GALV. STEEL CONDUIT 20mm DIA.	1.2m	
L	CONDUIT CLAMP ONE HOLE FOR 20mm DIA. CONDUIT	2	

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. / CHECKED BY	DATE / DATE	TITLE: GROUNDING INSTALLATION DETAILS STEEL STRUCTURE MOUNTED EARTH BUSBAR
DETAIL No.: G-103	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



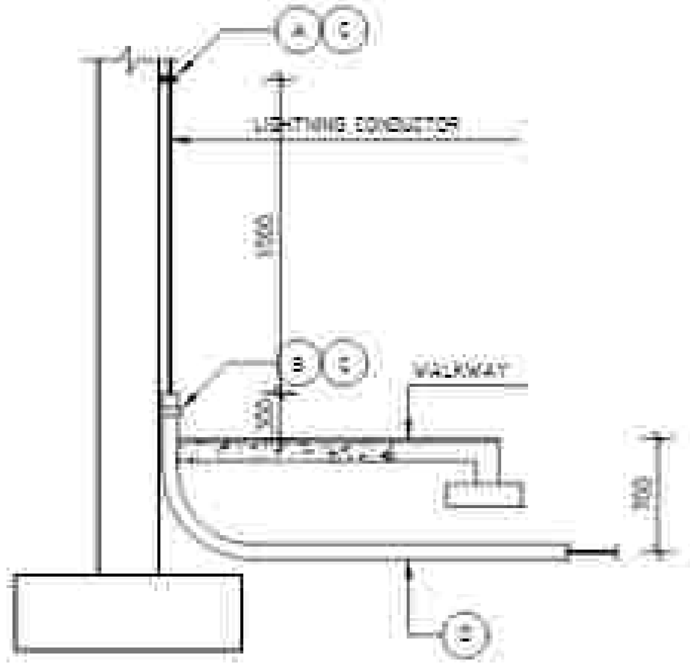
DETAIL G-104

STEEL STRUCTURE OR COLUMN EARTHING

ITEM	DESCRIPTION	QTY	REMARKS
A	RIGID HEAVY DUTY GALVANIZED STEEL CONDUIT 25mm DIA.	2.5m	
B	CONDUIT CLAMP ONE HOLE FOR 25mm DIA. CONDUIT	1	
C	BOLT PROJECTING RAWLBOLT AS 16A	1	
D	CRIMP TYPE COPPER CABLE LUG (FOR SIZE, SEE PLAN DRAWING)	1	
E	PHOSPHOR-BRONZE HEXAGON HEAD BOLT 10mm DIA. AND 50mm LONG	1	
F	PHOSPHOR-BRONZE HEXAGON NUT FOR 10mm DIA. BOLT	1	
G	PHOSPHOR-BRONZE HEXAGON FLAT ROUND WASHER FOR 10mm DIA. BOLT	1	
H	PHOSPHOR-BRONZE HEXAGON ROUND SPRING WASHER FOR 10mm DIA. BOLT	1	

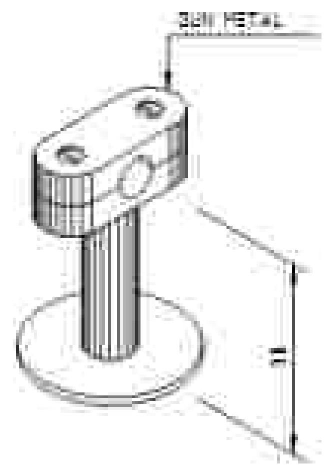
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. / CHECKED BY:	DATE: / DATE:	TITLE: GROUNDING INSTALLATION DETAILS: STEEL STRUCTURE EARTHING
DETAIL No.: G-104	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :

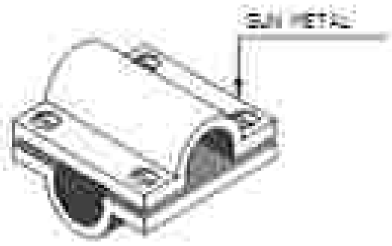


DETAIL G-105

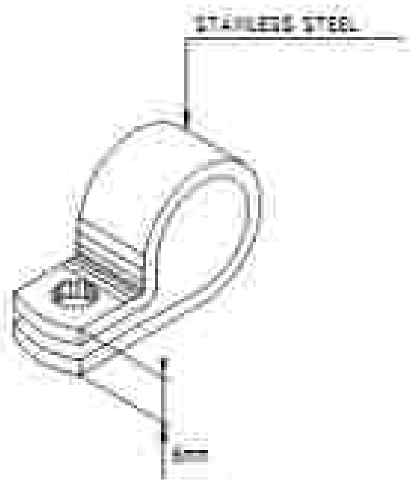
LIGHTING WIRE STUB-UP



CONDUCTOR DISTANCE SADDLE

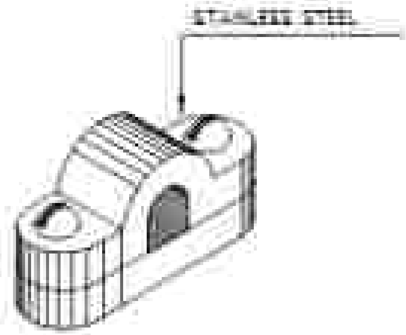


SQUARE CLAMP



ONE HOLE CABLE CLIP

(FOR FIXING CONDUCTOR ON THE EDGE OF THE ROOF)



CONDUCTOR SADDLE SPACER

(FOR FIXING CONDUCTOR ON THE WALLS AND STEEL STRUCTURES)

ITEM	DESCRIPTION		
A	TEST JOINT , GUN METAL		
B	SADDLE SPACER TYPE 029D		
C	BOLT PROJECTING RAWLBOLT SIZE M6 TYPE 07A		
D	RIGID HEAVY DUTY GALV. STEEL CONDUIT 32mm DIA		

MATERIAL TABLE FOR DETAIL G-105

NOTE:

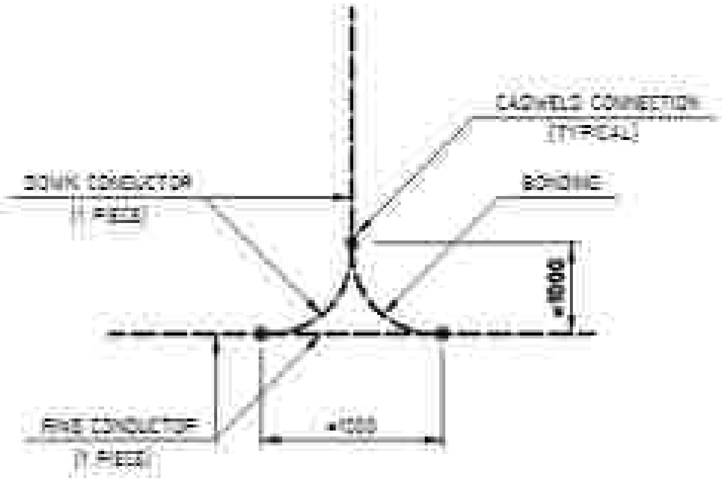
1- ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN

DETAIL G-105

LIGHTNING WIRE INSTALLATION DETAIL

TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE: GROUNDING INSTALLATION DETAILS LIGHTNING WIRE INSTALLATION DETAIL & EARTHING MATERIALS
	M.A.		
	CHECKED BY	DATE	
DETAIL No.: G-105	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

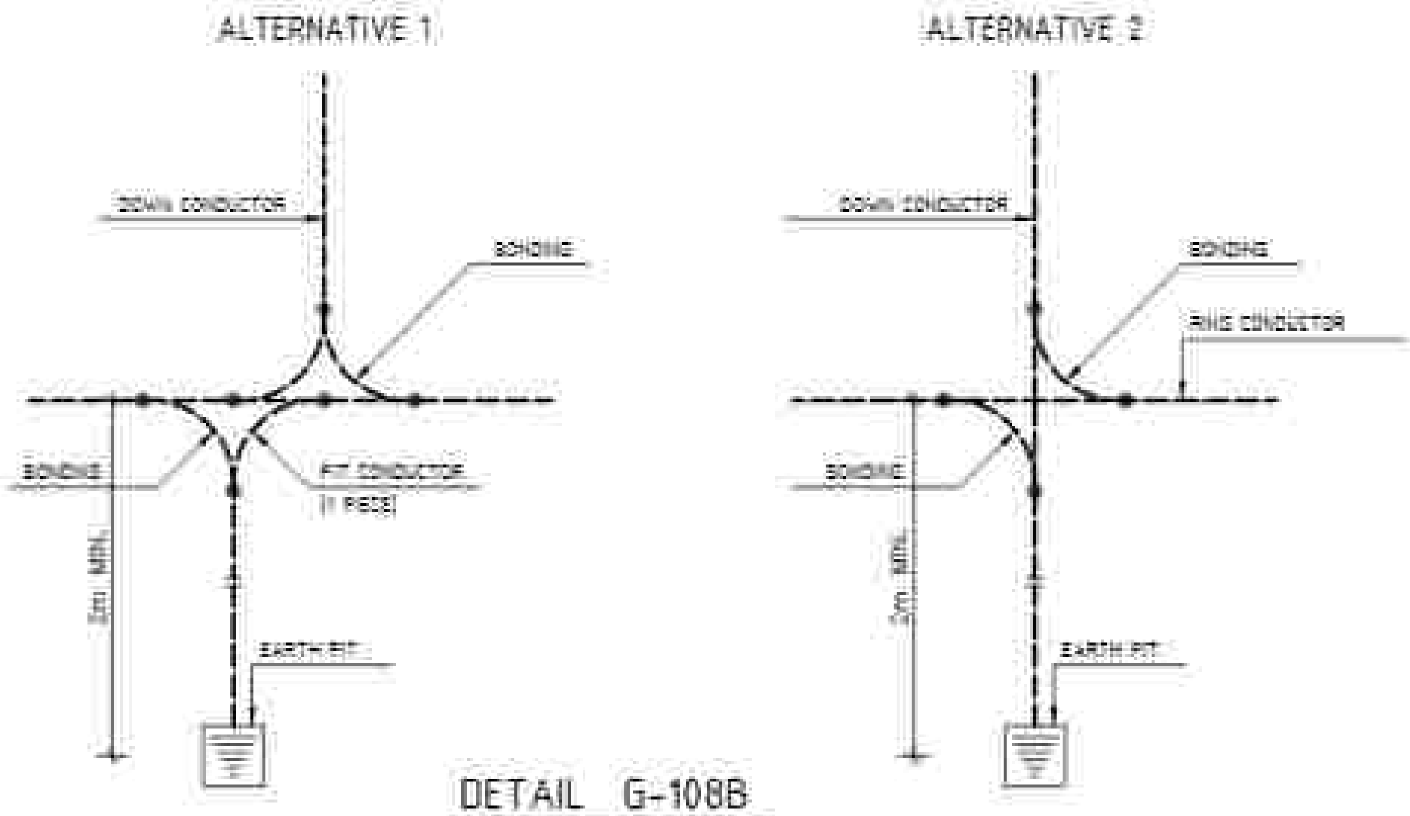
FILE NAME :



ALL CONDUCTORS ARE TYPE 7

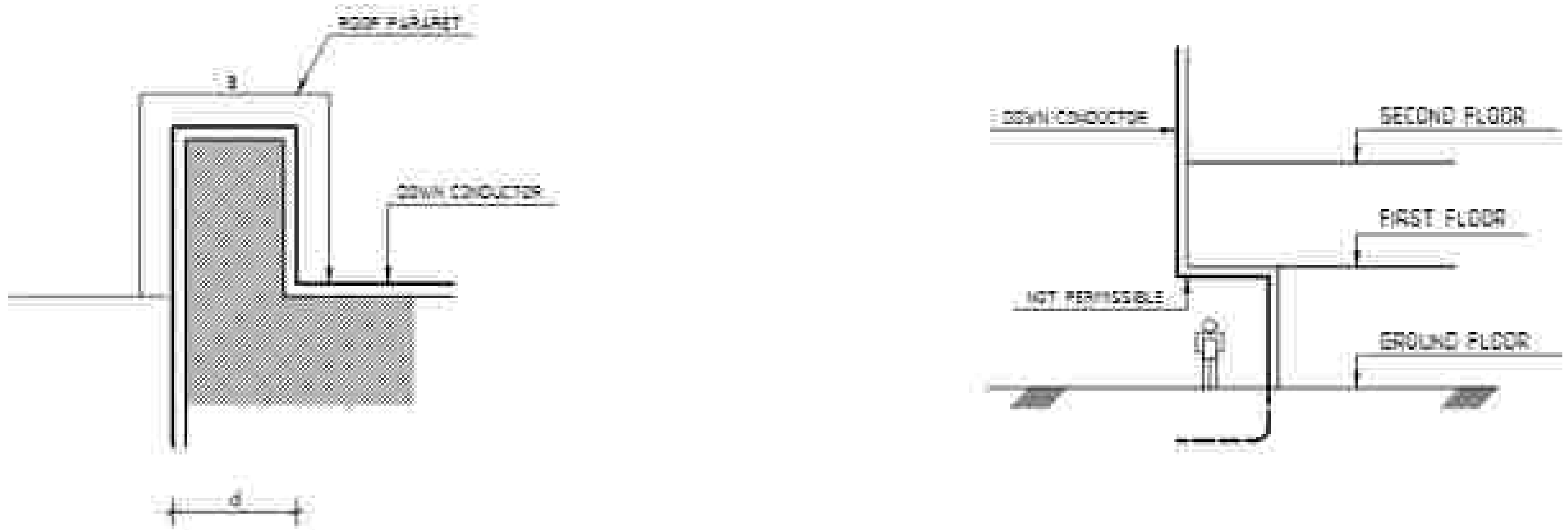
DETAIL G-108A

UNDERGROUND CONNECTION



DETAIL G-108B

PIT CONNECTION



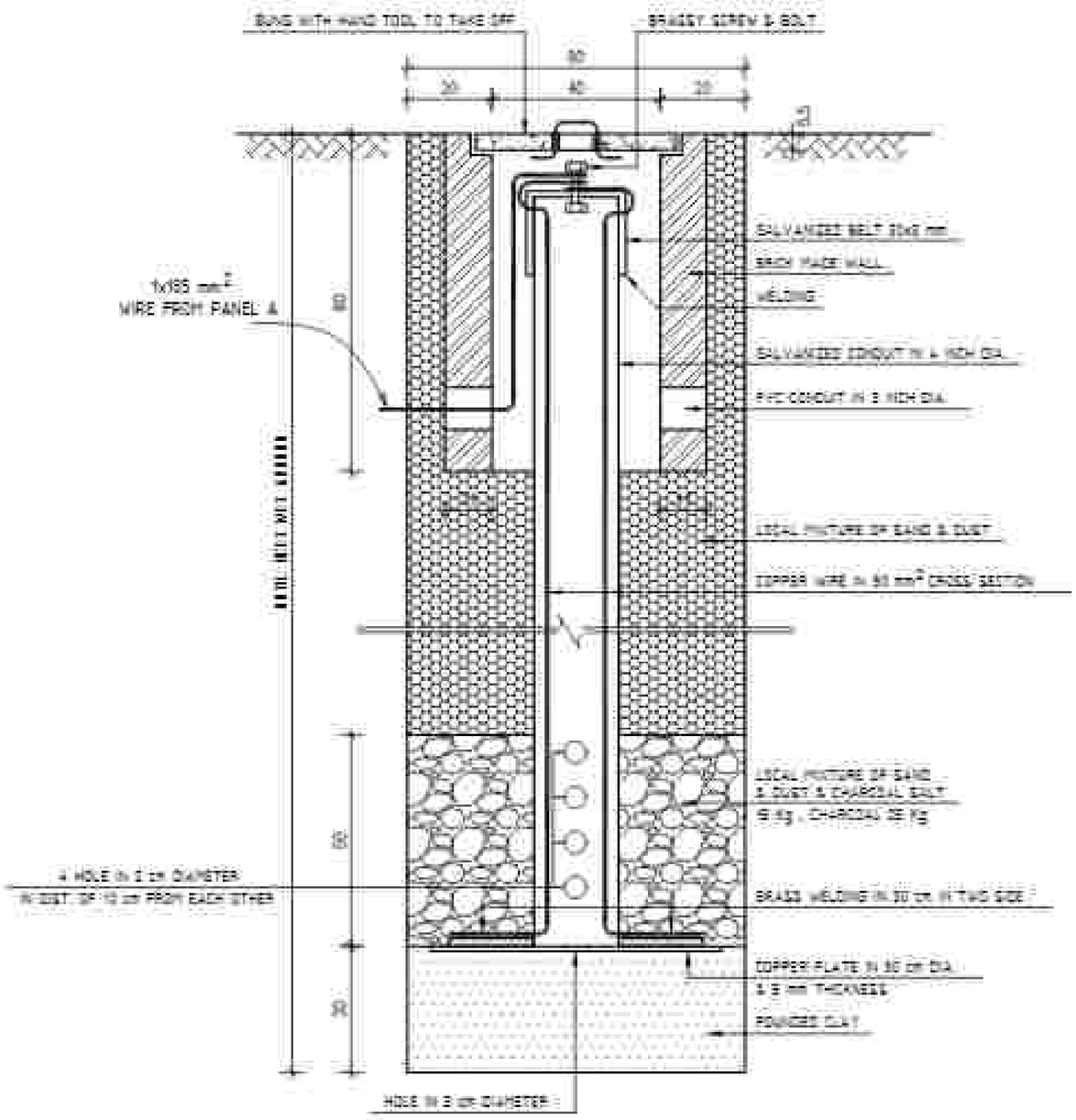
NOT PERMISSIBLE FOR a>8d

DETAIL G-108C

NOT PERMISSIBLE RE-INTRANT LOOPS

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: GROUNDING INSTALLATION DETAILS EARTHING CONNECTION	
	CHECKED BY:	DATE:		
DETAIL No.: G-108	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE	

FILE NAME :



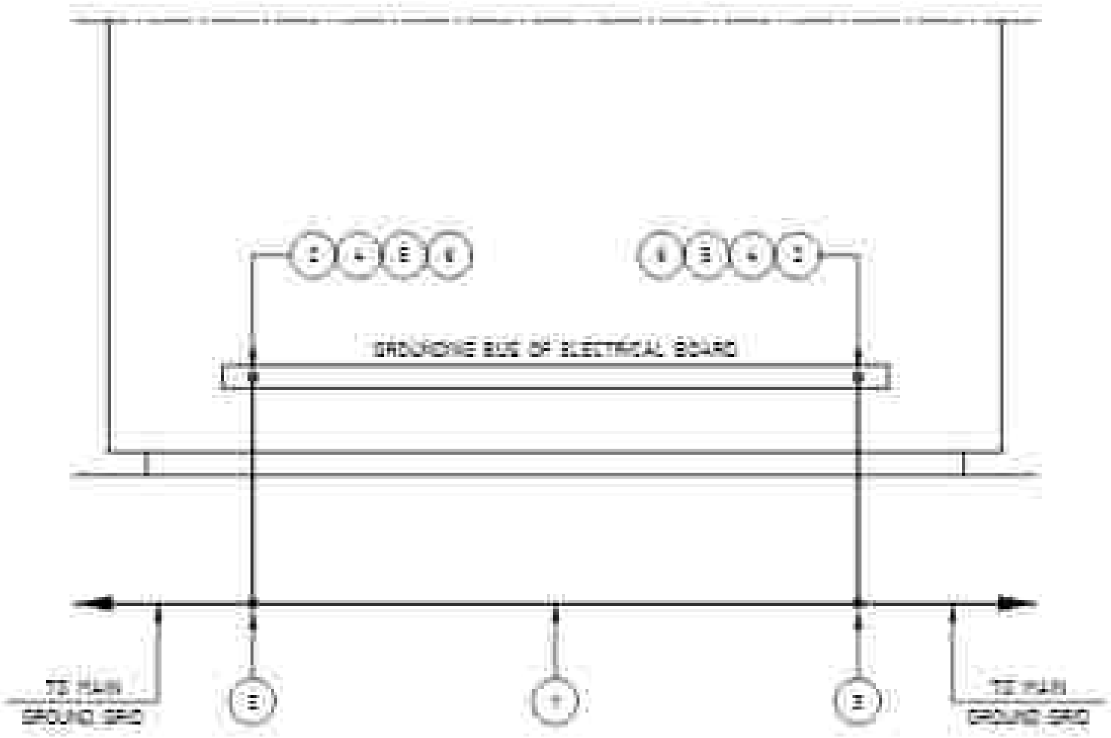
DETAIL G-112

EARTH WELL

HIGH VOLTAGE SYSTEM EARTH WELL DETAIL IN 2 OR 3 NOs AND IN DISTANCE OF 8 METERS FROM EACH OTHER WITH 1x185 mm² COPPER WIRE IN EACH WELL . THE RESISTANCE OF GROUND IS 5.5 OHM WITH TWO WELL & IS 3.4 OHM WITH THREE WELL . THUS THREE WELL IS BETTER SELECTION .

TARA TARH	DRAWN BY: R.A.	DATE:	TITLE: GROUNDING INSTALLATION DETAILS EARTHING WELL
	CHECKED BY:	DATE:	
DETAIL No.: G-112	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



ITEM	DESCRIPTION	UNIT	ITEM QTY	REMARKS
1	STRANDED ANNEALED COPPER CONDUCTOR 185 mm²	M	LAYOUT	
2	ONE HOLE #13 mm HEAVY DUTY COPPER LUG 185 mm²	N	2	
3	CRIMPING CONNECTOR CONDUCTOR 185 mm² COND. 185 mm²	N	2	
4	STAINLESS STEEL BOLT M12x40	N	2	
5	STAINLESS STEEL SPRING WASHER #13 mm	N	4	
6	STAINLESS STEEL NUT M12	N	2	

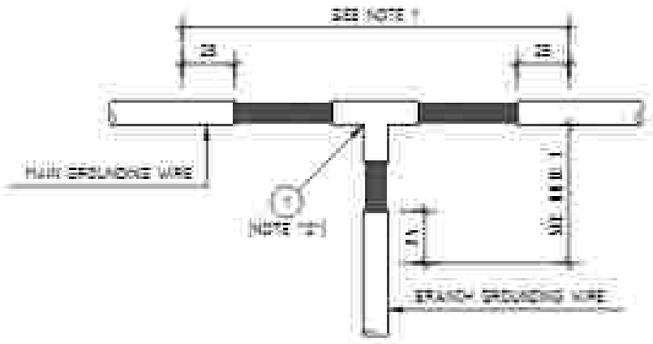
DETAIL G-118

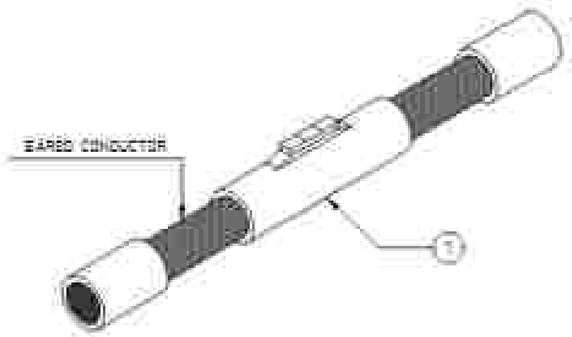
TYPICAL GROUNDING OF ELECTRICAL BOARDS

TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE: GROUNDING INSTALLATION DETAILS TYPICAL GROUNDING OF ELECTRICAL BOARDS
	M.A.		
	CHECKED BY	DATE	
DETAIL No.: G-118	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

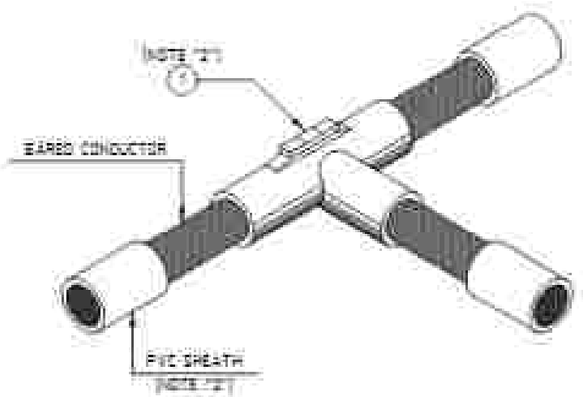
FILE NAME :

UNDER GROUND



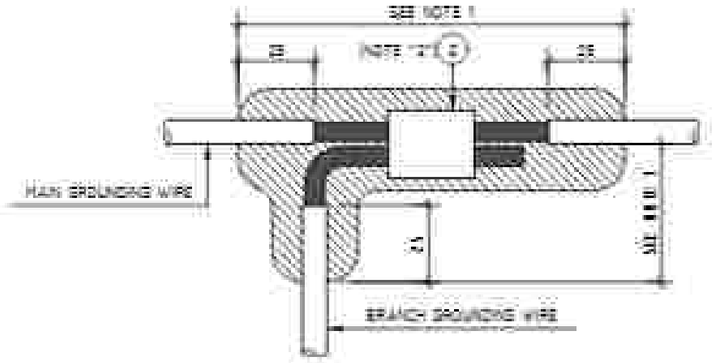


STRAIGHT JOINT

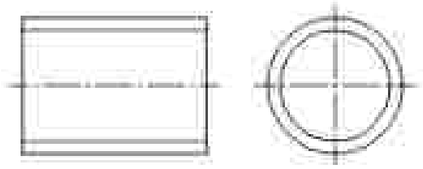


TEE BRANCH

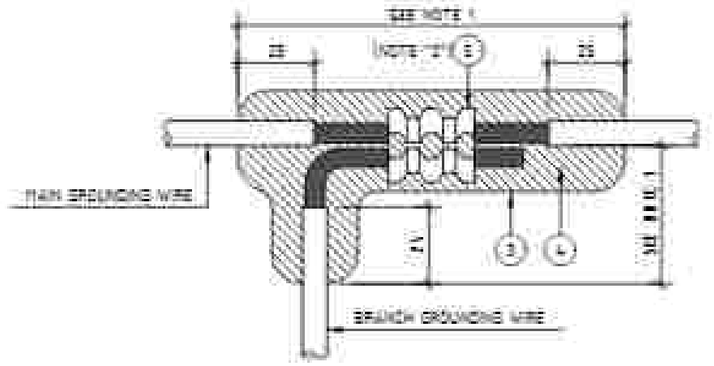
ABOVE GROUND



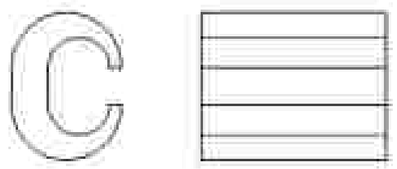
PARALLEL CONNECTOR



DETAIL OF PARALLEL CONNECTOR



"C" TYPE CONNECTOR



DETAIL OF "C" TYPE CONNECTOR

NOTES

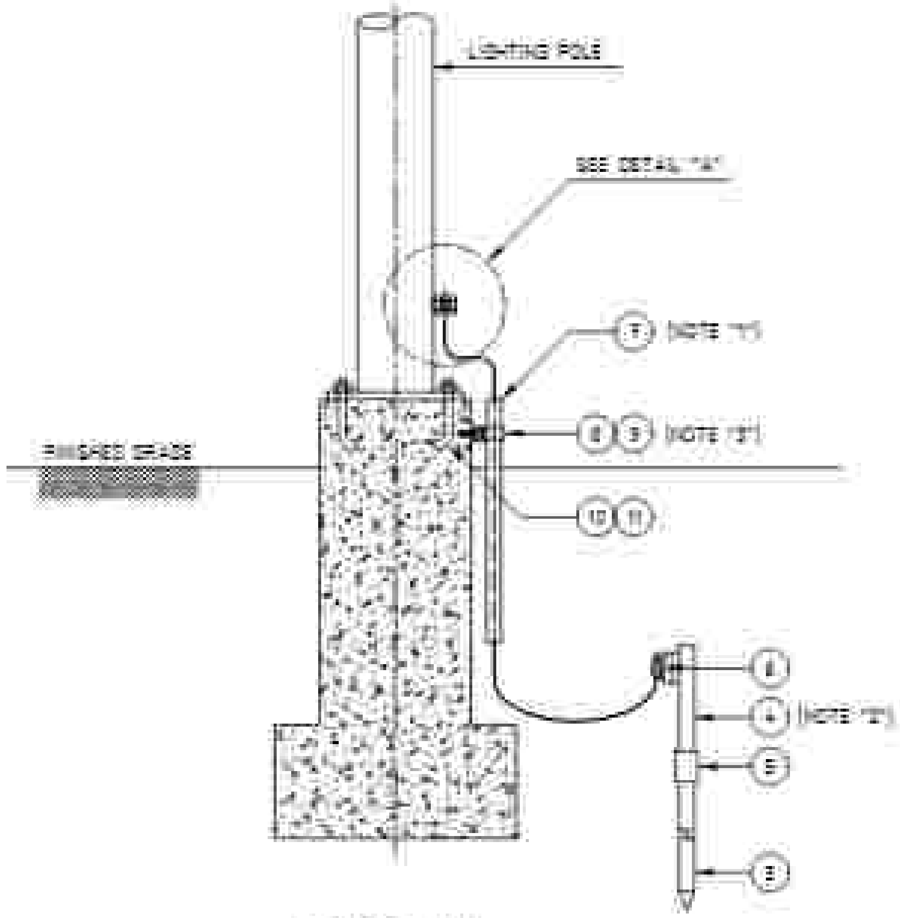
1. TO BE HALF LAP WRAPPED WITH ADHESIVE PVC TAPE (MIN. THREE LAYERS)
2. THERMO WELDING TOOL AND MATERIALS SHALL BE SUITABLE FOR JOINTED CONDUCTOR SIZES.
3. ALL DIMENSIONS ARE IN MILLIMETERS.

No	DESCRIPTION	QTY.
1	THERMOWELD (CADWELD) TYPE UNDERGROUND BRANCH CONNECTION	
2	PARALLEL CONNECTOR	
3	PVC TAPE	
4	ADHESIVE PVC INSULATION TAPE	
5	"C" TYPE CONNECTOR	
6		
7		
8		
9		
10		

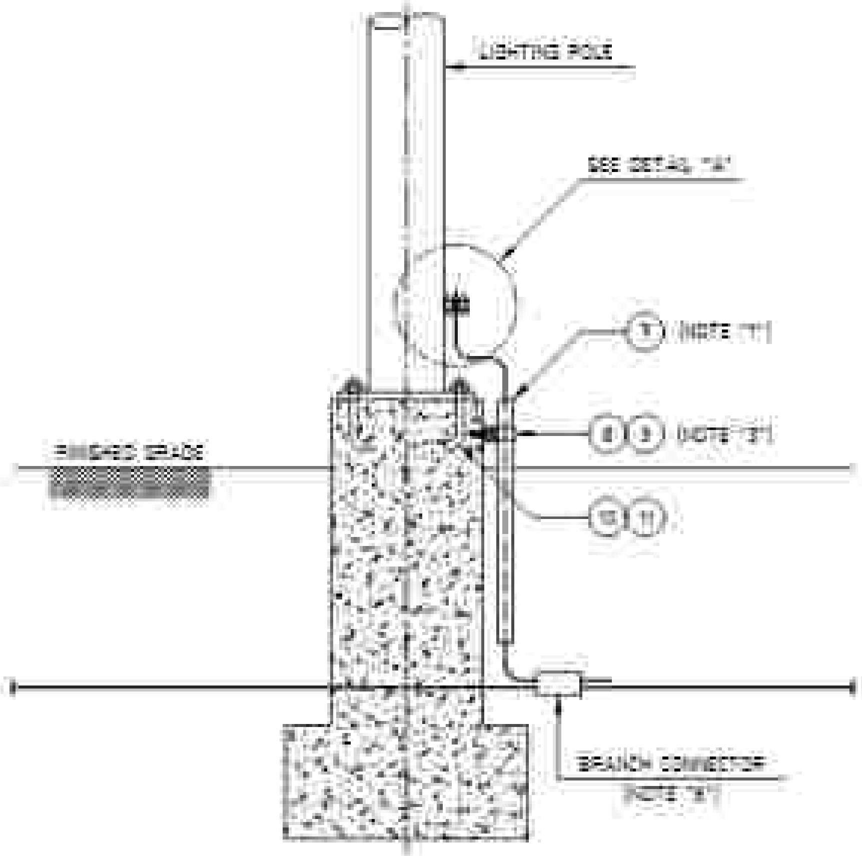
TARA TARH

DRAWN BY: P.S.	DATE:	TITLE: GROUNDING INSTALLATION DETAILS BRANCH WIRE CONNECTION	
CHECKED BY:	DATE:		
DETAIL No.: G-121	SHEET NO.: 1 OF 1	SCALE: NOT TO SCALE	

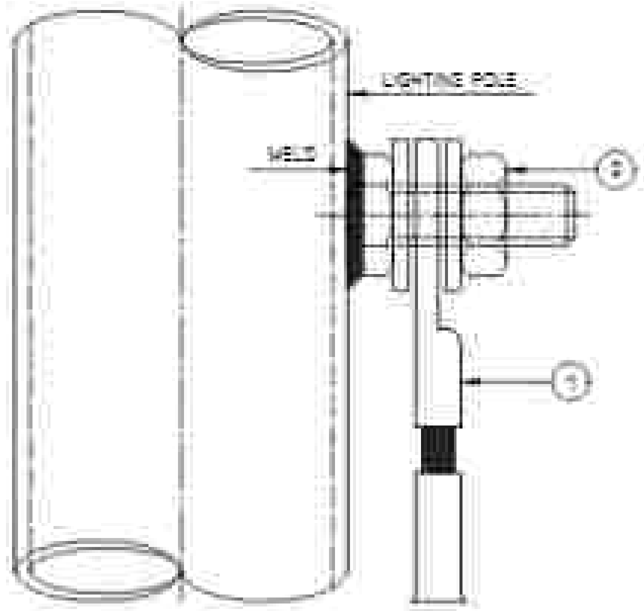
FILE NAME :



TYPE "A"



TYPE "B"



DETAIL "A"

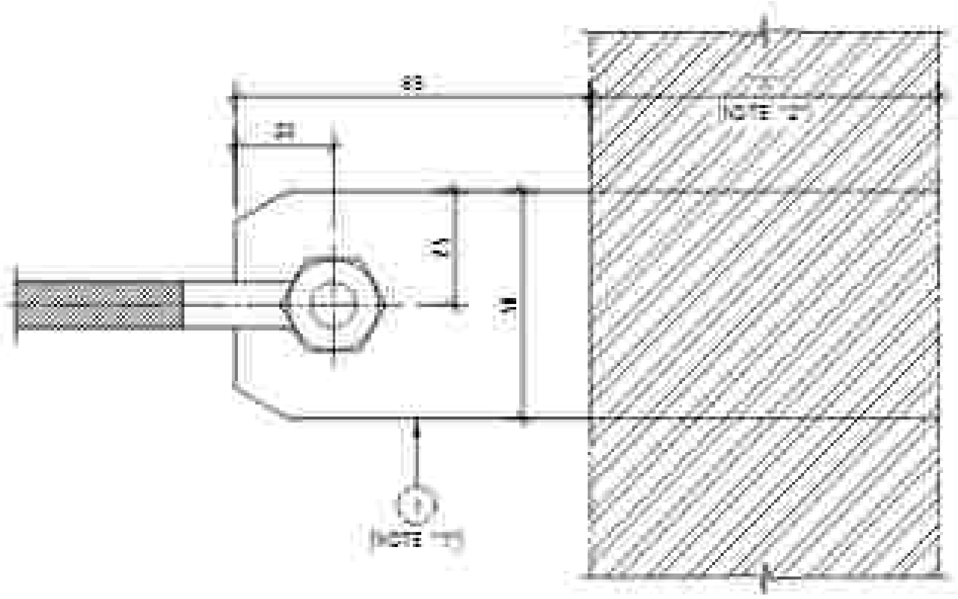
NOTES

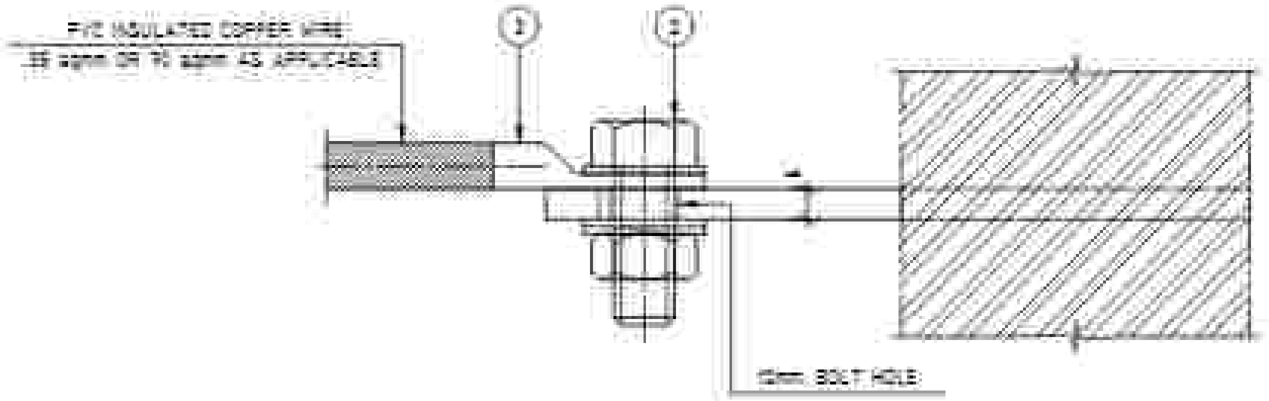
1- FOR STUB-UP OF RIGID PVC AT GRADE REFER TO DWG G-128
2- THE NUMBER OF ELECTRODES TO BE DETERMIND ON SITE DEPENDING ON THE EXPECTED READING OF GROUNDING RESIST.
3- FOR PIPE SUPPORT , REFER TO DWG. No. G-129 .
4- THE LOCATION OF CONNECTION POINTS ARE GENERALLY SHOWN ON THE LAYOUT DRAWING .
5- FOR No. OF GROUNDING POINTS AND WIRE SIZE , REFER TO THE SELECTION CHART IN DWG No. G-130 AND GROUNDING LAYOUT DRAWING .
6- FOR BRANCH CONNECTOR REFER TO DWG. No. G-131 .
7- ALL DIMENSION ARE IN MILLIMETERS .

No.	DESCRIPTION	QTY.
1	CRIMP TYPE TERMINAL LUG , 16 sqmm.	1-EA.
2	BOLT & NUT WITH 1-SPRING , 2-FLAT WASHERS SIZE : M10x35L , FOR EARTH LUG	1- SET
3	ELECTRODE , DRIVING SIDE , 19 mm 1500L	1-EA.
4	ELECTRODE , COUPLING SIDE , 19 mm 1500L	1-EA.
5	COUPLING FOR ELECTRODE	1-EA.
6	EARTH CLAMP FOR SINGLE CONDUCTOR	1-EA.
7	RIGID PVC PIPE 20mm Dia. 300L	1-EA.
8	UNISTRUT CHANNEL (1-4x30x41x2.5)x100L)	1-EA.
9	UNISTRUT CLAMP WITH BOLT/NUT , 20 mm DIA	1- SET
10	MASONRY ANCHOR WITHOUT STUD , M8	1-EA.
11	BOLT WITH 1-SPRING , 1-FLAT WASHER SIZE : M8x60L , FOR MASONRY ANCHOR	1- SET

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: GROUNDING INSTALLATION DETAILS LIGHTING POLE
	CHECKED BY:	DATE:	
DETAIL No.: G-128	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :





NOTES

1. EARTH LUG SHALL BE HOT DIP GALVANIZED STEEL .
2. "X" IS THICKNESS OF THE FIREPROOFING OR INSULATION .
3. ALL DIMENSIONS ARE IN MILLIMETERS .

No.	DESCRIPTION	QTY.
1	EARTH LUG	1-EA.
2	BOLT & NUT WITH 1-SPRING , 2-FLAT WASHERS SIZE : M10X50 , FOR EARTH LUG	1-SET
3	CRIMP TYPE TERMINAL	1-EA.
4		
5		
6		
7		
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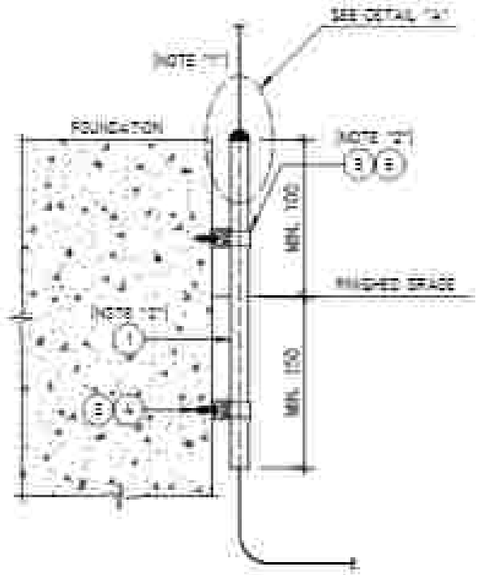
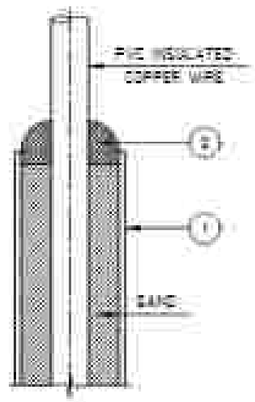
10		

TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE:
	M.A.		GROUNDING INSTALLATION DETAILS EARTHING LUG
	CHECKED BY:	DATE:	
DETAIL No.: G-23	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :

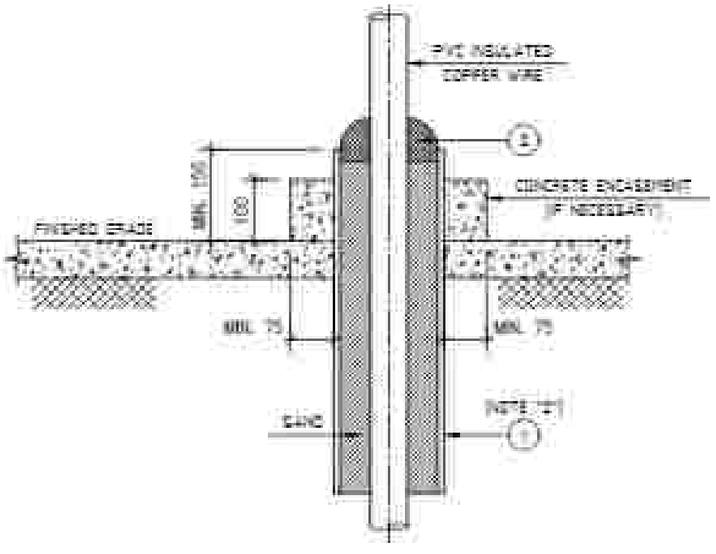
TYPE "A"



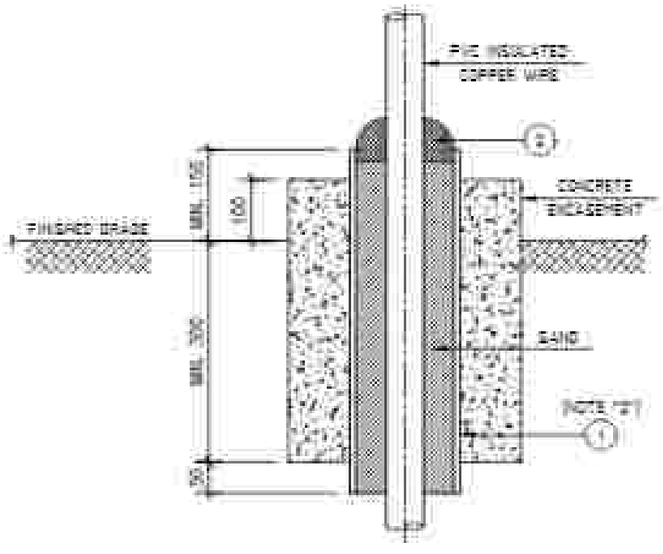


DETAIL "A"

TYPE "B"



PAVED AREA



UNPAVED AREA

FREE STANDING STUB-UP CONDUIT

NOTES

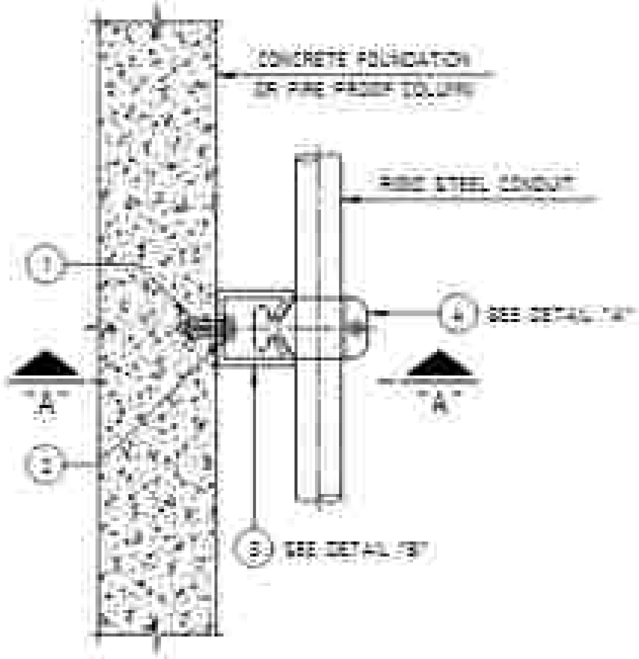
1. END OF RIGID STEEL CONDUIT TO BE REAMED FREE OF ALL BURRS.
2. FOR CONDUIT SUPPORT, REFER TO DWG. NO. S-139.
3. ALL DIMENSIONS ARE IN MILLIMETERS.

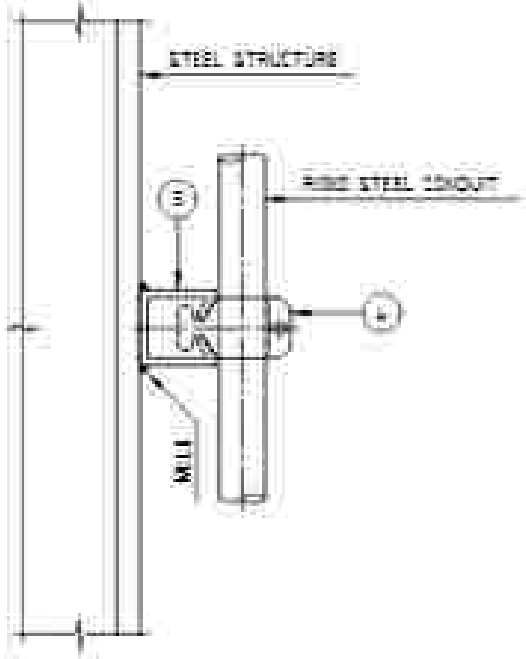
No	DESCRIPTION	QTY.
1	RIGID STEEL CONDUIT	
2	NON HARDENING SEALING COMPOUND	
3	MASONRY ANCHOR	
4	BOLT & NUT WITH 2-SPRING, 2-FLAT WASHERS HEXAGONAL FOR MASONRY ANCHOR	
5	UNISTRUT CHANNEL (41mmX41mmX2mmGI)	
6	UNISTRUT CLAMP WITH BOLT/NUT	
7		
8		
9		
10		

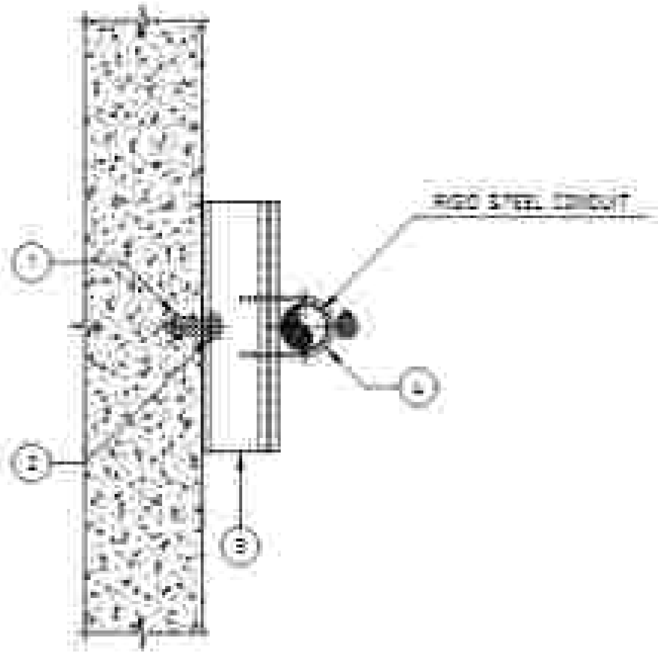
TARA TARH Engineering & Technological Co.

DRAWN BY: P.S.	DATE:	TITLE: GROUNDING INSTALLATION DETAILS STUB-UP CONDUIT PIPE
CHECKED BY:	DATE:	
DETAIL No.: C-128	SHEET NO.: 1 OF 1	SCALE: NOT TO SCALE

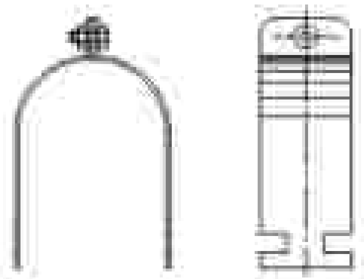
FILE NAME :



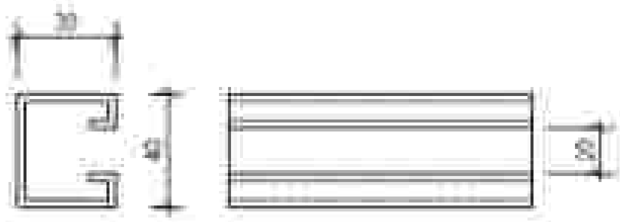




SECTION "A-A"



DETAIL "A"



DETAIL "B"

NOTES

1- ALL DIMENSIONS ARE IN MILLIMETERS.
2- MASONRY ANCHOR SHALL BE SUITABLE FOR REINFORCED CONCRETE AND MASONARY BUILDING.

No.	DESCRIPTION	QTY.
1	MASONRY ANCHOR	
2	[illegible] BOLT & NUT WITH 1 SPRING & 2 FLAT WASHERS FOR MASONRY ANCHOR	
3	UNISTRUT CHANNEL ((40X30X10X2.5MMx100L))	
4	UNISTRUT CLAMP WITH BOLT/NUT	
5		
6		
7		
8		
9		
10		

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: GROUNDING INSTALLATION DETAILS CONDUIT SUPPORT
	CHECKED BY:	DATE:	
DETAIL NO.: G-129	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :

GROUNDING CONDUCTOR SIZE FOR PROCESS EQUIPMENT

EQUIPMENT		No. OF GROUNDING POINTS	GROUNDING CONDUCTOR SIZE (sq.mm.)
TANK OR STORAGE	UP TO 10M IN DIA.	2	35
	MORE THAN 10M IN DIA.	(NOTE "2")	35
TOWER	LESS THAN 20M IN HEIGHT	1	35
	20M AND HIGHER	2	35
DRUM	———	1	35
HEAT EXCHANGER	———	1	16
STEEL STRUCTURE	———	2	70 OR 35
PIPE RACK	———	EVERY 30M	70
PIPE	———	(NOTE "1")	16
LADDER & STAIRWAYS	———	(NOTE "1")	35

GROUNDING CONDUCTOR SIZE FOR ELECTRICAL EQUIPMENT

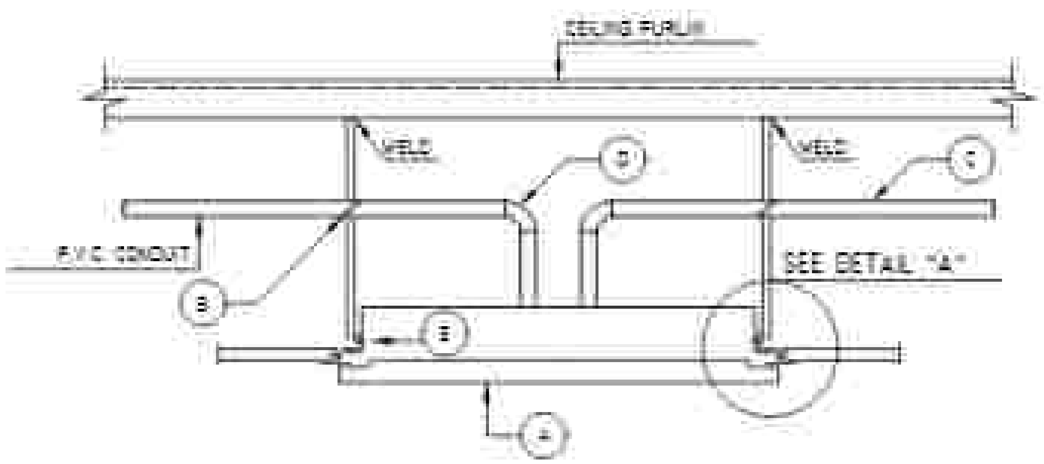
EQUIPMENT		No. OF GROUNDING POINTS	GROUNDING CONDUCTOR SIZE (sq.mm.)
TRANSFORMER	BODY	1	70
MEDIUM VOLTAGE & HIGH VOLTAGE SWITCHGEAR	SWITCHGEAR	2	120
	LIGHTNING ARRESTER	1	70
L/V SWGR., MCC OR PANELS	———	(NOTE "1")	70
LOCAL CONTROL STATION	———	1	16
LOCAL LIGHTING PANEL BOARD	———	1	35
WELDING OUTLET	———	1	35
MOTOR	UP TO 22KW	1	16
	23KW TO 55KW	1	35
	MORE THAN 55KW	1	70
MAIN LOOP	———	(NOTE "1")	70
SUBSTATION LOOP	———	(NOTE "1")	120

NOTES

1. THE No. OF GROUNDING POINTS SHALL BE IN ACCORDANCE WITH THE GROUNDING LAYOUT DRAWING.
2. THE INTERVAL BETWEEN GROUNDING POINTS ALONG TANK CIRCUMFERENCE SHALL NOT EXCEED 30 METERS.
3. GROUNDING CONDUCTOR SHALL BE PVC INSULATED STRANDED COPPER WIRE.

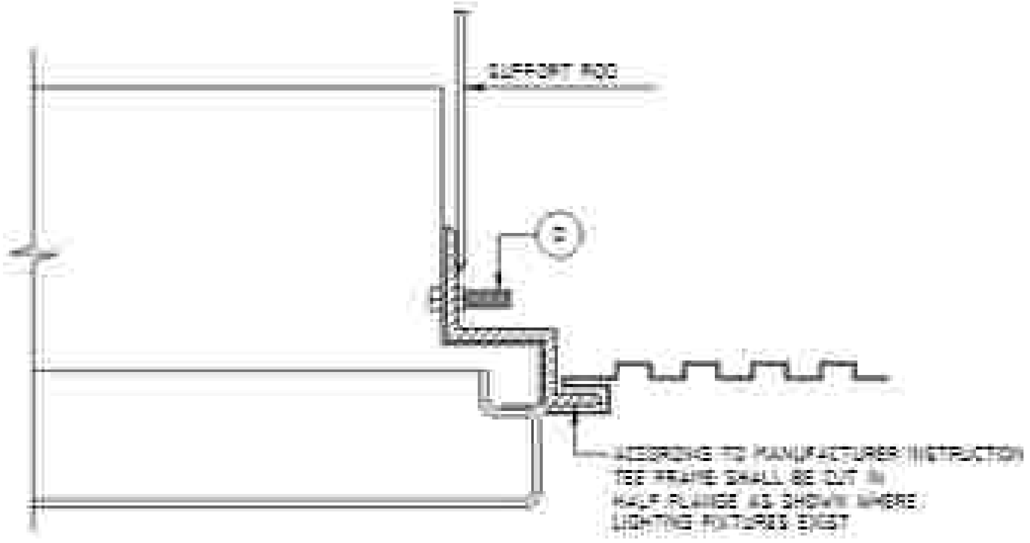
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: GROUNDING INSTALLATION DETAILS SELECTION CHART
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: G-130	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



DETAIL L-100

FLUSH MOUNTED FLUORESCENT FIXTURE
UNDER DAMPA FALSE CEILING

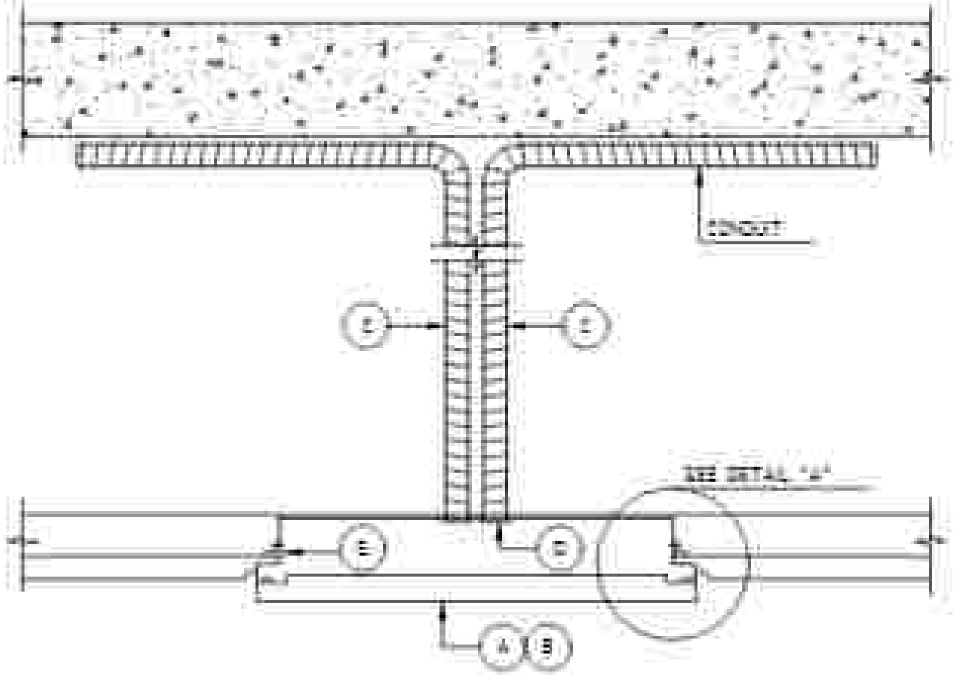


DETAIL "A"

ITEM	DESCRIPTION	QTY.	REMARKS
A	FLUORESCENT FIXTURE	1	
B	CONDUIT NYLON OR STEEL TIES	2	
C	20mm DIA. P.V.C. CONDUIT	AS REQ.	
D	20 mm DIA. P.V.C. ELBOW	2	
E	BLACK BOLT AND NUT 1/4"x1"	4	

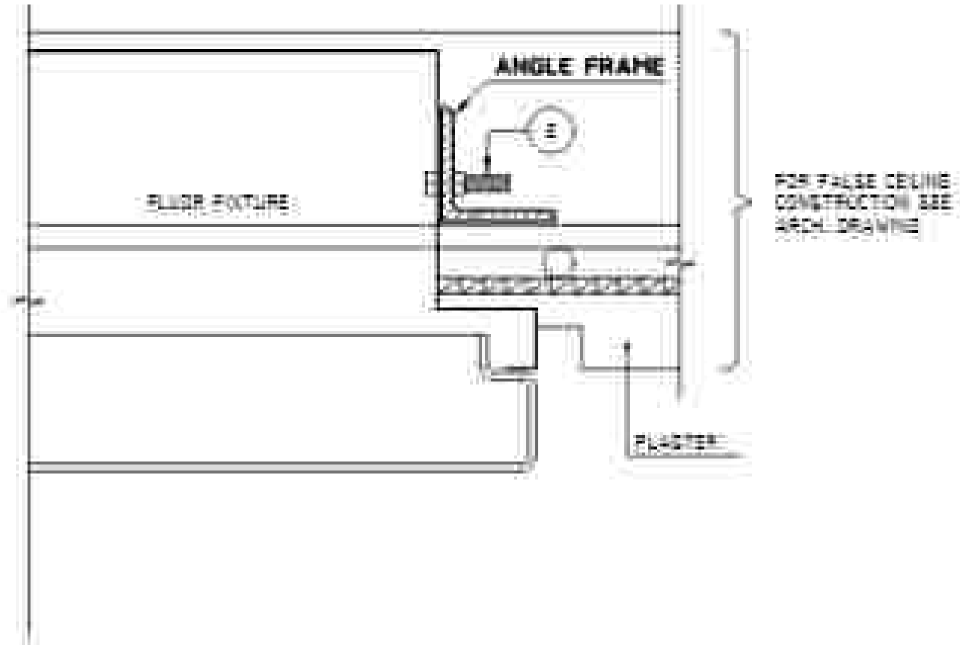
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION FLUSH MOUNTED FLUORESCENT FIX. UNDER DAMPA FALSE CEILING
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: L-100	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



DETAIL L-101A

FLUSH MOUNTED FLUORESCENT FIXTURE
UNDER PLASTER FALSE CEILING

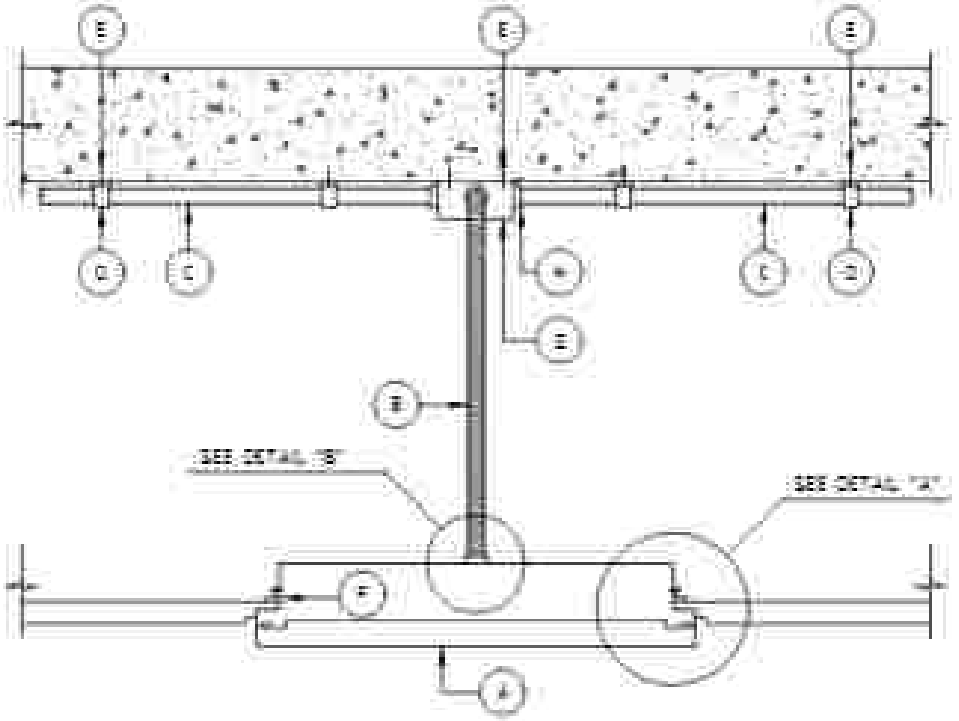


DETAIL "A"

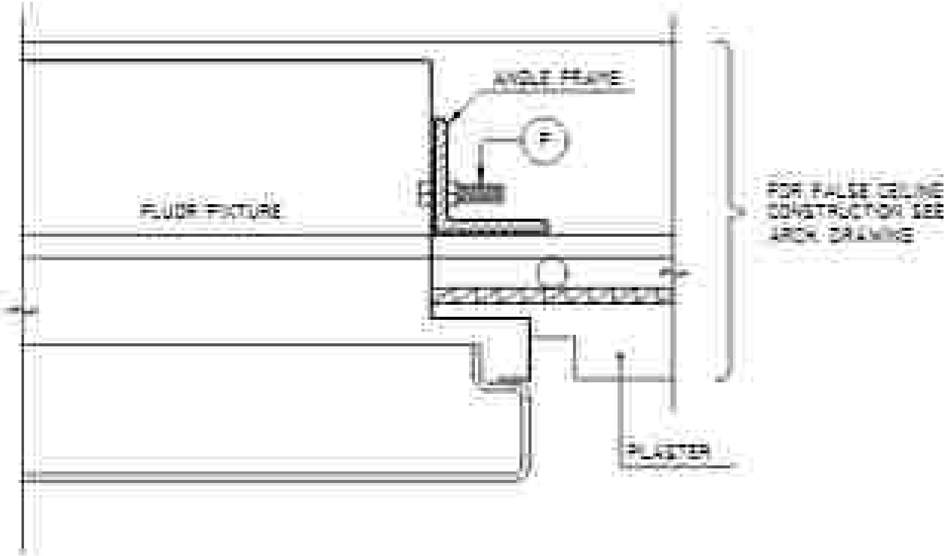
ITEM	DESCRIPTION	QTY	REMARKS
A	FLUORESCENT FIXTURE	1	
B	FLUORESCENT LAMP, 2×40W	1	
C	STEEL CONDUIT	AS REQ.	
D	20mm DIA. BRASS BUSHING	2	
E	BLACK BOLT AND NUT 1/4"×1"	8	

TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION FLUSH MOUNTED FLUORESCENT FIX. UNDER PLASTER FALSE CEILING
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: L-101A	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

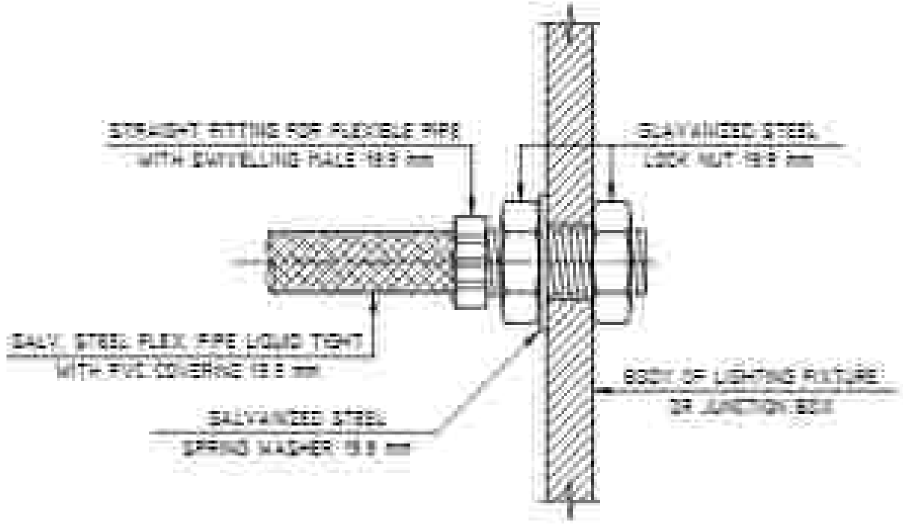
FILE NAME :



ITEM	DESCRIPTION	UNIT	QTY.	REMARKS
A	FLUORESCENT FIXTURE	N	1	
B	GALV. STEEL FLEX. CONDUIT LIQUID TIGHT WITH PVC COVERING PG-13.5	M	AS REQ.	
C	GALV. STEEL RIGID CONDUIT PG-13.5	M	AS REQ.	
D	CONDUIT CLAMP FOR PG-13.5	N	1 x METER	
E	BOLT PROJECTION RAWLBOLT , M6 AS 161A	N	AS REQ.	
F	M6X25 BLACK BOLT & NUT WITH SPRING WASHER	N	AS REQ.	
G	ROUND TYPE , THREE WAYS JUNCTION BOX	N	1	
H	GALV. STEEL CONDUIT FLANGED COUPLING SET FOR PG-13.5	N	4	



DETAIL "A"



DETAIL "B"

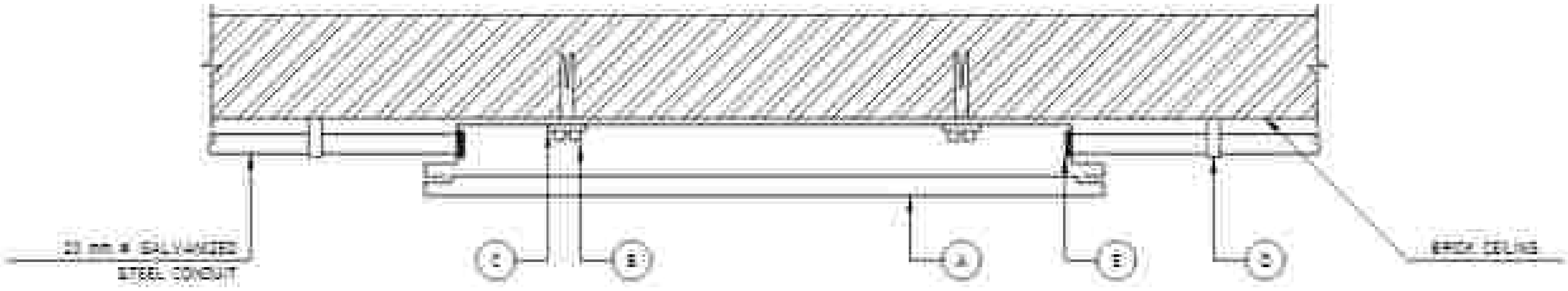
TYPICAL DETAIL FOR FIXING OF FLEX. CONDUIT
TO LIGHTING FIX. OR JUNCTION BOX

DETAIL L-101B

FLUSH MOUNTED FLUORESCENT FIXTURE
UNDER PLASTER FALSE CEILING

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. / CHECKED BY	DATE / DATE	TITLE: LIGHTING FIXTURE INSTALLATION FLUSH MOUNTED FLUORESCENT FIX. UNDER PLASTER FALSE CEILING
DETAIL No.: L-101B	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



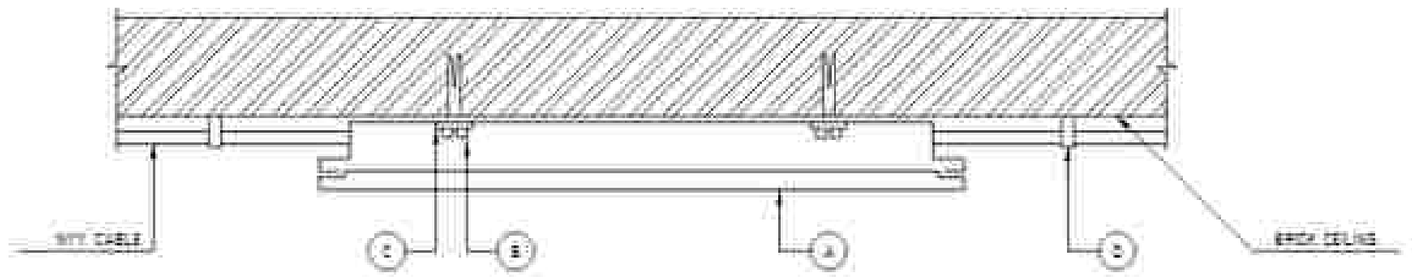
DETAIL L-102A

SURFACE MOUNTED FLUORESCENT FIXTURE
UNDER BRICK CEILING

ITEM	DESCRIPTION	QTY	REMARKS
A	FLUORESCENT LUMINAIRE	1	
B	WOODSCREW WITH RAWLPLUG M6x60	2	
C	ROUND WASHER M6	2	
D	CONDUIT CLIP WITH FIXING SCREW	2	
E	20 mm DIA. BRASS BUSHING	2	

TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE: LIGHTING FIXTURE INSTALLATION SURFACE MOUNTED FLUORESCENT FIXTURE UNDER BRICK CEILING
	M.A.		
	CHECKED BY	DATE	
DETAIL No.: L-102A	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



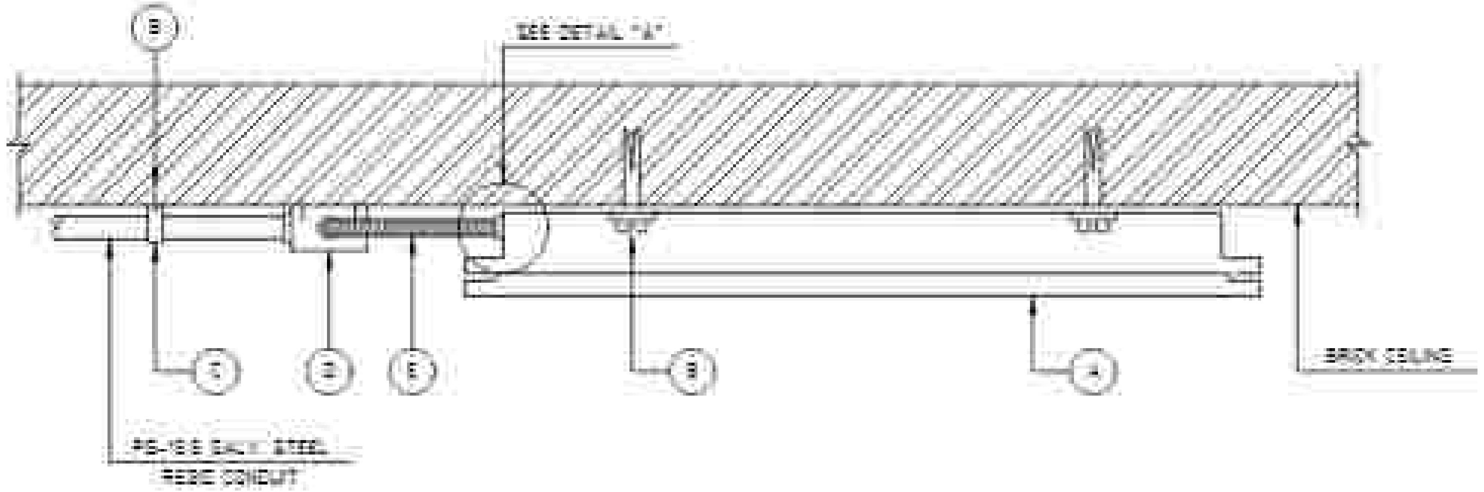
DETAIL L-102B

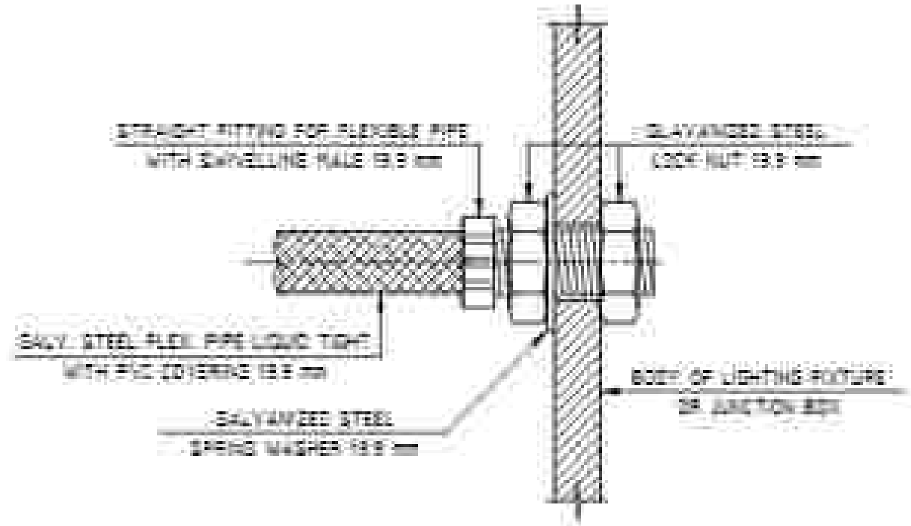
SURFACE MOUNTED FLUORESCENT FIXTURE
UNDER BRICK CEILING

ITEM	DESCRIPTION	QTY	REMARKS
A	FLUORESCENT LUMINAIRE	1	
B	WOODSCREW WITH RAWLPLUG M6X8	2	
C	ROUND WASHER, M6	2	
D	CABLE CLAMP	2	

TARA TARH	DRAWN BY: P.A.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION SURFACE MOUNTED FLUORESCENT FIXTURE UNDER BRICK CEILING
	CHECKED BY:	DATE:	
DETAIL No.: L-102B	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :





DETAIL "A"

TYPICAL DETAIL FOR FIXING OF FLEX. CONDUIT TO LIGHTING FIX. OR JUNCTION BOX

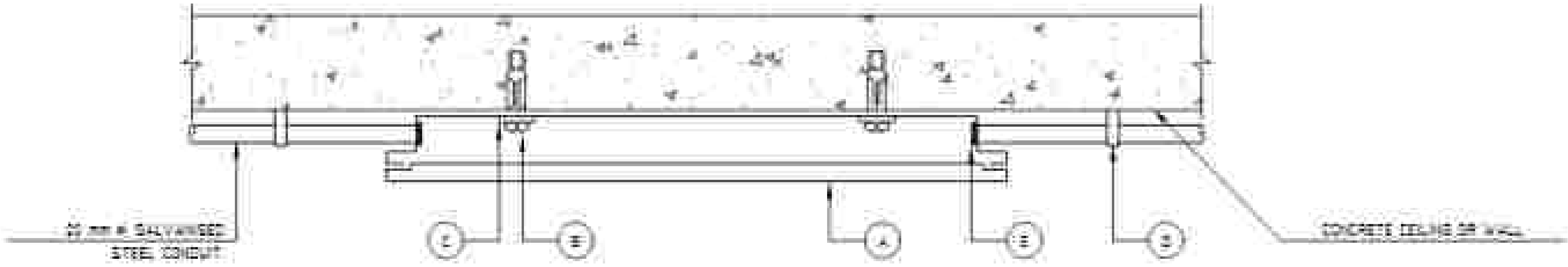
ITEM	DESCRIPTION	UNIT	QTY	REMARKS
A	FLUORESCENT LUMINAIRE	N	1	
B	M6x30 WOODSCREW WITH ROUND WASHER & RAWLPLUG	N	2	
C	CONDUIT CLIP FOR PG-13.5	N	2	
D	ROUND TYPE , THREE WAYS JUNCTION BOX	N	2	
E	GALV. STEEL FLEX. CONDUIT LIQUID TIGHT WITH PVC COVERING PG-13.5	M	AS REQ.	

DETAIL L-102C

SURFACE MOUNTED FLUORESCENT FIXTURE UNDER BRICK CEILING

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION SURFACE MOUNTED FLUORESCENT FIXTURE UNDER BRICK CEILING
	CHECKED BY:	DATE:	
DETAIL No.: L-102C	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



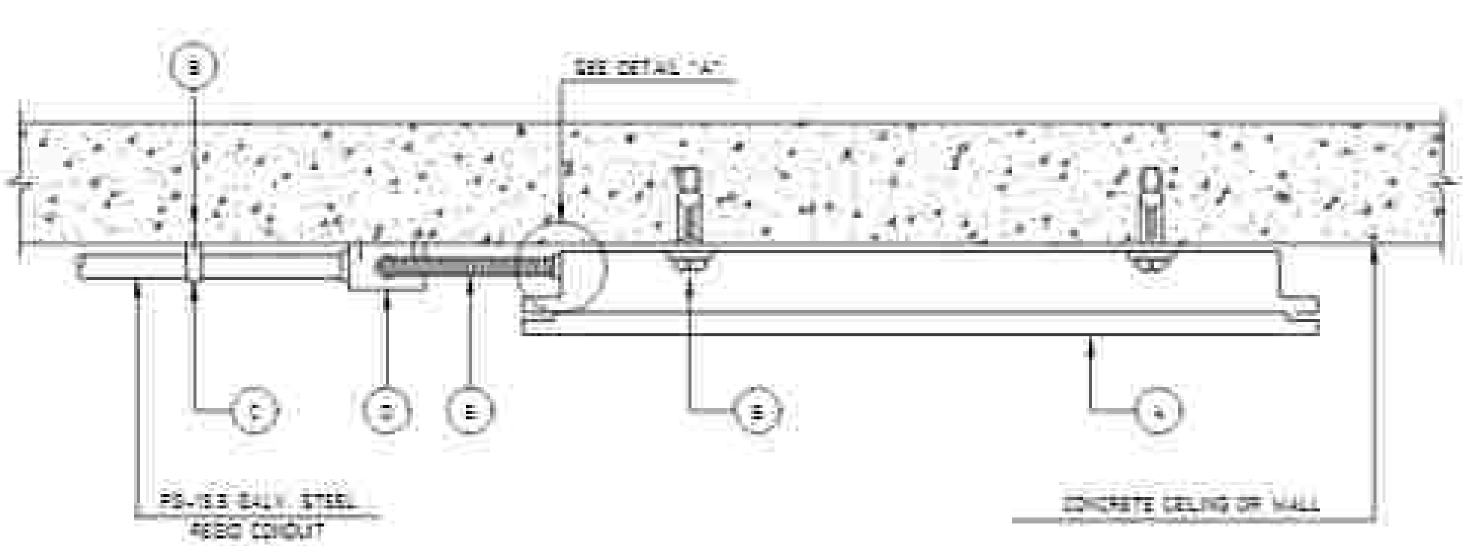
DETAIL L-103A

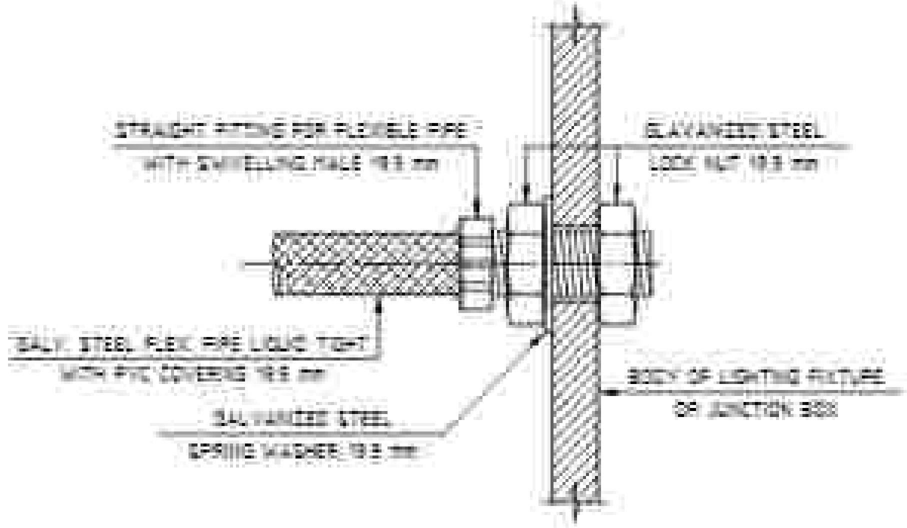
SURFACE MOUNTED FLUORESCENT FIXTURE
UNDER CONCRETE CEILING

ITEM	DESCRIPTION	QTY	REMARKS
A	FLUORESCENT LUMINAIRE	1	
B	BOLT PROJECTION RAWLBOLT, M6, AS 1914	2	
C	ROUND WASHER, M6	2	
D	CONDUIT CLIP WITH FIXING SCREW	2	
E	20 mm DIA. BRASS BUSHING	2	

TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE: LIGHTING FIXTURE INSTALLATION SURFACE MOUNTED FLUORESCENT FIXTURE UNDER CONCRETE CEILING
	CHECKED BY	DATE	
DETAIL No.: L-103A	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :





DETAIL "A"

TYPICAL DETAIL FOR FIXING OF FLEX. CONDUIT TO LIGHTING FIX. OR JUNCTION BOX

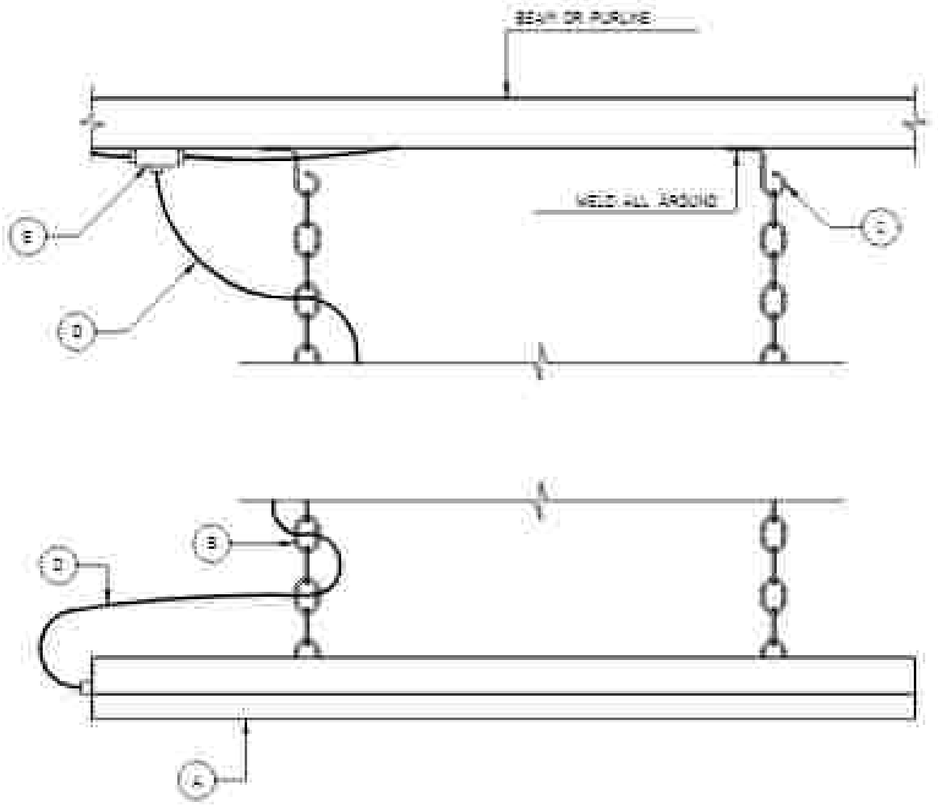
ITEM	DESCRIPTION	UNIT	QTY	REMARKS
A	FLUORESCENT LUMINAIRE	N	1	
B	BOLT PROJECTION RAWLBOLT, M6, AS 16A WITH ROUND WASHER	N	2	
C	CONDUIT CLIP FOR PS-13.5	N	2	
D	(ROUND TYPE), THREE WAYS JUNCTION BOX	N	2	
E	GALV. STEEL FLEX. CONDUIT LIQUID TIGHT WITH PVC COVERING PS-13.5	M	AS REQ.	

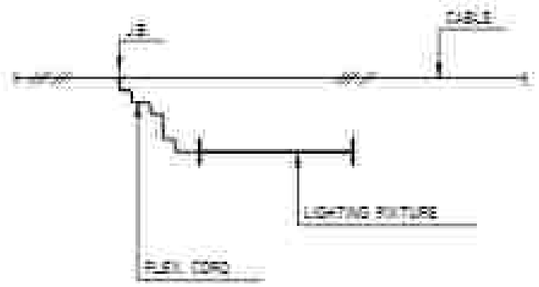
DETAIL L-103B

SURFACE MOUNTED FLUORESCENT FIXTURE UNDER CONCRETE CEILING

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION SURFACE MOUNTED FLUORESCENT FIXTURE UNDER CONCRETE CEILING
	CHECKED BY:	DATE:	
DETAIL No.: L-103B	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :





LIGHTING PLAN

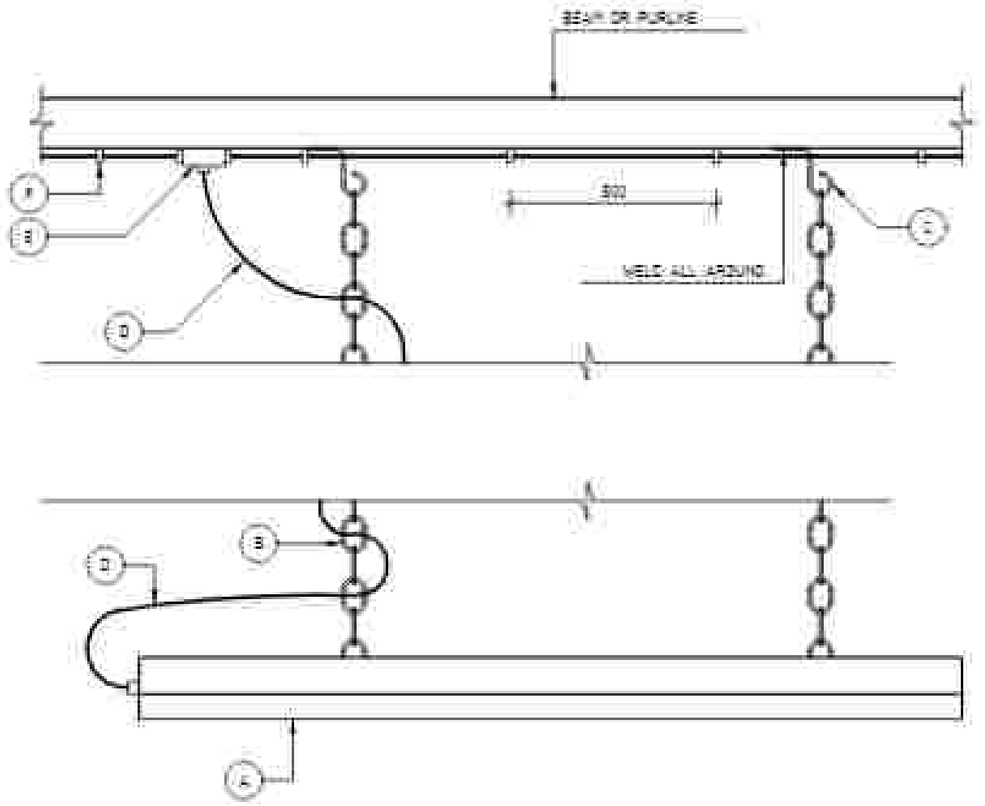
DETAIL L-104A

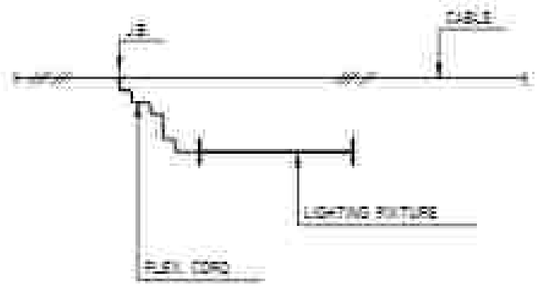
PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE

ITEM	DESCRIPTION	QTY	REMARKS
A	FLUORESCENT LIGHTING FIXTURE	1	
B	SUITABLE CORROSION-PROOF CHAIN FOR HANGING FIXTURE	-	LENGTH VARIES
C	HOOK MADE OF 5x12mm ROUND BAR	2	
D	FLEXIBLE CORD, 3 CORE	-	LENGTH VARIES
E	SMALL JUNCTION BOX, THROUGH WITH COVER TYPE COVER	1	

TARA TARH	DRAWN BY: R.A.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE
	CHECKED BY:	DATE:	
DETAIL No.: L-104A	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :





LIGHTING PLAN

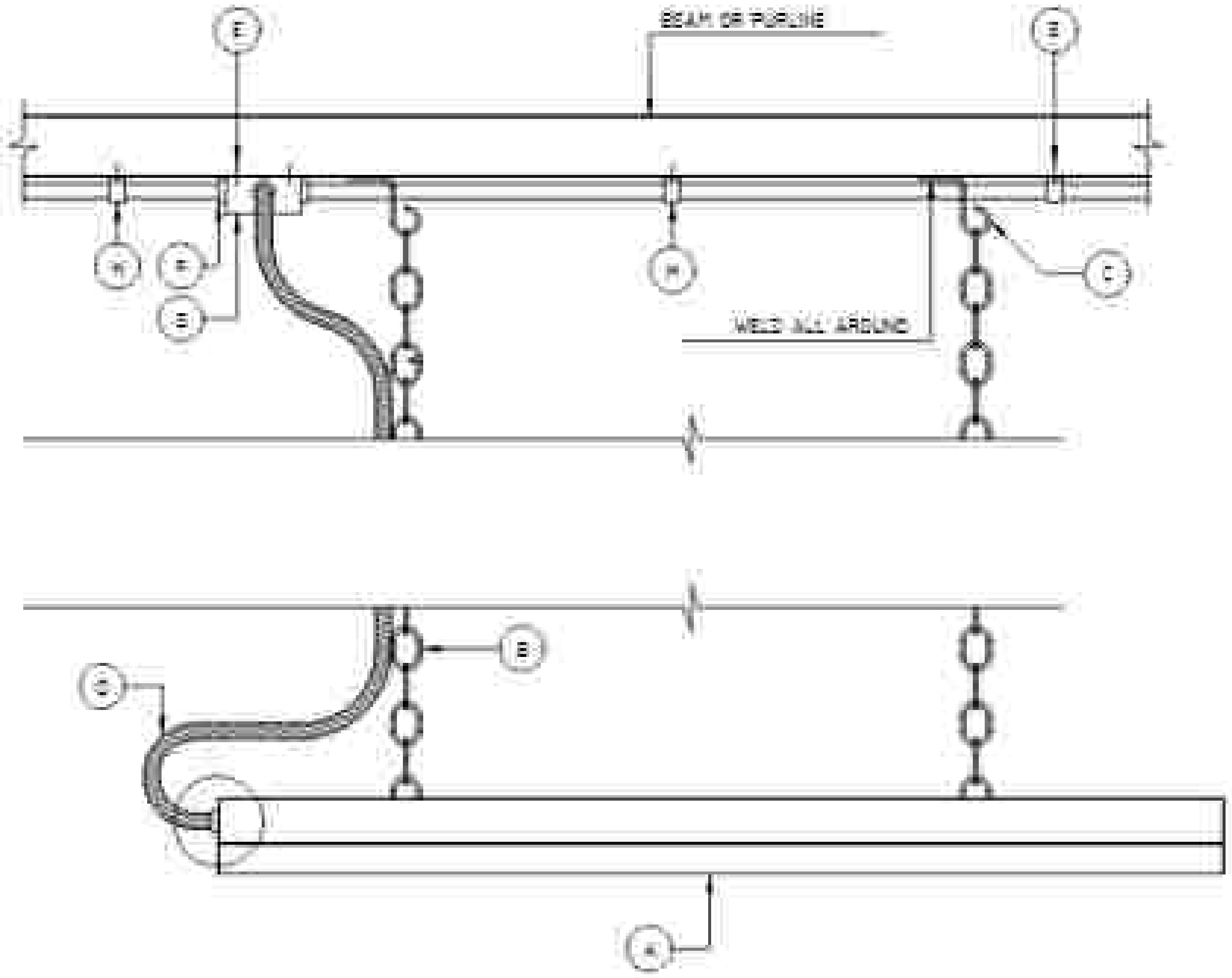
DETAIL L-104B

PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE

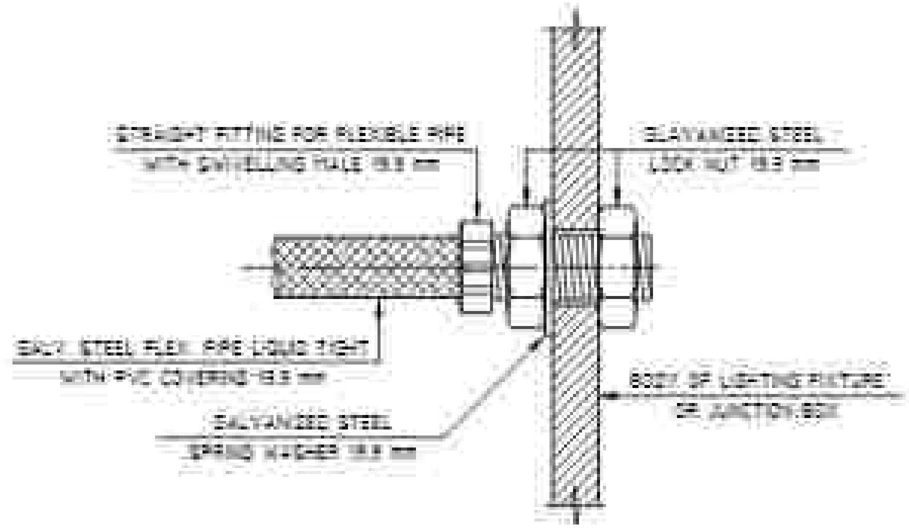
ITEM	DESCRIPTION	QTY	REMARKS
A	FLUORESCENT LIGHTING FIXTURE	1	
B	SUITABLE CORROSION-PROOF CHAIN FOR HANGING FIXTURE	-	LENGTH VARIES
C	HOOK MADE OF 5x12mm ROUND BAR	2	
D	FLEXIBLE CORD, 3 CORE	-	LENGTH VARIES
E	SMALL JUNCTION BOX, THROUGH WITH COVER TYPE COVER	1	
F	CABLE CLAMP	AS REQ.	

TARA TARH	DRAWN BY: R.A.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE
	CHECKED BY:	DATE:	
DETAIL No.: L-104B	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :

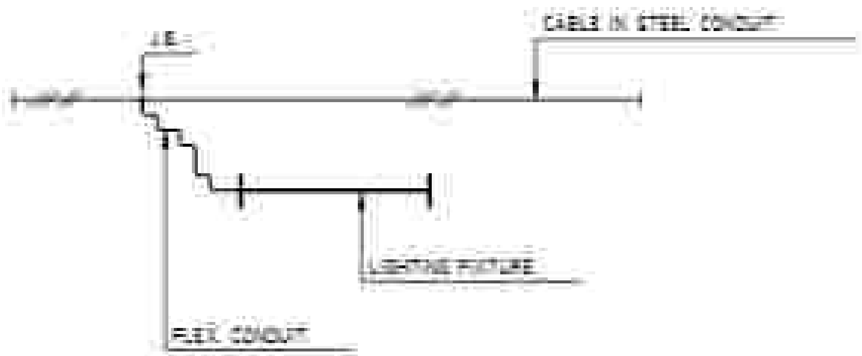


ITEM	DESCRIPTION	UNIT	QTY	REMARKS
A	FLUORESCENT LIGHTING FIXTURE	N	1	
B	SUITABLE CORROSION-PROOF CHAIN FOR HANGING FIXTURE	M	AS REQ.	
C	HOOK MADE OF Ø=12mm ROUND BAR	N	2	
D	GALV. STEEL FLEX. CONDUIT LIQUID TIGHT WITH PVC COVERING PG-13.5	M	AS REQ.	
E	M6X20 BLACK BOLT & NUT WITH SPRING WASHER	N	AS REQ.	
F	GALV. STEEL CONDUIT FLANGED COUPLING SET FOR PG-13.5	N	4	
G	ROUND TYPE - THREE WAYS JUNCTION BOX	N	1	
H	CONDUIT CLAMP FOR PG-13.5	N	1 ≈ METER	



DETAIL "B"

TYPICAL DETAIL FOR FIXING OF FLEX. CONDUIT
TO LIGHTING FIX. OR JUNCTION BOX



LIGHTING PLAN

L-104C

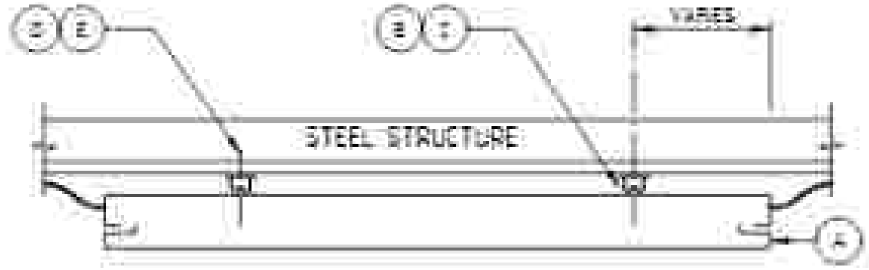
PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE

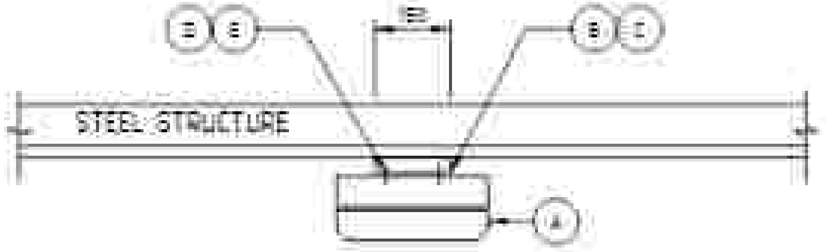
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: L-104C	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :

ALTERNATIVE "A"

VERTICAL OR HORIZONTAL

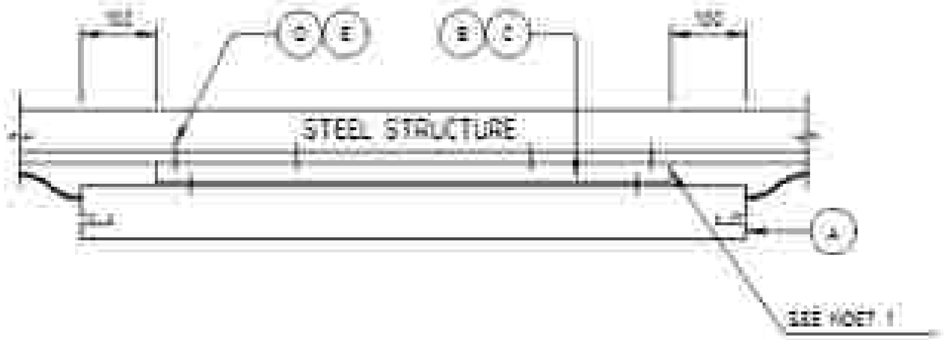


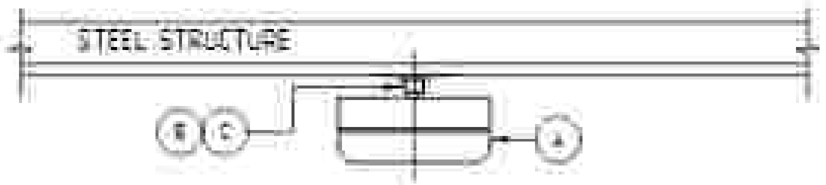


SIDE VIEW

ALTERNATIVE "B"

HORIZONTAL ONLY





SIDE VIEW

DETAIL L-105

STEEL STRUCTURE MOUNTED FLUORESCENT FIXTURE

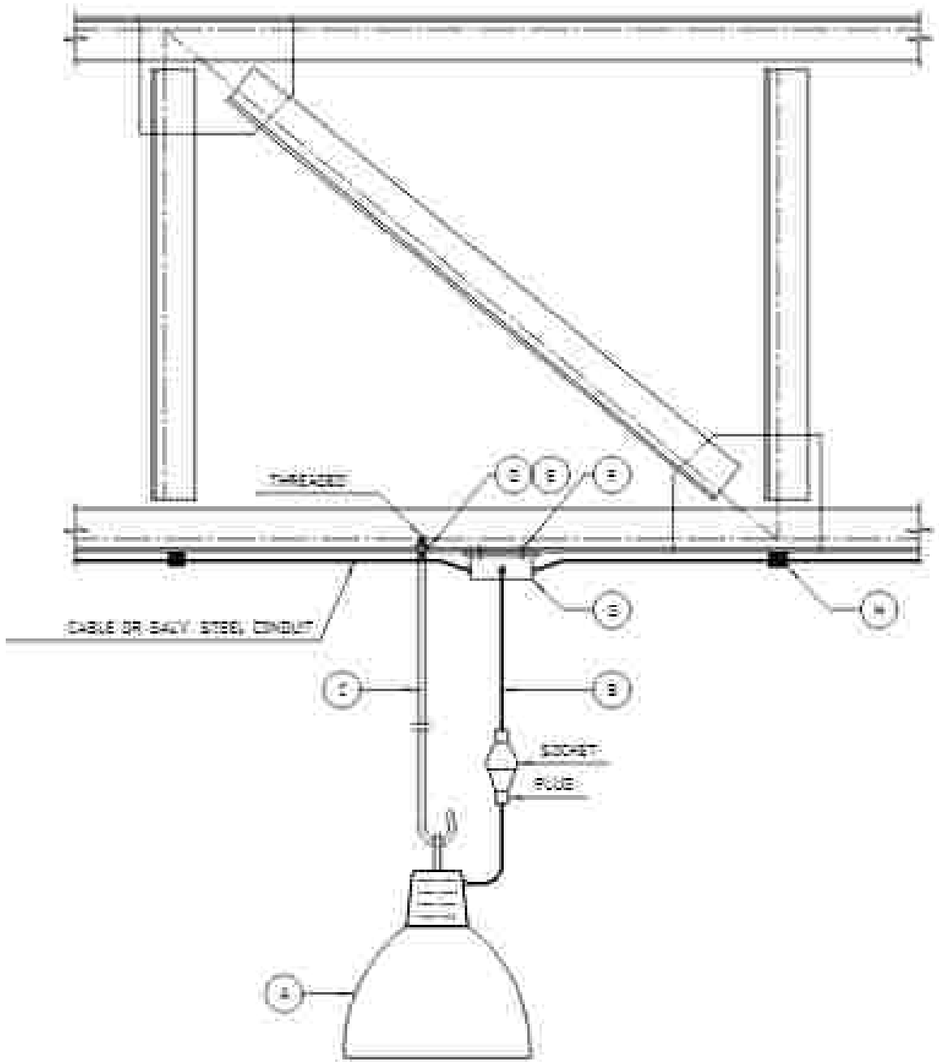
NOTES:

1- WHERE THERE IS NOT ANY STEEL STRUCTURE RIGHT BENEATH THE FIXTURE, THE STRUT CHANNEL MAY BE SPAN UP TO 2.5 METERS.

ITEM	DESCRIPTION	QTY	REMARKS
A	FLUORESCENT LIGHTING FIXTURE	1	
B	STRUT CHANNEL AS 122	AS REQ.	
C	STRUT BOLT, NUT WITH SPRING & SQUARE WASHER AS 1614	2	
D	SELF CUTTING SCREW, M6	4	
E	ROUND WASHER, M6	4	

TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE:
	M.A.		LIGHTING FIXTURE INSTALLATION STEEL STRUCTURE MOUNTED FLUORESCENT FIXTURE
	CHECKED BY	DATE	
DETAIL No.: L-105	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



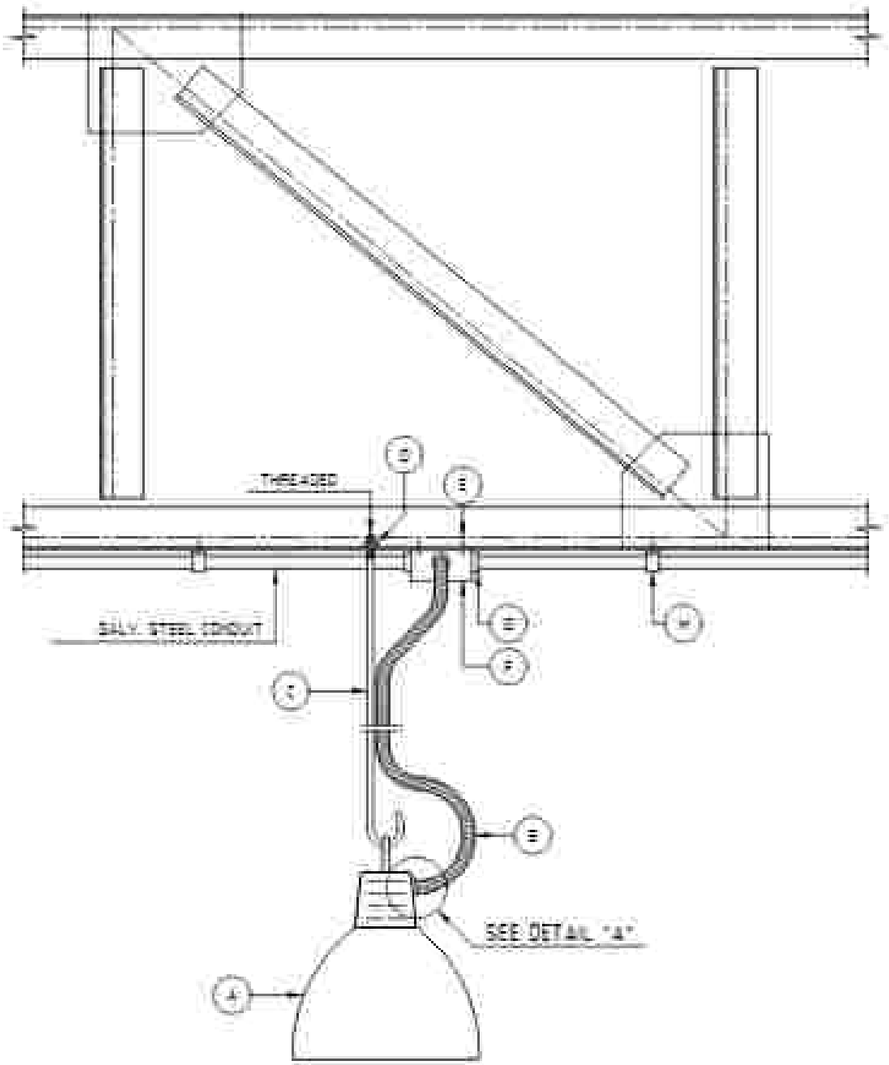
ITEM	DESCRIPTION	QTY	REMARKS
A	HIGH BAY INDUSTRIAL LUMINAIRE (FOR TYPE SEE PLAN ENTRY) COMPLETE WITH HIGH PRESSURE MERCURY LAMP CONTROL GEAR & P.F. CORRECTION CAPACITOR	1	
B	YYY CABLE	AS REQ.	**LENGTH VARIES**
C	HOOK MADE OF STEEL ROD Φ=12	1	**LENGTH VARIES**
D	NUT Φ=12	1	
E	PLAIN & SPRING WASHER Φ12	1	
F	BOLT, NUT, PLAIN & SPRING WASHER Φ8	2	
G	CAST ALUMINIUM JUNCTION BOX THREE WAY APPROX. DIMENSION 150×150×60 mm	1	
H	**ONE HOLE CABLE OR CONDUIT CLAMP** WITH SUITABLE SCREW	AS REQ.	

DETAIL L-106A

PENDANT TYPE HIGH BAY LIGHTING FIXTURE UNDER STEEL STRUCTURE

TARA TARH	DRAWN BY: P.K.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION PENDANT TYPE HIGH BAY LIGHTING FIXTURE UNDER STEEL STRUCTURE
	CHECKED BY:	DATE:	
DETAIL No.: L-106A	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

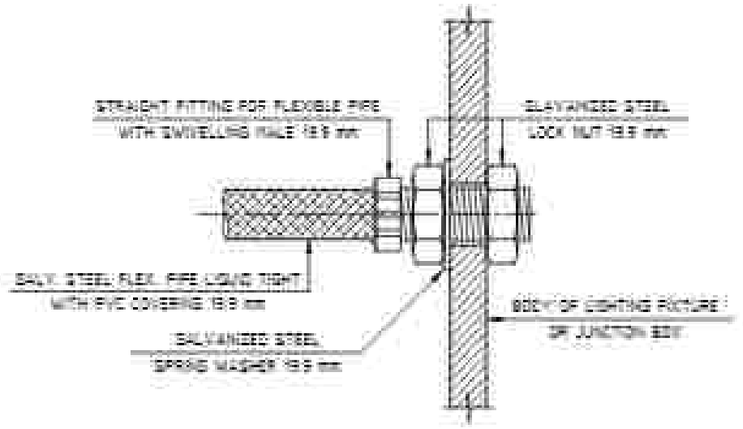
FILE NAME :



DETAIL L-106B

PENDANT TYPE HIGH BAY LIGHTING FIXTURE UNDER STEEL STRUCTURE

ITEM	DESCRIPTION	UNIT	QTY	REMARKS
A	HIGH BAY, INDUSTRIAL LUMINAIER (FOR TYPE SEE PLAN DWG) COMPLETE WITH HIGH PRESSURE MERCURY LAMP CONTROL GEAR & P.F. CORRECTION CAPACITOR	N	1	
B	GALV. STEEL FLEX. CONDUIT LIQUID TIGHT WITH PVC COVERING PG-13.5	M	AS REQ.	
C	HOOK MADE OF STEEL ROD 4MM	N	1	
D	NUT 4MM	N	1	
E	HEAD BLACK BOLT & NUT WITH SPRING WASHER	N	AS REQ.	
F	ROUND TYPE , THREE WAYS JUNCTION BOX	N	1	
G	GALV. STEEL CONDUIT FLANGED COUPLING SET FOR PG-13.5	N	4	
H	CONDUIT CLAMP FOR PG-13.5	M	1.4 METER	

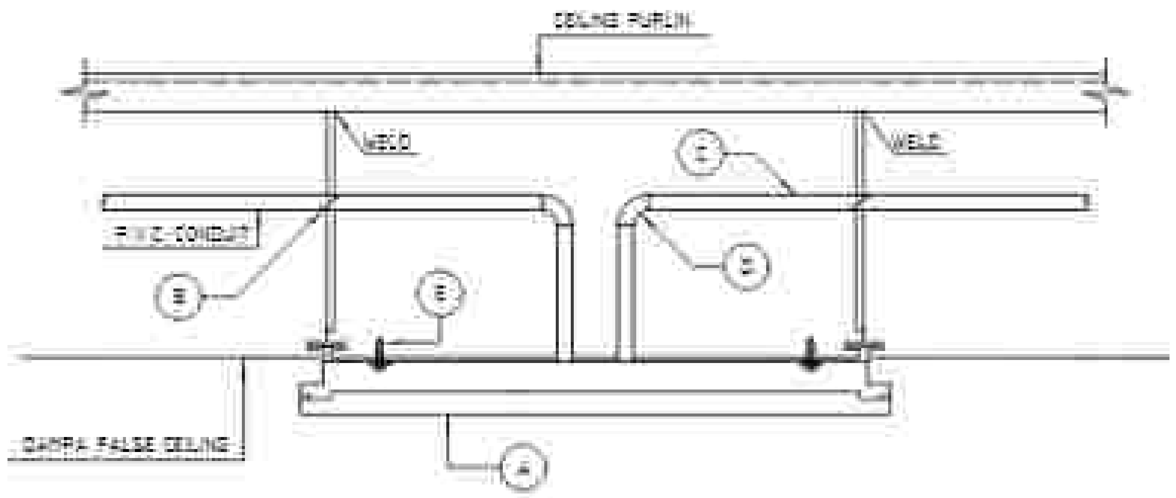


DETAIL "A"

TYPICAL DETAIL FOR FIXING OF FLEX. CONDUIT TO LIGHTING FIX. OR JUNCTION BOX

TARA TARH	DRAWN BY: R.A.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION PENDANT TYPE HIGH BAY LIGHTING FIXTURE UNDER STEEL STRUCTURE
	CHECKED BY:	DATE:	
DETAIL NO: L-106B	SHEET NO.	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



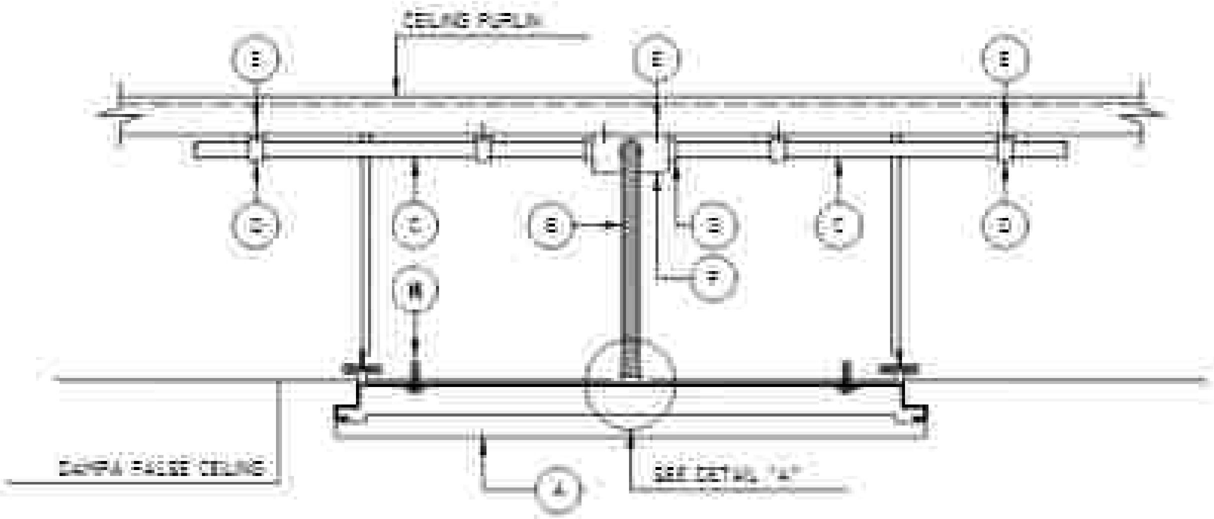
DETAIL L-107A

SURFACE MOUNTED FLUORESCENT FIXTURE
UNDER DAMPA FALSE CEILING

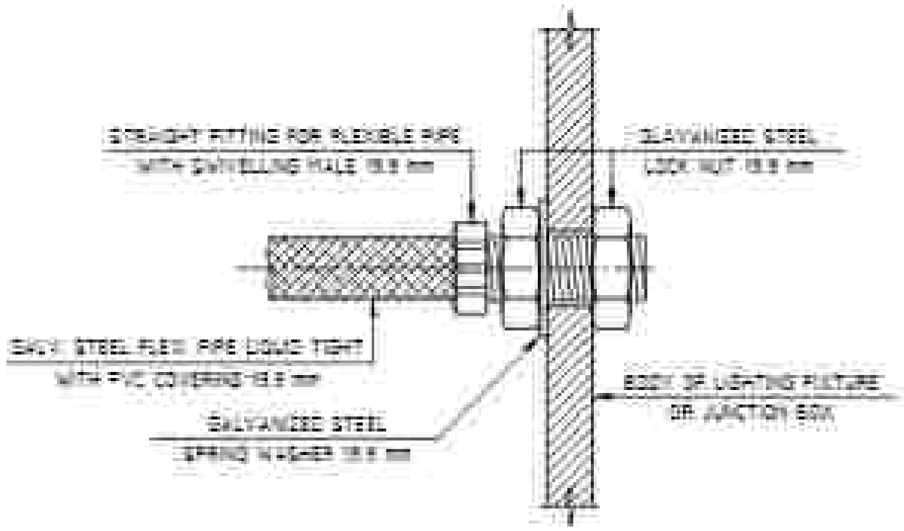
ITEM	DESCRIPTION	QTY.	REMARKS
A	FLUORESCENT FIXTURE	1	
B	CONDUIT NYLON OR STEEL TIES	2	
C	20 mm DIA. P.V.C. CONDUIT	AS REQ.	
D	20 mm DIA. P.V.C. ELBOW	2	
E	SELF TAPPING SCREW M8x30 mm WITH FLAT WASHER	4	

TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE: LIGHTING FIXTURE INSTALLATION SURFACE MOUNTED FLUORESCENT FIX. UNDER DAMPA FALSE CEILING
	M.A.		
	CHECKED BY	DATE	
DETAIL No.: L-107A	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



ITEM	DESCRIPTION	UNIT	QTY.	REMARKS
A	FLUORESCENT FIXTURE	N	1	
B	GALV. STEEL FLEX. CONDUIT LIQUID TIGHT WITH PVC COVERING PG-13.5	M	AS REQ.	
C	GALV. STEEL RIGID CONDUIT PG-13.5	M	AS REQ.	
D	CONDUIT CLAMP FOR PG-13.5	N	1 @ METER	
E	M6x20 BLACK BOLT & NUT WITH SPRING WASHER	N	AS REQ.	
F	ROUND TYPE , THREE WAYS JUNCTION BOX	N	1	
G	GALV. STEEL CONDUIT FLANGED COUPLING SET FOR PG-13.5	N	4	
H	SELF TAPPING SCREW M6x20 mm WITH FLAT WASHER	N	4	



DETAIL "A"

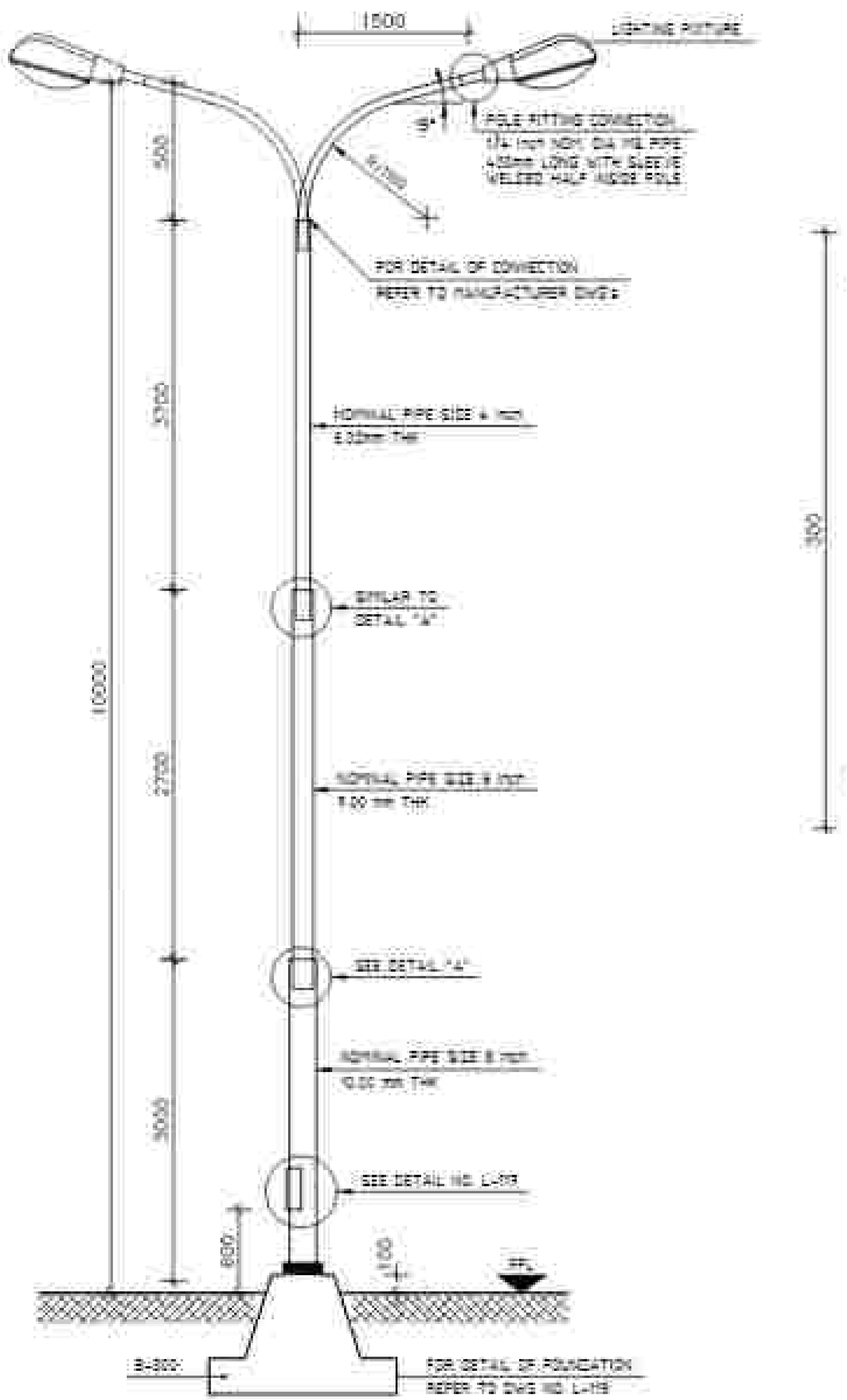
TYPICAL DETAIL FOR FIXING OF FLEX. CONDUIT
TO LIGHTING FIX. OR JUNCTION BOX

DETAIL L-107B

SURFACE MOUNTED FLUORESCENT FIXTURE
UNDER DAMPA FALSE CEILING

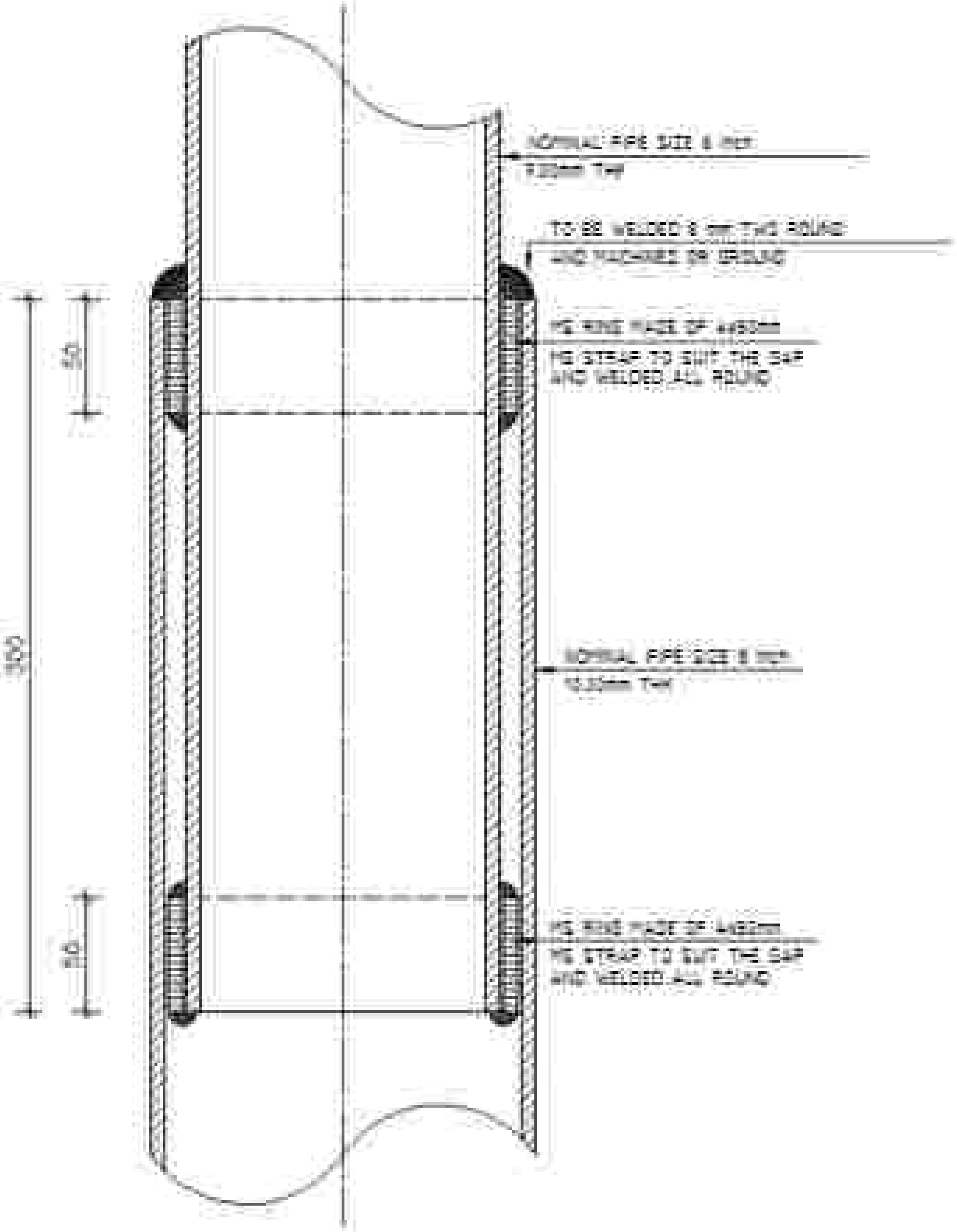
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION SURFACE MOUNTED FLUORESCENT FIX. UNDER DAMPA FALSE CEILING
	CHECKED BY:	DATE:	
DETAIL No.: L-107B	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :

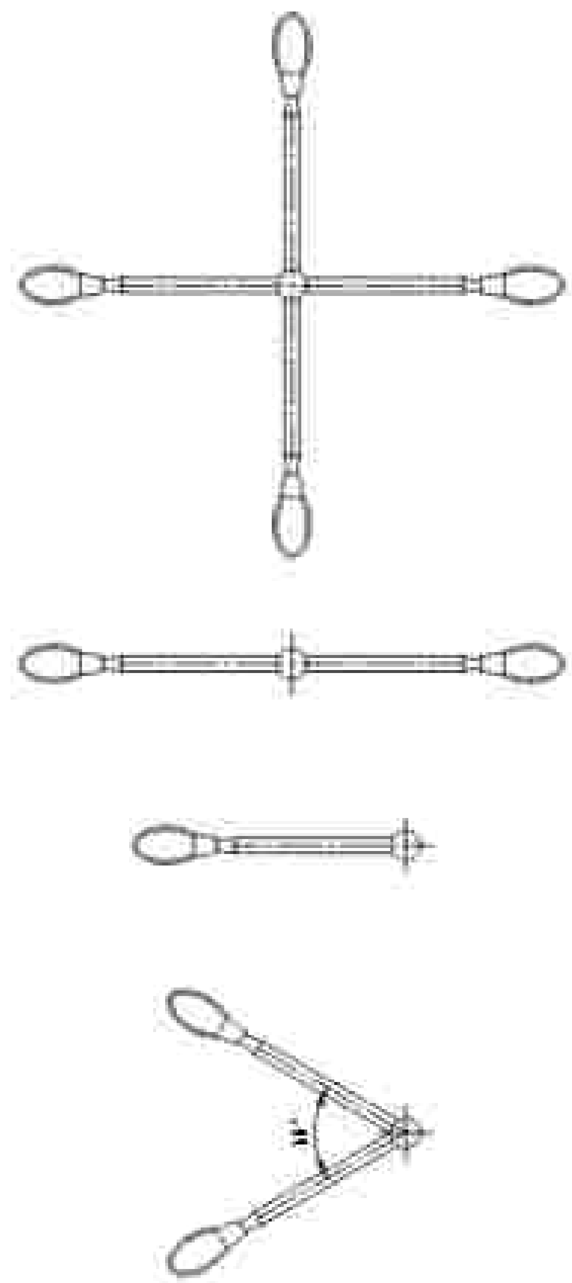


DETAIL L-116

10m LONG ROADWAY LIGHTING POLE



DETAIL "A"



VARIOUS KINDS OF FIXTURE

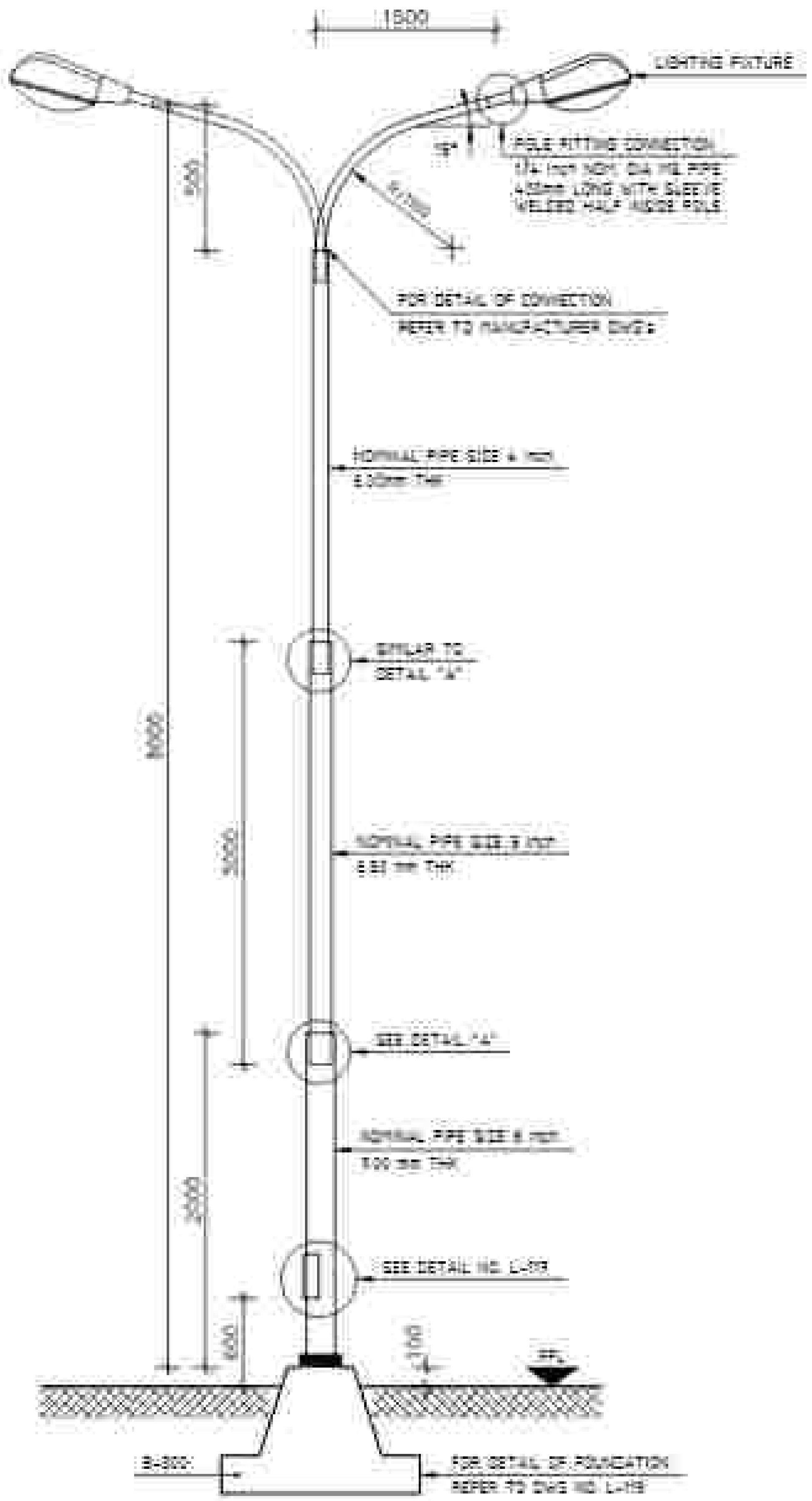
CONNECTION TO LIGHTING POLE

NOTES :

1. DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL
2. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
3. PAINTING COULD BE AS PER MANUFACTURER'S STANDARD PROVIDING IT MEETS THE MIN. REQUIREMENT OF ANTIRUST PRIME COATING PLUS SILVER GREY FINISH.

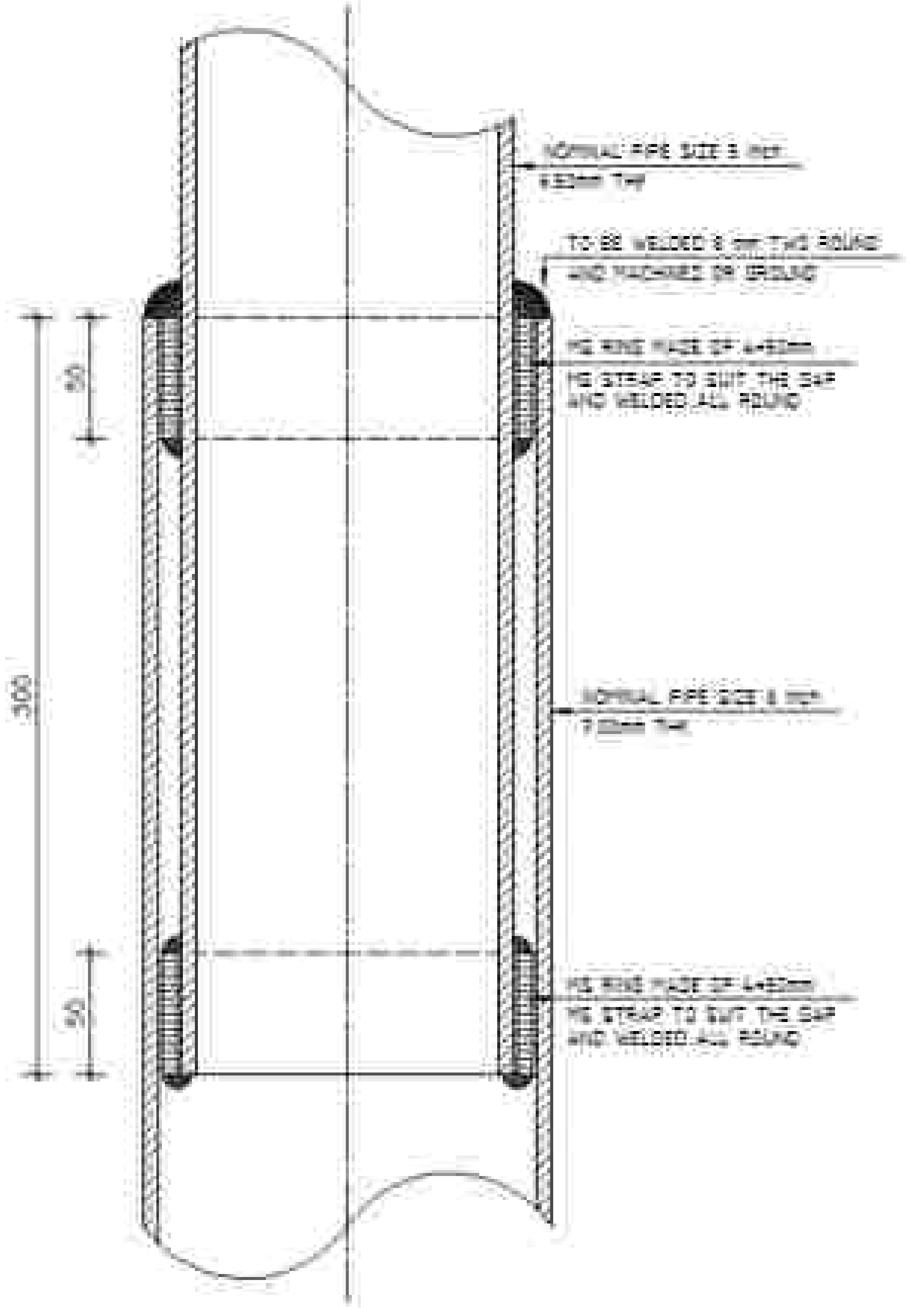
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: 10 m LONG ROADWAY LIGHTING POLE
	CHECKED BY:	DATE:	
DETAIL No.: L-116	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :

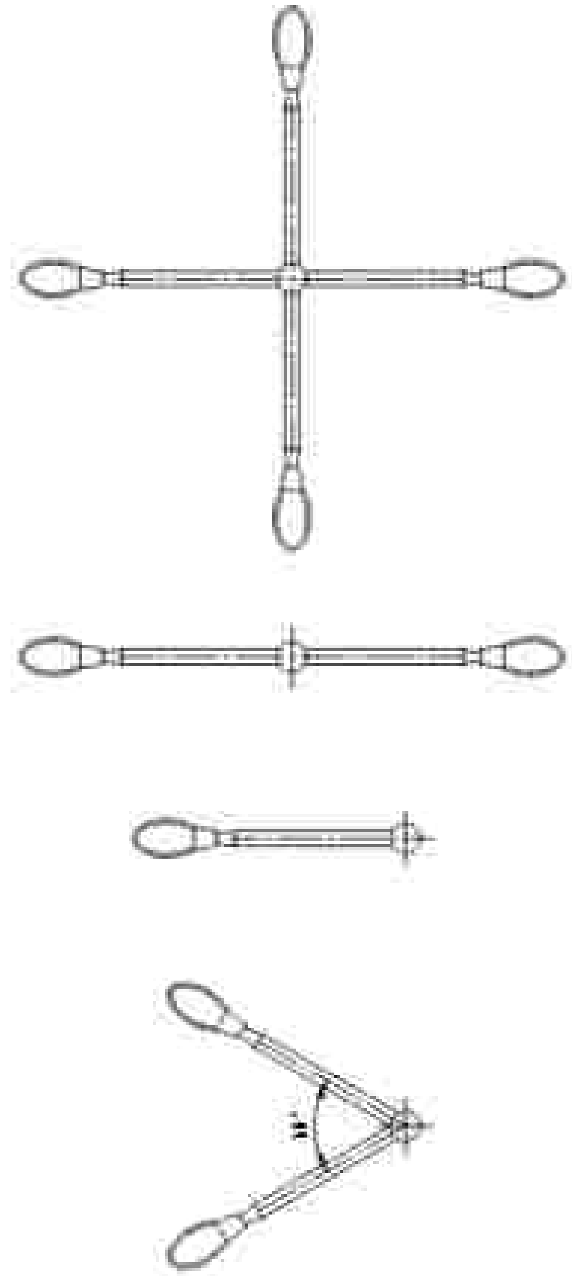


DETAIL L-116B

8m LONG ROADWAY LIGHTING POLE



DETAIL "A"



VARIOUS KINDS OF FIXTURE

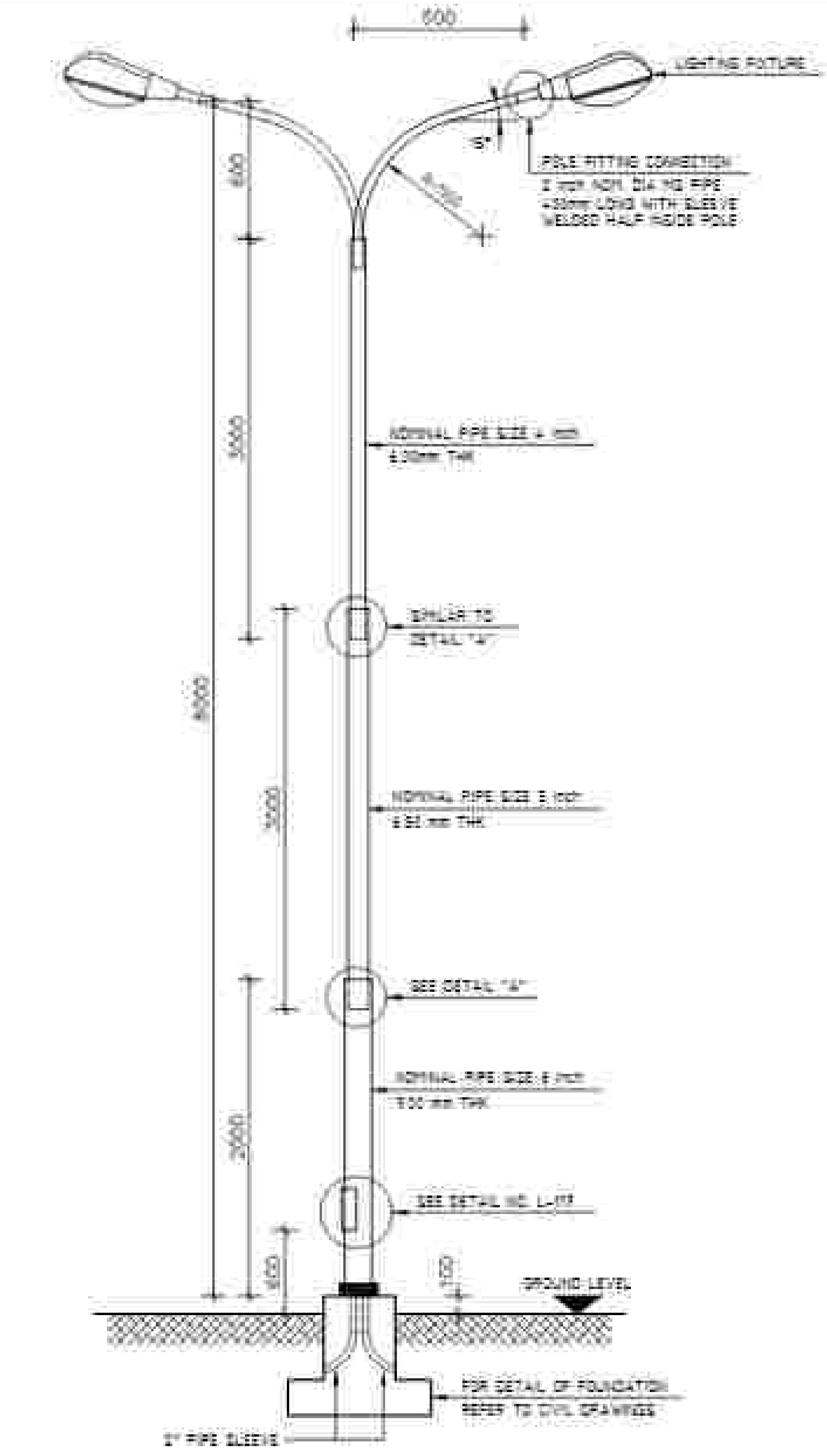
CONNECTION TO LIGHTING POLE

NOTES :

1. DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL.
2. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.
3. PAINTING COULD BE AS PER MANUFACTURER'S STANDARD PROVIDING IT MEETS THE MIN. REQUIREMENT OF ANTIRUST PRIME COATING PLUS SILVER GREY FINISH.

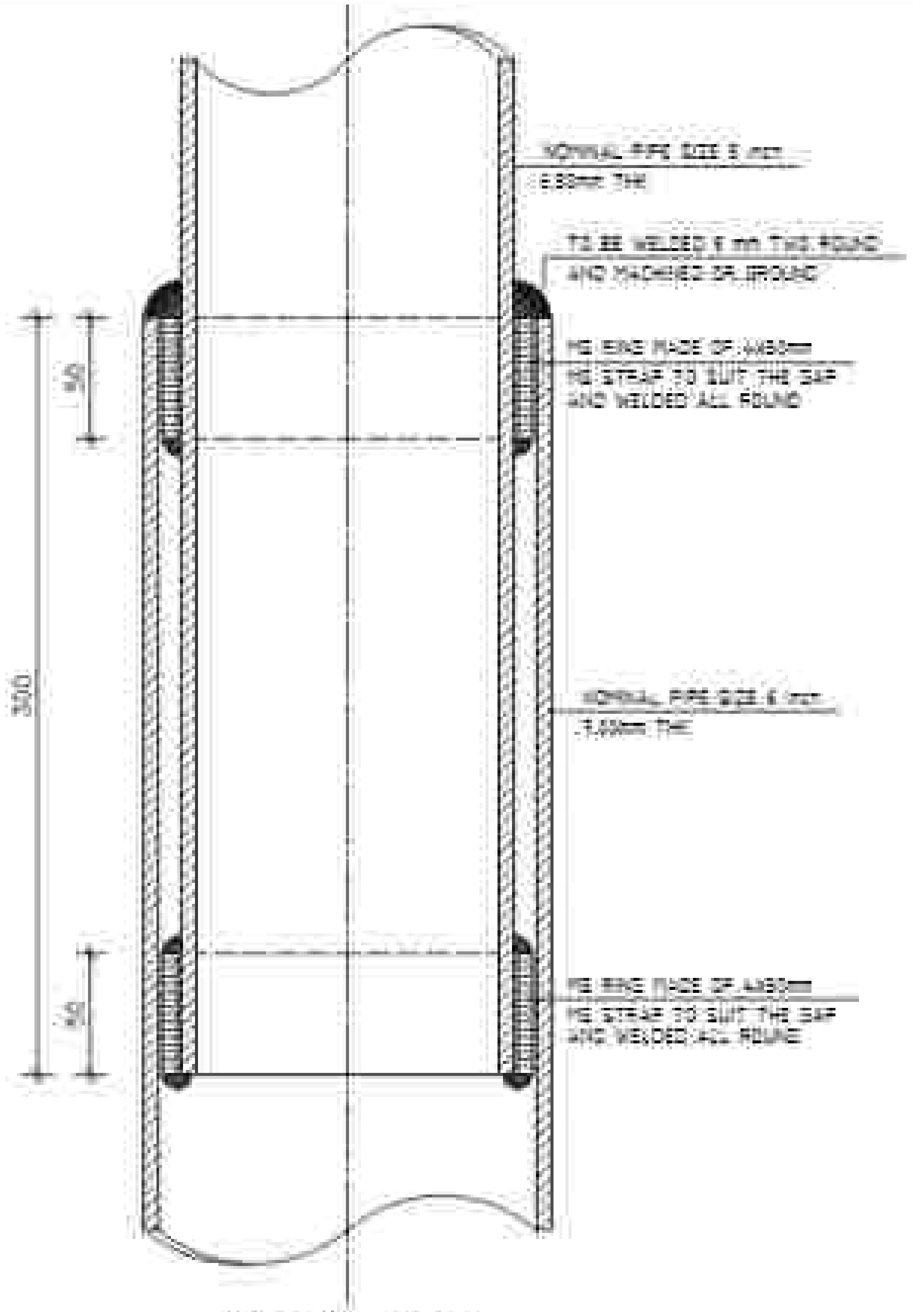
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: 8 m LONG ROADWAY LIGHTING POLE
	CHECKED BY:	DATE:	
DETAIL No.: L-116B	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :

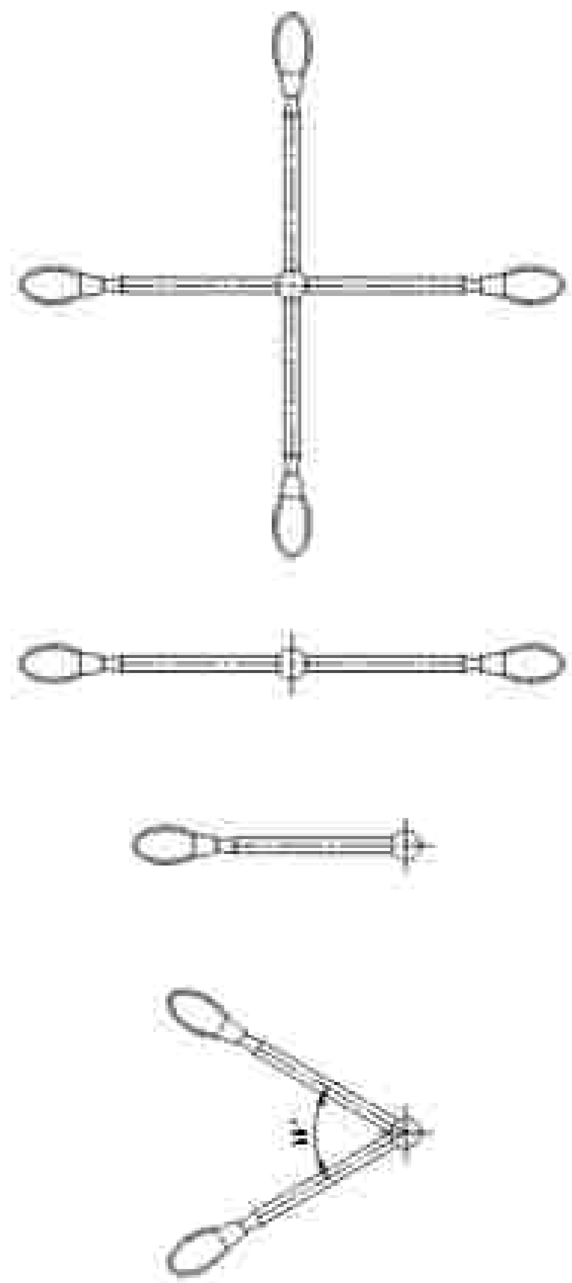


DETAIL L-116C

8m LONG ROADWAY LIGHTING POLE



DETAIL "A"



VARIOUS KINDS OF FIXTURE

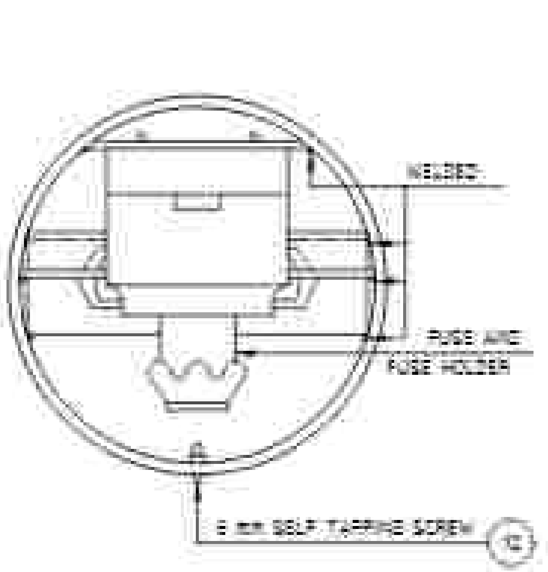
CONNECTION TO LIGHTING POLE

NOTES :

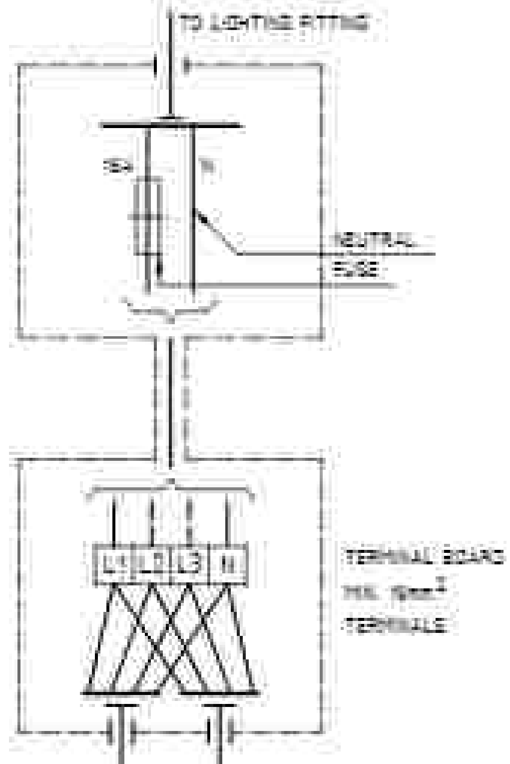
1- DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL.
2- ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.
3- PAINTING COULD BE AS PER MANUFACTURER'S STANDARD PROVIDING IT MEETS THE MIN. REQUIREMENT OF ANTIRUST PRIME COATING PLUS SILVER GREY FINISH.

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: 8 m HEIGHT ROADWAY LIGHTING POLE TYPE 2	
	CHECKED BY:	DATE:		
DETAIL No.: L-116C	SHEET NO.: 2 OF 2		SCALE: NOT TO SCALE	

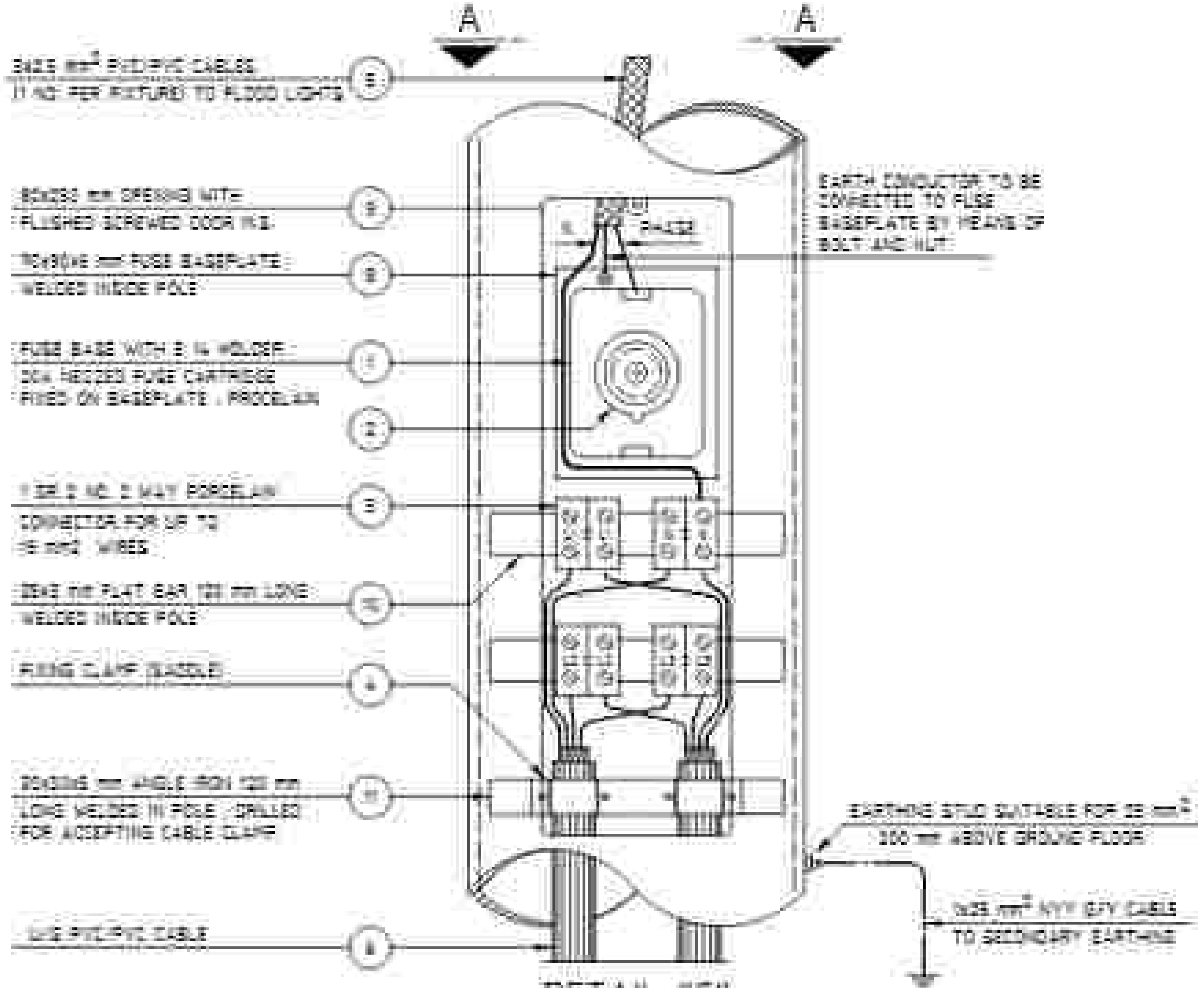
FILE NAME :



SECTION A-A



FEEDING CIRCUIT WIRING DIAGRAM



DETAIL "C"

CABLE CONNECTION TO POLE

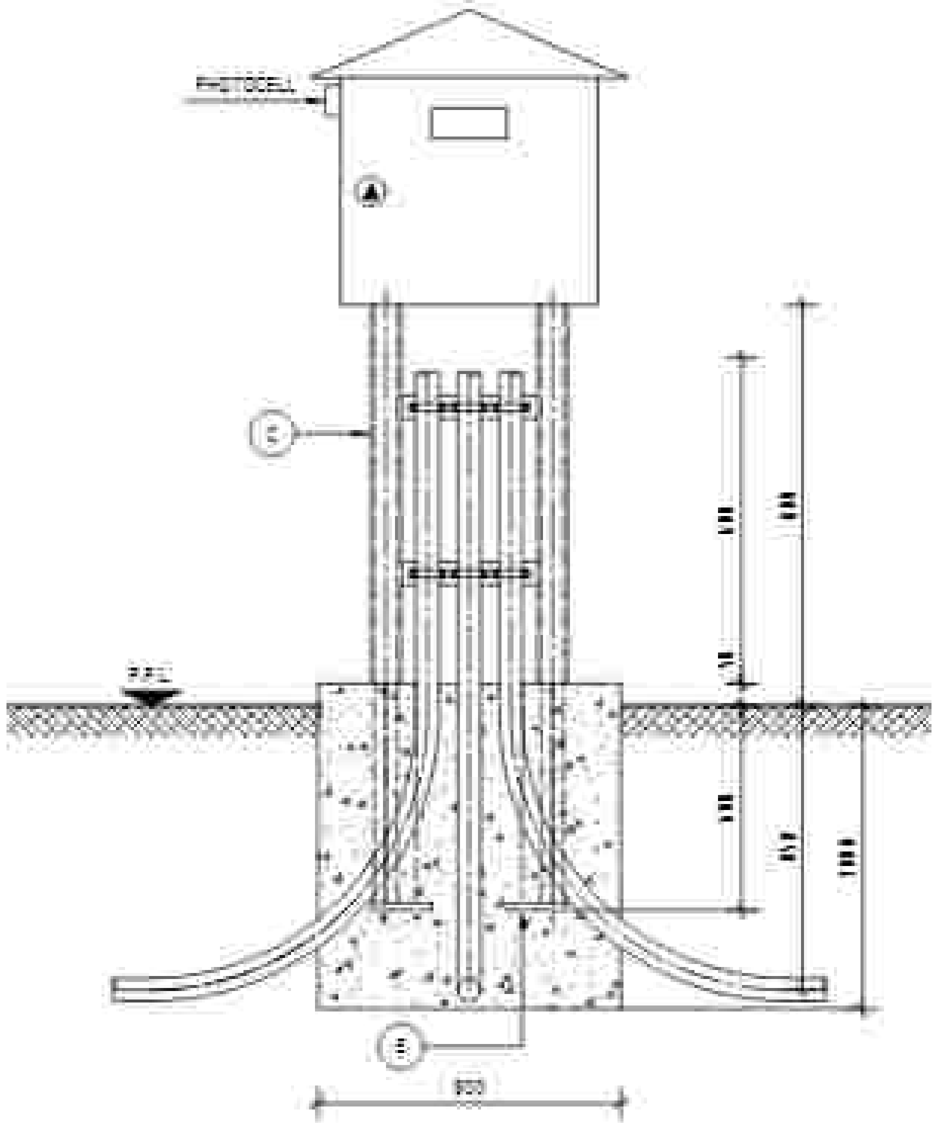
ITEM	DESCRIPTION	QTY	REMARKS
1	FUSE BASE , 20A (PER FIXTURE)	1	
2	NEOZED FUSE CARTRIDGE 16A (PER FIXTURE)	1	
3	PORCELAIN SCREW CONNECTOR	2	
4	CABLE CLAMP	2	
5	3C 2.5 mm² PVC/PVC CABLES (PER FIXTURE)	10m	
6	U/G PVC/PVC CABLE 10 OR 16 mm²	AS REQ.	
7			
8	70x90x6 mm FUSE BASEPLATE	1	
9	80x80x6 mm THICK PLATE	1	
10	25x3 mm FLAT BAR 120 mm LONG	1	
11	30x30x6 mm ANGLE IRON 120 mm LONG	1	
12	SELF TAPPING SCREW 6x30 mm LONG	2	

NOTES :

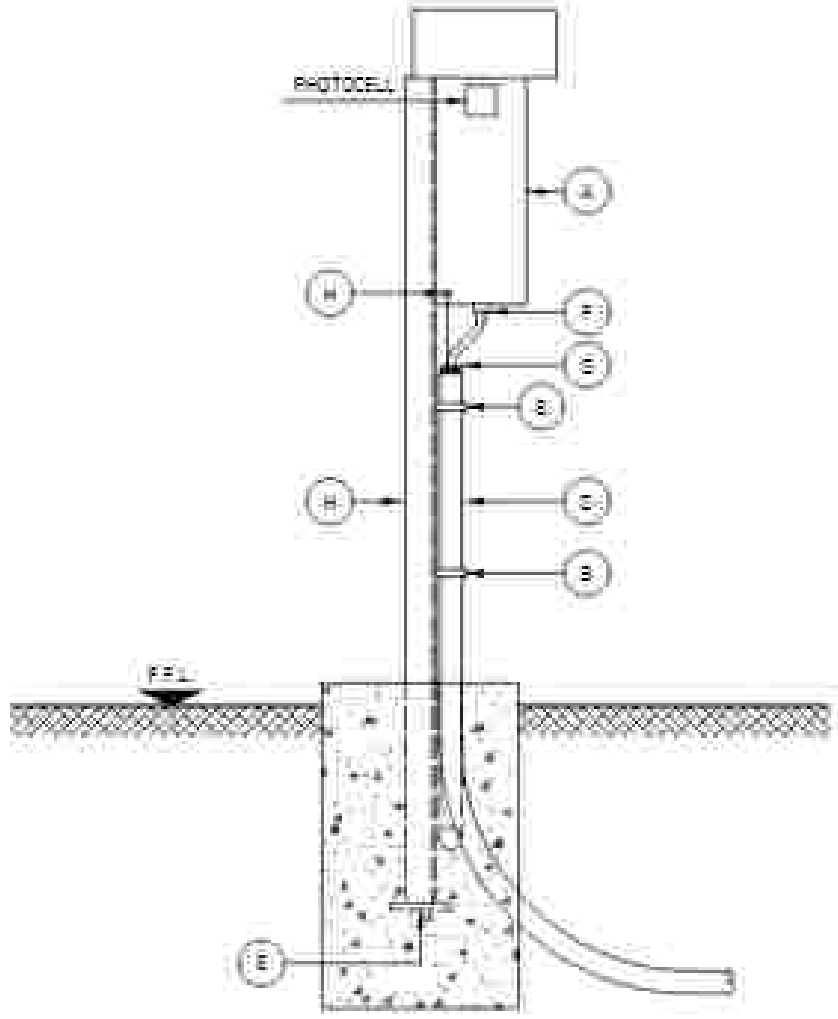
1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.
2. INDIVIDUAL FUSE UNIT , TERMINAL PLATE AND CLAMP PLATES ARE SHOWN TYPICALLY. VENDOR TO PROPOSE A SINGLE UNIT TO EMBODY THE FUSE/LINK/TERMINALS AND TO RECEIVE 4 CORE PVC INSULATED PVC SHEATED CABLES UP TO SIZE 16 mm2 .
3. DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL.

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: TERMINAL BOARD OF ROADWAY & FLOODLIGHT LIGHTING POLE
	CHECKED BY:	DATE:	
DETAIL NO.: E-117	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



FRONT VIEW



SIDE VIEW

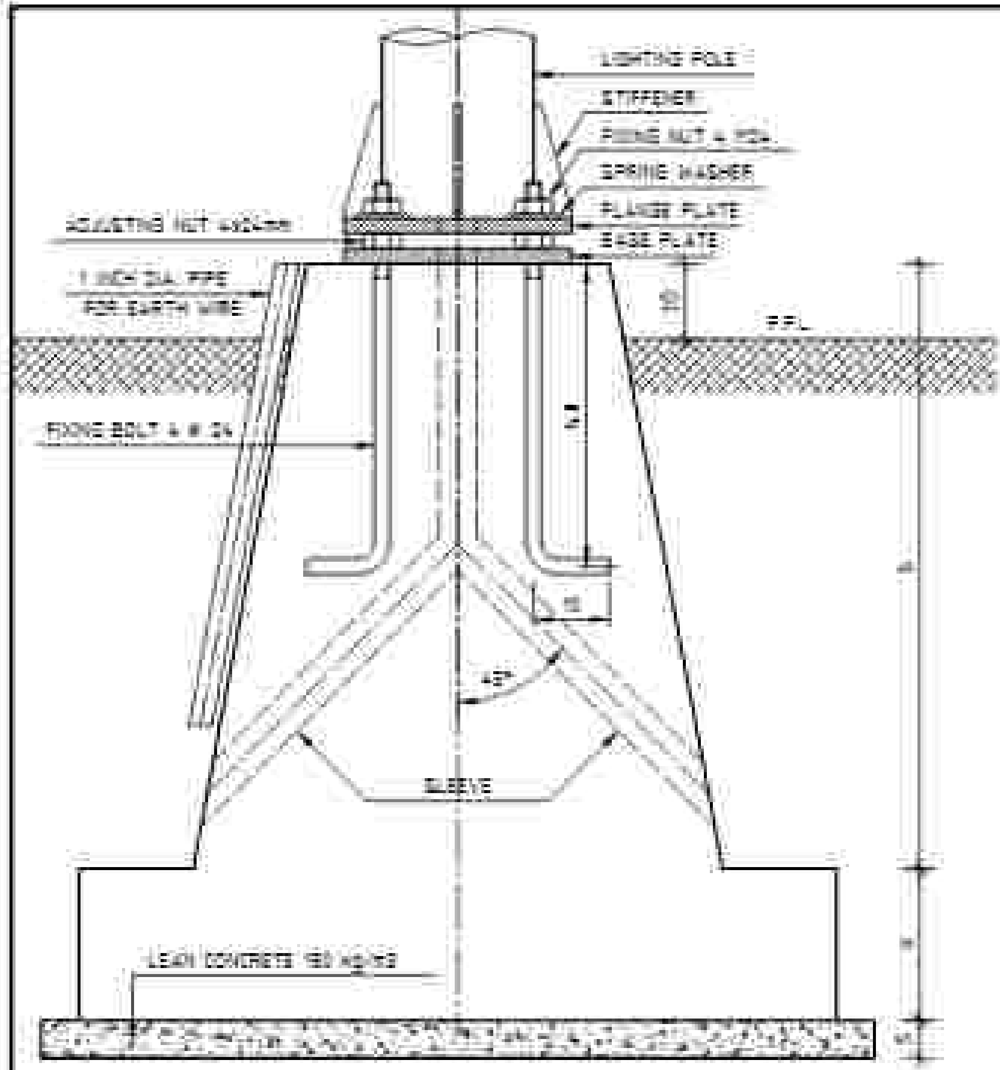
ITEM	DESCRIPTION	QTY	REMARKS
A	OUTDOOR LIGHTING PANEL (IP65)	1	
B	SADDEL WITH 2 No's SCREW / FIXED ON FLAT BARS	3	
C	CHANNEL 80x2000 mm	2	
D	100 mm GALVANIZED STEEL PIPE SLEEVES	8	
E	150x150x6 mm THK. MS PLATE TO BE WELDED AT CHANNEL BOTTOM	2	
F	CABLE GLANDS		
G	SEALING COMPOUND		
H	EARTH TERMINAL	2	

DETAIL L-118

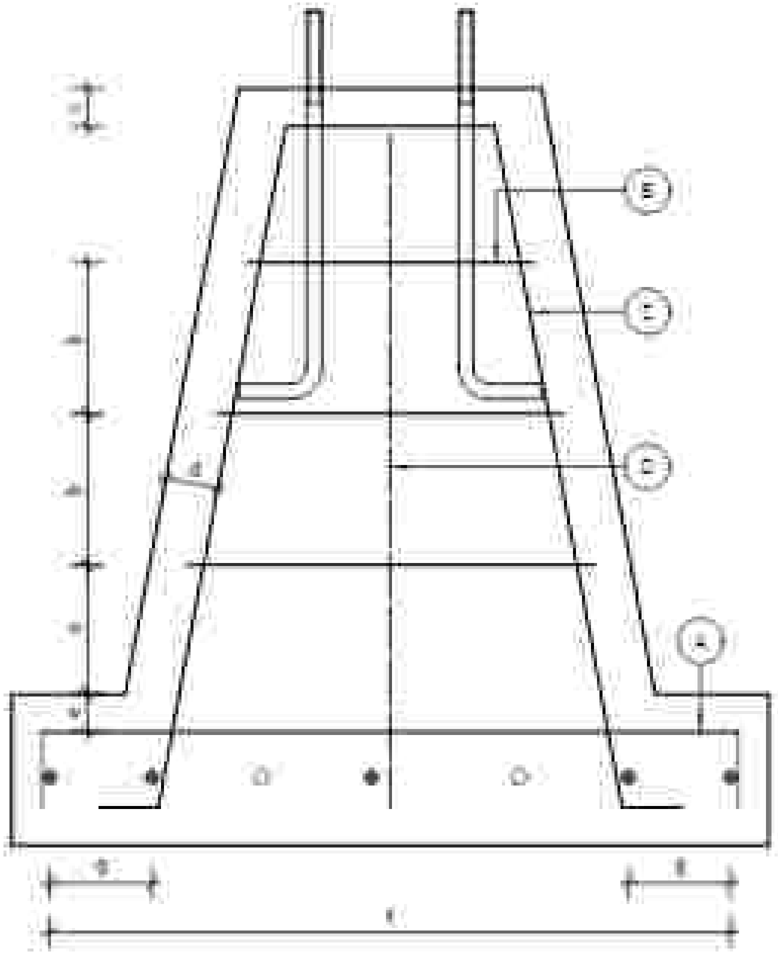
STREET LIGHTING PANEL

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: STREET LIGHTING PANEL
	CHECKED BY:	DATE:	
DETAIL No.: L-118	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

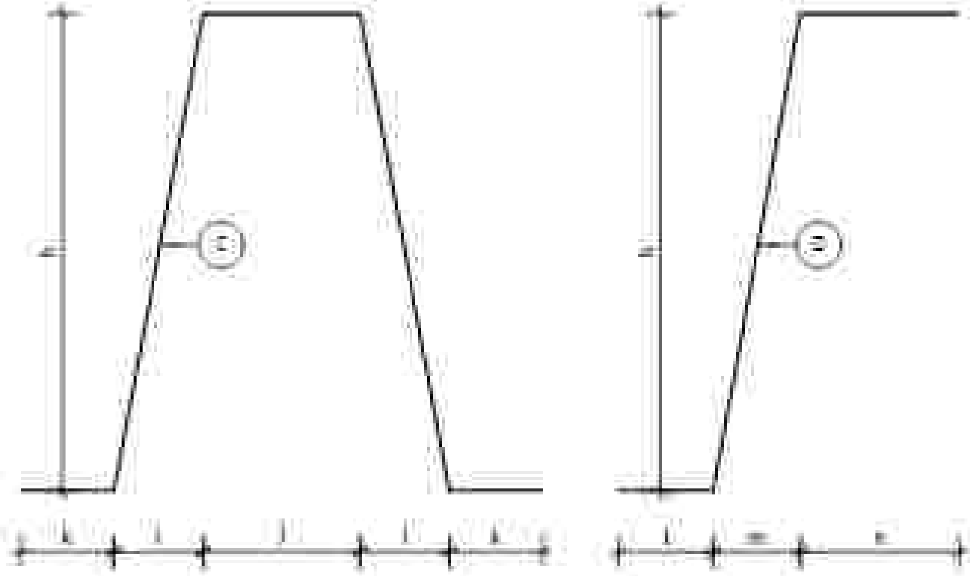
FILE NAME :

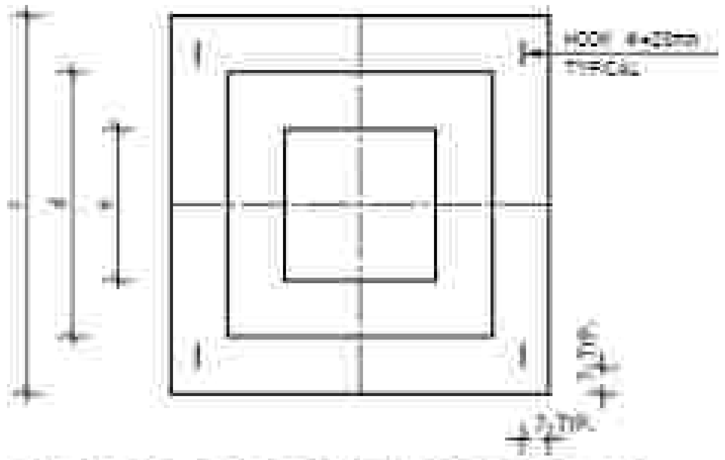


LIGHTING POLE INSTALLATION ON FOUNDATION



FOUNDATION REINFORCEMENTS





LIGHTING POLE FOUNDATION PLAN

FOUNDATION TYPE	DIMENSION OF FOUNDATION	a	b	c	d	e
	TYPE A FOR 10.5 TO 12.5 m LONG POLE	20	90	140	70	40
	TYPE B FOR 12.5 TO 15.5 m LONG POLE	25	100	140	70	40
	TYPE C FOR 16.0 TO 18.0 m LONG POLE	25	95	160	90	50
	TYPE D FOR 19.0 TO 21.0 m LONG POLE	30	150	160	90	50

FOUNDATION TYPE	DIMENSIONS	a	b	c	d	e	f	g	h	i	j	k	l	m	n
	TYPE A	25	25	5	7.5	10	100	32	90	25	35	20	-	-	-
	TYPE B	10	30	5	7.5	12.5	120	32	120	25	35	20	-	-	-
	TYPE C	10	30	5	7.5	12.5	160	25	110	35	30	20	20	25	20
	TYPE D	10	40	5	7.5	15	150	25	168	30	30	20	20	25	20

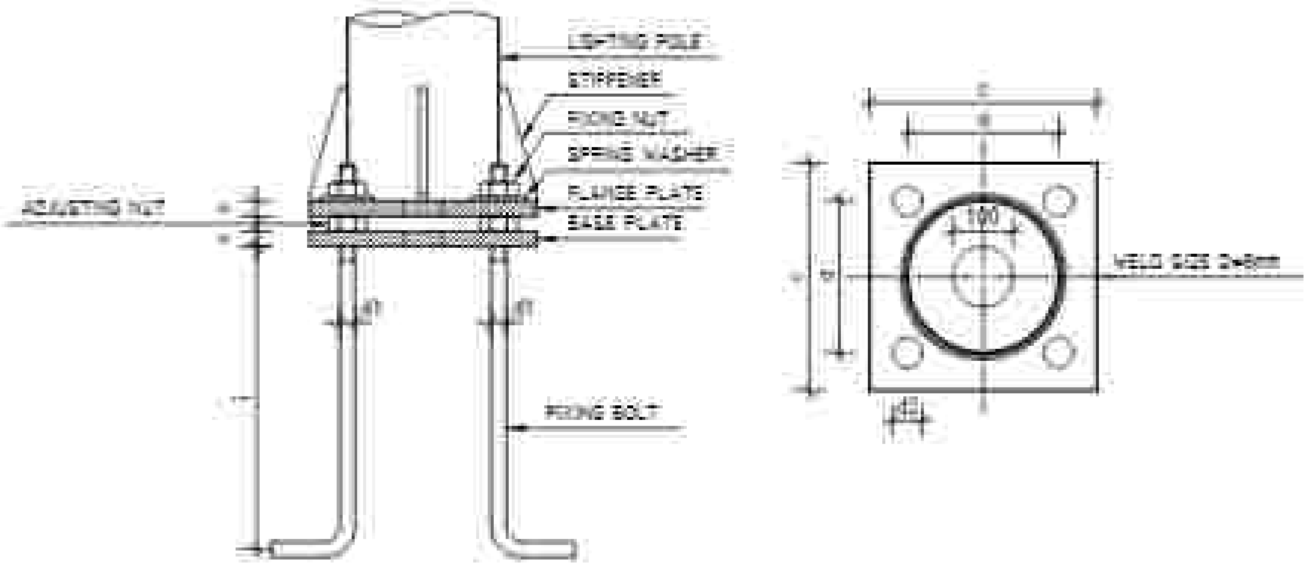
FOUNDATION TYPE	TYPE OF BARS	A		B		C		D	
		QTY	DIA. mm	QTY	DIA. mm	QTY	DIA. mm	QTY	DIA. mm
	TYPE A	2x5	12	3	10	2	12	-	-
	TYPE B	2x5	14	3	12	2	12	-	-
	TYPE C	2x5	12	3	12	2	12	4	12
	TYPE D	2x5	14	4	12	4	14	4	14

NOTE :

1- THE MINIMUM 28 DAYS COMPRESSIVE STRENGTH OF CONCRETE (CYLINDER TYPE SAMPLE) SHOULD BE Fc=210 kg/cm2.
2- DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APROVAL.
3- ALL DIMENSIONS ARE IN CENTIMETER UNLESS OTHERWISE STATED.

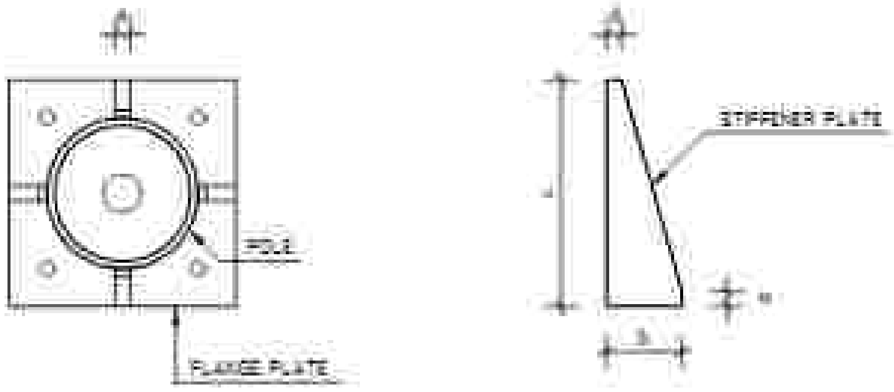
TARA TARH Engineering & Technological Co.	DRAWN BY: / P.A. / CHECKED BY:	DATE: / DATE:	TITLE: TYPICAL LIGHTING POLE FOUNDATION
DETAIL No.: L-118-A	SHEET NO.: 1 OF 2		SCALE: NOT TO SCALE

FILE NAME :



FLANGE PLATE

	DIMENSION	a	c	e	d1	d2	l
FOUNDATION TYPE	TYPE A FOR [illegible] m LONG POLE	20	29	0.8	m16	2.2	30
	TYPE B FOR [illegible] m LONG POLE	30	40	1	m24	3	60
	TYPE C FOR [illegible] m LONG POLE	30	40	1	m24	3	60
	TYPE D FOR [illegible] m LONG POLE	40	50	2	m27	3.3	70



STIFFENER PLATE

	DIMENSION	a	b	c	d	e
FOUNDATION TYPE	TYPE A FOR [illegible] m LONG POLE	1	8	15	1	1
	TYPE B FOR [illegible] m LONG POLE	1	8	15	1	1
	TYPE C FOR [illegible] m LONG POLE	1	8	15	1	1
	TYPE D FOR [illegible] m LONG POLE	1.2	8	15	15	2

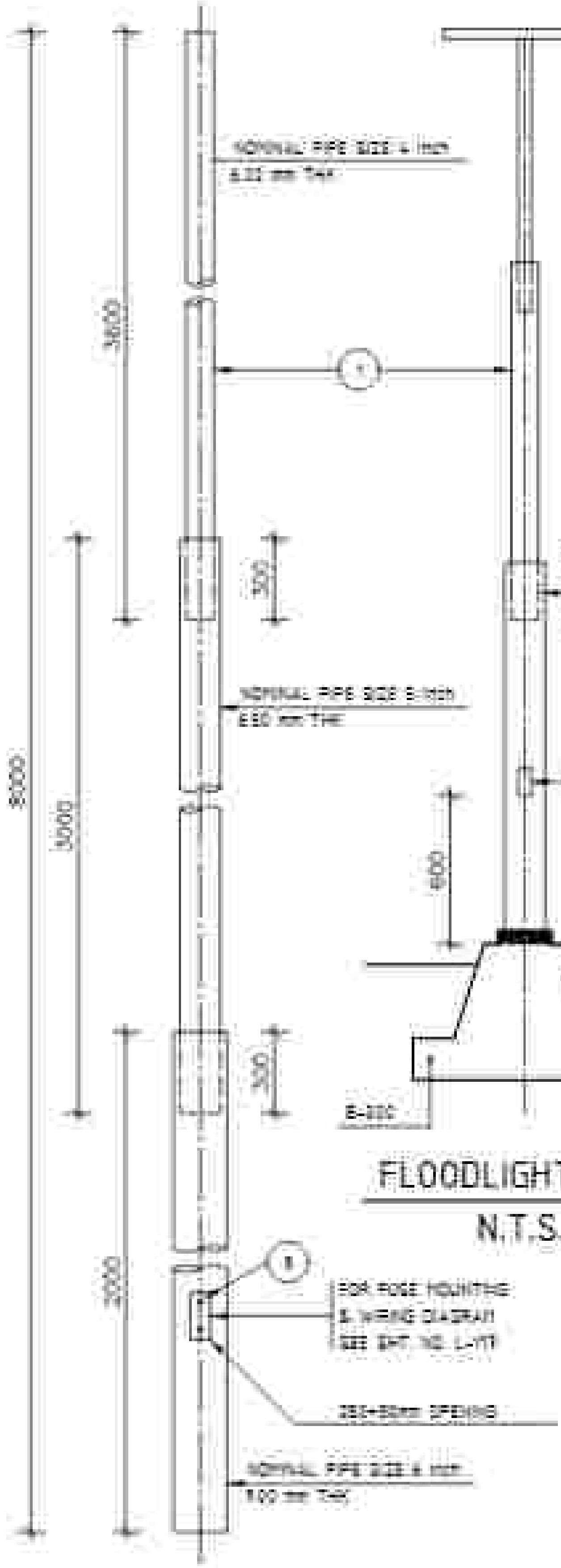
NOTE :

1- DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL.

2- ALL DIMENSIONS ARE IN CENTIMETER UNLESS OTHERWISE STATED.

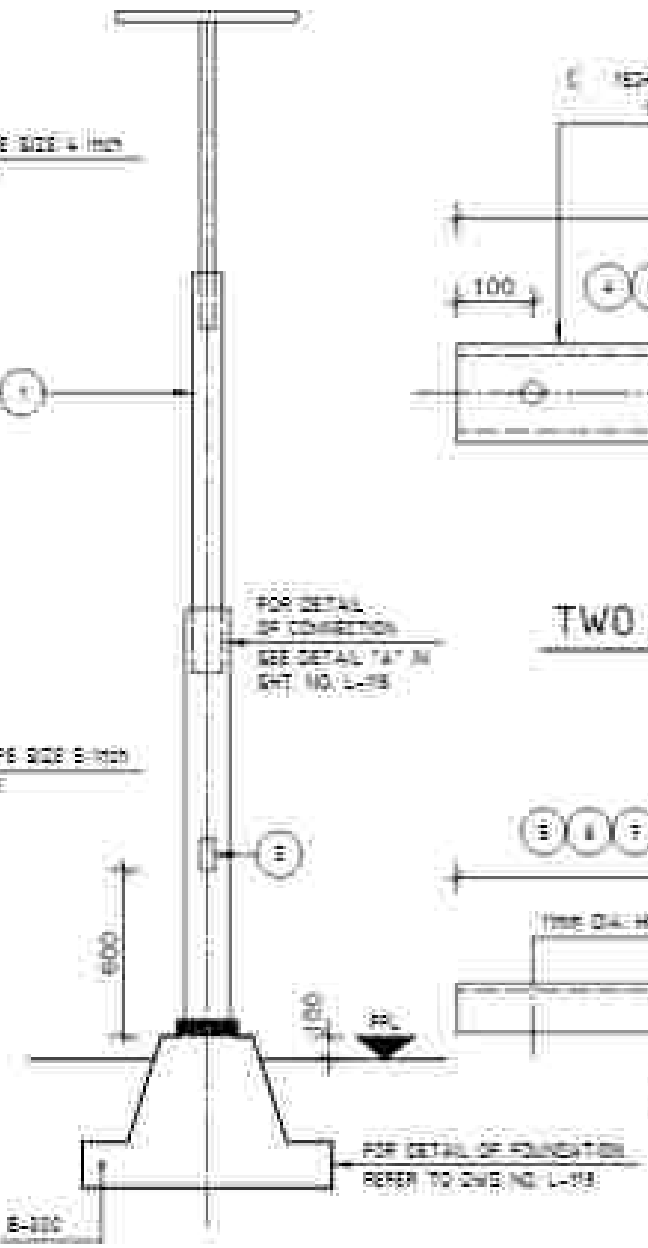
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE:
	M.A.		TYPICAL LIGHTING POLE FOUNDATION
	CHECKED BY:	DATE:	
DETAIL No.: L-119B	SHEET NO.:	2 OF 2	SCALE: NOT TO SCALE

FILE NAME :



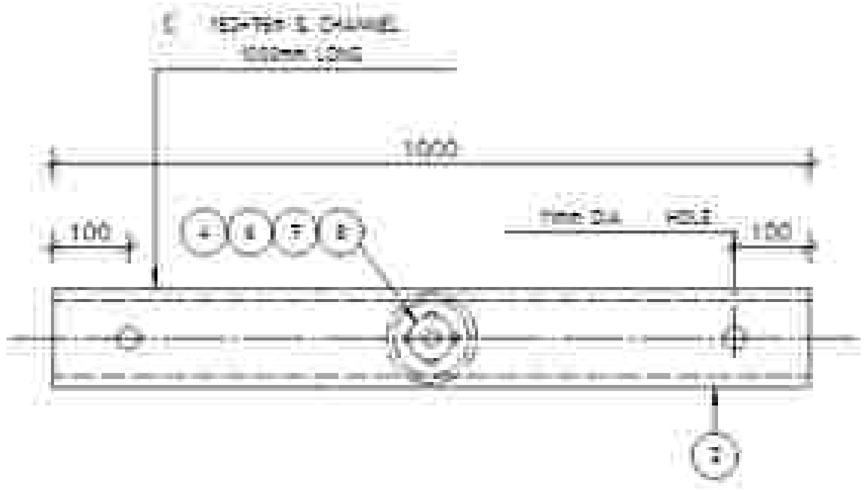
LIGHTING POLE

N.T.S.



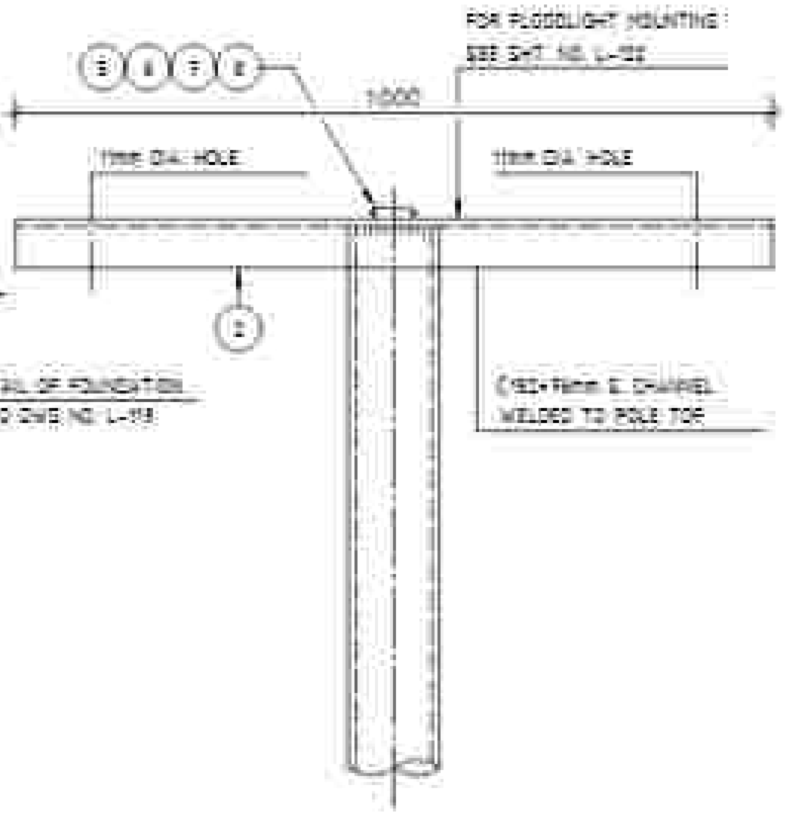
FLOODLIGHT POLE

N.T.S.



TWO FLOOD CROSS ARM - PLAN

SCALE 1:10



TWO FLOOD CROSS ARM

SCALE 1:10

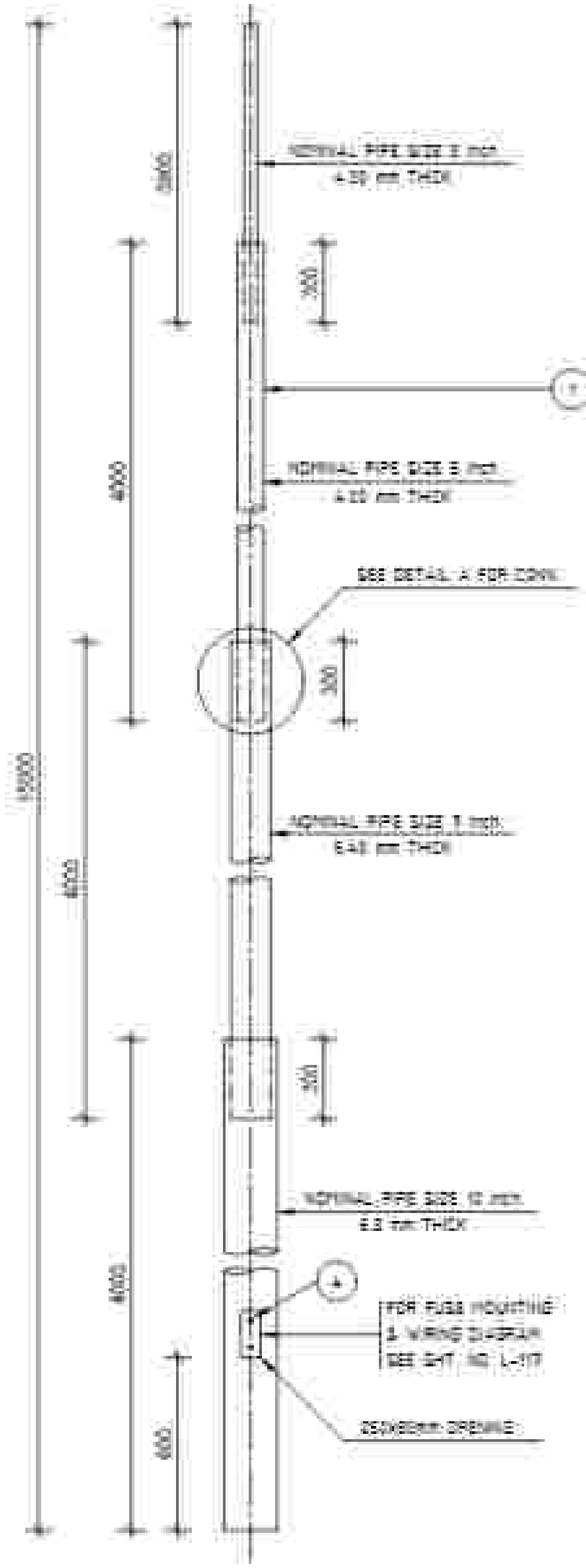
ITEM	DESCRIPTION	QTY	REMARKS
1	9.9 m HIGH STEEL LIGHTING POLE	1	
2	152x76mm CHANNEL IRON 1m LONG FOR CROSS ARM	2	
3	FUSE/CABLE LOOPING BOX	1	
4	BACK ENTRY INTERSECTION JUNCTION BOX	1	
5	BACK ENTRY THROUGH JUNCTION BOX	1	
6	20mm CABLE GLAND	5	
7	SCREW-ON-CONNECTOR FOR 2.5 mm² CONDUCTOR	1	
8	SELF TAPPING SCREW 6mmx40mm LONG	2	
9	SELF TAPPING SCREW 6mmx60mm LONG	2	
10			

NOTES :

1- THE CONTRACTOR SHALL DRILL OTHER HOLES FOR FIXING FLOODLIGHTS ACCORDING TO THE MANUFACTURER'S REQUIRMENT
2- ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.
3- DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL.
4- PRINTING COULD BE AS PER MANUFACTURER'S STANDARD PROVIDING IT MEETS THE MIN. REQIREMENT OF ANTIRUST PRIME COATING PLUS SILVER GREY FINISH.

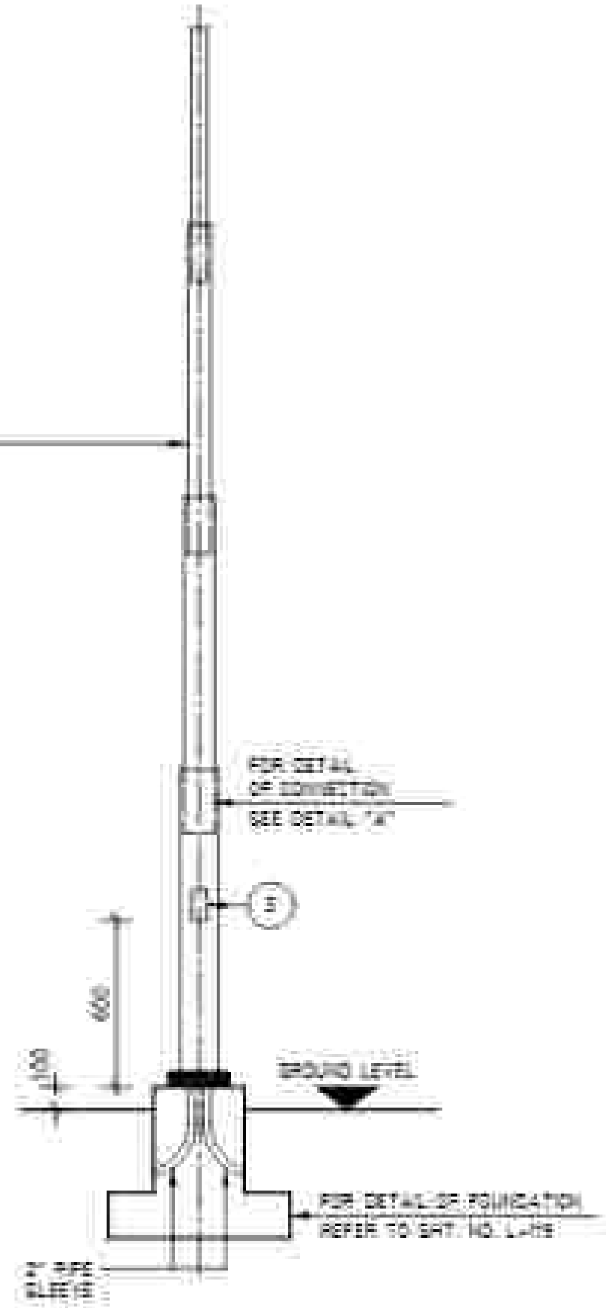
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: FLOODLIGHT POLE
	CHECKED BY:	DATE:	
DETAIL No.: L-120	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



15m LONG LIGHTING POLE

N.T.S.



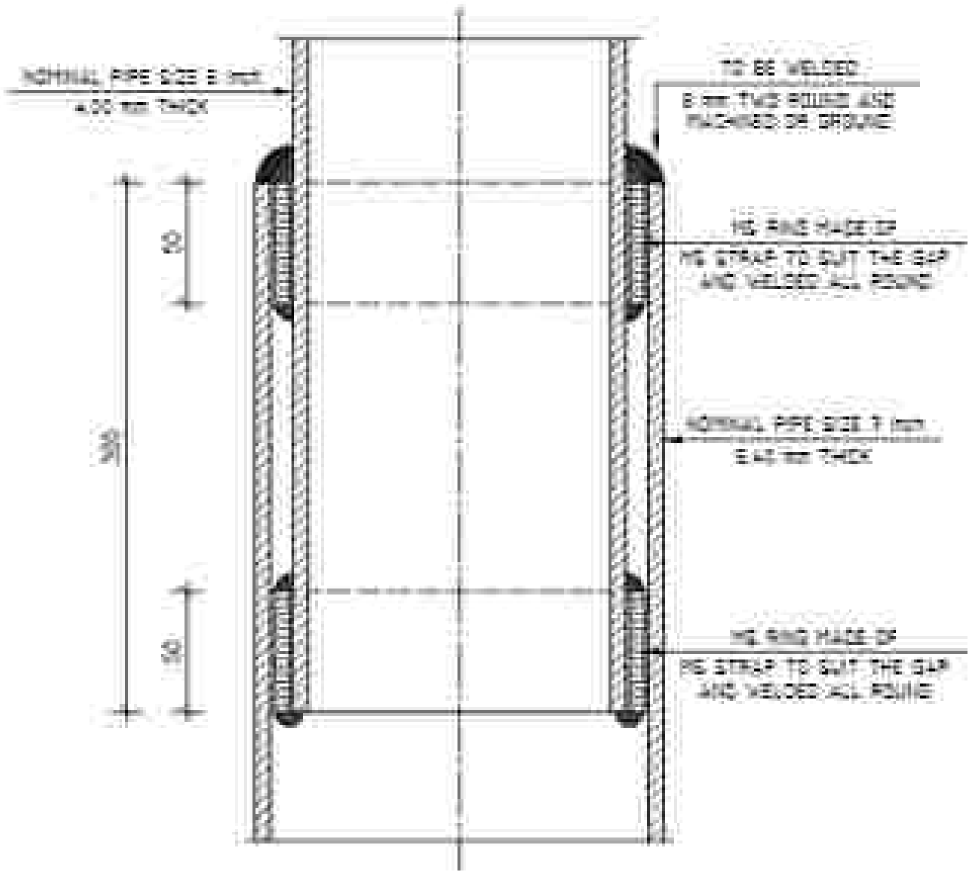
FLOODLIGHT POLE

N.T.S.

ITEM	DESCRIPTION	QTY	REMARKS
1	20 m HIGH STEEL LIGHTING POLE	1	
2			
3	FUSE/CABLE LOOPING BOX	1	
4	SELF TAPPING SCREW 6mmx20mm LONG	2	

NOTES :

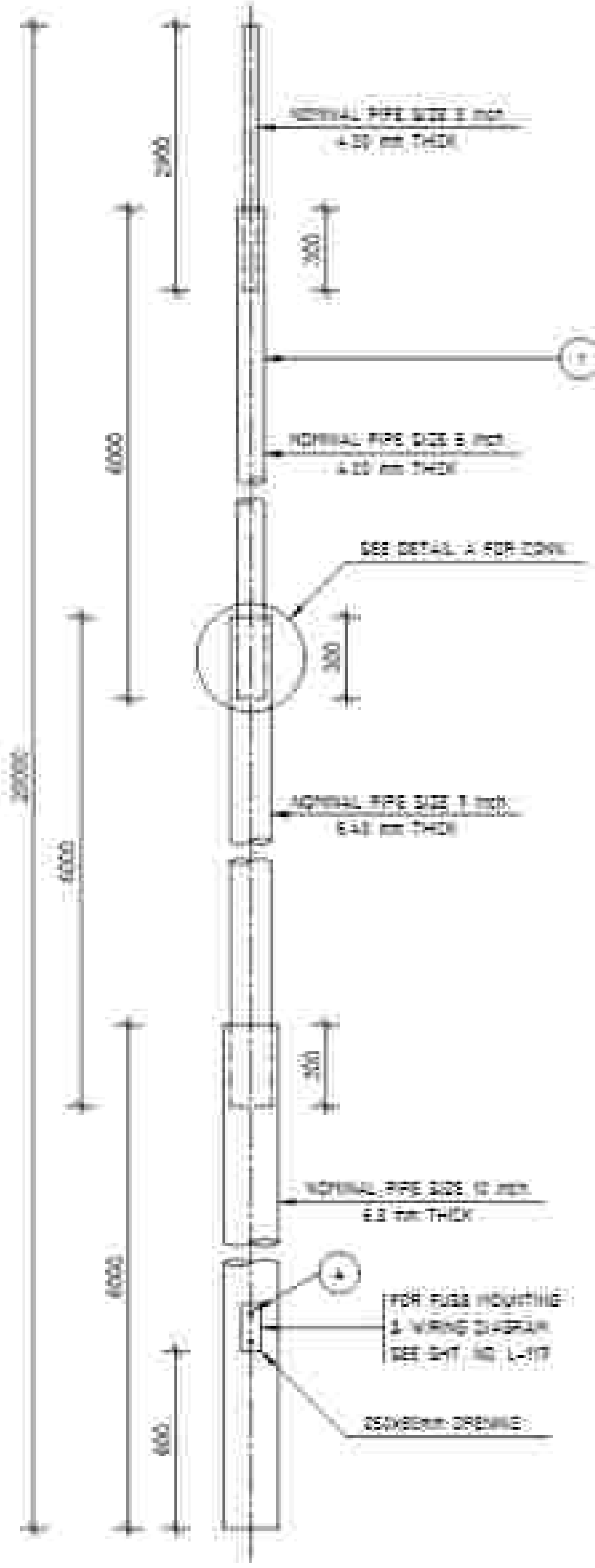
1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.
2. DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL.
3. PAINTING COULD BE AS PER MANUFACTURER'S STANDARD PROVIDING IT MEETS THE MIN. REQIREMENT OF ANTIRUST PRIME COATING PLUS SILVER GREY FINISH.



DETAIL "A"

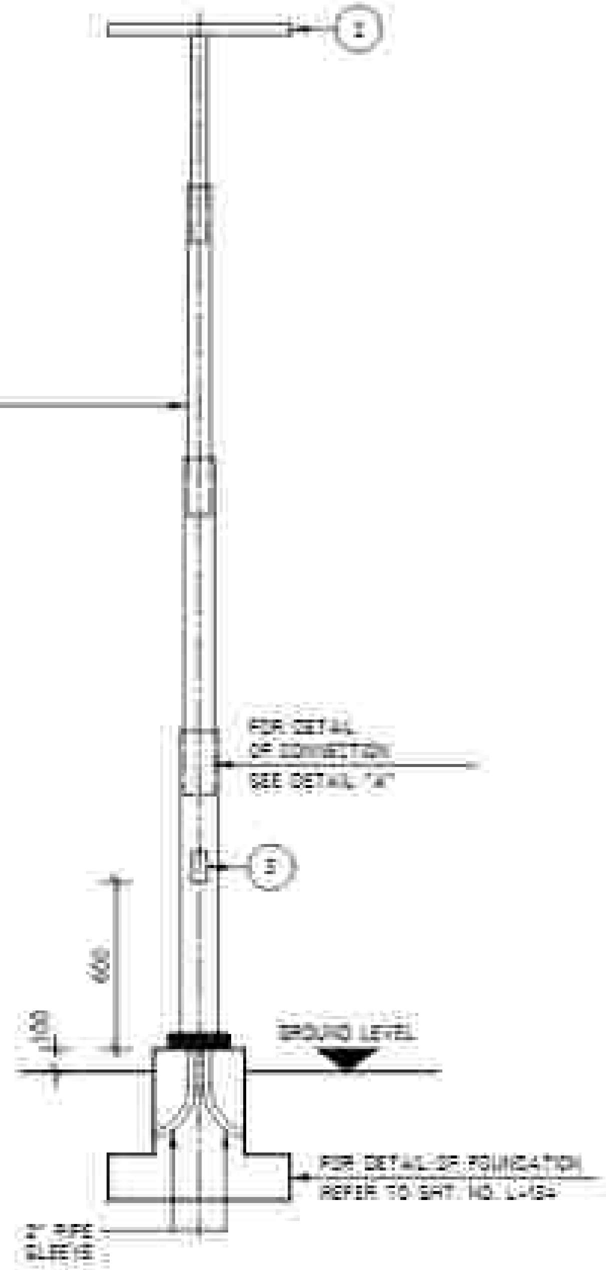
TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE: FLOODLIGHT POLE , H=15 m
	P.A.		
	CHECKED BY	DATE	
DETAIL No.: L-121A	SHEET NO.	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



20m LONG LIGHTING POLE

N.T.S.



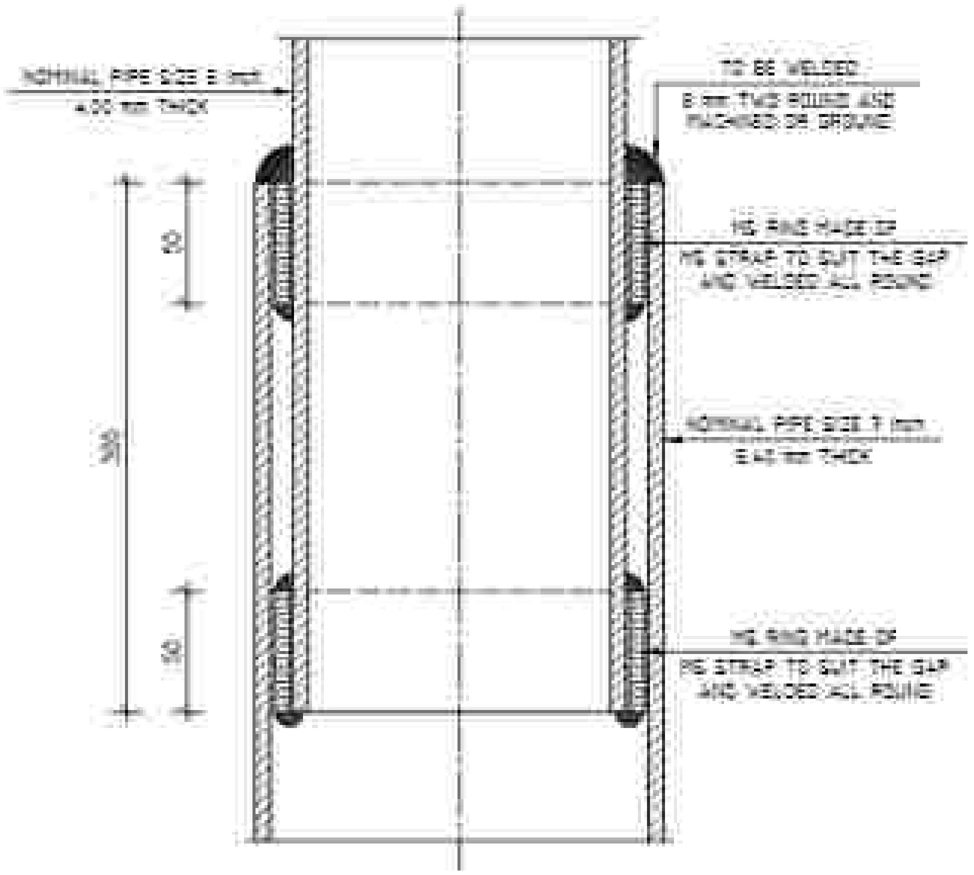
FLOODLIGHT POLE

N.T.S.

ITEM	DESCRIPTION	QTY	REMARKS
1	20 m HIGH STEEL LIGHTING POLE	1	
2	"UNP 160" CHANNEL IRON 1m LONG FOR CROSS ARM	2	
3	FUSE/CABLE LOOPING BOX	1	
4	SELF TAPPING SCREW 6mmx30mm LONG	2	

NOTES :

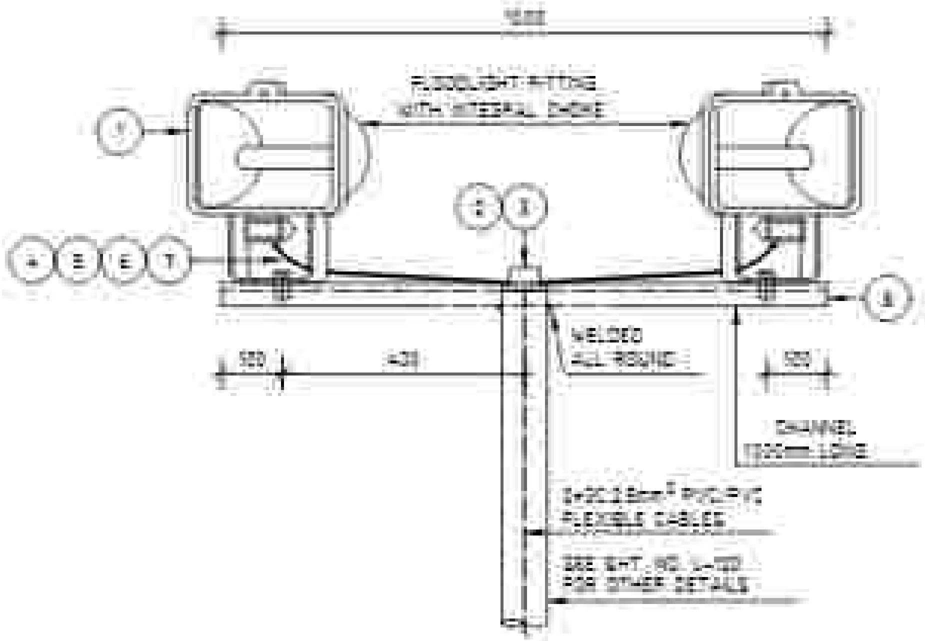
1. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.
2. DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL.
3. PAINTING COULD BE AS PER MANUFACTURER'S STANDARD PROVIDING IT MEETS THE MIN. REQIREMENT OF ANTIRUST PRIME COATING PLUS SILVER GREY FINISH.



DETAIL "A"

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. / CHECKED BY:	DATE: / DATE:	TITLE: FLOODLIGHT POLE , H=20 m.
DETAIL No.: L-121B	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



DETAIL A

FLOODLIGHT FIXING ON POLE TOP

N.T.S.

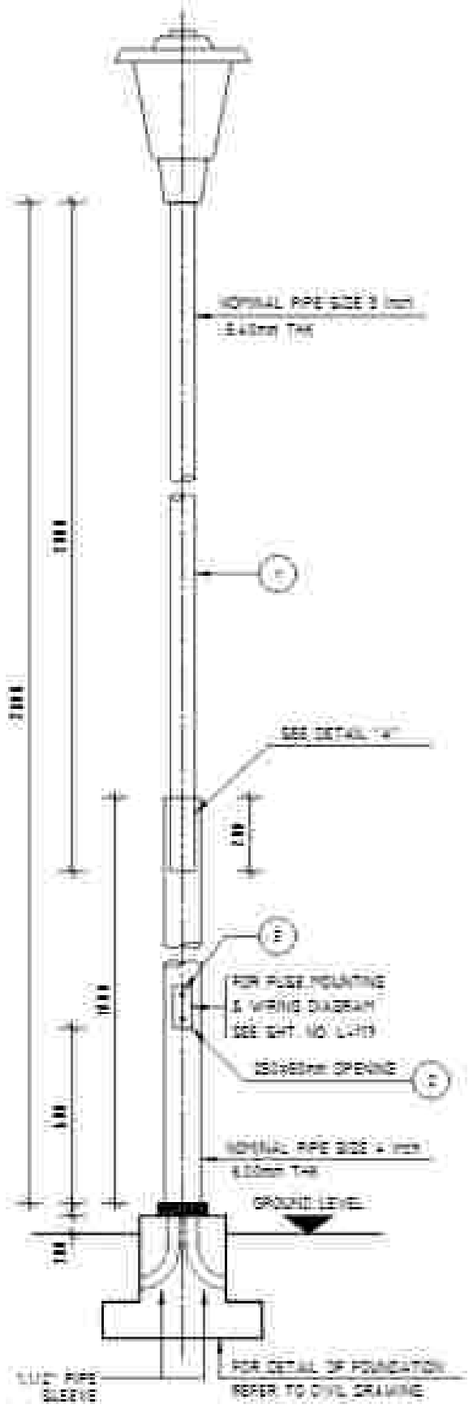
ITEM	DESCRIPTION	QTY.	REMARKS
1	FLOODLIGHT FITTING	2	
2	BACK ENTRY THROUGH BOX	1	
3	SELF TAPPING SCREW 6mmx40mm LONG	2	
4	8 ISO COARSEx40 LONG HEX. HD SCREW	2	
5	8 ISO COARSE HEX. HD NUT	2	
6	8 LOCK WASHER	2	
7	8 FLAT WASHER	2	
8	CHANNEL 1m LONG (CROSS ARM)	1	

NOTE:

1- THE CONTRATOR SHALL DRILL OTHER HOLES FOR FIXING THE FLOODLIGHTS ACCORDING TO THE MANUFACTURER'S REQUIREMENTS.
2- ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED.
3- DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL.

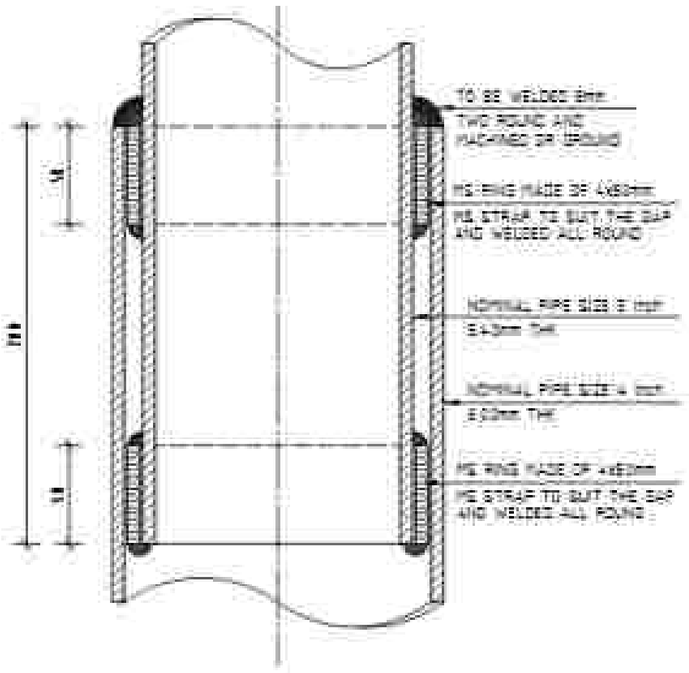
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: FLOODLIGHT FIXING ON POLE TOP
	CHECKED BY:	DATE:	
DETAIL No.: L-122	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



PARK LIGHTING POLE

N.T.S.



DETAIL "A"

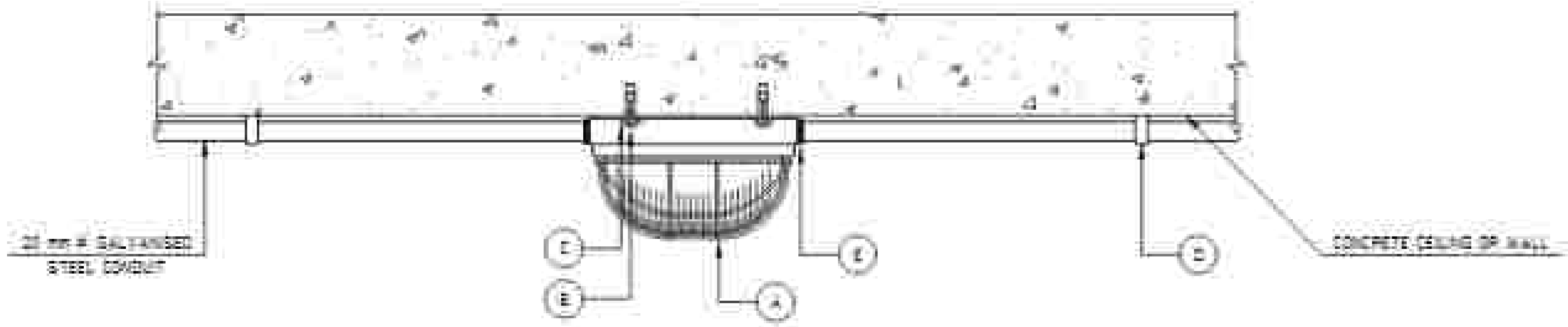
ITEM	DESCRIPTION	QTY	REMARKS
1	9.80 m HIGH PARK LIGHTING POLE .	1	
2	FUSE TABLE LOOPING BOX	1	
3	SELF TAPPING SCREW 5mmx20mm LONG .	2	

NOTES :

1. THE CONTRACTOR SHALL DRILL OTHER HOLES FOR FIXING FLOODLIGHTS ACCORDING TO THE MANUFACTURER'S REQUIREMENT
2. ALL DIMENSIONS ARE IN MILLIMETER UNLESS OTHERWISE STATED
3. DETAILS GIVEN ON VENDOR DRAWINGS CAN SUPERSEDE THOSE GIVEN ON THIS DRAWING UPON CONSULTING ENGINEER APPROVAL
4. PAINTING COULD BE AS PER MANUFACTURER'S STANDARD PROVIDING IT MEETS THE MIN. REQUIREMENT OF ANTIRUST PRIME COATING PLUS SILVER GREY FINISH .

TARA TARH	DRAWN BY: P.A.	DATE:	TITLE: PARK LIGHTING POLE
	CHECKED BY:	DATE:	
DETAIL No.: L-125	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



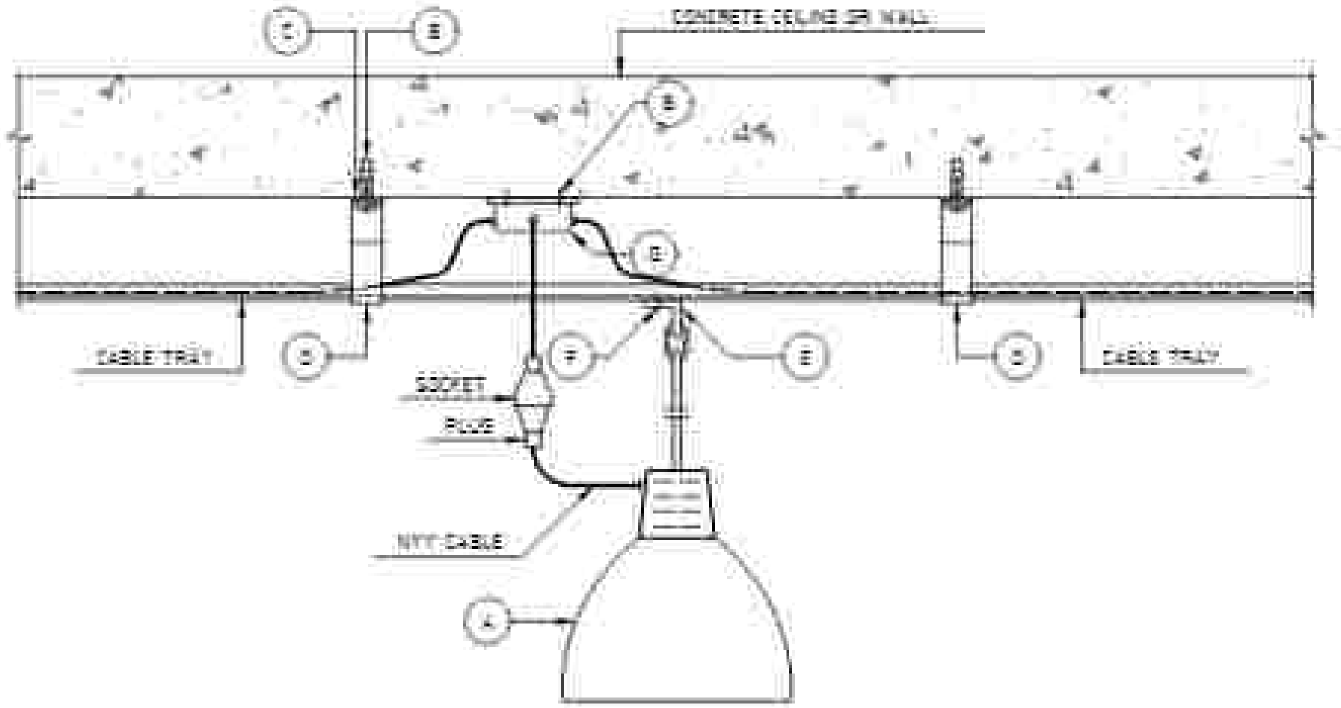
DETAIL L-131A

SURFACE MOUNTED INCANDESCENT LUMINAIRE
ON CONCRETE CEILING OR WALL

ITEM	DESCRIPTION	QTY	REMARKS
A	INCANDESCENT LUMINAIRE 1x100W	1	
B	BOLT PROJECTION RAWLBOLT, M6, AS 195A	2	
C	ROUND WASHER, M6	2	
D	CONDUIT CLIP WITH FIXING SCREW	2	
E	20 mm DIA. BRASS BUSHING	2	

TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE
	M.A.		LIGHTING FIXTURE INSTALLATION SURFACE MOUNTED INCANDESCENT LUMINAIRE ON CONC. CEILING OR WALL
	CHECKED BY	DATE	
DETAIL No.: L-131A	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



DETAIL L-132

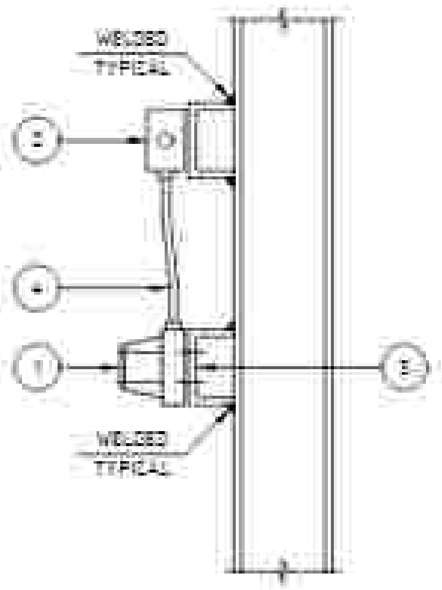
PENDANT TYPE HIGH BAY LIGHTING FIXTURE
UNDER CABLE TRAY

ITEM	DESCRIPTION	QTY	REMARKS
A	HIGH BAY INDUSTRIAL LUMINAIER (FOR TYPE SEE PLAN DWG) COMPLETE WITH HIGH PRESSURE MERCURY LAMP CONTROL GEAR & P.F. CORRECTION CAPACITOR	1	
B	BOLT PROJECTION RAWLBOLT, M6, AS M14	2	
C	ROUND WASHER, M6	2	
D	CABLE TRAY SUPPORT	AS REQ.	
E	ANGLE BRACKET	AS REQ.	LENGTH VARIES
F	BOLT, NUT, PLAIN & SPRING WASHER, M6	2	
G	CAST ALUMINUM JUNCTION BOX THREE WAY APPROX. DIMENSION 150X150X65 MM		

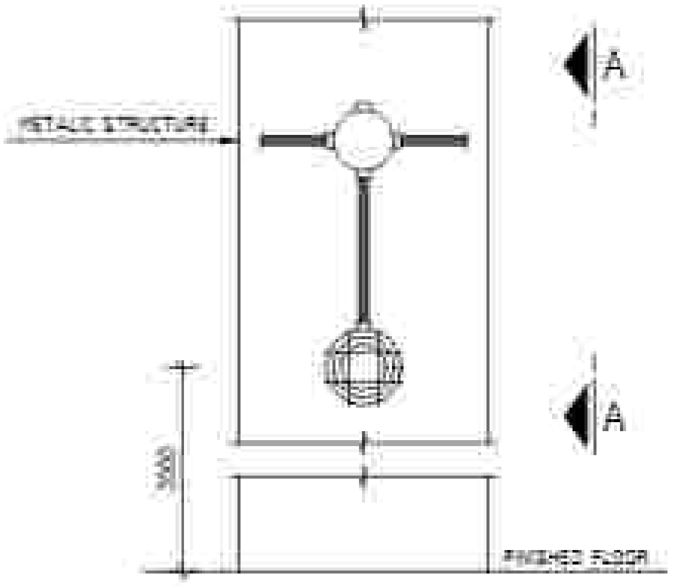
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION PENDANT TYPE HIGH BAY LIGHTING FIXTURE UNDER CABLE TRAY
	CHECKED BY:	DATE:	
DETAIL No.: L-132	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :

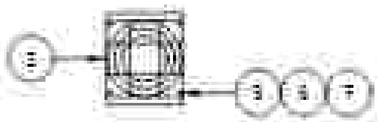
ITEM	DESCRIPTION	QTY	REMARKS
1	INCANDESCENT LIGHTING FIXTURE 1x100W IP44/IP65	1	
2	ROUND 4 HOLES # 2x35.5 mm x 2x79.5 mm # 55 mm	1	
3	GALVANIZED STEEL SUPPORT "L" 50x50x5	1 METER	
4	GALVANIZED STEEL RIGID CONDUIT # PG-13.5	AS REQ.	
5	M6x25 GALVANIZED STEEL SCREW	2	
6	DIA. 7 GALVANIZED STEEL SPRING WASHER	4	
7	M6 GALVANIZED STEEL NUT	2	



SECTION A-A



ELEVATION



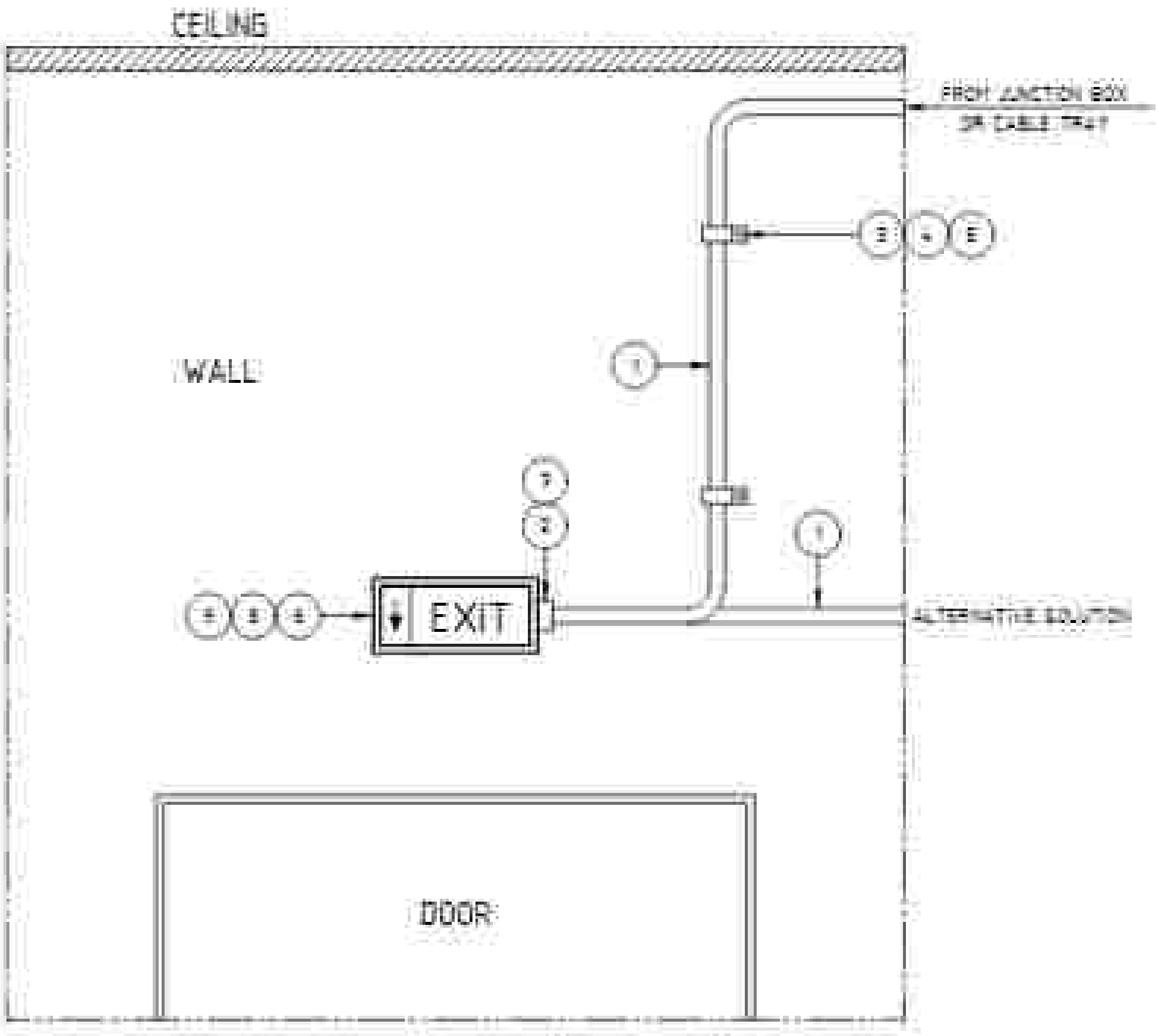
DETAIL "1"

DETAIL L-136

INDOOR/OUTDOOR INCANDESCENT LIGHTING ON STEEL STRUCTURE

TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE: LIGHTING FIXTURE INSTALLATION INDOOR/OUTDOOR INCANDESCENT LIGHTING ON STEEL STRUCTURE
	M.A.		
	CHECKED BY	DATE	
DETAIL No.: L-136	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :



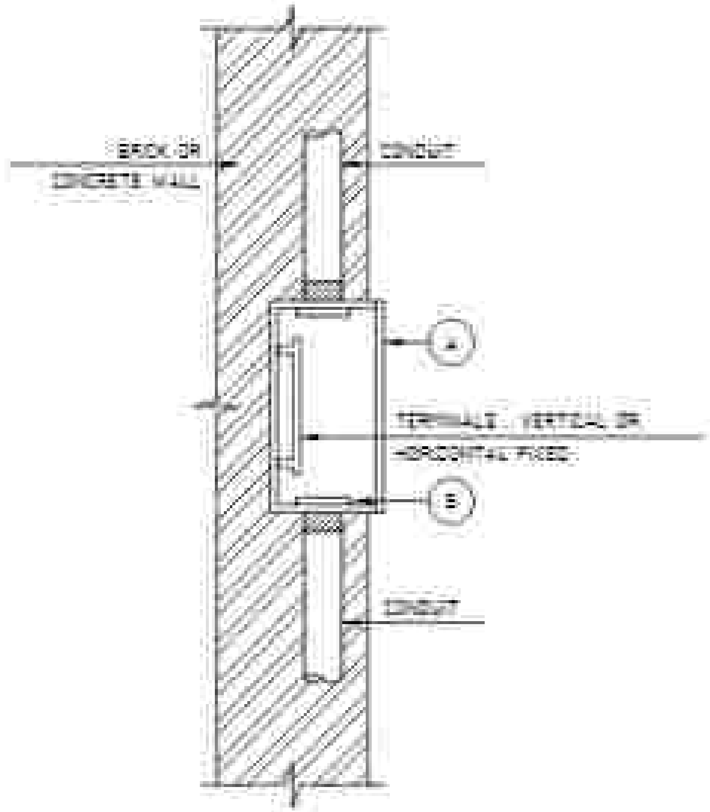
DETAIL L-137

WALL MOUNTED LIGHTING FIXTURE FOR EVACUATION LIGHT

ITEM	DESCRIPTION	QTY	REMARKS
1	GALVANIZED STELL RIGID CONDUIT Ø PG-13.5	AS REQ.	
2	GALVANIZED STELL 3 PIECES UNION Ø 19.5 mm	1	
3	GALVANIZED STEEL CLAMP Ø 19.5 mm WITH HOLE Ø 7 mm	1 ø METER	
4	NYLON EXPANSION BOLT 8x40 WITH SCREW M6x48	1 ø METER	
5	GALVANIZED STEEL SPRING WASHER Ø 7 mm	1 ø METER	
6	WALL MOUNTED LIGHTING FIX. WITH SCREW INCAN. LAMP	1	EVACUATION LAMP
7	GALVANIZED LOCK NUT Ø 19.5 mm	1	
8	GALVANIZED STEEL SPRING WASHER Ø 7 mm	2	
9	NYLON EXPANSION BOLT 8x40 WITH SCREW M6x48	2	

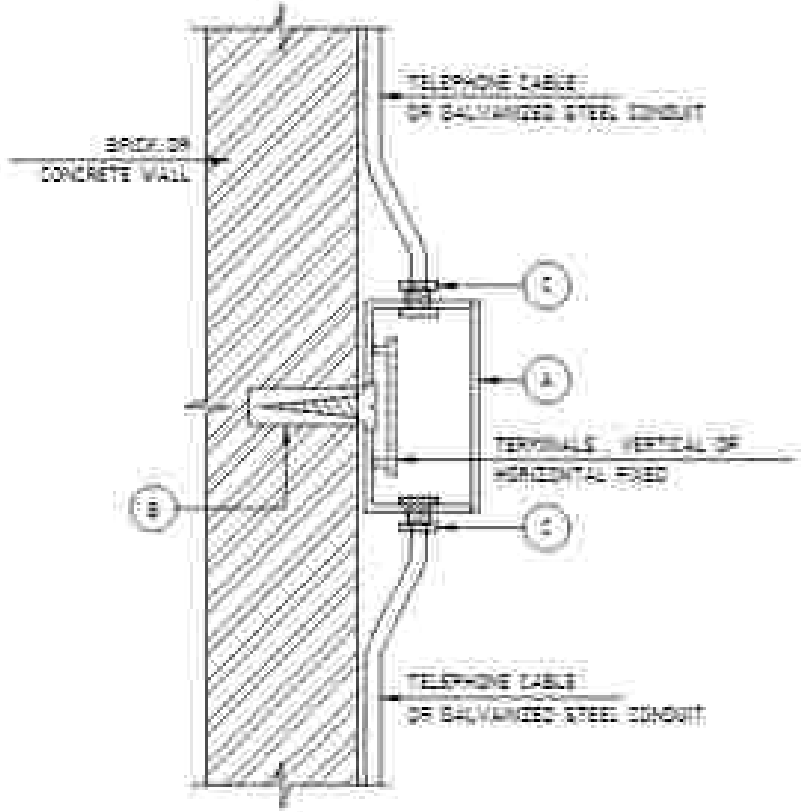
TARA TARH Engineering & Technological Co.	DRAWN BY:	DATE:	TITLE: LIGHTING FIXTURE INSTALLATION WALL MOUNTED LIGHTING FIXTURE FOR EVACUATION LIGHT
	M.A.		
	CHECKED BY:	DATE:	
DETAIL No.: L-137	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



DETAIL T-101 A

INDOOR TELEPHONE JUNCTION BOX , FLUSH MOUNTED



DETAIL T-101 B

INDOOR TELEPHONE JUNCTION BOX , SURFACE MOUNTED

ITEM	DESCRIPTION	QTY	REMARKS
A	TELEPHONE JUNCTION BOX , FLUSH MOUNTED INDOOR	1	
B	BRASS BUSHING	AS REQ.	ONLY FOR STEEL CONDUIT
C			

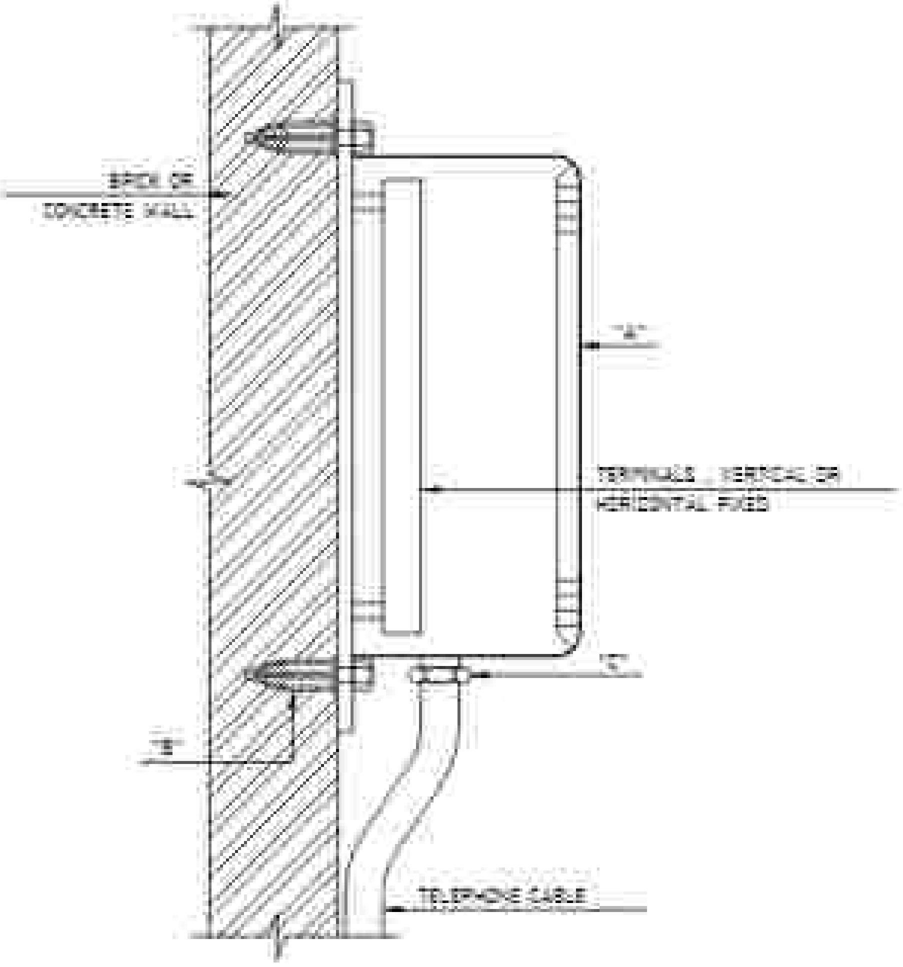
ITEM	DESCRIPTION	QTY	REMARKS
A	TELEPHONE JUNCTION BOX , SURFACE MOUNTED INDOOR	1	
B	FAN SCREW WITH RAWL PLUG M6x50	2	
C	CABLE GLAND OR GALV. RIGID STEEL CONDUIT COUPLING SET	AS REQ.	

NOTE :

1- INSTALLATION HEIGHT : 220 cm ABOVE FINISHED FLOOR.

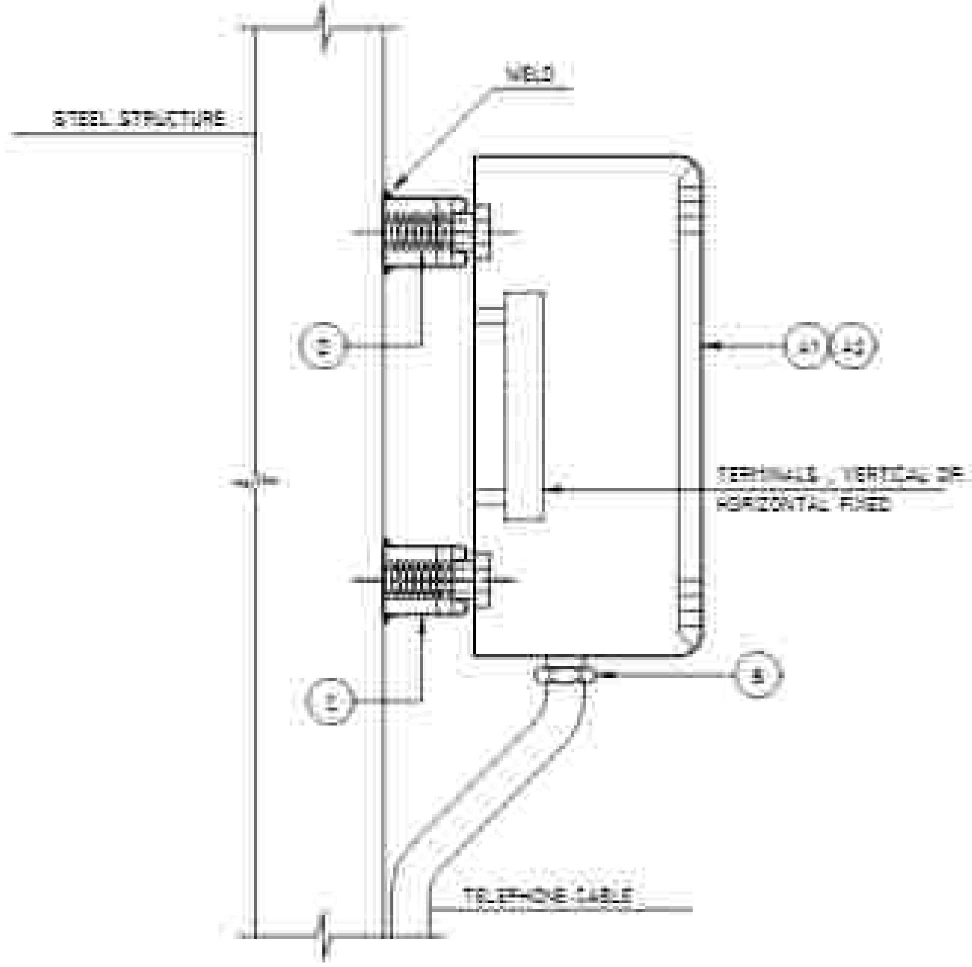
TARA TARH Engineering & Technological Co.	DRAWN BY	DATE	TITLE : FLUSH & SURFACE MOUNTED TELEPHONE JUNCTION BOX INSTALLATION
	M.A.		
	CHECKED BY	DATE	
DETAIL No. : T-101	SHEET NO. : 1 OF 1		SCALE : NOT TO SCALE

FILE NAME :



DETAIL T-102A

OUTDOOR TELEPHONE JUNCTION BOX , SURFACE MOUNTED



DETAIL T-102B

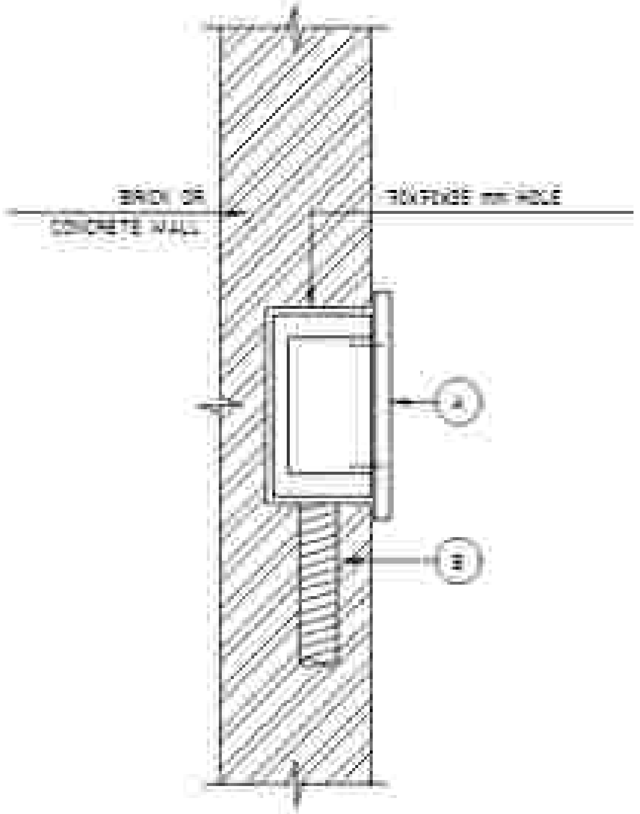
INDOOR OR OUTDOOR TELEPHONE JUNCTION BOX , SURFACE MOUNTED

ITEM	DESCRIPTION	QTY	REMARKS
A	TELEPHONE JUNCTION BOX , SURFACE MOUNTED , OUTDOOR	1	
B	BOLT PROJECTING RAWLBOLT , M8 TYPE 20RE	4	
C	CABLE GLAND	AS REQ	

ITEM	DESCRIPTION	QTY	REMARKS
A1	TELEPHONE JUNCTION BOX,SURFACE MOUNTED,OUTDOOR	1	
A2	TELEPHONE JUNCTION BOX,SURFACE MOUNTED,INDOOR	1	
B	CABLE GLAND	AS REQ	
C	STRUT CHANNEL , AS 20Y	AS REQ	
D	STRUT BOLT,NUT WITH SPRING & SQUARE WASHER,M8	4	

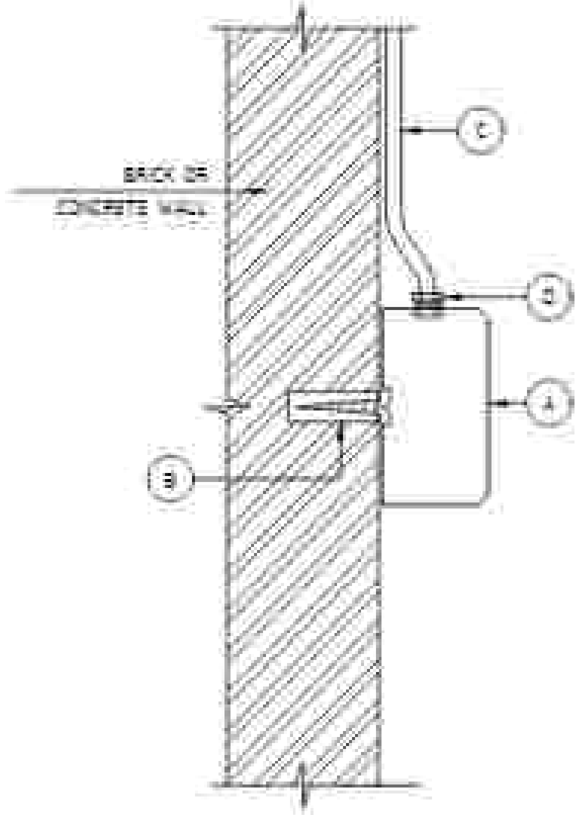
TARA TARH Engineering & Technological Co.	DRAWN BY: M.A. / CHECKED BY:	DATE: / DATE:	TITLE: SURFACE MOUNTED TELEPHONE JUNCTION BOX INSTALLATION
DETAIL No.: T-102	SHEET NO.:	1 OF 1	SCALE: NOT TO SCALE

FILE NAME :



DETAIL T-103A

TELEPHONE SOCKET OUTLET , FLUSH MOUNTED



DETAIL T-103B

TELEPHONE SOCKET OUTLET , SURFACE MOUNTED

ITEM	DESCRIPTION	QTY	REMARKS
A	TELEPHONE SOCKET OUTLET 2 PIN , INDOOR , FLUSH MOUNTED	1	
B	19 mm DIA. HEAVY GAUGE PVC CONDUIT	AS REQ	
C			

ITEM	DESCRIPTION	QTY	REMARKS
A	TELEPHONE OUTLET 2 PIN , INDOOR , SURFACE MOUNTED	1	
B	WOOD SCREW WITH RAWL PLUG M6X35	2	
C	19 mm DIA. GALVANIZED STEEL CONDUIT	AS REQ	
D	GALVANIZED RIGID STEEL CONDUIT FLANGED COUPLING SET , 19mm DIA	1	

TARA TARH Engineering & Technological Co.	DRAWN BY: M.A.	DATE:	TITLE: FLUSH & SURFACE MOUNTD TELEPHONE SOCKET OUTLET INSTALLATION
	CHECKED BY:	DATE:	
DETAIL NO.: T-103	SHEET NO.: 1 OF 1		SCALE: NOT TO SCALE

FILE NAME :

شرکت صنعت فولاد شادگان
Shadegan Steel Industry Co.

SHADEGAN STEEL COMPLEX

ELECTRICAL GENERAL & TYPICAL DETAILS

Design
TARA TARH
Engineering & Technological Co.

SEP. 2015
REV. A

NO.	DWG NO.	DRAWING TITLE	REVISION			NO.	DWG NO.	DRAWING TITLE	REVISION		
			0	A					0	A	
1	E-100	FLUSH MOUNTED ELECTRICAL PANEL INSTALLATION	X	X		48	L-106A	PENDANT TYPE HIGH BAY LIGHTING FIXTURE UNDER STEEL STRUCTURE	X	X	
2	E-101	SURFACE MOUNTED ELECTRICAL PANEL INSTALLATION	X	X		49	L-106B	PENDANT TYPE HIGH BAY LIGHTING FIXTURE UNDER STEEL STRUCTURE	X	X	
3	E-102	INDOOR SELF-MOUNTED DISTRIBUTION PANEL INSTALLATION ON CABLE TRENCH	X	X		50	L-107A	SURFACE MOUNTED FLUORESCENT FIXTURE UNDER DAMPA FALSE CEILING	X	X	
4	E-103	INDOOR SELF-MOUNTED DISTRIBUTION PANEL INSTALLATION ON CABLE CELLAR	X	X		51	L-107B	SURFACE MOUNTED FLUORESCENT FIXTURE UNDER DAMPA FALSE CEILING	X	X	
5	E-104	FLUSH & SURFACE MOUNTED LIGHTING SWITCH INSTALLATION	X	X		52	L-116A	ROADWAY LIGHTING POLE , 10m LONG	X	X	
6	E-105	FLUSH & SURFACE MOUNTED SOCKET OUTLET INSTALLATION	X	X		53	L-116B	ROADWAY LIGHTING POLE , 8m LONG , TYPE 1	X	X	
7	E-107A	WALL MOUNTED TRUNKING INSTALLATION	X	X		54	L-116C	ROADWAY LIGHTING POLE , 8m LONG , TYPE 2	X	X	
8	E-107B	WALL MOUNTED TRUNKING INSTALLATION	X	X		55	L-117	TERMINAL BOARD OF ROADWAY & FLOODLIGHT LIGHTING POLE	X	X	
9	E-116	TYPICAL CABLE ROAD CROSSING	X	X		56	L-118	STREET LIGHTING PANEL	X	X	
10	E-117	TYPICAL CABLE TRENCH SECTION	X	X		57	L-119A	TYPICAL LIGHTING POLE FOUNDATION	X	X	
11	E-118A	TYPICAL CABLE RUN OUT FROM CABLE TRAY	X	X		58	L-119B	TYPICAL LIGHTING POLE FOUNDATION	X	X	
12	E-118B	TYPICAL CABLE RUN OUT FROM CABLE TRAY	X	X		59	L-120	FLOODLIGHT POLE , 8m LONG	X	X	
13	E-118C	TYPICAL CABLE RUN OUT FROM CABLE TRAY	X	X		60	L-121A	FLOODLIGHT POLE , 15m LONG	X	X	
14	E-126	TYPICAL CONDUIT RUN OUT OF LOCAL PANELS	X	X		61	L-121B	FLOODLIGHT POLE , 20m LONG	X	X	
15	E-127	TYPICAL DETAIL FOR FIXING OF FLEX. PIPE TO LIGHTING FIXTURE OR JUNCTION BOX	X	X		62	L-122	FLOODLIGHT FIXING ON POLE TOP	X	X	
16	E-128	TYPICAL DETAIL FOR INDOOR 63A SURFACE MOUNTED POWER SOCKET	X	X		63	L-125	PARK LIGTHING POLE , 2.8m LONG	X	X	
17	F-101	FIRE ALARM CONTROL PANEL INSTALLATION	X	X		64	L-131A	SURFACE MOUNTED INCANDESCENT LUMINAIRE ON CONCRETE CEILING OR WALL	X	X	
18	F-102	FIRE ALARM JUNCTION BOX INSTALLATION	X	X		65	L-132	PENDANT TYPE HIGH BAY LIGHTING FIXTURE UNDER CABLE TRAY	X	X	
19	F-103	FIRE DETECTOR INSTALLATION	X	X		66	L-136	INDOOR/OUTDOOR INCANDESCENT LIGHTING ON STEEL STRUCTURE	X	X	
20	F-104	MANUAL CALL POINT INSTALLATION	X	X		67	L-137	WALL MOUNTED LIGHTING FIXTURE FOR EVACUATION LIGHT	X	X	
21	G-100	GROUNDING INSTALLATION DETAILS , GROUNDING ROD	X	X		68	T-101	FLUSH & SURFACE MOUNTED TELEPHONE JUNCTION BOX INSTALLATION	X	X	
22	G-101	GROUNDING INSTALLATION DETAILS , EARTH CONNECTION	X	X		69	T-102	SURFACE MOUNTED TELEPHONE JUNCTION BOX INSTALLATION	X	X	
23	G-102	GROUNDING INSTALLATION DETAILS , WALL MOUNTED EARTH BUSBAR	X	X		70	T-103	FLUSH & SURFACE MOUNTED TELEPHONE SOCKET OUTLET INSTALLATION	X	X	
24	G-103	GROUNDING INSTALLATION DETAILS , STEEL STRUCTURE MOUNTED EARTH BUSBAR	X	X		71	I-101	ELECTRICAL INSTALLATION MATERIALS	X	X	
25	G-104	GROUNDING INSTALLATION DETAILS , STEEL STRUCTURE EARTHING	X	X		72	I-102	ELECTRICAL INSTALLATION MATERIALS	X	X	
26	G-105	GROUNDING INSTALLATION DETAILS , LIGHTNING DETAILS & EARTHING MATERIALS	X	X		73	I-103	ELECTRICAL INSTALLATION MATERIALS	X	X	
27	G-108	GROUNDING INSTALLATION DETAILS , EARTHING CONNECTION	X	X		74	I-104	ELECTRICAL INSTALLATION MATERIALS	X	X	
28	G-112	GROUNDING INSTALLATION DETAILS , EARTHING WELL	X	X		75	I-105	ELECTRICAL INSTALLATION MATERIALS	X	X	
29	G-118	GROUNDING INSTALLATION DETAILS , TYPICAL GROUNDING OF ELEC. BOARDS	X	X		76	I-106	ELECTRICAL INSTALLATION MATERIALS	X	X	
30	G-121	GROUNDING INSTALLATION DETAILS , TYPICAL BRANCH WIRE CONNECTION	X	X		77	I-107	ELECTRICAL INSTALLATION MATERIALS	X	X	
31	G-126	GROUNDING INSTALLATION DETAILS , LIGHTING POLE	X	X		78	I-108	ELECTRICAL INSTALLATION MATERIALS	X	X	
32	G-127	GROUNDING INSTALLATION DETAILS , EARTHING LUG	X	X		79	I-109	ELECTRICAL INSTALLATION MATERIALS	X	X	
33	G-128	GROUNDING INSTALLATION DETAILS , STUB-UP CONDUIT PIPE	X	X		80	R-100	CABLE RACKS & TRAYS GENERAL NOTES	X	X	
34	G-129	GROUNDING INSTALLATION DETAILS , CONDUIT SUPPORT	X	X		81	R-101	CABLE RACK INSTALLATION	X	X	
35	G-130	GROUNDING INSTALLATION DETAILS , SELECTION CHART	X	X		82	R-102	CABLE RACK INSTALLATION	X	X	
36	L-100	FLUSH MOUNTED FLUORESCENT FIXTURE UNDER DAMPA FALSE CEILING	X	X		83	R-103	CABLE RACK INSTALLATION	X	X	
37	L-101A	FLUSH MOUNTED FLUORESCENT FIXTURE UNDER PLASTER FALSE CEILING	X	X		84	R-104	CABLE RACK INSTALLATION	X	X	
38	L-101B	FLUSH MOUNTED FLUORESCENT FIXTURE UNDER PLASTER FALSE CEILING	X	X		85	R-105	CABLE TRAY INSTALLATION	X	X	
39	L-102A	SURFACE MOUNTED FLUORESCENT FIXTURE UNDER BRICK CEILING	X	X		86	R-106	CABLE TRAY INSTALLATION	X	X	
40	L-102B	SURFACE MOUNTED FLUORESCENT FIXTURE UNDER BRICK CEILING	X	X		87					
41	L-102C	SURFACE MOUNTED FLUORESCENT FIXTURE UNDER BRICK CEILING	X	X		88					
42	L-103A	SURFACE MOUNTED FLUORESCENT FIXTURE UNDER CONCRETE CEILING	X	X		89					
43	L-103B	SURFACE MOUNTED FLUORESCENT FIXTURE UNDER CONCRETE CEILING	X	X		90					
44	L-104A	PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE	X	X		91					
45	L-104B	PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE	X	X		92					
46	L-104C	PENDANT TYPE FLUORESCENT FIXTURE UNDER STEEL STRUCTURE	X	X		93					
47	L-105	STEEL STRUCTURE MOUNTED FLUORESCENT FIXTURE	X	X		94					

REV.	DATE	DESCRIPTION	CK. BY	APP. BY
A	09/2015	ISSUED FOR CONSTRUCTION	P. K.	A. S.
0	07/2011	ISSUED FOR APPROVAL	H. J.	M. Z.

CLIENT : Shadegan Steel Industry Co.

PROJECT : SHADEGAN STEEL COMPLEX

TARA TARH Engineering & Technological Co.

TITLE : ELECTRICAL GENERAL & TYPICAL DETAILS

DESIGNED BY: - | DRAWN BY: M. A. | DATE: 07/2011
CHKD BY: H. J. | APP. BY: M. Z. | SCALE: N.T.S.

DWG NO: TA-140-1230-E-DW001
CLIENT DWG NO: SATU1800E000000001A
SHEET: 1 OF 1 | REV: A

NOTES

1. CONTRACTOR SHALL CHECK ALL OF THE DRAWINGS OF DIFFERENT TRADES (ARCH. , STRUC. , MECH. & ELEC.) BEFORE EXECUTION AND SHALL INFORM ABOUT ANY COORDINATION PROBLEM.
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE

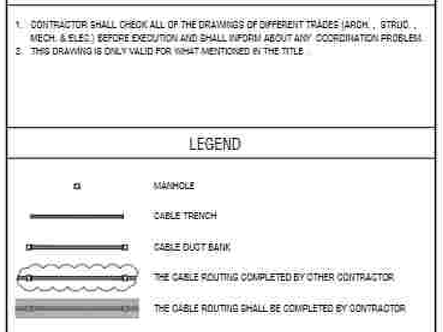
LEGEND

- MANHOLE
- CABLE TRENCH
- CABLE DUCT BANK
- THE CABLE ROUTING COMPLETED BY OTHER CONTRACTOR
- THE CABLE ROUTING SHALL BE COMPLETED BY CONTRACTOR
- THE CABLE ROUTING COMPLETED BY EMPLOYER IN FUTURE (OUT OF SCOPE OF CONTRACTOR)
- SLPXX — SITE LIGHTING PANEL, OUTDOOR TYPE
- CTSX — COMPACT TRANSFORMER STATION
- FLOOD LIGHTING TOWER WITH CABLING COMPLETED BY OTHER CONTRACTOR
- FLOOD LIGHTING TOWER WITH CABLING SHALL BE COMPLETED BY CONTRACTOR IN PHASE 1
- FLOOD LIGHTING TOWER WITH CABLING SHALL BE COMPLETED BY CONTRACTOR IN PHASE 2

TA-140-U00-E-DW001	ELECTRICAL SYSTEMS STANDARD DETAILS
DWG NO.	DESCRIPTION

REFERENCE DRAWING

KEY PLAN :



REV.	DATE	DESCRIPTION	CHK. BY	APP. BY
L	11/2020	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
K	07/2019	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
J	06/2019	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
I	02/2019	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
H	10/2018	REVISED DUE TO LT-11350/556 - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
G	10/2018	REVISED DUE TO LT-11350/600 - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
F	03/2018	GENERALLY REVISED FOR TENDER - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
E	08/2017	GENERALLY REVISED FOR TENDER - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
D	09/2016	GENERALLY REVISED - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
C	12/2015	REVISED DUE TO NEW LAYOUT - ISSUED FOR CONSTRUCTION	F. R.	A. S.
B	10/2015	GENERALLY REVISED - ISSUED FOR CONSTRUCTION	F. R.	A. S.
A	06/2013	ISSUED FOR CONSTRUCTION	F. G.	M. Z.
0	05/2012	ISSUED FOR APPROVAL	F. G.	M. Z.

CLIENT: شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

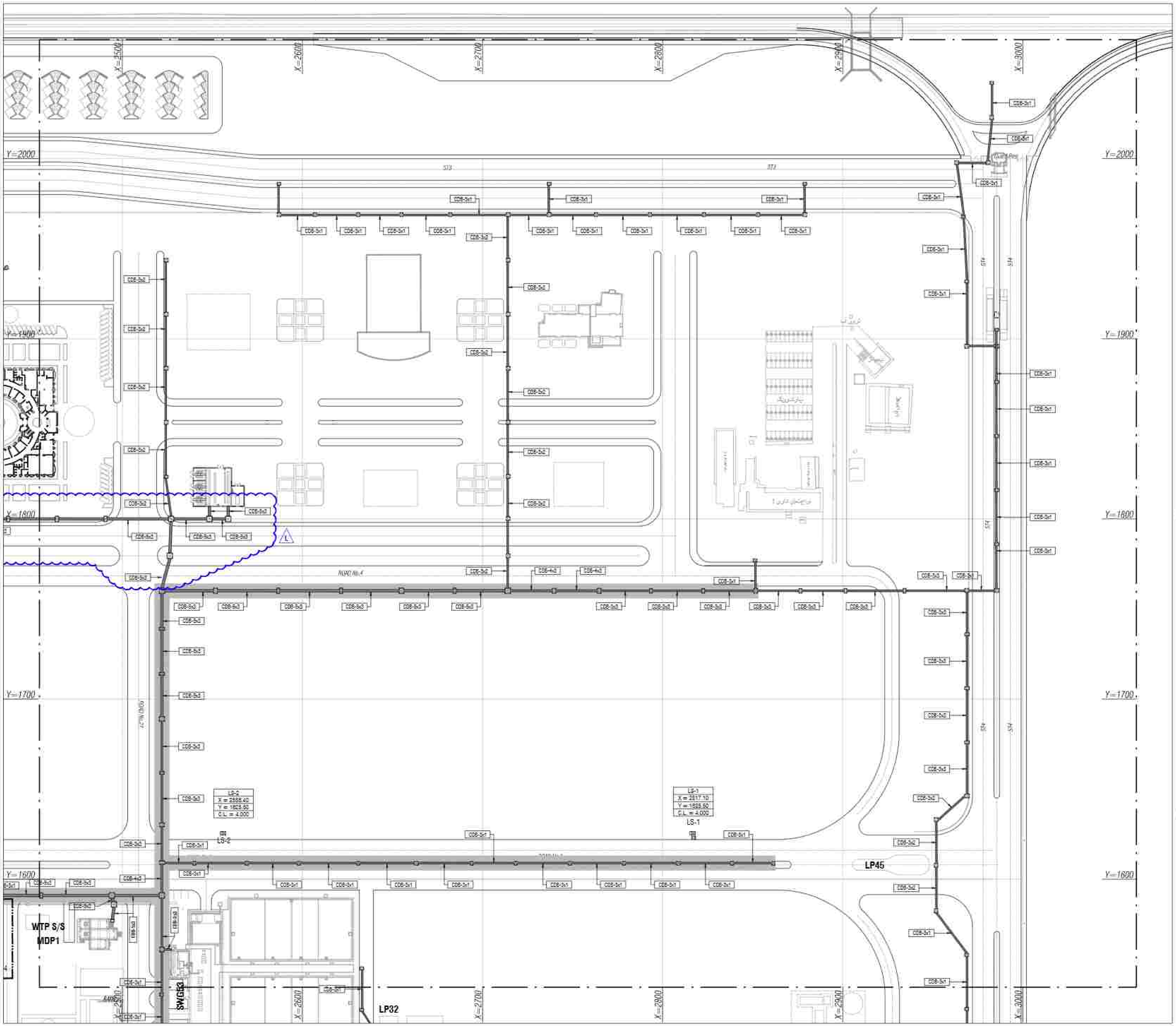
CONSULTANT: TARA TARH

PROJECT TITLE: SHADEGAN STEEL COMPLEX

DESIGNED BY:	A. MAHMOUDI
DRAWN BY:	M. ASGHARI
CHECKED BY:	F. GOLDHIN
APPROVED BY:	M. ZORRIASATEIN
DATE:	05/2012

DWG TITLE : SITE PLAN PART "2" CABLE ROUTE LAYOUT

CLIENT-DWG. NO.	SDTU1 G75 E25 102 001 I	SCALE : 1/1000	SIZE : A1
TARA DWG. NO.	TA-140-U31-E-DW102	SH. 1 OF 1	REV. L



NOTES

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2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE .

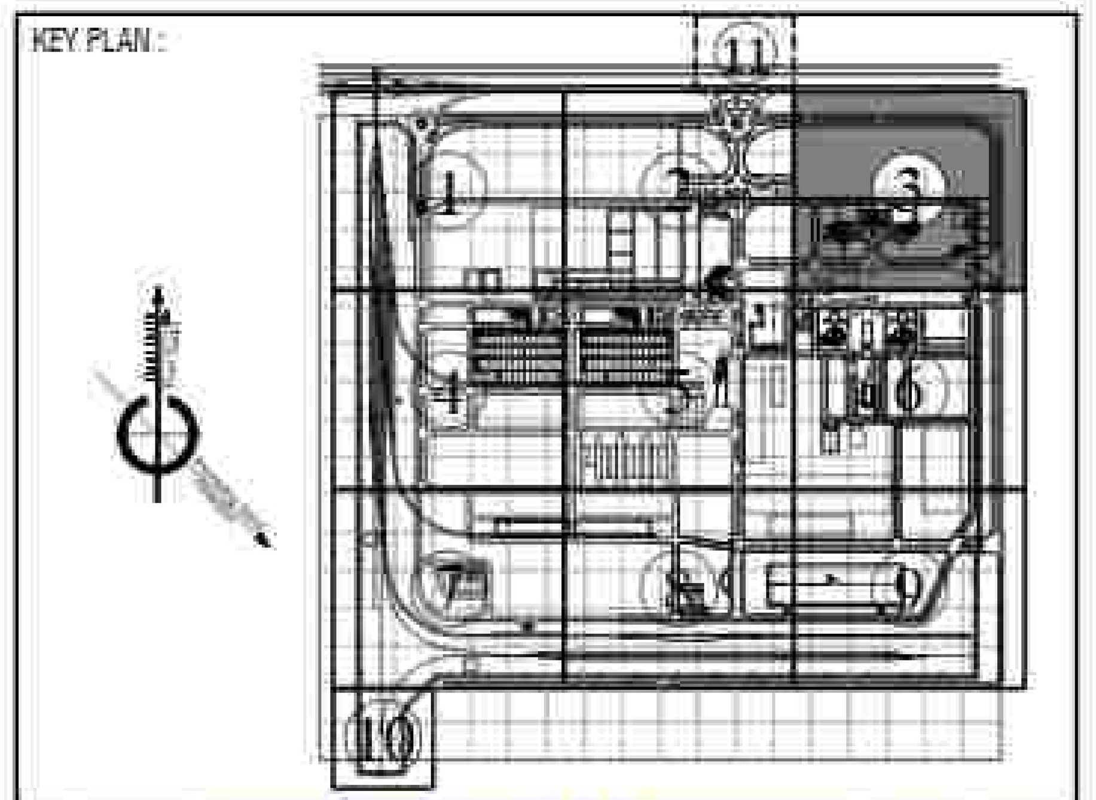
LEGEND

- MANHOLE
- CABLE TRENCH
- CABLE DUCT BANK
- THE CABLE ROUTING COMPLETED BY OTHER CONTRACTOR
- THE CABLE ROUTING SHALL BE COMPLETED BY CONTRACTOR
- THE CABLE ROUTING COMPLETED BY EMPLOYER IN FUTURE (OUT OF SCOPE OF CONTRACTOR)
- SLPXX — SITE LIGHTING PANEL, OUTDOOR TYPE
- CTSX — COMPACT TRANSFORMER STATION
- FLOOD LIGHTING TOWER WITH CABLING COMPLETED BY OTHER CONTRACTOR
- FLOOD LIGHTING TOWER WITH CABLING SHALL BE COMPLETED BY CONTRACTOR IN PHASE 1
- FLOOD LIGHTING TOWER WITH CABLING SHALL BE COMPLETED BY CONTRACTOR IN PHASE 2

DWG NO.	DESCRIPTION
TA-140-U30-E-DW001	ELECTRICAL SYSTEMS STANDARD DETAILS

REFERENCE DRAWING

KEY PLAN :



REV.	DATE	DESCRIPTION	CHK. BY	APP. BY
L	11/2020	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
K	07/2019	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
J	05/2019	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
I	02/2019	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
H	12/2018	REVISED DUE TO LT.11250/556 - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
G	10/2018	REVISED DUE TO LT.11250/500 - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
F	02/2018	GENERALLY REVISED FOR TENDER - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
E	08/2017	GENERALLY REVISED FOR TENDER - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
D	09/2016	GENERALLY REVISED - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
C	12/2015	REVISED DUE TO NEW LAYOUT - ISSUED FOR CONSTRUCTION	P. R.	A. S.
B	10/2015	GENERALLY REVISED - ISSUED FOR CONSTRUCTION	P. R.	A. S.
A	06/2013	ISSUED FOR CONSTRUCTION	F. S.	M. Z.
0	03/2012	ISSUED FOR APPROVAL	F. S.	M. Z.

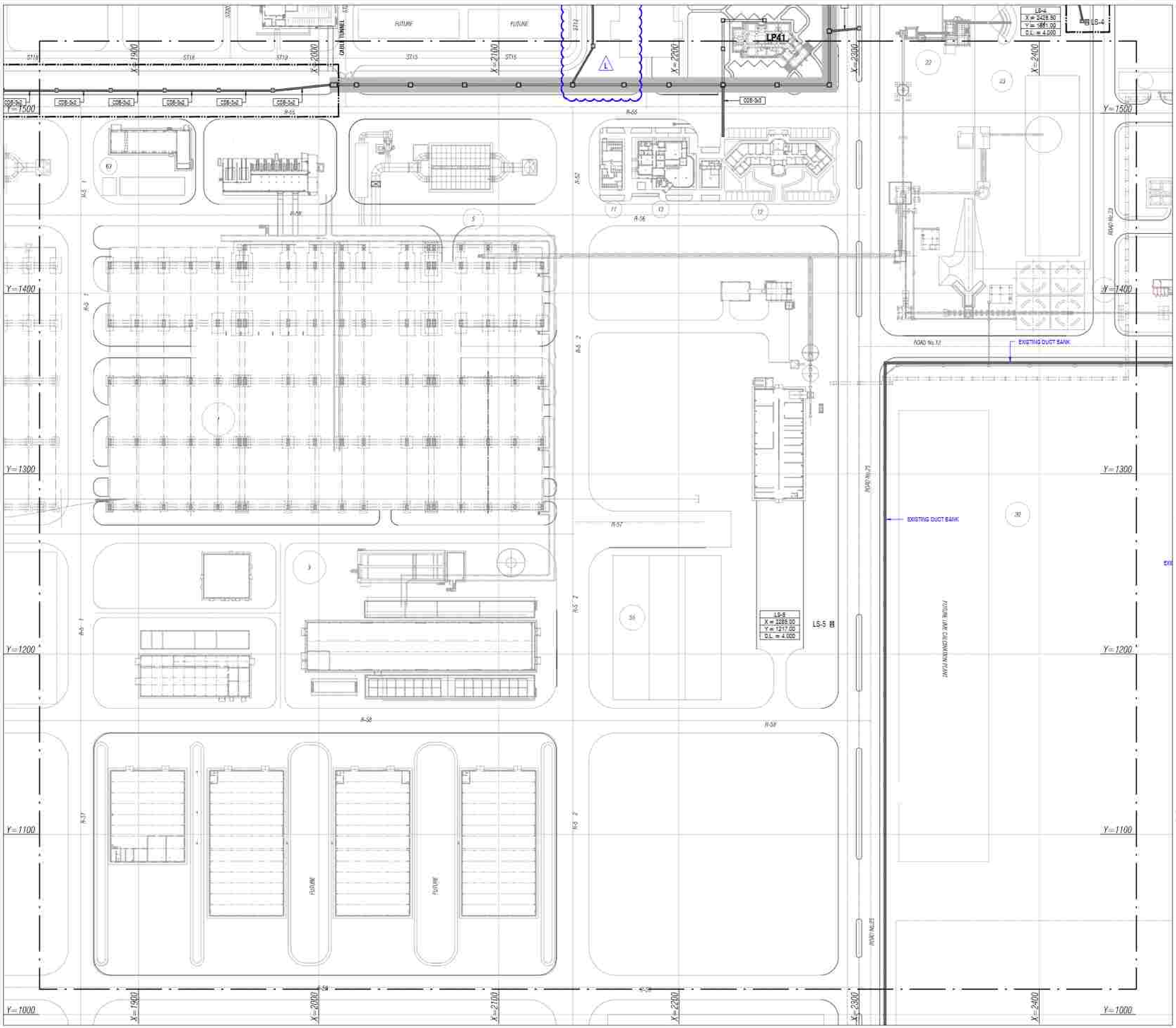
CLIENT: شرکت صنعت فولاد شادگان — Shadegan Steel Industry Co.

CONSULTANT: TARA TARH

PROJECT TITLE: SHADEGAN STEEL COMPLEX

DESIGNED BY:	A. MAHMOUDI	DWG TITLE : SITE PLAN PART "3" CABLE ROUTE LAYOUT
DRAWN BY:	M. ASGHANI	
CHECKED BY:	F. GOLCHIN	
APPROVED BY:	M. ZORRIASATEIN	
DATE:	03/2012	

CLIENT-DWG. NO.	SDTU1 G75 E25 103 001 I	SCALE : 1/1000	SIZE : A1
TARA DWG. NO.	TA-140-U31-E-DW103	SH. 1 OF 1	REV. L



NOTES

1. CONTRACTOR SHALL CHECK ALL OF THE DRAWINGS OF DIFFERENT TRADES (ARCH. , STRUC. , MECH. & ELEC.) BEFORE EXECUTION AND SHALL INFORM ABOUT ANY COORDINATION PROBLEM.
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE .

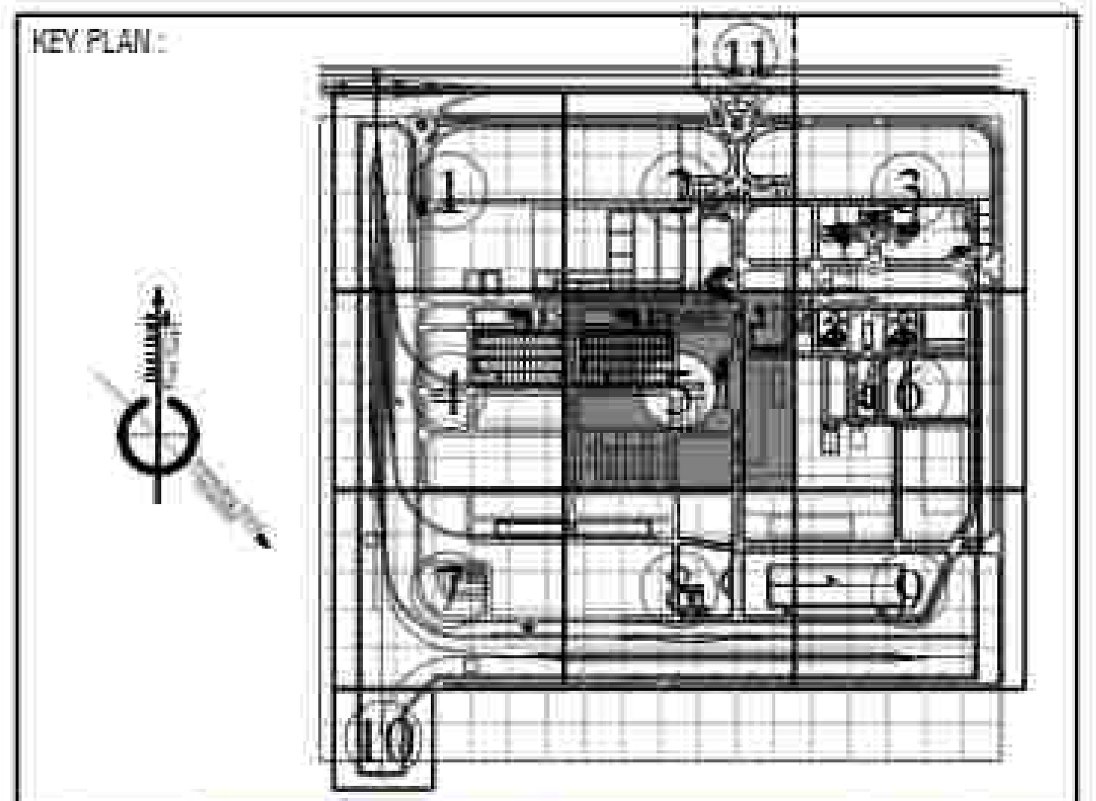
LEGEND

- MANHOLE
- CABLE TRENCH
- CABLE DUCT BANK
- THE CABLE ROUTING COMPLETED BY OTHER CONTRACTOR
- THE CABLE ROUTING SHALL BE COMPLETED BY CONTRACTOR
- THE CABLE ROUTING COMPLETED BY EMPLOYER IN FUTURE (OUT OF SCOPE OF CONTRACTOR)
- SLPXX — SITE LIGHTING PANEL, OUTDOOR TYPE
- CTSX — COMPACT TRANSFORMER STATION
- FLOOD LIGHTING TOWER WITH CABLING COMPLETED BY OTHER CONTRACTOR
- FLOOD LIGHTING TOWER WITH CABLING SHALL BE COMPLETED BY CONTRACTOR IN PHASE 1
- FLOOD LIGHTING TOWER WITH CABLING SHALL BE COMPLETED BY CONTRACTOR IN PHASE 2

DWG NO.	DESCRIPTION
TA-140-U30-E-DW001	ELECTRICAL SYSTEMS STANDARD DETAILS

REFERENCE DRAWING

KEY PLAN :



REV.	DATE	DESCRIPTION	CHK. BY	APP. BY
L	11/2020	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
K	07/2019			
J	06/2019	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
I	02/2019	REVISED DUE TO CLIENT COMMENT - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
H	10/2018	REVISED DUE TO LT.11250/556 - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
G	10/2018	REVISED DUE TO LT.11250/600 - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
F	02/2018	GENERALLY REVISED FOR TENDER - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
E	08/2017	GENERALLY REVISED FOR TENDER - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
D	09/2016	GENERALLY REVISED - ISSUED FOR CONSTRUCTION	S. KH.	A. S.
C	12/2015	REVISED DUE TO NEW LAYOUT - ISSUED FOR CONSTRUCTION	P. R.	A. S.
B	10/2015	GENERALLY REVISED - ISSUED FOR CONSTRUCTION	P. R.	A. S.
A	05/2013	ISSUED FOR CONSTRUCTION	F. S.	M. Z.
0	03/2012	ISSUED FOR APPROVAL	F. S.	M. Z.

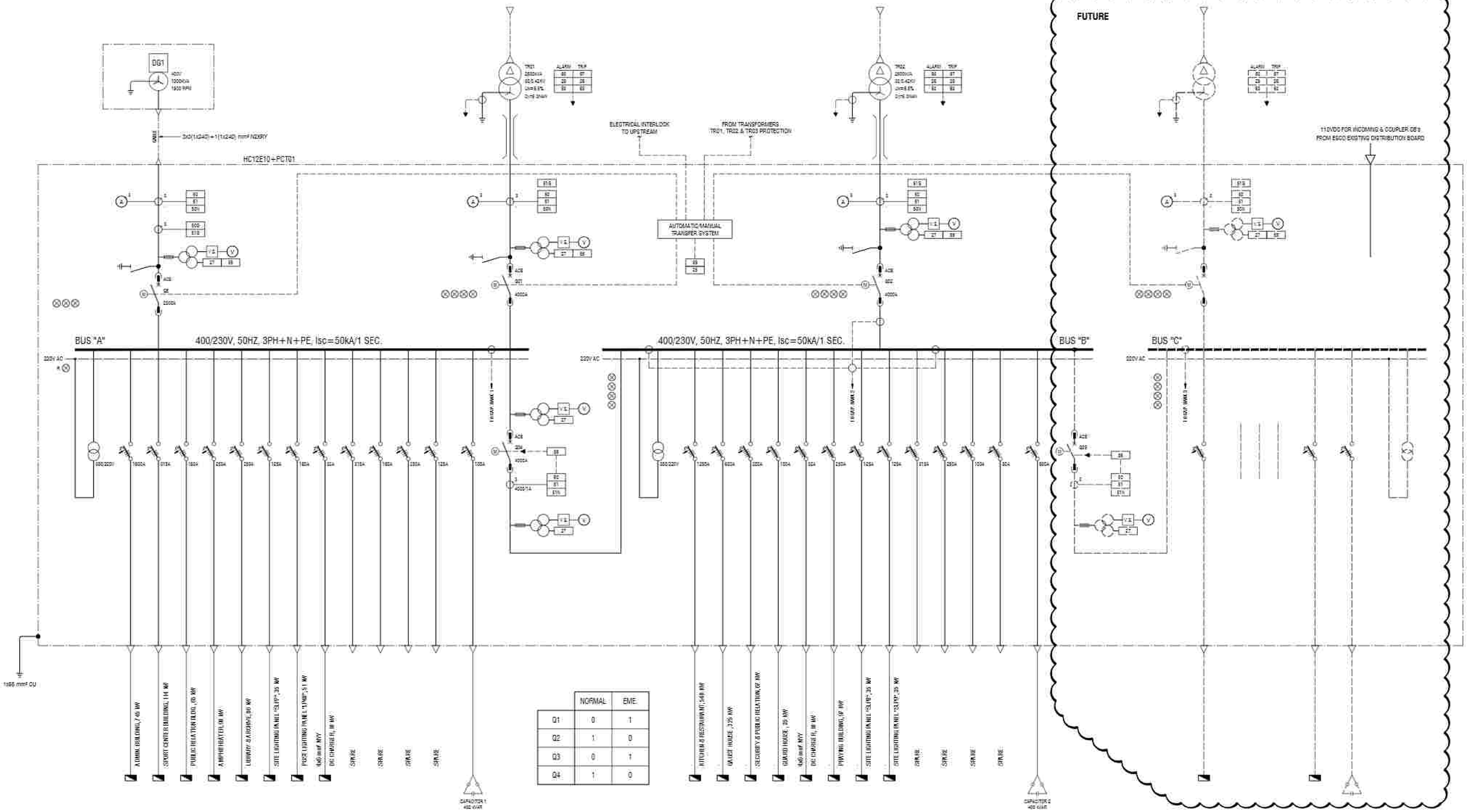
CLIENT: شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

CONSULTANT: TARA TARH

PROJECT TITLE: SHADEGAN STEEL COMPLEX

DESIGNED BY:	A. MAHMOUDI	DWG TITLE : SITE PLAN PART "5" CABLE ROUTE LAYOUT
DRAWN BY:	M. ASGHANI	
CHECKED BY:	F. GOLCHIN	
APPROVED BY:	M. ZORRIASATEIN	
DATE:	03/2012	

CLIENT-DWG. NO.	SDTU1 G75 E25 105 001 L	SCALE : 1/1000	SIZE : A1
TARA DWG. NO.	TA-140-U31-E-DW105	SH. 1 OF 1	REV. L



	NORMAL	EME.
Q1	0	1
Q2	1	0
Q3	0	1
Q4	1	0

NOTES

1. CONTRACTOR SHALL CHECK ALL OF THE DRAWINGS OF DIFFERENT TRADES (ARCH. , STRUC. , MECH. & ELEC.) BEFORE EXECUTION AND SHALL INFORM ABOUT ANY COORDINATION PROBLEM.
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE.
3. IN NORMAL OPERATION QD-1 AND QD-3 (BUS COUPLER) ARE CLOSED. IN POWER OFF EMERGENCY OPERATION QD-1 AND QD-3 OPEN AND QD-2 CLOSES AFTER A PRESPIRED DELAY ALLOWING DIESEL GENERATOR TO START AND SUPPLY POWER. ON RESTORATION OF MAIN POWER THE REVERSE ACTION SHALL BE DONE.

DWG NO.	DESCRIPTION
REFERENCE DRAWING	

REV.	DATE	DESCRIPTION	CHK.	APP.
E	07/2020	GENERALLY REVISED - ISSUED FOR CONSTRUCTION	S.KH.	A.S.
D	03/2018			
C	06/2017			
B	09/2015			
A	05/2012	ISSUED FOR CONSTRUCTION	F. G.	M. Z.
0	11/2011	ISSUED FOR APPROVAL	F. G.	M. Z.

CLIENT: شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

CONSULTANT: TARA TARH

PROJECT TITLE: SHADEGAN STEEL COMPLEX

DESIGNED BY:	A. MAHMOUDI
DRAWN BY:	M. ASGHARI
CHECKED BY:	F. GOLDHIN
APPROVED BY:	M. ZORRIASATEIN
DATE:	11/2011

DWG TITLE: SITE PLAN — MDP2 — SINGLE LINE DIAGRAM

CLIENT-DWG. No:	SDTU1 G75 E70 113 001 E	SCALE: NTS	SIZE: A1
TARA DWG. No:	TA-140-U31-E-DW113	SH. No: 1 OF 1	REV. E

SHADEGAN STEEL COMPLEX

UTILITY SUBSTATION

Tara Tarh Doc. №: TA-140-U48-E-DS007				**Rev.:A**	**№ of Pages** 6	
Client Doc. №:: SWTU11048E70007001A						
Document Title: **Data Sheet for Utility Substation LV Switchgear**						
A	Nov. 2016	Issued for Construction	H. Joghataei	S. Khaksari	M. Saeedi	A. Salamat
0	May 2013	Issued for Approval	N. Sedighi	R. Zamani	F.Golchin	M.Zorrias.
Rev.	Date	Subject	Preparation	Checking	Verification	Approval

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Engineering & Technological Co.

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Tel: (98 21) 88337394
Fax: (98 21) 88337397
Email: tara@tara-tarh.com
Web site: http://www.tara-tarh.com

Table of Contents

GENERAL DATA

Project Name	SHADEGAN Steel Complex
Manufacturer	
Tag №	
Quantity	1 Set

SITE CONDITION

Site elevation	6 meters above sea level		
Minimum ambient temperature	+1 °C		
Maximum outdoor temperature	+51 °C		
Relative humidity	93%		
Area classification	☐ Zone 1	☐ Zone 2	☑ Safe area

COMPONENT / ACCESSORIES

Specification №		
Single line diagram №		
Applicable standard	☑ IEC ☐ VDE	☐ BS
Degree of protection	IP42 (Minimum)	
Cubicle Type		
Incomer	☑ Withdrawable	☐ Fixed
Bus Tie	☑ Withdrawable	☐ Fixed
Capacitor Feeder	☑Withdrawable	☐ Fixed
Motor Starter	☑ Withdrawable	☐ Fixed
Sub Feeder	☑ Withdrawable	☐ Fixed
Lighting Feeder	☑ Withdrawable	☐ Fixed
Separate Control Voltage Circuits Individually Fused By MCB	☑ For Display and alarms	☐ For Panel Heater
Sheet Steel Thickness	2 mm (Minimum)	
Cable Entry	☐ From top	☑ From bottom
Bus duct Entry	☑ From top	☐ From bottom
Accessibility	☐ Front	☑ Rear
Cubicle Space Heater	By Supplier	
Switchgear Waste Heat		KW
Paint Finish Color	RAL7032	

Electrical Data

Voltage	400V ± 10%	
Frequency	50Hz ± 0.5%	
Short Circuit Capability	50 kA	1 Sec
Insulation Voltage	1kV	
Rated Earthing Short time Withstand	3 kV	
Control Voltage	110V DC from external(for incomers & bus tie only)	
Control Voltage Supply	☑ Internal	☐ External

Required Control Voltage Power	By supplier	
Neutral System	☐ IT ☐ TNC	☐ TT ☑ TNCS

Busbar

Busbar System	Single Busbar	
Main Busbars Rating & Section	By Supplier	
Main Busbar Type	☑ Insulated	☐ Bare
Distribution Busbars	By Supplier	
Distribution Busbar Type	☑ Insulated	☐ Bare
Manufacturer / Model Type	By Supplier	

Switching Devices

	Type	Hand Operated	Motor Operated	Coil Operated	Control Voltage
Incomer	ACB	☐	☑	☐	110V DC
Bus Tie		☐	☑	☐	110V DC
Motor Feeder < 110 kW	MCCB	☑	☐	☑	
Motor Feeder ≥ 110 kW	MCCB	☑	☐	☑	
Compensation Feeder	F	☑	☐	☑	

Protection Devices

Incomer	See SLD
Bus Tie	See SLD
Motor Feeder < 110 KW	See SLD
Motor Feeder > 110 KW	See SLD
Transformer Feeder	See SLD
Compensation Feeder	See SLD

Type of Relays

☐ Electromechanical	☑ Solid State
☑ Microprocessor	☑ Multifunction Type
☑ With Drawable	☑ Programmable
☐ Serial Data Interface	☐ Bimetal Type

Voltage Transformer

	Incomers	Bus bars
Ratio / Qty	400/110V	400/110V
Power / Class	By Supplier	By Supplier
Fuse	☑ Primary	☑ Secondary
Selector Switch For V-Meter	☑ Yes	☐ No

Current Transformer

Outgoing Current Transformer	Protection	Measuring
Ratio / Qty	X/5A	X/1A
Power / Class	5P10	CL 1
Selector Switch	☐ Yes	☑ No

Core-Balance Current Transformer	Protection	Measuring
Ratio / Qty	X/5A	
Power / Class	By Supplier	

Instrument

Amp Meter	See SLD
Volt Meter	See SLD
Cos φ Meter	See SLD
KWh Meter	See SLD
kVAR Meter	See SLD
Frequency Meter	See SLD

Transfer System

Automatic Reacceleration	☑ Automatic	☐ Manual
Reactive Power Compensation Pane	☑ Yes	☐ No
Switching Device Of Compensation Unit	☑ Include	☐ Not Include

Signals, Indications and Alarms

Indications	Lamp/ Mechanical/ Buzzer	Signal Out

Motor Or CB On	Lamp	☑
Motor Or CB Off	Lamp	☑
Motor Or CB Fault	Lamp	☑
Heater On	Lamp	☐
Earthing Switch	Lamp	☐
Emergency Stop	Lamp	☑
Switchgear General Alarm	Lamp/ Buzzer	☑
Auto Transfer Operation	Lamp	☑
Local/Remote Selection	Lamp	☐

Mechanical Arrangement

Lifting eye	☑ Required	☐ Not Required
Earthing bolt	☑ Required	☐ Not Required
Terminal blocks	☑ Required	☐ Not Required
Cubicle Arrangement	☑ Free Standing	☐ Wall Mounted
Room Floor Design	☑ Concrete Floor	☐ False Floor
Switch Gear Base Frame	☑ Required	☐ Not Required
Cubicle Gland Plate	☑ Required	☐ Not Required
Switch Gear Extendible	☐ From One Side	☑ From Both Sides
Panel Weight/No. Of Panels		kg
Switch Gear Dimension	Length	mm
	Depth Total	mm
	Length	mm

Spare Part List for 2 Years Operation
By Supplier

SHADEGAN STEEL COMPLEX

UTILITY SUBSTATION

Tara Tarh Doc. Nr: TA-140-U48-E-DS008			**Rev.:** B		**Nr. of Pages** 6	
Client Doc. Nr: SWTU1U48E700080001B						
Document Title: **Data Sheet for Utility Substation MV Switchgear**						
B	June 2020	Issued for Construction	H. Joghataei	S. Khakveri	S. Khakveri	A. Salamat
A	Nov. 2016	Issued for Construction	H. Joghataei	S. Khakveri	M. Saeedi	A. Salamat
1	Oct 2013	Issued for Approval	S.Sadri	P.Rajabi	M.Saeidi	M.Zorriasatin
0	May 2013	Issued for Approval	N. Sedighi	R. Zamani	F.Golchin	M.Zorriasatin
Rev.	Date	Subject	Preparation	Checking	Verificatio	Approval

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Tel: (98 21) 88837394
Fax: (98 21) 88837397
Email: tara@taratarh.com
Web site: http://www.taratarh.com

Table of Contents:

GENERAL DATA

Project Name	SHADEGAN Steel Complex
Manufacturer	
Tag №	
Quantity	1 Set

SITE CONDITION

Site elevation	6 meters above sea level		
Minimum ambient temperature	+1 °C		
Maximum outdoor temperature	+51 °C		
Relative humidity	93%		
Area classification	☐ Zone 1	☐ Zone 2	☑ Safe area

COMPONENT / ACCESSORIES

Specification №		
Single line diagram №		
Applicable standard	☑ IEC ☐ VDE	☐ BS
Enclosure	Metal Clad Acc. To IEC60298	
Degree of protection	IP42 (Minimum)	
Cubicle Type	☑Withdraw able	☐Fixed
Sheet Steel Thickness	2.5 mm (Minimum)	
Incoming Cable Entry	☐ From top	☑ From bottom
Outgoing Cable Entry	☐ From top	☑ From bottom
Cubicle Space Heater	By Supplier	
Switchgear Waste Heat		KW
Paint Finish Color	RAL 7032	
Bus bar material	Hard Drawn Copper	
Main Bus bar Insulation Material	Flame Retardant Non hygroscopic	
Accuracy Class Of Measuring & Control System	CL1	

B

Electrical Data

Voltage	40.5 kV	
Frequency	50Hz ± 5%	
Short Circuit Capability	31.5kA	1 Sec
Short-duration power frequency withstand voltage		
Rated Lightning Impulse Withstand		
Control Voltage	110V DC	
Control Voltage Supply	☐ Internal	☑ External
Voltage Of Space Heater	230 VAC	

Neutral System	☐IT ☐ TNC	☑ TT ☐ TNCS

Circuit Breakers

Manufacturer / Country	By Supplier
Type of CB (SF6 / Vacuum / Others)	Vacuum
Maximum System Voltage	40.5 kV
Rated Current	Acc. To Single Line Diagram
Closing Time	By Supplier
Spring Charge Motor Voltage Supply	110 VDC
Weight Of One Unit	By Supplier

PT

Manufacturer	By Supplier
Type Of Construction	Epoxy Cast Resin
Operating Voltage	Suitable with voltage level of switchgear
Rated Secondary Voltage	110 V
Accuracy Class	CL 0.5 & 3p
Single / 3 Phase	Single Phase
Burden	Acc. To Single Line Diagram

CT

Manufacturer	By Supplier
Type Of Construction	Epoxy Cast Resin
Operating Voltage	Suitable with voltage level of switchgear
Rated Primary Current	Acc. To Single Line Diagram
Rated Secondary Current	1A
Accuracy Class	CL 0.5 & 3p
Single / 3 Phase	Single Phase
Burden	Acc. To Single Line Diagram

Switching Devices

	Hand Operated	Motor Operated	Coil Operated	Control Voltage
Incomer	☐	☑	☐	110V DC
Outgoing Feeder	☐	☑	☐	110V DC

Protection Devices

Incomer	See SLD
Transformer Feeder	See SLD

Type of Relays

☐ Electromechanical
☑ Solid State
☑ Microprocessor
☑ Multifunction Type
☑ Withdraw able
☑ Program able
☐ Serial Data Interface
☐ Bimetal Type

Instrument

Amp Meter	See SLD
Volt Meter	See SLD
Cos φ Meter	See SLD
KWh Meter	See SLD
KVAR Meter	See SLD
Frequency Meter	See SLD

Signals, Indications and Alarms

Indications	Lamp/ Mechanical/ Buzzer	Signal Out
CB On	Lamp	☑
CB Off	Lamp	☑
CB Fault	Lamp	☑
Heater On	Lamp	☐
Earthing Switch	Lamp	☑
Emergency Stop	Lamp	☑
Switchgear General Alarm	Lamp/ Buzzer	☑
Local/Remote Selection	Lamp	☑

Mechanical Arrangement

Cubicle Arrangement	Free Standing	
Lifting eye	☑ Required	☐ Not Required
Earthing bolt	☑ Required	☐ Not Required
Terminal blocks	☑ Required	☐ Not Required
Room Floor Design	☑ Concrete Floor	☐ False Floor
Switch Gear Base Frame	☑ Required	☐ Not Required
Cubicle Gland Plate	☑ Required	☐ Not Required
Switch Gear Extendible	☐ From One Side	☑ From Both Sides
Panel Weight No. Of Panels		kg
Switch Gear Dimension	Length	mm
	Depth Total	mm
	Length	mm

Spare Part List for 2 Years Operation
By Supplier

SHADEGAN STEEL COMPLEX

UTILITY SUBSTATION

Tara Tarh Doc. №: TA-140-U48-E-DS009				**Rev.:** B	**№ of Pages:** 5	
Client Doc. №: SWTU1U48E70009001B						
Document Title: **Data Sheet for Utility Substation DC System**						
B	June. 2020	Issued for Construction	H. Joghataei	S. Khaksari	Khaksari	A. Salamat
A	Nov. 2016	Issued for Construction	H. Joghataei	S. Khaksari	M. Saeidi	A. Salamat
0	May 2013	Issued for Approval	N. Sedighi	R. Zamani	F.Golchin	M.Zorriaa
Rev.	Date	Subject	Preparation	Checking	Verificati	Approval

Distribution Table					
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Engineering & Technological Co.

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No. 18 Shadan Alley, Jahan Ara St., Yousef Abad, 14389, Tehran, Iran.
Tel: (98 21) 88337394
Fax: (98 21) 88337397
Email: tara@taratarh.com
Web site: http://www.taratarh.com

Table of Contents

GENERAL DATA

Project Name	SHADEGAN Steel Complex
Manufacturer	
Tag №:	
Quantity:	1 Set

SITE CONDITION

Site elevation	6 meters above sea level		
Minimum ambient temperature	-1 °C		
Maximum outdoor temperature	+51 °C		
Relative humidity	93%		
Area classification	☐ Zone 1	☐ Zone 2	☑ Safe area

DESIGN DATA

Specification №:			
Single line diagram №:			
Applicable standard	☑ IEC	☐ VDE	☐ BS
Battery Charger Rating	2.5 KVA		
Output Voltage, Charger Rating	110VDC, 20A		
Dc Load(s)	min. 7 Amps (Continuous)		
Emergency Period	5 Hours		
Supply voltage	☐ 230 V ±10%	☑ 400 V ±10%	
Phase	☐ 1 Ph	☑ 3 Ph	
Frequency	☑ 50 Hz	☐ 60 Hz	
Wire	☐ 2 Wire	☑ 4 Wire	
Degree of protection	IP 42		
Power Factor			

Chargers

Number Of Chargers	Dual Type
Output Voltage Regulation From No. Load To Full Load	1%
Percent Of A.C. Ripple In The Charger Output	1%
Type Of Rectifiers	
Nominal Float Charge Voltage	
Maximum Boost Charge Voltage	
Output Range On Float Charge	A
Output Range On Boost Charge	A
Maximum Load Current	A
Type Of Changeover Device For Return To Float Charge	
Permissible Maximum Temperature	°C

Rise of Rectifiers :	
Permissible Maximum Temperature Rise of Transformers	°C
Output Voltage Regulation From No Load To Full	
Current Limiting Device Setting	
Dimensions	
Weight	kg

Batteries

Number Of Battery Banks	(3x50%)
Battery Bank Capacity	100 Ah
Nominal Voltage Of Battery Bank	110VDC
Type Of Batteries	Sealed Lead Acid
Manufacturer	
Manufacturer's Ref. №	
Applicable Standard	
Number Of Cells In Each Battery Bank	
Rate Of Discharge Current	
Number Of Cells In Each Battery Bank	№
Terminal Voltage Permitted	V/Cell

DC Distribution Board

Number Of Outgoing Feeder(s)	6	
Outgoing Feeder(s) Rating	10 A	
Outgoing Feeder(s) Interrupting Breaker Type	MCB 2 Pole	
Outgoing Feeder(s) Label	To Be Given	
Degree of protection	IP 42	
Outside paint finish color	☑ RAL 7032	☐ by manufacturer
Cubicle / case thickness	2 mm	
Wire	☐ 2 Wire	☑ 4 Wire

COMPONENT / ACCESSORIES

Lifting eye	☑ Required	☐ Not Required
Earthing bolt	☑ Required	☐ Not Required
Terminal blocks	☑ Required	☐ Not Required
Duty /alarm /trip signal status	☑ Required	☐ Not Required
L.E.D indicator	☑ Required	☐ Not Required
Fault detecting relay	☑ Required	☐ Not Required
Power switch / Fuses isolator	☑ Required	☐ Not Required

Meter	☑ Voltmeter	☑ Ammeter
Power switch rating		
Fuses isolator rating		
Contactor rating		

CABLE ENTRY

Power circuit	☐ From top	☑ From bottom
Cable size		
Control circuit	☐ From top	☑ From bottom
Cable/wire size	Min. 2.5 mm^2	

Note:
Blanks shall be filled by Manufacturer.
General Characteristics of DC Charger Reference Must Be Made To Technical Specification.

SHADEGAN STEEL COMPLEX

UTILITY SUBSTATION

Tara Tarh Doc. №: TA-140-U48-E-DS910			**Rev.:** B		**№ of Pages** 5	
Client Doc. №: SWTU1U48E70010001B						
Document Title: **Data Sheet for Utility Substation Diesel Generator**						
B	June. 2020	Issued for Construction	H. Joghataei	S. Khakrari	Khakrari	A. Salamat
A	Nov. 2016	Issued for Construction	H. Joghataei	S. Khakrari	M. Saeedi	A. Salamat
0	May 2013	Issued for Approval	N. Sedighi	R. Zamani	F.Golchin	M.Zorriat
Rev.	Date	Subject	Preparation	Checking	Verificati	Approval

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Web site: http://www.taratarh.com

Table of Contents

GENERAL DATA

Project name	SHADEGAN Steel Complex
Manufacturer	
Tag №:	
Quantity:	1 Set

SITE CONDITION

Site elevation	6 meters above sea level		
Minimum ambient temperature	-1 °C		
Maximum outdoor temperature	+51 °C		
Relative humidity	93%		
Area classification	☐ Zone 1	☐ Zone 2	☑ Safe area

DESIGN DATA

Specification №:		
Single line diagram №:		
Applicable standard	☑ IEC ☐ VDE	☐ BS
Duty	Continuous	
Power Output (at Site Conditions)	1000 KVA	
Voltage	400 V ±10%	
Frequency	50 Hz	
Phase	☐ 1 Ph	☑ 3 Ph
№ of Wires	4	
Power Factor	0.8 Lagging	
Winding Connection	Star	
Insulation Class	Stator Rotor Exciter	F F E

ENCLOSURE

Degree of protection	☑ Indoor type IP 23	☐ Outdoor type Per IEC 60947-1
Type of cooling	☐ Natural air cooled	☑ Forced air cooled
Outside paint finish color	☐ RAL 7032	☑ by manufacturer
Bearing Type	Ball or Ball & Roller Lubrication Grease	

COMPONENT / ACCESSORIES

Generator Capability Curve	☑ Required	☐ Not Required
Anti-Condensation Heater	☑ Required	☐ Not Required
Lifting eye	☑ Required	☐ Not Required
Earthing bolt	☑ Required	☐ Not Required
Terminal blocks	☑ Required	☐ Not Required
Duty /alarm /trip signal status	☑ Required	☐ Not Required

Fault-detecting relay	☑ Required	☐ Not Required
Power switch / Fuses isolator	☑ Required	☐ Not Required
Meter	☑ Voltmeter ☑ Ammeter	☑ Power factor
Power switch rating		
Fuses isolator rating		
Contactor rating		

Control Panel

Type	Construction Sheet Steel, Free Standing	
Degree of protection	IP 55	Per IEC 60529
Main Circuit Breaker	Withdraw able	Air Circuit Break
Rated Current	2000 A	
№ of Poles		
Control Voltage	24 V	
Short Circuit Capability	..... kA	1 Sec
Power circuit	☐ From top	☑ From bottom
Power Cable size		
Control circuit	☐ From top	☑ From bottom
Control Cable-wire size	Min. 2.5 mm^2	

Protection and Control

Short Circuit	☑ Required	☐ Not Required
Over Current	☑ Required	☐ Not Required
Earth Fault	☑ Required	☐ Not Required

Battery & Battery Charger

Battery Type	Sealed lead acid
Voltage	24 Vdc
	To Be Supplied By Vendor

Remarks:
Blanks shall be filled by Manufacturer.
The Generator Set Shall Be Capable Of Sequential and Satisfactory Starting Of The Motor(S) Specified Above While Supplying The Remaining Load
Maximum Voltage Drop during Motor Starting Shall Not Exceed 15%

TO BE FILLED BY VENDOR AT PROPOSAL STAGE

Automatic Voltage Regulator

Manufacturer's Name	
Maximum and Minimum Regulation Limits (From No-Load To Full-Load)	
Response Time to Restore Voltage to Preset Value Sec	
Momentary Over Voltage Due to Response to Rejection of Max. Continuous Load at Rated Power Factor	

Battery

Manufacturer's Fame	
Type Designation	
Rated Voltage.	
Rated Ampere Hour Ah.	
Number. of Cell(S)	
Number of Batteries	
Resistance of Battery Including Internal Resistance and Conductors Up To Starting Element(S)	

Battery Charger

Manufacturer's Name	
Type Designation	
Applicable Stasdard	
Rated Input Power	
Rated Input Voltage	
Rated Output Current	
Boost Charging Device	
Maximum Input Voltage Tolerance	
Maximum Frequency Tolerance	
Maximum Ripple To Dc Voltage Ratio	

SHADEGAN STEEL COMPLEX

UTILITY SUBSTATION

Tara Tarh Doc. №: TA-140-U48-E-DS011		**Rev.: B**	**№ of Pages:** 4
Client Doc. №: SWTU1U48E70011001B			
Document Title:			
Data Sheet for Utility Substation Capacitor Bank			

Rev.	Date	Subject	Preparation	Checking	Verificatn	Approval
B	June. 2020	Issued for Construction	H. Joghataei	S. Khaksari	Khaksari	A. Salamat
A	Nov. 2016	Issued for Construction	H. Joghataei	S. Khaksari	M. Saeedi	A. Salamat
0	May 2013	Issued for Approval	N. Sedighi	R. Zamani	F.Golchin	M.Zorrias

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Table of Contents

GENERAL DATA

Project Name	SHADEGAN Steel Complex
Manufacturer	
Tag №:	
Quantity:	2 Set

SITE CONDITION

Site elevation	6 meters above sea level		
Minimum ambient temperature	-1 °C		
Maximum outdoor temperature	+51 °C		
Relative humidity	93%		
Area classification	☐ Zone 1	☐ Zone 2	☑ Safe area

DESIGN DATA

Specification №:		
Single line diagram №:		
Applicable standard	☑ IEC ☐ VDE	☐ BS
Power factor correction device for	☐ Transformers ☑ Fluorescent lamp	☑ Induction motors
Present kW of equipment	~1300 kW	
Present power factor	80%	
Required power factor	95%	
Fixed capacitor size		
Capacitor bank size	400 kVAR (10 steps of 40kvar)	
Type of compensation	☐ Individual ☐ Group	☑ Centralized
Degree of protection	☑ Indoor type ☑ IP 42	☐ Outdoor type ☐ IP 54
Type of cooling	☑ Natural air cooled	☐ Forced air cooled
Outside paint finish color	☑ RAL 7032	☐ by manufacturer
Cubicle / case thickness	2 mm	
Supply voltage	☐ 230 V ±10%	☑ 400 V ±10%
Phase	☐ 1 Ph	☑ 3 Ph
Frequency	☑ 50 Hz	☐ 60 Hz
Wire	☐ 2 Wire	☑ 4 Wire

COMPONENT / ACCESSORIES

Discharge facility	☑ Required	☐ Not Required
Lifting eye	☑ Required	☐ Not Required
Earthing bolt	☑ Required	☐ Not Required
Terminal blocks	☑ Required	☐ Not Required
Power factor control relay	☑ Required	☐ Not Required
Duty / alarm /trip signal status	☑ Required	☐ Not Required

L.E.D indicator	☑ Required	☐ Not Required
Type of Power factor control relay	☑ Automatic	☑ Manual
Number and steps for control unit	☑ By Vendor	
Manufacturer of PF control relay		
Fault detecting relay	☑ Required	☐ Not Required
Power switch / Fuses isolator	☑ Required	☐ Not Required
Meter	☑ Voltmeter ☑ Ammeter	☑ Power factor
Power switch rating		
Fuses isolator rating		
Contactor rating		

CABLE ENTRY

Power circuit	☐ From top	☑ From bottom
Cable size		
Control circuit	☐ From top	☑ From bottom
Cable/wire size	Min. 2.5 mm²	

Note
Blanks shall be filled by Manufacturer.

SHADEGAN STEEL COMPLEX
UTILITY SUBSTATION

Tara Tarh Doc. No.: TA-140-U48-E-DS012	**Rev.** B	**No. of Pages :** 10	
Client Doc. No.: SWTU1U48E70012001B			

Document Title:

Data Sheet for Utility Substation MV/LV Transformer

Rev.	Date	Subject	Preparation	Checking	Verification	Approval
B	June. 2020	Issued for Construction	H. Joghataei	S. Khaksari	S. Khaksari	A. Salamat
A	Nov. 2016	Issued for Construction	H. Joghataei	S. Khaksari	M. Saeedi	A. Salamat
0	May 2013	Issued for Approval	N. Sedighi	R. Zamani	F.Golchin	M.Zorriassatin

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Email: tara@taratarh.com

TAG №	
Employer	
Vendor	
Quantity	2 Set
Project	SHADEGAN
Type	
Serial №	

Climate Conditions

Min Temperature	+1°C	Max Temperature	+51°C
Ambient	Dusty (Iron Dust) & Corrosive	Max Humidity	93%
Altitude above Sea Level	6 m		
Location	*indoor*	■*outdoor*	-

Applicable Specifications

Noise Specification	Acc. to IEC, VDE	
Paint Specification	Acc. to Standards	
Paint Finish Color	RAL7038 or RAL7032	
Protection Class	IP54	
Mounting	Rail Mounted On Concrete Pad	
Voltage Variation	±10%	
Frequency Variation	±5%	
TAP Changer	☑ M.V side	☐ L.V side
☑ Off Load	☐ On Load	☐ Automatic
Number of TAPs	5	
Percentage per TAP	2.5%	
Uk	8%	
Parallel Operation with Other Transformer		
☐ YES	☑ NO	☐ For Short Time

Electrical Characteristics :

Type	Oil Immersed With Conservator	
Self Cooled Continuous Output at Ambient Condition	2500 KVA	
Number of Phases / Wires	3/3	
Vector Group	Dyn 5	
Impedance Voltage at Mid. Tap	As Per IEC-60076	
Insulation Class	A	
Cooling Provisions	ONAN	
Winding Conductor Material	Copper	
Primary / Secondary Fault Levels	31.5KA / 50 KA @ 1 Sec	
Surge Protection	☑ Yes	☐ No
Screen between MV&LV Windings	☑ Yes	☐ No
Frequency	50	HZ
Highest Primary Voltage	36	kV
Highest Secondary Voltage	0.6	kV
Rated Primary Voltage	33	kV
Rated Secondary Voltage	0.42	kV
Primary Lightning Impulse Withstand	170	kV
Secondary Short duration Power Frequency Withstand Voltage	3	kV
Method of Neutral Grounding	☐ Isolated	☑ Solid
	☐ Resistor	☐ Resonant (Petersen Coil)
Resistance Value		Ohms
Impedance Value		Ohms
Neutral Current Transformer Ratio	4000/1	A
Neutral Current Transformer Rating		VA
Class	5P20	

Terminations M.V. Side (Primary)

☐ Over Head Lines	☐ BusDuct	☑ Cable
Size of Over Head Lines		mm2
Size of Bus duct (LxW)		mm
Cable Type	NZNSYBY	
Number Of Cable Runs & Size	3(1x500)	mm2
Diameter Over Lead		mm
Diameter Overall		mm
Dry Withstand Voltage		kV
Wet Withstand Voltage		kV
Cable Connection Box	☑ Yes	☐ No

Terminations L.V. Side (Secondary)

☐ Over Head Lines	☑ Bus Duct	☐ Cable
Size of Over Head Lines		mm2
Size of Busduct (LxW)		mm
Cable Type		
Number / Cable Runs & Size		mm2
Diameter Over Lead		mm
Diameter Overall		mm
Neutral Cable Run & Size		mm2
Bus duct Connection Box	☑ Yes	☐ No

Bushings

M.V. Side (Primary)	36	KV
L.V. Side (Secondary)	1	KV

Accessories

Dial Type Thermometer for Oil (1 pcs)	☑ Yes	☐ No
Fan Actuation	☐ Yes	☑ No
Oil Temperature Alarm/ Tripping	☑ Yes	☐ No
Winding Temperature Alarm	☐ Yes	☑ No
Winding Temperature Tripping	☐ Yes	☑ No
Abnormal Pressure Relief Device	☑ Yes	☐ No
Pressure Relief Device Tripping	☑ Yes	☐ No
Pressure Alarm/ Tripping	☐ Yes	☑ No
Buchholz Relay (1 pcs)	☑ Yes	☐ No
Buchholz Alarm	☑ Yes	☐ No
Buchholz Tripping	☑ Yes	☐ No
Oil / Liquid Level Indicator (Magnetic Type)	☑ Yes	☐ No
Level Alarm	☑ Yes	☐ No
Level Trip	☑ Yes	☐ No
Oil Level Sight Glass	☑ Yes	☐ No
Thermometer Pocket	☑ Yes	☐ No
Pressure Indicator	☐ Yes	☑ No

Filling Cap For Topping Liquid	☑ Yes	☐ No
Drain Valve	☑ Yes	☐ No
Oil Sampling Device (On the Bottom)	☑ Yes	☐ No
Filter Connection Valve (2 pcs)	☑ Yes	☐ No
Dehydrating Breather	☑ Yes	☐ No
Vent	☑ Yes	☐ No
Oil For First Filling	☑ Yes	☐ No
Oil Conservator	☑ Yes	☐ No
Earthing Terminals	2	pcs
Wheels	☑ Yes	☐ No
Lifting Lugs	☑ Yes	☐ No
Jack Pad	☑ Yes	☐ No
Instrument Connection Box	☑ Yes	☐ No
Stainless Steel Name Plate	☑ Yes	☐ No
CT For Differential Protection on Neutral	☐ Yes	☑ No
CT For Earth Fault Protection on Neutral	☑ Yes	☐ No
Butterfly Valve to Isolate Radiators	☑ Yes	☐ No
1" Draining Plugs For Radiators	2	pcs
Conservator Cleaning Hole	☑ Yes	☐ No

Tests Required

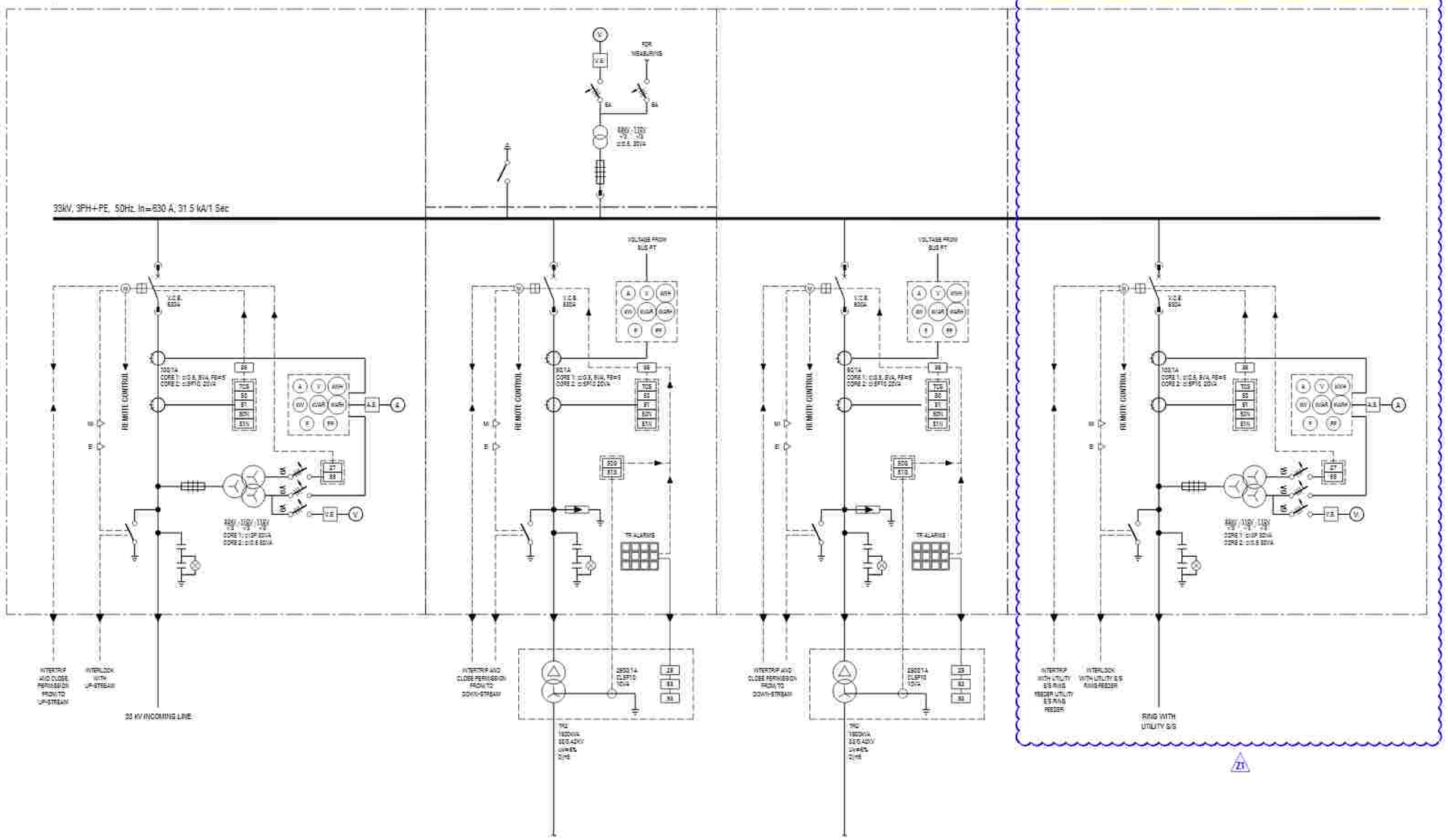
Refer to transformer specification & acc. to IEC 60076. Routine tests shall be witnessed by purchaser representatives'. Type test certificates should be submitted by manufacturer for similar transformers type, voltage ratio & capacity

MANUFACTURER'S DATA

Manufacturer				
Manufacturer's Type				
Continuous Output At Natural Cooling		KVA		
Continuous Output At Fan Cooling		KVA		
No Load Losses At Un/ 1.1 Un		KW		
Full Load Losses At 75°C And Tap changer In Mid Position	Pf=1		Pf=0.8	
Half Load Losses At 75°C And Tap changer In Mid Position	Pf=1		Pf=0.8	
Efficiency At 75°C And 100% Load	Pf=1		Pf=0.8	
Efficiency At 75°C And 75% Load	Pf=1		Pf=0.8	
Efficiency At 75°C And 50% Load	Pf=1		Pf=0.8	
Max. Inrush Current And Duration		A		Sec
No Load Current At Un / 1.1 Un		/		A
Short Circuit Withstand Current And Duration		A		Sec
Impedance Voltage At 75°C And Tap changer In Mid Position		%		
Filling Oil/Liquid Make And Type				
Temperature Rise Of Oil/Liquid		°C		
Temperature Rise Of Windings		°C		
Insulation Class				
Induced Voltage Test		KV/Hz		
Impulse Test		KV(1.2/50 μs)		
Separate Source Test H.V (Primary)		KV		

Separate Source Test L.V (Secondary)		KV		
Test Carried Out At				
Weight Of Core		Kg		
Weight Of Winding		Kg		
Weight Of Oil		Kg		
Weight Of Extractable Part		Kg		
Total Weight (Filled)		Kg		
Dimensions (HxWxL)		mm		
Distance Wheels / Skids		mm		
Lifting Height Core / Windings		mm		
Screen Between MV & LV Windings				
Busduct Dimensions LxW (If Any)		mm		
Quotation Drawing Number				
Sound Pressure Level At 1 Meter		dB(A)		

W.T.P. 33/0.42 kV ELECTRICAL SUBSTATION



ELECTRICAL LEGEND

- MOTORIZED VACUMM CIRCUIT BREAKER
- POTENTIAL TRANSFORMER 3NOS. (3WINDINGS) WITH FUSE
- POWER TRANSFORMER
- EARTH SWITCH
- MINIATUR CIRCUIT BREAKER (MCB) CROSS LINES INDICATES NO. OF POLES
- ALARM ANNOUNCIATOR WITH 12 WINDOWS
- SIGNAL LAMP
- GROUND CONNECTION
- AMMETER
- A.S AMMETER SWITCH
- V VOLTMETER
- V.S VOLTMETER SWITCH
- CURRENT TRANSFORMER
- CAPACITIVE VOLTAGE SIGNAL INDICATOR 3#
- SURGE ARRESTOR
- ELECTRICAL INTERLOCK
- MECHANICAL INTERLOCK
- TERMINAL / LUG :
- MEASURING CENTER
- ACTIVE ENERGY METER
- REACTIVE ENERGY METER
- ACTIVE POWER METER
- F FERQUENCY METER
- PF POWER FACTOR METER
- REACTIVE POWER METER
- TCS TRIP CIRCUIT SUPERVISION
- 26 OIL TEMPERATURE INDICATOR
- 27 UNDER VOLTAGE RELAY
- 50 INSTANTENOUS OVER CURRENT RELAY
- 50N INSTANTANOUS EARTH FAULT RELAY
- 50G EARTH FAULT RELAY
- 51 AC TIME OVER CURRENT RELAY
- 51G SENSITIVE EARTH FAULT RELAY
- 51N AC TIME OVER CURRENT GROUND RELAY
- 63 OIL LEVEL OF TRANS.
- 59 OVER VOLTAGE RELAY
- 80 BUCHHOLZ RELAY
- 86 LOCK OUT RELAY

NOTES

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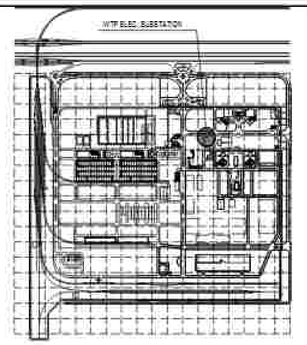
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE.

REFERENCE DRAWING	
TA-140-U48-E-SP008	M.V. SWITCHGEAR SPECIFICATION
TA-140-U48-E-DS002	M.V. SWITCHGEAR DATA SHEET
TA-140-U00-E-DW001	ELECTRICAL SYSTEMS STANDARD DETAILS
DWG NO.	DESCRIPTION

KEY PLAN :



REV.	DATE	DESCRIPTION	CHK. BY	APP. BY
Z1	11/2020	REVISED AS CLOUDED	S. KH.	A. G.
C	03/2017	AS-BUILT	S. KH.	A. G.
A	08/2015	ISSUED FOR CONSTRUCTION	P. R.	A. G.
1				
0	10/2013	ISSUED FOR APPROVAL	P. R.	M. Z.

CLIENT : شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

CONSULTANT : TARA TARH

PROJECT TITLE : SHADEGAN STEEL COMPLEX

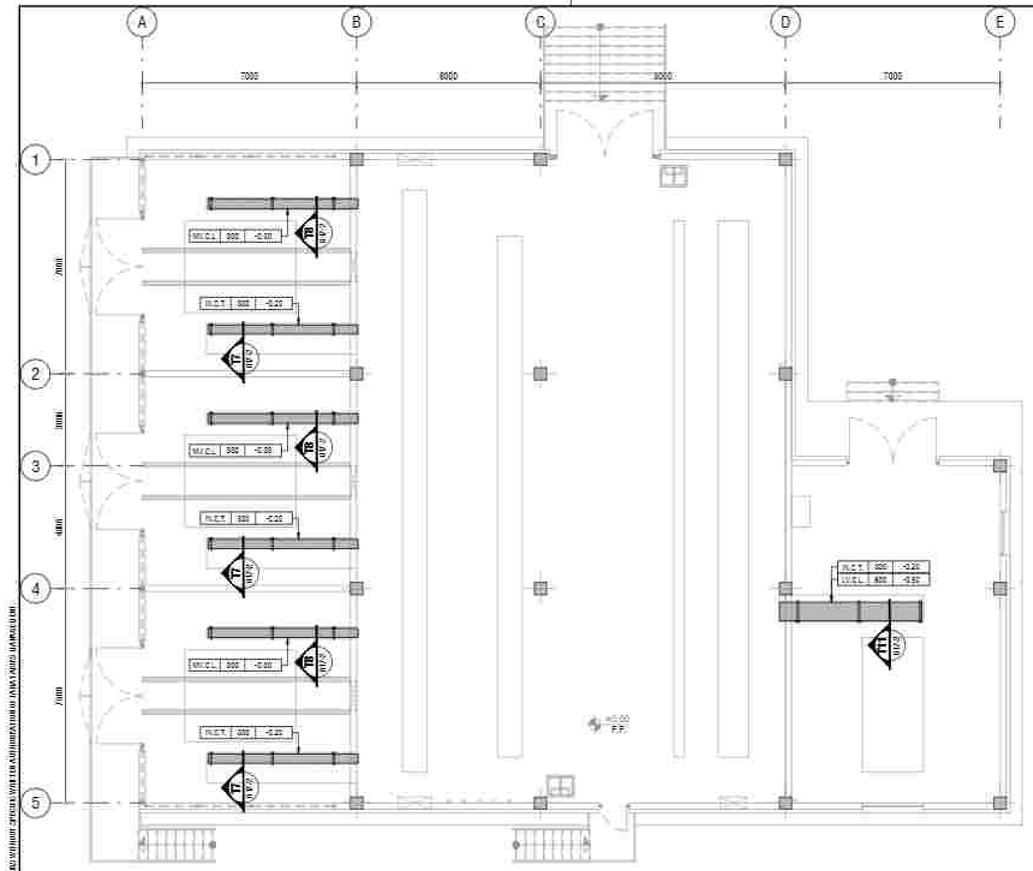
DESIGNED BY:	S. REYHANI
DRAWN BY:	M. ASGHANI
CHECKED BY:	A. KARIMI
APPROVED BY:	F. AHJADI
DATE :	08/2008

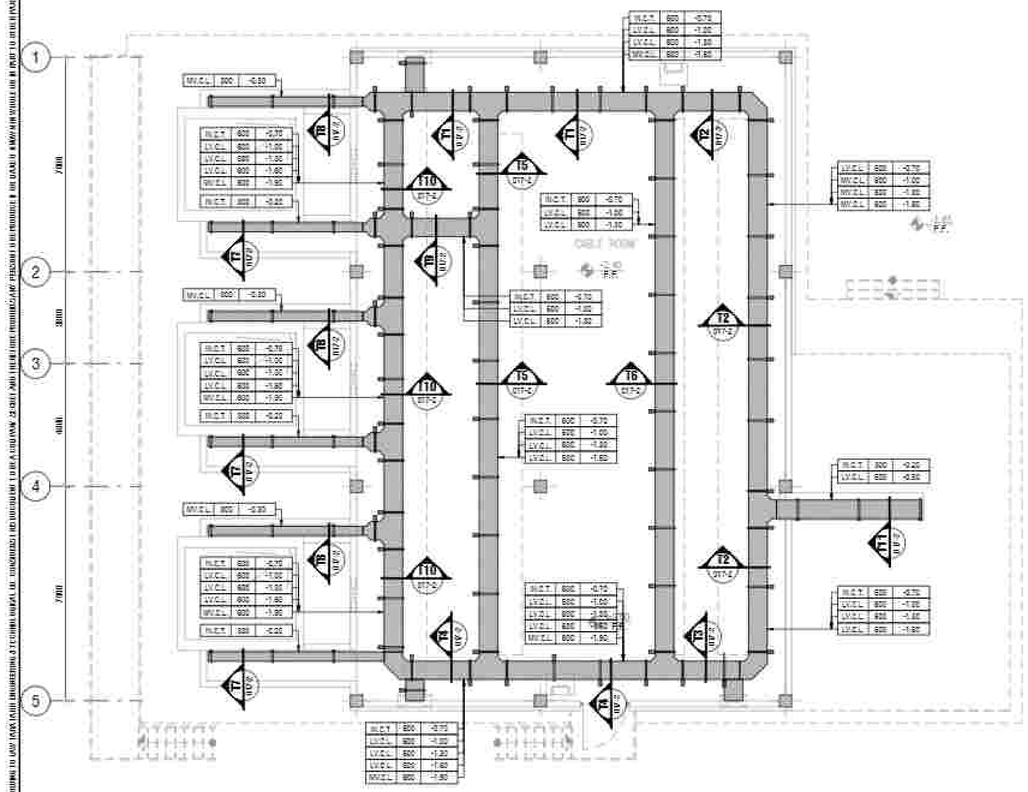
DWG TITLE : WTP ELEC. SUBSTATION 33/0.42 KV SUBSTATION 33kV SINGLE LINE DIAGRAM

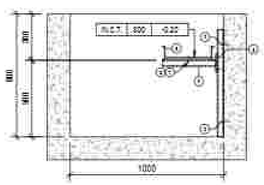
CLIENT-DWG. NO : SDTU1 U48 E70 009 001 Z1

TARA DWG. NO. TA-140-U48-E-DW009

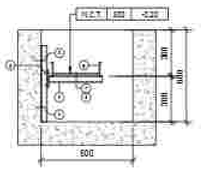
SCALE : AS SHOWN | SIZE : A1 | SH. 1 OF 1 | REV. Z1



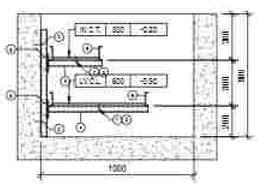




T7 TRENCH - SECTION
SCALE : 1/20



T8 TRENCH - SECTION
SCALE : 1/20



T11 TRENCH - SECTION
SCALE : 1/20

ITEM	DESCRIPTION
1	STRUT CHANNEL
2	BASE PLATE FOR DOUBLE CHANNEL
3	BOLT PROJECTION RAWLBOLT , BOLT SIZE: M12
4	BRACKET FOR CABLE LADDER
5	STRUT BOLT, NUT WITH SPRING & SQUARE WASHER: M12
6	STRAIGHT LADDER
7	HOLD DOWN CLIP , AE 181C
8	STRUT BOLT, NUT WITH SPRING & SQUARE WASHER: M8
9	

NOTES

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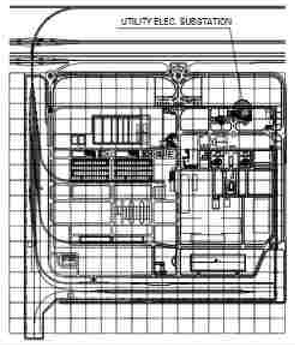
KEY PLAN :



REV.	DATE	DESCRIPTION	CHK.	APP.
C	07/2020	GENERALLY REVISED, ISSUED FOR CONSTRUCTION	S.KH.	A.S.
B	09/2018	REVISED AS NOTED, ISSUED FOR CONSTRUCTION	S.KH.	A.S.
A	08/2012	ISSUED FOR CONSTRUCTION	F.G.	M.Z.
0	08/2009	ISSUED FOR APPROVAL	A.K.	P.A.

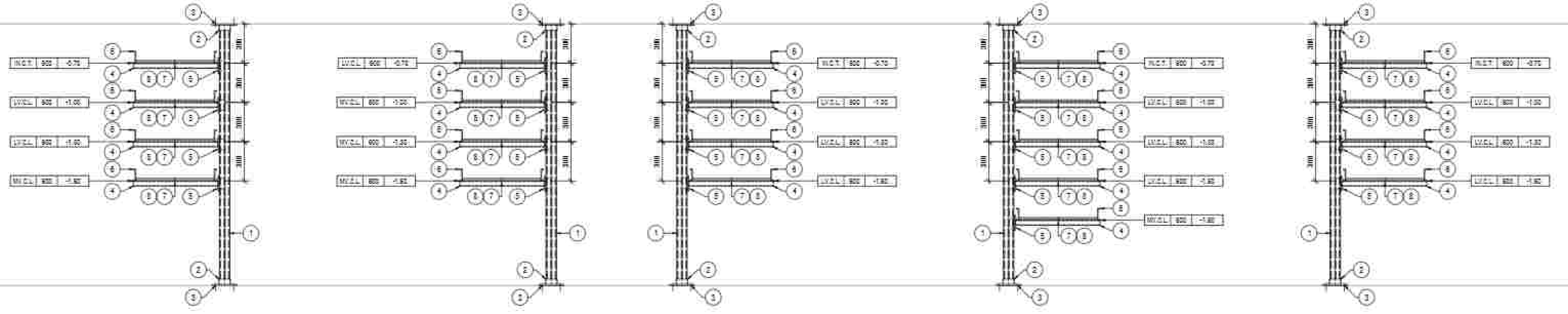
CLIENT : شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

CONSULTANT: TARA TARH

PROJECT TITLE: SHADEGAN STEEL COMPLEX

DESIGNED BY:	H. JOGHATAEI	DWG TITLE:	UTILITY ELEC. SUBSTATION ELECTRICAL SYSTEMS DRAWINGS
DRAWN BY:	M. ASGHARI		
CHECKED BY:	E. KHAKSARI		
APPROVED BY:	A. SALAMAT		CABLE ROUTE LAYOUT & DETAILS
DATE:	08/2009		

CLIENT-DWG. No:	SDTU1 U48 E70 017 001 C	SCALE: AS SHOWN	SIZE: A1
TARA DWG. No:	TA-140-U48-E-DW017	SH. No: 1 OF 2	REV. C



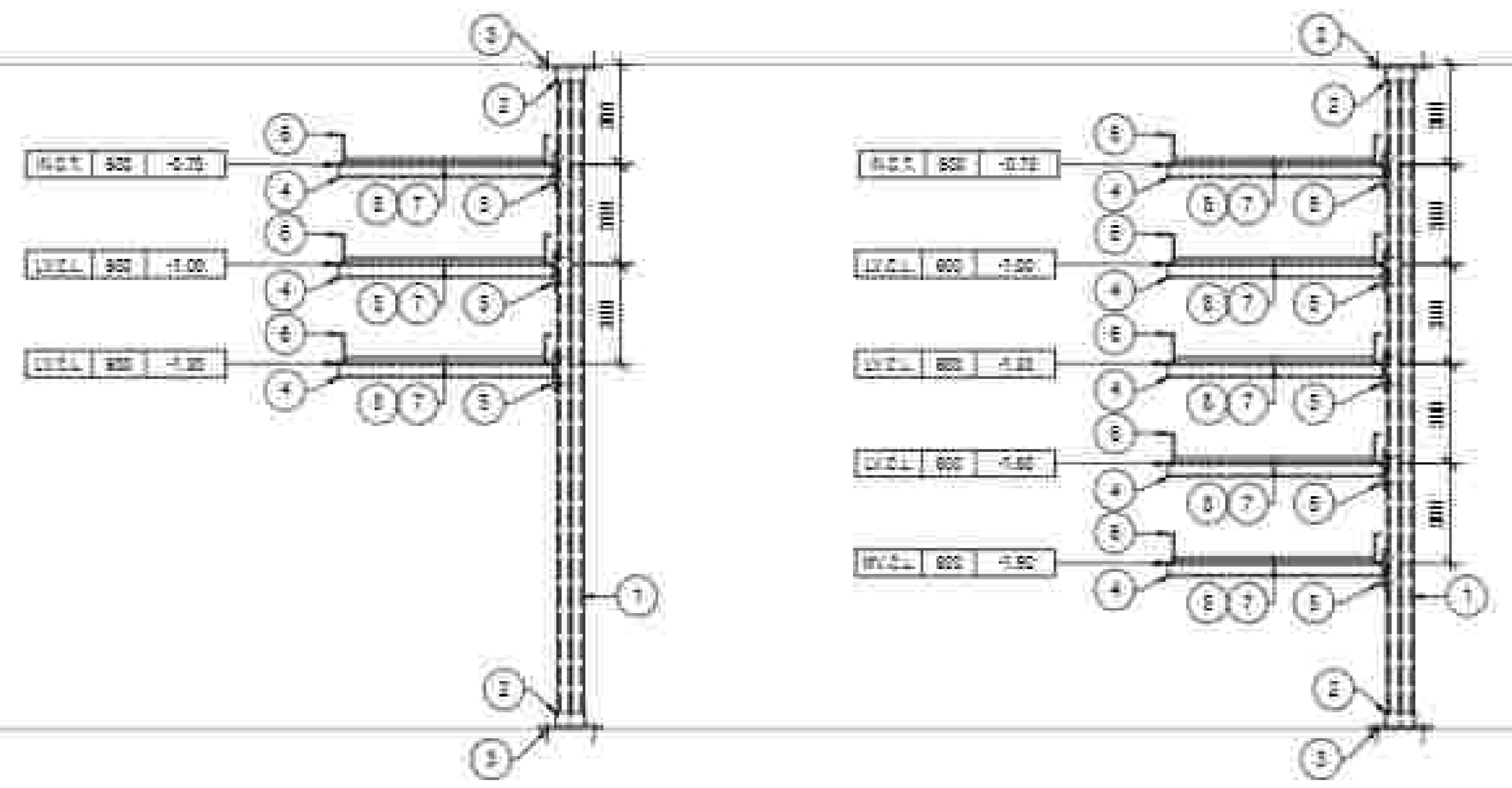
T1 CABLE LADDER - SECTION
SCALE : 1/20

T2 CABLE LADDER - SECTION
SCALE : 1/20

T3 CABLE LADDER - SECTION
SCALE : 1/20

T4 CABLE LADDER - SECTION
SCALE : 1/20

T5 CABLE LADDER - SECTION
SCALE : 1/20



T9 CABLE LADDER - SECTION
SCALE : 1/20

T10 CABLE LADDER - SECTION
SCALE : 1/20

ITEM	DESCRIPTION
1	STRUT CHANNEL
2	BASE PLATE FOR DOUBLE CHANNEL
3	BOLT PROJECTION RAWLBOLT , BOLT SIZE: M12
4	BRACKET FOR CABLE LADDER
5	STRUT BOLT, NUT WITH SPRING & SQUARE WASHER: M12
6	STRAIGHT LADDER
7	HOLD DOWN CLIP , AS 161C
8	STRUT BOLT, NUT WITH SPRING & SQUARE WASHER: M8
9	

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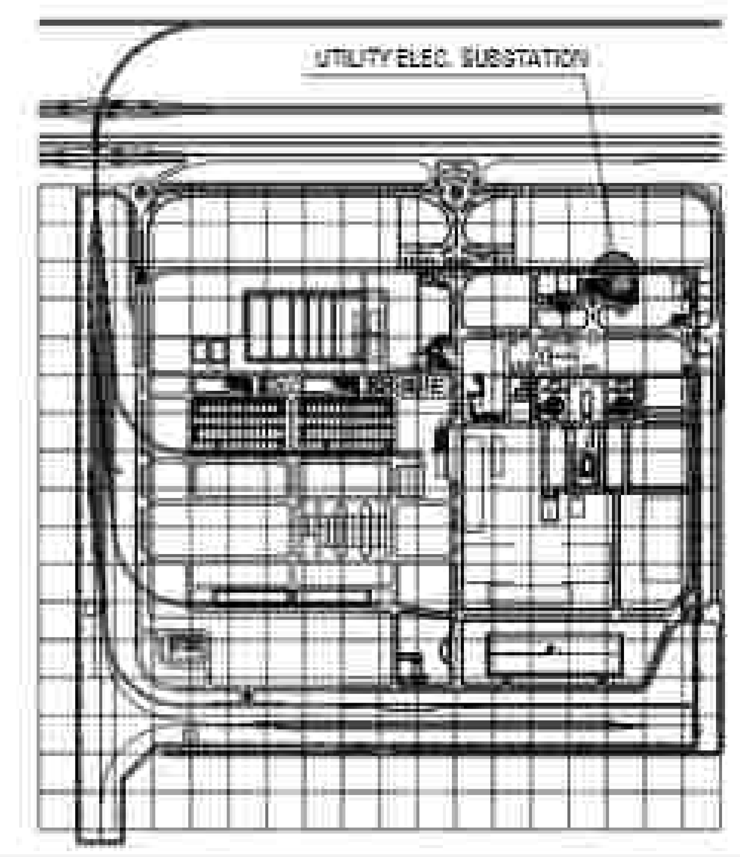


REV.	DATE	DESCRIPTION	CHK.	APP.
C	07/2020	GENERALLY REVISED, ISSUED FOR CONSTRUCTION	S.KH.	A.S.
B	09/2016	REVISED AS NOTED, ISSUED FOR CONSTRUCTION	S.KH.	A.S.
A	09/2012	ISSUED FOR CONSTRUCTION	F.G.	M.Z.
0	08/2009	ISSUED FOR APPROVAL	A.K.	F.A.

CLIENT :

شرکت صنعت فولاد شادگان
Shadegan Steel Industry Co.

CONSULTANT:

TARA TARH

PROJECT TITLE:

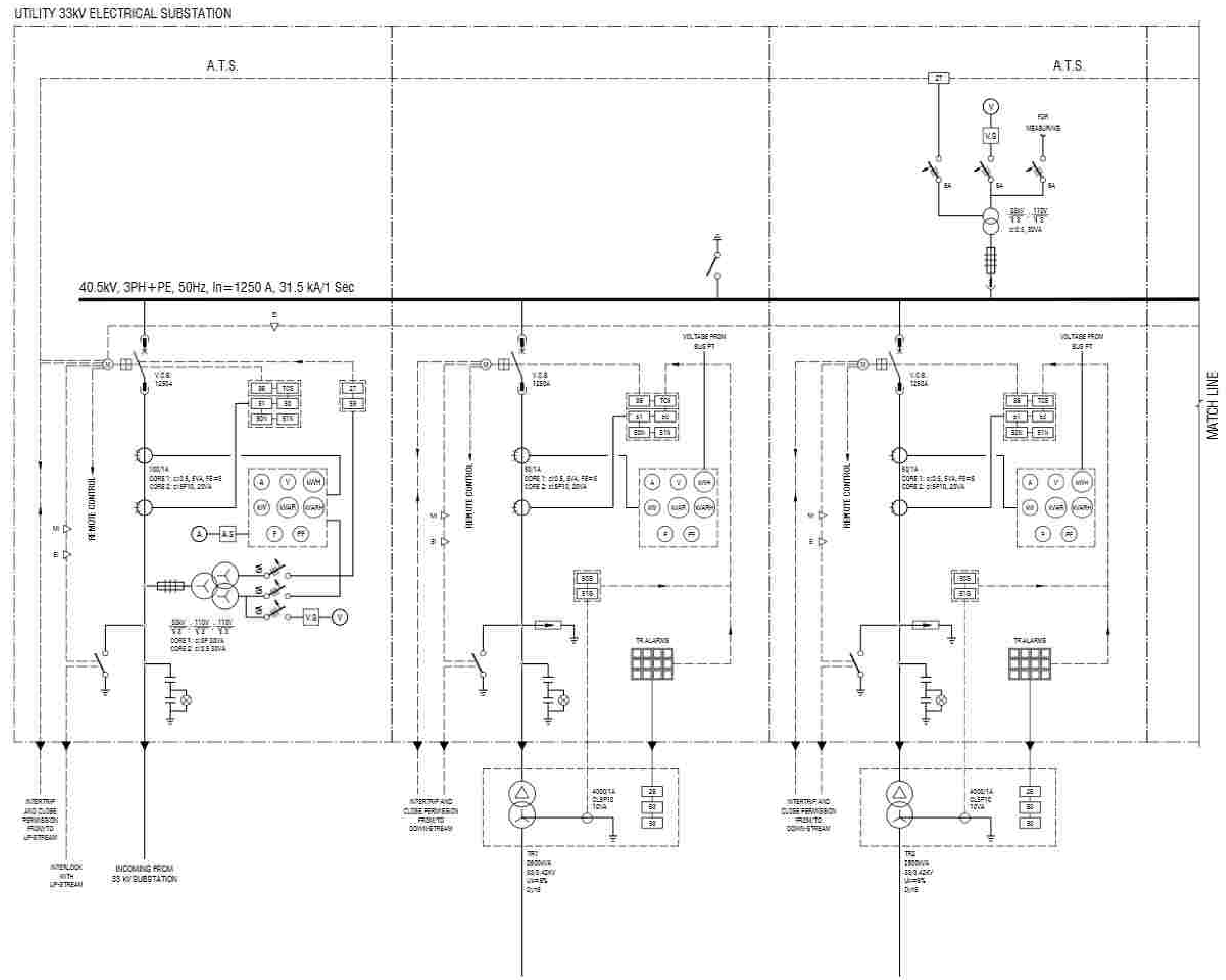
SHADEGAN STEEL COMPLEX

DESIGNED BY:	H. JOGHATABI
DRAWN BY:	M. ASGHANI
CHECKED BY:	E. KHAKSARI
APPROVED BY:	A. SALAMAT
DATE:	08/2008

DWG TITLE:
UTILITY ELEC. SUBSTATION
ELECTRICAL SYSTEMS DRAWINGS

CABLE ROUTE DETAILS

CLIENT-DWG. No: SDTU1 U48 E70 017 002 C		SCALE: AS SHOWN	SIZE: A1
TARA DWG. No: TA-140-U48-E-DW017		SH. No: 2 OF 2	REV. C



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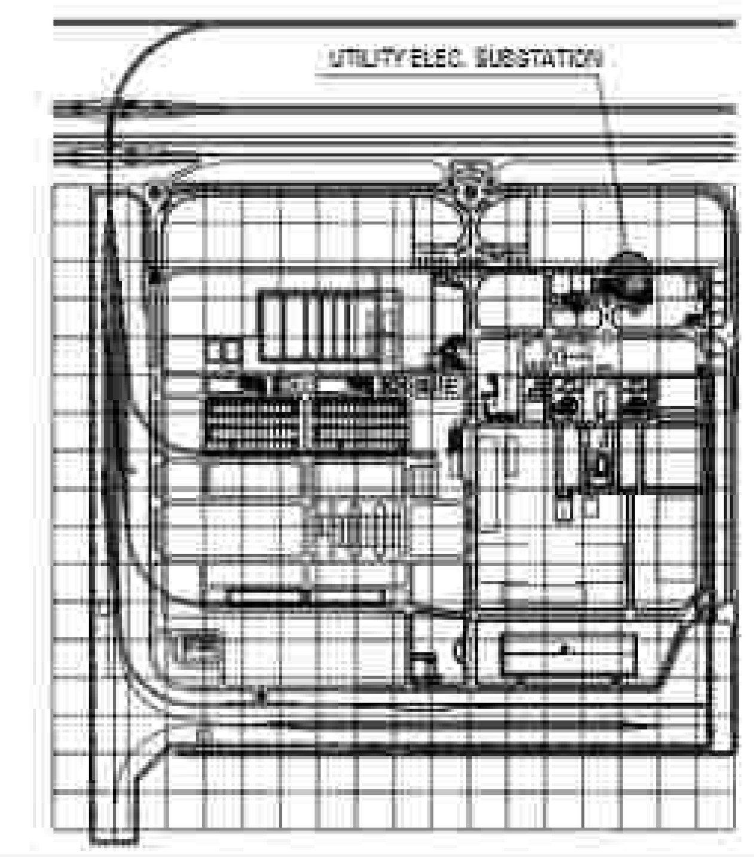


ELECTRICAL LEGEND

MOTORIZED VACUMM CIRCUIT BREAKER
POTENTIAL TRANSFORMER 3NOS. (3WINDINGS) WITH FUSE
POWER TRANSFORMER
EARTH SWITCH
MINIATUR CIRCUIT BREAKER (MCB) CROSS LINES INDICATES NO. OF POLES
ALARM ANNUNCIATOR WITH 12 WINDOWS
SIGNAL LAMP
GROUND CONNECTION
AMMETER

A.S — AMMETER SWITCH
V — VOLTMETER
V.S — VOLTMETER SWITCH
CURRENT TRANSFORMER
CAPACITIVE VOLTAGE SIGNAL INDICATOR 3#
SURGE ARRESTOR
E — ELECTRICAL INTERLOCK
M — MECHANICAL INTERLOCK
TERMINAL / LUG
MEASURING CENTER

ACTIVE ENERGY METER
REACTIVE ENERGY METER
ACTIVE POWER METER
FERQUENCY METER
POWER FACTOR METER
REACTIVE POWER METER
TCS — TRIP CIRCUIT SUPERVISION
26 — OIL TEMPERATURE INDICATOR
27 — UNDER VOLTAGE RELAY
50 — INSTANTENOUS OVER CURRENT RELAY
50N — INSTANTANOUS EARTH FAULT RELAY
50G — EARTH FAULT RELAY
51 — AC TIME OVER CURRENT RELAY

SENSITIVE EARTH FAULT RELAY
51N — AC TIME OVER CURRENT GROUND RELAY
OIL LEVEL OF TRANS.
OVER VOLTAGE RELAY
BOCHHOLZ RELAY
LOCK OUT RELAY

REV.	DATE	DESCRIPTION	CHK.	APP.
B	07/2020	REVISED AS NOTED, ISSUED FOR CONSTRUCTION	S.KH.	A.S.
A	11/2016	ISSUED FOR CONSTRUCTION	S.KH.	A.S.
C	10/2013	ISSUED FOR APPROVAL	P.R.	M.Z.

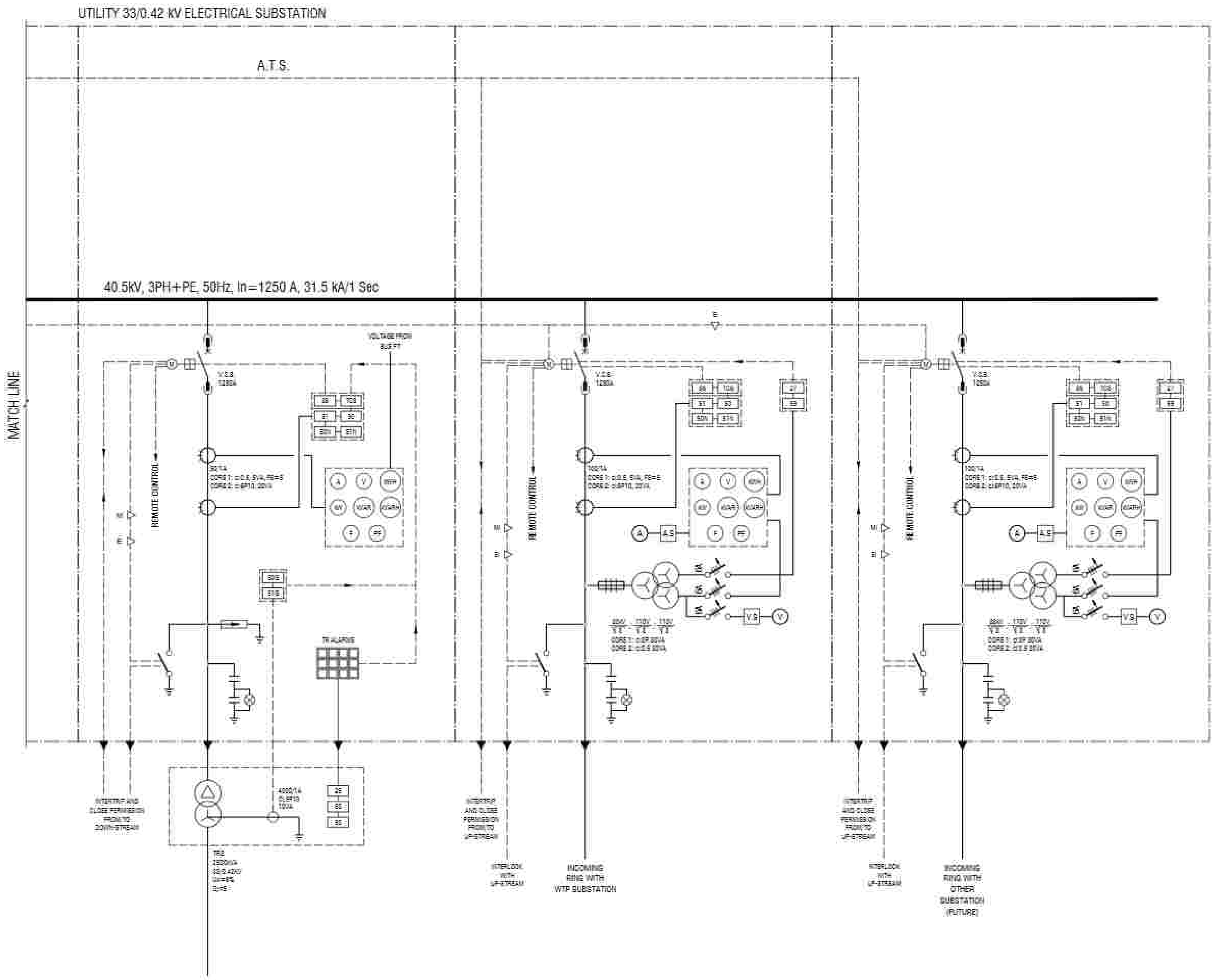
CLIENT : شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

CONSULTANT: TARA TARH

PROJECT TITLE: SHADEGAN STEEL COMPLEX

DESIGNED BY:	H. JOGHATAEI	DWG TITLE: UTILITY ELEC. SUBSTATION ELECTRICAL SYSTEMS DRAWINGS 33 KV SINGLE LINE DIAGRAM PART "1"
DRAWN BY:	M. ASGHANI	
CHECKED BY:	P. RAJABI	
APPROVED BY:	M. ZORIASATAIN	
DATE:	10/2013	

CLIENT-DWG. No:	SDTU1 U48 E70 019 001 B	SCALE: AS SHOWN	SIZE: A1
TARA DWG. No:	TA-140-U48-E-DW019	SH. No: 1 OF 2	REV. B



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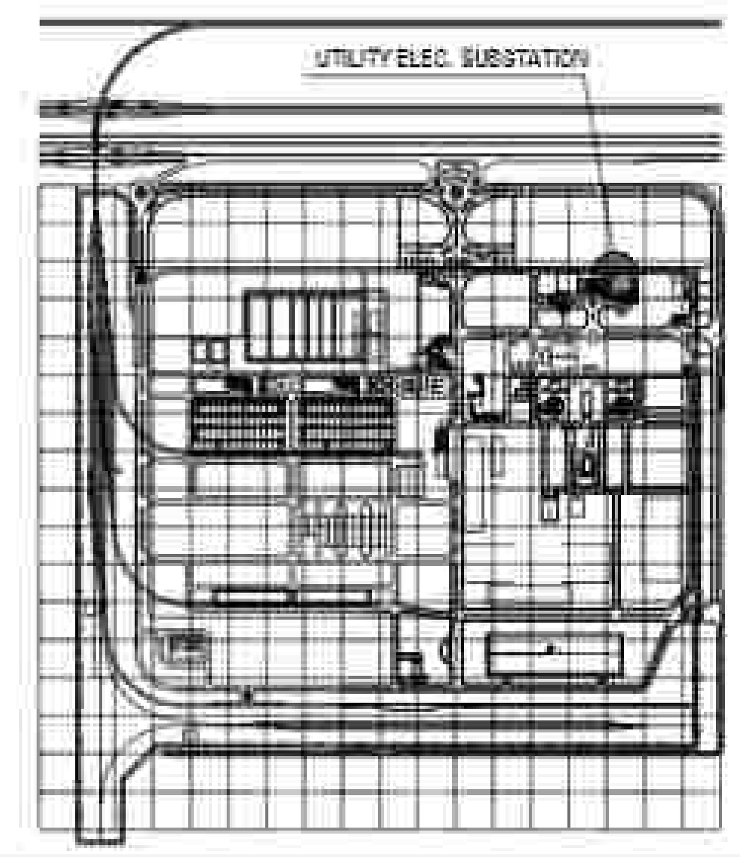


ELECTRICAL LEGEND

- MOTORIZED VACUMM CIRCUIT BREAKER
- POTENTIAL TRANSFORMER 3NOS. (3WINDINGS) WITH FUSE
- POWER TRANSFORMER
- EARTH SWITCH
- MINIATUR CIRCUIT BREAKER (MCB) CROSS LINES INDICATES NO. OF POLES
- ALARM ANNUNCIATOR WITH 12 WINDOWS
- SIGNAL LAMP
- GROUND CONNECTION
- A — AMMETER
- A.S — AMMETER SWITCH
- V — VOLTMETER
- V.S — VOLTMETER SWITCH
- CURRENT TRANSFORMER
- CAPACITIVE VOLTAGE SIGNAL INDICATOR 3Ø
- SURGE ARRESTOR
- E — ELECTRICAL INTERLOCK
- M — MECHANICAL INTERLOCK
- TERMINAL / LUG
- MEASURING CENTER
- WH — ACTIVE ENERGY METER
- VARH — REACTIVE ENERGY METER
- KW — ACTIVE POWER METER
- F — FERQUENCY METER
- PF — POWER FACTOR METER
- VAR — REACTIVE POWER METER
- TCS — TRIP CIRCUIT SUPERVISION
- 26 — OIL TEMPERATURE INDICATOR
- 27 — UNDER VOLTAGE RELAY
- 50 — INSTANTENOUS OVER CURRENT RELAY
- 50N — INSTANTANOUS EARTH FAULT RELAY
- 50G — EARTH FAULT RELAY
- 51 — AC TIME OVER CURRENT RELAY
- 51G — SENSITIVE EARTH FAULT RELAY
- 51N — AC TIME OVER CURRENT GROUND RELAY
- 63 — OIL LEVEL OF TRANS.
- 59 — OVER VOLTAGE RELAY
- 80 — BOCHHOLZ RELAY
- 86 — LOCK OUT RELAY

REV.	DATE	DESCRIPTION	CHK.	APP.
B	07/2020	REVISED AS NOTED, ISSUED FOR CONSTRUCTION	S.KH.	A.S.
A	11/2016	ISSUED FOR CONSTRUCTION	S.KH.	A.S.
0	10/2013	ISSUED FOR APPROVAL	P.R.	M.Z.

CLIENT : شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

CONSULTANT: TARA TARH

PROJECT TITLE:

SHADEGAN STEEL COMPLEX

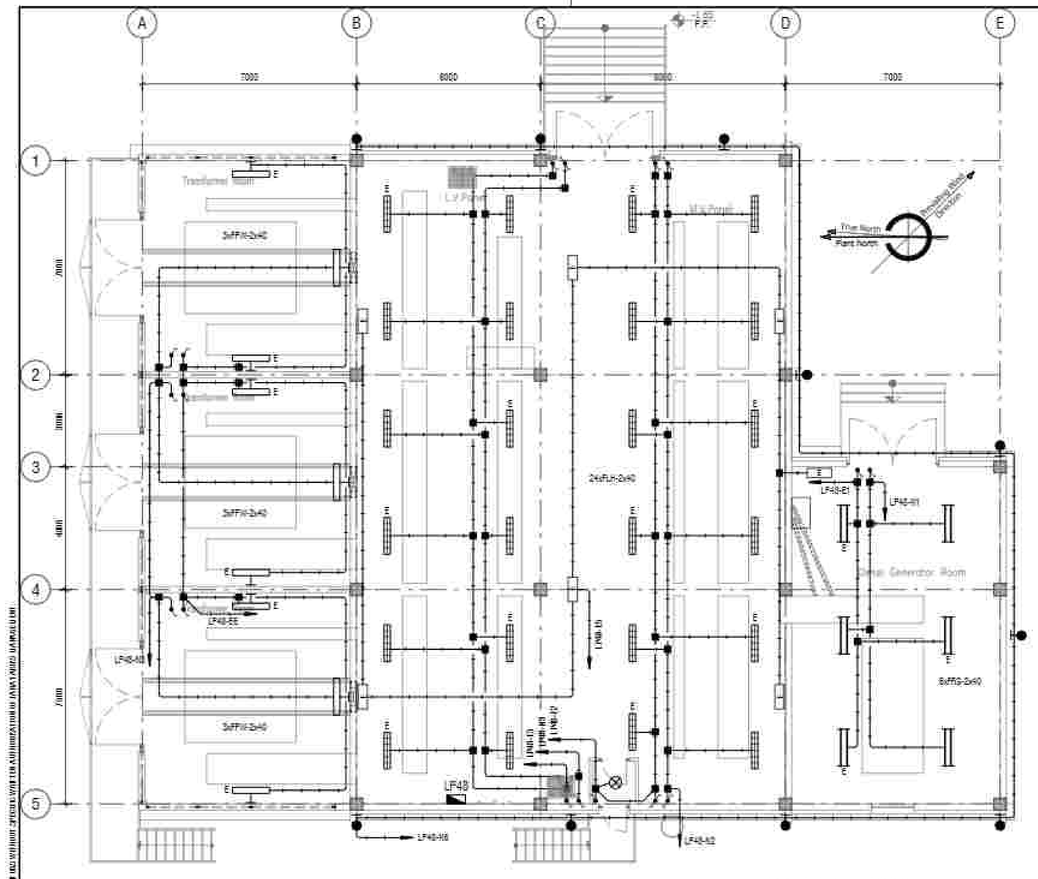
DESIGNED BY:	H. JOSHATABI
DRAWN BY:	M. ASGHANI
CHECKED BY:	P. RAJABI
APPROVED BY:	M. ZORIASATAIN
DATE:	10/2013

DWG TITLE:

UTILITY ELEC. SUBSTATION
ELECTRICAL SYSTEMS DRAWINGS

33 kV SINGLE LINE DIAGRAM
PART "2"

CLIENT-DWG. No: SDTU1 U48 E70 019 002 B	SCALE: AS SHOWN	SIZE: A1
TARA DWG. No: TA-140-U48-E-DW019	SH. No: 2 OF 2	REV. B



GROUND FLOOR PLAN
LIGHTING SYSTEM LAYOUT

SCALE : 1/100

BASEMENT FLOOR PLAN
LIGHTING SYSTEM LAYOUT

SCALE : 1/100

LEGEND

FLS-2x40	LOUVER TYPE FLUORESCENT LUMINAIRE SURFACE MOUNTED WITH 2x40W FLUORESCENT LAMP
FLH-2x40	DITTO BUT HUNG (PENDANT) TYPE
FRS-2x40	REFLECTOR TYPE FLUORESCENT LUMINAIRE SURFACE MOUNTED WITH 2x40W FLUORESCENT LAMP
IWW-1x100	INCANDESCENT WEATHER PROOF DECORATIVE LUMINAIRE WALL MOUNTED WITH 1x100W INCANDESCENT LAMP
ICS-1x60 ⊗	SURFACE CEILING MOUNTED LUMINAIRE WITH METAL FRAME, OPALIZED GLASS COVER, E27 LAMP HOLDER AND 1x60W INCANDESCENT LAMP
ITW-1x100	INCANDESCENT TUNNEL TYPE LUMINAIRE WITH WIRE GUARD WALL SURFACE MOUNTED WITH 1x100W INCANDESCENT LAMP
ITS-1x100	DITTO BUT CEILING SURFACE MOUNTED
	EXIT TYPE EMG. FLUORESCENT LUMINAIRE COMP. WITH BATTERY, RECTIFIER, INVERTER & 1x8W FLUORESCENT LAMP
	EMG. FLUORESCENT LUMINAIRE COMP. WITH BATTERY, RECTIFIER, INVERTER & 1x8W FLUORESCENT LAMP
■	JUNCTION BOX , SURFACE MOUNTED IN. HEIGHT 220 cm A.F.F. OR AS NOTED
	LIGHTING SYSTEM CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT UNLESS OTHERWISE NOTED
	SWITCH, SINGLE POLE, ONE WAY, ONE GANG SURFACE MOUNTED, 250V, 10A, IN. HEIGHT 110 cm A.F.F.
	SWITCH, SINGLE POLE, ONE WAY, TWO GANG SURFACE MOUNTED, 250V, 10A, IN. HEIGHT 110 cm A.F.F.
	SWITCH, SINGLE POLE, TWO WAY, ONE GANG SURFACE MOUNTED, 250V, 10A, IN. HEIGHT 110 cm A.F.F.
	ELECTRICAL PANEL , WALL SURFACE MOUNTED , M.H. 1.60 m ABOVE FINISHED FLOOR

NOTES

1. CONTRACTOR SHALL CHECK ALL OF THE DRAWINGS OF DIFFERENT TRADES (ARCH. , STRUC. , MECH. & ELEC.) BEFORE EXECUTION AND SHALL INFORM ABOUT ANY COORDINATION PROBLEM.
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE :
3. ALL LIGHTING CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT.
4. THE LIGHTING FIXTURES ARE CODED WITH A FIVE CARACTERS DESIGNATION CODE CONSIDERD AS FOLLOWING :

XXX - XxX

5th. CODE - LAMP WATTAGE
4th. CODE - NUMBER OF LAMPS
3rd. CODE - TYPE OF FIXTURES MOUNTING (SEE TABLE ONE)
2nd. CODE - TYPE OF FIXTURES (SEE TABLE ONE)
1st. CODE - TYPE OF LAMPS (SEE TABLE ONE)

TABLE ONE
LIGHTING FIXTURES DESIGNATION CODE

1st. CODE		3rd. CODE	
TYPE OF LAMPS		MOUNTING TYPE	
C	COMPACT FLUORESCENT	S	SURFACE
F	FLUORESCENT	F	FLUSH
H	HALOGEN	H	HUNG (PENDANT)
I	INCANDESCENT	W	WALL
M	HIGH PRESSURE MERCURY VAPOUR	P	POLE
S	HIGH PRESS. SODIUM	B	BRACKET
2nd. CODE		4th. CODE	
TYPE OF FIXTURES		NUMBER OF LAMPS	
A	AREA	1	ONE
B	BATH	2	TWO
C	CYLINDERICAL	3	THREE
D	DECORATIVE	4	FOUR
E	SELF POWER EMERGENCY WITH BATTERY CHARGER & RECTIFIER	5	FIVE
F	FLOOD LIGHT	6	SIX
G	GRIF TYPE	8	EIGHT
H	CHANDELIER	5th. CODE	
I	INDUSTRIAL	LAMP WATTAGE	
L	LUOVERED	20	20 W
P	PLASTIC	40	40 W
R	REFLECTOR	100	100 W
S	SPOT LIGHT	125	125 W
T	TUNNEL	250	250 W
W	WEATHER PROOF	400	400 W
X	EXPLOSION PROOF	1000	1000 W

KEY PLAN

REV.	DATE	DESCRIPTION	CK. BY	APP. BY
A	01/2020	ISSUED FOR CONSTRUCTION	E. KH.	A. S.
0	08/2018	ISSUED FOR APPROVAL PER CLIENT RECOMMEND	E. KH.	A. S.

CLIENT :
شرکت صنعت فولاد شادگان
Shadegan Steel Industry Co.

CONSULTANT :
TARA TARH

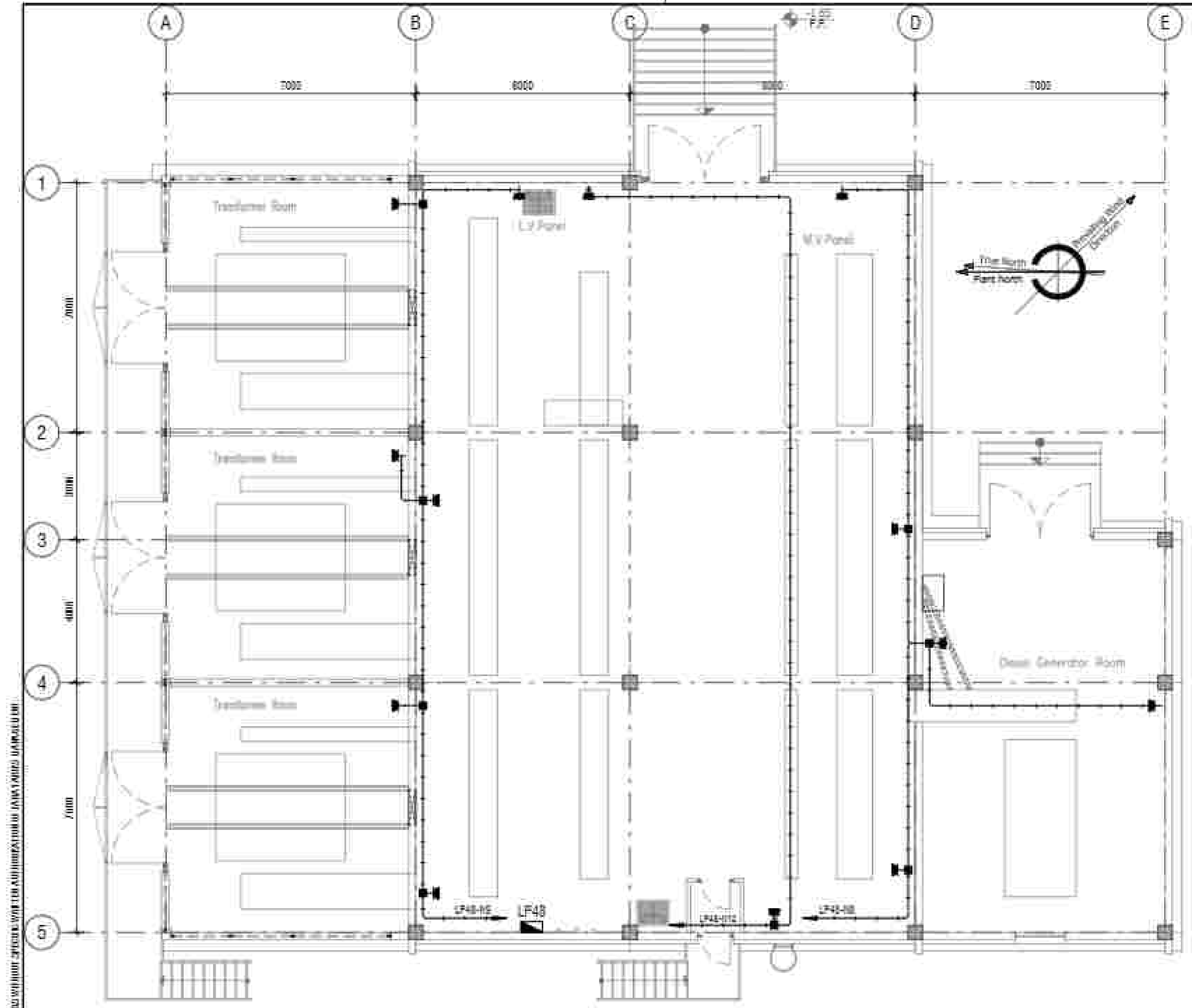
PROJECT TITLE :
SHADEGAN STEEL COMPLEX

DESIGNED BY:	H. JOGHATAEI
DRAWN BY:	M. ASGHANI
CHECKED BY:	E. KHAKSARI
APPROVED BY:	A. SALAMAT
DATE :	08/2018

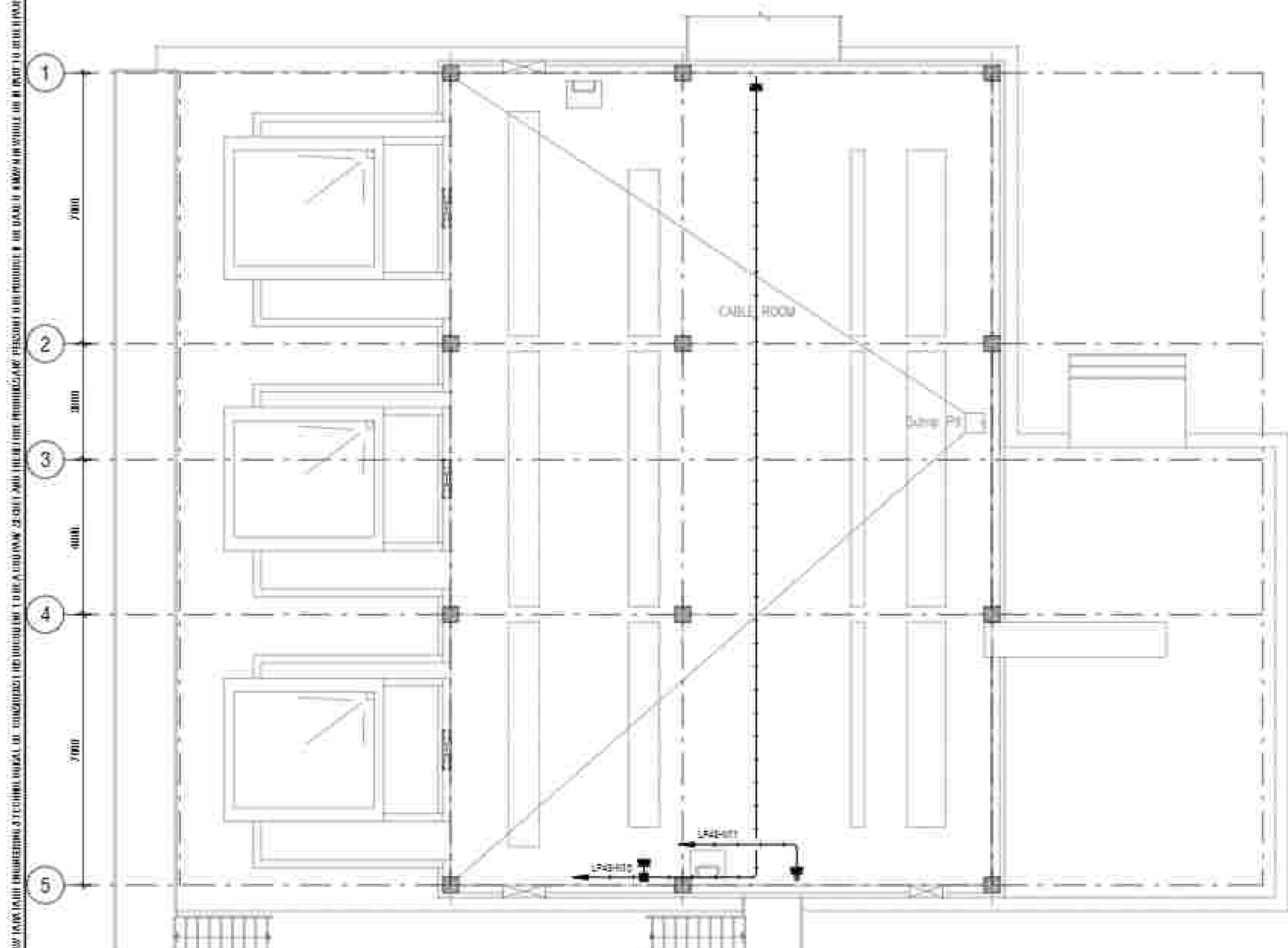
DWG TITLE :
UTILITY ELEC. SUBSTATION
ELECTRICAL SYSTEMS DRAWINGS

LIGHTING SYSTEM LAYOUT

CLIENT-DWG. NO :	SDTU1 U48 E55 021 001 A	SCALE : AS SHOWN	SIZE : A1
TARA DWG. NO.	TA-140-U48-E-DW021	SH. 1 OF 1	REV. A



GROUND FLOOR PLAN
SOCKET OUTLET LAYOUT
SCALE : 1/100



BASEMENT FLOOR PLAN
SOCKET OUTLET LAYOUT
SCALE : 1/100

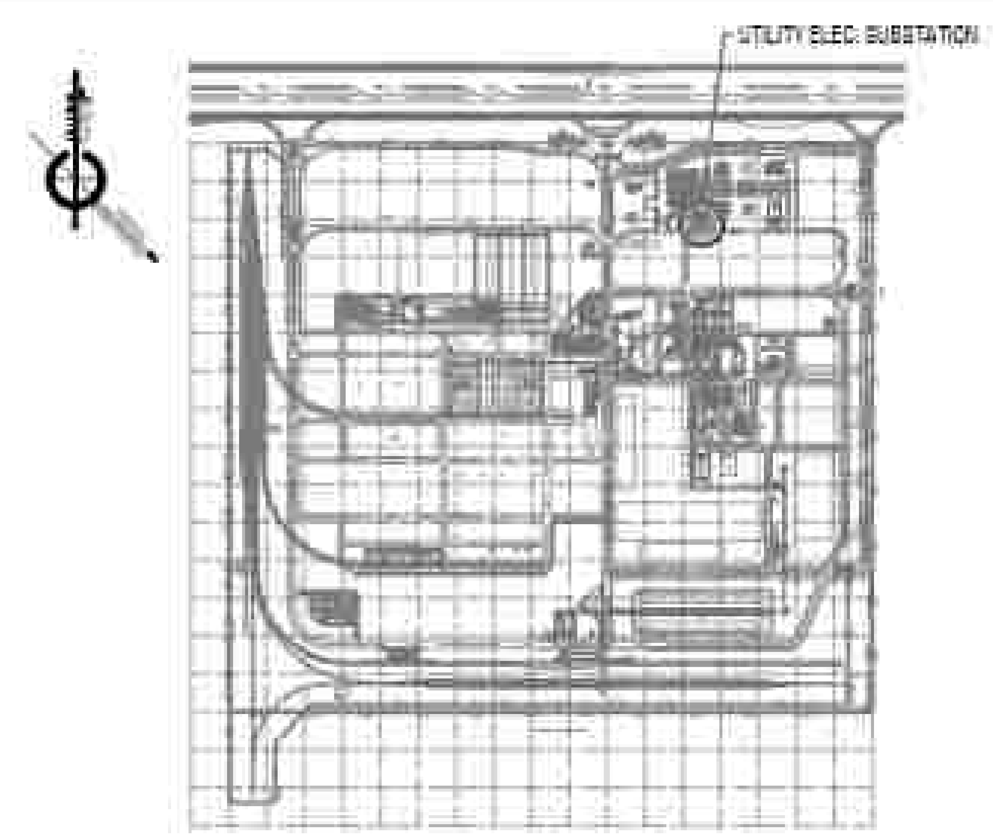
NOTES

1. CONTRACTOR SHALL CHECK ALL OF THE DRAWINGS OF DIFFERENT TRADES (ARCH. , STRUC. , MECH. & ELEC.) BEFORE EXECUTION AND SHALL INFORM ABOUT ANY COORDINATION PROBLEM.
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE :
3. ALL SOCKET CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT .
4. ALL OPENINGS, PANELS AND CABLES IN SUBSTATION BUILDING SHALL BE FIRE STOP AFTER COMPLETION OF CABLE AND PANEL INSTALLATION.

LEGEND

- POWER CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT UNLESS OTHERWISE NOTED
- ELECTRICAL PANEL , WALL MOUNTED , M.H. 1.60 m ABOVE FINISHED FLOOR
- POWER SOCKET OUTLET, 230V, 50HZ, 1PH, 16A WITH GROUND TERMINAL, SURFACE MOUNTED, IN. HEIGHT 110 cm A.F.F.
- DITTO BUT, 380V, 50HZ, 3PH, 32A WITH GROUND TERMINAL, SURFACE MOUNTED, IN. HEIGHT 110 cm A.F.F.
- JUNCTION BOX , SURFACE MOUNTED IN. HEIGHT 220 cm A.F.F. OR AS NOTED

KEY PLAN



REV.	DATE	DESCRIPTION	CK. BY	APP. BY
A	01/2020	ISSUED FOR CONSTRUCTION	E. KH.	A. S.
0	08/2018	ISSUED FOR APPROVAL PER CLIENT RECOMMEND	E. KH.	A. S.

CLIENT : شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

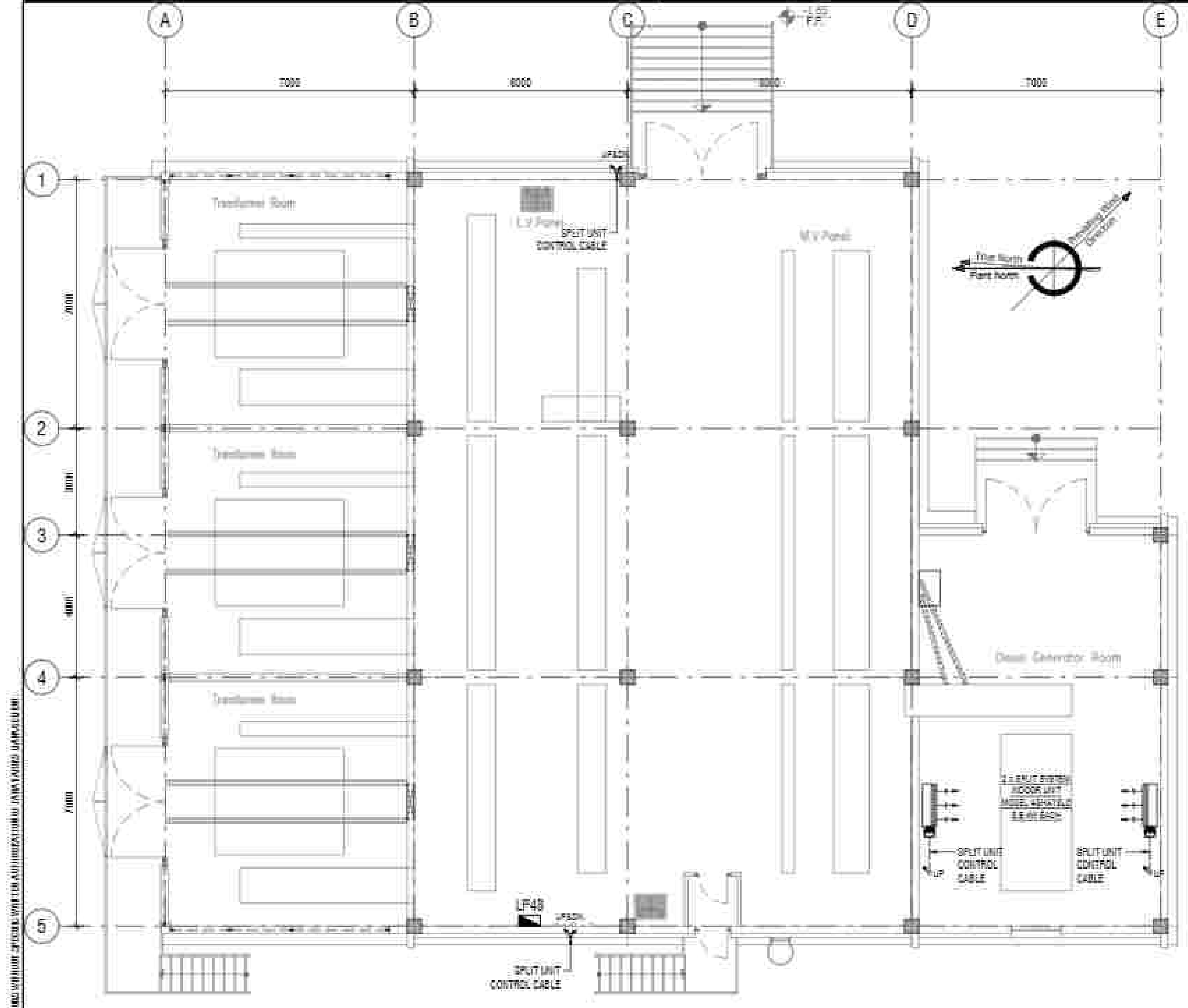
CONSULTANT : TARA TARH

PROJECT TITLE :

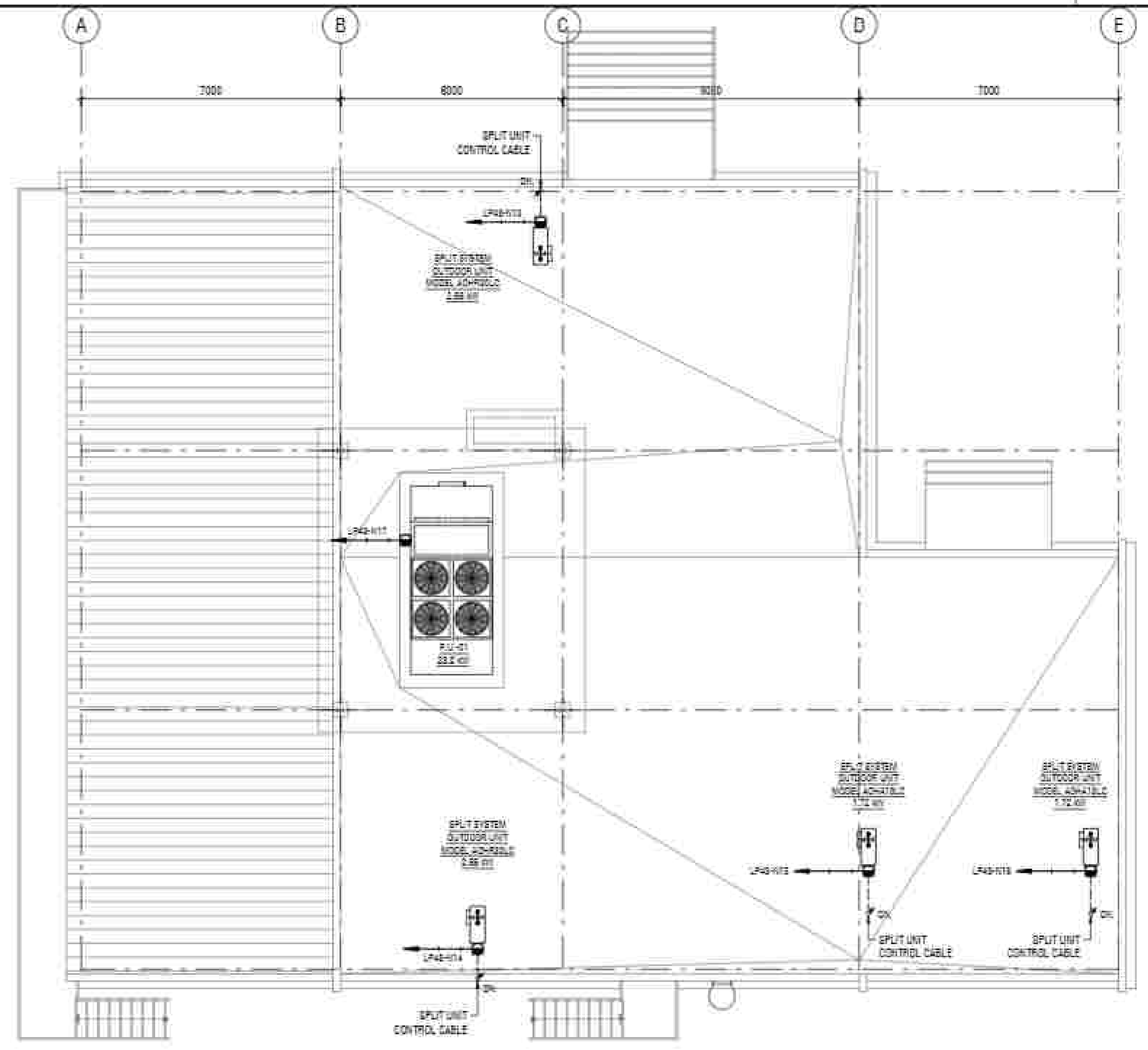
SHADEGAN STEEL COMPLEX

DESIGNED BY:	H. JOSHATABI	DWG TITLE : UTILITY ELEC. SUBSTATION ELECTRICAL SYSTEMS DRAWINGS — SOCKET OUTLET LAYOUT
DRAWN BY:	M. ASGHARI	
CHECKED BY:	E. KHAKSARI	
APPROVED BY:	A. SALAMAT	
DATE :	08/2018	

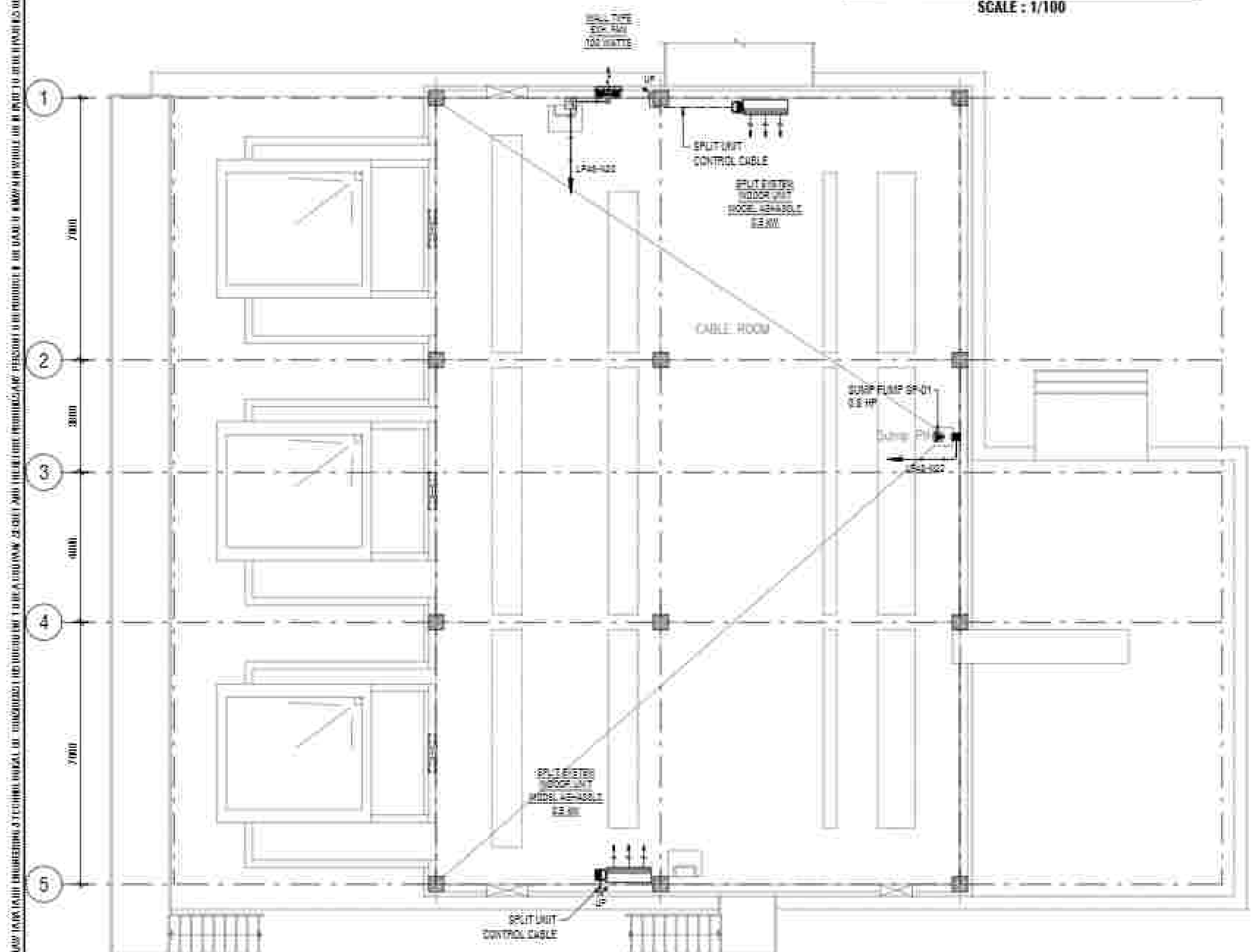
CLIENT-DWG. NO :	SDTU1 U48 E55 022 001 A	SCALE : AS SHOWN	SIZE : A1
TARA DWG. NO.	TA-140-U48-E-DW022	SH. 1 OF 1	REV. A



GROUND FLOOR PLAN
HVAC SYS. POWER SUPPLY LAYOUT
SCALE : 1/100



ROOF FLOOR PLAN
HVAC SYS. POWER SUPPLY LAYOUT
SCALE : 1/100



BASEMENT FLOOR PLAN
HVAC SYS. POWER SUPPLY LAYOUT
SCALE : 1/100

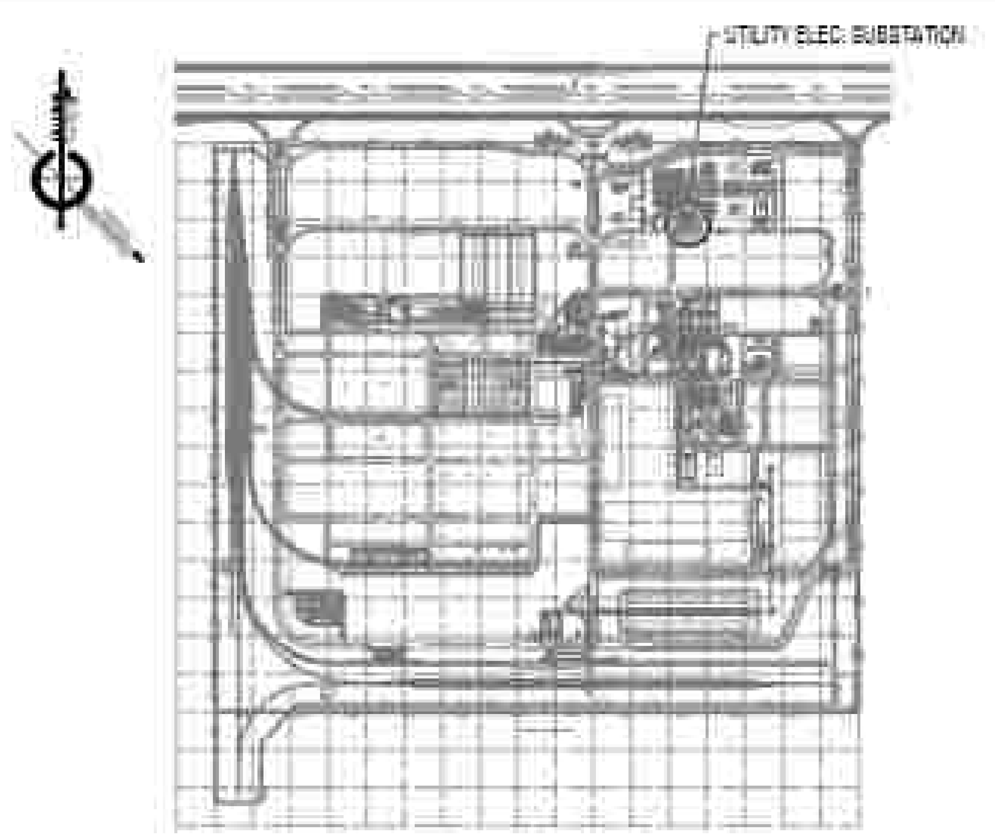
NOTES

1. CONTRACTOR SHALL CHECK ALL OF THE DRAWINGS OF DIFFERENT TRADES (ARCH. , STRUC. , MECH. & ELEC.) BEFORE EXECUTION AND SHALL INFORM ABOUT ANY COORDINATION PROBLEM.
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE.
3. ALL HVAC CONDUCTORS RUN IN HOT DIP EXPOSED CONDUIT.

LEGEND

- HVAC SYS. POWER CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT UNLESS OTHERWISE NOTED
- HVAC SYS. CONTROL CONDUCTORS RUN IN HEAVY GAUGE PVC CONCEALED CONDUIT UNLESS OTHERWISE NOTED
- ELECTRICAL PANEL , WALL MOUNTED , M.H. 1.80 m ABOVE FINISHED FLOOR
- JUNCTION BOX , SURFACE MOUNTED IN, HEIGHT 220 cm A.F.F. OR AS NOTED
- JUNCTION BOX, FLUSH MOUNTED, FOR HVAC SYSTEM POWER SUPPLY
- WALL MOUNTED INDOOR PANEL SPLIT SYSTEM
- OUTDOOR PANEL CONDENSING UNIT

KEY PLAN



REV.	DATE	DESCRIPTION	CK. BY	APP. BY
A	01/2020	ISSUED FOR CONSTRUCTION	S. KH.	A. S.
0	08/2019	ISSUED FOR APPROVAL PER CLIENT RECOMMEND	S. KH.	A. S.

CLIENT : شرکت صنعت فولاد شادگان Shadegan Steel Industry Co.

CONSULTANT : TARA TARH

PROJECT TITLE : SHADEGAN STEEL COMPLEX

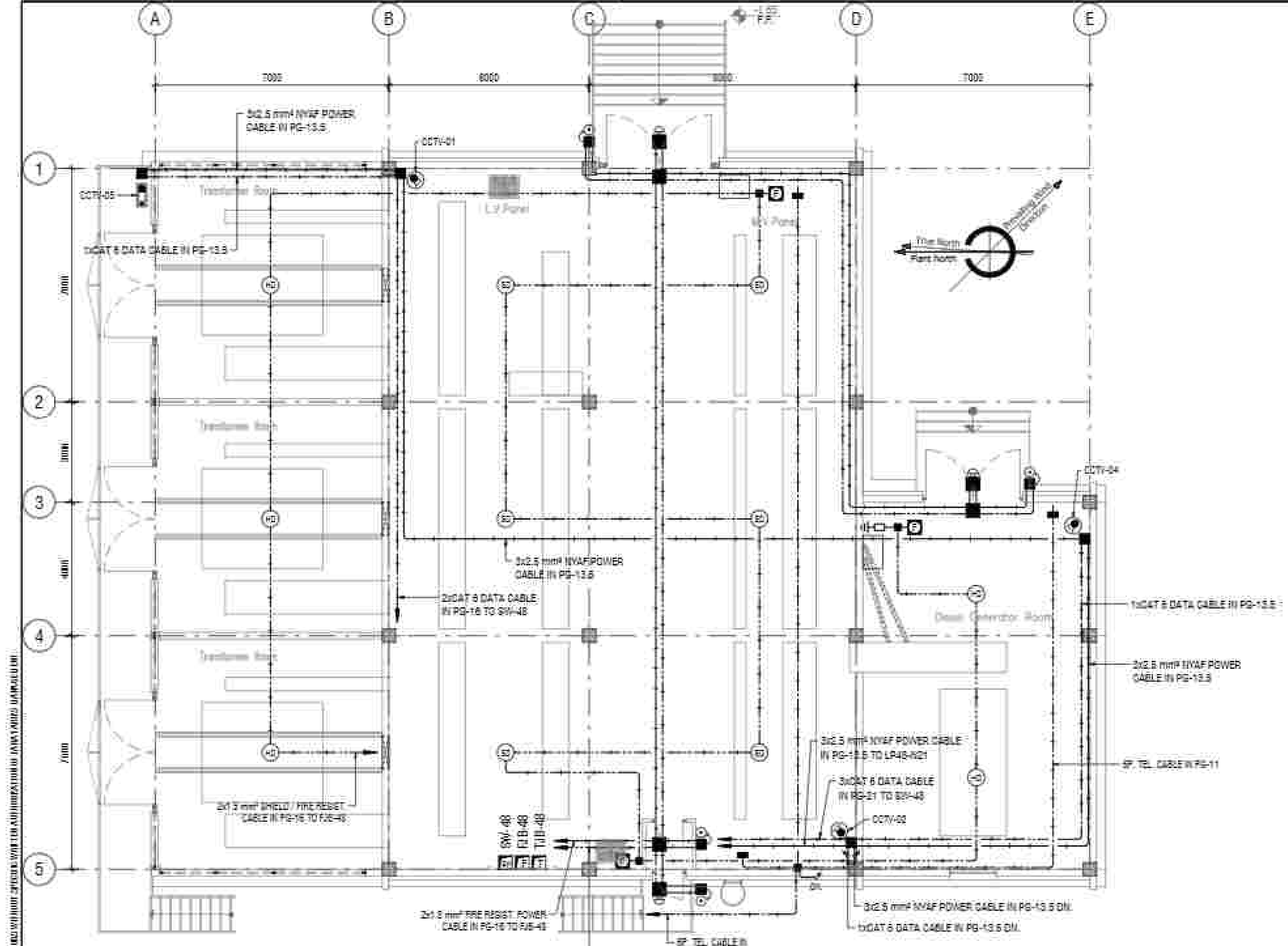
DESIGNED BY:	H. JOSHATABI
DRAWN BY:	M. ASGHANI
CHECKED BY:	S. KHAKSARI
APPROVED BY:	A. SALAMAT
DATE :	08/2019

DWG TITLE : UTILITY ELEC. SUBSTATION ELECTRICAL SYSTEMS DRAWINGS

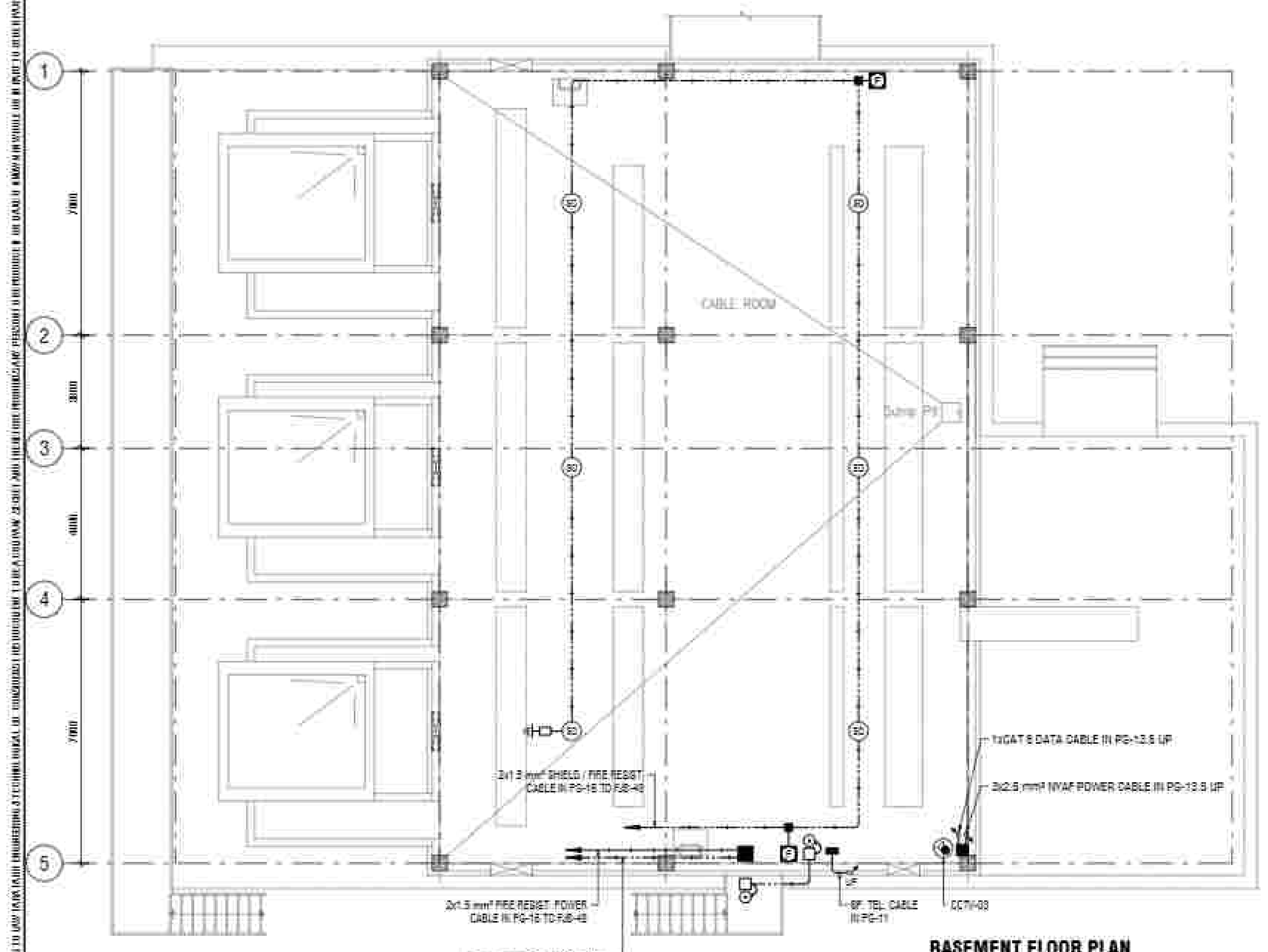
HVAC SYSTEM POWER SUPPLY LAYOUT

CLIENT-DWG. NO : SDTU1 U48 E75 023 001 A — SCALE : AS SHOWN — SIZE : A1

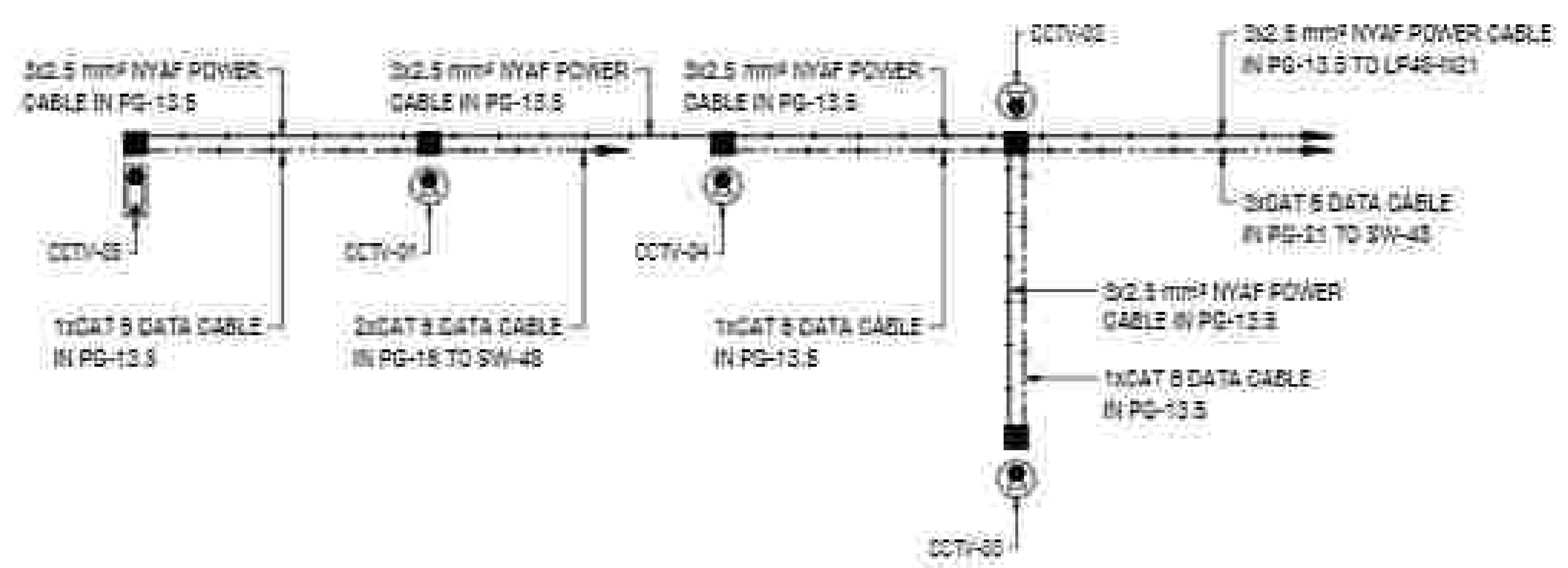
TARA DWG. NO. TA-140-U48-E-DW023 — SH. 1 OF 1 — REV. A



GROUND FLOOR PLAN
FIRE ALARM, CCTV & TELEPHONE SYSTEMS LAYOUT
SCALE : 1/100



BASEMENT FLOOR PLAN
FIRE ALARM, CCTV & TELEPHONE SYSTEMS LAYOUT
SCALE : 1/100



CCTV SYSTEM DATA & POWER BLOCK DIGARAM
SCALE : NTS

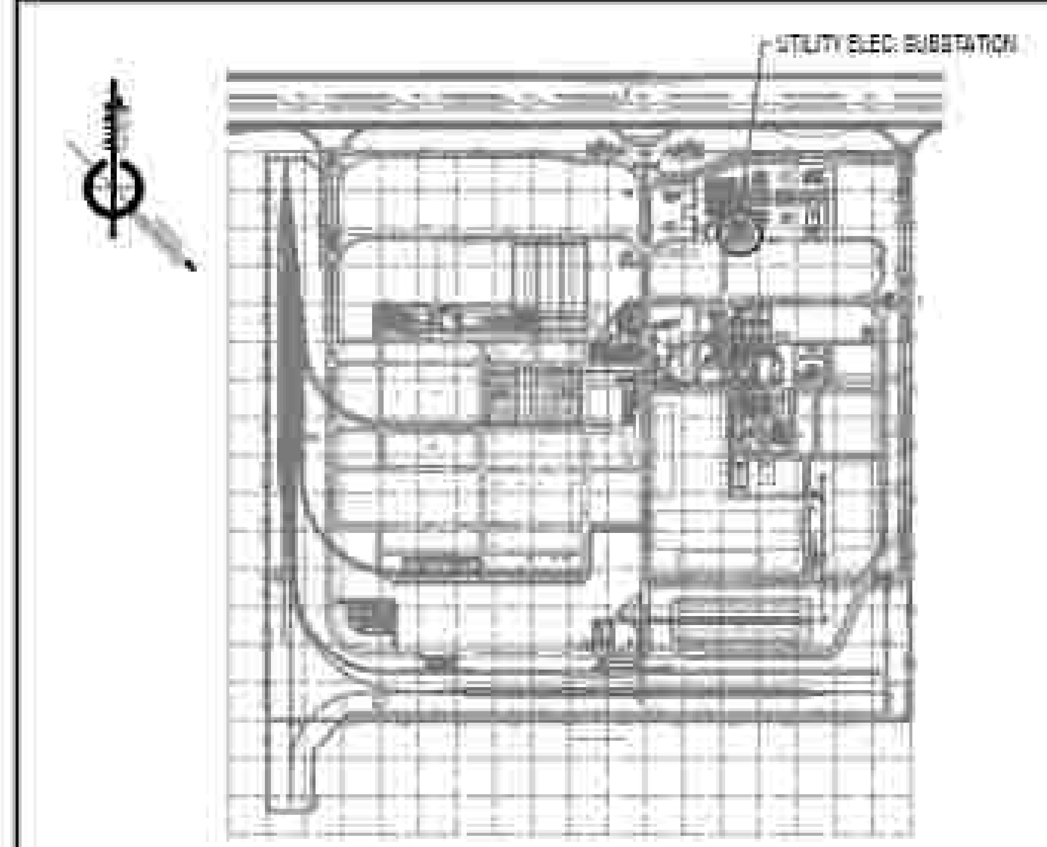
NOTES

1. CONTRACTOR SHALL CHECK ALL OF THE DRAWINGS OF DIFFERENT TRADES (ARCH. , STRUC. , MECH. & ELEC.) BEFORE EXECUTION AND SHALL INFORM ABOUT ANY COORDINATION PROBLEM.
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE.
3. ALL FIRE ALARM CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT.
4. ALL TELEPHONE CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT.

LEGEND

- FIRE ALARM CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT UNLESS OTHERWISE NOTED
- FACP — FIRE ALARM SYSTEM CONTROL PANEL, 2 ZONES CONVENTIONAL TYPE, M.H. 1.80m ABOVE FINISHED FLOOR
- FIRE ALARM TERMINAL BOX M.H. 2.00m ABOVE FINISHED FLOOR.
- SD — PHOTOELECTRIC SMOKE DETECTOR.
- HD — COMBINATION (FIXED & RATE OF RISE) HEAT DETECTOR.
- FIRE ALARM BELL, M.H. 2.30m ABOVE FINISHED FLOOR.
- MANUALLY OPERATED FIRE ALARM, WITH POWER SUPPLY UNIT, SURFACE MOUNTED , M.H. 1.40m A.F.F.
- TELEPHONE CONDUCTORS JY(ST)Y 0.8 mm RUN IN HOT DIP GALV. STEEL EXPOSED CONDUIT UNLESS OTHERWISE NOTED
- TELEPHONE TERMINAL BOX, M.H. 2.00m ABOVE FINISHED FLOOR.
- TELEPHONE OUTLET , SURFACE MOUNTED , RJ-11 TYPE, IN. HEIGHT 110 cm A.F.F.
- DATA SYSTEM SWITCH WITH SUITABLE ENTRIES AND TERMINALS AND OTHER REQUIRED ACCESSORIES
- CCTV SYSTEM DATA CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED SURFACE MOUNTED CONDUIT, UNLESS OTHERWISE NOTED
- CCTV SYSTEM POWER CONDUCTORS RUN IN HOT DIP GALV. STEEL EXPOSED SURFACE MOUNTED CONDUIT, UNLESS OTHERWISE NOTED
- CCTV DOME CAMERA FOR INDOOR, IP BASE TYPE
- CCTV FIX COLOR CAMERA, IP BASE, WITH SUITABLE HOUSING FOR OUTDOOR, WITH BASE IP65.
- JUNCTION BOX , SURFACE MOUNTED IN. HEIGHT 220 cm A.F.F. OR AS NOTED

KEY PLAN



REV.	DATE	DESCRIPTION	CK. BY	APP. BY
A	01/2020	ISSUED FOR CONSTRUCTION	E. KH.	A. S.
0	08/2019	ISSUED FOR APPROVAL PER CLIENT RECOMMEND	E. KH.	A. S.

CLIENT : شرکت صنعت فولاد شادگان — Shadegan Steel Industry Co.

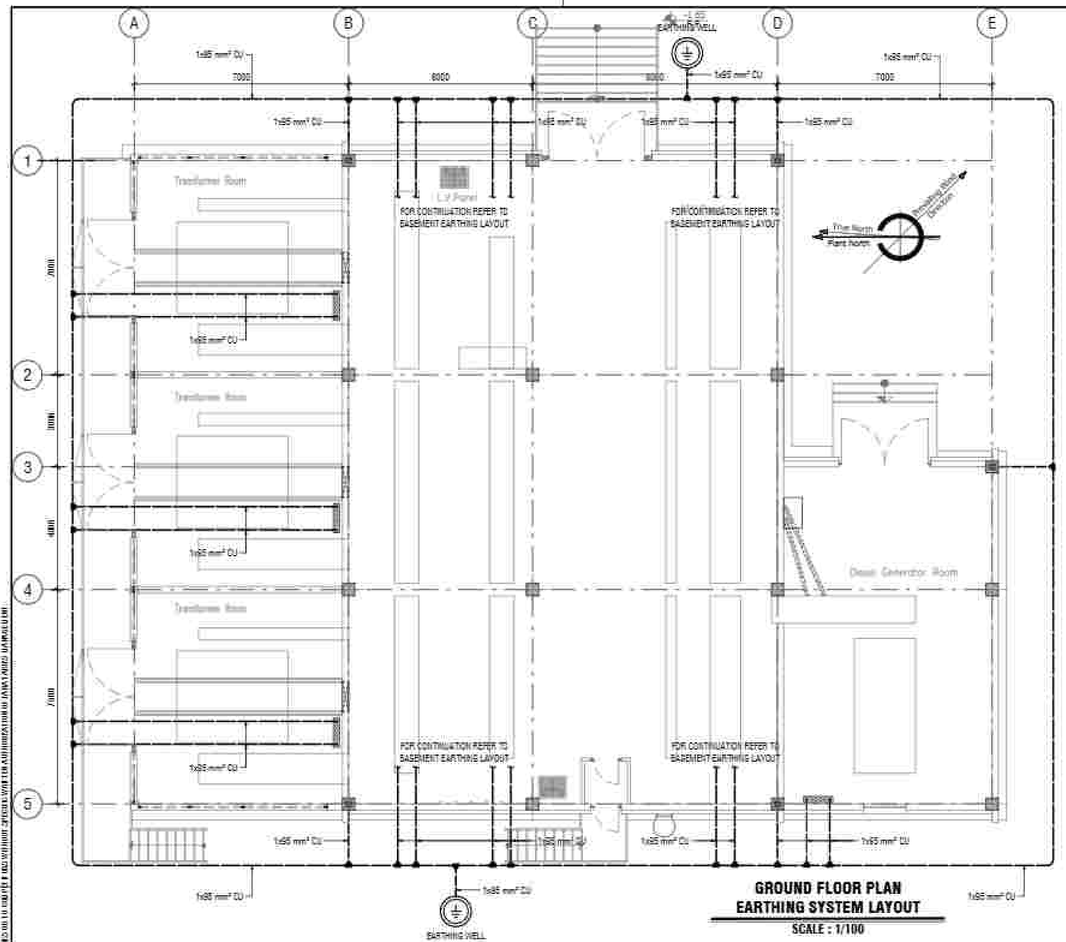
CONSULTANT : TARA TARH

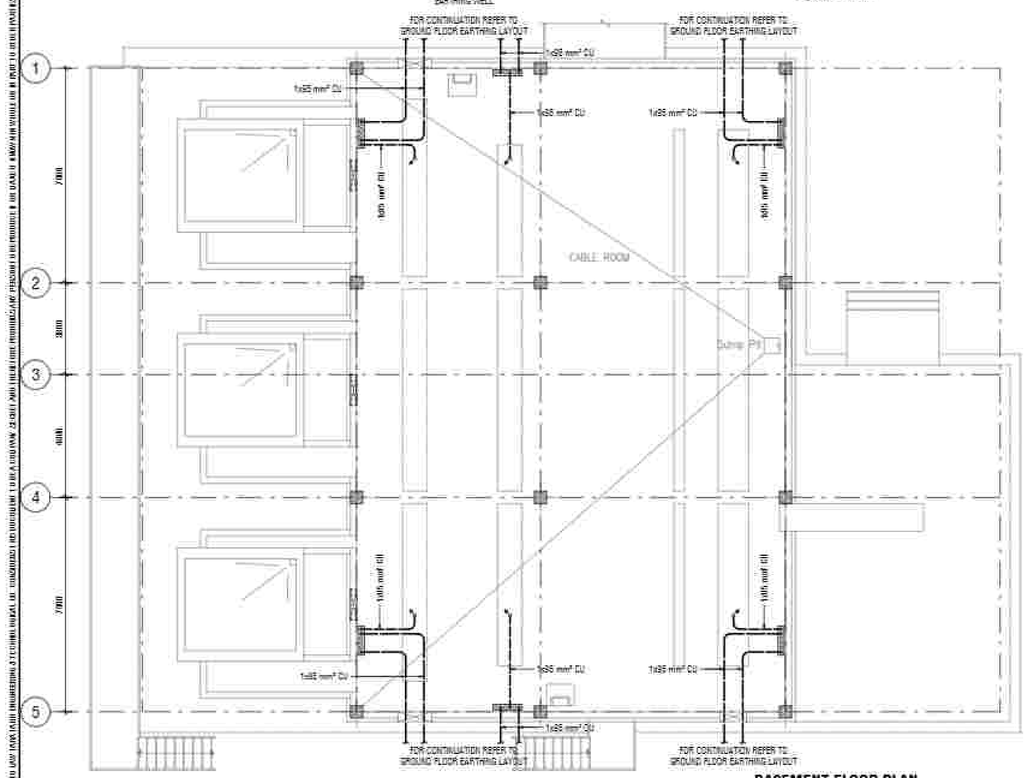
PROJECT TITLE : SHADEGAN STEEL COMPLEX

DESIGNED BY:	H. JOSHATABI
DRAWN BY:	M. ASGHANI
CHECKED BY:	E. KHAKSARI
APPROVED BY:	A. SALAMAT
DATE :	08/2019

DWG TITLE : UTILITY ELEC. SUBSTATION ELECTRICAL SYSTEMS DRAWINGS
TEL. & FIRE ALARM SYS. LAYOUT

CLIENT-DWG. NO :	SDTU1 U48 E15 024 001 A	SCALE : AS SHOWN	SIZE : A1
TARA DWG. NO.	TA-140-U48-E-DW024	SH. 1 OF 1	REV. A





GROUND FLOOR PLAN
EARTHING SYSTEM LAYOUT
SCALE : 1/100

BASEMENT FLOOR PLAN
EARTHING SYSTEM LAYOUT
SCALE : 1/100

NOTES

1. CONTRACTOR SHALL CHECK ALL OF THE DRAWINGS OF DIFFERENT TRADES (ARCH. , STRUC. , MECH. & ELEC.) BEFORE EXECUTION AND SHALL INFORM ABOUT ANY COORDINATION PROBLEM.
2. THIS DRAWING IS ONLY VALID FOR WHAT MENTIONED IN THE TITLE.

LEGEND

— - — - —	SURFACE EARTH BARE STRANDED CONDUCTOR SIZE & IN. DEPTH AS NOTED ON PLAN DWG.
———	INSULATED GREEN/YELLOW PVC EARTH CONDUCTOR SIZE & IN. DEPTH AS NOTED ON PLAN DWG.
—●—	CADWELD CONNECTION
—■—	COMPRESSED / BOLTED CONNECTION
▬	EARTHING BUSBAR , 500x50x6 mm
⏚	EARTHING WELL
⏚	EARTHING ROD

KEY PLAN

REV.	DATE	DESCRIPTION	CK. BY	APP. BY
A	01/2020	ISSUED FOR CONSTRUCTION	E. KH.	A. S.
0	08/2018	ISSUED FOR APPROVAL PER CLIENT RECOMMEND	E. KH.	A. S.

CLIENT :

شرکت صنعت فولاد شادگان
Shadegan Steel Industry Co.

CONSULTANT :

TARA TARH

PROJECT TITLE :

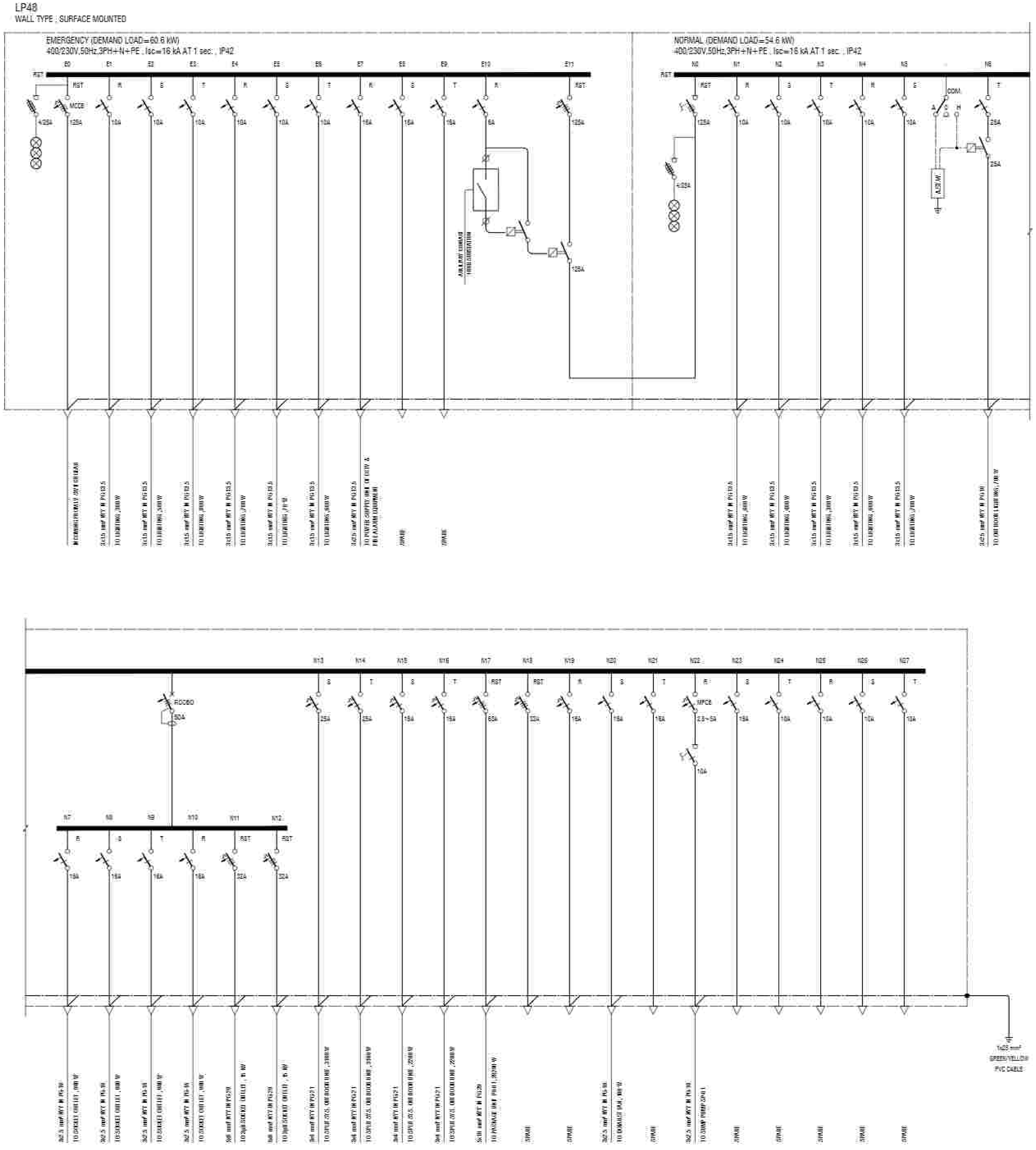
SHADEGAN STEEL COMPLEX

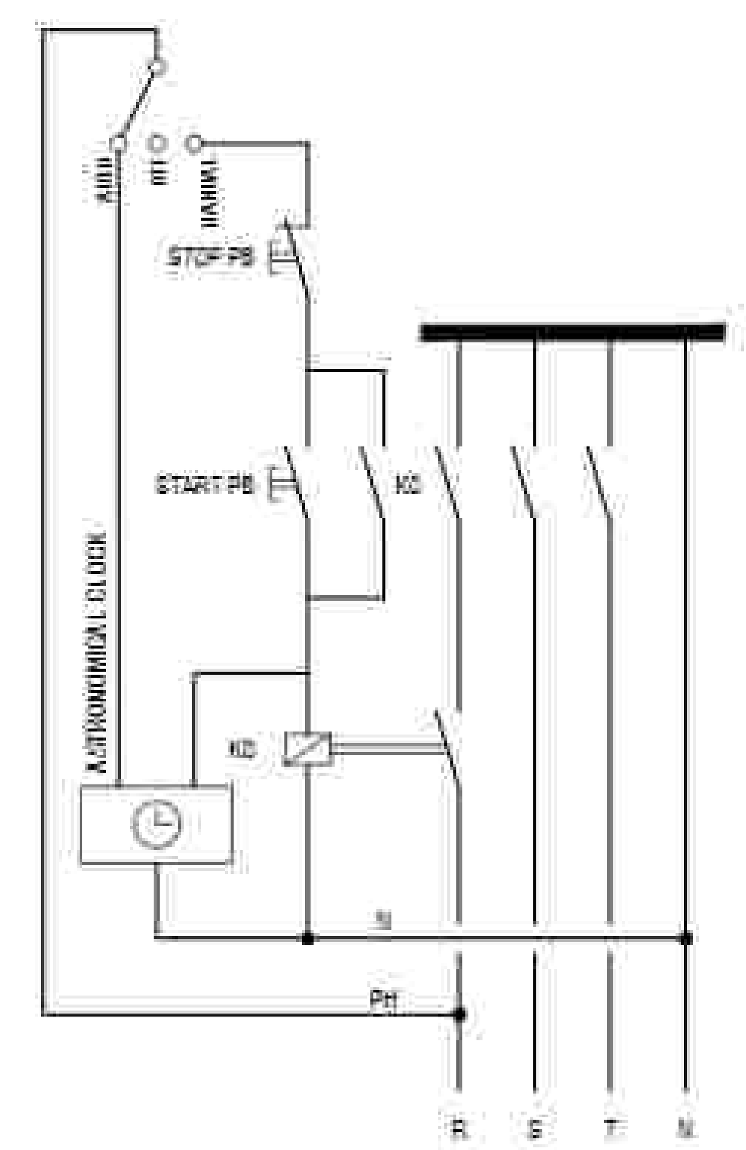
DESIGNED BY:	H. JOGHATAEI
DRAWN BY:	M. ASGHANI
CHECKED BY:	E. KHAKSARI
APPROVED BY:	A. SALAMAT
DATE :	08/2018

DWG TITLE :
UTILITY ELEC. SUBSTATION
ELECTRICAL SYSTEMS DRAWINGS

EARTHING SYSTEM LAYOUT

CLIENT-DWG. NO :	SDTU1 U48 E60 025 001 A	SCALE : AS SHOWN	SIZE : A1
TARA DWG. NO.	TA-140-U48-E-DW025	SH. 1 OF 1	REV. A





AREA LIGHTING SCHEMATIC CONTROL DIAGRAM

LEGEND

- MOULDED CASE CIRCUIT BREAKER (MCCB) CROSS LINES INDICATES NO. OF POLES
- MINIATURE CIRCUIT BREAKER (MCB) CROSS LINES INDICATES NO. OF POLES
- SCREW TYPE FUSE CROSS LINES INDICATES NO. OF POLES
- ROTARY SWITCH , ON LOAD CROSS LINES INDICATES NO. OF POLES
- CONTACTOR
- PULSE OPERATED LATCHING RELAY AS USED FOR LIGHTING REMOTE ON/OFF CONTROL SYSTEM
- SIGNAL LAMP
- FUSED SWITCH CROSS LINES INDICATES NO. OF POLES
- THREE POSITION HAND-OFF-AUTO SELECTOR SWITCH
- GROUND CONNECTION
- MOTORIZED CIRCUIT BREAKER
- RCCBO EARTH LEAKAGE CIRCUIT BREAKER

NOTES

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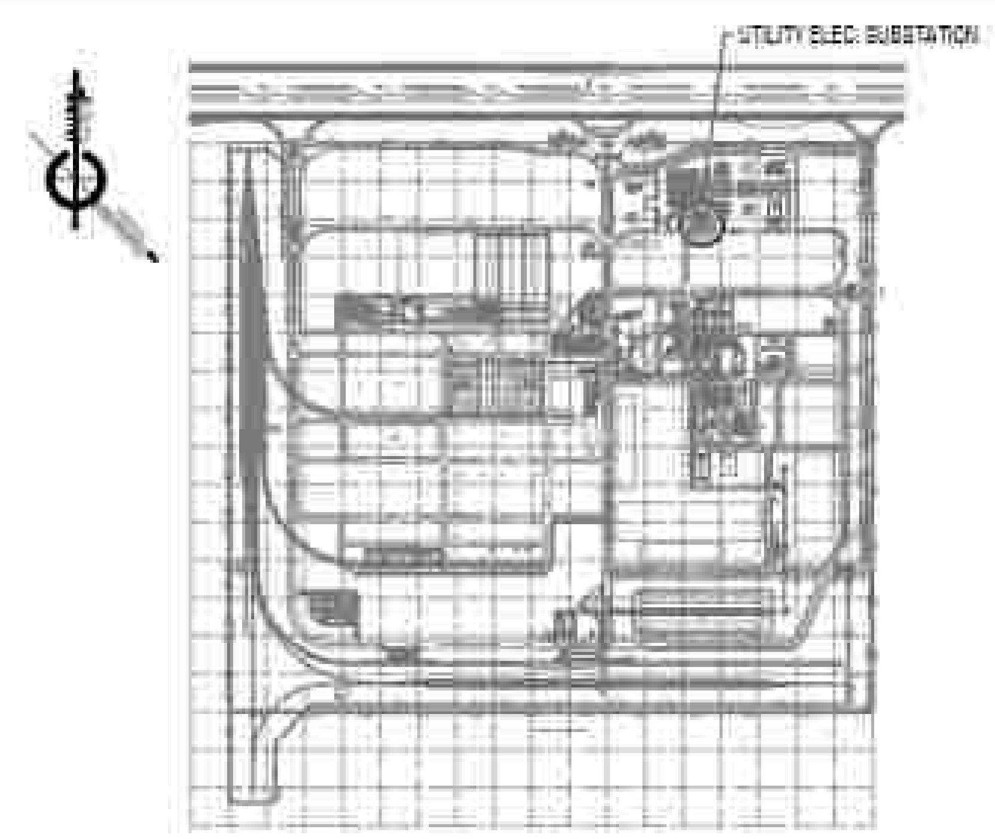
KEY PLAN



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CLIENT : Shadegan Steel Industry Co. شرکت صنعت فولاد شادگان

CONSULTANT : TARA TARH

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DESIGNED BY:	H. JOGHATAEI
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CHECKED BY:	E. KHAKSARI
APPROVED BY:	A. SALAMAT
DATE :	08/2019

DWG TITLE : UTILITY ELEC. SUBSTATION ELECTRICAL SYSTEMS DRAWINGS

LP48 SINGLE LINE DIAGRAM

CLIENT-DWG. NO : SDTU1 U48 E70 026 001 A — SCALE : AS SHOWN — SIZE : A1

TARA DWG. NO. TA-140-U48-E-DW026 — SH. 1 OF 1 — REV. A

National Iranian Steel Company

SHADEGAN STEEL COMPLEX

Utility Substation

Tara Tarh Doc. No.: TA-140-U48-E-SP001		Rev. A	No. of Pages 18
Client Doc. No.: SWTU1U48E70001001A			
Document Title: **Technical Specification for LV Switchgear of Utility Substation**			

Rev.	Date	Subject	Preparation	Checking	Verification	Approval
A	NOV. 2016	Issued for Construction	H. Joghataei	S. Khaksari	M. Saeedi	A. Salamat
0	JUN. 2012	Issued for Approval	N. Sedighi	H. joghataei	F. Golchin	M. Zorriasat

Distribution Table:					
Row	Receiver	Copy No.	Row	Receiver	Copy No.
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2			5		
3			6		

TARA TARH
Engineering & Technological Co.

Address:
No. 18 Shadan Alley, Jahan Ara St., Yousef Abad, 14389, Tehran, Iran.
Tel: (98 21) 88337394
Fax: (98 21) 88337397
Email: tara@taratarh.com
Web site: http://www.taratarh.com

Page	Revision		Remark	Page	Revision		Remark	Page	Revision		Remark
	0	A			0				0		
1	x	x		30				59			
2	x	x		31				60			
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4	x	x		33				62			
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9	x	x		38				67			
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13	x	x		42				71			
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Contents

1. Scope

This standard covers the minimum requirements for design, testing, rating and supply of low voltage switchgear/MCC up to 1 kV, 3 phases, 4 wires, 50 Hz which will be installed in substations. This standard is supplemented by datasheets, schedule sheets, one line diagrams and interconnection diagrams on which the operating conditions and special requirements will be listed in detail.

In case of conflict between documents listed below, the one appearing first in sequence of this listing will proceed over the following ones.

- Purchase order
- Schedule sheets/datasheets
- All the drawings attached to the requisition
- This material standard
- Other specifications and standards referred to in the above documents.
- Vendor drawings.

Deviations from this standard which the manufacturer may consider advisable shall be submitted in writing to purchaser, together with his quotation, purchaser may approve or reject such deviations. Exceptions other than those included in the above mentioned documents shall not be considered.

Standard designs and models are preferred, provided they meet the requirements of this standard, serve the intended purpose, and can be shown to have at least three years of proven successful service in the field.

All documentation shall be issued, using SI metric system of measurement.

The English language shall be used for all correspondence documents, catalogs, drawings and nameplates. All other languages are not acceptable.

2. Standard and Codes

Design, test and rating of LV switchgear and MCCs shall conform to requirements of the latest editions of the following IEC publications:

IEC-60051	Recommendations for Direct Arcing Indicating Electrical Measuring Instruments and their Accessories.
IEC-60144	Degree of Protection of Enclosures for Low Voltage Switchgear and Control Gear.

IEC-60185/186	Current and Voltage Transformers.
IEC-60255	Electrical Relays.
IEC-60292-1	Low Voltage Motor Starters.
IEC-60439	Factory Built Assemblies of Low Voltage Switchgear and Control gear.

Other relevant IEC publications supplemented by this document, switchboard schedules and single line drawings

Vendor shall state in the quotation standards to which equipment conforms. If these are the national standards, vendor shall state in quotation, deviations if any form the relevant IEC recommendations.

3. Conditions and Regulations

3.1. Conditions of Operation

All of the Electrical Equipment & Systems will be suitable for 24 hours, 7 days/week and 360 days/year operation.

3.2. Site Conditions

The Shadegan Steel Complex is located near the city of Shadegan in Khouzestan province with approximate coordinate of:

Latitude 30°, 32' North

Longitude 48°, 58' East

The region's elevation is about 6 meters above mean sea level (M.S.L.).

The nearest airport is Ahwaz airport.

Max. outdoor ambient temperature	: 51 °C
Min. outdoor ambient temperature	: 1.4 °C
Average maximum air temperature in the summer	: 41-46 °C
Average Relative humidity	: 50 %

4. Design and Construction

4.1. General Requirements

The switchboard/MCC shall be of indoor, metal enclosed type and in accordance with the requirements of IEC publication 60439.

The switchgear and motor control centers shall be of air insulated, multi-tiered type and free standing, self supporting, floor mounting, flush fronted and dead front design with all equipment installed inside vertical steel structures suitably subdivided into arc proof compartment at least for:

- The horizontal busbars
- Incoming feeders
- Bus tie cubicle
- Starters and outgoing feeders.

Each line up of switchgear and MCC shall be suitable and prepared for future extension at either end without any drilling, welding or cutting of the equipment. Unless otherwise noted, MCCs shall be front access type.

The total enclosure shall have the degree of protection IP42 as defined in IEC publication 60144, without using the floor of the switch room as part of the enclosure.

Individual panels of the switchboard /MCC shall be self ventilating.

Thermal rating for all current carrying parts shall be a minimum of 1 second for the rated symmetrical short circuit current, but not less that 150% of that time which is required to clear the faults at the maximum rated symmetrical short circuit level. If the maximum short circuit time must be extended, the I_2t value shall remain constant.

Structural main frames, section frames and forming shall provide strength and rigidity. The switchgear shall be supplied with the base channels and holding down bolts, nuts and washers.

Auxiliary voltages shall be as follows:

Control voltage power center incomers and bus coupler	110 V DC (Battery charger will be supplied by contractor)
Control voltage for Outgoing feeders	110 V AC (from two transformers, one as stand-by, in each MCC)
Space heater voltage	230 V AC

The equipment shall be capable of proper operation for voltage deviations of ±10% and frequency deviations ± 5%. In addition, contactors and relays shall be able to ride through voltage dips of 80% nominal, such as those experienced during motor starting and suitable for maximum fault current of the system.

Unless otherwise noted, the circuit breakers for *I < 630A* can be *MCCB* type and for *I≥630A* should be *ACB* type.

Similar parts shall be interchangeable wherever practicable. Electrically identical components shall be mechanically interchangeable.

Ratings shall not be dependent upon the use of cooling fans.

When the panel has two incomers & one coupling (tie breaker), its operation method should be 2 of 3 breakers.

When the panel has two incomers, (two transformers or one transformer and diesel generator) 4-pole circuit breaker will be considered.

All panel boards shall have necessary spares and 10% space, as shown in SLD.

4.2. Safety and Reliability

Switchgear and motor control centers shall offer a maximum degree of safety under all normal operating and fault conditions. Arc barriers shall be arranged such that the propagation of a possible arc is hindered.

All interlocks shall be mechanical in nature.

All interlocks that prevent potentially dangerous mal-operations must be constructed such that they cannot be defeated easily.

It shall not be possible to open doors of breaker and starter compartments when the breaker or switch is in *ON* position. In *OFF* position, breaker operating mechanism or control circuit shall be lockable.

The switchboard/MCC shall be designed and constructed to facilitate inspection, cleaning, repair and maintenance and to ensure absolute safety during operation, inspection and maintenance.

The assembly shall be suitable for continuous operation at full load for at least 20,000 hr without maintenance which would require the bus bar and dropper system to be de-energized.

4.3. Busbars

Busbars shall be manufactured from hard drawn, high conductivity copper, Silver or Tin coated.

All busbars shall be fully insulated and shall be color coded *Red, Yellow, Blue* and *Black*.

Insulation shall be flame retardant non hygroscopic and rated at *60*°C. It shall be designed for full rated current at maximum ambient temperature specified in requisition, without exceeding their temperature rise limits.

Design of busbars shall be such that future extension of the switchgear to either side is possible.

The main busbars shall be of the same cross sectional area throughout the length of switchboard/MCC.

Bus bars shall be encased in separate compartments within the switchboard/MCC.

All horizontal bus bar joints shall be Tin coated.

A Copper earth bus, rated for the maximum available earth fault current for 1 second, shall run the entire length of the switchgear, with connecting points at each feeder point and at each end of the switchgear.

Unless otherwise noted in data sheet, a neutral bus of at least 50% phase current rating shall extend entire length of switchgear and shall be insulated from phase bus system and also from earth potential.

4.4. Power Circuit Breakers

Air circuit breakers in draw out type design are required. The closing mechanism shall be of stored energy, spring operated type and either manual or motor operated.

Circuit breakers shall conform to IEC publication 60157-1 in terms of rating, testing and performance, to perform the particular duties stated in the switchboard data sheets.

Motor operated breakers shall have provisions for manual emergency operation and slow closing-opening of contacts for inspection and adjustment. Local mechanical off push buttons shall permit tripping of the breaker upon loss of control voltage. Breakers mechanisms shall be mechanically and electrically trip free and have anti pump circuits.

Circuit breaker tripping shall be by means of shunt trip coil and a mechanical trip mechanism.

Each circuit breaker shall be provided with a continuous trip circuit supervision lamp and equipment to indicate trip circuit supply and circuit are healthy.

Facilities shall be provided for testing circuit breakers closing and tripping mechanisms when breaker is in either isolated or withdrawn position.

The breaker disconnect device shall be interlocked with breaker trip shall to prevent withdrawal or insertion of breaker from/into cubicle with breaker in *ON* position. If moving of breaker from, or into the operating position requires undue effort by operator, mechanical aids shall be provided. Automatic shutters shall cover line side primary disconnect contacts automatically upon withdrawal of breaker. The breaker shall be lockable in *DISCONNECT* position.

Breaker control connections shall be via fixed; self aligning disconnects, or via umbilical cord type plugs connections.

As a minimum, *2 N/O + 2N/C* contacts are required, wired to the terminal strip. If additional contacts are required, this will be indicated in the datasheets.

Rated currents of circuit breakers shall be selected from the following IEC standard range: -630-1250-1600-2000-2500-3150-4000 Amperes. Short circuit breaking and making rating current shall be specified on related SLD.

Unless otherwise noted, circuit breakers equal and above 630A should be Air Circuit Breaker type.

All low voltage wiring to and from the circuit breaker shall be terminated on an easily accessible terminal strip within, or close to breaker compartment. Each terminal and each wire shall be clearly identified by the same symbols used in circuit diagrams.

Breakers of identical rating and control scheme shall be completely interchangeable within the same switchgear.

Breakers shall have mechanical indicators for contact positions and spring charging status. It shall also be fitted with indicating lights to show *CLOSED* (red) *TRIPPED* (amber) *OFF* (green) and *TEST* (white) positions.

Maintenance intervals shall be 5 years during normal operation, or after 3 fully rated short circuit interruptions, as per the requirement of IEC 60157-1.

4.5. Motor Control Center Cubicles

MCC cubicles shall preferably have the same height as power switchgear cubicles. Cubicles shall be free standing, self supporting steel structures with isolated arc proof compartments for the following:

- Main horizontal busbars.
- Vertical (dropper) busbars.
- Motor starter or feeder compartments

Cubicles shall be suitable for extension in field without use of cutting, drilling or welding tools.

Unless otherwise specified, fully equipped spare cubicles shall be provided on basis of 20% with minimum of 1 unit, for each different starter size and type. Completion of vertical sections will be by empty cubicles suitably sized where applicable. The empty cubicles shall include connections to bus bar and corresponding support, fixed parts of equipments and doors with holes for mounting instruments and control/indication accessories. The holes shall be blanked off with easily removable plates. Neutral and earthling bus bars shall be as described under power switchgear cubicles.

4.6. Starter and Feeder Modules

Unless otherwise specified, motor starters shall be of direct on line type in accordance with the requirements of IEC 60292-1. Starters shall be draw-out type.

The starters shall include:

- Motor Protection Circuit Breaker (*MPCB*) for motors equal or less than *45kW* and Molded Case Circuit Breaker (*MCCB*) and *Thermal Overload* for motors greater than

45kW. MPCB & MCCBs are mechanically interlocked to compartment door and switch operating handle.

- Electrically operated air contactor.
- Earth fault relay for motors>18.5KW.

Outgoing feeders shall be circuit breakers fitted with protective and indicating devices, with or without shunt trips, as specified in purchaser's data sheets.

Operating handle of main interrupt device shall be door mounted and interlocked with switching device to prevent opening of compartment door when the breaker/switch is in *ON* position. Handles shall clearly indicate *ON* and *OFF* positions of the breaker/switch. For maintenance purposes interlock mechanism shall be able to be defeated by means of a purpose made tool.

Circuit breakers shall be provided with a trip auxiliary contact to open the contactor when an overload trips the circuit breaker.

Control power supply shall be by means of two control power transformers, one as spare, located in each MCC panel. Control voltage shall be *110 VAC*.

Motor *contactors* shall be magnetically operated air break type rated for category *AC3* according to IEC 60158, unless stated in the requisition otherwise.

In addition to load contacts and auxiliary contacts required to operate the starter, a minimum of *1NO + 1NC* auxiliary contacts shall be provided, wired to the terminal strip.

All contactors shall be provided with inherent ambient compensated thermal overload release which shall be adjustable over its full range.

Reset shall be via a door-mounted push-button.

Each starter module shall be equipped with *ON* (red), *OFF* (green) and *FAULT* (amber) pilot light on the door.

All motor starters shall have facilities for remote *START/STOP* of motors.

Starters shall be fitted with a *1A* secondary current transformer for a remote ammeter for motors>4KW.

Starter and feeder modules of identical rating and control scheme shall be fully interchangeable.

Short circuit protection coordination shall be type 2as per IEC.

Stay put type *STOP/RESET* push button accessible from outside of motor starter shall be provided on front of all motor starter doors.

Starters for motors rated above *4kW* shall be provided with one ampere meter and above *18.5kW* with instantaneous ground fault leakage relay (with *core balance* transformer) that will trip the starter on low level ground fault currents.

All components and materials shall be of latest field proven and in current production. Obsolete components or components scheduled for immediate discontinuation shall not be used.

4.7. Protection

Incoming feeders shall be provided with protective relays as indicated on single line drawings which will be attached with the requisition. The following are minimum requirement:

- Over current, adjustable, time delayed (inverse or definite time adjustable)
- Short circuit, fixed or adjustable, short time delayed (adjustable)
- Earth fault (time graded).

Protection relays for power center incoming and bus coupler feeders and motors>150KW shall be multifunction, LCD type, draw-out, flush or semi flush mounted and installed to facilitate ease of maintenance, inspection and testing.

Protective relays and meters shall have provisions for testing and calibrating using an external power supply without disconnecting permanent wiring.

Each incoming feeder shall be fitted with *voltmeter* with selector switch and ammeter with selector switch. Additional metering shall be provided as what will be listed on the datasheets.

4.8. Current Transformers

Rated secondary current shall be preferably *1A* for all switchboard/MCC and remote mounted protective relays and instruments.

Current transformers for *metering* purposes shall be of the accuracy class *0.5*.

Current transformers for *protection* purposes shall be of the accuracy class *5P10* unless otherwise specified in the requisition.

Current transformers shall be capable of carrying, without injurious heating or mechanical damage specified fault current of switchboard for short time rating of cubicle in which are installed.

Vendor shall be responsible for assessing and selecting output rating of current transformers.

Secondary leads of each current transformer shall be connected to test and short circuiting links.

Current transformers shall be installed in stationary part of cubicle. Their secondary terminals shall be accessible from front and shall have shorting facilities.

Test blocks complete with facilities for monitoring shall be foreseen for all protection CT's and PT's.

4.9. Instruments

All indicating instruments shall be flush mounted on front of cubicle and shall be of industrial grade.

Ammeters and voltmeters shall be of the accuracy class 1 and watt-hour meters shall be of the accuracy class 2.5.

Instruments shall be capable of carrying full load continuously without damage or overheating.

Instruments shall not be damaged by the passage of fault currents in the primary of current transformers or voltage variations on the system within the specified system characteristics.

External zero adjustment facilities shall be provided on all ammeters and voltmeters.

4.10. Grounding

All metallic non-current carrying parts of the switchboard/MCC shall be bonded together either by welding or bolting. Main structure shall be grounded via a hard drawn, high conductivity Copper bar, which shall run entire length of switchboard/MCC.

Main ground bar shall be sized to withstand a bolted ground fault for a duration equal to longest short time rating of any item of equipment contained in switchboard/MCC. Minimum size of main ground bar shall be 250 mm^2.

Main ground bar shall be located at rear of switchboard/MCC and shall be accessible from bottom.

Main ground bar shall have provision at each end for connections to the substation main ground grid.

All doors shall be bonded to main structure by means of a flexible Copper connection arranged so that it cannot be trapped as door is closed or opened.

In addition, grounding contacts of withdraw-able items shall make before electrical contacts and break after electrical contacts.

4.11. Internal Wiring and Terminals

All wirings shall be continuous from terminal to terminal with no splicing. Wiring shall be stranded Copper conductor with flame retardant, *600V* insulation.

Minimum conductor size is 4mm^2 for CTs, 2.5 mm^2 for power, 1.5 mm^2 for control and signal wiring.

All wiring shall be marked on each end with permanently embossed wire markers of the heat shrinkable or slip-on type. Wire markers reflecting phase identification shall be provided at the ends of all phase conductors. Wire numbers shall match the vendor's drawings.

Flexible wires shall be used for connection of door mounted equipment to cubicle mounted equipment. This wiring shall be loomed together, wrapped with flexible PVC coil for protection and shall be firmly clamped at both ends to prevent movement at terminations.

Each terminal shall be identified by suitable plastic type numbered ferrules in accordance with the relevant wiring diagrams.

Terminal blocks shall be arranged and positioned to afford easy access for carrying out external cable terminations, testing, inspection and maintenance.

Not more than one wire shall be connected to one terminal. Links shall be provided where more connections are required at one point.

Circuits and terminals operating at different voltage and/or performing different functions shall be adequately segregated or separated by barriers.

The control terminal blocks shall include not less than 15% spare terminals.

4.12. Cable Terminations

The switchboard/MCC shall be complete with the necessary cable termination facilities suitable for the type and size of cables specified in the datasheets and single line drawings.

Terminals for wires 4 mm^2 and above shall be suitable for accepting compression lugs.

Cable entry shall be located to allow sufficient space and access for easy wirings termination of cables and sealing of building entry. Particular attention shall be given to the space and bending radius required for large cables.

Cable supports shall be provided inside the switchboard/MCC for external cable tails, to alleviate undue strain on the cable terminations.

Vendor shall provide compression type cable lugs suitable for the specified type and size of the cables.

All terminal strips shall be treated with anti-fungus varnish.

4.13. Space Heaters

Space heaters to eliminate condensation within the unit shall be mounted in bottom of each vertical section, easily accessible from front. A circuit breaker switch shall be provided for overload protection and a blue light shall be provided on enclosure door to indicate that space heater is in operation. Heaters shall be rated for continuous service and for *230V*, 1 phase *and 50Hz* operation.

Heaters shall be thermostatically controlled with a manual safety *ON/OFF* switch which shall be mounted close by the heater, or on the switchboard.

All heater terminals shall be labeled with a danger notice, or shall be protected or shrouded.

4.14. Assembly

Switchgear shall be completely assembled, wired and tested at the factory and shall be shipped completely assembled if practicable. Where equipment must be disassembled for shipment, material and instructions for reassembling shipping sections including making up main power bus connections at shipping splits shall be provided.

Terminal strips shall be provided for all interconnecting wiring at shipping split and each wire and terminal shall be identified with permanent markers. Detailed wiring diagrams shall be provided to facilitate reconnection of wiring. Necessary bus connections, wire jumpers, bolts, nuts, washers, etc., shall be furnished, suitably packaged and marked to facilitate field assembly. Each shipping container shall be identified as specified in the material requisition and/or purchaser order. Vendor shall indicate his recommendation for onsite storage and handling.

5. Inspections and Tests

5.1. Inspection

During the switchgears/ MCC fabrication process, manufacturer shall provide access to his shops to inspectors so that can verify progress and status of the work being performed.

Inspection shall not relieve manufacturer form his obligations and warranties in accordance with the codes and standards mentioned in this standard.

5.2. Tests

Routine testing of each cubicle shall be performed according to IEC 60157 recommendations or the standards of the country of manufacture.

Routine tests, minimum:

- Power frequency voltage dry test
- Rated voltage test on auxiliary circuits
- Insulation resistance test on auxiliary circuits
- Mechanical operation test
- Function test of auxiliary devices, including relays.

These tests may be witnessed by purchaser. Test certificates are required for each switchboard without additional cost. Purchaser to be notified of these tests at least two weeks prior to tests. Any change in testing schedules shall be communicated immediately to purchaser and confirmed in writing.

Switchgear shall be visually inspected for technical execution and conformity with the approved drawing and the order.

All defects detected as a result of testing shall be repaired by manufacturer at his expense and shall be documented and corrected prior to shipment. If in opinion of purchaser retesting is required after such repairs, this shall also be at expense of manufacturer.

Certified records of the above inspection and tests shall be compiled into one inspection document by the vendor and shall be provided in the quantities and at the times specified in the requisition documents.

Vendor shall provide copies of "type test" certificates to prove design of equipment and components has been successfully tested by a recognized international testing authority at required operating and short circuit duties. Data shall include full details of the "type test" certifications granted to his equipment and shall cover all different items (e.g. circuit breakers, main busbars, down dropper busbars, etc.) Certificates shall be provided for each type and rating of equipment offered.

6. Information Required With Quotation

At least following information shall be submitted with quotation to enable purchaser's engineers for evaluating proposal as to its compliance with enquiry specifications.

- Detailed summary of exceptions of enquiry specification.
- Completed enquiry datasheets.
- Brochures and catalogs containing outline dimensions, main electrical data, and installation details.
- Relay data.
- List of accessories included in bid.
- Tests included.
- Main outline and floor cutout dimensions.
- Shipping weights and sizes.

7. Information Required After Order

7.1. Approval Data

The following information and data shall be submitted to purchaser engineer for approval prior to manufacturing of switchgear and motor control centers:

- Certified outline and floor cutout dimensions, including required clearances for installation, operation and maintenance, and approximate weights.
- Certified drawings of embedded leveling and support steel, if required by the design.
- Certified layout of starter and feeder modules.
- Updated, completed datasheets of purchaser.
- Control schematics and interlock sequences.
- Instrument transformer data, if used.
- Indicating instrument scale values.
- Protective relay types, curves and setting ranges.

7.2. Final Data

At the times and in quantities agreed upon in purchase order, the following shall be submitted:

- Final drawings and documents as listed in clause 7.1.
- Complete schematic circuit diagram of each cubicle.
- Device location drawings.
- Bill of materials for each LV switchgear and MCC, showing complete re-ordering information for all replaceable parts. This information shall coincide with identification found on devices listed.
- Spare parts location, identification and price list.
- Painting specification.
- Installation, operation and maintenance instructions.

Prior to shipment, copies of all routine test certificates shall be made available to purchaser.

All engineering data provided for this equipment shall show equipment as specified and ordered. Typical drawings are not acceptable unless they are revised to show only the equipment being furnished. The format, standards, quality and quantities of drawings shall be manufacturer's standard.

8. Accessories

Accessories shall be furnished together with the switchgear and the MCCs as required for proper and safe operation. As a minimum, the followings are required:

- Manual operating handle for motor operated air circuit breakers;

- Lifting trolley or similar device to remove circuit breakers and large starter module from cubicles;
- Adapter cables for control circuits of withdraw able starter modules.
- Testing cabinet and cable for circuit breakers, if they cannot be tested in withdrawn position in their cubicles;
- Special tools if required for breaker contact maintenance.
- Special tools if required for testing.

9. Installation

Vendors shall note the following:

All incoming and outgoing feeder cables will enter equipment from below via cable gland from trenches or floor cutouts. If bus ducts are specified as incoming feeders, they enter equipment from above.

Foundation bolts and installation instructions shall be provided by vendor.

Proposed layout and elevation plans for the switchgear and MCCs shall be part of vendor's proposal. This drawing shall show recommended clearances for safe operation and maintenance of the equipment.

10. Nameplates

Each circuit breaker and feeder shall be identified with its feeder designation engraved on laminated plastic tags of at least 40x100 mm size. Tag information will be supplied by purchaser. These tags shall be bolted or riveted onto a non removable part of the cubicle. Stick on or glued labels are not acceptable for this purpose. Characters shall be white on a black background.

Each power switchgear cubicle shall have a rating plate with the information required by IEC 60157

Each device installed in the cubicles, each plug assembly and terminal strip, and each indicating and operating element shall be identified with permanently attached plastic tags or labels of approved design. Inscriptions on these tags shall coincide with those used on the drawings.

Each circuit breaker shall have its own rating plate with information according to IEC 60157.

Wording on name-plates, etc., shall be in English.

11. Painting

The equipment shall be painted in accordance with vendor suitable preparation and specification painting cycle.

The painting system shall be suitable for the specified climate condition in the requisition.

Five tins of one liter or paint taken from the same batch as the factory paint shall be included for touching up after installation.

Color of the switchgear shall be RAL7032. (Shall be approved by client before construction)

All panels should be painted by baked color in two/three layer & 120 micron.

12. Spare Parts, Special Tools and Manuals

All special tools and spare parts required for commissioning, startup, and two years operation shall be provided, as well as relevant documents such as drawing, maintenance, operating and installation manuals.

13. Preparation for Shipment

Preparation for shipment shall be in accordance with manufacturer's standards, unless otherwise noted on the request for quotation and/or purchase order. The manufacturer shall be solely responsible for the adequacy of preparation for shipment employed with respect to materials and application, and provide materials to their destination in ex-works condition when handled by commercial carrier systems. All equipment shall be securely fastened to case bottom to avoid displacement during transportation.

All equipment & parts shall be shipped in airtight polyethylene covers and suitably boxed in wooden cases for export shipment. Parts shall have identification tags specifying main equipment, item number and drawing reference.

Additionally silica gel or similar dehydrating compound shall be enclosed in each package.

One complete set of the installation, operation and maintenance instructions shall be packed in the boxes or crates with the equipment. This set in addition to the number of sets specified in the purchaser's requirement for document's forms included in the inquiry/purchase order.

National Iranian Steel Company

SHADEGAN STEEL COMPLEX

Utility Substation

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Document Title:

Technical Specification for MV Switchgear of Utility Substation

Rev.	Date	Subject	Preparation	Checking	Verification	Approval
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0	JUN. 2012	Issued for Approval	N.Sedighi	H.joghataei	F.Golchin	M.Zarria.

Distribution Table

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TARA TARH
Engineering & Technological Co.

Address:
No. 18, Shadan Alley, Jahan Ara St.,
Yousef Abad, 14389, Tehran, Iran.
Tel: (98 21) 88337394
Fax: (98 21) 88337397
Email: tara@tarataeh.com
Web site: http://www.tarataeh.com

Sheet	Revision		Remark	Sheet	Revision		Remark	Sheet	Revision		Remark
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1	X	X		30				59			
2	X	X		31				60			
3	X	X		32				61			
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9	X	X		38				67			
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MV Switchgear Specification

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1. Introduction

1.1 This specification covers the minimum requirements for design, manufacture of AC 33kV switchgear which will be installed in Substations.

1.2 This specification covers only the general requirements of the switchgear and control gear. The specific requirements of each assembly (plan, arrangement, breaker ratings, relaying, metering, one line diagrams, control schemes, etc.) will be shown on detailed Data Sheets and/or drawings which will be part of the Requisition for Quotation and/or purchase order.

2. Standards and Codes

2.1 The medium voltage switchgear shall be designed, manufactured, inspected and tested in accordance with the applicable sections of the latest edition of the following International Electro technical Commission "IEC" standards.

- IEC 60038 IEC Standard Voltages
- IEC 60044-1 Current transformers
- IEC 60186 Voltage transformers
- IEC 62271 High voltage switchgear & control gear
- IEC 60298 AC Metal enclosed switchgear and control gear for rated voltages above 1kV and up to and including 52 kV
- IEC 60529 Degrees of protection provided by enclosures (IP code)

2.2 Where standards other than IEC are specified it is understood that the equivalent IEC standard is acceptable.

2.3 Any deviation from this specification and the above mentioned references shall be clearly mentioned in the vendor's proposal.

2.4 Document Priority

In case of conflict between documents, the order of precedence shall be:

- Single line diagramThe Data Sheets
- This Specification,
- I.E.C standards,

3. Service Conditions

3.1 The switchgear specified herein will generally be installed indoor in substation rooms, which will be ventilated and/or air conditioned.

3.2 Site condition is as follows:

Equipment and materials shall be designed and manufactured for use under the following site conditions:

- Altitude:6m A.S.L.
- Ambient Temperature
  - -Maximum: +51 ℃
  - -Minimum: 1.4 ℃
- Average Relative Humidity 50%
- Design Atmospheric Pressure: 1.01Bar

4. Application

4.1 The operating voltage is 33kV and the highest system voltages according to IEC recommendations.

4.2 The MV switchgear includes circuit breakers with associated control, measuring, protective and regulating devices as specified in this specification and/or indicated in the single line diagram.

5. General Requirements

5.1. Enclosure

5.1.1 The enclosure shall be metal clad type, as defined in IEC 60298 and shall be self supporting, free standing, floor mounted consisting of steel structure/s enclosed by sheet steel with minimum thickness of 2.5 mm. Components shall be accessible from the front of the switchgear.

5.1.2 The indoor enclosure shall provide a degree of protection of IP 42 according to IEC 60529 without using the floor of the switch room as part of the enclosure. The partitions between functional units and shutters for the bus bar side and cable side shall at least provide a degree of protection of IP 41.

5.1.3 The switchgear enclosure shall be self ventilating .Switches, buttons and operating handles shall be installed at a height of not more than 180cm.

5.1.4 The enclosure together with bus bars and wirings shall be extendable at both ends without the need to cut or drill any part of the enclosure.

5.1.5 All incoming and outgoing cable entry to the switchgear shall be from bottom. Gland plates shall be provided in the switchgear assembly for this purpose.

5.1.6 Lifting lugs shall be provided on enclosure/s for ease of handling.

5.1.7 Foundation bolts and installation instructions shall be provided by the vendor.

5.2. Bus bars

5.2.1 Unless otherwise indicated the switchgear shall be with single bus bar and bus bars shall be manufactured from hard drawn, high conductivity copper.

5.2.2 Bus bars shall be designed for the full rated current at the maximum ambient temperature specified without exceeding the temperature rise limits. It shall have the possibility of keeping the symmetrical short circuit level of31.5KA. Design of the bus bars shall be such that future extension of the switchgear to either side will be possible.

5.2.3 Power bus bars shall be fully insulated with flame retardant non-hygroscopic insulation material and shall be color coded. Suitable insulation shall be provided for the bolted joints. The insulation of bus bar joints and connections shall be removable for inspection purposes. Bus bar joints and connections shall be corrosion protected by silver-plating and secured to prevent loosening.

5.2.4 The color or the color coding of the bus bars insulation shall be red, yellow and blue for phase bus bars, from top to bottom and from left to right when facing the front of the switchgear.

5.2.5 The main horizontal bus bars shall be of the same cross sectional area throughout the length of the switchgear. The continuous ampere rating of the main horizontal bus bars shall be indicated in data sheet and/or single line diagram.

5.2.6 Vertical bus bars, if any, shall be of the same cross sectional area throughout their length and their current rating shall be equal to the sum of the maximum full load ratings of the outgoing functional units connected to that bus bar.

5.2.7 The horizontal and vertical bus bars shall be capable of withstanding, without damage, the magnetic forces and the thermal effects created by the maximum specified short circuit current for at least one second . 5.2.8 Main horizontal bus bars shall be in separate compartment. The vertical bus bars shall also be in separate compartment and can be installed behind functional units of each vertical section. The vertical bus bars shall be arranged such that accidental contact with live parts shall be impossible.

5.2.9 An earth bus bar, rated for the maximum available earth fault current shall run the entire length of the switchgear. Adequate provisions shall be fitted to connect the cables screen and/or armor to the earth bus bar. The earth bus bar shall be equipped with suitable connectors or bolts to be connected to earth copper conductors at both ends. The size of the earth bus bar and earth conductors shall conform to IEC 60298.

5.3. Wiring, Terminals and Markings

5.3.1 All internal wiring shall be continuous from terminal to terminal with no splicing.

5.3.2 Wiring shall be stranded copper conductor with flame retardant PVC insulation. Minimum conductor sizes shall be 2.5 mm2 for control and protection, and 1.5 mm2 for signal wiring.

5.3.3 Where wiring is run through a metal sheet or barrier, bushing or other mechanical protection shall be provided.

5.3.4 All internal power cables and wires shall be suitable for the largest continuous current rating of the functional unit and the short circuit current as limited by fuses or circuit breakers.

5.3.5 The sizes of earth wires shall be according to the recommendations of IEC 60298.

5.3.6 Where applicable, flexible wires shall be used for connection of door mounted equipment to the cubicle mounted equipment. Such wiring shall be wrapped with flexible PVC coil or installed in flexible conduit and shall be firmly clamped at both ends to prevent movement at terminations.

5.3.7 Covers and/or doors with electrical apparatus attached to them shall be connected to the switchgear frame via bonding conductors.

5.3.8 All wiring shall be numbered on each end with permanently embossed wire markers of the heat shrinkable type or slip-on ferrules. Wire numbers shall match the manufacturer's interconnection drawings.

5.3.9 All wires shall have cable lugs and shall be terminated in clamp type terminals such that direct contacts between screw, bolt or nut and cable lugs are avoided. For current transformers secondary wiring, ring type cable lugs shall be used.

5.3.10 The terminals shall be identified by suitable permanent numbers in accordance with the relevant wiring diagrams. Terminal marking shall comply with IEC 60445.

5.3.11 Not more than two wires shall be connected to any one terminal. Links shall be provided where more connections are required at one point.

5.3.12 The control terminal blocks shall include 10% spare terminals.

5.3.13 Nameplates shall comply with IEC 60604 and information on the nameplates shall be approved by company representative. Nameplates shall be made of durable corrosion resistant material. The nameplates shall at least contain the following information: Manufacturer's name or trade mark, type designation or serial number, applicable rated values and number of relevant standard.

- Holes for fixing the nameplates shall not influence in any way degree of ingress protection of enclosure.
- Circuit designation on nomenclature to be engraved into the white layer of trifoliate to give black lettering on white background.
- Instruction plates shall be yellow with black inscription.
- Warning or caution plate shall be red with white inscription.

5.3.14 Labels on withdraw able units shall be duplicated on the withdraw able part and the fixed part.

5.3.15 when operation of certain items of the switchgear needs sequential actions such as the release of interlocking features, instruction plates shall be provided near the point of operation.

5.4. Safety Considerations and interlocks

5.4.1 The medium voltage switchgear and control gear shall offer a maximum degree of safety under all normal operating and fault conditions. It must be impossible to unwillingly,

without the use of tools, touch live parts of the switchgear or to perform operations that may lead to arcing faults.

5.4.2 The switchgear assembly shall be suitable for continuous operation at full load for at least 27,000 hrs without maintenance.

5.4.3 Circuit breaker units shall be provided with required safety interlocks in accordance with the functions of such equipment in the overall electrical system and shall conform with the requirements of IEC publication 60298.Interlocks shall be mechanical in nature.

5.4.4 All interlocks that prevent potentially dangerous mal operations must be constructed such that they cannot be easily defeated. If any mechanical interlock is capable of being defeated without the use of tools, provision shall be made for padlocking. The requirements for interlocks and/or padlocking shall be approved by company representative.

5.4.5 When a withdraw able unit has been removed from the switchgear assembly, the live parts inside the fixed compartments shall be protected against touch. Shutters shall be provided to cover the bus bar side and cable side disconnected contacts automatically. The shutters shall be mechanically operated by the movement of the withdraw able units. The shutters for the bus bar side shall be equipped with padlock facilities in their closed position. Earthed metallic shutters are preferred. Shutters shall be colored red for bus bar side and yellow for cable side.

5.4.6 Each functional unit of the switchgear assembly and each section of the bus bars shall have integral facilities for earthing. Earthing arrangement for bus bars can be provided in incomer circuit breaker. The operation of the earthing switch shall be interlocked with the functional unit switching devices so that it can be manually closed only when the relative switching device is not in service position. Padlocking facilities for locking the earthing devices in closed position shall be provided. Earthing method of functional units and bus bar sections shall be approved by company representative prior to manufacturing.

5.4.7 Temperature rise of current-carrying parts shall be limited to the values stipulated in IEC60694 and de rated in accordance with environmental conditions specified in data sheet.

5.4.8 The complete switchgear assembly shall be capable to withstand the thermal and dynamic stresses resulting from short circuit currents. The supplier shall state the short circuit withstand current of the assembly namely bus bars, circuit breakers, at quotation stage.

5.4.9 All the metallic non-current carrying parts of the switchgear including the main structure shall be bonded together and connected to the earth bus bar. Doors shall be bonded to the main structure by means of flexible copper connections.

6. Major Components

6.1. Circuit Breakers

6.1.1 In the medium voltage switchgear, circuit breakers shall be used as incomers to the switchgear, bus couplers, feeders as indicated in the single line diagram.

6.1.2 Circuit breakers shall be withdraw able typefor indoor installations; complete with vacuum interrupters and self aligning disconnecting devices.

6.1.3 The contacts of vacuum interrupters shall be made of proper material such as chrome-copper or equivalent in order to assure low chopping levels of current and produce no harmful over voltages. The circuit breaker actuating mechanism shall be of the spring loading type and the spring shall be charged by a DC motor.

6.1.4 Circuit breakers shall conform to IEC publication 62271-100 in terms of rating, testing and performance and shall be suitable for uninterrupted duty (utilization category B).

6.1.5 Rated currents of circuit breakers shall be selected conforming to IEC recommendations taking into account possible de ratings as per site condition. Incomer circuit breakers shall be sized to feed all the loads indicated in the single line diagram including the spare units.

6.1.6 Circuit breakers shall withstand the r.m.s. symmetrical short circuit for 1 seconds.

6.1.7 Circuit breakers shall be capable of interrupting the specified short circuit current without the aid of replaceable current limiters or fuses.

6.1.9 Tripping of circuit breakers shall be by means of manual mechanical tripping device and dc. shunt trip coil. Electrical and manual closing release shall be provided.

6.1.10 The local manual trip facility of each circuit breaker shall be fitted with a guard to preclude inadvertent operation.

6.1.11 Facilities shall be provided for testing the circuit breaker closing and tripping mechanisms when the breaker is in TEST position.

6.1.12 There shall be three distinct positions for circuit breakers. The draw out mechanism shall hold the breaker rigidly in the three positions of CONNECTED, TEST and DISCONNECTED. The breaker disconnect device shall be interlocked with the breaker trip-shaft to prevent withdrawal or insertion of the breaker from/into the cubicle with the breaker in the ON position.

6.1.13 If moving of the breaker from or into the operating position requires undue effort by the operator, mechanical aids such as handle shall be provided. The breaker shall be lockable in the TSET and DISCONNECTED positions.

6.1.14 Circuit breaker control connections (secondary disconnects) shall be via fixed, self-aligning disconnects, or via flexible cord type plug connection. Either system shall allow test-operation of the breaker in the TEST position.

6.1.15 In addition to auxiliary contacts required for breaker operation, 2 N/O + 2 N/C similar contacts shall be provided and wired to the terminal strip. If additional auxiliary contacts are required, it will be indicated in data sheet.

6.1.16 All low-voltage wiring to and from the circuit breaker shall be terminated on an easily accessible terminal strip within the breaker compartment with label numbering. Each terminal and each wire shall be clearly identified by the same symbols or numbers used in the circuit diagrams.

6.1.17 Circuit breakers of identical rating and control voltage shall be completely interchangeable. It shall not be possible to interchange breakers of different ratings.

6.1.18 Circuit breakers shall have mechanical indicators to show their contact positions status. They shall also be fitted with red and green indicating lights as per IEC 60073 recommendations to show whether the breaker is in closed or open position. In addition, a yellow indicating light shall be provided to show trip on fault condition.

6.1.19 Each circuit breaker shall be provided with a trip circuit supervision system complete with a white indicating lamp to indicate that the trip circuit and trip circuit supply are healthy.

6.1.20 Each circuit breaker shall be equipped with required indicating instruments and protective relays as specified in this standard specification and/or indicated on single line diagrams.

7. Auxiliary Components

7.1. Protective Relays

7.1.1. General requirements

a) The selection of relays shall be in compliance with the requirement of each circuit and in accordance to pertinent section of IEC60255.

b) The number and type of protective relays are stated in single line diagram and data sheets.

c) Relays shall be dust proof flush mounted and of the removable type, provided with calibrating, resetting and testing facilities. Current carrying terminals of the relays shall be automatically short circuited when the relays are withdrawn.

d) Protective relays shall have hand reset facilities and relay operated signals such as flags or other means of indication used on static type relays like Light Emitting Diodes (LED).

e) Indicators (flags or light emitting diodes) shall be visible from the front of the switchgear without the need of opening the relay case or equipment door.

f) Special precautions shall be taken to ensure that relays will not operate accidentally owing to vibrations or shocks e.g. by opening or closing of doors and switching the devices.

g) Elements with multiple functions such as trip and alarm duties shall have separate operating contacts for each function which shall be wired out to separate terminals. Tripping circuits shall always be separated from the other circuits.

h) Relays shall be capable of withstanding the output current of associated current transformers for at least the specified short circuit withstand time of the assembly.

i) The relay test provision shall consist of built in test plugs or switches or separately mounted test terminal blocks.

j) The test provisions shall permit the shorting of any current transformer circuit and for selective disconnection of the relays from current transformers, potential transformers, auxiliary power and circuits controlled by relays.

k) The relay test provisions shall be arranged so that relay cover or compartment door cannot be closed while the relay connections are in the test position.

l) Contacts rating and performance shall be in accordance with IEC 60255.

7.1.2 All relays with the same function shall be interchangeable. The relays shall be such that, the removal of each relay automatically short circuits the relevant current transformer.

7.1.3 Protective relays shall have provision for testing and calibration.

7.1.4 The relaying shall be fail safe such that, failure of any relay does not jeopardize the operation of the electrical system, but alarms the operator.

7.1.5 Relays shall be equipped with clear trip indication, visible to the operator.

7.1.6 Relays shall be manually resettable. In cases where manual resetting of individual relays are not available, a lockout relay with manual reset facilities shall be provided. Non tripping relays, under voltage relays shall be self resetting with indications of operation which shall be hand reset.

7.1.7 Over current relay (OCR)

Over current relays shall be of the inverse definite minimum time (standard inverse , very inverse or extremely inverse) type with high set instantaneous operation and with the following ranges of settings (unless otherwise stated in requisition):

- Current: 50% to 200% of rated nominal current in steps of 5 adjustable.
- Time: Multiplier time characteristics from 0.05 to 1.00.

7.1.8 Earth fault relays

Earth fault protection for consumers shall operate instantaneously.

In other case a range of setting possibilities shall be provided for both current and time.

7.1.9 Under voltage relay (UVR)

The UVR shall be of the automatic reset type, but equipped with a relay operated signal that is maintained until hand reset. The drop out value shall be adjustable between 50% and 65%.The pick up value shall be at least 85% of the system voltage.

The number of operation contacts shall be:

- 3 sets normally open and;
- 1 set normally closed.

This UVR shall operate in combination with a time delayed tripping relay, having a time delay adjustable between 0.2 and 5 s.

7.2. Current Transformers

7.2.1 Current transformers shall be in accordance with IEC 60044-1.

7.2.2 The rated secondary current shall be 1 Ampere for switchgear mounted protective relays and instruments, as well as remote mounted instruments, either directly or via intermediate current transformers. The secondary leads of current transformers for remote mounted instruments shall be short circuited by a removable link at the switchgear factory.

7.2.3 The switchgear manufacturer shall be responsible for assessing and selecting the output rating of the current transformers.

7.2.4 Current transformers for measuring purposes shall be of the accuracy class 0.5.

7.2.5 Current transformers for protection purposes shall be of the accuracy class 5P. The accuracy class of differential protection current transformers shall be class X as defined in IEC60044-1.

7.2.6 The secondary of the current transformers shall be earthed on one side. Where current transformers are connected in Wye, the Wye point shall be earthed. The wiring of the secondary circuits shall have a cross section of 2.5 mm2. Separate earth wire shall be used for measuring and protection current transformers.

7.2.7 The secondary leads of each current transformer shall be accessible and shall be connected to test and short circuiting links.

7.2.8 Current transformers for circuit breakers shall be installed in the stationary part of the relevant cubicle.

7.2.9 Current transformers shall be capable of carrying, without injurious heating or mechanical damage, the specified fault current of the switchgear.

7.2.10 Current transformers shall have appropriate VA rating and saturation factor. The saturation factor shall not be less than 5.

7.2.11 The markings on the current transformers shall be in accordance with the requirements of IEC publications 60044-1.

7.3. Voltage Transformers

7.3.1 Voltage transformers shall be in accordance with IEC 60186, with secondary voltageof 110V between phases.

7.3.2 Voltage transformers shall be protected by current limiting fuses on primary and secondary sides.

7.3.3 One side of the secondary winding of single phase voltage transformers and the star point of three phase voltage transformers shall be earthed through a removable link.

7.3.4 The voltage transformers for measuring purposes shall be of accuracy class 0.5 and for protection purposes shall be class 3P.

7.3.5 Voltage transformers shall be dry Epoxy-Resin or Butyl-Rubber molded type.

7.4. LV compartment

A LV compartment complete with annunciator and with the following requirement may be provided for MV switchgear assembly:

7.4.1 The compartment shall include an open/close push button for each circuit breaker, with synoptic diagrams and associated indication lamps as follows:

- Red - closed
- Green – open
- White - trip circuit healthy
- Amber - auto trip operated

7.5. Anti-condensation Heaters

7.5.1 Anti-condensation heaters will generally be required for all indoor panels. They shall be rated for continuous service and shall operate on single phase voltage of 230Volt, 50Hz.

7.5.2 The numbers and sizes of the heaters, if not shown on drawings, shall be selected by the switchgear supplier.

7.5.3 Heaters shall be energized from 230VAC power provided by the purchaser.

7.5.4 Heater/s shall be protected by a miniature circuit breaker and an earth leakage protection device of 30mA sensitivity.

7.5.5 A contactor/relay in combination with a thermostat shall be provided for the operation of heater/s. An indicating light (preferably blue) shall be provided on the switchgear enclosure to indicate that the relevant space heater/s is in operation.

7.5.6 Heater/s terminals shall be shrouded.

7.6. Accessories

Accessories required for proper and safe operation of the switchgear shall be supplied. At least the following accessories shall be furnished for each assembly or group of assemblies in the same switch room.

a) Device for manually charging the stored energy operating mechanism of circuit breakers.

b) Handle for moving circuit breakers into positions.

c) Fuse pulling device.

d) Lifting trolley or similar device to remove circuit breakers.

e) Special tools for erection and maintenance if applicable.

8. Tests and Inspection

8.1 The equipment under this specification shall be factory tested. Three certified copies of test reports and certificates shall be submitted to the purchaser.

8.2 Purchaser will require the presence of his nominated representative to witness the final factory tests. The supplier shall inform the date of such tests at least four weeks in advance.

8.3 The purchaser's inspectors shall be granted the right for inspection at any stage of manufacture and testing.

9. Spare Parts

9.1 Together with the supply of all equipment under this specification, a complete set of spare parts for commissioning shall be supplied for each switchgear .The supplied spare parts shall comply with the same specifications as the original parts and shall be fully interchangeable with the original parts without any modification.

9.2 The vendor shall also supply a list of recommended spare parts for two years of operation.

10. Documentation

10.1 The vendor shall supply the necessary information with the quotation to enable evaluation of the submitted proposal. General documents/drawings are not acceptable unless they are

revised to show the equipment proposed. The documents to be supplied with the quotation shall at least include the following:

a) Completed enquiry data sheet/s.

b) Summary of exceptions/deviations to this standard specification.

c) Brochures and catalogues containing description of typical switchgear and technical data on major and auxiliary components such as circuit breakers, contactors, relays, meters etc.

d) List of accessories included in the bid.

e) Preliminary dimensional drawings.

f) Approximate shipping weights and sizes.

10.2 The documents which shall be supplied together with the equipment shall at least include the following:

a) Updated and completed enquiry data sheet/s.

b) Final single line diagram/s.

c) Schematic control circuit diagrams of each kind of circuit breaker.

d) General arrangement drawings showing main dimensions, panels' layout, floor panel and shipping sections.

e) Drawing/s showing the location of field wiring terminal strips and power cable connections.

f) Information concerning interlock sequences.

g) List of major and auxiliary components, showing complete reordering information for all replaceable parts.

h) Recommended spare parts list for two years of operation.

i) Test reports and performance curves of the final routine tests.

j) Painting specification and test result/s.

k) Applicable test certificates.

l) Installation, operation and maintenance instruction/s.

m) Fault finding and troubleshooting manual/s.

n) Protective relay/s types, curves and setting ranges.

o) Cut-off current characteristics of fuses.

p) Total weight of the assembly and of the individual shipping sections.

q) List of accessories and/or any special tools required for erection, operation and maintenance.

11. Shipment

11.1 The supplier of the equipment under this specification is the sole responsible for packaging and preparation for shipment.

11.2 The packaging in wooden box and preparation for shipment shall be adequate to avoid mechanical damage during transport and handling.

11.3 Each shipping section shall be provided with permanently attached identification tag containing necessary information together with the switchgear identification number as indicated in data sheet.

11.4 Shipping documents with exact description of equipment for custom release shall be supplied, with the equipment.

12. Guarantee

12.1 The supplier of the equipment under this specification shall guarantee the equipment and shall replace any damaged equipment/parts resulting from poor workmanship and / or faulty design.

12.2 The supplier shall replace any equipment failed under the following condition:

- Failure under startup and commissioning tests performed according to IEC recommendations.

Failure under normal usage for a period of 12 months, not exceeding 18 months from the date of dispatch from the manufacturers works.