

C2791a - STAFFORD COMMUNITY CLUB

C2791a-0001(L).xls

ELECTRICAL SERVICES CONTRACT DOCUMENT SCHEDULE

REVISION L - 07 MARCH 2024

ISSUING INFORMATION				DATE OF ISSUE										
		DAY	MONTH	YEAR	REASON FOR ISSUE		21	07						
							12	03						
							23	24						
							C	C						
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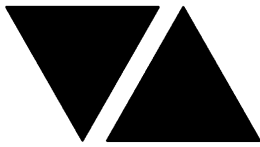
ELECTRICAL BUILDING SERVICES CONSULTANTS

P.O. Box 15, SHERWOOD Q. 4075

Phone: (07) 3278 4375 Fax: (07) 3716 0222

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ELECTRICAL EQUIPMENT SCHEDULE					
REVISION G - 1 MARCH 2024					
THE LIGHT FITTING SUPPLIER CONTACT DETAILS MAY BE AVAILABLE ON THE EDG WEBSITE VIA THE FOLLOWING LINK www.edg.net.au/Links/Lighting.htm					
TYPE	LAMPS	DESCRIPTION	COLOUR / ACCESSORY	CATALOGUE No	REV
L1	20W 4000K LED	600 X 300 LAY IN FLAT PLATE LED FITTING C/W REMOTE DRIVER MOUNTED IN A FLUSH RECESSED PLASTER BOARD KIT	WHITE TRIM	ATOM LED PANEL 12196	E
L2	40W 4000K LED	1200 X 300 LAY IN FLAT PLATE LED FITTING C/W REMOTE DRIVER MOUNTED IN A FLUSH RECESSED PLASTER BOARD KIT	WHITE TRIM	ATOM LED PANEL 12197	E
L3	50W 5000K LED	EXTERNAL ADJUSTABLE LOADING DOCK WALL MOUNTED AT HIGH LEVEL FLOOD LIGHT C/W INTEGRAL DRIVER	WHITE	ATOM SLIM FLOOD LIGHT AT9819/50W/BLK	E
L4	8W 3000K LED	AMENITY RECESSED DOWNLIGHT C/W REMOTE DALI DRIVER	WHITE	EKTOR ALTE 13W 38 DEG BEAM WRMBAD1249030C3	E
L5	36W LED 4000K	1200 LONG SURFACE MOUNTED IP65 DIFFUSED BATTEN C/W INTEGRAL ELECTRONIC CONTROL GEAR AND PRESENCE DETECTION SENSOR	LIGHT GREY	EKTOR 36W LED BATTEN C/W SENSOR & EM UMBRA ADVANCED IP65S	E
L6	34W 4000K LED	CARPARK LIGHT MOUNTED ON A BLACK 6M POLE C/W RPEQ CERTIFIED RAG BOLT ASSEMBLY AND FOOTING	GRAPHITE	LIGHT CULTURE 84 582 K4-4000K	C
L7	NO LONGER REQUIRED				C
L8	20W 5000K LED	600 LONG WEATHERPROOF LED BATTEN C/W INTERNAL ELECTRONIC CONTROL GEAR	NA	EKTOR 17W LED BATTEN 600MM UMBRA ADVANCED IP65	E
LP1	380W 5000K LED	REPAIR THE EXISTING GREEN LIGHT POLE AND REPLACE THE LIGHT FITTINGS WITH TWO NEW FLOOD LIGHTS. CIRCUIT AND CONTROL THE FLOODLIGHTS AS INDICATED	BLACK FITTINGS	2 X SAL SE7169/380NDL/BK/T3	B
LP2	1200 LUMEN +/- 10% 3000K LED 240 VOLT	REPLACE THE EXISTING ENTRY STATEMENT SPHERE FITTING WITH A NEW EXTERNALLY RATED FITTING OF SIMILAR SIZE AND APPEARANCE CIRCUIT AND CONTROL THE NEW FITTINGS AS INDICATED	BLACK FITTING OPAL SPHERE	FITTING SELECTION BY THE CONTRACTOR	B
LP3	28W 3000K LED	BOLLARD C/W REINFORCED CONCRETE FOOTING AND INTEGRAL DRIVER	BLACK	HACIT 1000,, LOUVERED BOLLARD HCP-262440	E
LP4	3000K LED	CUSTOM POLE AND SPHERE LIGHT	MANNOR RED POWDERCOAT	LUMEN 8 CUSTOM	G



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CAT	4W LED AT 500 CENTRES	24V DC IP65 FESTOON LIGHTING TO BE FIXED TO THE WIRE SUPPORT SYSTEM PROVIDED BY THE CONTRACTOR. LOCATE THE POWER SUPPLY IN A CONCEALED ACCESSIBLE LOCATION WITH THE POSITION NOTED ON THE AS CONSTRUCTED DRAWINGS	BLACK CABLE AND FIXINGS	GLOW WORM LIGHTING 1M (2 GLOBE/M) COMMERCIAL GRADE LED FESTOON LIGHTING	B
SDL1	3000K LED	SURFACE MOUNTED CAN DOWNLIGHT C/W REMOTE DALI DIMMABLE DRIVER	WHITE	EKTOR HERA DOWNLIGHT	E
SDL2	3000K LED	SURFACE MOUNTED CAN DOWNLIGHT C/W REMOTE DALI DIMMABLE DRIVER	WHITE	EKTOR HERA DOWNLIGHT	E
SDL3	3000K LED	500DIA SPHERE C/W REMOTE DALI DIMMABLE DRIVER	OPAL	ORIEL PHASE 50 SPHERE OL64150WH	E
RDL1	13W 3000K LED	RECESSED 47 DEG BEAM DOWNLIGHT C/W REMOTE DALI DIMMABLE DRIVER	WHITE TRIM	EKTOR ALTE 13W 38 DEG BEAM WRMBAAD1249030C3	E
RDL2	13W 3000K LED	RECESSED 47 DEG BEAM DOWNLIGHT C/W REMOTE DALI DIMMABLE DRIVER	BLACK	EKTOR ALTE 13W 38 DEG BEAM WRMBAAD1249030C3	E
RDL3	22W 3000K LED	RECESSED ADJUSTABLE 55 DEG BEAM DOWNLIGHT C/W REMOTE DALI DIMMABLE DRIVER	WHITE TRIM	EKTOR ALTE TILT 22W 38 DEG BEAM BRMBAAD206030C3	E
PL1	600 LUMEN +/- 10% 240 VOLT 3000K LED	CUSTOM PENDANT C/W ROD SUSPENSION TO A HEIGHT CONFIRMED ON SITE WITH THE ARCHITECT	SAND	SURROUNDING MUUTO TOP PENDANT LAMP 36CM	C
PL2A	2700K LED	DECORATIVE 2 LAMP SUSPENDED 2M LONG LINEAR PENDANT C/W REMOTE DALI DIMMABLE DRIVER CONFIRM THE SUSPENSION HEIGHT ON SITE WITH THE ARCHITECT	GOLD POWDERCOAT	LUMEN 8 L8 MISC PL2A	B
PL2B	2700K LED	DECORATIVE 3 LAMP SUSPENDED 3.5M LONG LINEAR PENDANT C/W REMOTE DALI DIMMABLE DRIVER CONFIRM THE SUSPENSION HEIGHT ON SITE WITH THE ARCHITECT	GOLD POWDERCOAT	LUMEN 8 L8 MISC PL2B	B
PL2C	2700K LED	DECORATIVE 3 LAMP SUSPENDED 2M LONG LINEAR PENDANT C/W REMOTE DALI DIMMABLE DRIVER CONFIRM THE SUSPENSION HEIGHT ON SITE WITH THE ARCHITECT	GOLD POWDERCOAT	LUMEN 8 L8 MISC PL2C	B



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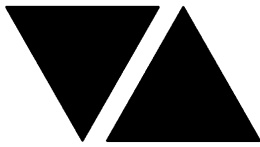
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TL1	1200 LUMEN +/- 10% 3000K LED 240 VOLT	TABLE LAMP ALLOW TO INSTALL. ALLOW A PC SUM OF \$1000.00 PLUS GST FOR THE SUPPLY OF THE TABLE LAMP	COLOUR TO BE ADVISED BY THE ARCHITECT	ALLOW A PC SUM TO SUPPLY.	B
TRK1	8No 22W 3000K LED	8400 LONG SURFACE 3 CHANNEL TRACK C/W A REMOTE 100VA DALI DIMMABLE DRIVER / POWER SUPPLY PER CHANNEL. DISTRIBUTE THE FITTINGS EVENLY ACROSS THE THREE CHANNELS. CONFIRM THE FITTING POSITIONS AND AIMING ON SITE WITH THE ARCHITECT	WHITE TRACK WHITE FITTINGS	R&C CONTRACTING 13W TRACK LIGHT EXTLED294WH3KDALI	E
TRK2	10No 22W 3000K LED	9200 LONG SURFACE 3 CHANNEL TRACK C/W A REMOTE 100VA DALI DIMMABLE DRIVER / POWER SUPPLY PER CHANNEL. DISTRIBUTE THE FITTINGS EVENLY ACROSS THE THREE CHANNELS. CONFIRM THE FITTING POSITIONS AND AIMING ON SITE WITH THE ARCHITECT	BLACK TRACK BLACK FITTINGS	R&C CONTRACTING 13W TRACK LIGHT EXTLED294BK3KDALI	E
WL1	2700K LED	WALL MOUNTED UP / DOWN LIGHT C/W REMOTE DALI DIMMABLE DRIVER. CONFIRM THE MOUNTING HEIGHT ON SITE WITH THE ARCHITECT	WHITE	DAVIS BATHURST BURD30- R83B60C01D10	E
WL2	2700K LED	WALL MOUNTED LIGHT. CONFIRM THE MOUNTING HEIGHT ON SITE WITH THE ARCHITECT	VANILLA BEAN BRASS OPAL	INLITE MARZ DESIGNS TERRA 0 SHORT ARTICULATING LIGHT	A
UP1	NO LONGER REQUIRED				D
UP2	13W 3000K LED	INGROUND IP67 ADJUSTABLE UP LIGHT C/W REMOTE DALI DIMMABLE DRIVER. IT IS ACCEPTABLE TO SUPPLY MULTIPLE UP1 FITTINGS ON THE SAME CHANNEL FROM A SINGLE SUITABLY SIZED DRIVER / POWER SUPPLY	STAINLESS STEEL	GAMMA ILLUMINATION 1069- VWFL-3K-13W	A
S1	2.0W 4000K LED	RECESSED DOWNLIGHTS AT 1600 CENTRES C/W ASYMMETRICAL REFLECTOR MOUNTED WITHIN THE STAIR HAND REMOTE DALI DIMMABLE DRIVER / POWER SUPPLY	SILVER	KLIK SYSTEMS LEDPOD 40	B
S2	WARM WHITE LED	HORIZONTAL LED STRIPS WITHIN AN ALUMINIUM EXTRUSION MOUNTED WITHIN THE REAR COUNTER DISPLAY AS PER THE ARCHITECTURAL DETAIL. PROVIDE THE STRIP WITH A COMMON REMOTE DEDICATED 240-12V POWER SUPPLY AND A DALI DIMMABLE INTERFACE UNIT PER 20M OF STRIP	NATURAL	ROBUS VEGAS LED STRIP RVA96302050	E



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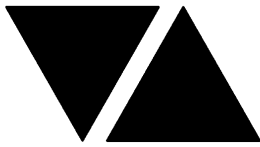
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S3	WARM WHITE LED	HORIZONTAL LED STRIP WITHIN AN ALUMINIUM EXTRUSION MOUNTED WITHIN THE GAMING BAR COUNTER PELMET AS PER THE ARCHITECTURAL DETAIL PROVIDE THE STRIP WITH A COMMON REMOTE DEDICATED 240-12V POWER SUPPLY AND A DALI DIMMABLE INTERFACE UNIT PER 20M OF STRIP	NATURAL	ROBUS VEGAS LED STRIP RVA96302050	E
S4	WARM WHITE LED	HORIZONTAL LED STRIPS WITHIN AN ALUMINIUM EXTRUSION MOUNTED WITHIN THE REAR COUNTER DISPLAY AS PER THE ARCHITECTURAL DETAIL PROVIDE THE STRIP WITH A COMMON REMOTE DEDICATED 240-12V POWER SUPPLY AND A DALI DIMMABLE INTERFACE UNIT PER 20M OF STRIP	NATURAL	ROBUS VEGAS LED STRIP RVA96302050	E
HEW	NO LONGER REQUIRED				D
HES	NO LONGER REQUIRED				D
H1	250W 240V IR LAMP	KITCHEN PASS OUT HEAT LAMPS ROD SUSPENDED WITH THE SUSPENSION LENGTH CONFIRMED ON SITE BY THE ARCHITECT	POLISHED BRASS	HATCO DL-R-R-700 PLUS 250W IR LAMP	C
E1	LED	EMERGENCY LIGHT: RECESSED NON-MAINTAINED EMERGENCY LIGHT. AS2293 CLASSIFICATION C0-D63 - C90-D63.	WHITE	EKTOR LED FIRE ADVANCED EM WHITE 0169	E
E2	LED	EMERGENCY LIGHT: RECESSED NON-MAINTAINED EMERGENCY LIGHT. AS2293 CLASSIFICATION C0-D63 - C90-D63.	BLACK	EKTOR LED FIRE ADVANCED EM BLACK 10973	E
E3	LED	FRONT OF HOUSE EXIT LIGHT: MAINTAINED 24M VIEWING DISTANCE EXIT LIGHT C/W DIFFUSERS & DIRECTIONAL ARROWS AS SHOWN. CEILING SURFACE MOUNT OR WALL MOUNT BETWEEN 2100mm & 2700mm AFFL IF THERE IS NO VERTICAL SURFACE TO MOUNT THE FITTING ON WITHIN THIS RANGE CONFIRM THE MOUNTING HEIGHT WITH THE ENGINEER. AS2293 CLASSIFICATION C0-D1.25- C90-D2	BLACK	EKTOR RAZOR EXIT 12124	E
EX BOH	LED	BACK OF HOUSE EXIT LIGHT: MAINTAINED 24M VIEWING DISTANCE EXIT LIGHT C/W DIFFUSERS & DIRECTIONAL ARROWS AS SHOWN. CEILING OR WALL MOUNT BETWEEN 2100mm & 2700mm AFFL IF THERE IS NO VERTICAL SURFACE TO MOUNT THE FITTING ON WITHIN THIS RANGE CONFIRM THE MOUNTING HEIGHT WITH THE ENGINEER. AS2293 CLASSIFICATION C0-D1.25- C90-D2	WHITE	EKTOR MERCURY CORE EXIT 11258	E



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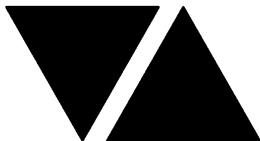
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EX FOH	LED	FRONT OF HOUSE EXIT LIGHT: MAINTAINED 24M VIEWING DISTANCE EXIT LIGHT C/W DIFFUSERS & DIRECTIONAL ARROWS AS SHOWN. CEILING SURFACE MOUNT OR WALL MOUNT BETWEEN 2100mm & 2700mm AFFL IF THERE IS NO VERTICAL SURFACE TO MOUNT THE FITTING ON WITHIN THIS RANGE CONFIRM THE MOUNTING HEIGHT WITH THE ENGINEER.	WHITE	EKTOR RAZOR SM CORE	E
EMERGENCY PACK		LIGHT FITTINGS THAT ARE DESIGNATED AS BEING PROVIDED WITH AN EMERGENCY PACK ARE TO BE PROVIDED WITH AN INTEGRAL AS2293 EMERGENCY PACK. THE FITTINGS ARE TO BE NON MAINTAINED WITH ALL LAMPS SWITCHED AS PER THE LIGHTING CONTROL FOR THAT SPACE UNLESS NOTED OTHERWISE. REFER TO THE SPECIFICATION FOR FURTHER DETAILS OF THE CONFIGURATION AND SWITCHING OF EMERGENCY LIGHTS.			A
PROXIMITY DETECTOR SWITCH (PD)		ADJUSTABLE FLUSH RECESSED 360 DEGREE TRIPLE PYRO PIR PRESENCE DETECTOR TO OPERATE THE ASSOCIATED LIGHTS FOR A PRE-SET AMOUNT OF TIME. ADJUST THE TIME AND SENSITIVITY ON SITE AS DIRECTED BY THE ENGINEER.	WHITE	CLIPSAL. SELECTION BY THE CONTRACTOR. SUBMIT DETAILS OF THE PROXIMITY DETECTOR SWITCH FOR APPROVAL PRIOR TO ORDERING	A
CEILING FAN (CF)		1500 DIA CEILING FAN C/W UNIVERSAL MOUNT TO SUIT THE RAKED CEILING. CONFIRM THE SUSPENSION HEIGHT OF THE FANS WITH THE ARCHITECT ON SITE. PROVIDE DETAILS OF THE SUSPENSION FOR APPROVAL.	WHITE	BRILLIANT LIGHTING CONCORDE II 3BLADE 1470MM BRI20067/05	E
ONE-WAY LIGHT SWITCH		ONE-WAY LIGHT SWITCH C/W CIRCUIT IDENTIFICATION ON THE FACEPLATE BEHIND THE SURROUND MOUNTED AT 1000mm AFFL UNLESS NOTED OTHERWISE.	WHITE	CLIPSAL C2000 SERIES 30USM	A
TWO-WAY LIGHT SWITCH		TWO-WAY LIGHT SWITCH C/W CIRCUIT IDENTIFICATION ON THE FACEPLATE BEHIND THE SURROUND MOUNTED AT 1000mm AFFL UNLESS NOTED OTHERWISE.	WHITE	CLIPSAL C2000 SERIES 30USM	A
LIGHTING CONTROL SWITCH PANEL (SPx)		6-BUTTON PROGRAMMABLE SWITCH PANEL C/W CENTRAL LCD DISPLAY MOUNTED AT 1000mm AFFL UNLESS NOTED OTHERWISE.	ALUMINIUM	DYNALITE ANTUMBRA DISPLAY	A
HAND DRYER CONNECTION (HD)		SINGLE POWER OUTLET C/W CIRCUIT IDENTIFICATION ON THE FACEPLATE BEHIND THE SURROUND FOR THE HAND DRYER MOUNT THE GPO AS PER THE ARCHITECTURAL DETAIL	WHITE UNLESS NOTED AS BLACK (BK)	CLIPSAL C2000 SERIES	A
SINGLE POWER OUTLET		SINGLE POWER OUTLET C/W CIRCUIT IDENTIFICATION ON THE FACEPLATE BEHIND THE SURROUND MOUNT AT 300mm AFFL U.N.O. RATING 10A U.N.O.	WHITE UNLESS NOTED AS BLACK (BK)	CLIPSAL C2000 SERIES	A
SINGLE 15A POWER OUTLET SUSPENDED (SUS)		SINGLE 15A POWER OUTLET SUSPENDED TO 1600 AFFL UNLESS NOTED OTHERWISE VIA A 3MM STAINLESS STEEL WIRE ROPE.	WHITE	CLIPSAL "56 SERIES" 56SPO315	A



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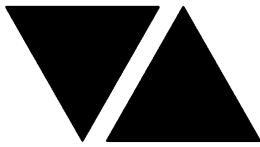
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DOUBLE POWER OUTLET		DOUBLE POWER OUTLET C/W CIRCUIT IDENTIFICATION ON THE FACEPLATE BEHIND THE SURROUND MOUNT AT 300mm AFFL U.N.O. RATING 10A U.N.O.	WHITE UNLESS NOTED AS BLACK (BK)	CLIPSAL C2000 SERIES	A
IP56 SINGLE POWER OUTLET		SINGLE POWER OUTLET IP56 MOUNT AT 300mm AFFL U.N.O. RATING 10A U.N.O.	GREY	CLIPSAL 56 SERIES	A
DOUBLE POWER OUTLET (USB)		DOUBLE POWER OUTLET C/W USB CHARGER AND CIRCUIT IDENTIFICATION ON THE FACEPLATE BEHIND THE SURROUND MOUNT AT 300mm AFFL U.N.O. RATING 10A U.N.O.	WHITE UNLESS NOTED AS BLACK (BK)	CLIPSAL 2000 SERIES + 30USBCM MECH	A
WEATHERPROOF POWER OUTLET (WP)		IP54 WEATHERPROOF SINGLE / DOUBLE POWER OUTLET AS NOTED ON DRAWING C/W COVER FLAP OVER SOCKET. MOUNT AT MINIMUM 1100mm AFFL U.N.O. RATING 10A U.N.O.	-	CLIPSAL WSCF227F	A
20A WEATHERPROOF POWER OUTLET (WP 20A)		IP66 WEATHERPROOF 20A SINGLE POWER OUTLET. MOUNT AT MINIMUM 1100mm AFFL U.N.O. RATING 20A U.N.O.	-	CLIPSAL WSF226/20	A
SPECIAL PURPOSE OUTLET		SPECIAL PURPOSE OUTLET TYPE AS NOTED. MOUNT AT 1350mm AFFL U.N.O. RATING 20A U.N.O. CONNECT TO EQUIPMENT VIA FLEXIBLE CONDUIT.			A
SINGLE-PHASE ISOLATOR		SINGLE-PHASE WEATHERPROOF ISOLATOR. MOUNT AT 1350mm AFFL U.N.O. RATING 20A U.N.O. CONNECT TO EQUIPMENT VIA FLEXIBLE CONDUIT.	-	CLIPSAL WHT20	A
THREE-PHASE ISOLATOR		THREE-PHASE WEATHERPROOF ISOLATOR. MOUNT AT 1350mm AFFL U.N.O. RATING 20A U.N.O. CONNECT TO EQUIPMENT VIA FLEXIBLE CONDUIT.	-	CLIPSAL WHT35	A
SIGN CONNECTION		COORDINATE THE LOCATION AND CONNECTION WITH THE SIGN CONTRACTOR ENSURING THE GPO / ISOLATORS ARE PROVIDED WITH APPROPRIATE WEATHER PROTECTION AND ARE CONCEALED FROM VIEW.			B
DB-A		DISTRIBUTION BOARD DB-A TO BE PROVIDED INTEGRAL TO THE MSB AS PER THE DB-A SCHEDULE, POWER SCHEMATICS AND THE SPECIFICATION.			A
DB-B		DISTRIBUTION BOARD DB-B AS PER THE DB-B SCHEDULE, POWER SCHEMATICS AND THE SPECIFICATION. PROVIDE A SHOP DRAWING OF DB-B FOR APPROVAL.			A
MSB		MAIN SWITCHBOARD AS PER THE POWER SCHEMATIC AND THE SPECIFICATION. PROVIDE A SHOP DRAWING OF THE MAIN SWITCHBOARD FOR APPROVAL.			A
MSSB		MECHANICAL SERVICES SWITCHBOARD PROVIDED BY THE MECHANICAL SUB CONTRACTOR. COORDINATE THE SUBMAIN CONNECTION WITH THE MECHANICAL SUB CONTRACTOR ON SITE.			A
REVENUE METER (M)		QUEENSLAND ELECTRICITY METERING MANUAL COMPLIANT RETAIL METER INCLUDING ALL ASSOCIATED COMPONENTS INCLUDING THE METERS AND CTS ETC.			A



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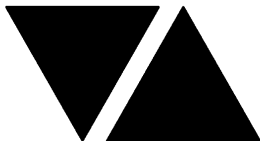
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RISER 1		PROVIDE THE HAT SECTION RISER ADJACENT TO THE MSB / DB-A TO PROVIDE CABLE ACCESS TO THE CEILING SPACE AS PER THE RISER DETAIL. PAINT THE RISER TO MATCH THE BUILDING COLOURS.			A
COMMUNICATIONS RACK (CR-1)		IT FREE STANDING 42 RU MINIMUM 800 DEEP 800 WIDE COMMUNICATIONS RACK CR-1 PROVIDE A SHOP DRAWING OF THE RACK INCLUDING THE ARRANGEMENT OF EQUIPMENT PROVIDED WITHIN IT AS PART OF THE CONTRACT FOR APPROVAL. PROVIDE THE RACK WITH THE REQUIRED CAT 6 PATCH PANELS, CABLE MANAGEMENT AS PER THE SPECIFICATION. PROVIDE THE RACK WITH CASTERS. REFER TO THE SPECIFICATION FOR ADDITIONAL REQUIREMENTS.		4 CABLING SKU 002.001.4280	B
COMMUNICATIONS RACK (CR-2)		GAMING FREE STANDING 42 RU MINIMUM 600 DEEP 600 WIDE COMMUNICATIONS RACK CR-2 PROVIDE A SHOP DRAWING OF THE RACK INCLUDING THE ARRANGEMENT OF EQUIPMENT PROVIDED WITHIN IT AS PART OF THE CONTRACT FOR APPROVAL. PROVIDE THE RACK WITH THE REQUIRED CAT 6 PATCH PANELS, CABLE MANAGEMENT AS PER THE SPECIFICATION. PROVIDE THE RACK WITH CASTERS. REFER TO THE SPECIFICATION FOR ADDITIONAL REQUIREMENTS.		4 CABLING SKU 002.001.4280	B
COMMUNICATIONS RACK (CR-3)		AV SECURITY FREE STANDING 42 RU MINIMUM 600 DEEP 600 WIDE RACK CR-3 PROVIDE A SHOP DRAWING OF THE RACK. PROVIDE THE RACK WITH CASTERS. REFER TO THE SPECIFICATION FOR ADDITIONAL REQUIREMENTS.		4 CABLING SKU 002.001.4280	B
TAB COMMUNICATIONS RACK (CR-T)		NO LONGER REQUIRED			D
COMMUNICATIONS OUTLET T		NO LONGER REQUIRED			D
COMMUNICATIONS OUTLET		RJ45 CAT-6 COMMUNICATIONS OUTLET, CABLED BACK TO CAT 6 PATCH PANELS IN RACK CR-1 VIA 4-PAIR CAT-6 UTP CABLE. MOUNT UP TO 3 RJ45 OUTLETS PER MULTI-GANG FACEPLATE WITH SEPARATE PERMANENT LABELLING FOR EACH OUTLET. MOUNT AT 300 AFFL UNLESS NOTED OTHERWISE	WHITE UNLESS NOTED AS BLACK (BK)	REFER TO THE SPECIFICATION	A
CAT 6 GAMING OUTLET		RJ45 CAT-6 COMMUNICATIONS OUTLET, CABLED BACK TO CAT 6 DEDICATED GAMING PATCH PANELS IN RACK CR-2 VIA 4-PAIR CAT-6 UTP CABLE. MOUNT UP TO 3 RJ45 OUTLETS PER MULTI-GANG FACEPLATE WITH SEPARATE PERMANENT LABELLING FOR EACH OUTLET. MOUNT AT 300 AFFL UNLESS NOTED OTHERWISE	WHITE UNLESS NOTED AS BLACK (BK)	REFER TO THE SPECIFICATION	A
GAMING FIBRE (GF)		INSTALL DUPLEX FIBRE OPTIC CABLE BETWEEN THE POKER MACHINE BASES AND FROM THE POKER MACHINE BASES BACK TO RACK CR-2 AS INDICATED. THE DUPLEX FIBRE OPTIC CABLE WILL BE SUPPLIED AND TERMINATED BY OTHERS.			A
NBN PREMISE CONNECTION DEVICE (PCD)		NBN COMPLIANT PREMISES CONNECTION DEVICE TO BE CONNECTED TO THE NTD VIA AN NBN COMPLIANT DROP CONDUIT. CONNECT THE PCD TO THE TELSTRA PIT VIA AN NBN COMPLIANT LEAD-IN CONDUIT.			A



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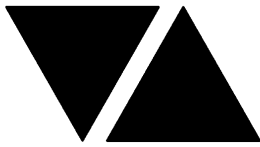
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ELECTRICAL EQUIPMENT SCHEDULE					
REVISION G - 1 MARCH 2024					
THE LIGHT FITTING SUPPLIER CONTACT DETAILS MAY BE AVAILABLE ON THE EDG WEBSITE VIA THE FOLLOWING LINK www.edg.net.au/Links/Lighting.htm					
TYPE	LAMPS	DESCRIPTION	COLOUR / ACCESSORY	CATALOGUE No	REV
NBN NETWORK TERMINATION UNIT (NTD)		NBN COMPLIANT NETWORK TERMINATION UNIT TO BE PROVIDED IN ACCORDANCE WITH THE NBN REQUIREMENTS			A
SECURITY CAMERA (C)		CCTV CAMERA AND ALL ASSOCIATED CABLING BY OTHERS. ELECTRICAL DRAWING E08 NO LONGER REQUIRED.			F
HDMI CABLE (HDM1)		NO LONGER REQUIRED			D
HDMI CABLE (HDM2)		NO LONGER REQUIRED			D
PIT A		900 X 900 CLEAR INTERNAL X 1000 DEEP INSITU POWER PIT C/W A REINFORCED CONCRETE SURROUND AND A CLASS C STEEL LID WITH A SLIP RESISTANCE OF R10 SUBMIT DETAILS OF THE PIT, LID AND AN INSTALLATION SECTION FOR APPROVAL.			A
PIT B		900 X 900 CLEAR INTERNAL X 1000 DEEP INSITU POWER PIT C/W A REINFORCED CONCRETE SURROUND AND A CLASS C STEEL LID WITH A SLIP RESISTANCE OF R10 SUBMIT DETAILS OF THE PIT, LID AND AN INSTALLATION SECTION FOR APPROVAL.			A
PIT C		900 X 900 CLEAR INTERNAL X 1000 DEEP INSITU POWER PIT C/W A REINFORCED CONCRETE SURROUND AND A CLASS C INFILL LID SUBMIT DETAILS OF THE PIT, LID AND AN INSTALLATION SECTION FOR APPROVAL.			A
PIT D		NBN COMPLIANT PIT 5			A
PIT E		450 X 450 CLEAR INTERNAL X 700 DEEP PLASTIC COMMUNICATIONS PIT C/W A REINFORCED CONCRETE SURROUND AND A CLASS C INFILL LID SUBMIT DETAILS OF THE PIT, LID AND AN INSTALLATION SECTION FOR APPROVAL.			A
PIT F		600 X 600 CLEAR INTERNAL X 7000 DEEP PLASTIC POWER PIT C/W A REINFORCED CONCRETE SURROUND AND A CLASS C STEEL LID WITH A SLIP RESISTANCE OF R10 SUBMIT DETAILS OF THE PIT, LID AND AN INSTALLATION SECTION FOR APPROVAL.			B
TELSTRA / NBN PIT		EXISTING TELSTRA PIT CONFIRM THE POSITION ON SITE			A
CONDUIT CA		2 X 100 DIA HD POWER CONDUITS CONNECTING PIT A TO THE ENERGEX SUBSTATION LV CUBICAL PROVIDE EACH CONDUIT WITH A SPARE DRAW WIRE			A
CONDUIT CB		4 X 100 DIA HD POWER CONDUITS CONNECTING THE POWER PITS PROVIDE EACH CONDUIT WITH A SPARE DRAW WIRE			E
CONDUIT CC		2 X 100 DIA HD POWER CONDUITS CONNECTING POWER PIT B TO THE MSBS INCOMING CUBICAL PLUS 2 X 100 DIA HD POWER CONDUITS CONNECTING POWER PIT B TO THE MSBS UNMETERED SUBMAIN CUBICAL AND 4 X 100 DIA HD POWER CONDUITS CONNECTING POWER PIT B TO THE DB-B CUBICAL PROVIDE EACH CONDUIT WITH A SPARE DRAW WIRE			B
CONDUIT CD		P50 NBN CONDUIT FROM THE NBN PIT D TO THE PCD.			A



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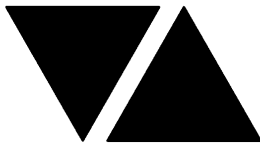
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C2791a - STAFFORD COMMUNITY CLUB ELECTRICAL EQUIPMENT SCHEDULE REVISION G - 1 MARCH 2024					C2791a-0002(G).xls
THE LIGHT FITTING SUPPLIER CONTACT DETAILS MAY BE AVAILABLE ON THE EDG WEBSITE VIA THE FOLLOWING LINK www.edg.net.au/Links/Lighting.htm					
TYPE	LAMPS	DESCRIPTION	COLOUR / ACCESSORY	CATALOGUE No	REV
CONDUIT CE		P50 NBN CONDUIT FROM THE NBN PIT D TO THE TELSTRA FOOTPATH PIT.			A
CONDUIT CF		2 x 25mm HD PVC UNDERGROUND CONDUITS C/W DRAW WIRES TO INTERCONNECT THE POWER PIT TO THE POLE. ONE OF THE CONDUITS IS TO REMAIN SPARE FOR FUTURE USE.			A
CONDUIT CG		2 x 25mm HD PVC UNDERGROUND CONDUITS C/W DRAW WIRES TO INTERCONNECT THE POLES. ONE OF THE CONDUITS IS TO REMAIN SPARE FOR FUTURE USE.			A
CONDUIT CH		2 x 50mm HD PVC UNDERGROUND CONDUITS C/W DRAW WIRES TO INTERCONNECT THE POWER PIT TO THE BOOSTER CABINET. ONE OF THE CONDUITS IS TO REMAIN SPARE FOR FUTURE USE.			A
CONDUIT CJ		2 x 32mm HD PVC UNDERGROUND CONDUITS C/W DRAW WIRES TO INTERCONNECT THE POWER PIT TO THE BOLLARD. ONE OF THE CONDUITS IS TO REMAIN SPARE FOR FUTURE USE.			A
CONDUIT CK		2 x 25mm HD PVC UNDERGROUND COMMUNICATIONS CONDUITS C/W DRAW WIRES TO INTERCONNECT THE COMMUNICATIONS PIT TO THE BOLLARD.			A
CONDUIT CL		2 x 50mm HD PVC UNDERGROUND COMMUNICATIONS CONDUITS C/W DRAW WIRES TO INTERCONNECT THE COMMUNICATIONS PIT TO THE BUILDING CEILING SPACE.			A
CONDUIT CM		2 X 100 DIA HD POWER CONDUITS CONNECTING THE POWER PITS PROVIDE EACH CONDUIT WITH A SPARE DRAW WIRE			B
CONDUIT CN		2 X 100 DIA HD POWER CONDUITS CONNECTING THE POWER PIT TO THE EXISTING PROPERTY POLE PROVIDE EACH CONDUIT WITH A SPARE DRAW WIRE			B
PROTECTIVE BOLLARDS		PROVIDE THE PROTECTIVE BOLLARDS AS 150 DIA 1000 HIGH PAINTED BLACK STEEL CONCRETE FILLED VEHICLE PROTECTION BOLLARD. PROVIDE THE BOLLARD WITH A REINFORCED CONCRETE FOOTING AT LEAST 500 DIA X 900 DEEP. LOCATE THE BOLLARD SUCH THAT THERE IS AT LEAST 1,200 CLEAR IN FRONT OF ANY ELECTRICAL PLANT. PROVIDE THE BOLLARD WITH YELLOW FLUORESCENT VEHICLE MARKING TAPE WITH A 50MM GAP SPIRALLING AROUND THE BOLLARD FOR ITS FULL HEIGHT.			B
OUTLET BOLLARDS		CUSTOM MADE FULLY WELDED HOT DIPPED GALVANIZED STEEL BOLLARD C/W MOUNTING PLATE BOLTED TO A REINFORCED CONCRETE FOOTING. SIZE THE BOLLARD TO ACCOMMODATE THE NOMINATED OUTLETS WITH THE CABLE ACCESS TO THE OUTLETS RISING UP THROUGH THE BOLLARD. PROVIDE A SHOP DRAWING OF THE BOLLARD INCLUDING THE OUTLETS FOR APPROVAL. CONFIRM THE POSITION OF THE BOLLARD ON SITE WITH THE ARCHITECT.			B
PV INVERTER		PV INVERTER BY OTHERS			C
PV PANELS		PV PANELS AND ALL ASSOCIATED CABLING BY OTHERS			C
REFRIGERATION ISOLATION PANELS		PROVIDE PLYWOOD MOUNTING PANELS WITHIN THE CEILING SPACE ABOVE THE COOL ROOM / FREEZER ACCESS PANELS C/W ISOLATION SWITCHES AND LIGHTING AS PER THE REFRIGERATION ISOLATOR PANEL DETAILS. CIRCUIT EACH ISOLATOR AS INDICATED. CONNECTION OF THE ISOLATOR TO THE REFRIGERATION EQUIPMENT WILL BE BY THE REFRIGERATION SUB CONTRACTOR			B



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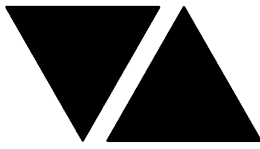
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STANDARDS SCHEDULE

REVISION A - 24 APRIL 2023

STANDARD No.	STANDARD NAME
ACA TS 102:1998	TELECOMMUNICATION TECHNICAL STANDARD
AS 1049.1:2014	TELECOMMUNICATION CABLES - INSULATION, SHEATH AND JACKET - MATERIALS
AS 11801.2:2019	INFORMATION TECHNOLOGY - GENERIC CABLING FOR CUSTOMER PREMISES - OFFICE PREMISES (ISO/IEC 11801-2:2017 MOD)
AS 1307.2:1996	SURGE ARRESTORS - METAL OXIDE SURGE ARRESTERS WITHOUT GAPS FOR AC SYSTEMS
AS 1345-1995	IDENTIFICATION OF THE CONTENTS OF PIPES, CONDUITS AND DUCTS
AS 1603.11-2018	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - VISUAL WARNING DEVICES
AS 1603.1-1997	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - HEAT DETECTORS
AS 1603.13-2018	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - DUCT SAMPLING UNITS
AS 1603.15-2002	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - REMOTE INDICATORS
AS 1603.16-2002	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - IN SITU TESTERS
AS 1603.2-1997	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - POINT TYPE SMOKE DETECTORS
AS 1603.3-2018	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - HEAT ALARMS
AS 1603.5-1996	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - MANUAL CALL POINTS
AS 1603.7-1996	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - OPTICAL BEAM SMOKE DETECTORS
AS 1603.8-1996	AUTOMATIC FIRE DETECTION AND ALARM SYSTEMS - MULTI POINT ASPIRATED SMOKE DETECTORS
AS 1670.1 -2018	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - SYSTEM DESIGN, INSTALLATION AND COMMISSIONING - FIRE
AS 1670.3-2018	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - SYSTEM DESIGN, INSTALLATION AND COMMISSIONING - FIRE ALARM MONITORING
AS 1670.4-2018	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - SYSTEM DESIGN, INSTALLATION AND COMMISSIONING - SOUND SYSTEMS AND INTERCOM SYSTEMS FOR EMERGENCY PURPOSES
AS 1670.6-1997	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - SYSTEM DESIGN, INSTALLATION AND COMMISSIONING - SMOKE ALARMS
AS 1798-2014	LIGHTING POLES AND BRACKET ARMS - PREFERRED DIMENSIONS
AS 1851-2012	MAINTENANCE OF FIRE PROTECTION SYSTEMS AND EQUIPMENT
AS 1882-2002	EARTH AND BONDING CLAMPS
AS 2201.3-1991	INTRUDER ALARM SYSTEMS-DETECTION DEVICES FOR INTERNAL USE
AS 2293.3:2018	EMERGENCY EVACUATION LIGHTING FOR BUILDINGS - EMERGENCY LUMINAIRES AND EXIT SIGNS
AS 2467-2008	MAINTENANCE OF ELECTRICAL SWITCHGEAR
AS 2756:1997	LOW VOLTAGE SWITCHGEAR AND CONTROL GEAR - MOUNTING RAILS FOR MECHANICAL SUPPORT OF ELECTRICAL EQUIPMENT
AS 3158:2004	APPROVAL AND TEST SPECIFICATIONS - ELECTRIC CABLES - GLASS FIBRE INSULATED FOR WORKING VOLTAGES UP TO AND INCLUDING 0.6/1KV
AS 4070-1992	RECOMMENDED PRACTICES FOR PROTECTION OF LOW-VOLTAGE ELECTRICAL INSTALLATIONS AND EQUIPMENT IN MEN SYSTEMS FROM TRANSIENT OVER VOLTAGES
AS 4418.2-2000	SUPERVISORY CONTROL AND DATA ACQUISITION - GENERIC TELECOMMUNICATIONS AND INTERFACE PROTOCOL - FIRE ALARM SYSTEMS
AS 4428.0-1997	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - CONTROL AND INDICATING EQUIPMENT - GENERAL REQUIREMENTS AND TEST METHODS
AS 4428.10-1998	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS CONTROL AND INDICATING EQUIPMENT-ALARM INVESTIGATION
AS 4428.1-1998	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - CONTROL AND INDICATING EQUIPMENT - FIRE
AS 4428.3-2010	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - CONTROL AND INDICATING EQUIPMENT - FIRE BRIGADE PANEL
AS 4428.4-2016	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - INTERCOMMUNICATION SYSTEMS FOR EMERGENCY PURPOSES
AS 4428.5-1998	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - CONTROL AND INDICATING EQUIPMENT - POWER SUPPLY UNITS
AS 4428.6-2018	FIRE DETECTION, WARNING, CONTROL AND INTERCOM SYSTEMS - CONTROL AND INDICATING EQUIPMENT - ALARM SIGNALLING EQUIPMENT
AS 4702:2000	POLYMERIC CABLE PROTECTION COVERS
AS 4934.2-2011	INCANDESCENT LAMPS FOR GENERAL LIGHTING SERVICES- MINIMUM ENERGY PERFORMANCE STANDARDS (MEPS) REQUIREMENTS
AS 60038-2012	STANDARD VOLTAGES
AS 60529-2004	DEGREES OF PROTECTION PROVIDED BY ENCLOSURES
AS 60849-2004	SOUND SYSTEMS FOR EMERGENCY PURPOSES
AS 60890-2009	A METHOD OF TEMPERATURE-RISE ASSESSMENT BY EXTRAPOLATION FOR PARTIALLY TYPE-TESTED ASSEMBLIES (PTTA) OF LOW-VOLTAGE SWITCHGEAR AND CONTROL GEAR
AS 60947.3:2018	LOW-VOLTAGE SWITCHGEAR AND CONTROL GEAR - SWITCHES, DISCONNECTORS, SWITCH DISCONNECTORS AND FUSE-COMBINATION UNITS
AS 61000.3.100-2011	ELECTROMAGNETIC COMPATIBILITY (EMC) - LIMITS - STEADY STATE VOLTAGE LIMITS IN PUBLIC ELECTRICITY SYSTEMS
AS 7240.11-2018	FIRE DETECTION AND ALARM SYSTEMS-MANUAL CALL POINTS



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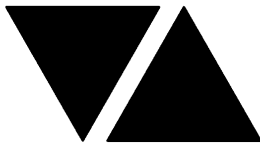
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STANDARDS SCHEDULE

REVISION A - 24 APRIL 2023

STANDARD No.	STANDARD NAME
AS IEC 60990:2018	METHODS OF MEASUREMENT OF TOUCH CURRENT AND PROTECTIVE CONDUCTOR CURRENT
AS ISO 7240.1:2018	FIRE DETECTION AND ALARM SYSTEMS-GENERAL AND DEFINITIONS
AS/CA S008:2010	REQUIREMENTS FOR CUSTOMER CABLING PRODUCTS
AS/CA S009:2013	INSTALLATION REQUIREMENTS FOR CUSTOMER CABLING (WIRING RULES)
AS/NZS 1125:2001	CONDUCTORS IN INSULATED ELECTRIC CABLES AND FLEXIBLE CORDS
AS/NZS 11801.1:2019	INFORMATION TECHNOLOGY - GENERIC CABLING FOR CUSTOMER PREMISES - GENERAL REQUIREMENTS (ISO/IEC 11801-1:2017)
AS/NZS 14763.3:2017	TELECOMMUNICATIONS INSTALLATIONS- IMPLEMENTATION AND OPERATION OF CUSTOMER PREMISES CABLING- TESTING OF OPTICAL FIBRE CABLING
AS/NZS 1574:1996	COPPER AND COPPER ALLOYS - WIRE FOR ELECTRICAL PURPOSES
AS/NZS 1660.1:1998	TEST METHODS FOR ELECTRIC CABLES, CORDS AND CONDUCTORS - CONDUCTORS AND METALLIC COMPONENTS
AS/NZS 1680.3:2017	INTERIOR LIGHTING - MEASUREMENT, CALCULATION AND PRESENTATION OF PHOTOMETRIC DATA
AS/NZS 2053.3:1995	CONDUITS AND FITTINGS FOR ELECTRICAL INSTALLATIONS - rigid PLAIN CONDUITS AND FITTINGS OF FIBRE-REINFORCED CONCRETE MATERIAL
AS/NZS 2201.1:2007	INTRUDER ALARM SYSTEMS - CLIENT PREMISES - DESIGN, INSTALLATION, COMMISSIONING AND MAINTENANCE
AS/NZS 2201.5:2008	INTRUDER ALARM SYSTEMS-ALARM TRANSMISSION SYSTEMS
AS/NZS 2293.1:2018	EMERGENCY EVACUATION LIGHTING FOR BUILDINGS - SYSTEM DESIGN, INSTALLATION AND OPERATION
AS/NZS 2293.2:2019	EMERGENCY EVACUATION LIGHTING FOR BUILDINGS - INSPECTION AND MAINTENANCE
AS/NZS 2373:2003	ELECTRIC CABLES - TWISTED PAIR FOR CONTROL AND PROTECTION CIRCUITS
AS/NZS 2967:2014	OPTICAL FIBRE COMMUNICATION CABLING SYSTEMS SAFETY FIBRE OPTIC SYSTEMS IN GENERAL
AS/NZS 3000:2018	ELECTRICAL INSTALLATIONS (KNOWN AS THE AUSTRALIAN/NEW ZEALAND WIRING RULES)
AS/NZS 3008.1.2:2017	ELECTRICAL INSTALLATIONS-SELECTION OF CABLES- CABLES FOR ALTERNATING VOLTAGES UP TO AND INCLUDING 0.6/1 KV- TYPICAL NEW ZEALAND CONDITIONS
AS/NZS 3013:2005	ELECTRICAL INSTALLATIONS-CLASSIFICATION OF THE FIRE AND MECHANICAL PERFORMANCE OF WIRING SYSTEM ELEMENTS
AS/NZS 3017:2007	ELECTRICAL INSTALLATIONS - VERIFICATION GUIDELINES
AS/NZS 3084:2017	TELECOMMUNICATIONS INSTALLATIONS - TELECOMMUNICATIONS PATHWAYS AND SPACES FOR COMMERCIAL BUILDINGS
AS/NZS 3085.1:2004	TELECOMMUNICATIONS INSTALLATIONS - ADMINISTRATION OF COMMUNICATIONS CABLING SYSTEMS - BASIC REQUIREMENTS
AS/NZS 3191:2008	ELECTRIC FLEXIBLE CORDS
AS/NZS 3760:2010	IN-SERVICE SAFETY INSPECTION AND TESTING OF ELECTRICAL EQUIPMENT
AS/NZS 3808:2000	INSULATION AND SHEATHING MATERIALS FOR ELECTRIC CABLES
AS/NZS 3820:2009	ESSENTIAL SAFETY REQUIREMENTS FOR LOW VOLTAGE ELECTRICAL EQUIPMENT
AS/NZS 3827.1:1998	LIGHTING SYSTEM PERFORMANCE - ACCURACIES AND TOLERANCES - OVERVIEW AND GENERAL RECOMMENDATIONS
AS/NZS 3835.2:2006	EARTH POTENTIAL RISE-PROTECTION OF TELECOMMUNICATIONS NETWORK USERS, PERSONNEL AND PLANT-APPLICATION GUIDE
AS/NZS 3863:2002	GALVANIZED MILD STEEL WIRE FOR MOUNTING CABLES
AS/NZS 4437:1996	SOLDERLESS CRIMPED CONNECTIONS - GENERAL REQUIREMENTS, TEST METHODS AND PRACTICAL GUIDANCE
AS/NZS 4507:2006	CABLES - FIRE PERFORMANCE
AS/NZS 4703:2007	ELECTRICAL WIRING IN FURNITURE
AS/NZS 4836:2011	SAFE WORKING ON LOW-VOLTAGE ELECTRICAL INSTALLATIONS
AS/NZS 4961:2003	ELECTRIC CABLES-POLYMERIC INSULATED-FOR DISTRIBUTION AND SERVICE APPLICATIONS
AS/NZS 5000.1:2005	ELECTRICAL CABLES - POLYMERIC INSULATED - FOR WORKING VOLTAGES UP TO AND INCLUDING 0.6/1KV
AS/NZS 5000.2:2006	ELECTRIC CABLES - POLYMERIC INSULATED - FOR WORKING VOLTAGES UP TO AND INCLUDING 450/750 V
AS/NZS 5000.3:2003	ELECTRIC CABLES-POLYMERIC INSULATED-MULTICORE CONTROL CABLES
AS/NZS 60227.5:2003	POLYVINYL CHLORIDE INSULATED CABLES OF RATED VOLTAGES UP TO AND INCLUDING 450/750 V-FLEXIBLE CABLES (CORDS)
AS/NZS 60335.1:2011	SAFETY OF HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES- GENERAL REQUIREMENTS
AS/NZS 60598.1:2017	LUMINAIRES - GENERAL REQUIREMENTS AND TESTS
AS/NZS 60598.2.1:2014	LUMINAIRES - PARTICULAR REQUIREMENTS - FIXED GENERAL PURPOSE LUMINAIRES
AS/NZS 60598.2.2:2016	LUMINAIRES - PARTICULAR REQUIREMENTS - RECESSED LUMINAIRES
AS/NZS 60598.2.20:2018	LUMINAIRES - PARTICULAR REQUIREMENTS - LIGHTING CHAINS
AS/NZS 60598.2.5:2018	LUMINAIRES - PARTICULAR REQUIREMENTS - FLOODLIGHTS
AS/NZS 60898.1 :2004	ELECTRICAL ACCESSORIES-CIRCUIT-BREAKERS FOR OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR INSTALLATIONS- CIRCUIT-BREAKERS FOR A.C. OPERATION
AS/NZS 60898.2:2004	CIRCUIT-BREAKERS FOR OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR INSTALLATIONS-CIRCUIT-BREAKERS FOR A.C. AND D.C. OPERATION
AS/NZS 61000.3.12:2013	ELECTROMAGNETIC COMPATIBILITY - LIMITS FOR HARMONIC CURRENTS PRODUCED BY EQUIPMENT CONNECTED TO PUBLIC LOW-VOLTAGE SYSTEMS WITH INPUT CURRENT > 16A AND <=75 A PER PHASE
AS/NZS 61000.3.2:2013	ELECTROMAGNETIC COMPATIBILITY - LIMITS FOR HARMONIC CURRENT EMISSIONS (EQUIPMENT INPUT CURRENT LESS THAN OR EQUAL TO 16 A PER PHASE)



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STANDARDS SCHEDULE

REVISION A - 24 APRIL 2023

STANDARD No.	STANDARD NAME
AS/NZS 61000.3.4:2007	ELECTROMAGNETIC COMPATIBILITY - PART 3.4: LIMITATION OF EMISSION OF HARMONIC CURRENTS IN LOW-VOLTAGE POWER SUPPLY SYSTEMS FOR EQUIPMENT WITH RATED CURRENT GREATER THAN 75A
AS/NZS 61000.6.1:2006	ELECTROMAGNETIC COMPATIBILITY - GENERIC IMMUNITY STANDARD - RESIDENTIAL COMMERCIAL AND LIGHT INDUSTRY
AS/NZS 61008.1:2015	RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS WITHOUT INTEGRAL OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR USES (RCCBS)-GENERAL RULES
AS/NZS 61009.1:2015	RESIDUAL CURRENT OPERATED CIRCUIT-BREAKERS WITH INTEGRAL OVERCURRENT PROTECTION FOR HOUSEHOLD AND SIMILAR USES
AS/NZS 61058.1:2008	SWITCHES FOR APPLIANCES - GENERAL REQUIREMENTS
AS/NZS 61347.1:2016	LAMP CONTROL GEAR - GENERAL AND SAFETY REQUIREMENTS
AS/NZS 61386.1:2015	CONDUIT SYSTEMS FOR CABLE MANAGEMENT - GENERAL REQUIREMENTS
AS/NZS 61386.21:2015	CONDUIT SYSTEMS FOR CABLE MANAGEMENT - PARTICULAR REQUIREMENTS - RIGID PLAIN CONDUITS
AS/NZS 61386.22:2015	CONDUIT SYSTEMS FOR CABLE MANAGEMENT - PARTICULAR REQUIREMENTS - PLIABLE CONDUIT SYSTEMS
AS/NZS 61386.23:2015	CONDUIT SYSTEMS FOR CABLE MANAGEMENT - PARTICULAR REQUIREMENTS - FLEXIBLE CONDUIT SYSTEMS
AS/NZS 61439.1:2016	LOW VOLTAGE SWITCHGEAR AND CONTROL GEAR ASSEMBLIES - GENERAL RULES
AS/NZS 61439.3:2016	LOW VOLTAGE SWITCHGEAR AND CONTROL GEAR ASSEMBLIES - PARTICULAR REQUIREMENTS FOR LOW VOLTAGE SWITCHGEAR AND CONTROL GEAR ASSEMBLIES INTENDED TO BE INSTALLED IN PLACES WHERE UNSKILLED PERSONS HAVE ACCESS FOR THEIR USE - DISTRIBUTION BOARDS
AS/NZS 61558.2.8:2011	SAFETY OF POWER TRANSFORMERS, POWER SUPPLY UNITS AND SIMILAR DEVICES - PARTICULAR REQUIREMENTS FOR BELL AND CHIME TRANSFORMERS
AS/NZS IEC 60947.1:2015	LOW-VOLTAGE SWITCHGEAR AND CONTROL GEAR - GENERAL RULES
AS/NZS IEC 60947.2:2015	LOW-VOLTAGE SWITCHGEAR AND CONTROL GEAR - CIRCUIT BREAKERS
AS/NZS IEC 60947.4.3:2015	LOW VOLTAGE SWITCHGEAR AND CONTROL GEAR - CONTACTORS AND MOTOR STARTERS - AC SEMICONDUCTOR CONTROLLERS AND CONTACTORS FOR NON-MOTOR LOADS
AS/NZS IEC 60947.6.2:2015	LOW-VOLTAGE SWITCHGEAR AND CONTROL GEAR - MULTIPLE FUNCTION EQUIPMENT - CONTROL AND PROTECTIVE SWITCHING DEVICES
AS/NZS IEC 60947.7.1:2015	LOW-VOLTAGE SWITCHGEAR AND CONTROL GEAR - ANCILLARY EQUIPMENT - TERMINAL BLOCKS FOR COPPER CONDUCTORS
AS/NZS IEC 60947.7.2:2015	LOW-VOLTAGE SWITCHGEAR AND CONTROL GEAR - ANCILLARY EQUIPMENT - PROTECTIVE CONDUCTOR TERMINAL BLOCKS FOR COPPER CONDUCTORS
AS/NZS IEC/TR 61000.2.7:2009	ELECTROMAGNETIC COMPATIBILITY (EMC)-ENVIRONMENT-LOW FREQUENCY MAGNETIC FIELDS IN VARIOUS ENVIRONMENTS
CISPR 15 ED 8.1	LIMITS AND METHODS OF MEASUREMENT OF RADIO DISTURBANCE CHARACTERISTICS OF ELECTRICAL LIGHTING AND SIMILAR EQUIPMENT
CISPR 24 ED 2.1	INFORMATION TECHNOLOGY EQUIPMENT - IMMUNITY CHARACTERISTICS - LIMITS AND METHODS OF MEASUREMENT
HB 219:2006	EARTH POTENTIAL RISE-PROTECTION OF TELECOMMUNICATIONS NETWORK. USERS, PERSONNEL AND PLANT-WORKED EXAMPLES FOR THE APPLICATION GUIDE
IEC 60269.1 ED 4.2	LOW-VOLTAGE FUSES - GENERAL REQUIREMENTS
IEC 60315.4:2.0	METHODS OF MEASUREMENT ON RADIO RECEIVERS FOR VARIOUS CLASSES OF EMISSION - PART 4 - RECEIVERS FOR FREQUENCY-MODULATED SOUND BROADCASTING EMISSIONS
IEC 61935.1 Ed 4.0	SPECIFICATION FOR THE TESTING OF BALANCED AND COAXIAL INFORMATION TECHNOLOGY CABLING - INSTALLED BALANCED CABLING AS SPECIFIED IN ISO/IEC 11801 AND RELATED STANDARDS
IEC 62026.1 ED 2.0	LOW-VOLTAGE SWITCHGEAR AND CONTROL GEAR - CONTROLLER DEVICE INTERFACES - GENERAL RULES



ELECTRICAL DESIGN GROUP

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UNIT RATES SCHEDULE

REVISION A - 24 APRIL 2023

THIS SCHEDULE OF UNIT RATES FORMS PART OF THE CONTRACT AND WILL BE USED TO ASSESS VARIATIONS TO THE CONTRACT. THE UNIT RATES OFFERED ARE TO BE FOR SUPPLY, INSTALLATION, AND TERMINATION OF EQUIPMENT IN ACCORDANCE WITH THE SPECIFICATION AND DRAWINGS, OR DELETIONS OF SAME.

ITEM	DESCRIPTION	PER	AMOUNT TO ADD	AMOUNT TO DELETE
1	LABOUR (NORMAL HOURS)	HOURLY	\$	\$
2	LABOUR (OUT OF HOURS)	HOURLY	\$	\$
3	SINGLE GPO INSTALLED	EACH	\$	\$
4	DOUBLE GPO INSTALLED	EACH	\$	\$
5	WP GPO INSTALLED	EACH	\$	\$
6	SINGLE-PHASE ISOLATOR c/w 40m 2.5mm ² CABLE	EACH	\$	\$
7	THREE-PHASE ISOLATOR c/w 40m 2.5mm ² CABLE	EACH	\$	\$
8	BLANK WALL PLATE c/w CONDUIT TO C.S. ABOVE	EACH	\$	\$
9	100mm DIA SURFACE CONDUIT	PER METER	\$	\$
10	80mm DIA SURFACE CONDUIT	PER METER	\$	\$
11	65mm DIA SURFACE CONDUIT	PER METER	\$	\$
12	32mm DIA SURFACE CONDUIT	PER METER	\$	\$
13	25mm DIA SURFACE CONDUIT	PER METER	\$	\$
14	100mm DIA U/G POWER CONDUIT (NO TRENCHING)	PER METER	\$	\$
15	50mm DIA U/G POWER CONDUIT (NO TRENCHING)	PER METER	\$	\$
16	50mm DIA U/G COMMS CONDUIT (NO TRENCHING)	PER METER	\$	\$
17	32mm DIA U/G COMMS CONDUIT (NO TRENCHING)	PER METER	\$	\$
18	UNDERGROUND CABLE TRENCH (incl BACKFILL etc)	PER METER	\$	\$
19	20A 6kA MINIATURE CIRCUIT BREAKER	EACH	\$	\$
20	20A 6kA MINIATURE CIRCUIT BREAKER c/w RCD	EACH	\$	\$
21	160A MCCB INSTALLED IN MSB	EACH	\$	\$
22	250A MCCB INSTALLED IN MSB	EACH	\$	\$
23	2C 2.5 mm ² Cu PVC/PVC + E	PER METER	\$	\$
24	2C 4 mm ² Cu PVC/PVC + E	PER METER	\$	\$
25	2C 6 mm ² Cu PVC/PVC + E	PER METER	\$	\$
26	4C 2.5 mm ² Cu PVC/PVC + E	PER METER	\$	\$
27	4C 4 mm ² Cu PVC/PVC + E	PER METER	\$	\$
28	4C 6 mm ² Cu PVC/PVC + E	PER METER	\$	\$
29	4C 10 mm ² Cu PVC/PVC + E	PER METER	\$	\$
30	4C 16 mm ² Cu PVC/PVC + E	PER METER	\$	\$
31	4C 25 mm ² Cu PVC/PVC + E	PER METER	\$	\$
32	4C 70 mm ² Cu XLPE + E	PER METER	\$	\$
33	SINGLE-GANG LIGHT SWITCHPLATE	EACH	\$	\$
34	TWO-GANG LIGHT SWITCHPLATE	EACH	\$	\$
35	L1	EACH	\$	\$
36	L2	EACH	\$	\$
37	L3	EACH	\$	\$
38	L4	EACH	\$	\$
39	L5	EACH	\$	\$



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ITEM	DESCRIPTION	PER	AMOUNT TO ADD	AMOUNT TO DELETE
40	L6	EACH	\$	\$
41	L7	EACH	\$	\$
42	L8	EACH	\$	\$
43	LP1	EACH	\$	\$
44	LP2	EACH	\$	\$
45	LP3	EACH	\$	\$
46	CAT	EACH	\$	\$
47	SDL1	EACH	\$	\$
48	SDL2	EACH	\$	\$
49	SDL3	EACH	\$	\$
50	RDL1	EACH	\$	\$
51	RDL2	EACH	\$	\$
52	RDL3	EACH	\$	\$
53	PL1	EACH	\$	\$
54	PL2A	EACH	\$	\$
55	PL2B	EACH	\$	\$
56	PL2C	EACH	\$	\$
57	TRK1	EACH	\$	\$
58	TRK2	EACH	\$	\$
59	WL1	EACH	\$	\$
60	WL2	EACH	\$	\$
61	UP1	EACH	\$	\$
62	UP2	EACH	\$	\$
63	S1	EACH	\$	\$
64	S2	EACH	\$	\$
65	S3	EACH	\$	\$
66	S4	EACH	\$	\$
67	HEW	EACH	\$	\$
68	HES	EACH	\$	\$
69	H1	EACH	\$	\$
70	E1	EACH	\$	\$
71	EX BOH	EACH	\$	\$
72	EX FOH	EACH	\$	\$
73	COMMUNICATIONS OUTLET C/W 60M CABLE TO AN EXISTING PATCH PANEL	EACH	\$	\$
74	PROXIMITY DETECTOR SWITCH (PD)	EACH	\$	\$
75	CEILING FAN (CF)	EACH	\$	\$
76	ONE-WAY LIGHT SWITCH	EACH	\$	\$
77	TWO-WAY LIGHT SWITCH	EACH	\$	\$
78	HAND DRYER CONNECTION	EACH	\$	\$



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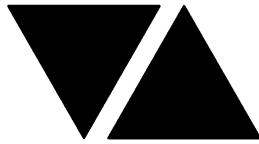
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TENDER BREAKUP SCHEDULE

REVISION A - 24 APRIL 2023

ENSURE THAT ALL PRICES ARE IN ACCORDANCE WITH THE ELECTRICAL SERVICES SPECIFICATION AND THAT THE AMOUNTS FILLED IN AGAINST EACH ITEM INCLUDE ALL CHARGES SUCH AS PURCHASE OF MATERIALS, LABOUR, FREIGHT, TRAVELLING TIME, FIXING, INSTALLATION, TESTING, COMMISSIONING, AND PROFIT.

ITEM	DESCRIPTION	AMOUNT
1	SITE ESTABLISHMENT	\$
2	FEES	\$
3	DRAWINGS & MANUALS	\$
4	TRENCHING UNDERGROUND CONDUITS AND PITS	\$
5	ENERGEX SUBSTATION WORKS	\$
6	CONSUMERS MAINS	\$
7	MAIN SWITCHBOARD INC DB-A	\$
8	DISTRIBUTION BOARD DB-B	\$
9	SUBMAINS	\$
10	POWER OUTLETS AND SUBCIRCUITS	\$
11	LIGHTING OUTLETS AND SUBCIRCUITS	\$
12	DYNALITE LIGHTING CONTROL SYSTEM	\$
13	COMMUNICATIONS	\$
14	PROVISIONAL ALLOWANCE WITHIN THE SPECIFICATION CLAUSE 1.1	\$
15	OTHER (SPECIFY)	\$
16	OTHER (SPECIFY)	\$
	TOTAL LUMP SUM TENDER PRICE	\$
	NAME OF TENDERER:	
	SIGNATURE OF TENDERER:	
	DATE:	



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LIGHTING CONTROL SCHEDULE

REVISION E - 11 DECEMBER 2023

MISCELLANEOUS EQUIPMENT					REV
ITEM	DESCRIPTION				A
SP1	AS DETAILED IN THE EQUIPMENT SCHEDULE 6-BUTTON PROGRAMMABLE SWITCH PANEL C/W CENTRAL LCD DISPLAY DYNALITE ANTUMBRA DISPLAY ALUMINIUM				A
SP2	AS DETAILED IN THE EQUIPMENT SCHEDULE 6-BUTTON PROGRAMMABLE SWITCH PANEL C/W CENTRAL LCD DISPLAY DYNALITE ANTUMBRA DISPLAY ALUMINIUM				A
SP3	AS DETAILED IN THE EQUIPMENT SCHEDULE 6-BUTTON PROGRAMMABLE SWITCH PANEL C/W CENTRAL LCD DISPLAY DYNALITE ANTUMBRA DISPLAY ALUMINIUM				A
SP4	AS DETAILED IN THE EQUIPMENT SCHEDULE 6-BUTTON PROGRAMMABLE SWITCH PANEL C/W CENTRAL LCD DISPLAY DYNALITE ANTUMBRA DISPLAY ALUMINIUM				B
SP5	AS DETAILED IN THE EQUIPMENT SCHEDULE 6-BUTTON PROGRAMMABLE SWITCH PANEL C/W CENTRAL LCD DISPLAY DYNALITE ANTUMBRA DISPLAY ALUMINIUM				B
PE CELL	PROGRAMMABLE PE CELL DUS 90CS CONFIRM THE LOCATION ON SITE WITH THE ARCHITECT				A
TIME CLOCK	PROGRAMMABLE TIME CLOCK ENVISION GATEWAY PDEG C/W INTERNET ACCESS LOCATE DB-B				A
CONTROL MODULE 1					A
TYPE:		DYNALITE DDRC1220FR-GL		A	
DESCRIPTION		12 CH SWITCHING CONTROLLER			A
LOCATION		DIN RAIL MOUNTED WITHIN DB-A			A
BUS:		A			A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUIT	USE	A
1	SWITCH	EXTERNAL	DB-A - L2	CARPARK LIGHTS	A
2	SWITCH	EXTERNAL	DB-A - L3	CARPARK LIGHTS	A
3	SPARE				C
4	SPARE				C
5	SPARE				E
6	SWITCH	KITCHEN	DB-A - L7	KITCHEN	A
7	SWITCH	DECK	DB-A - L9	HEATER	B
8	SWITCH	DECK	DB-A - L10	HEATER	B
9	SWITCH	DECK	DB-A - L11	HEATER	B
10	SWITCH	DECK	DB-A - L12	HEATER	B
11	SWITCH	DECK	DB-A - L13	HEATER	B
12	SWITCH	DECK	DB-A - L14	FANS	A
CONTROL MODULE 2					A
TYPE:		DYNALITE DDRC1220FR-GL		A	
DESCRIPTION		12 CH SWITCHING CONTROLLER			A
LOCATION		DIN RAIL MOUNTED WITHIN DB-A			A
BUS:		A			A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUIT	USE	A
13	SPARE				C
14	SWITCH	EXTERNAL	DB-A - L16	LP1	A
15	SWITCH	EXTERNAL	DB-A - L17	ENTRY	A
16	SWITCH	EXTERNAL	DB-A - L18	PYLON SIGN	A
17	SWITCH	EXTERNAL	DB-A - L20	CATENARY	A
18	SPARE	DECK	DB-A - L18	HEATER	B
19	SPARE	DECK	DB-A - L19	HEATER	B
20	SPARE	DECK	DB-A - L20	HEATER	B
21	SPARE	DECK	DB-A - L21	HEATER	B
22	SPARE	DECK	DB-A - L22	HEATER	B
23	SPARE	BISTRO	DBA - L28	PL1	C
24	SPARE				A



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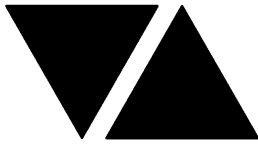
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LIGHTING CONTROL SCHEDULE

REVISION E - 11 DECEMBER 2023

CONTROL MODULE 3					A
TYPE:		DYNALITE DDBC1200			A
DESCRIPTION		12CH BOARD CAST DALI CONTROLLER			A
LOCATION		DIN RAIL MOUNTED WITHIN DB-A			A
BUS:		A			A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUIT	USE	A
25	DALI DIM				D
26	DALI DIM				D
27	DALI DIM				D
28	DALI DIM				D
29	DALI DIM	EXTERNAL	DBA - L22	UPLIGHTS	D
30	DALI DIM				D
31	DALI DIM				D
32	DALI DIM	EXTERNAL	DBA - L22	UPLIGHTS	A
33	DALI DIM				D
34	DALI DIM	EXTERNAL	DBA - L22	UPLIGHTS	A
35	DALI DIM				D
36	DALI DIM	EXTERNAL	DBA - L23	S1	A
CONTROL MODULE 4					A
TYPE:		DYNALITE DDBC1200			A
DESCRIPTION		12CH BOARD CAST DALI CONTROLLER			A
LOCATION		DIN RAIL MOUNTED WITHIN DB-A			A
BUS:		A			A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUITS	USE	A
37	DALI DIM		DBA - L23	WL1	A
38	DALI DIM		DBA - L24	SDL1	A
39	DALI DIM		DBA - L25	WL1	A
40	DALI DIM		DBA - L26	RDL1	A
41	DALI DIM		DBA - L27	WL2	A
42	DALI DIM		DBA - L27	WL2	A
43	DALI DIM		DBA - L27	RDL1	A
44	DALI DIM		DBA - L27	RDL1	A
45	DALI DIM		DBA - L28	RDL3	A
46	SPARE				C
47	DALI DIM		DBA - L29	SDL3	B
48	SPARE		DBA - L30	TRK1	A
CONTROL MODULE 5					A
TYPE:		DYNALITE DDBC1200			A
DESCRIPTION		12CH BOARD CAST DALI CONTROLLER			A
LOCATION		DIN RAIL MOUNTED WITHIN DB-A			A
BUS:		A			A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUITS	USE	A
49	DALI DIM		DBA - L30	TRK1	A
50	SPARE				A
51	SPARE				A
52	SPARE				A
53	SPARE				A
54	SPARE				A
55	SPARE				A
56	SPARE				A
57	SPARE				A
58	SPARE				A
59	SPARE				A
60	SPARE				A



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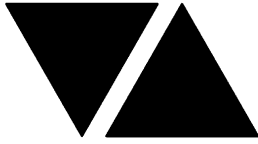
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LIGHTING CONTROL SCHEDULE

REVISION E - 11 DECEMBER 2023

CONTROL MODULE 6					A
TYPE:	DYNALITE DDRC1220FR-GL				A
DESCRIPTION	12 CH SWITCHING CONTROLLER				A
LOCATION	DIN RAIL MOUNTED WITHIN DB-B				A
BUS:	A				A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUIT	USE	A
61	SWITCH	EXTERNAL	DB-B - L1	LP3	B
62	SWITCH	EXTERNAL	DB-B - L2	LP1	A
63	SWITCH	EXTERNAL	DB-B - L3	LP1	A
64	SWITCH	RECEPTION	DB-B - L4	TABLE LAMP	A
65	SWITCH	GAMING	DB-B - L5	SIGN	A
66	SWITCH	GAMING	DB-B - L5	SIGN	A
67	SWITCH	GAMING	DB-B - L5	SIGN	A
68	SWITCH	GAMING	DB-B - L5	SIGN	A
69	SWITCH	GAMING	DB-B - L6	SIGN	A
70	SWITCH	GAMING	DB-B - L6	SIGN	A
71	SWITCH	GAMING	DB-B - L6	SIGN	A
72	SWITCH	GAMING	DB-B - L6	SIGN	A
CONTROL MODULE 7					A
TYPE:	DYNALITE DDRC1220FR-GL				A
DESCRIPTION	12 CH SWITCHING CONTROLLER				A
LOCATION	DIN RAIL MOUNTED WITHIN DB-B				A
BUS:	A				A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUIT	USE	A
73	SWITCH	GAMING	DB-B - L6	SIGN	A
74	SWITCH	GAMING	DB-B - L6	SIGN	A
75	SWITCH	DECK	DB-B - L10	FANS	A
76	SWITCH	DECK	DB-B - L17	HEATER	B
77	SPARE	DECK	BB-B - L18	HEATER	B
78	SPARE				A
79	SPARE				A
80	SPARE				A
81	SPARE				A
82	SPARE				A
83	SPARE				A
84	SPARE				A
CONTROL MODULE 8					A
TYPE:	DYNALITE DDBC1200				A
DESCRIPTION	12CH BOARD CAST DALI CONTROLLER				A
LOCATION	DIN RAIL MOUNTED WITHIN DB-B				A
BUS:	A				A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUIT	USE	A
85	DALI DIM				D
86	DALI DIM	EXTERNAL	DB-B - L8	S1	A
87	DALI DIM		DB-B - L8	SDL1	A
88	DALI DIM		DB-B - L8	WL1	A
89	DALI DIM		DB-B - L8	SDL1	A
90	DALI DIM		DB-B - L8	WL1	A
91	DALI DIM		DB-B - L9	SDL1	A
92	DALI DIM		DB-B - L9	WL1	A
93	DALI DIM		DB-B - L11	S4	A
94	DALI DIM		DB-B - L11	SDL2	A
95	DALI DIM		DB-B - L12	WL2	A
96	DALI DIM		DB-B - L12	RDL1	A



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LIGHTING CONTROL SCHEDULE

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CONTROL MODULE 9					A
TYPE:		DYNALITE DDBC1200			A
DESCRIPTION		12CH BOARD CAST DALI CONTROLLER			A
LOCATION		DIN RAIL MOUNTED WITHIN DB-B			A
BUS:		A			A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUITS	USE	A
97	SPARE				A
98	DALI DIM		DB-B - L13	TRK 2	A
99	DALI DIM		DB-B - L13	TRK 2	A
100	DALI DIM		DB-B - L14	SDL2	A
101	DALI DIM		DB-B - L14	WL2	A
102	DALI DIM		DB-B - L15	S2	A
103	DALI DIM		DB-B - L15	RDL2	A
104	DALI DIM		DB-B - L15	S3	A
105	DALI DIM		DB-B - L15	WL2	A
106	DALI DIM		DB-B - L15	RD02	A
107	DALI DIM		DB-B - L16	WL2	B
108	DALI DIM		DB-B - L16	RDL01	B
CONTROL MODULE 10					A
TYPE:		DYNALITE DDBC1200			A
DESCRIPTION		12CH BOARD CAST DALI CONTROLLER			A
LOCATION		DIN RAIL MOUNTED WITHIN DB-B			A
BUS:		A			A
CHANNEL	CONTROL	DESCRIPTION			A
		LOCATION	CIRCUITS	USE	A
109	DALI DIM		DB-B - L18	RDO2	A
110	DALI DIM		DB-B - L19	PL2	A
111	DALI DIM		DB-B - L20	PL2	A
112	SPARE				A
113	SPARE				A
114	SPARE				A
115	SPARE				A
116	SPARE				A
117	SPARE				A
118	SPARE				A
119	SPARE				A
120	SPARE				A



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ABBREVIATIONS SCHEDULE

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ABBREVIATION	DESCRIPTION
500	NUMBER DENOTES MOUNTING HEIGHT AFFL
15A	15-AMP
24HR	24-HOUR
A	AMPS
AB	MOUNT ABOVE BENCH
AC	ALTERNATING CURRENT
ACOP	APPROVED CODE OF PRACTICE
AD	AUTO DOOR
AFFL	ABOVE FINISHED FLOOR LEVEL TO THE CENTRE OF THE ITEM UNLESS NOTED OTHERWISE
AV	AUDIO VISUAL
BB	MOUNT BELOW BENCH
BC	MOUNT 100mm BELOW CEILING
BH	MOUNT ON / IN BULKHEAD
BL	OUTLET TO BE BLACK IN COLOUR
BS	BRITISH STANDARDS
BWU	BOILING WATER UNIT
C/W	COMPLETE WITH
CATV	CABLE TELEVISION
CCTV	CLOSED CIRCUIT TELEVISION
CD	COMPACT DISK
CEIL	MOUNT ON CEILING
CIBSE	CHARTERED INSTITUTION OF BUILDING SERVICES ENGINEERS
COAX	CO-AXIAL
COMMS	COMMUNICATIONS
CPU	CENTRAL PROCESSING UNIT
CS	MOUNT CONCEALED WITHIN CEILING SPACE
CT	CURRENT TRANSFORMER
DB	DISTRIBUTION BOARD
DBA	DECIBELS – ADJUSTED
DC	DIRECT CURRENT
DDC	DIRECT DIGITAL CONTROL
DIA	DIAMETER
DIM	LIGHT SWITCH TO BE DIMMABLE
DW	DISH WASHER
DWG	AUTOCAD DRAWING FORMAT
DXF	DRAWING EXCHANGE FORMAT - AUTOCAD DXF
ELCB	EARTH LEAKAGE CIRCUIT BREAKER
EMC	ELECTROMAGNETIC COMPATIBILITY
EMI	ELECTROMAGNETIC INTERFERENCE
EXIST	EXISTING EQUIPMENT TO REMAIN UNLESS NOTED OTHERWISE
FFL	FINISHED FLOOR LEVEL
FIP	FIRE INDICATOR PANEL
FLOOR	FLOOR MOUNTED
FM	FREQUENCY MODULATION
HCFC	HYDROCHLOROFLUOROCARBON
HD	HAND DRYER
HP	HOT PLATE
HV	HIGH VOLTAGE
HWS	HOT WATER SYSTEM
HZ	HERTZ (CYCLES PER SECOND)
K	KILO (1000 UNITS)
KA	KILOAMPERE (1000A)
KVA	KILO VOLT AMPERES
KWH	KILO WATT HOURS
LCD	LIQUID CRYSTAL DISPLAY



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ABBREVIATIONS SCHEDULE

REVISION A - 24 APRIL 2023

ABBREVIATION	DESCRIPTION
LED	LIGHT EMITTING DIODE
LV	LOW VOLTAGE
M	METRE
MATV	MASTER ANTENNA TELEVISION
MCB	MINIATURE CIRCUIT BREAKER
MCCB	MOULDED CASE CIRCUIT BREAKER
MDF	MAIN DISTRIBUTION FRAME
MM	MILLI- METRE(S)
MSB	MAIN SWITCH BOARD
MSSB	MECHANICAL SERVICES SWITCHBOARD
MW	MICROWAVE
N	NEUTRAL
NTS	NOT TO SCALE
OV	OVEN
PDF	PORTABLE DOCUMENT FILES
PE	POLYETHYLENE
PF	POWER FACTOR
PH	PHASE
PIR	PASSIVE INFRA RED
POT	PLAIN OLD TELEPHONE
PP	POLYPROPYLENE
PTFE	POLYTETRAFLUOROETHYLENE
PVC	POLYVINYLCHLORIDE
RAD	RADIUS
RCCB	RESIDUAL CURRENT CIRCUIT BREAKER
RCD	CIRCUIT PROTECTED VIA A 30mA RESIDUAL CURRENT DEVICE
REF	REFRIGERATION
RH	RANGE HOOD
RMS	ROOT MEAN SQUARE
RPM	REVOLUTIONS PER MINUTE
RS232	SIGNAL INPUT/OR OUTPUT SERIALY CODED
RSD	ROLLER SHUTTER DOOR
STP	SHIELDED TWISTED PAIR
SUS	SUSPENDED
SWA	GALVANISED STEEL WIRE ARMOUR
TEX	TOILET EXHAUST
TP	TEST POINT
TPN	THREE PHASE & NEUTRAL
TRC	TELECOM REFERENCE CONDUCTOR
UNO	UNLESS NOTED OTHERWISE
UPS	UNINTERRUPTIBLE POWER SUPPLY
UPVC	UNPLASTICISED POLYVINYLCHLORIDE
UTP	UNSHIELDED TWISTED PAIR (WIRE CABLE)
UV	ULTRA VIOLET
V	VOLTS
VA	VERTICAL ARCHITRAVE OUTLET TYPE
W	WATT
WC	MOUNT WITHIN WALL CAVITY
WP	WEATHERPROOF TO IP56 UNLESS NOTED OTHERWISE
XLPE	CROSS-LINKED POLYETHYLENE INSULATED



ELECTRICAL DESIGN GROUP

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C2791a - STAFFORD COMMUNITY CLUB

C2791a-0008(E).xls

DISTRIBUTION BOARD DB-A

REVISION E - 27 SEPTEMBER 2023

FAULT CURRENT: 6kA CHASSIS SIZE: 3 X 84 POLES CHASSIS RATING: 250A PHASES: A							REV
MAIN SWITCH: INTEGRAL TO THE MSB							A
							A
							A
PROVIDE THE DB WITH A FULL WIDTH EMPTY DIN RAIL TO ACCOMMODATE FUTURE CONTACTORS AND CONTROLS IN ADDITION TO THE CONTROLS INCLUDING THE DYNALITE EQUIPMENT PROVIDED AS PART OF THE INITIAL WORKS. PROVIDE THE DB WITH AN AS2293 EMERGENCY LIGHTING CONTROL SYSTEM TO CONTROL THE ASSOCIATED EMERGENCY LIGHTS. PROVIDE THE DB WITH SURGE PROTECTION.							A
CIRC	PH	CIRCUIT BREAKER (amps)	CONTROL EQUIPMENT	CABLE SIZE (mm ²)	LOCATION	CIRCUIT USE	
P1	1	20	RCBO	2.5	EXTERNAL	MAINTENANCE	A
P2	3	20	RCBO	2.5	ROOF	REF COMP	A
P3	3	20	RCBO	2.5	ROOF	REF COMP	A
P4	3	20	RCBO	2.5	ROOF	REF COMP	A
P5	1	20	RCBO	2.5	KEG ISOLATION PANEL	KEG ROOM	A
P6	1	20	RCBO	2.5	KEG ISOLATION PANEL	KEG ROOM	A
P7	1	20	RCBO	2.5	CR ISOLATION PANEL	COOLROOM	A
P8	1	20	RCBO	2.5	CR ISOLATION PANEL	COOLROOM	A
P9	1	20	RCBO	2.5	CR ISOLATION PANEL	COOLROOM	A
P10	1	20	RCBO	2.5	CR ISOLATION PANEL	COOLROOM	A
P11	1	20	RCBO	2.5	CR ISOLATION PANEL	COOLROOM	A
P12	1	20	RCBO	2.5	CR ISOLATION PANEL	COOLROOM	A
P13	1	20	RCBO	2.5	CR ISOLATION PANEL	COOLROOM	A
P14	1	20	RCBO	2.5	CR ISOLATION PANEL	COOLROOM	A
P15	1	20	RCBO	2.5	KITCHEN	PENDANT OUTLET	E
P16							D
P17							D
P18							D
P19							D
P20							D
P21							E
P22							E
P23	1	32	RCBO	6.0	KITCHEN	PIZZA OVEN	E
P24	1	20	RCBO	6.0	BOOSTER CABINET	CHARGER	A
P25	1	20	RCBO	6.0	BOOSTER CABINET	JACKING PUMP	A
P26	1	20	RCBO	2.5	EXTERNAL	GAS HWS	A
P27	1	20	RCBO	2.5	STAFF	GPO	A
P28	1	20	RCBO	2.5	PWD	HD	A
P29	1	20	RCBO	2.5	OFFICE	GPO	A
P30	1	20	RCBO	2.5	MALE	HD	A
P31	1	20	RCBO	2.5	FEMALE	HD	A
P32	1	20	RCBO	2.5		CLEANING	A
P33	1	20	RCBO	2.5		CLEANING	A
P34	1	20	RCBO	2.5	KEG ROOM	BEER	A
P35	1	20	RCBO	2.5	KEG ROOM	BEER	A
P36	1	20	RCBO	2.5	KEG ROOM	GLYCOL	A
P37	1	20	RCBO	2.5	LOADING DOCK	MAINTENANCE	A
P38	3	20	RCBO	2.5	LOADING DOCK	RSD	A
P39	1	20	RCBO	2.5	LOADING DOCK	ICE MACHINE	A
P40	1	20	RCBO	2.5	LOADING DOCK	POST MIX	A
P41	1	20	RCBO	2.5	LOADING DOCK	POST MIX	A
P42	1	20	RCBO	2.5	KITCHEN	GPO	A
P43	1	20	RCBO	2.5	KITCHEN	GPO	A
P44	3	20	RCBO	2.5	ROOF	GYCOL COMP	B
P45	1	20	RCBO	2.5	KITCHEN	PRINTER	A



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DISTRIBUTION BOARD DB-A

REVISION E - 27 SEPTEMBER 2023

FAULT CURRENT: 6kA CHASSIS SIZE: 3 X 84 POLES CHASSIS RATING: 250A PHASES: A							MAIN SWITCH: INTEGRAL TO THE MSB	REV
								A
								A
								A
								A
PROVIDE THE DB WITH A FULL WIDTH EMPTY DIN RAIL TO ACCOMMODATE FUTURE CONTACTORS AND CONTROLS IN ADDITION TO THE CONTROLS INCLUDING THE DYNALITE EQUIPMENT PROVIDED AS PART OF THE INITIAL WORKS. PROVIDE THE DB WITH AN AS2293 EMERGENCY LIGHTING CONTROL SYSTEM TO CONTROL THE ASSOCIATED EMERGENCY LIGHTS. PROVIDE THE DB WITH SURGE PROTECTION.								A
CIRC	PH	CIRCUIT BREAKER (amps)	CONTROL EQUIPMENT	CABLE SIZE (mm ²)	LOCATION	CIRCUIT USE		
P46	1	20	RCBO	2.5	KITCHEN	GPO		A
P47	1	20	RCBO	2.5	KITCHEN	REF		A
P48	1	32	RCBO	6.0	KITCHEN	PIZZA OVEN		E
P49	1	20	RCBO	2.5	KITCHEN	PENDANT OUTLET		E
P50	1	20	RCBO	2.5	KITCHEN	PENDANT OUTLET		E
P51	1	20	RCBO	2.5		MW		A
P52	1	20	RCBO	2.5		FREEZER		A
P53	1	20	RCBO	2.5		CHILLER		A
P54	1	20	RCBO	2.5	KITCHEN	GAS CONTROLLER		A
P55	1	20	RCBO	2.5	BAR	GPO		A
P56	3	20	RCBO	2.5		DISH WASHER		A
P57	1	20	RCBO	2.5		AUTO BOILER		A
P58	1	20	RCBO	2.5		REF		A
P59	1	20	RCBO	2.5		COFFEE		A
P60	1	20	RCBO	2.5	BAR SERVERY	PRINTER		B
P61	1	20	RCBO	2.5	BAR	GPO		A
P62	1	20	RCBO	2.5	SERVERY	COLD DISPLAY		A
P63	1	20	RCBO	2.5	KITCHEN	OVEN		A
P64	1	20	RCBO	2.5	KITCHEN	GAS STARTERS		A
P65	1	20	RCBO	2.5		REF		A
P66	1	20	RCBO	2.5		CHILLER		A
P67	1	20	RCBO	2.5		BAINE MARIE		A
P68	3	40	RCBO	6.0	KITCHEN	22.2KW COMBI		A
P69	1	20	RCBO	2.5	KITCHEN	11.2KW COMBI		A
P70	1	20	RCBO	2.5	KITCHEN	GPO		A
P71	1	20	RCBO	2.5	BISTRO	TV		A
P72	1	20	RCBO	2.5	STAFF	AMENITY		B
P73	1	20	RCBO	2.5	AMENITY	AMENITY		B
P74	3	50		10.0	KITCHEN	DW 31KW		B
P75	1	20	RCBO	2.5	KITCHEN	SPARE		B
P76	1	20	RCBO	2.5	KITCHEN	SPARE		B
P77	1	20	RCBO	2.5	KITCHEN	SPARE		B
P78	1	20	RCBO	2.5	KITCHEN	SPARE		B
P79	1	20	RCBO	2.5	KITCHEN	SPARE		B
L1	1	20	RCBO	2.5	BOH	LIGHTS		A
L2	1	20	RCBO	2.5	EXTERNAL	CARPARK		A
L3	1	20	RCBO	2.5	EXTERNAL	CARPARK		A
L4								C
L5								C
L6	1	20	RCBO	2.5	EXTERNAL	LOADING DOCK		A
L7	1	20	RCBO	2.5	KITCHEN	LIGHTS		A
L8	1	20	RCBO	2.5	SERVERY	HEAT LAMPS		A



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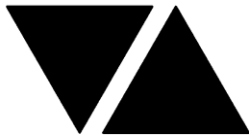
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DISTRIBUTION BOARD DB-A

REVISION E - 27 SEPTEMBER 2023

FAULT CURRENT: 6kA CHASSIS SIZE: 3 X 84 POLES CHASSIS RATING: 250A PHASES: A							MAIN SWITCH: INTEGRAL TO THE MSB	REV
								A
								A
								A
								A
PROVIDE THE DB WITH A FULL WIDTH EMPTY DIN RAIL TO ACCOMMODATE FUTURE CONTACTORS AND CONTROLS IN ADDITION TO THE CONTROLS INCLUDING THE DYNALITE EQUIPMENT PROVIDED AS PART OF THE INITIAL WORKS. PROVIDE THE DB WITH AN AS2293 EMERGENCY LIGHTING CONTROL SYSTEM TO CONTROL THE ASSOCIATED EMERGENCY LIGHTS. PROVIDE THE DB WITH SURGE PROTECTION.								A
CIRC	PH	CIRCUIT BREAKER (amps)	CONTROL EQUIPMENT	CABLE SIZE (mm ²)	LOCATION	CIRCUIT USE		
L9	1	20	RCBO	2.5	FRONT DECK	HEATER		B
L10	1	20	RCBO	2.5	FRONT DECK	HEATER		B
L11	1	20	RCBO	2.5	FRONT DECK	HEATER		B
L12	1	20	RCBO	2.5	FRONT DECK	HEATER		B
L13	1	20	RCBO	2.5	REAR DECK	HEATER		B
L14	1	20	RCBO	2.5	REAR DECK	FANS		A
L15								C
L16	1	20	RCBO	4.0	EXTERNAL	LP1		A
L17	1	20	RCBO	4.0	EXTERNAL	ENTRY		A
L18	1	20	RCBO	10.0	EXTERNAL	PYLON SIGN		A
L19	1	20	RCBO	10.0	EXTERNAL	BOOSTER CABINET		A
L20	1	20	RCBO	2.5	EXTERNAL	CATENARY LIGHTS		A
L21								D
L22	1	20	RCBO	2.5	EXTERNAL	UPLIGHTS		A
L23	1	20	RCBO	2.5	EXTERNAL	LIGHTS		A
L24	1	20	RCBO	2.5	EXTERNAL	LIGHTS		A
L25	1	20	RCBO	2.5	EXTERNAL	LIGHTS		A
L26	1	20	RCBO	2.5		LIGHTS		A
L27	1	20	RCBO	2.5		LIGHTS		A
L28	1	20	RCBO	2.5		LIGHTS		A
L29	1	20	RCBO	2.5		LIGHTS		A
L30	1	20	RCBO	2.5		LIGHTS		A
L31	1	20	RCBO	2.5	REAR DECK	HEATER		B
L32	1	20	RCBO	2.5	FRONT DECK	HEATER		B
L33	1	20	RCBO	2.5	FRONT DECK	HEATER		B
L34	1	20	RCBO	2.5	FRONT DECK	HEATER		B
L35	1	20	RCBO	2.5	FRONT DECK	HEATER		B



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C2791a - STAFFORD COMMUNITY CLUB
DISTRIBUTION BOARD DB-B (GROUND SOUTH)
REVISION F - 7 MARCH 2024

C2791a-0009(F).xls

<div>FAULT CURRENT: 6KA</div> <div>CHASSIS SIZE: 2 X 60 + 1 X 36</div> <div>CHASSIS RATING: 250A</div> <div>PHASES: 3</div> <div>MAIN SWITCH: 250A NON AUTO LOAD BREAK</div> <div>SUPPLIED FROM: MSB</div> <div>SUPPLY CABLE: 4C70</div>							REV
							A
							A
							A
							A
PROVIDE THE DB WITH A FULL WIDTH EMPTY DIN RAIL TO ACCOMMODATE FUTURE CONTACTORS AND CONTROLS IN ADDITION TO THE CONTROLS INCLUDING THE DYNALITE EQUIPMENT PROVIDED AS PART OF THE INITIAL WORKS. PROVIDE THE DB WITH AN AS2293 EMERGENCY LIGHTING CONTROL SYSTEM TO CONTROL THE ASSOCIATED EMERGENCY LIGHTS. PROVIDE THE DB WITH SURGE PROTECTION.							A
CIRC	PH	CIRCUIT BREAKER (amps)	CONTROL EQUIPMENT	CABLE SIZE (mm ²)	LOCATION	CIRCUIT USE	
P1	1	20	RCBO	2.5	ROOF	MAINTENANCE	A
P2	1	20	RCBO	2.5	EXTERNAL	MAINTENANCE	A
P3	3	20	RCBO	2.5	EXTERNAL	PUMP	A
P4	1	20	RCBO	2.5		ATM	A
P5	1	20	RCBO	2.5		CLEANING	A
P6	1	20	RCBO	2.5	PUBLIC BAR	TV	A
P7	1	20	RCBO	2.5	ENTRY	CLEANING	A
P8	1	20	RCBO	2.5	ENTRY	KIOSK	A
P9	1	20	RCBO	2.5	ENTRY	RECEPTION	A
P10	1	20	RCBO	2.5	ENTRY	AUTO DOOR	A
P11	1	20	RCBO	2.5	PUBLIC BAR	TV	C
P12	1	20	RCBO	2.5	PUBLIC BAR	TICKER TAPE	C
P13	1	20	RCBO	2.5	PUBLIC BAR	TICKER TAPE	C
P14	1	20	RCBO	2.5	PUBLIC BAR	TV	C
P15	1	20	RCBO	2.5	PUBLIC BAR	TV	C
P16	1	20	RCBO	2.5		CLEANING	A
P17	1	20	RCBO	2.5	OFFICE	GPOs	A
P18	1	20	RCBO	2.5	OFFICE	PRINTER	A
P19	1	20	RCBO	2.5	OFFICE	CR1	A
P20	1	20	RCBO	2.5	OFFICE	CR1	A
P21	1	20	RCBO	2.5	OFFICE	CR3	B
P22	1	20	RCBO	2.5	OFFICE	CR3	B
P23	1	20	RCBO	2.5	OFFICE	CR2	B
P24	1	20	RCBO	2.5	OFFICE	CR2	B
P25	3	32	RCBO	4.0	BAR	HWS	A
P26	1	20	RCBO	2.5	BAR	GPOs	A
P27	1	25	RCBO	4.0	BAR	GLASS WASHER	E
P28	1	20	RCBO	2.5	BAR	REF	A
P29	1	20	RCBO	2.5	BAR	POS	A
P30	1	20	RCBO	2.5	BAR	GPOs	A
P31	1	20	RCBO	2.5	BAR	KENO	D
P32	1	20	RCBO	2.5	BAR	COFFEE	A
P33	1	20	RCBO	2.5	BAR	OVEN	A
P34	1	20	RCBO	2.5	GAMING	COFFEE	A
P35	1	20	RCBO	2.5	GAMING	REF	A
P36	1	20	RCBO	2.5	GAMING	TV	A
P37	1	20	RCBO	2.5	GAMING	MODEM	A
P38	1	20	RCBO	2.5	GAMING	CRT	A
P39	1	20	RCBO	2.5	GAMING	KIOSK	A
P40	1	20	RCBO	2.5	GAMING	CRT	A
P41	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P42	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P43	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P44	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P45	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P46	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P47	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P48	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P49	1	20	RCBO	2.5	GAMING	POKER MACHINES	A



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C2791a - STAFFORD COMMUNITY CLUB
DISTRIBUTION BOARD DB-B (GROUND SOUTH)
REVISION F - 7 MARCH 2024

C2791a-0009(F).xls

FAULT CURRENT: 6KA							REV
CHASSIS SIZE: 2 X 60 + 1 X 36							A
CHASSIS RATING: 250A							A
PHASES: 3							A
MAIN SWITCH: 250A NON AUTO LOAD BREAK							A
SUPPLIED FROM: MSB							A
SUPPLY CABLE: 4C70							A
PROVIDE THE DB WITH A FULL WIDTH EMPTY DIN RAIL TO ACCOMMODATE FUTURE CONTACTORS AND CONTROLS IN ADDITION TO THE CONTROLS INCLUDING THE DYNALITE EQUIPMENT PROVIDED AS PART OF THE INITIAL WORKS. PROVIDE THE DB WITH AN AS2293 EMERGENCY LIGHTING CONTROL SYSTEM TO CONTROL THE ASSOCIATED EMERGENCY LIGHTS. PROVIDE THE DB WITH SURGE PROTECTION.							A
CIRC	PH	CIRCUIT BREAKER (amps)	CONTROL EQUIPMENT	CABLE SIZE (mm ²)	LOCATION	CIRCUIT USE	
P50	1	20	RCBO	2.5	GAMING	POKER MACHINES	A
P51	1	20	RCBO	2.5	PUBLIC BAR	GLASS CHILLER	A
P52	1	20	RCBO	2.5	PUBLIC BAR	REF	A
P53	1	20	RCBO	2.5	PUBLIC BAR	REF	A
P54	1	20	RCBO	2.5	PUBLIC BAR	CASHIER COMPUTER	D
P55	1	25	RCBO	4.0	PUBLIC BAR	GLASS WASHER	E
P56	1	20	RCBO	2.5	PUBLIC BAR	POS	A
P57	1	20	RCBO	2.5	PUBLIC BAR	GLASS CHILLER	A
P58	3	20	RCBO	2.5	PUBLIC BAR	HWS	A
P59	1	20	RCBO	2.5	PUBLIC BAR	GLASS CHILLER	A
P60	1	25	RCBO	4.0	PUBLIC BAR	6.7KW GLASS WASHER	E
P61	1	20	RCBO	2.5	PUBLIC BAR	REF	A
P62	1	20	RCBO	2.5	PUBLIC BAR	REF	A
P63	1	20	RCBO	2.5	PUBLIC BAR	GLASS CHILLER	A
P64	1	20	RCBO	2.5	AMENITY	HD	A
P65	1	20	RCBO	2.5	OFFICE	NBN NTD	A
P66	1	20	RCBO	2.5	PUBLIC BAR	TV	C
P67	1	20	RCBO	2.5	PUBLIC BAR	TV	C
P68	1	20	RCBO	2.5	AMENITY	AMENITY	B
P69	1	20	RCBO	2.5	AMENITY	HD	B
P70	1	25	RCBO	4.0	PUBLIC BAR	6.7KW GLASS WASHER	E
P71	1	20	RCBO	2.5	PUBLIC BAR	SPARE	B
P72	1	20	RCBO	2.5	PUBLIC BAR	KENO	B
P73	3	40	RCBO	6.0	EXTERNAL	EVENT OUTLET	F
P74							D
P75							D
L1	1	20	RCBO	2.5		LIGHTS	A
L2	1	20	RCBO	2.5		LIGHTS	A
L3	1	20	RCBO	2.5		LIGHTS	A
L4	1	20	RCBO	2.5		LIGHTS	A
L5	1	20	RCBO	2.5	GAMING	SIGNS	A
L6	1	20	RCBO	2.5	GAMING	SIGNS	A
L7							C
L8	1	20	RCBO	2.5	EXTERNAL	LIGHTS	A
L9	1	20	RCBO	2.5	EXTERNAL	LIGHTS	A
L10	1	20	RCBO	2.5	REAR DECK	FANS	A
L11	1	20	RCBO	2.5		LIGHTS	A
L12	1	20	RCBO	2.5		LIGHTS	A
L13	1	20	RCBO	2.5		LIGHTS	A
L14	1	20	RCBO	2.5		LIGHTS	A
L15	1	20	RCBO	2.5		LIGHTS	A
L16	1	20	RCBO	2.5		LIGHTS	A
L17	1	20	RCBO	2.5	REAR DECK	HEATERS	A
L18	1	20	RCBO	2.5		LIGHTS	A
L19	1	20	RCBO	2.5		LIGHTS	A
L20	1	20	RCBO	2.5		LIGHTS	A
L18	1	20	RCBO	2.5	REAR DECK	HEATERS	B

LEGEND

ELECTRICAL SERVICES SWITCHBOARD.

SWITCHBOARD / CONTROL PANEL NOT PROVIDED AS PART OF THE ELECTRICAL SUBCONTRACT.

SINGLE POWER OUTLET.

DOUBLE POWER OUTLET.

SPECIAL PURPOSE POWER OUTLET.

SINGLE PHASE ISOLATOR.

THREE PHASE ISOLATOR.

SIGN

SIGN CONNECTION.

CONDUIT ROUTE.

x DENOTES CONDUIT TYPE.

PIT x

ELECTRICAL PIT, TYPE AS NOTED.

HAND DRYER CONNECTION.

LIGHTING PRESENCE DETECTOR SWITCH.

LIGHTING CONTROL SWITCH PANEL, TYPE AS NOTED.

ONE-WAY LIGHT SWITCH.

TWO-WAY LIGHT SWITCH.

CIRCUIT LINE.

SWITCH LINE.

DB-x - Py

POWER CIRCUIT DESIGNATION. DENOTES DB AND CIRCUIT.

xx

LIGHTING CONTROL CHANNEL REFERENCE.

ELECTRICAL EQUIPMENT AS NOTED.

RJ45 COMMUNICATIONS OUTLET ALL TO CR-1.

RJ45 GAMING LINK OUTLET.

NBN PREMISES CONNECTION DEVICE.

NBN NETWORK TERMINATION DEVICE.

GAMING FIBRE.

NO LONGER REQUIRED.

SECURITY CAMERA.

REVENUE METER.

FUSE.

SINGLE PHASE.

THREE PHASE.

CURRENT TRANSFORMER C/W REMOVABLE LINK.

FUSE LINK.

COMBINED FUSE SWITCH.

CIRCUIT BREAKER.

ISOLATOR.

RESIDUAL CURRENT DEVICE.

CONTACTOR - NORMALLY OPEN.

CONTACTOR - NORMALLY CLOSED.

TELEVISION POSITION.

LEGEND

REFER TO DETAIL NOTED FOR THE AREA SHOWN HATCHED. ADDITIONAL OUTLETS & FITTINGS MAY BE SHOWN ON DETAIL.

E1

E1: GENERAL LED EMERGENCY LIGHT.

EX

EX: EMERGENCY LED EXIT LIGHT.

Lx

Lx: LIGHT FITTING C/W NON-MAINTAINED EMERGENCY BATTERY PACK. TYPE AS NOTED.

L1

L1: 600 X 300 LED FLAT PANEL.

L2

L2: 1200 X 300 LED FLAT PANEL.

L3

L3: LOADING DOCK FLOOD LIGHT.

L4

L4: AMENITY RECESSED DALI DOWNLIGHT.

L5

L5: 1200 LONG LED BATTEN C/W SENSOR.

L6

L6: 6M POLE FORWARD THROW CARPARK LIGHT.

L7

L7: NO LONGER REQUIRED.

L8

L8: 600 LONG LED BATTEN.

LP1

LP1: EXISTING GREEN LIGHT POLE REFURBISHED.

LP2

LP2: EXISTING ENTRY STATEMENT SPHERE TO BE REPLACED.

LP3

LP3: LED BOLLARD LIGHT.

LP4

LP4: LIGHT POLE AND SPHERE.

CAT

CAT: CATENARY FESTOON LIGHTING.

SDL1

SDL1: SURFACE MOUNTED CAN DALI DOWNLIGHT.

SDL2

SDL2: SURFACE MOUNTED CAN DALI DOWNLIGHT.

SDL3

SDL3: 500DIA DALI SPHERE.

RDL1

RDL1: RECESSED DALI WHITE DOWNLIGHT.

RDL2

RDL2: RECESSED DALI BLACK DOWNLIGHT.

RDL3

RDL3: RECESSED ADJUSTABLE DALI WHITE DOWNLIGHT.

PL1

PL1: DECORATIVE DALI PENDANT.

PL2A

PL2A: DECORATIVE DALI PENDANT.

PL2B

PL2B: DECORATIVE DALI PENDANT.

PL2C

PL2C: DECORATIVE DALI PENDANT.

TRK1

TRK1: 8400 LONG 8 FITTING DALI TRACK.

TRK2

TRK2: 9200 LONG 10 FITTING DALI TRACK.

TL1

TL1: TABLE LAMP.

WL1

WL1: WALL MOUNTED DALI UP DOWN LIGHT.

WL2

WL2: WALL MOUNTED DECORATIVE LIGHT.

UP1

UP1: NO LONGER REQUIRED.

UP2

UP2: INGROUND DALI UPLIGHT.

S1

S1: RECESSED DALI STAIR HANDRAIL LIGHT.

S2

S2: REAR BAR DALI LED STRIP LIGHTS.

S3

S3: COUNTER DALI LED STRIP LIGHT.

S4

S4: REAR BAR DALI LED STRIP LIGHTS.

H1

H1: KITCHEN PASS OUT HEAT LAMPS.

CF

CF: CEILING FAN.

SITE PLAN
CARPARK & DRIVEWAY LIGHTING
SCALE 1: 500

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ELECTRICAL DESIGN GROUP

ELECTRICAL BUILDING SERVICES CONSULTANTS

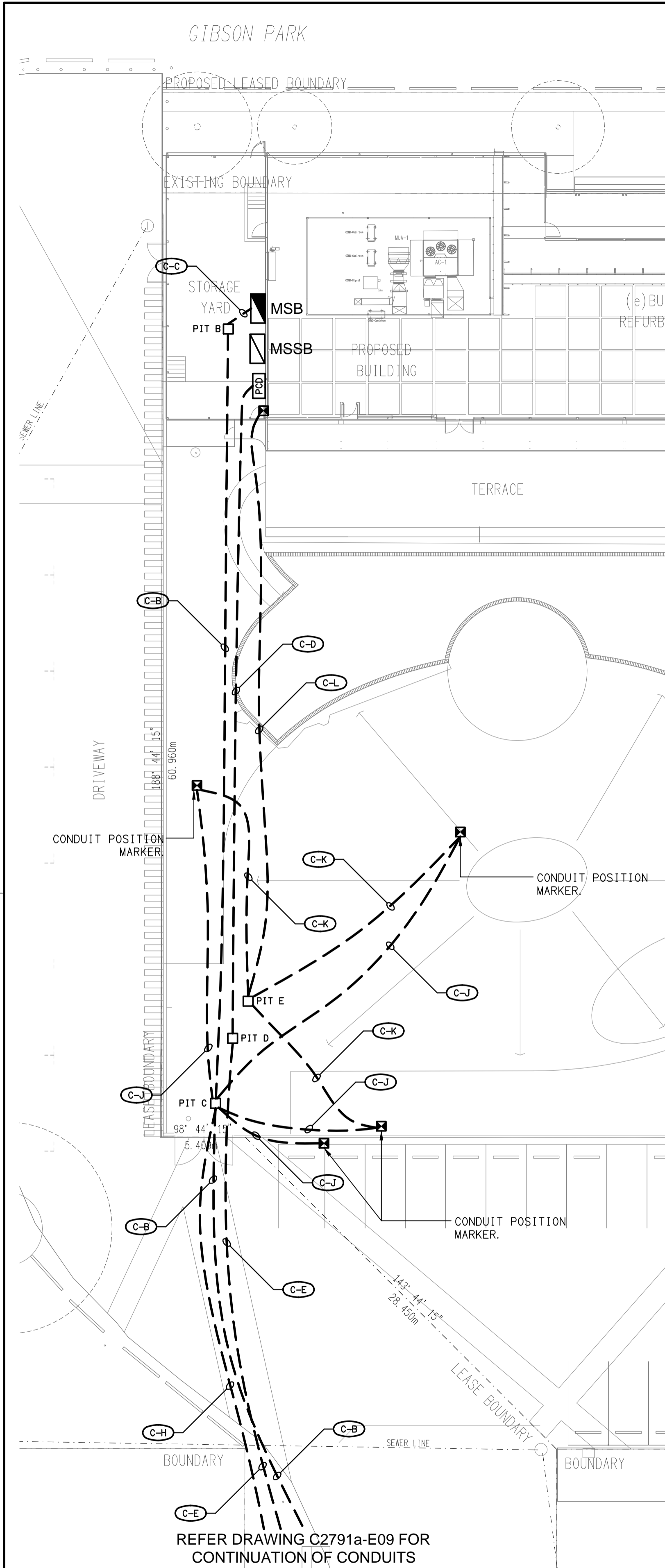
BRISBANE GOLD COAST

P.O.Box 15, Sherwood Q.4075
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Email: brisbane@edg.net.au
Web: www.edg.net.au

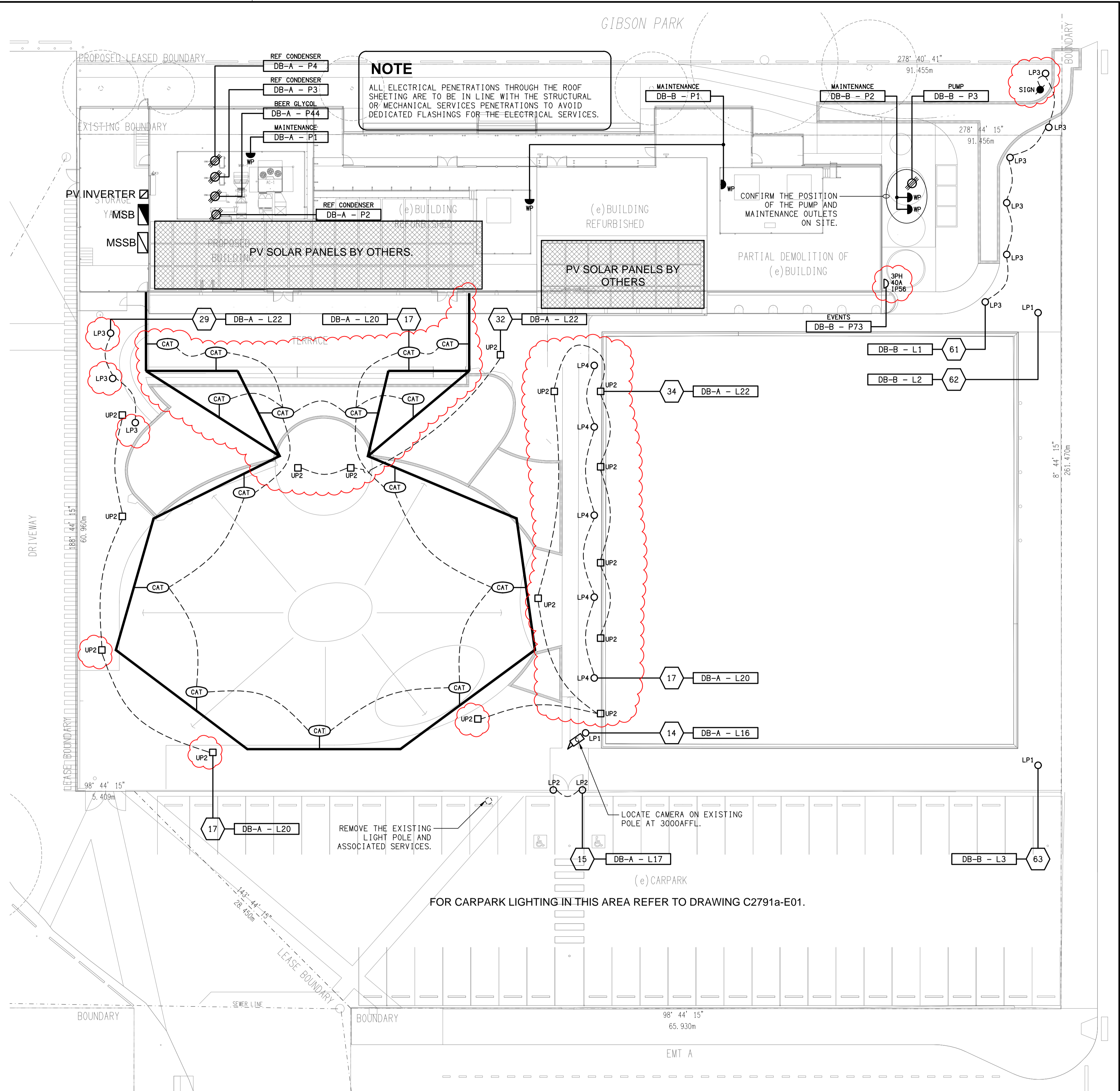
PROJECT:
STAFFORD COMMUNITY CLUB

352 STAFFORD ROAD, STAFFORD

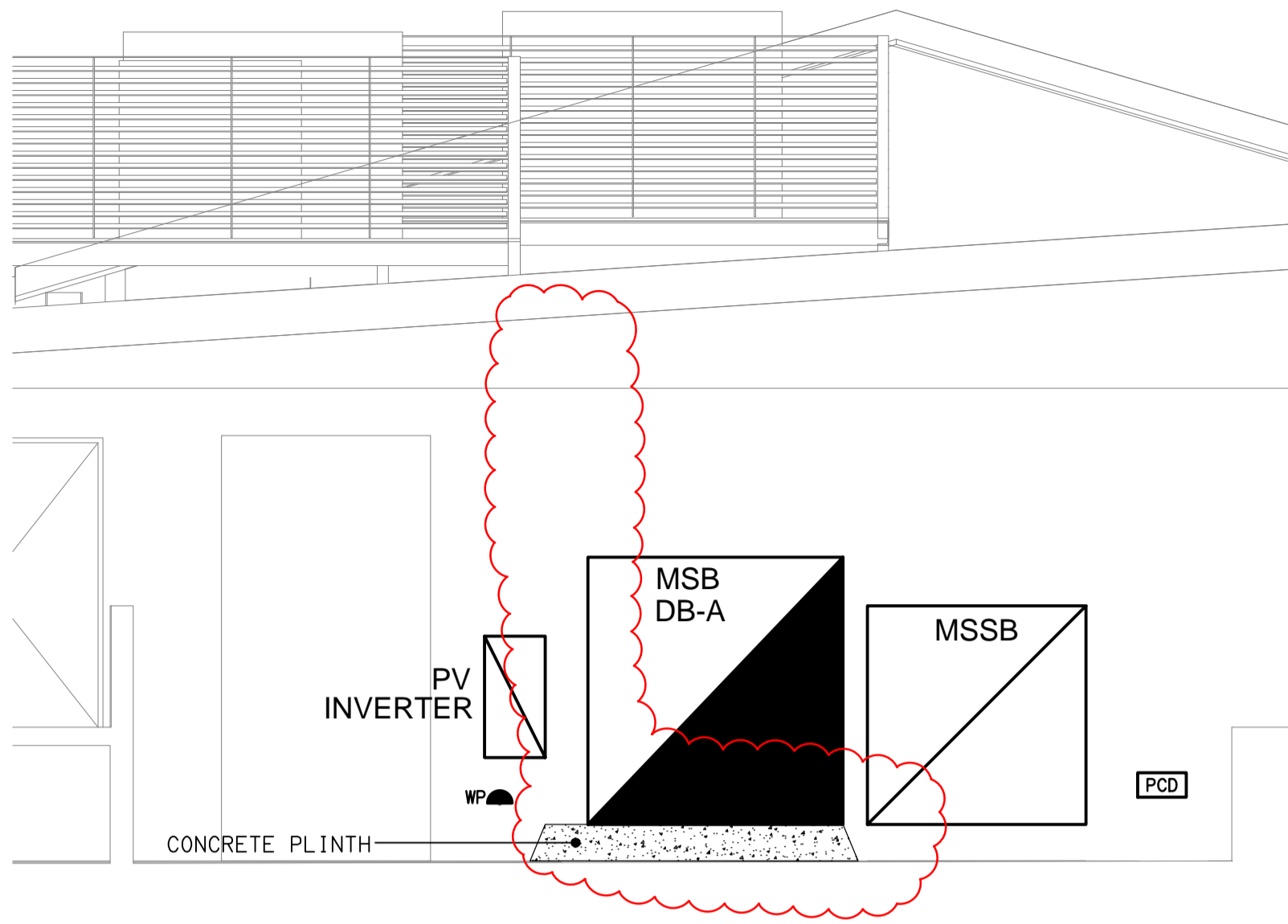
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REV:	DESCRIPTION:	DATE:
DRAWING: ELECTRICAL SERVICES LEGEND & LIGHTING SITE PLAN		
SCALE: 1:500	AT A1	PROJECT NO: C2791a DRAWING NO: E01 REVISION: G



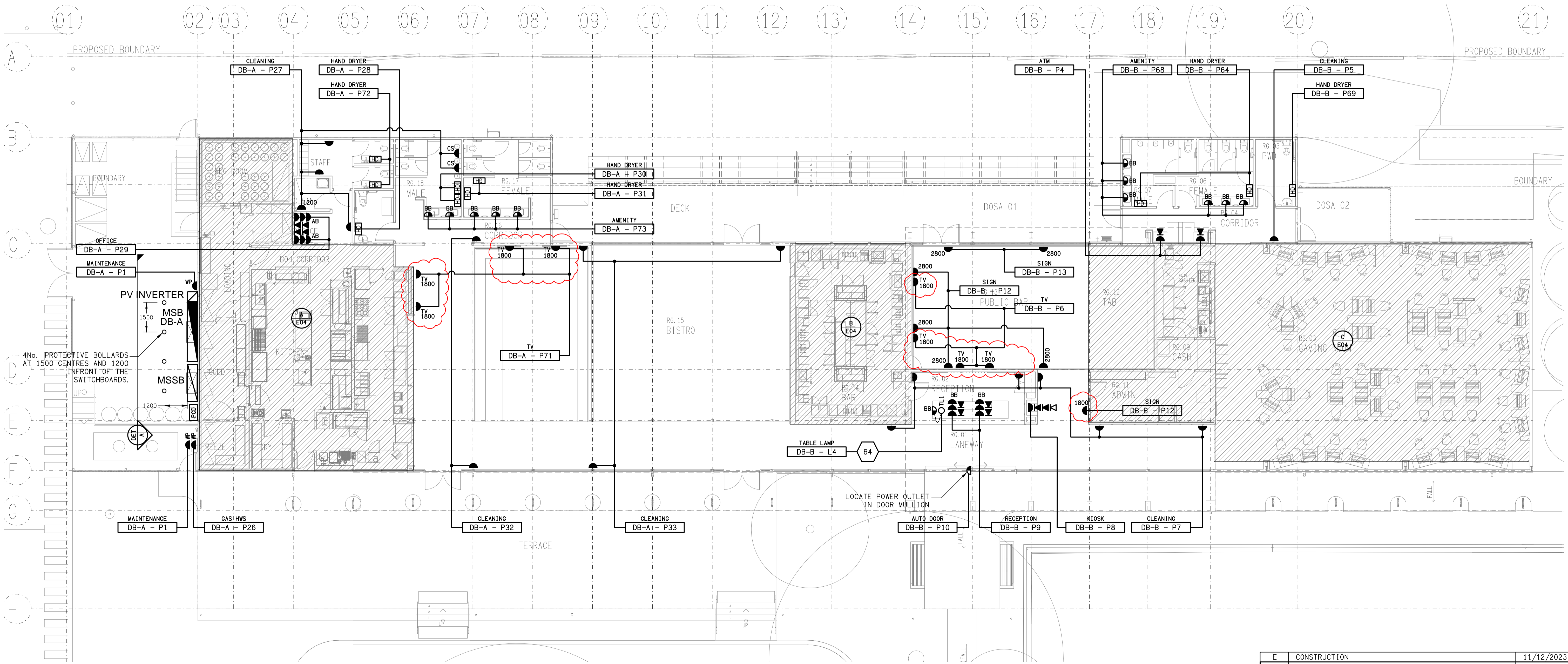
PART SITE PLAN
BOLLARD OUTLETS, PIT & CONDUITS
SCALE 1:200

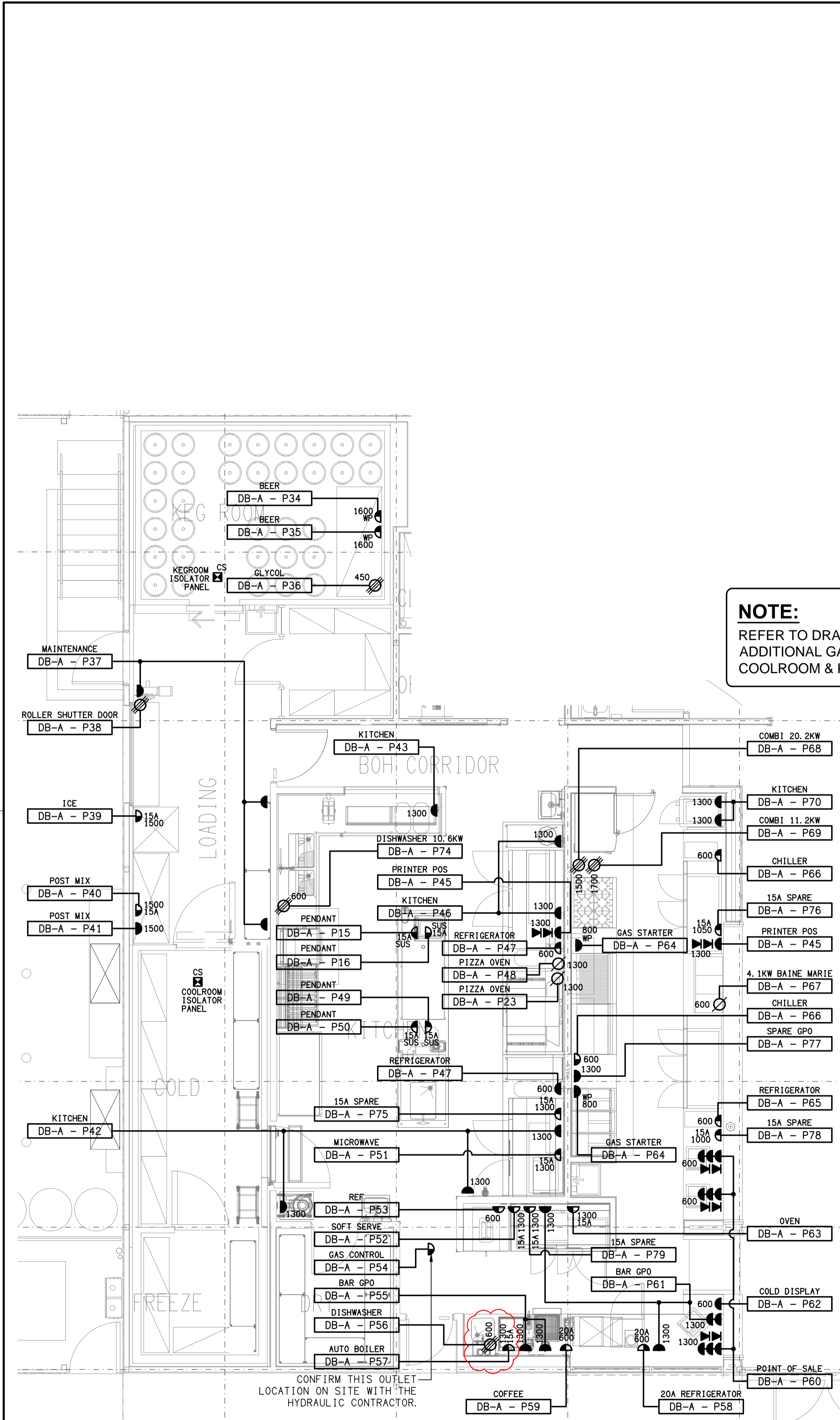


SITE PLAN
LANDSCAPE LIGHTING & ROOF
SCALE 1:200



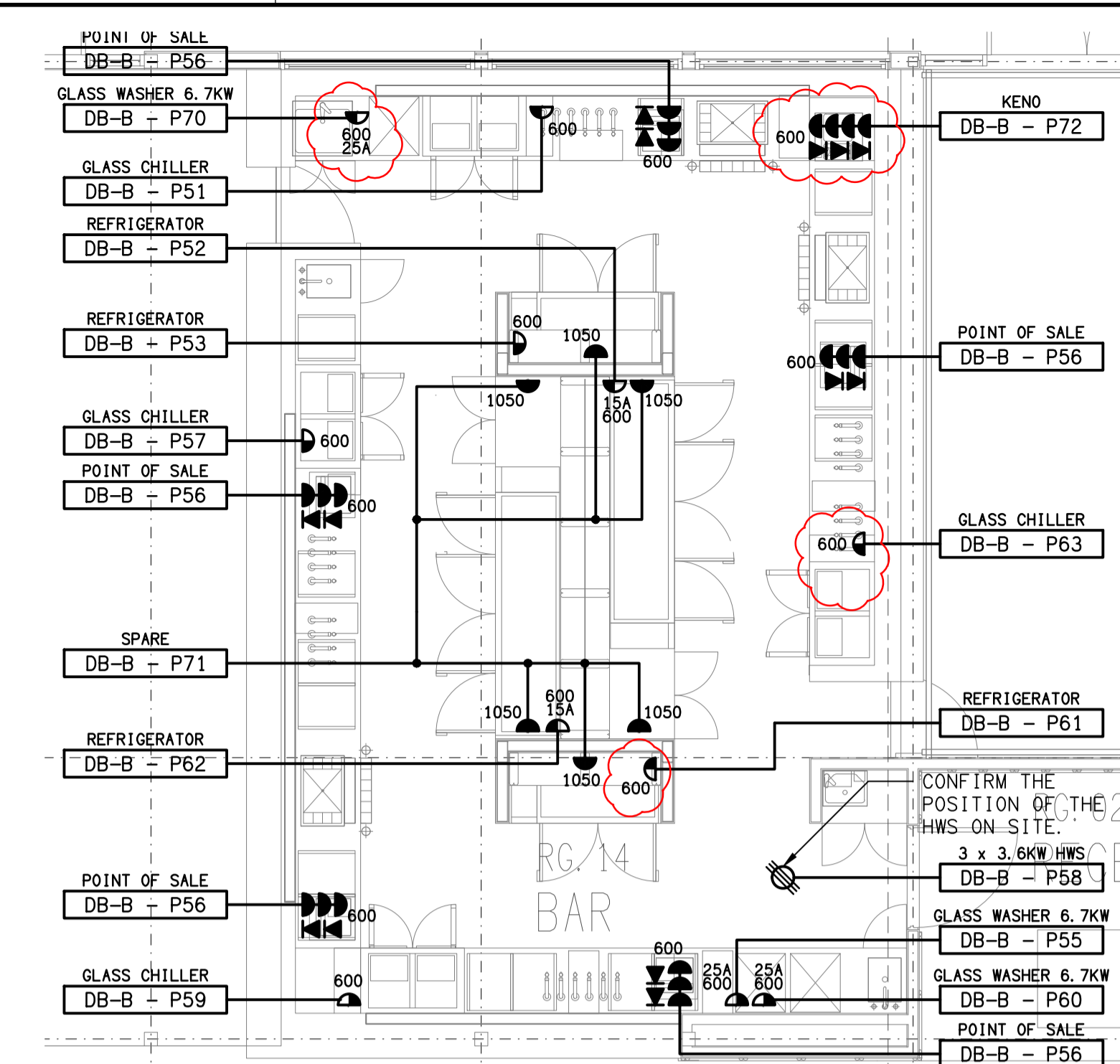
DETAIL A
ELECTRICAL EQUIPMENT ELEVATION
SCALE 1:50



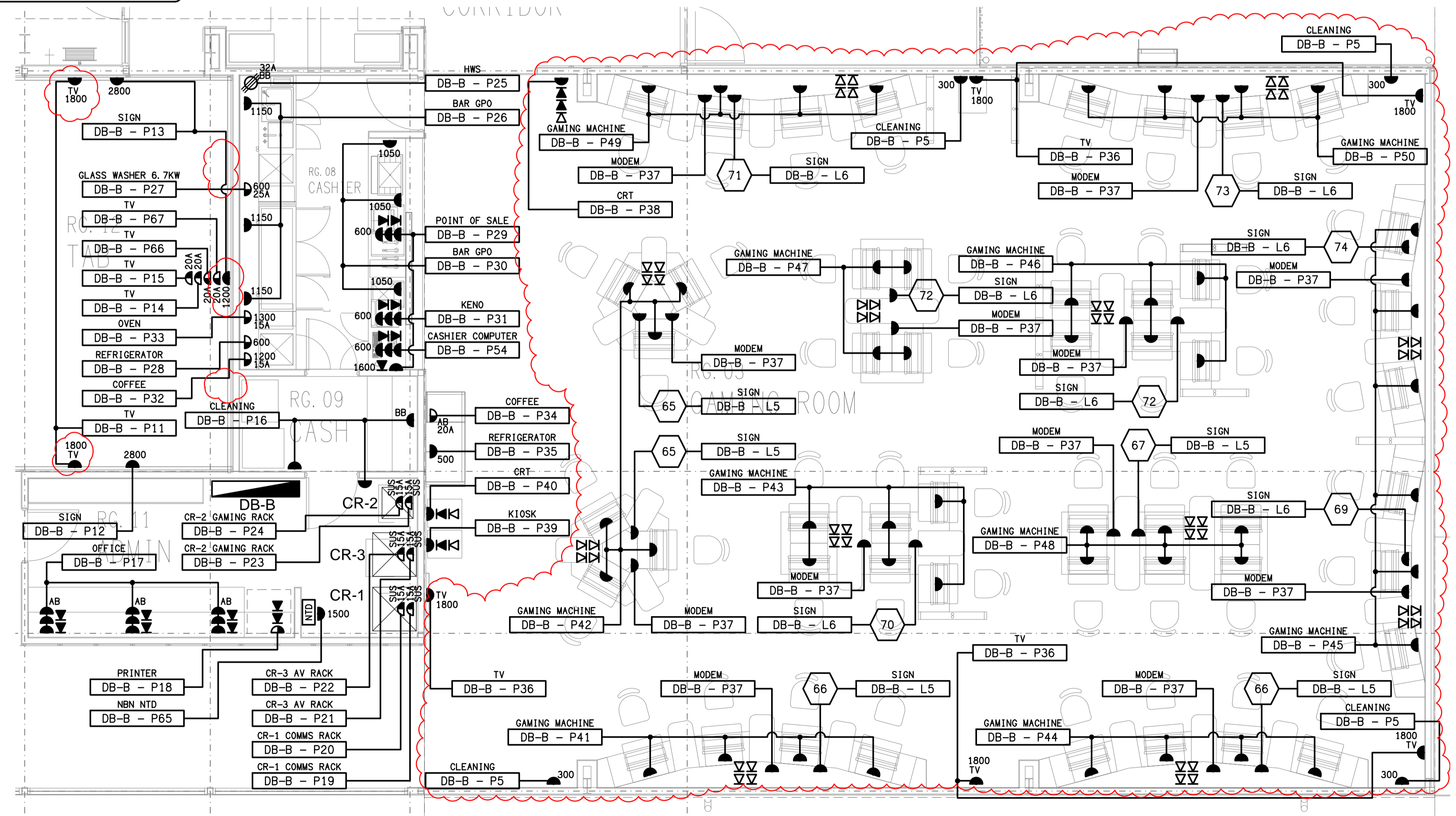


DETAIL A
KITCHEN FLOOR PLAN
SCALE 1:50

NOTE:
REFER TO DRAWING C2791a-E07.dwg FOR THE
ADDITIONAL GAMING ROOM FIBRE PLAN AND
COOLROOM & KEG ROOM ISOLATOR PANEL DETAILS.



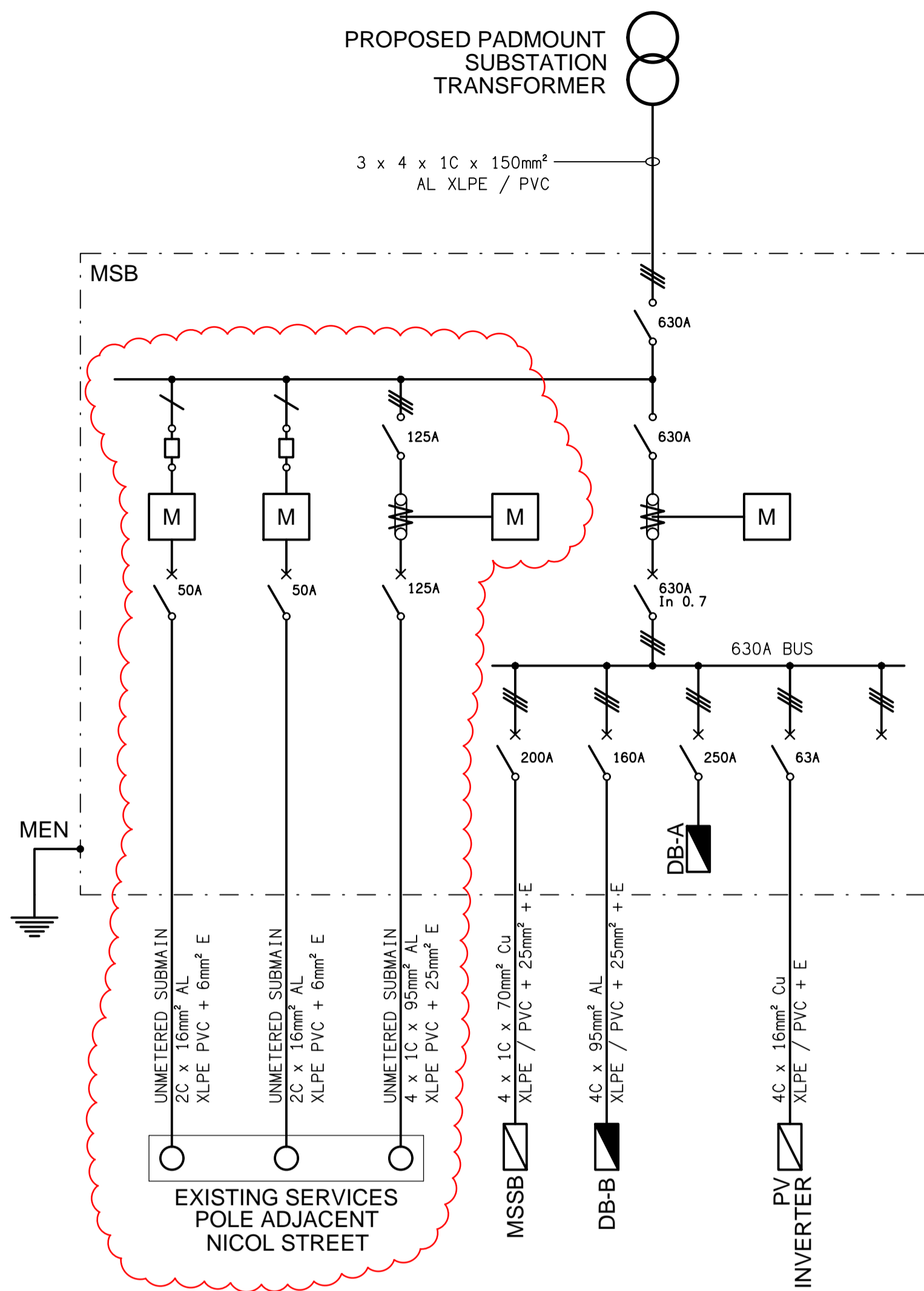
DETAIL B
PUBLIC BAR FLOOR PLAN
SCALE 1:50



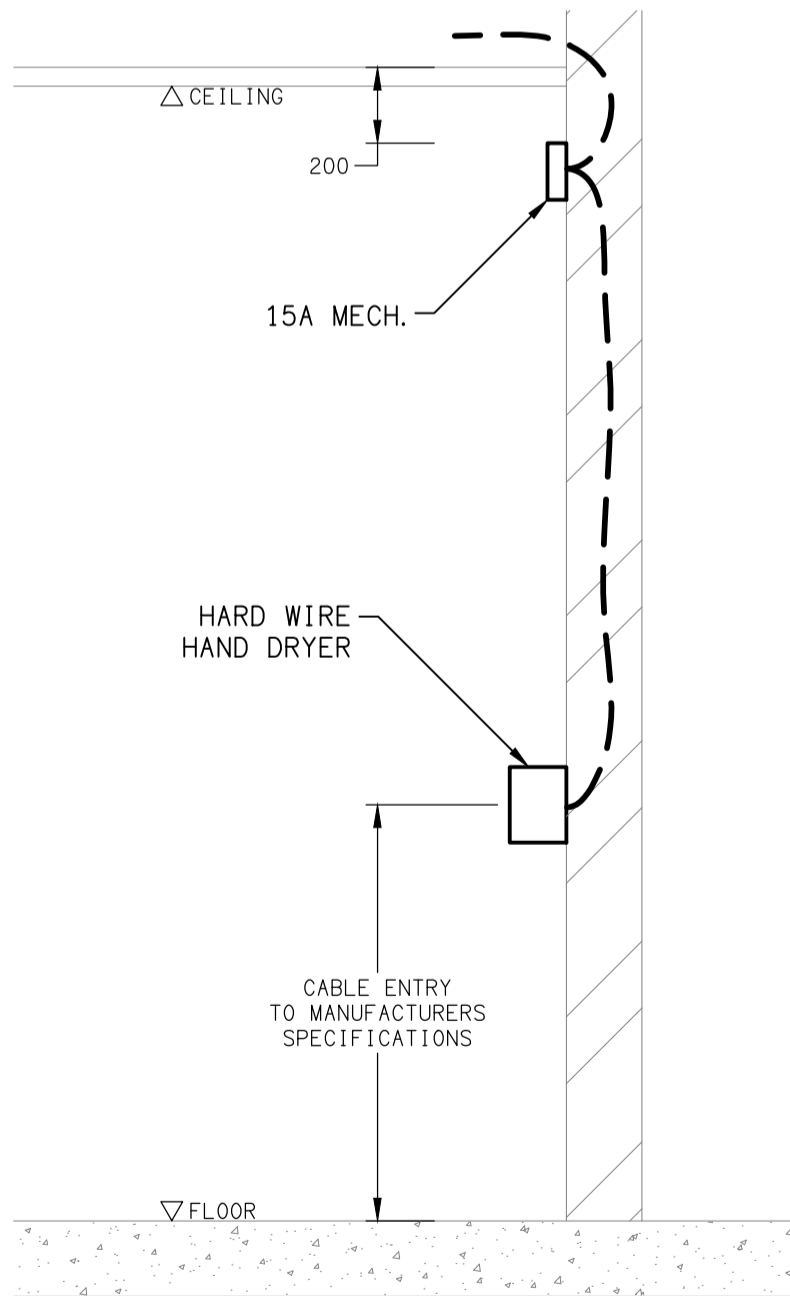
DETAIL C
GAMING ROOM FLOOR PLAN
SCALE 1:50

REFER TO DRAWING C2791a-E08.dwg
FOR THE SECURITY CAMERA PLAN

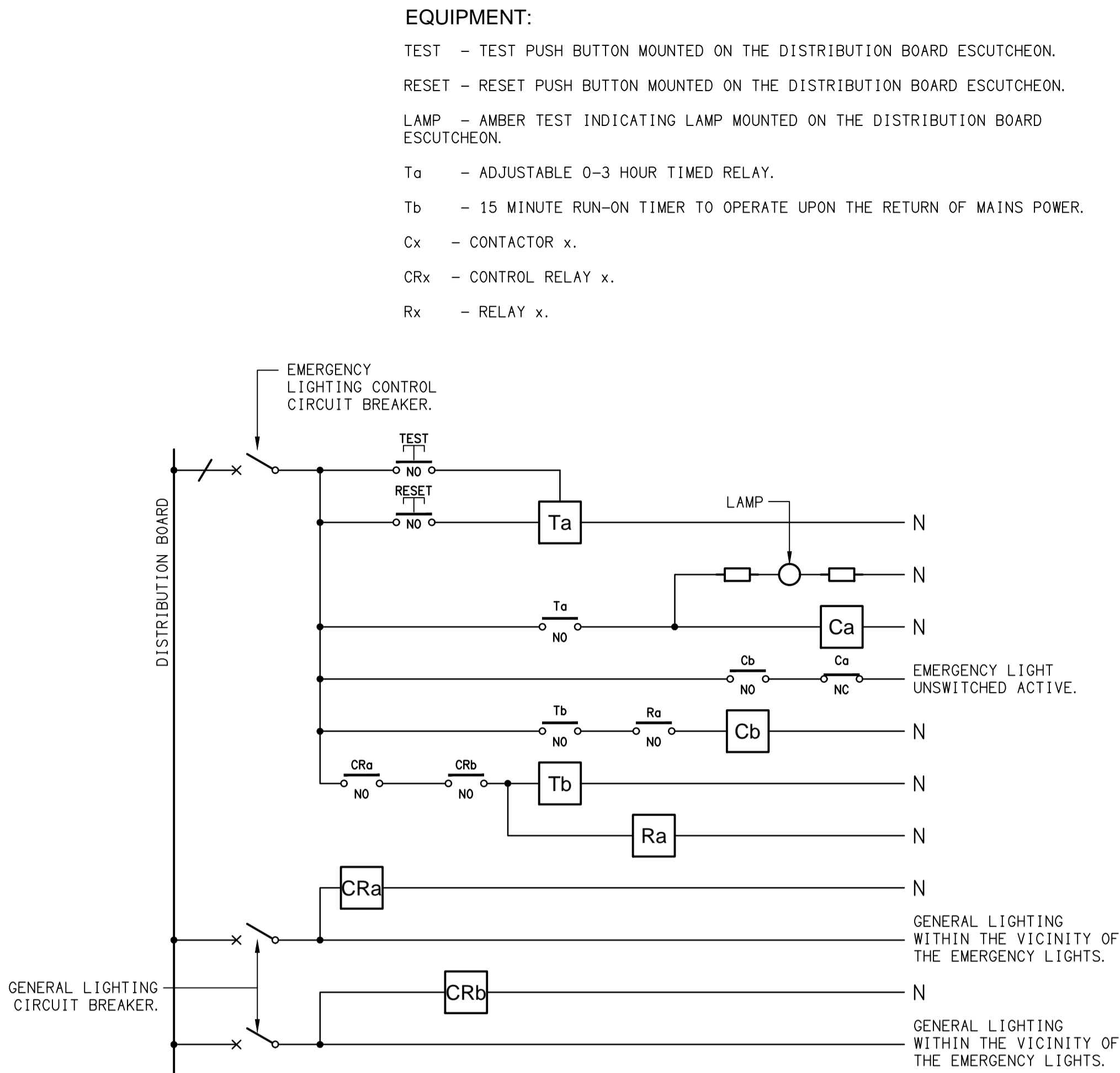




SCHEMATIC
POWER CONFIGURATION
NOT TO SCALE



DETAIL
HAND DRYER CONNECTION
NOT TO SCALE

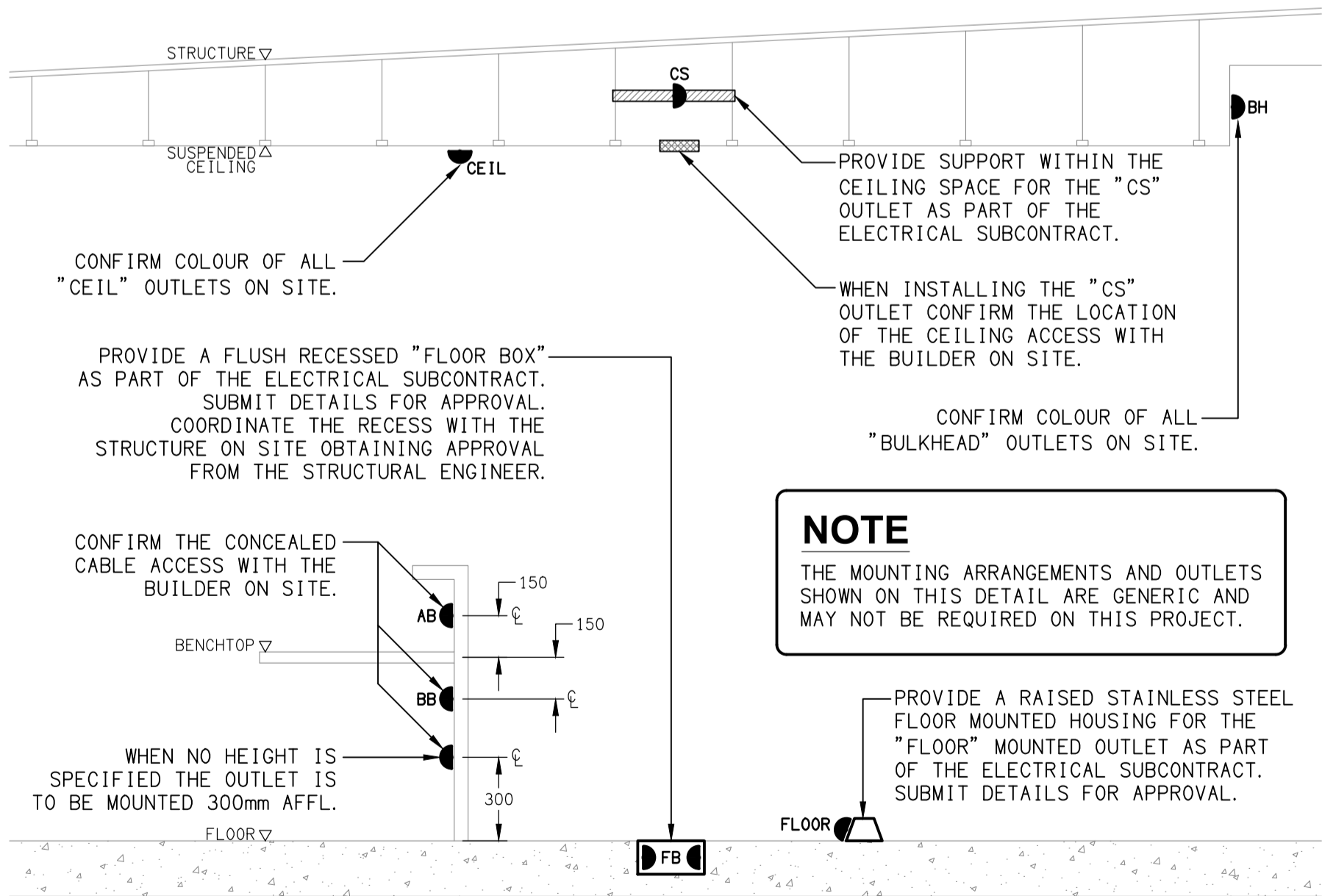


SCHEMATIC
EMERGENCY LIGHTING
NOT TO SCALE

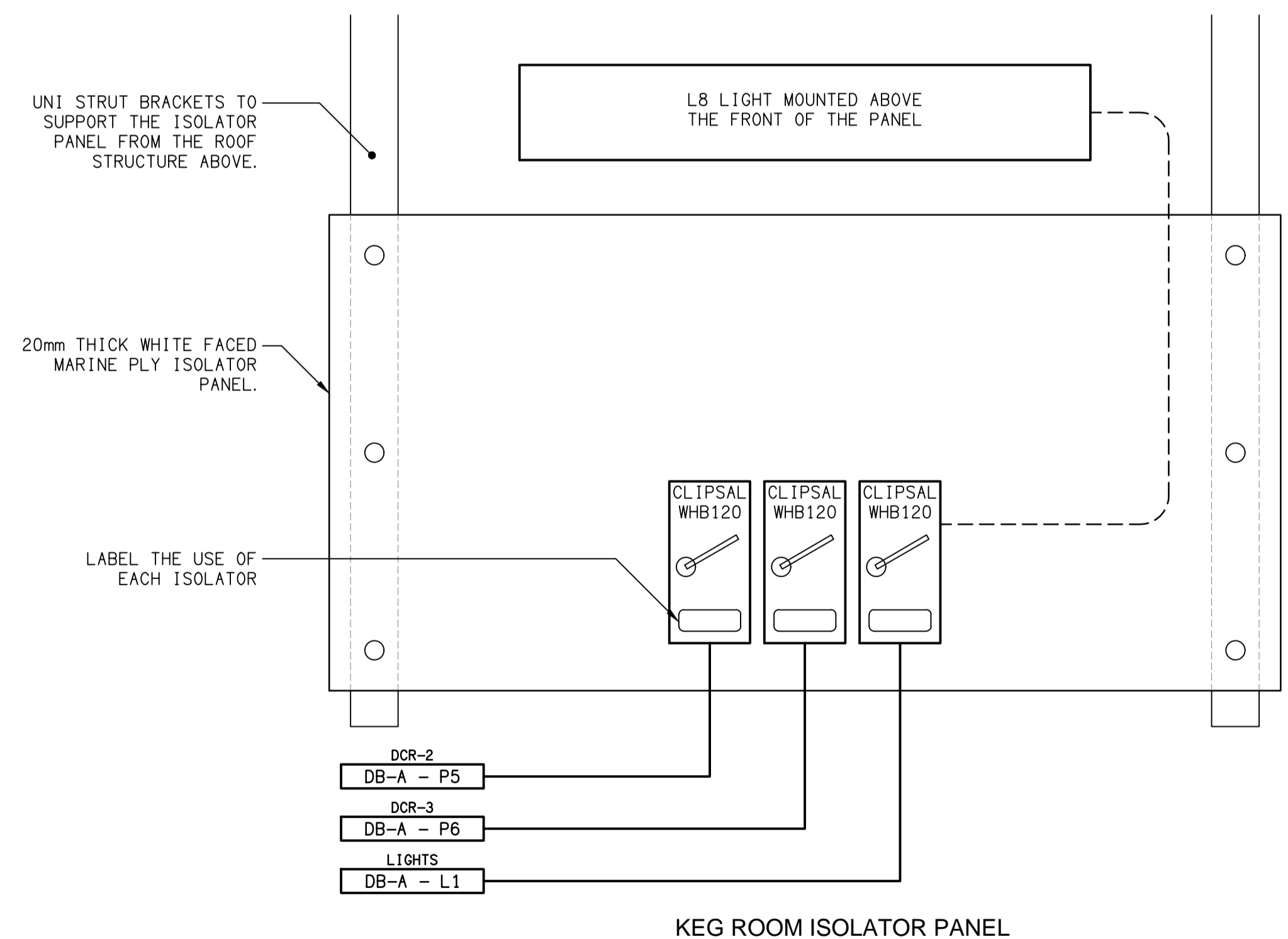
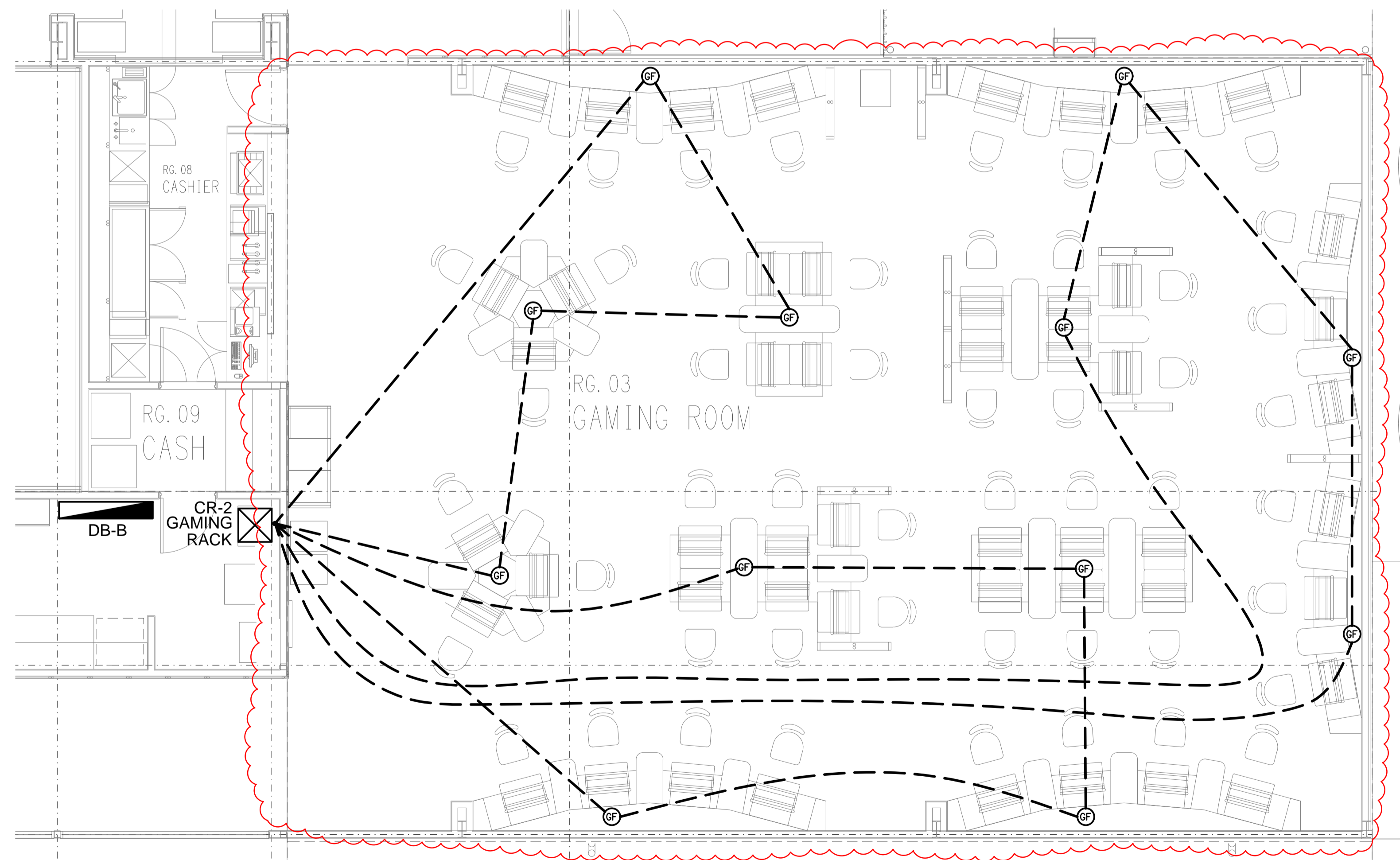
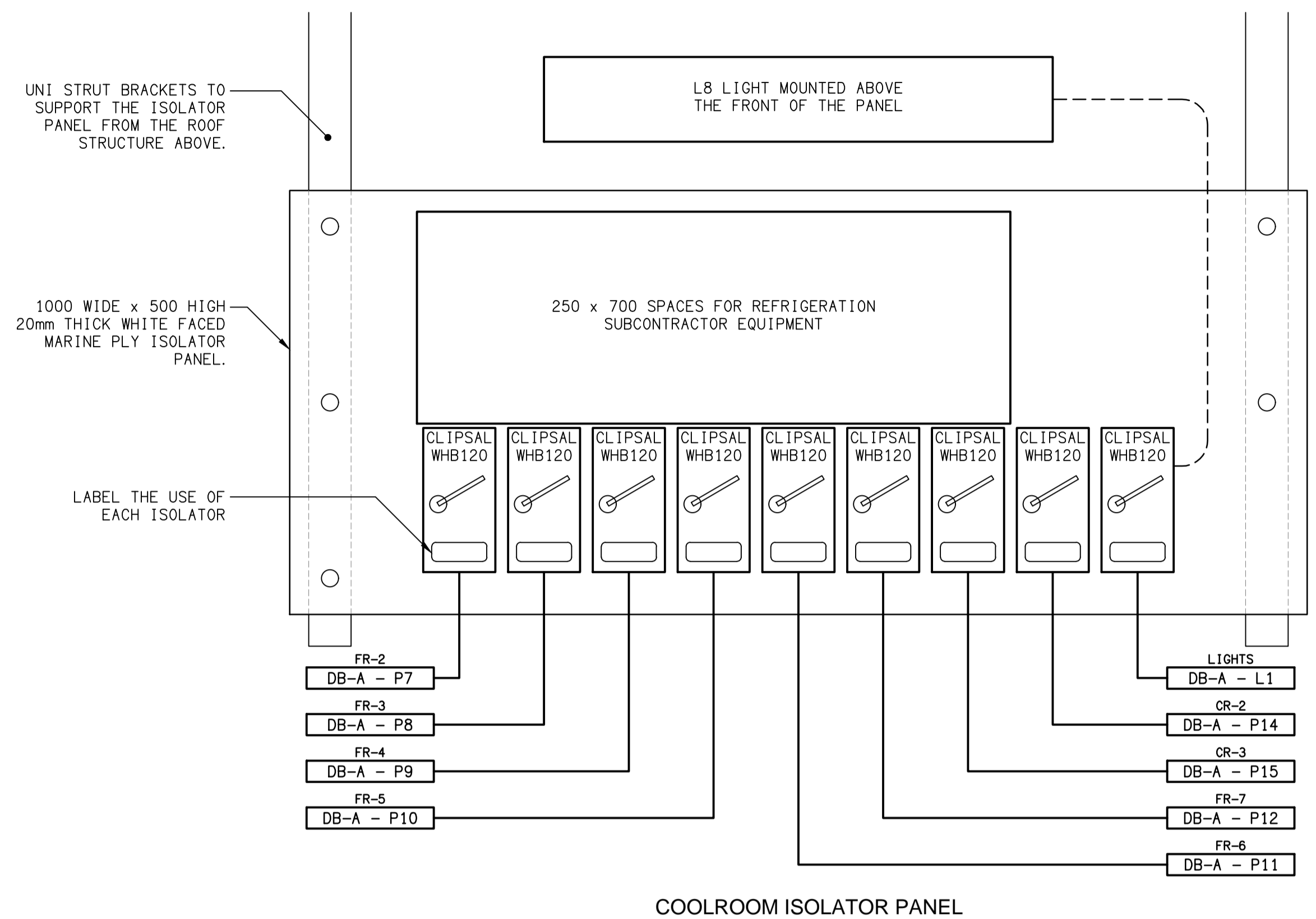
NOTES

1. THE EMERGENCY LIGHT UNSWITCHED ACTIVE / GENERAL LIGHTING SWITCHED ACTIVE CIRCUIT ARRANGEMENT AND CONTROL IS TYPICAL FOR ALL CIRCUITS SUPPLYING EMERGENCY LIGHTS.

2. PROVIDE ADDITIONAL CONTROL RELAYS (CRx) CONFIGURED AS PER CRa AND CRb FOR ALL ADDITIONAL LIGHTING CIRCUITS THAT SUPPLY LIGHTS IN THE VICINITY OF THE EMERGENCY LIGHTS.



DETAIL
TYPICAL OUTLET MOUNTINGS
NOT TO SCALE



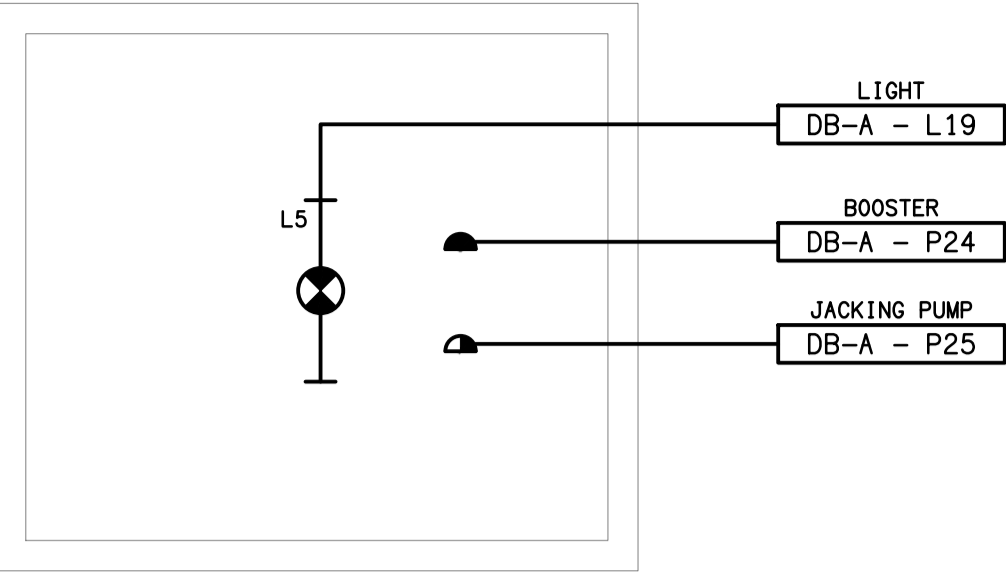
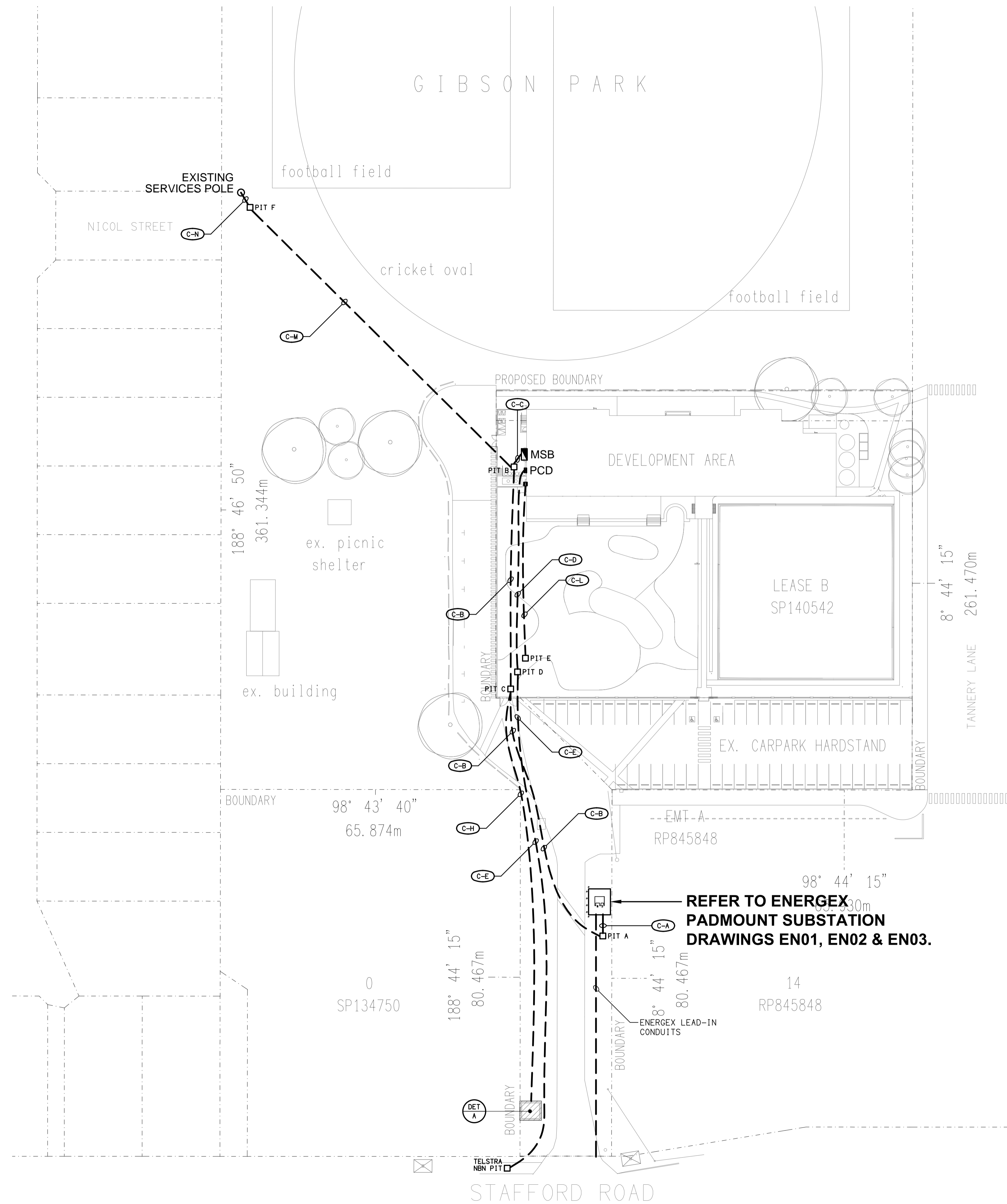
DETAILS

ISOLATOR PANEL ELEVATIONS

NOT TO SCALE

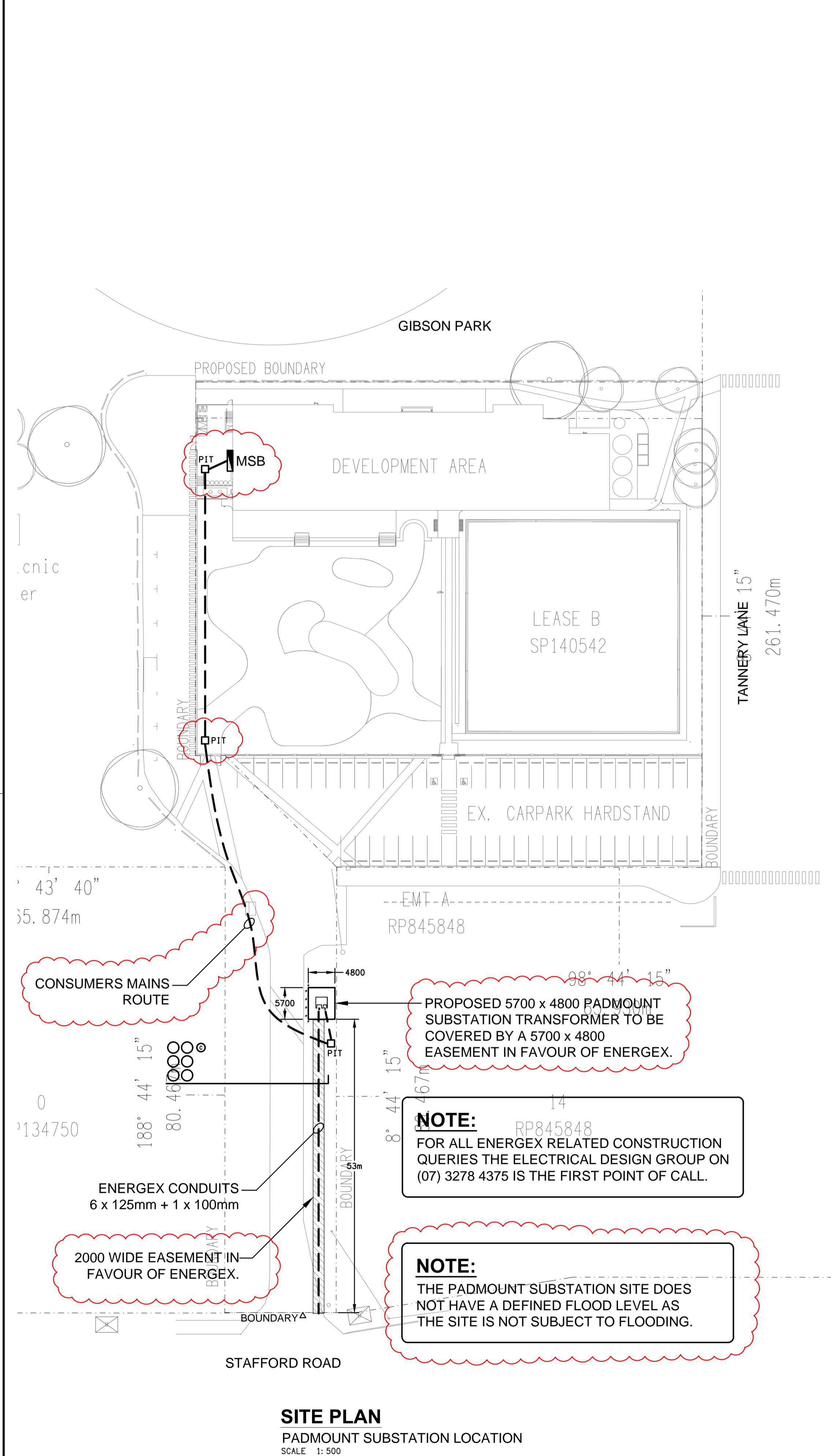
<p>ELECTRICAL DESIGN GROUP BRISBANE PTY LTD ACN 092 710 793</p> <hr/> <p>TRADING AS: ELECTRICAL DESIGN GROUP</p> <hr/>	<p>THE COPYRIGHT OF THIS DRAWING REMAINS THE PROPERTY OF THE ELECTRICAL DESIGN GROUP.</p> <hr/> <p>USE FIGURED DIMENSIONS IN PREFERENCE TO SCALE.</p> <hr/> <p>ALL DIMENSIONS TO BE VERIFIED ONSITE.</p> <hr/>	<div>  <div> ELECTRICAL DESIGN GROUP ELECTRICAL BUILDING SERVICES CONSULTANTS BRISBANE GOLD COAST </div> </div> <p> P.O.Box 15, Sherwood Q.4075 Phone: (07) 3278 4375 Email: brisbane@edg.net.au Web: www.edg.net.au </p>	<p>PROJECT: STAFFORD COMMUNITY CLUB</p>			<p>DRAWING: ELECTRICAL SERVICES GAMING ROOM FIBRE PLAN & ISOLATOR PANEL DETAILS</p>		
			<p>352 STAFFORD ROAD, STAFFORD</p>			<p>PROJECT NO: 1:50 UNO</p>	<p>DRAWING NO: E07</p>	<p>REVISION: D</p>

THEODORE STREET

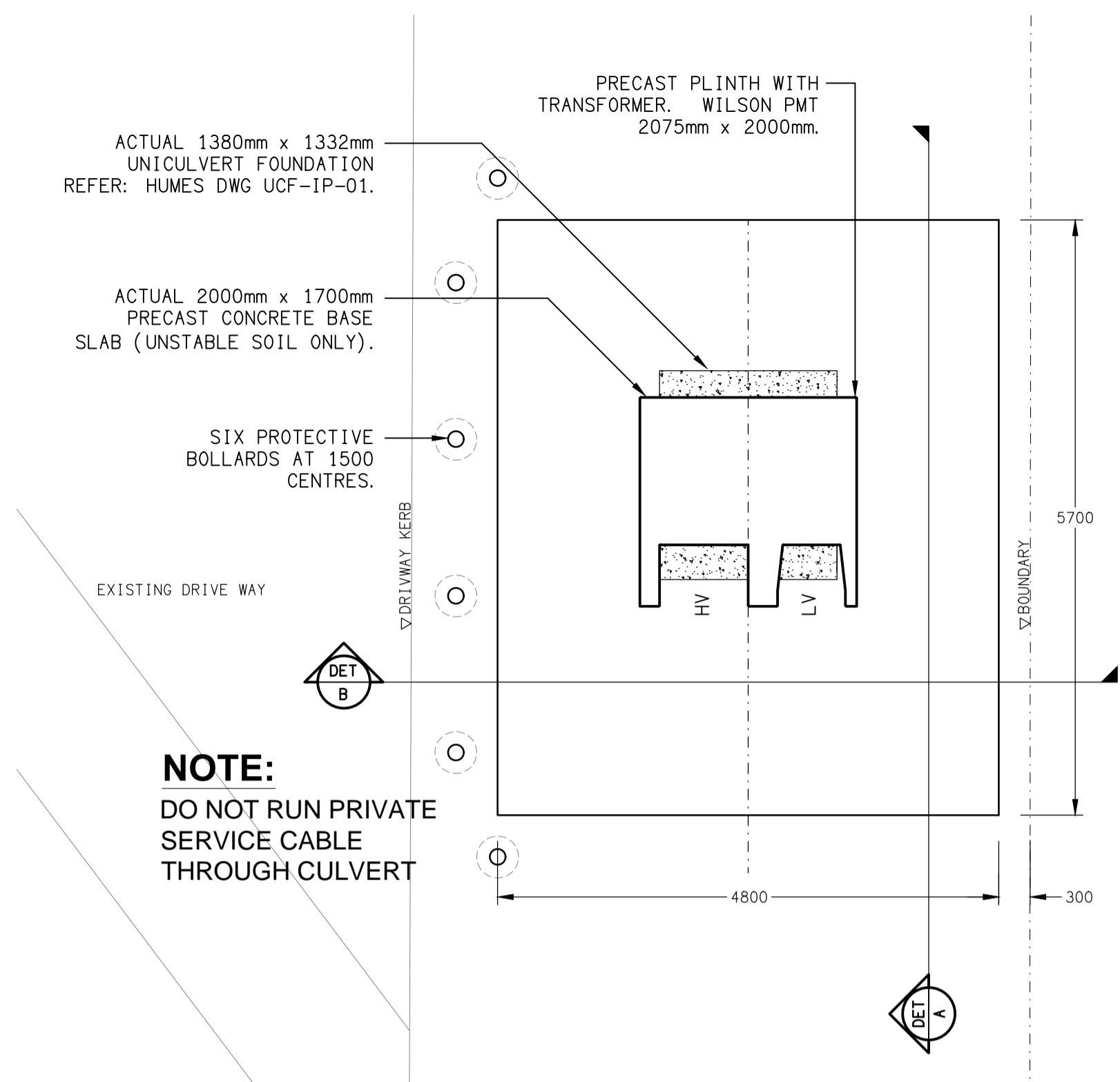


DETAIL A
BOOSTER CABINET PLAN
SCALE 1:50

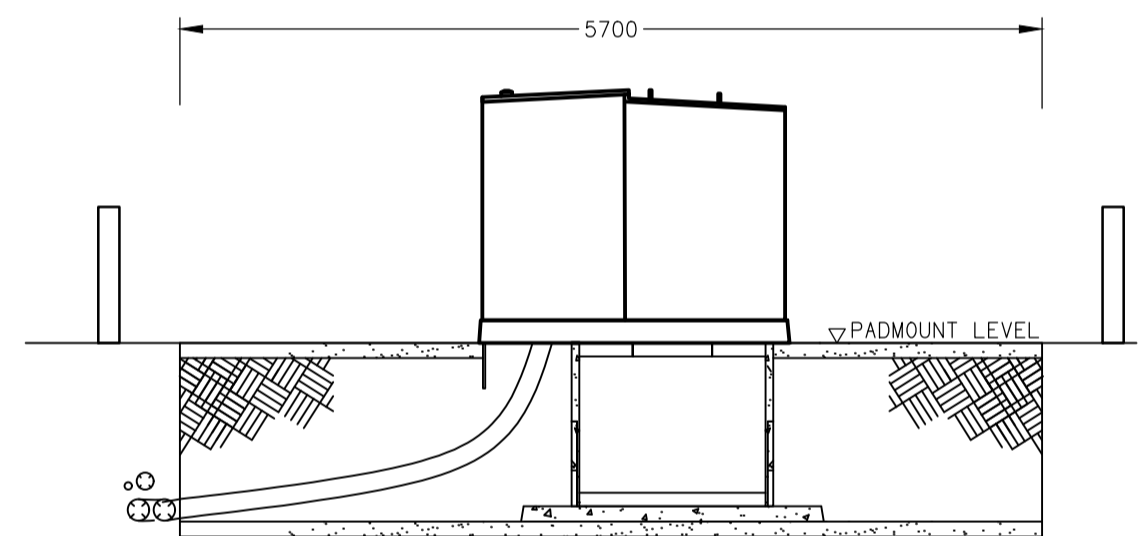
REFER TO ENERGEX
PADMOUNT SUBSTATION
DRAWINGS EN01, EN02 & EN03.



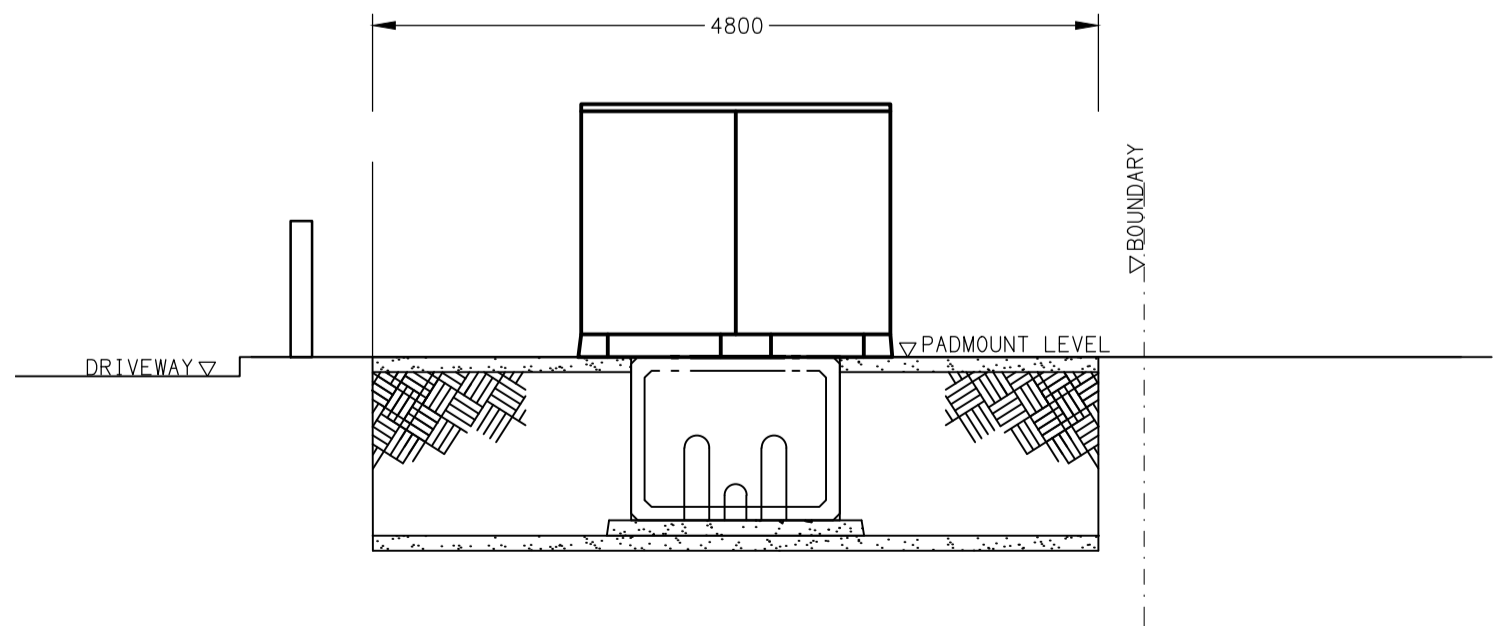
SITE PLAN
PADMOUNT SUBSTATION LOCATION
SCALE 1: 500



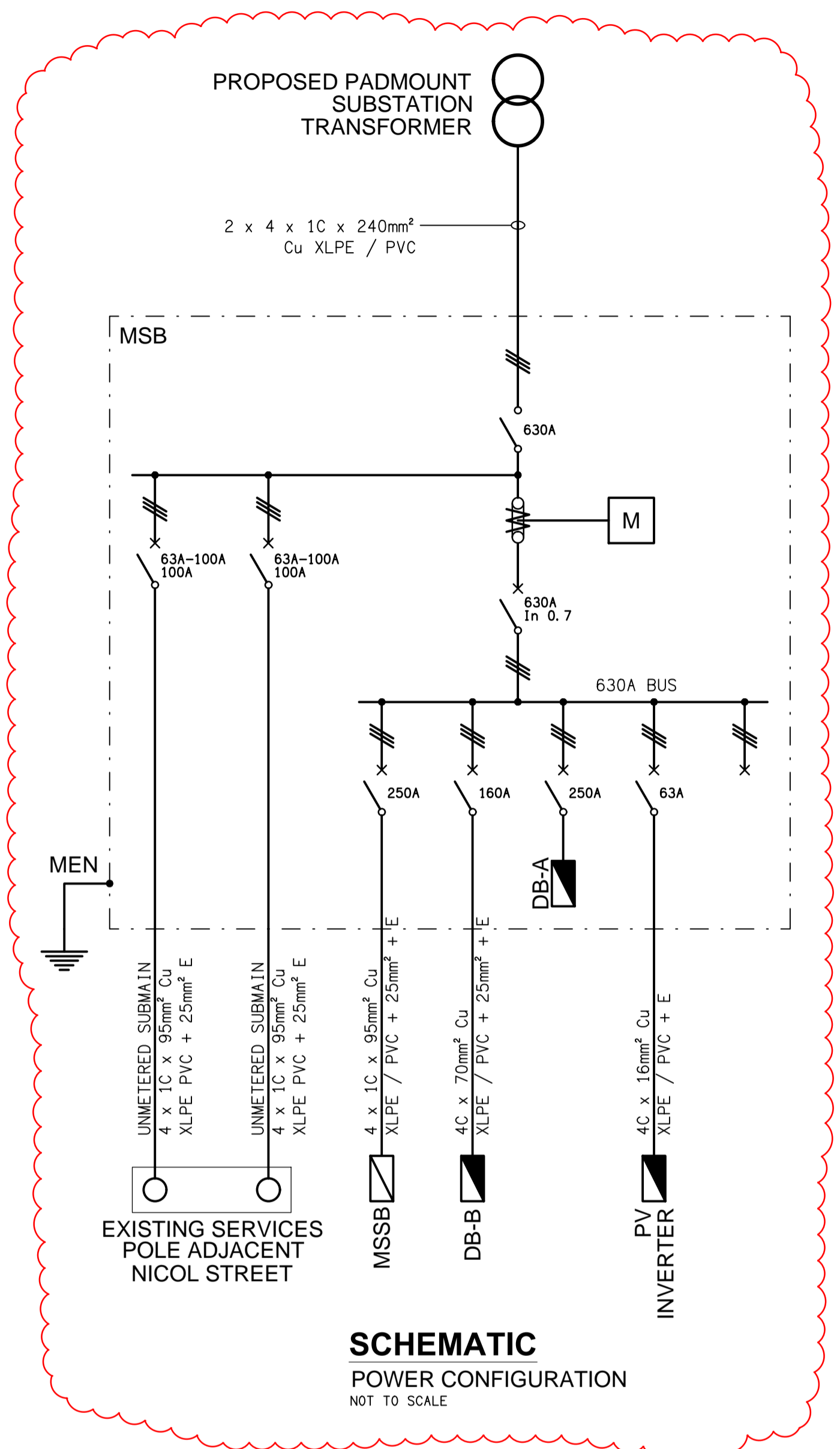
DETAIL PLAN
PADMOUNT SUBSTATION
SCALE 1: 50



DETAIL A
PADMOUNT SECTION VIEW
SCALE 1: 50



DETAIL B
PADMOUNT SECTION VIEW
SCALE 1: 50



SCHEMATIC
POWER CONFIGURATION
NOT TO SCALE

ENERGEX ACCEPTANCE

NAME

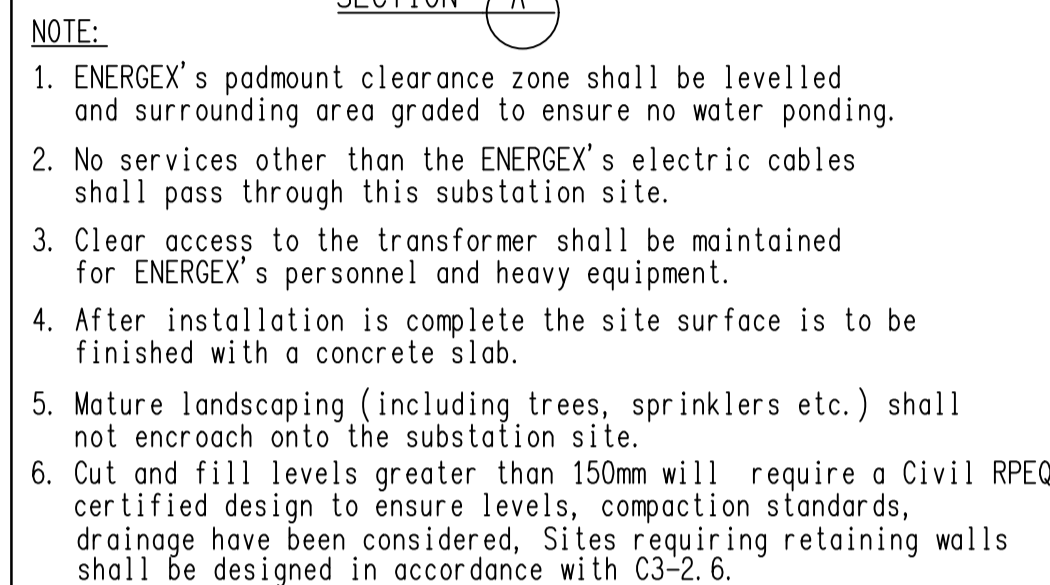
OFFICE

SIGNED

DATE / /

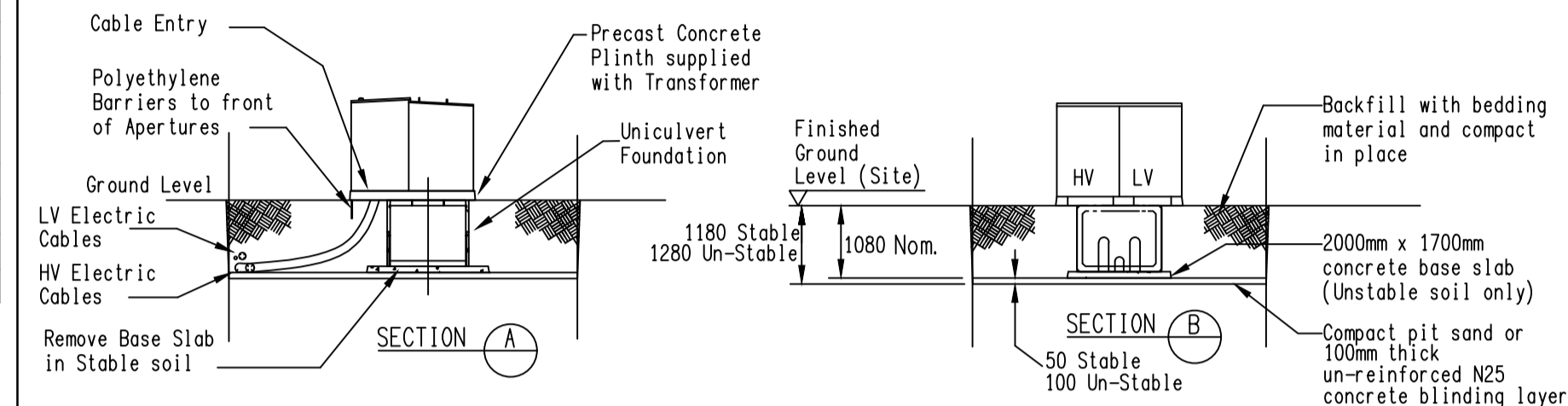
ENERGEX takes no responsibility for the accuracy of the information provided on this drawing





REQUIRED TASKS		DATE COMPLETED	CHECKED BY
CUSTOMER RESPONSIBILITIES		YES	NO
24 HOUR ACCESS PROVIDED.			
PADMOUNTED SUBSTATION SITE IS LEVEL.			
PADMOUNTED SUBSTATION SITE SIZE - 5.7M x 4.8M			
RETAINING WALLS (INCL. RPEQ APPROVAL IF REQUIRED).			
PADMOUNTED SUBSTATION SITE IS CLEAR OF ALL SERVICES.			
CORRECT FOUNDATION INSTALLED.			
CONDUITS ARE INSTALLED (INCLUDING BUNGS & DRAW WIRES)			
CONDUITS TRENCHES BACKFILLED & COMPACTED.			
FENCES INSTALLED.			
HAVE 2000mm DEDICATED CLEAR ZONE IN FRONT OF PLINTH.			
CUSTOMER RESPONSIBILITIES PRIOR TO COMMISSIONING			
SITE BACKFILLED & COMPACTED (INCLUDING UNDER PLINTH)			
BOUNDARY SURROUND & SITE SURFACE CONCRETED.			
AREA SUITABLY DRAINED (NO PONDING)			
SITE CLEANED-UP NEATLY.			

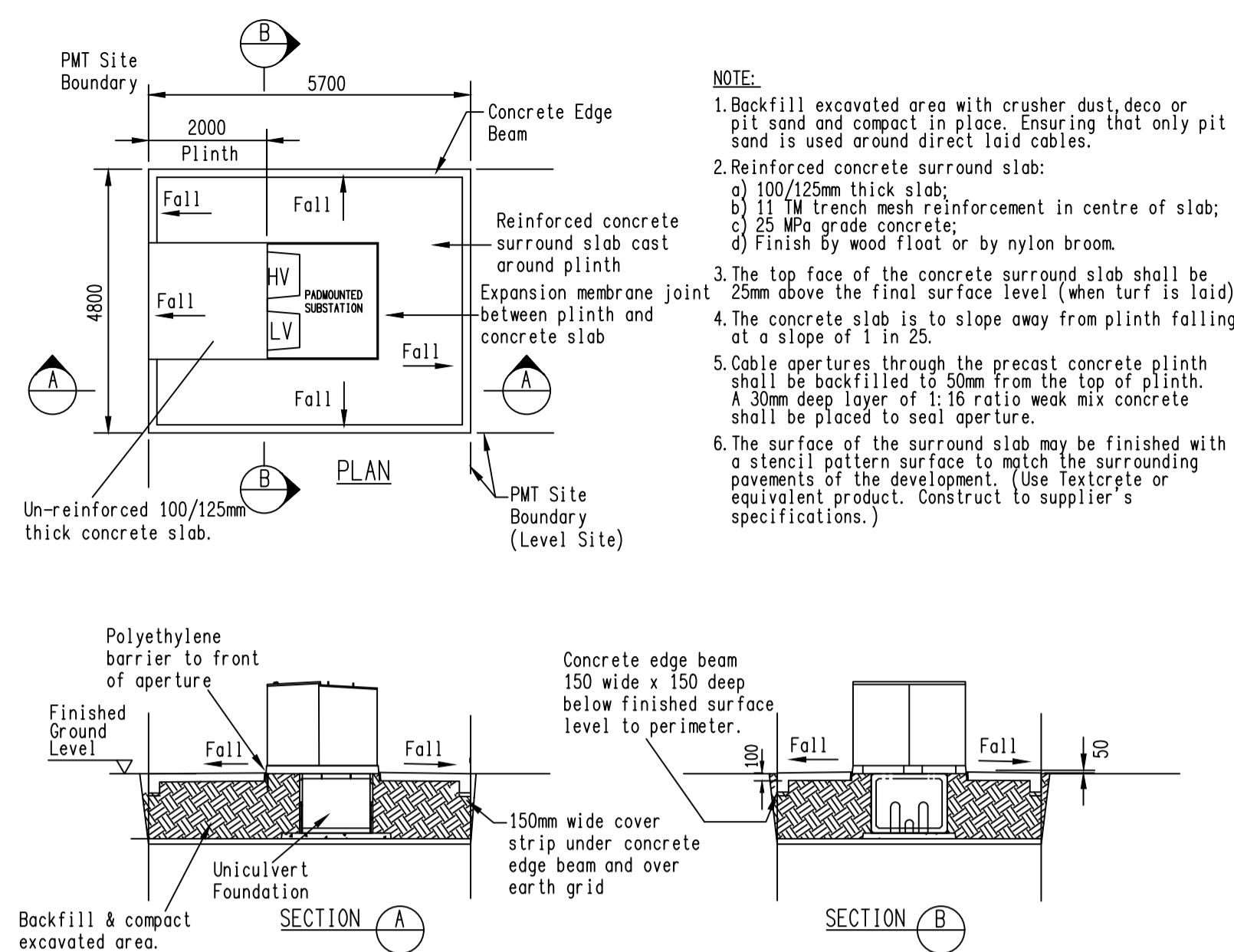
NOTE. x if applicable.



NOTES:

1. Foundation design details are as follows:
 - * Unstable soils are soft clay to sandy gravel with a soil strength of 50 - 150 kPa. These soil types REQUIRE a base slab as shown.
 - * Stable soils are very stiff clay to shale/silt/clay with soil strength of 150KPa or higher. These soil types REQUIRE a base slab as shown.
2. Lift univulcufit & base slab separately with 4 x 1.31 Red Swiftlift lifting eyes.
3. Position top face of Univulcufit at finished ground level.
(refer Civil Construction drawings)
4. Installed Univulcufit shall be level.
5. If deep excavation is required under transformer cabinet and in front of foundation, plinth front edge shall be propped while excavation remains open.
6. Foundation Components:
 - 1 x Univulcufit (Stock Code 19959)
 - 2 x End Walls (Stock Code 19959)
 - 1 x Base Slab (Stock Code 19960)
 - 1 x Univulcufit and End Wall shall be assembled with a Layer of Preformed Sealant to the perimeter of the Univulcufit End and between the Mating Surfaces.
7. Only remove minimum Knockout Area required to pass Conduits (Max. Conduit 150mm Nom. Dia.) or Cables through univulcufit wall by tapping out Concrete around the Conduits/Cables. Do not cut concrete wall at knockout interface by grouting with high strength sand and cement grout after conduit installation to prevent entry of vermin and backfill ingress to univulcufit void.
8. Successive to property boundaries to facilitate installation of earth grid.
9. Consumables (where present) shall not cross HV mains or run back under transformer.

FOUNDATION DETAIL

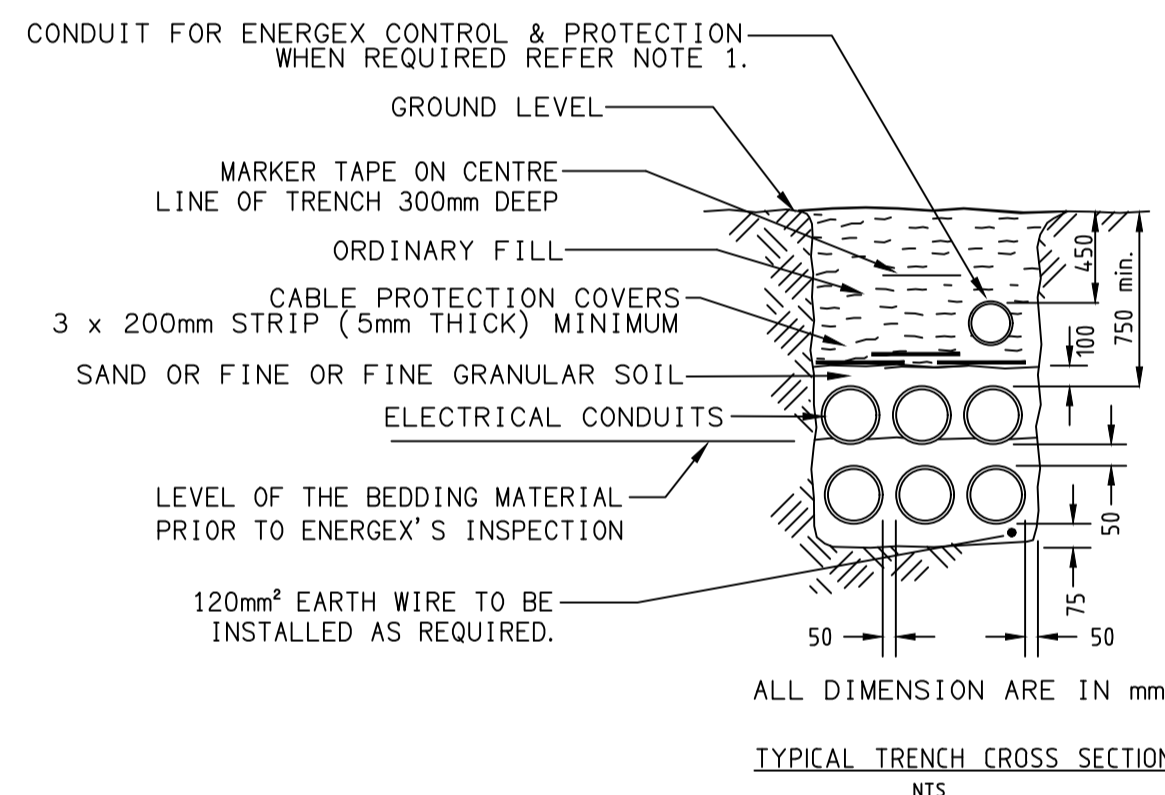


NOTE:

1. Backfill excavated area with crusher dust, deco or pit sand and compact in place. Ensuring that only pit sand is used around the cable. Lay cables.
2. Reinforced concrete surround slab:
 - a) 100/125mm thick slab;
 - b) 11 mm trench mesh reinforcement in centre of slab;
 - c) 25 MPa grade concrete;
 - d) Finish by wood float or by nylon broom.
3. The top face of the concrete surround slab shall be at 25mm above the final surface level (when turf is laid)
4. The concrete slab is to slope away from pith planting at a slope of 1 in 25.
5. Cable operation:
 - a) Through the precast concrete planting slot, cable is to be filled 50mm from the top of the planting.
 - b) A 30mm deep layer of 1:16 ratio weak mix concrete shall be placed to seal operation.
6. The concrete surround slabs may be finished with a stencil pattern surround which the surrounding pavements of the development. (Use Textcrete or equivalent product. Construct to supplier's specifications)

REINSTATEMENT DETAIL

Polymeric cable protection cover shall be a minimum of 5mm thick as described in Australian Standard: AS/NZS 4702 for Polymeric Cable Protection Covers.

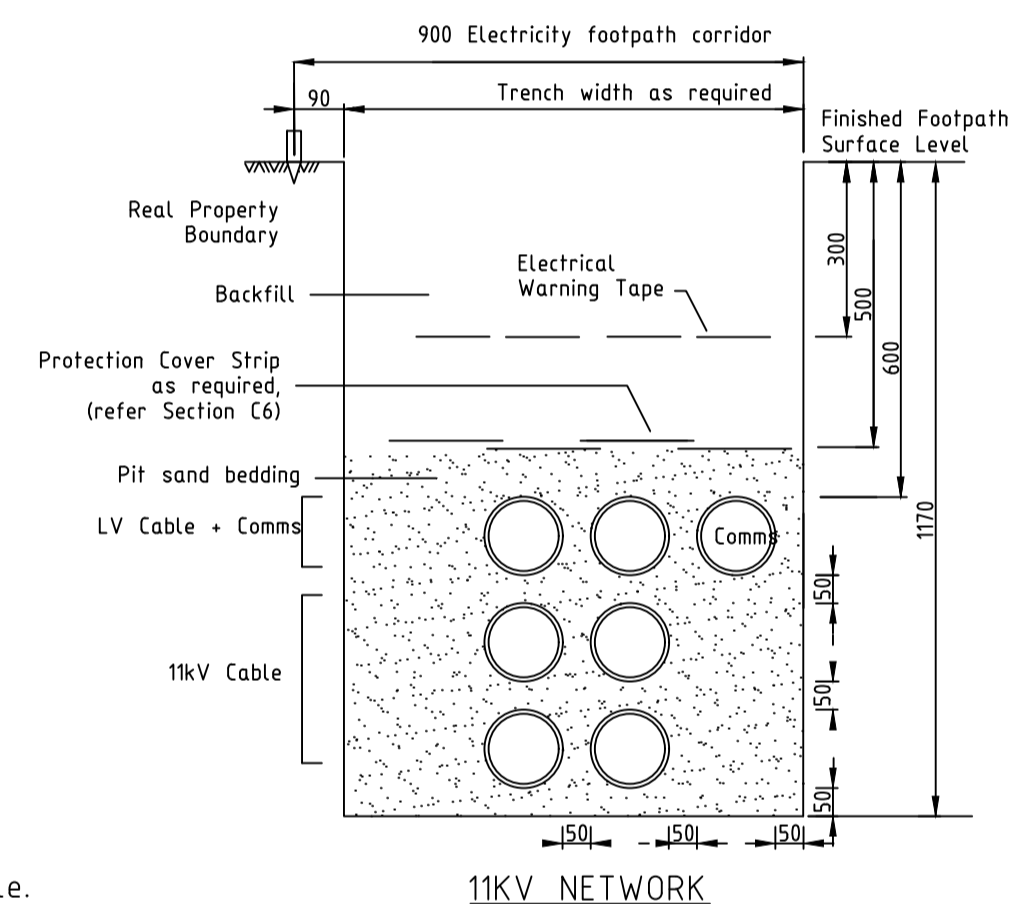


NOTE

1. INSTALL A NEW COMMUNICATIONS CONDUIT OF MINIMUM SIZE, 100mm LD PVC WHITE CONDUIT,

Notes:

- (1) Energex Communication conduit to be 100mm white located top kerbside.
- (2) Power cable conduits to be 125mm orange, light duty.
- (3) Separation for conduits - 50mm minimum, up to 160mm desirable.
- (3) Increased cover required for road crossings.
- (4) Select Backfill and Pit sand bedding complying with ENERGEX UDCM Section C2
- (5) For de-rating factors for cables in duct bank, refer to the Plant Rating Manual



NOTES

1. CABLE CONDUIT SHALL BE OF THE FOLLOWING TYPE: LIGHT DUTY ELECTRICAL CONDUIT TO AS/NZS 2053. CONDUIT BENDS SHALL HAVE A MINIMUM RADIUS OF 1830mm.
2. CONDUITS SHALL BE 125mm ORANGE FOR ELECTRICAL AND 100MM WHITE (LOCATED TOP KERBSIDE) AS SPECIFIED BY ENERGENX AND SHALL BE SUPPLIED AND INSTALLED BY THE DEVELOPER OR ENERGENX. CONDUITS SHALL BE SECURELY SEALED TO PREVENT INGRESS OF DIRT UNTIL CABLE INSTALLATION AND THEN RESEALED.
3. EACH CONDUIT TO BE FITTED WITH A 6mm BRAID POLYPROPYLENE DRAW ROPE TO PULL IN HAULAGE RIG. (MINIMUM BREAKING STRENGTH OF 10kN.)
4. ENERGENX MAY NEED TO INSTALL AN EARTH WIRE AND EARTH RODS IN CONDUIT TRENCHES FROM THE SUBSTATION SITE.
5. ELECTRICITY SUPPLY CONDUITS AND CABLES SHALL HAVE POLYMERIC CABLE PROTECTION COVER STRIPS PLACED 100mm ABOVE THE TOP CONDUIT FACE OF THE POLYMERIC CABLE PROTECTION CONDUITS AND CABLES. CABLE PROTECTION COVER STRIP SHALL BE LAPPED WHEN PLACED TOGETHER; 100mm MINIMUM ALONG THE LONGITUDINAL AXIS, 40mm MINIMUM ALONG THE TRANSVERSE AXIS. CABLE SHALL EXTEND 40mm MINIMUM PAST THE INTERNAL EDGES OF THE CONDUIT/CABLE BANK.
6. POLYMERIC CABLE PROTECTION COVER SHALL BE A MINIMUM OF 5mm THICK AS DESCRIBED IN THE AUSTRALIAN STANDARD: AS4702 FPR POLYMERIC CABLE PROTECTION COVERS.
7. REDUCED CONDUIT SEPARATION MAY BE ACCEPTED TO AVOID SPECIFIC OBSTACLES
8. MIN. DEPTHS SHOWN ARE THOSE DEPTHS REQUIRED BY CODE OF PRACTICE, WORKS (MINOR ROADS) AND DMR (ARTERIAL ROADS).

TYPICAL TRENCH CROSS SECTION FOR ENERGEX CONDUITS IN PRIVATE PROPERTY

Note

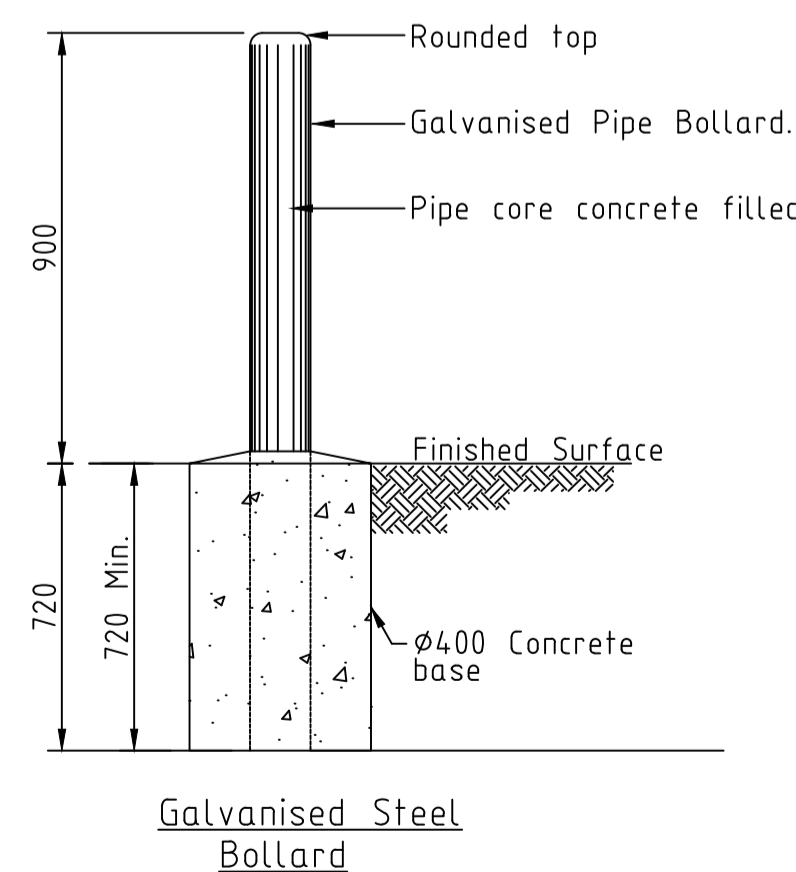
ENERGEX will not commission the transformer until the transformer site has been completed to ENERGEX specifications (including the concrete surround).

ENERGEX specifications for construction of the transformer site and installation of conduits on private property are available at the following web address:
https://swp.energen.com.au/service_providers/technical_docs/asp/technical_documents.asp

Underground Distribution Construction Manual 00305 v16
 Section C1 - Conduits
 Section C2 - Excavations & Reinstatements
 Section C3 - Padmount Transformer Sites

Commercial and Industrial Substations Manual 00293 v11
Section 14 - Drawing 11040-A4-14-33 Sht 2

The site contractor is to refer all substation construction queries to their electrical consultant.



Bollards Around Padmounts

Bollards shall be installed where padmounts are installed in car parks or other areas where padmounts are likely to be impacted by vehicles. The following outlines the minimum requirement for the design / installation of bollards: -

- Shall be manufactured of 5.6mm thick gal steel (medium)
- Circular tube min 140mm OD filled with concrete and capped.
- Buried 720mm in 400 x 400 x 720(D) concrete pad
- Installed 900mm above ground at 1.5m centers.

NOTES:

1. All materials and construction shall be in accordance with Australian Standards.
2. All concrete shall be minimum grade $F'c=25\text{MPa}$.
3. Galvanised pipe bollards may be painted to match the trim of surrounding dwellings.
4. A bollard will not be required provided a barrier such as a block wall, armo barrier or other permanent structure protects the PMT from vehicle traffic and likely impacts.

TYPICAL CROSS SECTION - 11KV AND C&I (FOOTPATH ON PUBLIC FOOTPATHS)

ENERGEX ACCEPTANCE

NAME

OFFICE

SIGNED

DATE / /

ENERGEX takes no responsibility for
the accuracy of the information provided
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ENERGEX SPECIFICATION

1.0 INTRODUCTION

This specification caters for padmounted transformer stations on customers premises within property and not fronting road reserve.

Padmounted transformer foundations to be built according to site sketch and design standards contained in this document.

It is the responsibility of the customer’s consultant to ensure that the information contained herein is passed on to the relevant contractors.

2.0 NEGOTIATIONS BETWEEN ENERGEX AND CUSTOMER

1. An application is made to ENERGEX giving information with regards to the size and type of load, site plans and drawings, and the location of the required supply.
2. If a substation is required, the substation site is agreed upon by ENERGEX and the customer.
3. ENERGEX accepts a site sketch detailing the substation construction details, specification, standard drawings (An RPEQ approved drawing may be required for structural plans).
4. ENERGEX prepares a Network Connection Contract with a request for payment (if required). Customer to accept Network Connection Contract and returns with any payment required.
5. Customer excavates PMT site, installs foundation and conduit trenches.
6. Customer leaves PMT site and conduit trench open for ENERGEX inspection as required..
7. ENERGEX inspects PMT site and conduit installation.
8. ENERGEX installs earthing and PMT cubicle
9. Customer installs their LV consumers mains
10. Customer reinstates PMT surface with concrete apron surround
11. ENERGEX energizes substation providing that:
 - a. Customer responsibilities are fulfilled.
 - b. All payments have been received (including storage fee if applicable).
 - c. ENERGEX has a signed Network Connection Contract.
 - d. ENERGEX easements secured (if required).

3.0 BUILDING GENERAL

3.1 Building Services:-

No services other than ENERGEX’s electric lines and approved parts of the customer’s electrical mains shall pass through or under the substation area.

3.2 Workmanship:-

Building work shall be completed in a neat tradesman like manner and shall be as detailed on the drawings.

3.3 Construction:-

All civil construction works must be undertaken in accordance with the requirements specified in ENERGEX Work Category Specification WCS61 "Underground Civil Construction".

The padmounted transformer site shall be prepared by the customer.
An access area of 4800mm x 5700mm is required for cabling, earthing, installation and safe operation of apparatus. Proposed overhangs must be approved by Energex & be greater than 5.0m above padmount site.

The transformer site shall be above the local flood level (Q100/DFL which ever is higher) with the top of the concrete plinth 25mm above the finished yard level.
Cable apertures through the precast concrete plinth shall be backfilled to 50mm from the top of plinth.

The concrete slab is to slope away from plinth falling at a slope of 1 in 25.

The transformer site shall be level ±25mm with a maximum cut and fill of ±150 mm and shall be concreted in accordance with ENERGEX Underground Distribution Construction Manual Sect C3.

Concrete filled 140mm OD 5.6mm thick galvanised steel pipes may be required outside the site for protection from vehicles in car parks, etc. Refer to ENERGEX Underground Distribution Construction Manual Section C3.

For a steep sloping site a retaining wall and guard rail will be required to be constructed by the customer. Refer to ENERGEX Underground Distribution Construction Manual.

4.00 ACCESS

4.1 Personnel:-

ENERGEX’s staff shall have access to the substation at all times without having to enter security areas. The onus will be on the customer to maintain said access 24 hours a day, 7 days a week.

A minimum of 2.0 metres of clear access shall be provided in front of the substation cabinet. This will provide a safe working platform and access around the lockable doors when opened for emergency operations.

4.2 Heavy Equipment – Stable Ground Sites:-

Padmounted transformers are hauled by flat bed trucks and "Franna" style mobile cranes.

Any access or manoeuvring area which will be used for the purpose of off loading or loading transformers should be constructed to take a minimum loading of 31 tonnes in all weather conditions.

The headroom along the access route is required to be 5.0m with no obstructions over the crane manoeuvring area. The width of access required for reasonably straight routes should be increased on bends and in the manoeuvring area near the substation equipment access door required for the off loading of the transformer from the truck by the mobile

Any reinstatement which may be necessary in the event of damage to concrete slab, paving tiles or road surfaces etc. is the responsibility of the owner of the property.

5.00 CABLE CONDUITS

All conduits, associated fittings and bends shall comply with the requirements of AS/NZS 2053 as specified by ENERGEX and shall be supplied and installed by the developer.
Conduits shall be securely sealed by builder to prevent ingress of dirt until cable installation by ENERGEX and then resealed by ENERGEX. All above ground conduits shall be U.V. stabilised.

Refer to ENERGEX Underground Distribution Construction Manual for details of conduit installation within the padmount transformer site.

Each conduit to be fitted with a 6mm braided polypropylene draw rope.

ENERGEX may need to install an earth wire and earth rods in conduit trenches from the substation site.

Polymeric cable protection cover shall be placed over all conduits and cables outside the electricity footpath alignment. To provide protection, electricity supply conduits and cables shall have polymetric cable protection covers placed 100mm above the top conduit face of the electricity supply conduits and cables. Cable protection covers shall be lapped when placed together; 100mm minimum along the logitudinal axis, 40mm minimum along the transverse axis and shall extend 40mm minimum past the external edges of the conduit/cable bank.

Polymeric cable protection cover shall be a minimum of 5mm thick as described in Australian Standard; AS/NZS 4702 for Polymeric Cable Protection Covers.
The supply of polymeric cable protection covers and marked plastic warning tape shall be the responsibility of the developer and they shall be manufactured and supplied in accordance with the ENERGEX Underground Distribution Construction Manual Section C6.

6.00 EARTHING

An earthing system consisting of driven earth rods, a continuous earth ring around the substation connecting the rods and earthing tails connected to ENERGEX equipment and gates will be installed by ENERGEX. The earthing system may be required to be extended into cable trenches adjoining the transformer site.

The builder shall notify ENERGEX’s works co-ordinator one week prior to trench and site foundation excavation to allow the installation of the earthing system and location of the earthing tails for equipment earthing.

7.00 CUSTOMER’S CABLES

Where supply is made available from the LV busbars of the transformer, the customer shall supply all connectors, stainless steel bolts, nuts, washers, cable cleats and supports and connect to the terminals as directed by ENERGEX.

Where supply is made available from a circuit of a low voltage distribution board, the customer shall supply all connectors, stainless steel bolts, nuts, washers and connect to the terminals as directed by ENERGEX.

Under no circumstances shall the customer cabling pass though or under the padmounted transformer culvert, nor the culvert end wall "knock-out" sections be removed.

8.00 UNDERGROUND CABLE PITS

Refer to ENERGEX Underground Distribution Construction Manual Section C5 for concrete pits.

9.0 EASEMENTS

The builder/developer is to provide Energex initially with a written undertaking that the easements will granted so that the project may proceed during the design process. Easement shall cover the HV cable route, substation site and remote earth grid area (if applicable). The ENERGEX network will not be commissioned until all the required easements have been registered.

The developer/builder is required to grant the easements as noted on the Easement/Site Plans referred to by Energex in the Network Connection Contract prior to the supply being made available.

All costs associated with the registering, surveying, document perpetration etc shall be bourne by the builder/ developer.

The builder/developer shall Liaise with Energex’s property department in relation to ensuring that all necessary documentation is completed. Contact Energex Property on propertyenquiries@energex.com.au including your project reference number.

The following general details will apply:
- all documents shall be acceptable to the Department of Natural Resources
- The grantee should be shown as "Energex Limited (ACN 078 849 055)"
- refer to Memorandum No 708346714 for underground electricity (memorandum is registered with Natural Resources)

The builder/developer will forward the document to Energex for review and execution. Energex will then return the documents to the builder/developer for registration with The department of Natural Resources.

The builder/developer is to return a copy of the Registration Confirmation Statement to Energex.

All private services easements must be registered prior to supply being made available to the future development sites.

10.0 RETAINING WALLS / FENCES

Retaining walls shall be installed where a change in ground level of 300mm or more occurs within 2000mm of the substation clearance zone. Fences shall be installed for:

- Residential areas (Typically 1200mm high)
- Sloping sites (either front to back or left-right).

Fences and Retaining walls shall be constructed to ENERGEX standards to satisfy minimum clearance zones of common earth configurations. Refer to section C3-1 for retaining wall construction notes. Alternative designs to those provided in this manual will require a Civil Engineer’s Certification.

Safety fences shall comply with the requirements of the Workplace Health and Safety Act, AS1657 and AS1926 and all amendments.
Metal retaining wall fences shall be used in CMEN areas. (Refer UDCM C3.1 Sheet 6)

All retaining walls and safety fencing on private property shall be maintained by the owner at no cost to Energex.

All fencing materials shall be galvanised or finished in an equally durable manner. All chainwire and support wires shall be PVC coated and coloured black or green.

All elevated areas shall be provided with toe boards and infill type fencing.

11.00 ENERGEX COMMUNICATION CONDUIT

Conduit
ENERGEX communication conduit shall be white, Medium Duty (MD), UPVC to AS/NZS 2053, Energex Technical Specification TS270 and AS1345. Conduit couplings shall comply with all the above requirements.

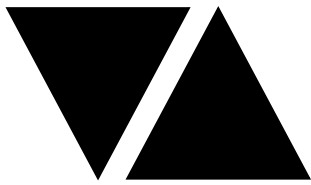
Tracer/Draw Rope

The electricity communications conduit when installed shall be fitted with a continuous metallic tracer/draw rope suitable for passing an electricity current through to accurately identify the conduit.

Installation

ENERGEX communication conduit installation:
100mm conduit shall be located adjacent to the top Low Voltage conduits on the kerb side of the trench, between the LV conduits and any Public Lighting conduit.

<div>ELECTRICAL DESIGN GROUP BRISBANE PTY LTD ACN 092 710 793</div> <div>THE COPYRIGHT OF THIS DRAWING REMAINS THE PROPERTY OF THE ELECTRICAL DESIGN GROUP.</div> <div>USE FIGURED DIMENSIONS IN PREFERENCE TO SCALE.</div> <div>ALL DIMENSIONS TO BE VERIFIED ONSITE.</div>		<div>CULVERT INSPECTION REQUIRED BEFORE TRANSFORMER IS DELIVERED - 5 BUSINESS DAYS PRIOR NOTICE NEEDED. CONTACT RUSSELL COLLINS EMAIL: russellcollins@energex.com.au</div> <div>TRANSFORMER WILL NOT BE ENERGISED UNTIL ALL REQUIREMENTS ARE MET.</div>		<div><div><div></div><div>ELECTRICAL DESIGN GROUP</div><div>ELECTRICAL BUILDING SERVICES CONSULTANTS</div><div>BRISBANE GOLD COAST</div></div><div>P.O.Box 15, Sherwood Q.4075 Phone: (07) 3278 4375 Email: brisbane@edg.net.au Web: www.edg.net.au</div></div>		<div>PROJECT: STAFFORD COMMUNITY CLUB</div> <div>352 STAFFORD ROAD, STAFFORD</div>		<div>DRAWING: ELECTRICAL SERVICES ENERGEX PADMOUNT SUBSTATION STANDARD NOTES</div> <div>SCALE: NOT TO SCALE AT A1</div>			<div>PROJECT NO: C2791a</div> <div>DRAWING NO: EN03</div> <div>REVISION: D</div>	
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PROJECT

STAFFORD COMMUNITY CLUB

DOCUMENT

ELECTRICAL SERVICES SPECIFICATION

SITE ADDRESS

**252 STAFFORD ROAD
STAFFORD
QUEENSLAND 4053**

ARCHITECT

**KP ARCHITECTS
43 DOGGETT ST, NEWSTEAD QLD 4006**

DESCRIPTION

**REVISION: D
DATE: 17 AUGUST 2023**

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REVISION SCHEDULE	
REVISION	PARAGRAPH/S CHANGED
Rev A	Original revision
Rev B	Clauses 4.1 and 6.1 scope updated.
Rev C	Clause 6.1 updated to remove the requirement for independent testing and certification of the performance of the communications installation.
Rev D	Clauses 4.1 and 4.7 updated to remove the PV system. Clause 6.1 updated to remove the Philips Dynalite system.

Post the original revision the most recent changes are in italic and bold as per this note.

1.0 EXTENT OF WORKS

1.1 SCOPE

The electrical services sub-contract includes but is not limited to the following:

- Supply and installation of all components forming part of the electrical services.
- Attendance at a handover meeting.
- Co-ordination.
- Authorities' approvals.
- Approvals.
- Shop drawings.
- Installation drawings.
- Work-as-executed drawings.
- Inspections.
- Testing and commissioning.
- Maintenance.
- Programming.
- Manuals.
- Cabling, cable support systems and access.
- Samples.
- Spare conduits, wall boxes and draw wires for future use and use by other trades.
- Quality assurance.
- Payment of all fees applicable to works
- All penetrations and sealing of penetrations
- Provision all cutting of holes in walls and ceilings for installation of services
- Defects liability for a period of 12 months from date of practical completion
- Equipment warranty for a period of 12 months from date of practical completion
- Maintenance for a period of 12 months from date of practical completion
- Training staff in the operation of all systems
- Seismic restraints in accordance with AS1170.4.
- Power distribution.
- Lighting.
- Communication cabling
- All minor components and incidental works not specifically referred to, however necessary to complete the electrical services installation such that it is handed over complete, operational and fit for the intended use.
- Include the provisional sum of \$10,000.00 within the electrical services sub contract to account for additional works which are yet to be resolved.

With the tender response, provide a copy of the Electrical Sub Contractors licence. Include a copy of all of the above licence in the maintenance manual.

Should the Electrical Sub Contractor not provide the information required to be submitted by this specification within two weeks of being requested to do so or as agreed to in writing, the Electrical Sub Contractor is to agree to a variation credit of \$2,000.00 to the contract in lieu of the provision of such information.

Should the Electrical Sub Contractor not provide the Work-As-Executed drawings within two weeks of practical completion or as agreed to in writing, the Electrical Sub Contractor is to agree to a variation credit of \$2,000.00 to the contract in lieu of the provision of the Work-As-Executed drawings.

Should the Electrical Sub Contractor not provide the Operation and Maintenance Manual within two weeks of practical completion or as agreed to in writing, the Electrical Sub Contractor is to agree to a variation credit of \$2,000.00 to the contract in lieu of the provision of the Operation and Maintenance Manual.

All dollar amounts nominated within the electrical documents including credit variations, rates and provisional sums do not include Goods and Services Tax (GST).

1.2 ASSOCIATED WORKS

Co-ordinate with the relevant bodies for the following works associated with but excluded from the electrical services sub-contract. The electrical sub-contractor is responsible for coordinating the interface of the electrical services with the following services:

Service	Responsibility
Motorised roller shutters, auto doors etc	Contractor.
Refrigeration services including lighting within the refrigerated spaces	Refrigeration sub contractor.
Lift motor room and lift shaft light and power.	Lift sub contractor.
Audio Visual Services	Specialist Audio Visual Contractor
Security	Specialist Security Contractor
CCTV	Specialist CCTV Contractor
Active communications equipment	Operator.
Illuminated signage	Signage contractor.
Connection of the power supply from the isolator to the sign.	Specialist signage contractor.
Mechanical Services	Mechanical services contractor.
Sub mains from the MSSBs to the mechanical plant.	Mechanical services contractor.
Hydraulic Services	Hydraulic services contractor.
Fixed equipment such as HWS and cooking equipment.	Dependant on the equipment either the contractor, other sub-contractor, specialist contractor or operator.
Plug in equipment such as fax machines.	Dependant on the equipment either the contractor, other sub-contractor, specialist contractor or operator.
Telephone exchange lines and services.	Operator.
Telecommunications equipment fly leads.	Specialist telecommunications contractor.
Build in sleeves, supports, hangers, fixings, anchorages and the like	Contractor.
Fire rated boots over recessed lights in fire rated ceilings	Contractor.
Rebates/cut-outs in fire stair door jambs for electric strikes and reed switches	Contractor.
Provision of penetrations through floors and walls. The electrical contractor to provide fire rating to penetrations after cables are installed if required.	Contractor.
Anti-termite treatments	Contractor.

Prior to rough in and again prior to fit off, the Electrical Sub-contractor is required to coordinate the position of all switches, outlets, connections and fittings with the following documentation as is current at the time:

- Architectural
- Joinery
- Other services
- Landscape

The cost associated with changes that are required due to the Electrical Sub-contractor failing to undertake the above coordination must be borne by the Electrical Sub-contractor.

1.3 CONTRACT DRAWINGS

The electrical services document schedule C2791a-0001.xls details the electrical drawings, details, schedules and associated documents that form part of the electrical service's sub-contract. The electrical services documents are diagrammatic only and the Electrical Sub-contractor must familiarise themselves with all other services documents and the architectural documents to establish the scope to be allowed for.

The current architectural drawings form part of the electrical sub-contract and as such information which appears on the architectural drawings which affects the electrical services will not be accepted as the basis of a cost variation. The electrical installation must be installed in accordance with the architectural drawings issued for construction.

1.4 SITE CONDITIONS

As part of the tender, the tenderer is required to familiarise themselves with all site conditions and allow for such conditions within the tender. Allow to modify / relocate all existing electrical services that are impacted / affected by the proposed works. Such impacts / effects include those that may be caused by works outside of the electrical services such as building works, civil works, other services, joinery etc: Changes or additions due to site conditions or requirements which could have been established during a tender period site inspection will not be accepted as the basis of a cost variation.

1.5 DEFINITIONS

Refer to the main contract for the definitions to be read into the electrical services documents

1.6 PRELIMINARIES

Carry out all of the electrical services works in accordance with the Builder's program and the preliminaries defined in main contract.

1.7 CORROSION AND UV PROTECTION

Ensure that all metal surfaces are suitably protected against corrosion, and that all plastic materials are UV stabilised. Repair to new condition or replace any components showing any signs of corrosion during the defects liability period.

Ensure that all metal surfaces are suitably protected against corrosion likely to be experienced during the life of the installation. Cover all electrical terminations including terminal screws and exposed raw metal including exposed conductors with clear synthetic resin based insulating enamel before fixing the terminal covers in place. Provide all fixings exposed to the weather and those in potentially corrosive environments as stainless steel. Do not use materials that will react with or cause galvanic reactions with adjacent materials or surfaces.

Use only plastic materials, paints, insulation materials and coatings that are UV stabilised and will not break down with the normal exposure to ultra violet radiation during the life of the installation. Provide written evidence for approval that all such materials are UV stabilised. Do not install PVC in locations it will be exposed to direct sunlight.

1.8 WORKMANSHIP

Under this contract the electrical sub-contractor and any further sub-contractors are to be self-supervising. The client, the client's representatives nor the Electrical Design Group will not provide supervision of the works covered under this contract. Provide a supervisor/s as necessary who has been properly trained and is competent in the respective trades covered by these works and holds license(s) required by the regulatory Authorities, on site during the performance of the contract works, to facilitate the works and co-ordination and co-operation with other trades and setting out the works.

Ensure that the work is performed by the holder of a current Electrical Sub-contractor license. Provide a copy of the license before commencing work onsite and include a copy in the Operations and Maintenance Manual.

Ensure the installation and all components, fixtures, fittings, outlets and cables are supplied and installed to a high standard throughout, and installed in a neat and tradesman like manner, to the current industry standards. Ensure all materials and components of a similar type are of the same manufacturer and installed in a uniform manner.

It is the Electrical Sub-contractor's responsibility to ensure that the installation is fit for purpose and is provided as a complete working installation. It is the Electrical Sub-contractor's responsibility to provide all components, fittings, fixtures, systems, programming etc. irrespective of the level detailed in the documents such that the installation is provided as a complete working installation.

Irrespective of the information documented it is the Electrical Sub-contractor's responsibility to ensure all aspects of the installation comply with and meet the requirements of all relevant authorities and the relevant current Australian Standards.

Provide all materials as new, and of the highest class available for their respective types.

It is the electrical sub-contractor's responsibility to ensure all conduits are not damaged during concrete pours.

Within the tender allow to conceal all wiring and conduits. Exposed cabling or conduits are generally not acceptable. For extreme circumstances a written request to allow the running of an exposed service in a specific location may be considered. In such circumstances the Electrical Sub Contractor is to agree to a variation credit of \$1,000.00 to the contract for each exposed service.

Provide all circuits and outlets required by any control or communications equipment supplied as part of this contract, irrespective of whether these outlets and circuits are shown on the drawings. Such outlets may include, but are not limited to, the following:

- Gateways.
- Hubs.
- Routers.
- Transmitters.
- CPUs.
- Servers.
- Amplifiers.
- Control panels.
- Communication and security equipment.

During the course of the building being painted, remove flush plates, light fittings and other equipment that is likely to be marred by painting and mask/cover other equipment such as switchboards and the like. On completion of the painting, replace all equipment; remove masking/covers and the like. Clean off any paint marks and return the finish to as new condition.

Install components and equipment in accordance with the manufacturers' recommendations and ensure such components and equipment are not operated outside of the limits specified by the manufacturer.

Irrespective of the extent of information or the accuracy of such information it is the Electrical Sub-contractor's responsibility to confirm the location of all existing services on site. The cost of repairing and of disruption to service due to damage to existing services is to be met by the Electrical Sub-contractor.

Ensure all components, equipment and materials supplied are new, unused, designed and selected to ensure satisfactory operation under varying atmosphere, climatic, humid tropical conditions without distortion and deterioration in any part affecting efficiency and reliability of the systems. Design and select all equipment to provide the necessary safety to human life and property during operation and maintenance with particular attention given to electrical safety and segregation precautions.

Check the finished paintwork around the area of each installation and touch up all damaged parts and finishes after the installation of the electrical services.

Within the tender response provide a list of sub-contractors that will be engaged by the electrical sub-contractor including the postal address, fax number, telephone number and email address. Within two weeks of being awarded the contract, provide the names and contact phone numbers of the electrical sub-contractor's supervisor and site foreman as well as the supervisor and site foreman of each of the sub-contractors that are to be engaged by the electrical sub-contractor.

Provide an electronic digital photograph for approval of all works that are carried out that will not be visible after installation, within five working days after the respective work has been completed. Each photograph is to be electronically stamped with the time and date and be either named with descriptive name that allows the location to be simply identified or accompanied with a tabulated description. Include a copy of the photos in the Operations and Maintenance Manual.

Ensure all materials and equipment are safely and securely stored or installed onsite until finally inspected, tested and accepted. Protect all work against damage or inclement weather. Protect all finished building surfaces with protective covering (drop sheets etc.) in the areas of immediate works.

Insulation tape must not be used in any circumstance other than as a temporary colour coding during construction. All insulation tape used during construction must be removed prior to practical completion.

Power boards must not be used in any circumstances.

It is the Electrical Sub-contractor's responsibility to ensure all joinery, cupboards and rooms housing electrical equipment are provided with appropriate ventilation. If the need for additional ventilation is not raised by the Electrical Sub-contractor prior to the completion of the rough in stage, the cost for providing additional ventilation must be borne by the Electrical Sub-contractor.

Allow to provide a label with the password adjacent to any equipment provided as part of the electrical sub-contract that requires a password. In all cases obtain approval to provide the password label prior to installation.

Exposed mounting tags are not allowable if concealed fixings or alternative mounting arrangements that do not involve exposed mounting tags are readily commercially available.

1.9 PROGRAM

Carry out all of the electrical services works in accordance with the Builder's program.

Where a component or document is noted as requiring to be submitted for approval, it is the electrical sub-contractor's responsibility to obtain in writing the approval of such from the client, the project manager, the engineer and from a senior member of the electrical sub-contractor's firm. The electrical sub-contractor must give each of the approving parties one weeks notice of the pending requirement for the approval and give each approving party a minimum of two working days to respond. Should an approval not be given, it is the electrical sub-contractor's responsibility to revise the material being submitted for approval and resubmit such material. The re-submission of material for approval does not constitute grounds for an extension of time.

1.10 ACCESS

Allow to provide all necessary access to install and complete the electrical services irrespective of the electrical services access provisions detailed on the drawings. The electrical services access provisions detailed on the drawings are not intended to be comprehensive or provide all of the access requirements necessary to complete the electrical installation. This includes, though is not limited to, the following:

- Conduits.
- Blockouts.
- Ducts.
- Risers.
- Hat sections.
- Covers.
- Cable trays and ladders.
- Chasing.
- Cutouts.
- Pits and trenching.

1.11 ALTERNATIVES

Alternative components and design will be considered with the cost of the consideration being borne by the Electrical Sub-contractor. Any alternative may be rejected without a reason being provided. Alternatives which are used without written approval must be removed from the installation and replaced with the complying item at the electrical sub-contractor's cost.

1.12 INSPECTIONS AND DEFECTS

Allow to actively assist the engineer in undertaking the progress and defects inspections. The Electrical Sub-contractor is required to be present at all times during the engineer's progress and defect inspections and will be given one weeks' notice of any such inspection. The Electrical Sub-contractor is required to provide the following as deemed necessary by the engineer during the inspection:

- Access to all areas of the works including ladders, cheery pickers, scaffolding and any other equipment necessary to gain access. This will include access to the ceiling space through removable ceiling tiles, fittings and access panels.
- Open all electrical equipment and covers including all necessary tools.
- Opening pits.

Should the Electrical Sub-contractor not attend the inspection or fail to provide the access, tools or services noted above the Electrical Sub-contractor will be responsible for cost of repeating the inspection with the minimum cost being \$1,000.00 plus GST. The approval of the contract payment will be dependent upon the successful completion of the inspection and the settlement of the respective inspection costs.

The engineer may also undertake further inspections without the Electrical Sub-contractor's attendance or assistance.

Should more than two defect inspections due to poor workmanship, be required to be performed by the electrical engineer, the cost of such inspections will be passed on to the electrical sub-contractor. The approval of the contract payment will be dependent upon the rectification of such defects and the settlement of the respective inspection costs.

When advice of a defect is received by the electrical sub-contractor, provide written advice within 24 hours of the date the defect will be rectified.

The expiration of the warranty period does not exclude the contractor or the electrical sub-contractor from the responsibility of latent defects discovered after the warranty has expired.

Commence the defects liability warranty periods at practical completion or at acceptance of installation if agreed to in writing by the superintendent.

The defects liability is to be for a period of one year unless required otherwise by contractual requirements.

1.13 ANOMALIES

It is a requirement that the tenderer allow for within the tender, the most expensive solution to address anomalies which may exist between any of the drawings, the drawings and the specification or between any of the contract documents and an authority requirement or a relevant Australian Standard. The Electrical Sub-contractor is to identify any anomalies and request in writing a direction on which option to proceed with. Any such direction will not constitute grounds for a variation or an extension of time.

1.14 APPROVALS

Where information has been nominated as requiring to be submitted for approval or the information must be approved, apply the following definition:

Each request for approval must be made in writing, accompanied with all necessary supporting information to allow for the prompt assessment of the request. Each request must be first approved by a senior member of the contracting firm prior to being submitted. For the approval to be valid the following parties must each grant an individual approval:

- A senior member of the contracting firm.
- The engineer.
- The project manager.
- The client.

Each request for approval must include the following information:

- Project name.
- Approval name.
- Approval submitted date.
- Approval required date.
- Description of what approval is required and how the approved information / items will be used.
- Facility for each of the approving parties to date and acknowledge their approval.

It is the Electrical Sub-contractor's responsibility to seek approvals and do so in a timely manner with the understanding that approvals may not be given and the request for approval may have to be modified and resubmitted. Delays in submitting requests for approval and resubmitting revised requests for approval will not constitute grounds for an extension of time. Unless advised otherwise the Electrical Sub-contractor must allow one working week for the approval to be given by the engineer, the project manager and the client.

1.15 CUSTOMER ACCEPTANCE

At the conclusion of the installation a preliminary walkthrough with the installation contractor and the customer's representative will be performed to check for installation quality, accurate performance of the work, and to verify the accuracy of work-as-executed documents. Complete any modifications to the documentation or the installation that may be required within a 2-week period from the walkthrough. Customer Acceptance will be given following a final walkthrough with the installation contractor and the customer's representative if all previously identified issues have been addressed.

If the Electrical Sub Contractor has advised that the previously identified issues have been addressed and it is found they have not been, the Electrical Sub Contractor is responsible for meeting the costs of subsequent customer acceptance inspections at the rate of \$250.00 per hour plus GST plus disbursements. The walk through will be scheduled within 3 weeks of the completion of the installation in order to turn the project and documentation over to the end user. Please note that "Customer Acceptance" does not release the Contractor from repairing any cabling errors or improperly labelled circuits, caused by the Contractor that may be discovered at a later date.

1.16 HANDOVER

Within two weeks of the contract being awarded, the contractors site foreman and the Electrical Sub Contractor's site foreman are both required to attend an electrical services handover meeting for a duration that will not exceed three hours. The time and location will be confirmed by the Electrical Design Group. The contractors site foreman and the Electrical Sub Contractor's site foreman are both required to confirm in writing to the Electrical Design Group that they will be attending the handover meeting. The intention of the handover meeting is to review the following information, answer any questions and identify any potential issues:

- How the electrical services design is documented and the purpose of each document.
- The services available on the Electrical Design Groups web site.
- The communication process and channels used by the Electrical Design Group.
- The relationship between the electrical services documents and the other discipline documents.
- The client's expectations of the electrical services.
- An overview of the contractual arrangements.
- A summary of the unusual contractual requirements within the electrical services.
- Identify any areas and items that may be subject to further design development or change.
- Identify any electrical services authority requirements.
- Summarise the major risks and or difficulties within the electrical services.
- Review the design of each system within the electrical services identifying the design critical components and components within the design that are open to the contractor's input.
- Review the layout of each system within the electrical services identifying the design critical areas and layouts that are open to the contractors input.
- Summarise the major areas of coordination and the coordination requirements.

Prior to the hand over meeting, the contractor's site foreman and the Electrical Sub Contractor's site foreman are both required to have reviewed the electrical services documents. The contractor's site foreman is required to bring a full size set of the current electrical services documents to the handover meeting. Other's such as the Client, Architect, Contractor's supervisor and Electrical Sub Contractor's supervisor are encouraged to attend the handover meeting, though not considered essential. If the contractor's site foreman or the Electrical Sub Contractor's site foreman do not attend the full duration of the handover meeting, the contractor agrees to a credit variation of \$1,000.00 to cover the costs of the aborted handover meeting and the handover meeting is to be rescheduled.

2.0 QUALITY REQUIREMENTS

2.1 STANDARDS

Irrespective of information contained in the electrical services documents or in instructions, it is the electrical sub-contractor's responsibility to ensure all electrical services works are being installed in accordance with the requirements of the following. Refer any discrepancies between the requirements of the following and/or the electrical services documents and instructions to the Architect for clarification prior to the placing of orders, fabrication or installation of the items/methods in discrepancy.

- Building Code of Australia.
- Electricity Act.
- Electrical Safety Act.
- Workplace Health and Safety Act.
- Telecommunications Act.

All cabling and cable support systems are to comply with requirements of AS 1170.4 (earthquake).

Unless specifically detailed within this specification, undertake all works to the requirements of the relevant standards included in the Standards Schedule C2791a-0003.xls. Refer any discrepancies between the following standards and or the specification to the Architect for clarification prior to the placing of orders, fabrication or installation of the items/methods in discrepancy.

It is the electrical sub-contractor's responsibility to obtain from all equipment and component suppliers confirmation that the equipment and components supplied as part of the electrical services installation comply with all of the following relevant standards and codes. Specific specification of equipment or a component does not alleviate the electrical sub-contractor of the aforementioned requirement.

Keep on the site a copy of AS/NZS 3000, AS/NZS 3008, AS 2293.1 and AS/NZS 2293.2.

2.2 REGULATORY AND AUTHORITY REQUIREMENTS

The electrical sub-contractor must obtain a copy of the associated development approval and building approval and ensure all relevant electrical services requirements of both documents are appropriately addressed. The electrical sub-contractor agrees to meet all of the relevant electrical services requirements of both the associated development approval and building approval documents if they do not advise in writing within two weeks of commencing work of any such requirements that the electrician believes are outside of their scope of work.

Ensure all of the electrical services comply with the requirements of all regulatory authorities having jurisdiction over the site including but not limited to the following authorities, codes, standards and regulations:

- ACMA.
- Local Council.
- Local Supply Authority.
- State Government Department of Environment and Heritage.
- Queensland Department of Justice and Attorney-General, Workplace Health and Safety Queensland
- Queensland Health
- Queensland Department of Justice and Attorney-General, Industrial Relations
- Building Regulations 2006
- Fire and Rescue Services Act 1990
- Building Fire Safety Regulation
- Queensland Electricity Act
- Queensland Electricity Regulation
- Queensland Electrical Safety Act
- Queensland Electrical Safety Regulation
- Queensland Development Code
- Queensland Fire and Rescue Service (QFRS)
- Queensland Electricity Connection and Metering Manual

- SAA Communications Cabling Manual
- AS/NZS 3000 SAA Wiring Rules
- The building certifier.
- Queensland Sustainable Planning Act and Regulation
- Queensland Building Act 1975
- National Construction Code (NCC) Building Code of Australia (BCA).

If any of the responsible Authorities, pursuant to the statutory powers vested in them, elect to perform, supply, inspect or test wholly or part of the works, make all necessary arrangements and co-ordinate with the Authorities.

Provide "for approval" copies of all Authorities' Approvals.

Pay all relevant authority fees and charges necessary to complete the electrical services installation to leave it in operating condition meeting all of the authority requirements.

2.3 CONTRACTOR DOCUMENTS

2.3.1 SHOP DRAWINGS

Before commencing fabrication or erection of the nominated item, submit an AutoCAD format electronic copy of detailed shop drawings via compact disc/USB or via email to brisbane@edg.net.au for approval. Prepare all drawings as A3 or A1 size to AS1100, AS1102, AS1103 and IEC 81346.1 with information detailed at the following minimum scales:

- Layout Drawings: 1:100
- Site Plans: 1:500
- Equipment Assemblies: 1:50

Ensure the shop drawings include the following information:

- General arrangement of all equipment: Include layout and clearances around equipment.
- Mounting details, structural details and calculations verifying the structural efficiency of load-bearing slabs, etc., footings and the like, supporting electrical equipment mounting structures, poles, lighting masts, etc.
- Supports: Details of equipment and cable support brackets and fixings including mountings.
- Physical cable layouts: Showing arrangement, location and identification of interconnecting wiring and cabling. All cable penetrations, connections and terminations details. Include all forms of conductors such as Bus Bars and Busducts.
- Labelling: Details of labelling and engraving.
- Earthing.
- The type, rating and capacity of all equipment and components.
- Comprehensive schematic diagrams showing the configuration and operation of all components.
- Co-ordination details with all other services.

2.3.2 WORK-AS-EXECUTED DRAWINGS

Prior to practical completion, provide for approval the following Work-as-Executed Drawings:

- Reticulation Drawings.
- Layout Drawings.
- Schematic Drawings.

Ensure the Work-as-Executed Drawings include the following information:

- All information required by the shop drawings.
- Comprehensive details on the reticulation for all of the Electrical Services including:
 - Support types and locations.
 - Conduit types and locations.
 - Junction Boxes.
 - All cable locations.

- Circuiting.
- Comprehensive details on the layout of all outlets, fittings and equipment of all of the Electrical Services including:
 - Outlet types and locations.
 - Equipment types and locations.
 - Mounting Detailing.
- Cross reference to the onsite labelling and numbering of all components and outlets.

Submit an AutoCAD format electronic copy of the work-as-executed drawings via compact disc/USB or via email to brisbane@edg.net.au for approval.

2.3.3 RED-LINE COPY OF DRAWINGS

In addition to the required clause 2.3.2 Work-as-Executed Drawings, the Principal Contractor is to keep and maintain onsite during construction, a complete set of drawings in hard copy, known as the "Red-Line" copy. This "Red-Line" copy is to be marked up, in RED, to reflect all variances from the drawings as they occur, particularly, but not limited to, underground or hidden services. This copy of drawings is to be handed over in their original state, must not be redrawn in CAD. This document will be used to check the required clause 2.3.2 Work-as-Executed Drawings.

2.4 MAINTENANCE / BUILDING TUNING

Undertake all necessary maintenance of the electrical installation during the Defects Liability Period for a period of 12 months.

Carry out periodic inspections and perform maintenance work at the frequencies and following the procedures recommended by the manufacturers of the supplied equipment with at least one visit each three months. Promptly rectify all faults. Replace faulty materials and equipment, including luminaire lamps, and accessories.

In addition to the above maintenance requirements, repeat the complete commissioning process three months, six months, nine months and twelve months from the date of practical completion.

The defects and liability period will not end until such certification has been approved.

2.5 DOCUMENTATION

2.5.1 OPERATIONS AND MAINTENANCE MANUAL

Within ten working days prior to practical completion, provide an electronic copy of combined operations and maintenance technical manuals for approval, written in clear concise English, containing the following data in the following format:

Within ten working days of receiving approval of the combined operations and maintenance technical manuals, provide the two copies of each of the approved combined operations and maintenance technical manuals.

Within ten working days of practical completion, provide the two copies of a combined operations and maintenance technical manuals, written in clear concise English, containing the following data in the following format: A typical combined operations and maintenance technical manual is available for download and editing from the Electrical Design Group web site www.edg.net.au.

- Contents.
- Project details.
 - Description of the project and the electrical services sub-contract.
 - Description of the major components of the electrical services sub-contract.

- Description of the manual and its intended use.
- Contact details of the electrical sub-contractor and each of the major suppliers.
- Licences and certificates.
 - Copies of all licences, certificates and statements of compliance as required by the specification.
- Operating instructions.
 - Provide an overall description of the operation of the electrical installation.
 - Describe the safe working procedures of the electrical installation.
 - Detail the environment that must be maintained for the safe and satisfactory operation of the electrical installation.
 - Detail the specific operating requirements for each component of the electrical installation.
 - Include a reference to the following government website for Electrical Safety at Work information.
<http://www.justice.qld.gov.au/fair-and-safe-work/electrical-safety/business-and-industry/electrical-safety-at-work#cords>
 - Include a copy of relevant first aid hints.
- Maintenance instructions.
 - Include a description of the general maintenance requirements for the electrical installation.
 - Include a description of the safe working procedures for the maintenance of the electrical installation.
 - Detail the specific maintenance requirements for each component of the electrical installation.
- Lighting.
 - Provide a detailed description of the lighting installation.
 - Include any information associated with the lighting installation required to be provided by the specification such as programming and aiming details.
 - Provide a schedule of each light fitting, the fitting manufacturer, catalogue number and lamp type.
 - Provide a detail sheet of each component.
- Lighting Control
 - Describe the lighting control system and maintenance requirements.
 - Include details of how to access the Casambi enabled devices via the LAN or WAN.
 - Include details of how to change the configuration, operation and settings of each Casambi enabled device.
 - Plans including the unique position and number (identifier) of each Casambi enabled device and the extent of each Casambi network.
 - Casambi installation and operation manual.
 - Manufacturers' installation and operation manual for each lighting control component in addition to the Casambi products used in the lighting control installation.
- General electrical components.
 - Provide a schedule of each general electrical component such as conduits, the component manufacturer and catalogue number. This schedule does not include light fittings or the power distribution components.
- Power distribution.
 - Provide a detailed description of the power installation.
 - Include any information associated with the power installation required to be provided by the specification such as programming and aiming details.
 - Provide a schedule of each component of the power installation, the component manufacturer and catalogue number and detail sheet of each component. This schedule is to include switchgear.
 - Provide a copy of each switchboard schedule.
 - Manufacturers' installation and operation manual for each component used in the power distribution installation.
- Emergency lighting.
 - Describe the emergency light installation and the statutory operation and maintenance requirements.
 - Include details of how to undertake complete emergency lighting testing and logging test results.
 - Plans including the unique position and number (identifier) of each emergency light fitting.
 - Details of the server.
 - Details of the mandatory testing and maintenance requirements of the emergency lighting systems.

- Emergency light fitting manufactures installation manual for each type of fitting.
- Communications cabling.
Provide a copy of the schematic layout of the communications cabling detailing the catalogue number of each component and how each component is connected.
- Test results.
Include all test results required to be provided by the specification.
- Work-as-executed drawings.
Provide a hard copy and an electronic copy on CD ROM in AutoCAD format. For all A1 and B1 drawings provide an A3 set as well as the full-size set.

Provide the manuals as A4 size, machine printed or typed on durable printing paper, with each page consecutively numbered, and neatly bound in a permanently labelled durable white vinyl covered ring binder folder. Securely fix a labelled CD / USB containing all of the information in the manual including Auto cad files of all drawings.

2.6 LAYING OUT

The positions of outlets, switches, and equipment shown on drawings are diagrammatic only. Check on site for positions and verify locations and mounting heights with the architect. When any relocating is required to conform to the above, undertake such relocation without additional costs. Verify locations of all outlets, switches, and equipment to ensure:-

- The work of any other trade does not interfere with the electrical installation.
- They are not shrouded by door swings and tracks, furniture or equipment.
- They conform to any pattern formed by ceilings, panels, tiles, beams, and the like.
- They are not located in restricted zones as defined by AS/NZS3000. It is the Electrical Sub-contractor's responsibility to check the volume of all sinks, tubs and basins.

Promptly report any anomalies, for consideration and instructions. Work proceeding without obtaining approval, will not be accepted as basis for a variation.

Locate all adjacent outlets at the same height and ensure power and non-power outlets are segregated by 150mm.

2.7 OPERATING PARAMETERS

Ensure the electrical services installation is installed in accordance with the following operating parameters and service conditions:

- Nominal voltages:
 - Line: 400-volt
 - Phase: 230-volt
- Frequency: (Hz): 50Hz
- Number of phases: Three
- Number of wires: Four
- Neutral Connection: Star Point
- Earthing System: MEN
- Ambient air temperature range: (°C): -5°C to 40°C
- Maximum relative humidity: (%): 90%

2.8 SAMPLES

Submit samples for approval for permission to use materials, fabrication, or workmanship, or as an example of design. All subsequent work is to be of the same quality as the sample on which the permission to use was given. Permission to use may be withdrawn if the standard of the sample is not maintained.

Keep approved samples in good condition on the site for the duration of the contract.

The Electrical Sub-contractor will be solely responsible for the consequences of delay resulting from failure to allow adequate time for the assessment and approval of samples, or from the rejection of samples which do not comply with the specification, or the like.

With every sample provide a sample information sheet: A separate sample information sheet must be provided for every location the relevant sample is to be installed where any of the installation conditions are different. Should a coordination conflict arise in a location that has not been addressed by a specific sample information sheet, the rectification of such a conflict must be undertaken at the Electrical Sub-contractor's expense and such conflicts will not be accepted as grounds for a variation.

The sample information sheets are provided as evidence that the Electrical Sub-contractor has checked the coordination of all components of the installation.

Ensure the sample information sheets are A4 in size and include the following information:

- Sample identification.
- Project identification.
- Sample submitted for approval date.
- Details of the location/s the sample will be used in.
- Details of how the sample will be mounted in each location.
- Details of how the cabling will be run to and connected to the sample in each location.

2.9 QUALITY ASSURANCE

Establish and maintain records which give evidence that the trade works has passed inspection and/or test with defined acceptance criteria and submit one (1) copy of all such records within seven (7) days of completion of the relevant work.

Allow approved representatives the right to verify at source or upon receipt that the purchased product conforms to the specified requirements. Such verification will not absolve the Electrical Sub-contractor of the responsibility to provide acceptable product nor will it preclude subsequent rejection.

Ensure a quality system is planned, established, implemented and maintained according to the requirements of SA TS ISO 9002 for and during the carrying out of the services.

Allow approved representatives appointed as a Quality System Auditors the right to undertake a quality assurance audit. Provide access and all necessary assistance to the Auditors in order to demonstrate compliance with the requirements of the quality standard.

Review and analyse the cause of any deficiency revealed in the report of an audit by the Quality System Auditors and develop and implement or procure the development and implementation of corrective action to prevent recurrence.

2.10 LABELLING

Permanently label and individually number all components, fixtures, fittings, outlets and cables installed as part of this contract such that they can be quickly and accurately identified. All labels must be permanent with the type and size of label appropriate to the location and conditions. The label type must be appropriate for weathering, UV exposure, vandalism and mechanical damage. Hand written labels are not acceptable in visible locations. Stick-on labels are not acceptable below 2,400 AFFL. The numbering and identification is to be consistent and consecutive for all items. Provide matching labelling and numbering where an existing numbering and labelling system exists. Submit all labelling types, identification schemes and numbering schemes for approval. Ensure all labelling is clearly identified and cross-referenced in the manual and on the work-as-executed drawing. Double sided tape is not acceptable as a method of securing labels below 2,400 AFFL.

- Power outlets and light switches with clip-on faceplate / surrounds are to have the circuit identification labelled by using neat hand written indelible ink in a concealed location under the clip-on faceplate / surround on the screw fixed plate.
- Isolators and power outlets and light switches that do not have clip-on faceplate / surrounds (such as weather proof outlets) are to have the circuit identification labelled by engraving with a contrasting infill colour on the faceplate of all power outlets and isolators in a permanently visible location. Such engraving is not permitted to be located on clip-on faceplates / surrounds. If the entire faceplate is clip on then the label is to be provided as a screw fixed traffolyte panel engraved with a contrasting infill colour mounted immediately above the outlet.
- Communication outlets are to have the circuit / channel identification labelled by engraving with a contrasting infill colour on the faceplate of all outlets in a permanently visible location. Such engraving is not permitted to be located on clip on faceplates / surrounds. If the entire faceplate is clip on then the label is to be provided as a screw fixed traffolyte panel engraved with a contrasting infill colour mounted immediately above the outlet.
- All exposed labels and identification method are to be identical in type and style.

2.11 KEYING

Ensure all of the lockable enclosures provided as part of the electrical installation are keyed alike and keyed as part of the site's master key system.

2.12 INSPECTION AND WITNESSING

Allow for inspections and witnessing.

Arrange for and give sufficient notice so that inspection for approval may be at the following stages:

- Concealed conduits: Prior to concrete pours, etc.
- Cables laid: After laying underground cables and before and after laying protective covering and marker tape.
- Roughin: Cables have been installed in walls and the ceiling space before the like has been sheeted.
- Connection: Connection of cabling and wiring.
- Factory testing of all control panels and switchboards.
- Factory inspection of all custom made components.
- Earthing: Installation and connection of earthing system.
- Acceptance: Installation ready for acceptance.
- Inspections required by Regulatory Authorities prior to their approval of the installation or its stages.
- All testing and commissioning.

To prevent any abortive factory visit, the manufacturer is to provide written evidence, including appropriate certification, that testing has been carried out to the required specification prior to the factory visit. As part of the factory testing and commissioning all operational, functional and safety sequences are to be simulated and checked. Should the factory testing and witnessing have to be repeated due to the manufacturer failing to provide the required written evidence or appropriate certification and or failing to carry out the testing prior to the visit, the Electrical Sub-contractor is to agree to a variation credit of \$2,000.00 to the contract per repeated factory test.

The manufacturer is to undertake the following prior to the factory visit:

- Undertake all required tests and ensure that signed test sheets and relevant product documentation and certification are in place.
- Obtain copies of the latest design specification and drawings
- Confirm the 'as built' drawings incorporate the latest modifications to the design drawings.
- Wire external switches on a temporary basis to simulate operational conditions for testing. Note that external switches and ports can be connected for test purposes.

2.13 TESTING

Arrange for and give two weeks' notice so that, the tests may be witnessed for approval.

Undertake on site the following tests:

- Insulation resistance measurements: On motors and major medium voltage equipment items, at 1000-volt D.C.; on cables and wiring.
- Functional checks: Full functional and operational checks on energised control equipment and circuits, including adjustments for the correct operation of safety devices.
- Motor rotation: Checking and where necessary altering connections for the correct motor rotation.
- Earth resistance.
- Earthing: Confirmation of effective earthing of the exposed metal of electrical equipment.

During testing, replace fuses and equipment damaged as a result of incorrect installation work.

Provide all Test Results for approval within one (1) week of the test being undertaken on A4 paper and as an electronic PDF file copy on CD / USB for approval.

Check control systems for correct operation under representative operational conditions. During the commissioning period these conditions may not arise because the building is unoccupied, and it is difficult properly to verify the performance of seasonal variations in control strategies. Control systems should therefore be checked when the building is occupied. In addition, illuminances cannot be checked until the space is completely fitted out and furnished. Representative operational conditions will often involve checks at dusk and/or night time.

The extent and frequency of post-occupancy checks should be included in the control system specification as part of the contract between the building owner and the construction supply chain and will depend on the nature and complexity of the control system. Lease documents should support any contractual requirements for post-occupancy evaluation and ensure that the leaseholder is required to provide reasonable access for their performance.

Post-handover checks comprise a continuation of functional checking relating directly to the lighting control system. Where a central control system is implemented, use should be made of its logging functions and the ability to display trend logs once it is confirmed that they are operating accurately.

2.14 COMMISSIONING

Commission all components of the electrical services to ensure the correct interfacing operation and control of all systems to the satisfaction of the engineer as per the approved commissioning method statement and commissioning plan. Arrange for and give two weeks' notice so the commissioning may be witnessed for approval.

Provide all necessary software, equipment and personnel to fully program and configure all systems to the satisfaction of the architect.

Following the completion of the commissioning and prior to Practical Completion thoroughly clean all components of the electrical installation to the satisfaction of the engineer.

Following commissioning, operate each component and system at the convenience of the engineer to their satisfaction, to provide evidence to the engineer that each component and system is working correctly.

A record of all settings, set point and offsets should be maintained throughout the commissioning period and included in the Operations and Maintenance Manual. Update the Operations and Maintenance Manual record following the completion of each of the post practical completion commissioning requirements. The defects and liability period will not end until the Operations and Maintenance Manual has been updated.

As part of the commissioning process, ensure the following actions are completed:

- Check that time schedules enable the intended operation at the correct times.

- Check that any specified out-of-occupancy periods, weekend and holiday time schedules operate correctly (note that the current operating date can be changed to simulate weekend and holiday dates).
- Check that the specified routine to ensure unified time clocks throughout the complete control system operates correctly.
- Check that any specified summer/winter seasonal changes to control strategies are properly enabled.
- Check that the calendar function can take leap years into account.
- Check the correct operation of the interlocks by individually switching interlocked items of plant.
- Check all safety interlocks, e.g. electro-thermal links and emergency knock off buttons etc.
- Check that the specified temperature interlocks operate correctly, e.g. low temperature frost protection.
- Check for the correct sequencing control in response to varying inputs operates in the correct order and at the desired set points.
- Check for the correct control and operation on start-up and shutdown. Check that the defined restart routine operates correctly when power is reinstated after failure. Check for any specified sequenced start-up to accommodate high loads.

Check the control system to confirm its specified operation following a mains power supply failure. In particular undertake the following checks:

- Check that controllers preserve control strategy configuration data for a specified period when the mains power is lost.
- Check that the condition of any volatile data protection system is regularly and automatically monitored. Check that an alarm is raised on loss of data by any controller or other device and/or failure of the monitoring system.
- Check that the control system operates correctly under generator standby and UPS power if applicable,
- Check that the control system will automatically return to normal action without operator intervention restoration of the mains electrical power supply.
- Check that any specified load shedding procedures operate correctly.

Check the application software and certify quality control off-site. Specific items or routines to be checked include though is not limited to:

- Specified set points have been configured.
- Suitable on/off times are entered for all time schedules and are associated with the correct items of plant.
- In principle all interlocks are configured correctly.
- Life safety interlocks are hard-wired unless approved by the relevant authorities (must be performed on-site).
- Each control loop is in place and that realistic default values have been added to enable commissioning to proceed.
- Any sequence control is configured and in principle associated with the correct items of plant.
- Configured software will start-up and shutdown the specified items of plant in the correct sequence.
- The configured software will trigger automatic plant change over in response to the specified signal (plant failure or hours run etc).
- All specified alarms are configured along with any specified time delays, masking and alarm categorisation in order to avoid unwarranted alarms.
- The use of mnemonics and abbreviations is checked between the display and the graphics to avoid inconsistencies.
- Data logging routines and parameters are set up in accordance with the control system specification.
- The binding of graphics with monitored points.

The manufacturer is to check all switchboards and control panels at the factory. Specific items or routines to be checked include though is not limited to:

Visual outside

- The finish to ensure there are no sharp edges.
- The metalwork: hinges on doors, flush doors, opening and closing doors, no sagging or drooping of doors when open, interlocking of doors.
- The door seals and gland plate gaskets are in place and securely fixed.
- The common key for all panels.
- For secure operation of door locks.
- That safe access to the control equipment is possible without having to isolate the control panel where specified.
- That the physical arrangement of the panel will allow transport to site and mounting in the final location.
- If the completed panel weighs more than 50kg, check that eyebolts are fitted.
- The location and labelling of switches and indicators (including colour).
- That plastic rivets or screws are used to mount labels.
- The scale of analogue devices and the status of digital devices.

Inside

- That all doors on any panel containing exposed dangerous voltages are provided with interlocking isolators so that the door cannot be opened except with the isolator in the 'off' position.
- That equipment that requires on-line adjustment and testing by non-electrically qualified personnel is accessible and usable without interrupting the supply or overriding the safety interlocks. (In general, outstations must not be located within control panels where isolation is necessary to gain access.)
- Access for incoming cables
- Access for outgoing power and control cables
- Provision of suitable gland plates
- All doors/gland plates to be earthed by cable links
- Bus-bars and power cabling as specified
- Anti-condensation heaters and thermostats are included and correctly set where specified
- Ventilation grills, filters and fans and thermostats are included and correctly set where specified
- Panel ventilation is adequate for the heat load
- Tightness of all connections, bolted power connections and bus-bar bolts tightened to the correct torque
- Neatness of cable looms with no pinching
- Sufficient spare capacity in all cable trunking to comply with BS 7671(13).
- Colour coding and numbering of all cables where specified and corresponding with numbering of terminals.
- Numbering of all terminals
- Shrouding and labelling of non-isolated equipment
- Shrouding of switches, lamps etc on doors if low voltage
- Segregation of power cabling and switch-gear from control cabling and electronic equipment
- Trunking lids cross referenced
- Connections between panel sections are numbered as specified, accessible and physically simple to connect/disconnect.
- Link type terminals for control system cables if specified
- Spare fuses and fuse ways if specified
- Drawing holder
- Fuses (type and ratings) against fuse chart
- Layout of equipment against drawings
- Ensure spare back panel space is provided as specified
- Ensure no equipment is mounted on the bottom or sides of the panel (similarly terminations) unless back/side plates are fitted
- Labelling of equipment in panel
- Access to all equipment especially devices requiring adjustment

- Power outlet is provided complete with 30 mA RCD protection
- Flexible looms connecting door mounted to interior mounted components will not weaken or break with repeated door opening. Check that the loom is arranged to avoid pinching or looping when the door is closed and is fully supported at each end.
- Screen and earth connections associated with the control system equipment comply with the manufacturer's installation requirements

General Function test

- The lamp test facility, if specified.
- Wiring interlocks by progressively energising or de-energising relay contacts, switches, timers etc in each circuit. Switches must be used to test that the system operates correctly in response to input signals.
- All indicators and signals out of the panel, e.g. those used to switch items of plant or to send status signals to the control system.

Typical starter/power circuit

- Fuse or circuit breaker frame size, trip unit type and settings against the drawings.
- Correct labelling has been provided.
- Energise the starter/contactors by 'making' the control circuit and ensure the starter operates correctly and that power is provided to outgoing terminals.
- Trip the starter and check that it de-energises and the trip indicator lights up.

All switchboards and control panels are to undergo on site checks including, though not limited to, the following specific items or routines:

- If the control panel is left on site for a long period then undertake adequate steps to ensure that it is protected from dirt, damage and moisture (e.g. by the use of anti-condensation heaters). Remove and store separately sensitive electronic components.
- Check all new connections into the panel and the interlocks re-checked before the power is switched on and is operated.
- Do not hand over the panel until it has been wired in and fully functionally tested and the testing has been witnessed and approved by the engineer.
- Perform a complete panel test on-site if the panel has not been tested in the factory, or if a multi-section panel has been received on-site having been split for shipment.

All wiring is to undergo, though not be limited to, the following checks and testing:

- Cable type as specified
- Cable identified at both ends
- Cable cores identified at both ends if not self-numbered or colour coded
- Security of fixing/protection of cables to walls etc where surface-run
- Cable carrier/container in accordance with the specification (tray, basket, conduit/trunking etc)
- Cable management in accordance with the specification
- Cables not damaged
- Secure termination of wires (using ferrules)
- Screening continuity
- Cable only earthed at one end (field controller) or as specified
- Electrical continuity ('belling out')
- Correct polarity where applicable
- Correct input/output (by briefly disconnecting cable)
- Correct and secure termination
- Separation of mains and signals cables
- No short circuits line-to-line and line-to-earth
- Volt-free contacts are volt-free (prior to the installation of the field controllers).

Undertake including, though not limited to, the following on site communications network checks and tests:

- All network devices such as routers and bridges are installed correctly.
- All control devices can be addressed over the communication network.
- When used in conjunction with an office IT network ensure that permission has been granted from the IT manager. All network data routing is correctly set up by the IT department including allocation of the appropriate TCP/IP addresses and default router addresses.
- For structured cabling systems ensure that all outlets are properly labelled and assigned. Ensure that any changes to the cabling system are reflected in the updated documentation.

Undertake including, though not limited to, the following on site insitu field control devices (controllers, outstations and unitary controllers etc) checks and tests using NATA approved testing equipment:

- Type as specified
- Size as specified
- Enclosures as specified
- Number and location (height, access) as specified
- Adequate mechanical fixing
- Identification by mnemonic labelling
- All cables terminated and identified
- All terminals used (check that any unused terminals are intended to be spare)
- Continuous power available and of an appropriate quality
- Fuse correct type/spares if specified
- Hardware configuration agrees with the specification
- All printed circuit boards in place
- All connection cables plugged in
- Document wallet containing wiring diagram where appropriate, i.e. when located in a control panel

2.15 TRAINING

Provide the operator with sufficient training such that they are capable of understanding how each of the electrical services systems operate and can be used in the normal day to day operation of the building. This is to include:

- General operation of the lighting and power installation.
- Changing lighting control time clock settings.

In addition to the operator training above at times to be agreed with the operator, instruct the operator's maintenance staff in the recommended methods of operation and maintenance of the electrical services. Allow to provide two such operation and maintenance training sessions on site each for duration of 4 hours.

Ensure the maintenance staff training includes the following information:

- A review of the Operations and Maintenance Manual.
- Maintenance cycles.
- Maintenance requirements.
- Types of all consumables including lamps.
- The location of all controls.
- Basic trouble shooting and fault finding techniques.
- Licencing arrangements and details.
- Software update procedures.
- Backup procedures.
- How to complete emergency lighting testing and record results.

3.0 INSTALLATION REQUIREMENTS

3.1 UNDERGROUND SERVICES

3.1.1 EXTENT OF UNDERGROUND SERVICES

The conduits and pits detailed within the electrical services documentation have been included as there are specific requirements that need to be accommodated and do not cover every requirement necessary to complete the installation. Unless the conduits and pits detailed within the electrical services documentation have been noted as being for future use or for use by another trade, it is acceptable to install the cabling for the initial installation through the conduits and pits detailed within the electrical services documentation. As the conduits and pits detailed within the electrical services documentation do not cover every requirement necessary to complete the installation, the electrical-sub contractor must allow for all additional pits and conduits necessary to complete the electrical installation.

Under no circumstances are buried direct cables permitted.

Before excavating any public area including roads, footpaths, reserves, and the like, obtain the approval of the relevant authorities and comply with their requirements for alternative traffic arrangements, excavation methods, backfilling and reinstatement.

Restore areas outside the limits of the Works, which have been disturbed by the Works, to their original condition on completion of the excavation. Reinstatement surfaces to their original level without subsidence and without cracking at junctions with existing surfaces. Restore pavements to match existing. Regrass grassed areas.

Provide a reinforced plastic, 150mm wide, underground, yellow or orange coloured marking tape with the words 'WARNING - ELECTRIC CABLES BURIED BELOW' or similar above all underground conduits at a depth of 200mm below ground level for the entire length of all underground conduits.

3.1.2 TRENCHING

Unless noted otherwise provide all trenching, bedding, backfilling and reinstatement required to complete the electrical services.

Excavate trenches in sections of suitable length, lay and bed the relevant service length, and backfill the trench section, with the minimum of delay, and if possible, on the same working day, unless otherwise approved.

Provide all saw cuts in existing concrete or bitumen surfaces in a straight line to a minimum depth of 75mm before excavation is commenced. Lift and store paving slabs for later reinstatement.

Ensure all trenches are cleared of sharp projections.

Notify, and obtain approval from, the appropriate owner or authority before any excavation is commenced beyond the site boundary. Carry out the excavation to the owner's or authorities' requirements. Reinstatement the surface to match existing.

3.1.3 BORING

Where specified or required by the relevant authorities, provide under road boring, by an approved specialist in lieu of trenches. Make the bored dimension to ensure a tight fit. If voids are encountered, fill by pressure grouting.

3.1.4 CONDUITS IN TRENCHES

Install all underground conduits 500mm below ground level and provide each conduit with a spare polypropylene draw cord.

Provide a minimum surrounding of 75mm clean sand around cables and conduits installed underground.

Under roadways and areas subject to traffic movement, install cables in a duct or conduit extending to not less than 1m on either side of the sealed surface or trafficable area and encase in concrete with a strength of 20MPa having a minimum cover thickness of 100 mm.

Seal the buried entries to ducts and conduits with a pliable non-setting waterproof compound. Seal spare ducts or conduits immediately after installation, and seal the other after the cable installation.

Install all conduits either straight or with large radius sweeping bends with a radius 40 times the diameter of the conduit. All conduits must be installed in such a manner to allow simple removal and installation of additional cables following the completion of the project. In cases where multiple conduits have been specified, install all initial cabling within the first conduit. Written approval must be obtained from the engineer prior to installing any cabling in the subsequent conduits.

Where underground conduit rise above ground, ensure they rise vertically and they are protected at ground level by a concrete plinth extending 250mm below ground, 100mm above ground. The plinth is to extend in each direction beyond the conduits more than three times the diameter of the largest conduit other than the side of the plinth / conduit that is against a structure. Provide the plinth with a fall such that water does not pool against the conduit or the adjacent structure.

3.1.5 BACKFILLING TRENCHES

Backfill trenches as soon as possible after approval of laid and bedded service to the following:

- Garden areas: Backfill the top 150mm of the trench with topsoil.
- Lawn areas: Re-loam the top 150mm and returf trenches passing through existing lawned areas.

Remove all excess soil and fill from the site unless otherwise directed. Reinstall existing surfaces and assets disturbed or removed as a result of the excavations of trenching. Reinstall concrete surfaces to the original level using approved reinforcing steel, keyed to the existing and laid to prevent the reinstalled concrete from subsiding and cracking.

In existing bitumen surfaces camber the reinstated surface so that the edges are flush and the centre is 10mm above the existing pavement. Fill the top 150mm below the bitumen surface with mechanically compacted finely crushed gravel. Prime coat the existing bitumen edges of the trench with bitumen prior to laying 75mm minimum of hot pre-mix bitumen to the finished cambered surface. If it can be shown that hot pre-mix is not available, cold pre-mix will be accepted. Provide a written certification that the backfilling has been completed as specified and compaction completed such that the trench will not subside.

3.2 CABLES

3.2.1 INSTALLATION

Unless otherwise specified, install and terminate cables in accordance with the manufacturers' recommendations. Unless noted otherwise joints are not acceptable. Install power wiring utilising the loop-in, loop-out system with joints in cables being affected at outlets.

Ensure oil, wax and powder based electrical cable lubricants are not used as cable lubricants. If cable lubricants are required to be used then use polymer-based for copper cables.

Remove redundant equipment and wiring, including that in accessible ceiling spaces, and make good exposed surfaces before commencing the installation of new wiring.

Handle cables so as to avoid damage to insulation and serving or sheathing. Replace all wiring with insulation damage after determining and removing the cause of damage.

Identify multicore cables and trefoil groups at each end and at crowded intermediate points by means of stamped, non-ferrous tags, clipped around each cable, or trefoil group.

Install and adequately support fixed wiring as specified throughout the installation. In accessible false ceilings, keep cables clear of all ceiling insulating material and/or removable ceiling tiles by securely fixing the cabling to permanent structural members. If the structural members are more than 1,200mm above the suspended ceiling, provide a catenary support system. It is not allowable to fix cables to the ceiling hangers.

Provide flexible connections or an approved form of vibration/movement isolation on the terminations of all cables that will experience vibration or movement under their normal operation.

Cable installation in areas where there are motors and/or generators shall comply with the guidelines set out in AS/NZS 3548 and AS/NZS 2834.

3.2.2 GENERAL CABLING REQUIREMENTS

The terms wiring and cabling are used interchangeably throughout this contract to refer to any cabling types and relevant standards.

Ensure all of the electrical services cabling comply with the following requirements:

- All cables are installed without joins.
- All cabling is concealed from view.
- All cabling installed externally is installed in conduit.
- All cabling that is installed in locations that are not concealed such as on exposed roof trusses, are to be run in conduit.
- Cabling fixed to trusses and beams in concealed ceiling spaces is to be fixed to the side of the truss / beam and not on top of the bottom cord of the truss / beam.
- Chasing of masonry walls is co-ordinated with other trades. Horizontal wall chases must be approved.
- Coordination of the installation of conduits and cables in the ceiling space does not interfere with the operation or maintenance of any equipment.
- Cables do not come into contact with hot water pipes.
- Above suspended ceilings, all conduits and cables are secured to the ceiling support members or roof structure above. Conduits and cables laid directly on the ceilings (on the ceiling suspension system or framing) are not acceptable.
- All cables in underground conduits are approved by the manufacture for external underground use.
- Enclose cables from above down to switches, outlets and equipment in conduits where the equipment is installed on single leaf masonry walls or concrete walls. TPS power cables where installed in cavity walls may be unenclosed within the cavities, unless otherwise detailed.
- Cables are secured to prevent any strain on the cable terminations. Support cables at a maximum of 1200mm spacing with minimum sag.
- The use of spring clips will not be permitted without approval.
- Do not install double insulated cables in locations where they cannot easily be withdrawn for rewiring purposes. Where double insulated cables are installed in accessible locations such as cavities, stud partitions and the like, do not clip or secure the cables such that they cannot be withdrawn.
- Double insulated cables are installed in conduits where they are installed within cement render, masonry walls or concrete slabs.
- External cabling is installed underground where installed between buildings, connecting signs, luminaries and the like.
- Catenaries are provided between cable trays and access conduits.
- Where cables traverse areas above set plasterboard ceiling (or similar) particularly in an office environment and providing access difficulties, use conduit secured to a catenary wire, or suitably saddled to the ceiling.
- Support all horizontal cabling via a dedicated catenary, cable tray, cable ladder, or via a structurally secure cable support system specifically installed to support cabling. All cable support systems must

be submitted for approval. It is not acceptable to use double sided tape, stick on hangers to support cables or to support cables from the ceiling support system or any other services support system.

- All cables entering wall cavities are to enter vertically above the outlet position and the access into the cavity allows for simple withdrawal of the cable and the simple installation of a second cable of equal size.
- Do not run cables horizontally through walls. Where such runs are necessary, (half height walls), use corrugated conduit to facilitate the cable run to the outlet or switch. Indicate the extent and location of all cables reticulated horizontally through walls.
- All cables passing through a metal surface, any sharp surface or any surface that could damage the cable insulation over the life of the installation is to be protected by grommets nylon bushes.
- Replace all wiring that contains kinks or abrasions.
- Provide all final connections from the wall box or isolator in flexible smooth wall PVC conduit to equipment. Enter the isolator with flexible conduit from the underside thus forming a drip loop and neatly install such conduit to minimise retention of grease, etc.
- The cable sizes indicated on the drawings are provided as a minimum only. The current capacity, voltage drop and fault capacity of the cables must be established by the Electrical Sub Contractor and the cables sized accordingly by the Electrical Sub Contractor. Size all cables to accommodate the respective loads, starting currents and maintain a spare capacity of 10%. All loads and fault levels must be confirmed on site by the Electrical Sub Contractor with the actual equipment being supplied.
- Unless otherwise approved, terminate copper conductors to equipment, other than small accessory and luminary terminals, by means of compression-type lugs of the correct size for the conductor, compressed only by the correct tool.
- Loom and lace together, with PVC straps, all conductors from within the same cable or conduit from the point of cable sheath or conduit termination to the terminal block. Neatly bend each conductor to enter directly into the terminal tunnel or terminal stud section, allowing sufficient slack for easy disconnection and reconnection.
- Provide flexible connections on the terminations of all cables that would experience sufficient stress/force under a bolted line fault condition that would cause damage to the cable termination or the equipment.

Provide mechanical protection of all cables in the following locations:

- Within 2,400mm of any floor, platform or landing that is accessible under normal operation and routine maintenance.
- All locations it is reasonable to expect that the cabling would be interfered with.
- All locations the cable could be subject to damage during normal operation and maintenance.

Provide all power and lighting cabling in accordance with the following:

- All T.P.I and T.P.S power and lighting wiring is to utilise stranded copper conductors with a minimum size of 2.5 mm sq. with 0.6/1kV V90 PVC insulation.
- Provide PVC free cables as low smoke zero halogen with X-HF-110 insulation.
- Provide PVC insulated cables with 0.6/1kV grade PVC compound, type V-75 or higher insulation.
- Provide PVC insulated and sheathed flat cables and single double insulated cables up to 16mm with 450/750V grade PVC compound, type V-90 insulation and sheathing.
- Provide PVC insulated and sheathed circular cables with 0.6/1kV grade PVC compound, type V-75 or higher insulation and sheathing.
- All low voltage and extra low voltage (32Vac or 115Vdc maximum) circuits and/or fire services are to be provided with different colour sheathing.
- Provide XLPE insulated and PVC sheathed cables with 0.6/1kV grade XLPE compound, type X-90 insulation, and PVC sheath.
- Provide all flexible cords as ordinary duty 250/440V rated with V-75 PVC insulation and PVC a sheath.
- Use white insulation for all TPS power cabling. For all cables supplying essential equipment use fire rated approved cables.
- Ensure all power and lighting wiring and cabling utilises stranded copper conductors.
- Ensure all wiring is provided and installed in such a manner that its installed overload rating exceeds the overload rating of the protective device.
- For fixed power wiring, colour the conductor insulation or, if this is not practicable, slide not less than 150 mm of close-fitting coloured sleeving to each conductor at the termination points as follows:

Active conductors in single phase circuits: RED.

Active conductors in polyphase circuits:

- A PHASE - RED
- B PHASE - WHITE
- C PHASE - BLUE

Run consumers mains and sub-mains in dedicated conduits and ensure there are no other cables in the same conduit as the consumer's mains or sub-mains.

3.2.3 SETTING OUT OF RETICULATION

The routes shown on the Drawings are approximate only. Determine the final routes to suit the building structure or site conditions. Obtain approval for the final routes prior to installing consumers' mains and sub-mains. Unless otherwise specified, conceal and protect cables and conduits. Arrange cables and conduits parallel with walls, ceilings and floors. Provide the main switchboard with a diagram indicating the route of any underground consumers' mains, printed on a durable card or similar, and indicating run distances for each 'leg' of the consumers' mains route.

3.2.4 WIRING IN CONDUIT

Complete and permanently fix the conduit run before installing the wiring. Use draw wires to pull in the conductor groups from outlet to outlet. For vertical conduit runs in excess of 15m make adequate provision for supporting the weight of the wiring to avoid insulation damage. Run circuits originating at different distribution boards in separate conduits.

3.2.5 TERMINATIONS

Terminate all cables installed as part of this contract. It is the Electrical Sub Contractor's responsibility to check and ensure the component or equipment the cable is being terminated to be appropriate and suitable for the cable to be terminated to. Advise the architect of any concerns with the component or equipment prior to the cable being terminated.

Where core identification is required, fit to each core durable numbered ferrules permanently engraved with numbers and/or letters to suit the specified connection diagrams. Terminate and identify any spare cores into spare terminals, if available; otherwise neatly insulate and bind the spare cores to the terminated cores.

Insulation displacement terminations or connections are not acceptable for 240-volt cabling. All 240-volt terminations must be screw type.

3.3 CONDUITS

Ensure all conduits installed as part of the electrical services are installed in accordance with the following requirements:

- Conduits are sized to permit drawing-in of cables to finished conduit runs without damage to cables.
- Protect all PVC conduits against UV exposure.
- Steel and galvanized conduit are not installed underground.
- Rigid UPVC conduit fittings are fastened to the conduits by fresh solvent cement in accordance with the manufacturer's recommendations. The cement is to be a contrasting colour to the conduit.
- Corrugated UPVC conduit fittings may be fastened with solvent cement as above or by use of snap-lock connectors in accordance with the manufacturer's recommendations.
- Flexible smooth wall PVC conduit fittings of the black nylon conduit clamp band type are provided.
- Conduits, pipes and conduit fittings are not visible on any wall, floor or ceiling surface with the exception of Switch rooms, Plant rooms and risers.
- Installation of conduits enables wiring to be drawn in and out at any future time without damage to the building and cabling and without disruption of the conduit continuity.
- Only conduit, deep draw-in boxes and couplings are to be cast in concrete. Do not cast conduit tees and elbows in concrete.

- Constant supervision at all times is provided when concrete containing conduits is being poured.
- Conduits passing through expansion joints are provided in concrete slabs with approved flexible expansion couplings.
- Conduits with expansion joints are provided as required to accommodate the expansion of the conduits and the supporting surfaces with a minimum of an expansion joint in straight runs at intervals of no more than 12,000mm.
- Unless noted otherwise provide conduit located internally as PVC light duty (LD), high impact rigid, minimum size being 20mm circular. Corrugated PVC conduit shall not be used unless approved.
- Unless noted otherwise, provide conduit located externally as PVC heavy duty (HD) conduit and stamped "underground" type.
- Conduit adaptors are lock nutted into metal wall boxes or welded into PVC boxes.
- Conduits, fittings and welding solution of the same manufacture are used.
- All change directions of conduits are set. Undertake setting by warming the conduit and bending around an internal spring. Ensure burn marks are not visible as a result of warming. Cold bending is not permitted. Secure conduits within 50mm of each change in direction.
- Secure 40mm or larger conduits every 500mm or less. Secure conduits less than 40mm every 300mm or less.
- Conduit ends above ceilings at right angles are set in the direction of the cable run.
- Conduit ends are cut square and free from sharp edges, burrs, and the like.
- Where subject to mechanical damage, exposure to sunlight, weather and/or damp conditions and/or ambient or contact temperatures exceeding 60 degrees Celsius, use heavy duty galvanised screwed steel conduit. Provide mechanical protection to UPVC conduit for a height of not less than 3m above ground or platform level.
- Where PVC conduit is embedded in concrete which is screeded or vibrated after pouring, or where conduits may be subjected to heavy traffic prior to concrete pour, provide constant supervision by a tradesperson to ensure that conduits are not damaged.
- All conduits are installed in concrete slabs above the bottom layer of reinforcement and securely tied in place. Boxes are firmly fixed to the formwork.
- Groups of conduits in slabs are separated by a distance equal to the diameter of the conduit/s. Obtain approval prior to installing conduits greater than 40mm OD in concrete slabs.
- Proprietary sealing caps (or aluminised flashing tape if sealing caps are not manufactured) are fixed to all conduit ends prior to the commencement of pouring of slabs, laying of bitumen, gravel, and the like and are to remain in position until the conduits are finally terminated.
- All conduits cast into a concrete slab, protrude perpendicular 100mm above the surface of the slab and are located as close as practicable to a wall.
- Prior to the installation of wiring, ensure conduits are clear of debris and liquids.
- All underground electrical conduits and conduits/pipes for special services (including spares) are sealed internally to approval at switchboards and/or at special services enclosures and where entering buildings to prevent the ingress of water.
- Metallic saddles with corrosion protection equal to hot dipped galvanizing with two galvanized fixings per conduit saddle are used to secure all surface mounted conduits. Do not use explosive-powered or similar equipment unless approved. Ensure the metallic saddles and fixings do not create a galvanic reaction with the support structure. In locations it is not practical to use saddles, submit details of the proposed conduit securing method for approval prior to commencing installation of the conduit. Any alternative conduit securing method must provide corrosion protection equal or better than galvanizing.
- UPVC conduits installed in accessible roof spaces and the like are protected by timber battens.
- Up to the commercially obtainable conduit lengths of run, conduits are installed without joints. Remove all jags, burrs, and sharp edges from each length before completing each conduit joint. Fit moulded plastic screwed bushes to the free ends of metallic conduit runs before installing the conductors.
- All inspection fittings and the like are accessible.
- Draw-in boxes are provided at suitable intervals not exceeding 30m in straight runs, and at intervals not exceeding 25m in other runs including directional changes.
- Conduits are not run in topping slabs unless approved.
- After removal of sharp edges, burrs, etc., ends and joint threads of steel conduits are painted with a rust-inhibiting metallic paint, which maintains conductivity.
- Standard size wall boxes of the same material as the conduit are used. Where special size boxes are specified and where such boxes are not obtainable in UPVC, use pre-fabricated metal boxes.

- Galvanised steel water pipe may be used for cable enclosures buried in the ground or run in concrete trenches or the like. Seal joints against the entry of water or moisture. Associated fittings will be either galvanised steel, cast iron or approved non-ferrous metal.
- Round off sharp edges and provide PVC bushes or the like for cable entries into metallic ducting.
- All conduits and ducts on cool room panels are mounted on 25mm stand offs.
- Arrange conduits below 2,700 AFFL such that a person cannot hang from or climb from the conduit by using the conduit as a foot hold or hand hold.
- All PVC conduits located externally above ground to a height of 2,000mm AFFL are protected with 1.6mm thick folded galvanised sheet steel hat section. Galvanized conduit may be substituted in the above ground location in lieu of the PVC conduit and steel hat section.
- Where the conduit is in an exposed location, paint the exposed conduit and hat section to match the building colour.
- All conduits are installed such that any moisture in the conduit drains away from the electrical connections. Where required provide the conduits with weep holes and drip loops.
- All conduits are installed and sealed such that insects cannot nest or seek refuge in them.
- All conduits are sealed such that the sealant can be removed in the following locations to prevent vermin and moisture entering through the conduits:
 - Conduits passing between different functional parts of the building such as food preparation areas, plant rooms, service areas and public areas.
 - Conduits passing between levels.
 - Conduits entering or leaving the building.
- Do not use conduits smaller than 20mm diameter in any circumstance or conduits smaller than 25mm diameter underground.
- Do not use light duty (MD-UPVC) conduit underground or where it may be exposed to mechanical damage or to sunlight.
- Ensure all associated plastic conduit fittings are of the same material as the conduits.
- Install conduits so the installation can be wired using the 'draw-in loop-in' principle.
- Provide power circuit conduit s so the power circuit wiring is drawn in only at outlets and the initial conduit entry point.
- Install conduits directly from the entry point to the termination point, with the minimum number of sets ensuring the number bends does not exceed the equivalent of 3 x 90-degree bends.
- Do not install elbows, tees, etc. in inaccessible locations.
- Cap all conduits during construction.
- Do not run conduits in roof spaces directly below the thermal insulation or sisalation.
- Do not run conduits in roof spaces or ceiling spaces directly on top of the ceiling.
- Provide deep pattern wall boxes securely fixed such that the front edge of the box is no more than 10mm behind the wall finish.
- Do not install wall boxes across the junction between different wall finishes.
- Provide all plastic wall boxes with threaded brass inserts for securing the flush plates.
- Do not use wall boxes with sliding type lugs for attaching flush plates.
- Earth all metal wall boxes.
- Run conduits within concrete slabs such that they are securely fixed to the reinforcing rods and pass above a single layer of rods or between a double layer of rods, generally midway in the thickness of the slab.
- Space parallel conduits within concrete slabs more than 75mm apart.
- Arrange conduits within concrete slabs such that cross overs are avoided and the number of conduits in one location is kept to a minimum.

Rectify all damage caused by flooding or vermin ingress that has occurred as a result of the conduits not being correctly sealed. Any such damage post practical completion is to be considered a latent defect and must be rectified as such.

3.4 PENETRATIONS

All penetrations that exit the building are to be waterproofed.

Seal all penetrations in a neat and tidy manner in such a way that the sealing material can be removed to allow future use of the penetration. Ensure all penetrations are sealed to at least the original integrity of the member or structure being penetrated. Provide independent certification of all fire rated and sound rated penetrations. Do not penetrate fire rated finishes, structural members, acoustically rated finishes or damp courses without approval. Run pipes entering a building at ground level under the waterproof membrane and vertically penetrate the membrane and the floor slab. Provide a suitable seal between the pipe and the roofing material.

Fit a UPVC sleeve for each penetration through ground floor slabs, ground floor beams and external walls for cables not enclosed in conduit. In addition, for MIMS cables fit a sleeve for each masonry penetration. Provide a penetration of diameter 10mm greater than the pipe or sleeve diameter for pipes and sleeves penetrating existing external walls, ground slab, or ground floor beams.

Fireproof all penetrations through fireproof walls or floor slabs, irrespective of size, upon completion of installation of cables. Provide fireproofing by fixing a suitable galvanised sheet metal cover (minimum thickness 1.6mm) around the cables on both sides of the wall and underside of slab, pack space with fireproof material. Provide independent certification of the rating of all penetrations through fire rated members. Fix plastic grommet around metal edges bearing against cables. Paint sheet metal covers to match surrounding areas.

Provide all electrical penetrations into refrigerated enclosures as rigid conduit extending a minimum of 50mm beyond each side of the refrigerated panel. Seal inside and outside of the refrigerated panel around the conduit with Sikaflex. After the cabling has been installed, seal around the cable within the conduit with Sikaflex. Ensure all penetrations into outlets, switches and fittings within refrigerated enclosures are waterproof.

In all locations where, underground conduits pass under a building or structure, provide flexible conduit with a smooth interior for 300mm each side of the transfer to accommodate movement of the building or structure. All such conduits are to be similar to Vindex Coreflow conduit.

Provide all outlets and switches flush mounted within floors, walls and ceilings that have an acoustic or fire rating with additional protection to achieve the same acoustic and / or fire rating as the base structure. Provide a copy of an independent certification for approval of the additional protection that the required acoustic and /or fire rating is achieved with the installation method and components employed. Provide a copy of the certification in the maintenance manual and indicate the location of all such additional protection installations on the as build documents. Surface mounted wall blocks are not acceptable as methods of achieving the required rating if the outlet / switch has been specified as flush. If additional furring channel and or wall / ceiling sheeting is required that is not part of the base design all such additional materials must be included as part of the tender price.

Provide ceiling roses or flush faceplates with a cable gland to trim all cables penetrating a wall or ceiling that are to be connected to equipment that is bracket mounted that does not inherently accommodate concealed cabling.

3.5 ACCESSORIES AND FITTINGS

Provide all accessories and fittings in accordance with the following requirements:

- All switches and outlets provided are of a like appearance, flush set sized at 115 x 70mm.
- Switch flush plates are mounted with the 115-dimension orientated vertically. Outlets are mounted with the 115-dimension orientated horizontally.
- All accessories shall be flush mounted rocker action type. Use red switch toggle marker 'dots' on GPO's but not on light switches. Provide accessories as white in colour unless specifically detailed otherwise.
- Flush plates are installed plumb and fit hard against wall surfaces. Wall boxes are used for masonry and concrete walls and proprietary mounting accessories for "stud" type partition walls.
- Switches and power outlets in exposed locations and in areas such as plant rooms and car parks are provided as IP56 rated light grey in colour with one piece covers where available.

- All wall boxes specified for future use are provided with blank flush plates.
- Instructions for final positions of all outlets and switches are requested at least ten working days in advance.
- Relocation of outlets and switches is allowed for at a maximum of 1.5m without additional cost, providing chasing is not required.
- Outlets, switches and accessories are installed to suit tiling and surrounding fixtures. The mounting heights shown on the electrical services drawings shall be taken as indicative only.
- All accessories are to be flush mounted installed in wall boxes.
- All suspended equipment provided is mounted off a raked ceiling with an adjustable ceiling mounting such that all suspended equipment hangs vertically.
- All fittings and accessories installed in refrigerated rooms and enclosures must be non-ferrous.
- All mechanisms and blank mechanism fillers are to be screwed fixed in place on the rear of the faceplate.
- Use fastenings that are of the same or more corrosive resistant material than the materials fastened, of a minimum number of varieties and sizes, and suitable for fitting with commonly available tools. Lubricate screw threads with long life lubricant.
- Provide washers under all nuts.
- Ensure fastenings subject to vibration are locked tight.
- Do not use self-tapping screws where periodic dismantling is required.
- Use bolts and set screws with hexagonal or Allen-keyed heads.
- Use blind rivets of the pressure tight type. Do not use Imex. rivets where they may be loaded in tension.

3.6 EARTHING

Provide a comprehensive earthing system throughout the project addressing all aspects of the structure, all services, all systems and components in addition to those forming part of the power distribution.

Provide earth electrodes as 19mm diameter of either copper or steel rod copper clad and will incorporate integral driving heads and points. Stainless steel rods grade 302 is also acceptable. Install earth electrodes vertically. Electrodes may be driven direct into the ground or installed in holes previously drilled and packed with suitable conductive graphite slurry. At ground level cover the rods with fibreglass reinforced concrete pits with appropriately embossed or stamped lids flush with the surrounding ground. Bond all exposed metallic parts or components in the project (i.e. conduits, frames, water pipes, enclosures, light fittings, sinks, cable sheaths, cable trays, skirting duct, partitions and the like) by means of adequate clamping/fixing. Where allowed by the supply authority, provide the earthing system as a combined earthing system.

Where electrodes are to be installed in rock, fill the gap between the rock and electrode with bentonite clay or resin compound or as otherwise approved. Where electrodes are to be installed in corrosive soil, install each electrode in a 200 mm bore hole, backfill with a conductive metallic grouting compound and compact with a vibrator.

Run a PVC-insulated copper conductor from the main switchboard earth bar to the slab reinforcing mesh. Clamp conductor to mesh (one point of contact only required) with a brass earth clamp. Wrap clamp and exposed copper conductor with insulation tape. Provide a label engraved 'Slab Reinforcing Mesh Bond' adjacent to the termination on earth bar.

Copper conductor is to penetrate slab inside building enclosure and be such as to avoid moisture penetration to slab reinforcing mesh.

Bond the electrical earth to all piped services (if metallic pipes) at the closest practical point to where these piped services enter the building. This includes cold water, hot water, soft water, steam, condensate return, waste, medical gases, suction and the like. The bonding earth conductor to be 6 sq. mm minimum.

3.7 ACCESS

In non-habitable locations such as plant rooms and store rooms provide cable access to surface mounted electrical equipment such as switchboards, control panels, intruder detection panels and communication equipment by surface mounted PVC or metal duct. Provide the duct with a removable lid of lengths not exceeding 1,200mm and arrange the duct such that it runs square with the building. Silicon seal between the duct the wall, the floor and the ceiling. Cover all conduits entering through the floor with such duct. Where the duct abuts the boards/panels provide neat cut-outs free of burrs in the duct and boards/panels to allow cable access. Where the duct does not adjoin the boards/panels provide cable glands in the duct and the boards/panels for all cable access. Ensure all of the cables run within the duct are supported vertically and horizontally to the cable manufacturer's requirements and as a maximum such supports are not to exceed 1,200mm. Provide or paint the duct to match the wall colour.

3.8 CATENARY SUPPORTS

Provide catenary supports in accordance with the following requirements:

- Use catenary wire as a minimum as seven strands galvanised steel wire.
- Catenaries are anchored and supported to the ceiling slab or structural members and tensioned by way of 2 wire clamp turnbuckles fixed in place by Dynabolts with a minimum size of 6mm.
- Where the cable loading is excessive for catenary wire or saddled enclosures, use tray/ladder.
- Catenary wire is supported by jack chain or similar at distances of no more than 3 metres. Do not use ceiling hangers as support for catenaries or cabling.
- Where cables leave a catenary, they must be supported in PVC conduit and/or PVC ridged and/or flexible conduit and/or an additional catenary and then the conduits. The conduits will be fastened to the catenary and then at every change of direction in a workmanship like manner. Corrugated conduits should not lay about in ceiling spaces.
- Attach an earth to the catenary with a 2-screw tunnel type connector.
- Catenary wire systems must installed be true to the building line in such a manner that they are not interfered with or in contact by the structure or any other service.

3.8.1 CATENARY WIRES

- Catenary wires shall be minimum 3.0mm diameter galvanized stranded steel wire, sized to carry the cable weight and shall be supported at regular intervals, not exceeding 3000mm, from structural components.
- The maximum deflection for loaded catenaries shall not exceed 150mm.
- All fixings, anchors and supports for catenary wires shall utilize metal fasteners.
- Cables shall be tied to catenary wires at maximum 900mm centres over the entire length, using proprietary nylon cable ties.

3.9 CABLE LADDER AND TRAY

Bolt the tray/ladder to single sided brackets for horizontal runs and roll steel channel in vertical runs. Provide cable tray as rolled or folded steel at least 1mm thick galvanised prior to delivery or from extruded structural grade aluminium with a thickness not less than 1.5mm. Use cable ladder with cable support rungs between the two rails spaced at intervals of not more than 300mm. Each adjacent length of the cable tray is to be bolted together.

Use tray/ladder 150 mm, 300mm, 450mm or 600mm wide. Provide bends, connectors, trays, ladders, brackets, and other support necessary to make a complete cable or conduit support system of the same manufacture, sized to adequately support the installed cabling.

Provide cable ladder with a cable contact area of less than 10% for power cables required to be supported on tray/ladder. Provide perforated cable tray for all non-power cables required to be supported on cable ladder or tray. Use tray that has slots that on both the normal and reverse sides there are no burrs or sharp edges. All trays and ladders must be galvanised after manufacture, prior to delivery to site.

Do not run cables with an outside diameter smaller than 13mm on cable ladder unless supported at intervals not exceeding 100mm. Slots or ladder rails will be considered suitable for fixing cable ties, strapping or saddles. Ensure all bends have a minimum inside radius of not less than twelve times the outside diameter of the largest diameter cable carried. Provide sufficient space on the tray or ladder for not less than 50% more cables or conduits than specified.

Position the tray/ladder to give adequate access for inspecting, replacing, or adding cable. Fix cable to the tray/ladder by proprietary nylon ties, straps or saddles, at 1000 mm centres for vertical runs and 2000mm centres for horizontal runs. Provide a slightly curved support surface under cables leaving the tray/ladder to protect the cable sheath from impingement by the tray/ladder edge.

Where the tray/ladder is exposed, provide a cover over the tray/ladder. Provide the cover as removable galvanised sheet steel screw fixed to the tray in lengths that allow it to be safely removed by a single person. Ensure the cover is installed in a neat manner without undue gaps and is free from burrs.

3.10 CEILING SUPPORTS

Provide termite resistant plywood support to all components mounted within lay-in ceiling tiles such that the weight of the component and any associated control gear is supported on the ceiling grid and not on the tile. Provide all necessary T Bars and cut tiles required to accommodate the installation of all components mounted within suspended tile ceilings. Provide all necessary additional structural supports and T Bar rails to mount the fittings and support the plywood support. Provide all cut-outs in set plaster ceilings and modify the structural support of the ceiling where necessary to accommodate the cut-out.

3.11 MOUNTING REQUIREMENTS

As part of the electrical-sub contract works allow for all necessary mounting brackets, fixings, trims, cut-outs, block outs and any other incidental component that will be required to complete the electrical installation. Provide a shop drawing of all such components including how they are mounted for approval.

Fittings and components that have any moving parts or weigh more than 2.5 Kg's that are fixed to the lined ceiling or walls must be provided with independent support system connected to the structure.

4.0 POWER DISTRIBUTION

4.1 SCOPE

The power distribution component of this contract includes a new Energex padmount substation supplying a new site MSB via new underground consumers mains.

The MSB is to provide two underground unmetered supplies to replace the two existing Energex overhead supplies from Nicol Street. Arrange with Energex to have the two existing overhead services from Nicole Street removed as well as the existing overhead service from Stafford Road. Remove the existing Stafford Road property pole and all associate cabling.

The MSB is to contain bulk retail metering (M1) for the bowels club that complies with the Queensland Metering Manual.

The MSB is to contain distribution board DB-A and MCCBs supplying submains to the MSSB and distribution board DB-B.

Cables are not allowed to be joined.

All neutral conductors are to be full size.

Power is to be reticulated from the distribution boards to equipment isolators and to outlets via final sub circuits.

The power distribution component of this contract includes, but is not limited to the following extent of work:

- Power distribution.
- Earthing.
- Switches, Outlets, Isolators and Accessories.
- Supply Authority Coordination.
- Lead-in services.
- Trenching.
- Conduits and pits.
- Energex substation.
- Energex conduits by an Energex approved contractor.
- Energex substation civil works.
- Consumer's mains.
- Main Switchboard. (MSB) incorporating distribution board DB-A.
- Distribution Board DB-B.
- Metering.
- Submains.
- Cable access ways.
- Tenant use cable ladders.
- Final sub-circuits.
- Connection to equipment.
- **Connect to the PV system provided by others.**
- Removal of all existing electrical services.

Any changes required by the authorities will be at the electrical sub-contractor's expense should the electrical sub-contractor not obtain authority approval of the shop drawings above.

Submit an EWR as required

Arrange with the supply authority to have the supply connected to the site and the retail metering installed. Submit all necessary forms and obtain all necessary signatures from the operator required by the supply authority for connection of supply and installation of the metering.

Provide written advice to all associated contractors and sub-contractors of the following information where switchboards and control panels are supplied outside of the electrical services and are provided with power by the electrical services: Provide a copy of such advice for approval and provide a copy of each piece of advice within the Operations and Maintenance Manual.

- Upstream protective device size and configurations.
- The fault level at the final point of termination.
- The cable size, type and configuration.
- Control and interface configuration and requirements.

Provide a sample of each type of switch and outlet. Provide shop drawings of all switchboards, distribution boards, load centres, metering panels and control panels. As part of the tender submission the Electrical Sub-contractor must include for all contractual requirements and costs required by the suppliers to the electrical sub-contract to provide the necessary samples. The Electrical Sub-contractor must bear the cost of supplying samples of the components specifically specified as well as those specified generically or by performance.

All suppliers and sub-contractors to the Electrical Sub-contractor must ensure they are familiar with and comply with the requirements of sections 1.0, 2.0 and 3.0 of this specification

4.2 INSTALLATION

4.2.1 SWITCHBOARDS

Ensure all switchboard enclosures are appropriate for the location they are intended to be installed in and have appropriate space and capacity to contain all equipment and cabling in the final configuration.

The switchgear sizes indicated on the drawings are provided as a minimum only. The current capacity and fault capacity of the switchgear must be established by the Electrical Sub-contractor and the switchgear sized accordingly by the Electrical Sub-contractor. Size all switchgear to accommodate the respective loads, starting currents and maintain a spare capacity of 10%. All loads and fault levels must be confirmed on site by the Electrical Sub-contractor with the actual equipment being supplied.

All switchgear is to be provided as Schneider Merlin Gerin or Terasaki.

All switchgear throughout the entire site is to be of the same manufacturer. All miniature circuit breakers are to be compact DIN style DIN rail mounted circuit breakers.

4.2.2 OUTLETS AND ACCESSORIES

The outlet and accessories sizes indicated on the drawings are provided as a minimum only. The current capacity and fault capacity of the outlet and accessories must be established by the Electrical Sub-contractor and the outlet and accessories be sized accordingly by the Electrical Sub-contractor. Size all outlets and accessories to accommodate the respective loads, starting currents and maintain a spare capacity of 10%. All loads and fault levels must be confirmed on site by the Electrical Sub-contractor with the actual equipment being supplied.

Ensure all electrical connections to equipment other than light fittings and control panels or switchboards with integral isolators are via a switched outlet or a switchable isolator. Provide all isolators as 20 Amp, lockable, IP56 isolators. Connect all isolators to the respective equipment via smooth flexible conduit unless noted otherwise.

Do not connect any motors larger than 5Kw to an isolator without motor protection relay and a control contactor.

4.2.3 FAULT PROTECTION

Unless specifically shown otherwise, provide overload, short circuit and earth fault protection utilizing automatically operated circuit breakers.

Provide 30mA earth fault protection of all cabling and outlets within residential areas, all general purpose outlets and circuits that the public could have access to during normal operation.

Ensure all circuits are suitably protected against earth faults and the protective device operates within the required time. Include details of how such protection is achieved with the testing and commissioning data for the worst case point on every circuit and submain. Such details must be in the form of one of the following:

- Circuit protected by a 30 mA RCD.
- Perspective fault current at the point, circuit impedance and protective device tripping characteristics

4.2.4 CABLING

Unless otherwise specified provide all power cables with copper conductors, a minimum size of 2.5mm² with insulation coloured as follows:

- Actives of single phase circuits: Red
- Actives of multiphase circuits:
 - A phase: Red
 - B phase: White
 - C phase: Blue
- All neutrals: Black

4.3 COMMISSIONING

As part of the commissioning of the power distribution undertake the following tests as relevant on all components of the power distribution installation:

- Has been fully commissioned in accordance with this specification.
- Phase rotation.
- Power availability.
- Resistance to earth.
- Voltage.
- Overload protection.
- Fault protection.
- Earth leakage residual current protection.
- All mechanical fixings.
- Maximum demand of each switchboard and submain.
- Mains power failure.
- Meter accuracy.
- Meter reporting and logging.
- BMS interfaces.

Schedule the results for each item and component and include a copy of all test results in the Operations and Maintenance Manual.

Ensure the correct phase sequence at the main switchboard after connection of the supply.

Balance the load as evenly as practicable at Practical Completion. Re-check and, where necessary, re-balance the load at completion of the Defects Liability Period. Submit the balance results for approval and include a copy of the results in the Operations and Maintenance Manual.

As part of the commissioning of the power distribution, undertake any necessary adjustments to components of the power distribution installation which, have integral adjustment capacity as directed. Record all adjustments undertaken and include a copy of all adjustments in the Operations and Maintenance Manual.

Upon the completion of the commissioning of the power distribution provide a written and signed statement that the power distribution installation:

- Has been fully programmed as necessary.
- Has been tested.
- Complies with the intent of the contract.
- Complies with the relevant authority requirements.
- Complies with the relevant standards and codes.
- Is fit for purpose and suitable for the intended use.

Ensure the following components of the power distribution system installation are complete and have been checked and tested prior to the adjusting of the power distribution system installation to commence:

- Labelling.
- Correct operation of the power distribution system.
- All components have been installed and are operating.

Should these items not be complete prior to the adjusting of the power distribution installation the additional expenses in re-attending the installation to undertake the adjusting of the power distribution installation as incurred by the engineer will be charged to the Electrical Sub-contractor.

Provide all equipment such as ladders, scaffolding and tools necessary for adjusting the power distribution installation. Should the Electrical Sub-contractor not have available the necessary equipment to complete the adjusting and aiming of the power distribution installation, the additional expenses in re-attending the installation to undertake the adjusting and aiming of the power distribution installation as incurred by the engineer will be charged to the Electrical Sub-contractor.

The adjusting and aiming of the power distribution installation will include the following:

- Adjusting mountings and brackets.
- Adjusting switch gear settings.
- Testing all operations of the power distribution installation.
- PE Cells.
- Time clocks.

Allow attending site twice during the defects and liability period and undertaking the above adjustments to and reprogram as directed by the operator the power distribution.

4.4 OUTLETS

Provide all power outlets and connections as follows:

- Provide isolators for motors with a suitable motor rating; where motors are supplied by other trades, confirm motor ratings prior to sizing isolators.
- Unless otherwise detailed, all appliances will be supplied and installed by other trades, and connected by the Electrical Sub-contractor either by means of an isolator or by means of a power outlet.
- It will be the responsibility of the Electrical Sub-contractor to check with suppliers that cable and circuit breaker/fuse sizes are suitable for the equipment being installed prior to the installation of cables and circuit breakers and/or fuses.
- Specific details regarding connection to various items of equipment are not given in the specification where it is considered that the installation is of a straightforward nature and full details are available from single line diagrams/circuit schedules.
- Ensure all three phase power outlets throughout the installation have identical phase rotation and polarity.
- Install a neutral conductor to every three phase power outlet.
- Confirm the location of sinks, fittings and the swing of doors before the installation of general purpose outlets and light switches.
- Mount outlets of the one type where grouped together under the common flush plate.
- Provide all outlets mounted on stainless steel joinery of the flush stainless steel type with black mechanisms.
- On face plates, secure the mechanism with retaining screws, or construct the faceplate and mechanism so that the mechanism cannot be displaced during normal operation.
- Orientate switch mechanisms to operate in the vertical plane.

- Provide all GPOs, 10 amps, 3 flat pin flush, impact resistant, polycarbonate switch plug combinations, all mounted under the one cover plate with the earth pin at the 6 o'clock position.
- Mount all special purpose outlets with the earth pin at the 6 o'clock position, the neutral pin in the centre, and the red, white and blue phases in a clockwise sequence when viewed from the front of the socket.
- Provide a matching plug top with a screw ring for each three phase and screw type outlet.
- All accessories are to be flush mounted installed in wall boxes.

4.5 SWITCHBOARDS

4.5.1 AUTHORITIES

Provide space for the Supply Authority metering equipment. Arrange to obtain the relevant metering equipment from the supply authority such that the metering equipment is installed in the workshop prior to the delivery of the switchboard.

Make all necessary provisions for Supply Authority metering, including appropriate alterations to switchboard designs and allow for all associated metering establishment costs.

Supply and install all of the supply authority metering facilities, including a current transformer metering cubicle complete with CTs and potential fuses as part of the main distribution board. Provide all necessary line-side isolation facilities for each set of supply authority metering CTs. Provide a separate surface mounted external meter box and all interconnecting wiring and accessories.

Ensure all metering is code compliant to allow the supply to the installation to be contested by the appropriate supply authorities.

4.5.2 TESTING

Supply a copy for approval of a 'certificate of verifications and tests', stating the testing authority, manufacturer, and details of parameters and results for each test. Provide documentation to verify that the tests were carried out on a switchboard of essentially identical design to that specified. The manufacturer will hold available certificates of type tests showing evidence of compliance with Australian Standards, together with detailed particulars of the equipment as tested and a record of any alterations that have been made to the equipment subsequent to the type test.

Provide routine switchboard tests, carried out at the manufacturer's works and repeated at the site. Use externally connected simulated circuits and equipment at the works to undertake functional electrical tests.

Provide a copy of the type test certificates and the routine test results in the Operations and Maintenance Manual.

4.5.3 OPERATIONAL MAINTENANCE

During the maintenance period, provide the following for each switchboard:

- Carry out periodic inspections and maintain the switchboard installation in a condition to meet the specified performance.
- Promptly rectify all faults.
- Replace faulty materials and equipment without charge.
- Provide a thermoscan report undertaken by qualified thermoscan inspection services at Practical Completion, at 6 months and at end of Defects Liability Period.
- Provide written reports on maintenance activities.
- Provide on line chart recording of the mains supply for a period of one week at Practical Completion, at 6 months and at end of Defects Liability Period.
- Ensure the chart recorder includes the following information:
 - Voltage of each phase to earth and each phase to phase.
 - Current of each phase.

- Power factor.

Include the chart recorder and thermoscan information within the Operations and Maintenance Manual with simple explanation of the findings of each.

4.5.4 SITE ERECTION

Install floor mounted switchboards level and plumb using neatly cut and fitted packing plates under the channel base. Align shipping sections and bolt together. Fix the base to the floor by means of minimum 12mm stainless steel fixing screws, front and rear, at either end and at intervals of 2 meters along the length of the board.

Complete bus bar connections after alignment and bolting procedures are completed. Neatly pack the space under the base after levelling with sand-cement grout. Complete the inter-panel wiring.

Provide all floor mounted switchboards with a hot rolled steel 75mm channel plinth finished in black bitumastic paint. Provide concrete plinths where required as 20Mpa strength grade with an 80mm slump with a single layer of mesh.

Fix wall-mounted switchboards to masonry wall only. Load centres may be fixed to non-masonry walls.

4.5.5 TRANSIENT PROTECTION

Provide equipment and accessories, which generally incorporate protection of semiconductor components against damage caused by switching and other external transients.

4.5.6 EXTERNAL DESIGN

Provide enclosures comprising panels, doors and the like, giving the specified enclosure, segregation and degree of protection. Provide separate compartments with metal segregation for all extra low voltage equipment.

All switchboards located externally must only be provided with bottom entry cable access and the top of the switchboard must not include any cable entry provisions. Provide / design switchboards located externally with appropriate protection from the environment and features to accommodate the following:

- Minimum and maximum ambient temperatures.
- Direct sun.
- High pressure hose cleaning.
- Condensation.
- Wind.
- Corrosion.

Include details of how the above requirements have been addressed on the switchboard shop drawings.

Provide all switchboards other than those located in the following areas with doors:

- Switch rooms.
- Plant rooms.

Switchboards located in cupboards and risers are required to be provided with doors.

Provide all switchboards with a red oxide chromate undercoat and a baked gloss enamel finish.

Provide all external switchboards with rust proofing and as weatherproof.

Provide separate doors to all supply authority meter panels and cubicles.

Fabricate supporting frames from rolled, cold formed or extruded metal sections, with joints fully welded and ground smooth. Provide concealed fixing or brackets located to allow the assembly to be mounted and fixed in the specified location without removal of equipment.

Where stainless steel is nominated, use 316 marine grade stainless steel.

Machine fold sheet metal angles, corners and edges with a minimum return of 25 mm around the edges of front and rear panels, and 13 mm minimum return edge around doors. Provide stiffening to panels and doors where necessary to prevent distortion or drumming. All panels are to be continuously welded and ground smooth.

Provide equipment mounting panels, fixed to threaded metal inserts, located inside the enclosure at the rear of the mounting panels.

Provide fixings in the supporting structure, and removable attachments, for lifting switchboard assemblies whose shipping dimensions exceed 1.8 m high x 0.6 m wide.

Provide all visible hardware or hardware immediately behind doors, as chromium plated or stainless steel. Hardware behind escutcheons, Bramite panels and the like which is not normally visible, may be cadmium plated for internal switchboards and chromium plated or stainless steel for external switchboards. Secure Bramite panels using dome headed hexagonal nuts.

For all switchboards with a rating above 400Amps and in cases where the cabling cannot be concealed within wall, seal from the top of the switchboard to the ceiling with a framed removable covers of a material and finish to match the switchboard. Provide the removable covers with vermin proof seals that allow the cover panels to be removed and replaced maintaining the seal. Hang the covers on fixed studs with knurled nuts or captive nuts with knurled bolts, in either case fixing is to remain part of the panel or cover when the panel or cover is removed.

All switchboard covers, panels and doors are to be a minimum of 1.6mm thick to achieve NCC compliance.

Provide all removable doors and panels with locating pins designed to prevent it from falling when the fastening screws are removed.

Provide all switchboard doors with / as:

- Dished type
- Fitted with a combined lock and catch and a separate key
- Concealed door hinges

In locations the door covers a section of board where live terminations could be exposed once the door is opened, provide the door with the following engraved laminate red/white/red label with 10mm text;

'DANGER'
LIVE ELECTRICAL TERMINATIONS

LICENSED ELECTRICIAN OR
SUPPLY AUTHORITY REPRESENTATIVE
ONLY TO OPEN.

All cables entering switchboards must be provided with appropriate cable glands and the switchboard appropriately sealed to prevent vermin entry.

Ensure all busbar, switchgear and cable connections can be thermoscanned without isolating the power.

4.5.7 REMOVABLE PANELS AND COVERS

The maximum width of any removable panel is 750 mm. Hang panels and covers on fixed studs with captive stainless steel 8mm square quarter turn locks such that they remain part of the panel or cover when the panel or cover is removed. Provide two stainless steel 'D' type handles to each removable plate. Provide a resilient strip seal, of foam neoprene or the like, around each cover or panel, housed in a suitable channel or housing, fixed with an approved industrial adhesive. In indoor locations, provide certified smoke seals to all panels and covers. For external switchboards provide a continuous positive line of weatherproof contact.

All doors are to be locked using three-point locking system with stainless steel lockable swing handle. Supply four keys on individual stamped aluminium key tags. Ensure all of the switchboards are keyed alike and are keyed on the site master key system. All meter panels located externally and in areas subject to unauthorised access are to be locked to the supply authorities' requirements using the supply authority key.

Provide each door with a substantial internal stiffener fitted with plan pockets and wind stops.

Provide all fixings on switchboards located externally or in potentially corrosive environments as stainless steel. Provide all fixings on switchboards located internally in non corrosive environments as chrome plated. Plastic or nylon fixings are not acceptable.

4.5.8 ESCUTCHEON PLATES

The maximum width of any escutcheon plates is 750 mm and the maximum height is 1,200mm. Hang escutcheons on stainless steel lift off pintail hinges and provide captive stainless steel 8mm square quarter turn locks such that they remain part of the panel or cover when the panel or cover is removed. Provide two stainless steel 'D' type handles to each escutcheon. Provide the escutcheon plates with neat cutouts for circuit breaker handles and the like. Provide a continuous 12 mm wide support frame for the fixing of each escutcheon plate, including additional support where necessary to prevent panel distortion. Hang escutcheon plates on hinges, which allow opening through a minimum of 90 and permit the removal of the escutcheon when in the open position.

Provide cutouts in the escutcheons for all spare future circuit breakers. Provide blank fillers in all spare escutcheon cut-outs.

Ensure all circuit breaker labels and adjustment dials are visible through the escutcheon when the escutcheon is closed.

4.5.9 FINISHES

Where metal surfaces are to be painted:

- Unprotected steel: Remove rust by abrasive blast to AS 1627.4 Class 3, clean by immersing in trichloroethylene or an alkaline solution, and apply a coat of iron phosphate.
- Galvanised steel: Clean by immersing in a suitable alkaline or acidic solution, apply a chromate or zinc phosphate chemical conversion coating, rinse and degrease.
- Aluminium: Clean by immersing in a suitable alkaline or acidic solution, caustic etch and apply a chromate chemical conversion coating.

Paint the internal and external surfaces of all switchboards, control panels and meter panels located externally in a polyurethane epoxy or epoxy powder coat. Paint the external surfaces, escutcheons and doors of all switchboards, control panels and meter panels located internally with a baked enamel or epoxy powder coat. Paint the internal surface of switchboards, control panels and meter panels located internally as acrylic, baked enamel or epoxy powder coat. Ensure all paint finishes are applied in accordance with the manufacturer's recommendations.

After the switchboards have been installed, repair all chips and scratches in the paintwork to an as new condition.

4.5.10 CONDUCTORS

4.5.10.1 BUS BARS

Provide bus bar systems as high conductivity copper capable of withstanding the thermal, magnetic and physical stresses set up by the fault level detailed for a period of one second. Provide fault level calculations with the shop drawings. Phase colour the bus bars at appropriate intervals for ease of identification over their entire length at any opening, to within 10.0mm of fixings and terminations. Ensure the connections from the bus bars to the equipment are as short as possible and made using bus bars unless the latter is physically impossible. Design bus bar systems for continuous full load operation over a 24 hour period at an ambient temperature of 40°C, with short time peaks of 50°C, resulting in a maximum final bus bar temperature of 105°C. Make allowance for totally enclosed cubicles and for cubicles installed within recesses with or without doors. Provide neutral links and earth bars with sufficient capacity and terminals for connection of all conductors, one conductor per terminal, with spare capacity as detailed and with each terminal being numbered by means of stamping. Clearly mark and number terminal connections. Provide neutral bars with a current carrying capacity equal to that of the incoming phase conductors. Provide bus bar circuits within the switchboard, extending from the termination of the incoming unit to the line side of protective equipment for outgoing circuits. Provide stud connections for cables of cross section 16 mm² or larger.

Divide the bus bar system into separate 'essential' and 'non-essential' circuits, each segregated from the other by fixed and continuous barriers. Clearly label each segregated section of the bus bar system.

Pre-drill the Bus Bars for future extension and extend bus bar droppers to spare locations. Drill each dropper to suit connection of future equipment of the same type as that specified.

Radius all bus bar edges and corners to prevent damage to insulation. Provide support sufficient to withstand without damage, the maximum prospective fault currents. Make bus bar joints with high tensile bolts and nuts, locked in position with lock nuts or locking tabs. Tighten bolts to the manufacturer's recommendation with a tension wrench. Do not use tapped holes and studs or the like for jointing current-carrying sections.

Colour the insulation or bus bar as follows:

- Active Bus Bars: Red, white or blue.
- Neutral Bus Bars: Black.
- Earth bus bar: Green and yellow.

4.5.10.2 NEUTRAL AND EARTH LINKS

Locate neutral and earth links within 0.6 m of each cable entry. Provide terminals for incoming and outgoing neutral and earth conductors, including the MEN link. Provide additional terminals for future circuits. Provide a bolted removable copper bar link in the incoming compartment, between the neutral and earth Bus Bars in the main switchboard labelled "MEN LINK".

4.5.10.3 WIRING

Provide all wiring within switchboards as follows:

- Install all internal cabling neatly horizontally and vertically. Cable trough (PVC with slotted sides) may be used, or alternatively cables may be laced/loomed using proprietary cable ties, with adequate insulated supports being provided. Ensure laces/looms are not unnecessarily tight.
- Unless otherwise specified, provide PVC wiring ducts to support and manage all switchboard control wiring and outgoing sub circuits. Ensure the total cross section of the wiring within any one duct, including allowance for outgoing connections, does not exceed 40% of the duct cross sectional area.
- Support cabling to ensure that strain does not occur at terminations.
- Use crimp type lugs at terminations, unless equipment has been specifically designed to preclude terminations being made in this manner. Use lugs with insulated ends.
- Fix cables 25.0mm² and over in size to internal cable trays.
- Bush openings in internal barriers for the passage of cables to prevent damage to insulation using Wattmaster or equivalent 'movable' bushing, glue fixed in position.

- Install cables associated with metering equipment and current transformers in conduit.
- Identify wiring at each end of each conductor with a captive type marking ferrule. Horizontally mounted markings are read from left to right and vertically mounted markings are read from top to bottom.
- Provide the cable lugs associated with consumer's mains and/or submains with permanent identification to denote phase colours.
- Provide sufficient space on mounting rails for future outgoing circuits possible in any cabling compartment.
- Provide terminal blocks for interconnecting wiring on each side of shipping breaks.
- Identify, by markers, each control core using an approved numbering system.

Provide cables sized to suit a current carrying capacity of not less than the maximum continuous rating of the equipment mounted within the switchboard, or sized to withstand the 'let-through' energy of the circuit protective device, whichever is the greater. If the conductors are to be bunched or installed within wiring ducts, apply appropriate de-rating factors when determining conductor size. The minimum size power conductor is multistrand 2.5 mm².

Provide control and indication conductors of not less than 1.0 mm² with 32/0.2 stranding and otherwise sized to suit the current carrying capacity of the particular circuit.

Colour code the wiring as follows:

- A Phase: Red.
- B Phase: White.
- C Phase: Blue.
- Neutral: Black.
- Earthing: Green/Yellow.

If no provision is made in wiring ducts for external connecting cables, install a galvanised perforated cable tray between terminal blocks and cable entries, of a size, and with available access space, sufficient to permit ready installation of the external wiring.

Segregate electric circuits subject to possible interference, and the like.

For connections up to 15 kW load, provide rail-mounted, spring-loaded, tunnel type terminal blocks. For connections to circuits above 15 kW load, provide stud type terminals of a size to continuously carry the load and not less than 5mm diameter. Fit washers and lock washers to each stud, and barriers between adjacent studs. For tunnel type terminals, connect one conductor only into each end of the tunnel and interconnect terminal groups where necessary, by standard cross connectors. Terminate wiring into terminal blocks using compression type lugs compatible with the terminals and crimped by the use of the correct tool. Lugs for connection to tunnel type blocks will be of pre-insulated lipped blade type. Terminate internal wiring to the one side of the terminal block, leaving the other side for outgoing circuits.

Segregate terminal groups and install together terminals for each outgoing circuit, in the same order throughout, as follows:

- Terminals for power wiring: 3 phases or phase and neutral;
- Control terminals: In numerical or alphabetical order of wire identification, with the lowest number or letter next to the power terminals.

Where more than two 100Amp submains/circuits are reticulated through the switchboard for more than 600mm, provide a metal segregated cable zone to accommodate such cabling.

4.5.11 SWITCHGEAR AND CONTROL GEAR

4.5.11.1 MOULDED CASE AND MINIATURE CIRCUIT BREAKERS

Provide all circuit breakers of the same manufacturer.

Mount the circuit breakers so that the 'ON-OFF' and current rating indications are clearly visible with the cover or escutcheon in position, and so that arc discharges from the circuit breakers are directed away from live metal and insulation. Align operating toggles in the same plane.

For miniature over current circuit breakers provide clip tray assemblies, capable of accepting the installation of single, double, or triple circuit breakers, and related Bus Bars. Provide moulded clip-on pole fillers for all unused portions of the chassis.

Maintain sufficient space around the circuit breakers to allow all incoming and outgoing cables, including cables to spare poles, to be installed and terminated without overcrowding. For clip tray chassis mountings, the clearance between the circuit breaker terminals and compartment walls will not be less than 90 mm up to 36 poles and 115 mm above 36 poles.

Provide auxiliary contacts shunt trips, motor operators and other required accessories. All motor operated circuit breakers for load shedding switchboards to be fitted with under volts trips.

Provide all circuit breakers that do not have adjustable trip units that supply motors and / or inductive loads as D curve circuit breakers. All other fixed trip unit circuit breakers are to be provided as C curve circuit breakers. Advise the engineer in writing of the circuits that will be supplied with D Curve circuit breakers so the clearing times of earth faults can be checked.

4.5.11.2 RESIDUAL CURRENT DEVICES

Unless specifically noted otherwise, provide residual current devices (RCD) with a maximum tripping current of 30milli-Amps and a maximum tripping time of 20 milli-seconds. Use RCDs specifically designed to be added to or integral to the circuit breaker and be suitable for mounting in the same manner as specified for moulded case and miniature circuit breakers. Ensure all RCDs have a test facility which can be operated with the escutcheon closed. Use RCD/circuit breaker combinations that do not use more than a single pole per single phase circuit and no more than four poles per three pole circuit.

All RCDs that protect supplies to variable speed drives are to have a minimum tripping current of 300milli-Amps.

Ensure that short circuit, cascading, a discrimination performance of the circuit breaker will not be affected by the earth leakage device.

4.5.11.3 SWITCH-ISOLATOR AND FUSE-SWITCH UNITS

Ensure switch-isolator and fuse-switch units have a rated thermal current applicable to the unit when installed in the nominated enclosure and they have an uninterrupted rated duty. Ensure the rated short-circuit making capacity is not less than the switchboard fault level. For circuits comprising essentially motor or other highly inductive loads, use units with a utilisation capacity not less than AC-23. For other circuits, ensure the utilisation capacity is not less than AC-22.

Ensure that independent manual operation with a positive manually operated on-off indicator facility to lock the unit in the OFF position is provided.

Use totally enclosed units incorporating arc control devices and shrouded stationary contacts.

4.5.11.4 TIME SWITCHES

Provide time switches that operate either by synchronous motor or electronically controlled drive from 240 V 50 Hz supply. Provide day omit and manual override facilities. Photoelectric cell input for operation is to be integral.

To account for mains failure, provide either a 24-hour spring or a battery with 100-hour operating capacity and a guaranteed life of 5 years.

The minimum contact rating is to be 20A at 240 V AC to utilisation category AC-22.

Provide a readily accessible means of adjustment of the switch operation. Ensure the switch operational settings are clearly visible when the switch cover is fitted. All time switches mounted in switchboards are to be extended through the escutcheon.

Provide engraved or etched surrounds or labels, identifying the control function of each push button and switch and the operation at each switch position.

4.5.11.5 DAYLIGHT SENSORS / PE CELLS

Provide the daylight sensor as an adjustable din rail mounted controller with an LCD display that protrudes through the escutcheon. Connect the daylight sensor to a proprietary PE cell.

Provide each daylight sensor with a PE Cell "On / Off / Auto" by pass switch on the escutcheon.

Locate the PE Cell on site such that it is able to obtain an accurate indication of the daylight level under normal operation and such that it will not be obscured by the future growth of vegetation or effected by incident light from any light fittings on this site or adjacent sites. Ensure the PE cell is located on the work-as-executed drawing and the operating and programming instructions for PE cell clock are included in the Operations and Maintenance Manual.

4.5.11.6 CONTACTORS

Provide contactors with a minimum rating of 20A at AC-22 of the block type, air break rated for continuous duty. Ensure the contactor is rated above the full load current of the load controlled when mounted in the nominated enclosure. Provide contactors with a utilisation category above AC-3 or DC-3 as applicable. Provide auxiliary contacts for the specified control circuits. Where space is available, fit not less than two sets of spare contacts. Where the number of specified auxiliary contacts exceeds the number which can be accommodated, provide a separate slave relay. Ensure reversing contactors are mechanically and electrically interlocked.

Mount the contactor with sufficient clearance to other equipment and to its enclosure to allow full access for maintenance, removal and replacement of coils and contacts, without the need to disconnect wiring or remove other equipment. All contactors mounted in switchboards are to be extended through the escutcheon.

Do not connect contactors in series or parallel to achieve the specified ratings.

4.5.11.7 CONTROL RELAYS

Provide control relays with a minimum rating of 5A suitable for continuous operation under the specified conditions with operating characteristics suitable for the application. Use plug-in types latched to the receptacle base by a captive clip, which can be applied and released without the use of tools.

Ensure the control relays employ electrically separate, double break, silver alloy, and non-welding contacts.

For standard control relays, provide assemblies with a minimum of four sets of contacts and capable of being expanded to a total of eight contacts in the same assembly. Where space is available, provide not less than one normally open and one normally closed contact.

Provide contact blocks, which are readily convertible in the field to either normally open or normally closed contacts.

Use time delay relays adjustable over the full timing range and have a timing repeatability within 12.5% of the nominal setting.

Use phase failure relays of the solid-state type, which drop out at 80% of the normal voltage after an appropriate time delay. Ensure the sensing circuit rejects disturbances having frequencies other than 50 Hz, and induced voltage spikes.

4.5.11.8 FUSES WITH ENCLOSED FUSE LINKS

Provide fuse-holders and fuse-links of the same manufacturer throughout the installation. Mount the fuse-holders so that the fuse carrier may be withdrawn directly towards the operator and away from live parts, and provide fixed insulation which shrouds all live metal when the fuse carrier is withdrawn.

Provide fused links as enclosed, high rupturing capacity (HRC) type mounted in a fuse carrier. Provide a "fuse blown" indication, which is visible, when the link is fitted to its carrier. Where necessary, for safe removal and insertion of the fuse carrier, provide extraction handles and mount them on clips within the spares cabinet.

Provide fault current limiting fuses as HRC fuses (cartridge and fitting) with a minimum and maximum current rating.

Provide three spare fuse cartridges in each switchboard of each size installed in each switchboard, mounted on a holder fitted internally to the switchboard such that it is not visible when the door is closed. Provide tools fixed in a similar manner required to remove or install the entire fuse sizes used.

4.5.11.9 SURGE PROTECTION

Provide the main switchboard with surge protection in accordance with AS/NZS1768 with the following features and requirements:

- The Maximum Discharge Current, I_{max} , as defined in SANS 61643.1 must be 100kA, 8/20 μ s per phase.
- The Nominal Discharge Current, I_n , as defined in SANS 61643.1 must be 70kA, 8/20 μ s per phase.
- The Impulse Current, I_{imp} , as defined in SANS 61643.1 must be 20 kA, 10/350 μ s per phase.
- The Voltage Protection Level Up as defined in SANS 61643.1 must be less than 800V at 3kA 8/20 μ s and 6kV 1.2/50 μ s.
- The Voltage Protection Level Up as defined in SANS 61643.1 must be less than 1000V at 20kA 8/20 μ s and 6kV 1.2/50 μ s.
- The Maximum Continuous Operating Voltage, U_c must be 415 Volts.
- The products must be UL recognised under UL1449-2 standard.
- (The product must be equivalent to CRITEC TDS MT277 or the CRITEC TDS MPM)
- The surge diverter must have 5 Segment light indication and voltage free contacts. An alarm must be raised when there is approximately 50% depletion of the surge material on any phase.
- Provide a manufacturer's warranty of a minimum of 5 years for the surge diverter.
- Tested in accordance with the requirements of UL1449 Edition 2 and IEC 61643.12 Class I and II

Provide the distribution boards with surge protection in accordance with AS/NZS1768 with the following features and requirements:

- The Maximum Discharge Current, I_{max} , as defined in SANS 61643.1 must be 50kA, 8/20 μ s per phase.
- The Nominal Discharge Current, I_n , as defined in SANS 61643.1 must be 25kA, 8/20 μ s per phase.
- The Voltage Protection Level Up as defined in SANS 61643.1 must be less than 750V at 3kA 8/20 μ s and 6kV 1.2/50 μ s.
- The Voltage Protection Level Up as defined in SANS 61643.1 must be less than 1200V at 20kA 8/20 μ s and 6kV 1.2/50 μ s.
- The Maximum Continuous Operating Voltage, U_c must be 415 Volts three phase 240 Volts single phase.
- The products must be UL recognised under UL1449-2 standard.
- (The product must be equivalent to CRITEC TDS 150 or the CRITEC TDS350)
- The surge diverter must have light indication and voltage free contacts.
- Provide a manufacturer's warranty of a minimum of 5 years for the surge diverter.
- Tested in accordance with the requirements of UL1449 Edition 2 and IEC 61643.12 Class I and II

All surge protection devices mounted in switchboards are to be extended through the escutcheon.

4.5.12 LABELS

Provide each switchboard with a unique name label and a separate label detailing the source name, supply cable type // size and length.

Provide a two-colour laminated plastic schematic for each switchboard. Provide additional control schematics as required. Securely fix the schematics to the front of the switchboard or behind the switchboard door if the switchboard is provided with a door.

Include the following information on the schematics:

- All installed cable types, lengths and cable sizes.
- All protective device frame sizes and settings.

Provide samples of proposed label material, label sizes, lettering sizes and lettering text for approval.

Screw-fix each label adjacent to its relevant item of equipment, but not on the equipment.

Provide warning notices as white letters on red background and other labels as black lettering on a white background.

Provide the lettering height not less than:

- Switchboard designation: 25mm.
- Main switches: 20mm.
- Feeder control switches: 10mm.
- Identifying labels: (on outside of cubicle rear covers, etc.): 6mm.
- Equipment labels within cubicles: 4mm.
- Warning notices: 4mm.

Provide the main switchboard with a diagram indicating the route of any underground consumer's mains, printed on a durable card or similar, and indicating run distances for each 'leg' of the consumer's mains route.

Provide each switchboard with a neatly typed A4 circuit index schedule, that includes the circuit breaker number, rating and the circuit function (i.e. 4 G.P.O's Sales Area, etc.). Mount the circuit index schedule in an index holder located on the inside of the switchboard door that is provided with a clear perspex cover.

Include a copy of the circuit index schedule and the SLD in the manual.

4.5.13 SWITCHBOARD OPERATING PARAMETERS

4.5.13.1 MAIN SWITCHBOARD

Provide the main switchboard to the following requirements:

- Line: 400 v.
- Phase: 230 v.
- Frequency: 50 HZ.
- Number of phases: three.
- Number of wires: four.
- Neutral connection: star point.
- Earthing system: MEN.
- Ambient air temperature range: -5 to +45deg c.
- Relative humidity: 90%.
- Switchboard designations: main switchboard.
- Mounting: floor mounted.
- Degree of protection: IP56.

- Numerical designation: category 1.
- Incoming supply compartments and essential equipment supply compartments form 3. General light and power supply compartments form 1.
- Equipment connection: front connected.
- Gland plates: 3mm thick brass or aluminium or 6mm thick grey UV stabilised PVC in internal locations. Provide all gland plates with a neoprene gasket.

Arrange the MSB and DB-A such that all cable access comes out of the bottom of the switchboard and the top of the switchboard is fully welded with no penetrations.

4.5.13.2 DISTRIBUTION BOARDS

Provide the distribution boards to the following requirements:

- Line: 400 v.
- Phase: 230 v.
- Frequency: 50 HZ.
- Number of phases: three.
- Number of wires: four.
- Neutral connection: star point.
- Earthing system: MEN.
- Maximum fault level symmetrical: 6 (ka r.m.s.).
- Ambient air temperature range: -5 to +45deg c.
- Relative humidity: 90%.
- Switchboard designations: DB.
- Mounting: wall mounted.
- Degree of protection: IP42.
- Numerical designation: category 1.
- Form 1.
- Equipment connection: front connected.
- Gland plates: 3mm thick brass or aluminium or 6mm thick grey UV stabilised PVC in internal locations. Provide all gland plates with a neoprene gasket.

4.5.14 MATERIALS AND FINISH

Provide the MSB / DB-A as:

Enclosure: Grade 316 Stainless steel, powder coat Light Grey, (AS 2700 - colour N35).

Escutcheons: Grade 316 Stainless steel I, powder coat white.

Doors: Grade 316 Stainless steel, powder coat Light Grey, (AS 2700 - colour N35).

Plinths: Mild Steel, Painted Black.

Provide DB-B as:

Enclosure: Zincoanneal, powder coat Light Grey, (AS 2700 - colour N35).

Escutcheons: Zincoanneal, powder coat white.

Doors: Zincoanneal, powder coat Light Grey, (AS 2700 - colour N35).

Plinths if required: Mild Steel, Painted Black.

4.6 EARTHING SYSTEM

Provide a comprehensive earthing system throughout the project addressing all aspects of the structure, all services, all systems and components in addition to those forming part of the power distribution.

Provide transient earth clamps between the power earth system and the connection to all other earthing systems. Bond the power earthing system to the building structure.

Provide a dedicated LV earthing system which includes a minimum of two earth electrodes a minimum of 2,000mm apart:

- Type: MEN.
- Material: Copper.
- Maximum earth resistance: .5 OHM.

Provide the earth electrodes as solid copper rod incorporating integral driving heads and points. Solid stainless steel rods grade 302 is also acceptable. Install earth electrodes vertically. Electrodes may be driven directly into the ground or installed in holes previously drilled and packed with suitable conductive graphite slurry.

Where electrodes are to be installed in rock, fill the gap between the rock and electrode with a bentonite clay or resin compound or as otherwise approved.

Install each electrode in a 200 mm bore hole, backfill with a conductive metallic grouting compound and compact with a vibrator.

Locate each earth stake in a PVC enclosure flush with the surrounding ground level with a lid that is removable with the use of a tool. The lid is to be permanently labelled "Power supply Earth Stake". Stick on and hand stencilled labels are not acceptable. Configure the enclosure such that the top of the earth stake and the bond to the interconnecting cable can be readily inspected when the lid is removed.

Provide additional bonding between the earthing system and the following:

- Slab reinforcing mesh.
- Building services.

Run a PVC-insulated copper conductor from the main switchboard earth bar to the slab reinforcing mesh. Clamp conductor to mesh (one point of contact only required) with a brass earth clamp. Wrap clamp and exposed copper conductor with insulation tape. Provide a label engraved 'Slab Reinforcing Mesh Bond' adjacent to termination on earth bar.

Copper conductor to penetrate slab inside building enclosure and be such as to avoid moisture penetration to slab reinforcing mesh.

Bond the electrical earth to all piped services (if metallic pipes) at the closest practical point to where these piped services enter the building. This includes cold water, hot water, soft water, steam, condensate return, waste, medical gases, suction and the like. The bonding earth conductor to be 6mm² minimum.

In all public accessible arrears and areas that the earth stakes could be subject to interference during normal operations such as being bumped locate each earth stake in a flush proprietary in-ground earth stake pit complete with a permanent label "Electrical Earth Stake. Do not disturb". Where the earth stake is not located in a proprietary pit, provide a permanently fixed label adjacent the earth stake "Electrical Earth Stake. Do not disturb"

4.7 THIS SECTION IS NO LONGER REQUIRED

5.0 LIGHTING

5.1 SCOPE

The lighting component of this contract includes all internal and external lighting, general lighting control, emergency and evacuation lighting and the lighting sub circuit wiring. All of the light fittings and accessories are to be provided as part of this contract.

All fixed light sources are to be solid state LED with a 5-year manufacturer's warranty.

The lighting component of this contract includes, but is not limited to the following extent of work:

- Lighting.
- Light fittings and accessories.
- Earthing of the lighting installation.
- Lighting control.
- ***A Philips Dynalite lighting control system is not required.***
- Emergency and exit lighting.
- Lighting subcircuits.

Provide a sample of each of each type of light switch, lamp and luminaire. Provide Shop Drawings of all custom luminaires. As part of the tender submission, the Electrical Sub-contractor must include for all contractual requirements and costs required by the suppliers to the electrical sub-contract, provide the necessary samples. The Electrical Sub-contractor must bear the cost of supplying samples of the components specifically specified as well as those specified generically or by performance.

All suppliers and sub-contractors to the Electrical Sub-contractor must ensure they are familiar with and comply with the requirements of sections 1.0, 2.0 and 3.0 of this specification.

Locate all transformers, drivers and control gear in accessible positions with the position and equipment details noted on the as built documents / manual.

Confirm the length, location, mounting arrangement and orientation of all LED extrusions / strip lights during rough in. Changes to the LED extrusions / strip lights due to the contractors failure to obtain the required confirmation prior to installation do not constitute valid grounds for a variation.

5.2 COMMISSIONING

5.2.1 GENERAL

Upon the completion of the commissioning of the lighting, provide a written and signed statement that the lighting installation:

- Has been fully commissioned in accordance with this specification.
- Has been fully programmed as necessary.
- Has been tested.
- Complies with the intent of the contract.
- Complies with the relevant authority requirements.
- Complies with the relevant standards and codes.
- Is fit for purpose and suitable for the intended use.

As part of the commissioning of the lighting, undertake the following tests as relevant on all components of the lighting installation.

Schedule the results for each item and component and include a copy of all test results in the Operations and Maintenance Manual.

As part of the commissioning of the lighting, undertake any necessary adjustments to components of the lighting installation which have integral adjustment capacity as directed by the project manager. Record all adjustments and include a copy of the adjustment records in the Operations and Maintenance Manual.

Chemically clean all reflectors, lenses, diffusers and lamps prior to the aiming and adjusting of the lighting installation.

Undertake each of the following mechanical checks for each component of the lighting installation as part of the commissioning process:

- All luminaires have been positioned to coordinate with other installers (such as air conditioning contractors, installers of girders and plasterers).
- All luminaries are in the correct position and in the correct orientation.
- All luminaries are clean and undamaged with the correct LEDS.
- All channel dials and function switches (as appropriate) have been set to the required settings.
- All sensor levels have been set to the required levels.
- All components are uniquely and clearly labelled.
- The alignment of all luminaries has been adjusted to avoid glare and unwanted over-spill.
- All cover plates have been fitted and electrical segregation is complete.
- All safety chains, safety cords and filter holders etc. on luminaries have been securely mounted; associated control gear have been fixed securely on lighting trusses, booms, barrels and bars, or placed in a secure position.

Undertake each of the following electrical checks for each component of the lighting installation as part of the commissioning process:

- All luminaries, switched and sensors have been wired correctly.
- All lights and track circuits have been wired to the required control switch or dimmer.
- All mains wiring has been tested and certified as complying with the recommendations of AS3000.
- The voltage and frequency is stable and within the relevant authority limits.
- Control operation.
- The Resistance to earth of each fitting switch panel and exposed metallic component.
- The supply voltage and frequency at each fitting.
- Overload protection has been installed and operates correctly.
- Fault protection has been installed and operates correctly.

At practical completion provide a Queensland Government, Department of Local Government and Planning Form 16 certifying the lighting installation and include a copy in the Operations and Maintenance Manual.

5.2.2 LIGHTING CONTROLS

Confirm all light occupancy sensors are located and orientated appropriately in relation to the occupants. Confirm the occupancy sensor sensitivity and timing is appropriate by adjusting the detector to ensure the occupant movement is detected throughout the occupied zone. Configure the sensitivity to ensure seated occupants are detected, whilst movement outside the controlled zone does not activate the lights. Confirm the time delay setting is representative of the occupant movement patterns and is assessed when the building is occupied.

Set all start and stop times along with override controls (e.g. occupant or security staff override) as advised by the engineer on site.

Allow to fully commission all of the lighting control systems prior to practical completion and then make any adjustments requested by the project manager or operator at 3 month intervals for 12 months post practical completion. Document all such changes and update the manual with the changes.

5.2.3 EMERGENCY LIGHTING

The commissioning of emergency lighting must be in accordance with AS2293 and completed by the holder of a Queensland Building and Construction Commission (QBCC), Emergency Lighting Licence, Class 1 and 2. Provide a copy of the QBCC licence and associated professional indemnity insurance certificate for approval prior to practical completion and include a copy in the Operations and Maintenance Manual.

At practical completion provide a Queensland Government, Department of Local Government and Planning Form 16 certifying the emergency lighting installation and include a copy in the Operations and Maintenance Manual.

5.3 LUMINARIES

5.3.1 GENERAL

It is the electrical sub-contractor's responsibility to ensure the luminaire is appropriate for the intended location considering the following:

- Mounting requirements.
- Lay in diffusers are sized such that they do not fall out of the light fitting or ceiling when the installation is subjected to normal air pressure changes and / or winds.
- Fitting size.
- IP protection.
- Exposure to corrosive environment.
- Hazardous environment.
- UV exposure.
- Safety.
- Heat.
- Vandalism.

Irrespective of the fitting type specified, provide all light fittings in compliance with the restricted zone requirements of AS/NZS 3000. Provide all light fittings over baths as Class II double insulated.

Provide all discharge fittings with low loss control gear. Replace any ballasts causing audible humming or crackling. Ensure all discharge lamps are compatible with the ballasts and other starting and control gear. Provide written evidence from the manufacturer of such and include it within the manuals.

Provide recessed luminaries with an external 1500 mm length of 1mm² 3-core PVC/PVC flexible cord to AS/NZS 3191, connected to a 10 A 3-pin plug top to AS/NZS 3112 (Flex and Plug).

Provide all discharge light fittings with power factor correction to achieve a power factor of not less than 0.9 lagging after two hours of continuous operation.

Where required by the supply authority, provide blocking inductors to the authority's approval.

Provide luminaries with all internal wiring colour coded to AS/NZS 60598.1.

Provide each extra-low voltage luminaire with a dedicated step down transformer c/w internal automatic thermal switch and a flex and plug. Provide the engineer with written confirmation that the proposed step-down transformers are compatible to be dimmed by the dimmers specified. Mount the transformers such that they are hanging in free air in a concealed location such that they can be accessed and removed.

5.3.2 MOUNTING

Co-ordinate with other trades to ensure that mounting locations are clear of other services. Ensure the locations of all luminaries are symmetrical with the adjacent fixtures and that unintentional glare is avoided.

Provide luminaries suitable for mounting in the required position or ceiling type. Ensure that all luminaries and luminary control gear are not covered by insulation and have appropriate ventilation. Mount all light fittings to fixed rigid supports.

Provide termite resistant plywood support to all luminaries mounted within lay-in ceiling tiles such that the weight of the light fitting and control gear is supported on the ceiling grid and not on the tile. Provide all necessary T Bars and cut tiles required to accommodate the installation of luminaries mounted within suspended tile ceilings. Provide all necessary additional structural supports and T Bar rails to mount the fittings and support the plywood support. Provide all cutouts in set plaster ceilings and modify the structural support of the ceiling where necessary to accommodate the cut-out.

Provide all light fittings mounted within T Bar ceilings with a flexible lead and plug and an unswitched active. Provide such fittings with an approved plug base securely fixed to the structure above the fitting.

For fixing of surface-mounted luminaries to ceilings or walls, provide not less than, four fixings in square and rectangular luminaries and three fixings in circular luminaries, placed symmetrically.

In locations light fittings are recessed into thermal or acoustic insulation provide all necessary supports and modifications to the insulation to allow the fitting to be installed and the integrity of the insulation to be maintained.

Provide suspensions and luminaries suspension connectors capable of supporting, without damage, five times the mass of the luminaries, or 25kg, whichever is the greater. Ensure all suspended light fittings hang horizontal and adjacent fittings are hung to the same level. Provide all light fittings suspended from a raked ceiling with an adjustable ceiling mounting such that the fitting equipment hangs vertically. Where light fittings are not supplied with integral suspensions provide the suspensions as follows:

- Structurally support the light fittings on threaded booker rod.
- Cover the booker rod with conduit painted to match the light fitting colour.
- Run all wiring to the light fitting through the conduit.
- Fix the conduit into a ceiling rose on the ceiling to provide a neat finish to the conduit.

In all cases suspended light fittings are subject to movement due to wind or air conditioning breeze provide the suspensions as fixed rod suspensions.

5.4 EMERGENCY LIGHTING

Provide a single point emergency lighting system that complies with the latest issue of all parts AS2293 and the relevant parts of the Building Code of Australia.

Provide emergency light fittings nominated as maintained as follows:

- If the fitting has only a single lamp, the lamp is to be permanently on supplied via an unswitched active mains supply when the mains supply is available. When the mains supply is not available, the lamp is to remain on supplied by the emergency pack. Single lamp maintained emergency lights are not switched with the local general area lighting. (The lamp is always on.)
- If the fitting has more than one lamp and it is not shown as being switched with the local general area lighting, all lamps are to be permanently on, supplied via an unswitched active mains supply when the mains supply is available. When the mains supply is not available all lamps are to remain on supplied by a separate emergency pack for each lamp. (All lamps are always on.)
- If the fitting has more than one lamp and is shown as being switched with the local general area lighting, one lamp is to be unswitched and remain permanently on supplied via an unswitched active mains supply when the mains supply is available. When the mains supply is not available the unswitched lamp is to remain on supplied by an emergency pack. All of the remaining lamps excluding the unswitched lamp are to be switched with the local general area lighting. (One lamp is always on.)

Provide emergency light fittings nominated as non-maintained as follows:

- If the fitting has only a single lamp and it is not shown as being switched, the lamp is to remain off when the mains supply is available. When the mains supply is not available the lamp is to be switched on supplied by the emergency pack. Unswitched single lamp non-maintained emergency lights are not switched with the local general area lighting. (The lamp is on only when the mains supply is not available.)

- If the fitting has only a single lamp and it is shown as being switched, the lamp is to be supplied and controlled with the local general area lighting when the mains supply is available. When the mains supply is not available the lamp is to be switched on, supplied by the emergency pack. (The lamp is on when turned on with the local general lighting or the main supply is not available.)
- If the fitting has more than one lamp and it is not shown as being switched with the local general area lighting, all lamps are to remain off when the mains supply is available. When the mains supply is not available all lamps are to be switched on supplied by a separate emergency pack for each lamp. (All lamps are on only when the mains supply is not available.)
- If the fitting has more than one lamp and is shown as being switched with the local general area lighting, all lamps are to be supplied and with the local general area lighting when the mains supply is available. When the mains supply is not available, one lamp is to be switched on, supplied by an emergency pack. (All lamps are to be turned on with the local general lighting and only one lamp is on when the main supply is not available.)

Provide the emergency lights as the self-contained type, Twin rate constant current, constant voltage, and temperature compensated type with automatically selected boost and float charging rates, 70°C rated sealed plastic type nickel cadmium cells or other approved type with a rated battery life of 7 to 10 years at the operating conditions in site. Indelibly stamp each battery with its date of manufacture. Protect the inverter system against damage whilst in operation in the event of failure, removal or replacement of a lamp.

Install emergency lights such that the status LED is clearly visible and the test buttons are readily accessible. Install the emergency lighting kits within fluorescent luminaires within the housing containing the 240 volt lamp control gear, and be fitted by the luminaire manufacturer and comply in all respects with AS2293. Provide emergency lighting kits consisting of battery, charger and associated control gear such that in the event of mains failure the battery operates one (1) of the normal fluorescent lamps at reduced output (not less than 25%).

Label each circuit breaker which controls the unswitched active to exit lights with a label fixed adjacent; engraved plastic laminate, green background with white characters:-

**WARNING
INTERRUPTING SUPPLY WILL DISCHARGE
EMERGENCY LIGHTING BATTERIES**

The emergency light fittings and exit signs are not to be energised until permanent power supplies are available, and in any event are to be commissioned in accordance with the manufacturer's recommendations and the following guidelines:

- When first connected to the supply, ensure the fittings remain connected without interruption, for a minimum of 48 hours. Carry out a full 2 hour discharge test, allowing the batteries to fully re-charge (minimum 24 hours), remove the lamp and disconnect from the power supply until no other interruptions to the power supply is likely or planned.
- In the case of installation with multiple master meters, and no permanent supply, the fittings are to be tested as previously outlined using 'builders supply' or temporary generator and left in a condition ready for operation when the permanent supply is connected.

Provide written evidence of the initial commissioning and testing and testing for the duration of the maintenance period in accordance with AS/NZS 2293.2.

This evidence is to be in the form of a log book similar to the General Lighting Service Pty Ltd "Emergency Lighting Maintenance Log Book and Manual" which is to be provided by the electrical sub-contractor and have all entries fully completed and be presented for inspection at practical completion. The log book is to be retained by the electrical sub-contractor for the duration of the maintenance period, and the six monthly test and maintenance results entered. The log book is to be presented for approval at final completion (expiry of the maintenance period) and will be forwarded to the operator for their use.

Provide maintenance of the emergency and exit lighting installation including records in accordance with the latest issue of all parts AS2293 and the relevant parts of the Building Code of Australia.

In the locations that are illuminated by discharge lamps provide a 15 minutes run on timer controlling the active supplies to the emergency lights such that upon the reinstatement of the mains supply the emergency lights continue to operate in emergency mode for a 15 minutes.

Provide each switchboard that supplies emergency lighting system with a supply sensing and testing facility in accordance with AS 2293.1.

5.5 LIGHTING CONTROL SYSTEM

5.5.1 GENERAL CONTROLS

Provide all manual light switches that are not controlling inductive loads (luminaries that do not have transformers or magnetic ballasts) as 20A mechanisms mounted with the rocker operating in the vertical position. Provide all manual light switches that control inductive loads (luminaries that do have transformers or magnetic ballasts) as 15A inductive load mechanisms mounted with the rocker operating in the vertical position. Position manual light switches and switch panels at 1100mm AFFL unless noted otherwise. Where multiple switches are located in the same location, use multigang switchplates. Use standard faceplates for quantities of up to six switches. For quantities of more than six switches and in locations dimmers and fan controllers are required, use flush engraved black marked stainless steel multigang switchplates. Where the function of any switch is not immediately logically obvious, label the switch with an engraved contrasting colour label on the switchpanel.

Provide all switch mechanisms in bathrooms, laundries, toilets, amenities and in locations the switch is within 2,000mm of a tap as IP56.

Switch the load via an AC3 20 Amp switching contactor for all switched lighting loads above the following ratings:

- Resistive loads above 2,500 watts.
- Inductive loads above 1,500 watts.
- Capacitive loads above 1,000 watts.

In locations that have accessible ceiling space, locate the switching contactors in an IP56 PVC storm grey din rail enclosure mounted in the ceiling space above the switch panel no more than 1000mm horizontally from the switch panel. In service areas that do not have accessible ceiling space, locate the switching contactors in an IP56 PVC storm grey din rail enclosure wall mounted against the ceiling or at 2,400mm AFFL immediately above the switch panel, no more than 1000mm horizontally from the switch panel. In all other locations, locate the switching contactors in the distribution board.

Provide a screw fixed engraved label with the words "This switch panel has two sources of supply" immediately above any switch panel that has supplies from different sources or distribution boards.

Utilise battery backed-up 24 hour 7 day programmable time clocks with a separate contactor to switch the time clock controlled load. Locate the time clock and contactor within an equipment section of the associated switchboard. Provide each time clock with a key-operated bypass switch mounted on the door of the associated switchboard. Obtain from the operator the settings of each time clock. Ensure the operating and programming instructions for each time clock are included in the Operations and Maintenance Manual.

Utilise adjustable photo electric (PE) cells with a separate contactor to switch the PE Cell controlled load. Locate the PE Cell on site such that it is able to obtain an accurate indication of the daylight level under normal operation and such that it will not be obscured by the future growth of vegetation or effected by incident light from any light fittings on this site or adjacent sites. Mount the PE Cell in an inverted position. Provide each PE Cell with a key operated bypass switch mounted on the escutcheon of the associated switchboard. Ensure the PE cell is located on the work-as-executed drawing and the operating and programming instructions for PE cell clock are included in the Operations and Maintenance Manual.

Provide all over-rides of the automatic lighting control with adjustable time over-ride periods. Provide the timers with a time range from one minute to two hours. Locate the adjustable timers in the associated distribution board and label appropriately.

5.5.2 PHOTO-ELECTRIC (PE) CELL

Provide PE cells as weatherproof, polarised, plug-in units with a mounting bracket and adjustable turn-on lighting level, surge protection, and a minimum 30 seconds 'on' or 'off' delay. Ensure the PE Cells have a voltage range of 220 to 260 volts and a temperature range of minus 10 degrees C to plus 75 degrees C. Provide PE Cells that are capable of being mounted in direct sunlight, without affecting the cell characteristics.

Provide a PE Cell "On / Off / Auto" by pass switch on the escutcheon of the associated distribution board for each PE Cell to provide ON / Off / Auto control of the PE Cell.

5.6 ADJUSTING AND AIMING OF LIGHTING INSTALLATION

Ensure the following components of the lighting Installation are complete and have been checked and tested prior to the adjusting and aiming of the lighting installation to commence:

- Circuiting.
- Labelling.
- Connection of correct lights to correct channels.
- Correct operation of lighting control system.
- All lights have been installed and are operating.

Should these items not be complete prior to the adjusting and aiming of the lighting installation the additional expenses in re-attending the installation to undertake the adjusting and aiming of the lighting installation as incurred by the project manager will be charged to the Electrical Sub-contractor.

Allow for the adjustment and aiming of luminaries over a period of four (4) hours per night for two (2) nights during the hours of darkness to achieve final set-up. This work will be carried out under the direction and to the satisfaction of the project manager.

Provide all equipment such as ladders, scaffolding and tools necessary for adjusting each luminaries. Should the Electrical Sub-contractor not have available the necessary equipment to complete the adjusting and aiming of the lighting installation, the additional expenses in re-attending the installation to undertake the adjusting and aiming of the lighting installation as incurred by the engineer will be charged to the Electrical Sub-contractor.

The adjusting and aiming of the lighting installation will include the following:

- Setting all PE cells and time clocks.
- Focusing of lights.
- Adjusting mountings and brackets.
- Aiming of fittings.
- Testing all operations of the lighting control system.
- Testing the emergency and exit lighting system.

Allow attending site twice during the defects and liability period and undertaking the above adjustments to and reprogram as directed by the operator the lighting installation.

Document the final results of all adjusting and aiming of the lighting installation and include them in the Operations and Maintenance Manuals.

6.0 COMMUNICATIONS CABLING

6.1 SCOPE

The communications cabling component of this contract includes the provision of a new NBN **lead-in** and NBN compliant pathway via a PCD to an NTU.

Advise the engineer when the NBN pathways have been completed such that the engineer can arrange for the NBN to inspect the pathways.

The communications cabling component of this contract includes an integrated telephone and data EIA/TIA 568-A Category 6 CommScope certified RJ45 cabling solution.

Provide three 42 RU 600 wide x 600 deep 19 inch racks:

- CR-1 General communications.
- CR-2 Gaming.
- CR-3 Security and audio visual.

Provide a 600 wide x 600 deep 19 inch rack CR-T as required by the TAB under the TAB counter for the TAB services.

Within all cases in this contract, Category 6 and Cat 6 is to be read as Category 6 Class E.

Provide different coloured UTP cabling including all fly and patch leads for the following:

- General communications.
- Gaming.
- CCTV.
- TAB

The terms Category and Cat are used interchangeably throughout this contract to refer to cabling types and standards.

Provide all copper products within the communications cabling scope as being capable of supporting the provision of power to the Data Terminal Equipment via the electrically conductive Media Dependant Interfaces as specified in the latest IEEE 802.3af "Power over Ethernet" standard.

Use only the 568A wiring scheme for 8-position modular components throughout the site. Do not mix 568A and 568B wiring schemes.

The communications cabling component of this contract includes but is not limited to the following extent of work:

- Communications cabling.
- Cable access ways.
- NBN lead-in pathway.
- Relocation of the existing lead-in service.
- Earthing.
- Facility cabling.
- 19-inch equipment rack/s.
- Patch panels.
- Patch leads.
- Communications outlets.
- Independent certification.
- Testing and commissioning.
- Factory terminated patch leads.
- Take possession of the duplex fibre cable from the gaming monitoring company and install it for them to terminate.

Provide the communications system as a propriety structured cabling system with a component manufacture's 25 year warranty over the communications installation. Include a copy of the propriety structured cabling system manufacturer's warranty in the Operations and Maintenance Manual.

Provide comprehensive details for approval of the structured cabling solution including the manufacturer's performance and installation requirements as well as details of the patch panels, frames, patch leads, cables, faceplates, outlets, and fly leads.

All suppliers and sub-contractors to the Electrical Sub Contractor must ensure they are familiar with and comply with the requirements of sections 1.0, 2.0 and 3.0 of this specification

Ensure that the work is performed by the holder of a current ACMA license and the staff member has been trained and is certified by the propriety structured cabling system manufacturer. Provide a copy of the appropriate ACMA license and propriety structured cabling system manufacturer's certification for approval prior to commencing work onsite and include a copy in the Operations and Maintenance Manual.

Ensure that the work is performed by the holder of a current ACMA license and the staff member has been trained and is certified by the propriety structured cabling system manufacturer. Provide a copy of the appropriate ACMA license and propriety structured cabling system manufacture's certification for approval prior to commencing work onsite and include a copy in the operating and maintenance manual.

Provide as part of the tender response, a list of the technical support staff and installation staff, together with their working experience in the relevant field who are proposed to undertake the installation and provide maintenance support. Include the date each of the nominated staff members received formal classroom training by the structured cable system manufacturer. Nominate the location of the office proposed to control and support the installation and maintenance.

6.2 INSTALLATION REQUIREMENTS

6.2.1 CABLING

6.2.1.1 GENERAL

Shielded twisted pair cables are not acceptable.

Ensure all communications cables are not installed with a pulling force that exceeds the manufacturer's recommended maximum pulling force. Use cable mounted pulling eyes / cable netting to install cables.

Do not paint communications cables.

Do not run communications cabling and power cables parallel in skirting duct for more than 10 meters.

Do not use motorised winches or vehicles to pull in communications cables.

Ensure the cable manufacturer's minimum bending radii are not exceeded at any time. Any cables that exceed the cable manufacturer's minimum bending radii or are kinked must be entirely replaced.

The communications cables are to avoid areas of concentration of electrical power and mechanical and hydraulic services.

Ensure where cables are reticulated via catenary wire, horizontal cables are tied off loosely, to the catenary wire at intervals no greater than 600 mm. Ensure a maximum of twenty-four (24) four pair UTP cables are supported on a single catenary wire support.

Ensure tension on the cable tie is such that ties must be able to be moved laterally along the cable run and yet still maintain the cable to the support structure.

Utilise installation procedures that ensure that no undue stress is placed on any cable and there is not any evidence of sag or kinks.

Ensure cable entry into a power pole, riser column, duct or cavity is preceded by at least a one-turn service loop of minimum 300 mm in diameter prior to entry into the pole, column, duct or cavity to allow for minor moves and changes allowances.

Use waterfall type control accessories for vertical direction changes of more than 45 degrees.

Ensure all cables have a unique cable identification permanently and legibly placed at each end of the terminated cable within approximately 200 mm from where the cable is terminated utilising a Brady type wrap around each label.

Do not install more than 10 UTP cables in a 35 x 40 duct or 15 UTP cables in a 40 x 50 duct or 18 UTP cables in a 50 x 50 duct. Do not install more than 75 UTP cables on a 150 wide tray or more than 160 UTP cable on a 300-wide tray. Do not install more than 2 UTP cables in a 20 dia conduit or 2 UTP cables in a 25 dia conduit or 7 UTP cables in a 32 dia conduit or 18 UTP cables in a 50 dia conduit. All communications cable trays are to be supported by cantilever L type brackets.

Ensure all communications conduits have 50% of the cross sectional area as spare after all of the cabling has been installed.

Use cable supports that are smooth and at least 34 mm wide with rounded-off edges.

It is not acceptable for any communications cables to be buried direct.

Ensure all cabling that is installed externally is loose tube, gel filled flooded PVC insulated PE sheathed installed in conduit. Ensure all external cabling including locations that are not secure such as sheds, covered areas, pool buildings, etc is installed in conduit and the conduit is arranged such that any water that may enter the conduit will immediately run out and not be trapped in the conduit. Minimise the extent of gel filled cable installed internally. Obtain approval of all internal runs of gel filled cable that are more than 30m. Do not use gel filled cable where the cable does not run externally.

Segregate the communications cables from other services by a minimum of 50mm. Increase the segregation distance as required to ensure the other services do not cause interference in the communications cabling.

For segregation between communications cabling and power cabling where a metallic earthed barrier is not present ensure:

- Where there are no more than 15 bunched circuits and all of the circuit are protected by an overcurrent device less than 60 Amps, a 200mm physical segregation is maintained.
- Where there are between 16 and 30 bunched circuits and all of the circuit are protected by an overcurrent device less than 60 Amps, a 300mm physical segregation is maintained.
- Where there are more than 30 bunched circuits and all of the circuit are protected by an overcurrent device less than 60 Amps, a 600mm physical segregation is maintained.
- Where any circuit is protected by an overcurrent device larger than 60 Amps a 600mm physical segregation is maintained.

For segregation between communications cabling and power cabling where a continuous metallic earthed barrier is present ensure:

- Where there are no more than 15 bunched circuits and all of the circuit are protected by an overcurrent device less than 30 Amps, a 50mm physical segregation is maintained.
- Where there are between 16 and 30 bunched circuits and all of the circuit are protected by an overcurrent device less than 30 Amps, a 100mm physical segregation is maintained.
- Where there are more than 30 bunched circuits and all of the circuit are protected by an overcurrent device less than 30 Amps, a 150mm physical segregation is maintained.

- Where there are no more than 15 bunched circuits and all of the circuit are protected by an overcurrent device less than 60 Amps, a 150mm physical segregation is maintained.
- Where there are more than 16 bunched circuits and all of the circuit are protected by an overcurrent device less than 60 Amps, a 300mm physical segregation is maintained.
- Where there are no more than 30 bunched circuits and all of the circuit are protected by an overcurrent device 60 Amps or more, a 300mm physical segregation is maintained.
- Where there are more than 30 bunched circuits and all of the circuit are protected by an overcurrent device 60 Amps or more, a 450mm physical segregation is maintained.

Ensure all UTP cabling is segregated from the following equipment by at least the dimension given:

- Segregate from all electrical appliances by more than 300mm.
- Segregate from all light fittings including remote control gear by more than 150mm.
- Segregate from all photocopiers and printers by more than 500mm.
- Segregate from all mains switching devices by more than 500mm.
- Segregate from all lighting system dimming equipment by more than 500mm.
- Segregate from all UPS less than 10kVA by more than 100mm.
- Segregate from all UPS between 10kVA and 30kVA by more than 300mm.
- Obtain a specific direction for the segregation distances for UPS larger than 30kVA.
- Segregate from all VSD controllers and VSD to motor cabling by more than 3,000mm.
- Segregate from all radio (wireless) transmitters by more than 3,000mm.
- Segregate from all thermostats by more than 500mm.

Ensure the communications cables are installed in dedicated compartments (separate to any power cabling) in all umbilical cable access ways associated with modular office systems. Additional separation or barriers are not required within the umbilical cable access ways. Ensure the ends of the umbilical cable access ways are arranged such that the minimum bending radius of the communications cables are not exceeded.

6.2.1.2 UNSHIELDED TWISTED PAIR CABLING

UTP cables within bundles or on tray are to be laid randomly and not installed in straight lines.

Install cables so coils and any bends follow the natural spiral lay of the cable.

Do not bundle more than 24 UTP cables in the same bundle and do not mix different category UTP cables in the same bundle.

Ensure the untwist in a pair at the IDC termination is less than, 13 mm for category 5 cables and 5 mm for category 6 cables.

Ensure all permanent category 6 cables have a minimum length of 15 m.

Secure Cat 6 cables with 6mm wide elastic Velcro™ ties applied at random spacing's up to 300mm apart on catenary wires and on vertical runs such that the weight of the cables are adequately supported.

Irrespective of the manufacture's recommendations ensure that the bending radius is not less than 50 mm radius (100 mm dia) during cable pulling, and not less than 25 mm radius (50 mm dia) for hand placement.

Avoid the provision of spare cable where possible unless specifically called for. If spare cable is specified as being required locate the spare cable so it is fully supported and that the minimum bending radius is maintained. Do not locate the spare cable inside service poles or skirting ducts. If spare cable is contained in loops, ensure there are no more than 4 loops in a coil and each loop is a different diameter with minimum diameter of 300 mm.

Ensure the cable sheath stripped back at any termination less than 10 mm from termination module.

Provide all facility cable as unshielded twisted pair having the following characteristics:

- Ensure the facility cables do not exceed 90m in length.
- 24 AWG 0.51mm solid plain annealed copper conductors.
- 4 pair/8 conductors.
- The insulated conductors shall be twisted into pairs, with the pairs balanced for maximum performance and noise reduction.
- Colour coded high density PVC-V75 diameter 1mm insulation.
- PVC-V75 sheath.
- 100+/- 15 Ohm.
- Conductor DC Resistance (Max): 9.38 Ohm/100m @ 20°C.
- DC Resistance unbalanced (Max): 5% @ 20°C.
- Insulation Resistance (Min): 5000 MOhm/km@ 20°C.
- Mutual Capacitance (Typical): 5.6nF/100m.
- Characteristics impedance: 100Ohm+/- 3Ohm@ 100MHz.
- Worst Case Cable Skew : 25 nsec/100 meters

If the project requires the minimisation of PVC use low smoke zero halogen (LSZH) non-PVC Cat 6 solid 4-pair cable colour grey.

Ensure the length of each cable is based on the distance set out in the tables and formulas in ISO/IEC 11801 plus de-rating for ambient temperature.

6.2.2 CONDUITS

Ensure the communication conduit fill rates do not exceed the following:

Cable type	Conduit Size				
	25mm	32mm	40mm	50mm	100mm
Cat 5 and Cat 6 UTP	4	7	12	18	75
10 pair UTP	2	3	6	10	35
25 pair UTP	1	3	3	4	20

Provide all above ground communications conduits with draw-in boxes at least every 30m or after the equivalent of two 90-degree bends whatever being the lesser distance. The draw-in boxes are to be located in straight runs of conduit and are not to be used for bends. Provide the draw-in boxes with an IP66 screw fixed lid and a conduit saddle within 50mm of the draw-in boxes on each conduit.

6.2.3 OUTLETS

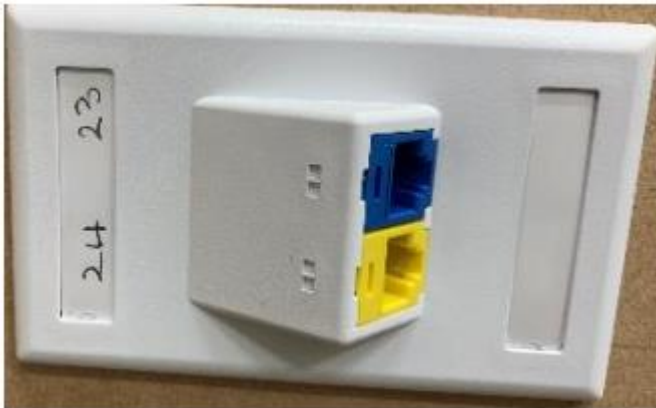
Provide all communication outlets as clip in female RJ45 socket terminals, clipped into an outlet face plate. Ensure the outlets are a minimum of 150mm from the nearest power outlet contact.

Provide all communications outlets as follows:

- Provide outlets in bars, wet areas and external locations as:



- Provide general internal outlets as:



- Provided ceiling mounted outlets as:



All cables must be arranged such that there is no Z bends or kinks in the cable behind the service outlet once it has been installed.

Ensure the UTP communications outlets have the following performance characteristics:

- Near End Crosstalk (NEXT) performance greater than 54dB @ 100MHz, and greater than 46dB @ 250MHz.
- RJ Interface resistance less than 20 mOhm
- Insulation resistance greater than 100 MOhm at 500 vDC
- Contact resistance less than of 20 mOhm
- Current rating greater than 2A at 20°C
- Rated for 1000 operations
- A contact force greater than 100g per contact using an FCC-approved plug.
- A plug retention force greater than 133 N.
- Rated for operation with a temperature range of -20°C to +75°C
- A minimum thickness hard gold contact plating on each pin of 1.3um
- A minimum thickness nickel contact plating on each pin of 2.0um under the gold coating.

6.2.4 INSULATION DISPLACEMENT CONNECTIONS (IDC)

Ensure all IDC's have the following performance characteristics and features:

- A minimum of 3 mechanical forces must be applied to the wire to provide a reliable and stress-free resistant connection.
- The IDC termination must have a 45 deg angular configuration when connecting with the cable conductor.
- The IDC contact element is to be spring special brass with silver plating, angularly arranged across the axis of the conductor.
- The contact range is to be silver-plated.
- The insulation displacement connectors of the outlets are to accept two insulated solid conductors of 26 to 22 AWG (0.40 - 0.65 mm) of the same size.
- Insulation resistance greater than 100 MOhm at 500 vDC
- Contact resistance less than of 20 mOhm
- Current rating greater than 2A at 20°C
- Rated for 1000 operations
- Rated for operation with a temperature range of -20°C to +75°C

6.2.5 EARTHING

Provide a dual-purpose telecommunication earthing system for both functional earthing and protective earthing purposes. Bond each communications rack and frame to a Communications Earthing Terminal (CET) Block located not more than 10m away from the communications rack or distribution frame. Bond each CET to the local power distribution system protective earth. Provide permanent machine printed labelling on / adjacent the CET with the wording "Communications Earthing Terminal". All earthing conductors are to have green/yellow insulation and a stranded copper conductor with a minimum area of 6 mm². Ensure each communications rack and frame has a resistance to earth of less than .5 ohm.

Earth a metallic cable access system with a 2.5mm² stranded copper conductor with green/yellow insulation to the power distribution system protective earth and ensure the resistance to earth is less than 1 ohm.

Ensure the communications, racks, distribution frames, pits, conduits, and cables are not located in positions the Earth Potential Rise could exceed 430 V AC under fault conditions. If the site contains a power substation or is located in a power substation hazard zone, establish the Earth Potential Rise and submit details of the Earth Potential Rise for approval prior to proceeding with the installation. In cases where the Earth Potential Rise will exceed 430 V AC under fault conditions, provide a custom engineered solution addressing the Earth Potential Rise and submit the details of the custom engineered solution for approval prior to proceeding with the installation.

6.2.6 RECORDS AND LABELLING

Label every component within the communications cabling system including though not limited to, outlets, patch panels, break out panels, cables, patch leads, racks, distribution panels, consolidation points and cable access pathways. The labelling between all components is to correspond allowing all associations between the source and destinations to be readily made. All labelling is to be arranged logically and be consecutive. Use a dash between numbers and abbreviations without any spaces.

Provide a machine printed label with the wording "Communications Cabling" on all communications cable pathways every 10 metres.

All names and labels are to read from bottom to top, left to right, omitting the letters "I" and "O".

Submit the labelling scheme for approval.

Provide each distribution panel and rack containing patch panels with a patching record book that contains the records of the connection of patch panel numbers to work station outlet numbers, the date and signature of the patching installer, a schematic drawing and a floor plan of the area detailing the location and labelling of all communications outlets and equipment within the area the associated panel or rack serves. Ensure the log book is able to simply accommodate future additions, moves and changes and it contains at least 50% or three, whatever is the lesser, spare pages. All entries in the log book are to be legible and only in pencil. Clearly designate the site's name and the name of the distribution panel or rack the log book applies to on the cover and on every page of the log book.

Submit a blank example page from the log book for approval.

Provide each distribution panel and rack containing patch panels with a wall mounted laminated A3 floor plan of the area detailing the location and labelling of all communications outlets and equipment within the area the associated panel or rack serves. Include a copy of the floor plan in the operation and maintenance manual.

Ensure all racks and distribution panels are uniquely identified with the label located on the external face of any door or cover that is normally closed and on the body if the door or cover is removable or lift off. For all racks and equipment that are floor mounted, provide the unique identifying label on both the front and rear doors / covers and the body.

Provide consolidation points with a unique identifying label that also includes the cable distance back to the source rack / distribution panel.

Provide a machined typed label either clear wrap around self-adhesive type or slip-on plastic ring type or a long plastic strip type fixed onto each permanent cable within 100 - 150mm from the termination point for UTP cabling and 200 - 400mm for Optical Fibre cabling. In addition to the end labelling, provide a label on each Optical Fibre cable at each side of every penetration and at intervals no greater than 10m. Each cable label is to designate the cable type, size and source / destination.

Permanently label each communications outlet with the channel number in accordance with clause 2.10. In addition to the label that is normally visible, neatly hand write in indelible ink the channel number on the faceplate behind the surround such that it is covered when the faceplate is in place.

In cases the maximum allowable fly lead length is less than 10 metres provide the faceplate with the following additional label designating the maximum allowable fly lead length "maximum fly lead Xm"

Provide each patch lead with a unique number at each end within 150mm of the termination.

6.3 COMMISSIONING

6.3.1 GENERAL

As part of the commissioning of the communications cabling, undertake the following tests as relevant on all components of the communications cabling installation including each pair in every cable for:

- Has been fully commissioned in accordance with this specification.
- Has been fully commissioned in accordance with the requirements of the system manufacturer.
- Compliance with the cabling diagram.
- Continuity.
- Cable location, identification and length.
- The installation of all cables must be complete and the cables and terminations cleaned prior to testing.
- All tests in accordance with the communication system certifying manufacturer's requirements.
- Undertake all tests in accordance with the recommendation of the testing equipment manufacturer.
- Test the resistance to earth of each Communications Earthing Terminal (CET) Block, each communications rack and each frame.
- Test the resistance to earth of each metallic cable access system.

6.3.2 UNSHIELDED TWISTED PAIR CABLING

Test every UTP cable / link in accordance with the following requirements:

- Correct sequence.
- Reversed pairs.
- Transposition and split pairs.
- Attenuation.
- Impedance matching of all twisted pairs within each UTP cable in the form of impedance Vs distance and impedance Vs frequency graphs.
- All mechanical fixings.
- Electrical length.
- The difference between the signal attenuation and the near-end cross talk (ACR).
- Power Sum ARC (PSARC)
- Near End Cross Talk (NEXT).
- Power Sum Near End Cross Talk (PSNEXT)
- Insertion Loss,
- ELFEXT, PSELFEXT.
- Return Loss.
- Delay Skew.
- Propagation Delay.
- All Cat 5 cables and components are to be tested in accordance with the requirements specified in the latest draft of ISO 11801 Class D.
- All Cat 6 cables and components are to be tested in accordance with the requirements specified in the latest draft of ISO 11801 Class E.

The UTP cables / links are to meet or better the following requirements:

	Cat 5	Cat 6
Correct sequence.	Pass	Pass
Reversed pairs.	Pass	Pass
Transposition and split pairs.	Pass	Pass
Attenuation.	24 dB	21.7 dB
All mechanical fixings.	Pass	Pass
Electrical length.	<90m	<90m
ACR	6.1 dB	18.2 dB
PSARC	3.1 dB	15.4 dB
NEXT	30.1 dB	33.9 dB
PSNEXT	27.1 dB	37.1 dB

Insertion Loss,	24 dB	21.3 dB
ELFEXT	17.4 dB	23.2 dB
PSELFEXT.	14.4 dB	20.2 dB
Return Loss.	10 dB	12 dB
Delay Skew.	50nsec	50nsec
Propagation Delay.	548nsec	548nsec

Tester and testing equipment

- Ensure the tester batteries are adequately charged and do not fall below 25% of the total battery capacity.
- Ensure all test gear and equipment is not worn, dirty and is in good as new working order.
- Ensure the NVP is not set HIGHER than specified for the cable.
- Ensure the tester “Margin Warning” or “Star-Pass” is always enabled during testing.
- The latest software available for the tester is being used.
- The tester has been independently calibrated within 12 months of the test.

Configure the tester for Cat 6 cabling as (F/UTP PVC 65% / UTP LSZH 79% / UTP PVC 69%), permanent Link Test limit to ISO 11801 Class E and channel test limit to ISO 11801 Channel Class E.

Configure the tester for Cat 5 cabling as (F/UTP PVC 69% / UTP LSZH 70% / UTP PVC 69%), permanent Link Test limit to ISO 11801 Class D and channel test limit to ISO 11801 Channel Class D.

The following testers are acceptable:

- Fluke DTX-18003.
- Fluke DTX-1200
- LANTEK 6A and 7G
- LANTEK II
- Agilent WireScope Pro
- Agilent WireScope WS350

Negative results (eg - 0.5 dB) for NEXT or RL on runs less than 15m even though a PASS is indicated in the test results are unacceptable and must be considered as unacceptable terminations.

Poor UTP terminations must be fixed by adding twist into the pairs, re-terminated and re-tested.

6.3.3 TEST RESULTS

Provide a copy of the “Plot Data Enabled” test results for each UTP cable in a recognised test vendor’s application format such as Fluke LinkWare or Agilent DataScope Pro or LANTEK Reporter as well as a copy of all results in PDF. Ensure the test results contain all of the testing and commissioning information required by section 6.3 Ensure the test results are / include:

- A single file containing all the final commissioning and test results.
- All results and data are relevant to this project.
- The number of test results the number of test results on the communications system manufactures system warranty form.
- An explanation is provided for all missing cable identification.
- Include a copy of all test results in the operation and maintenance manual.

Supply a copy of the latest NATA calibration certifications for test instruments that are to be used, before any testing commences.

Schedule the results for each item and component and include a copy of test results in the operation and maintenance manual. Typical test result forms are available from the Electrical Design Group web site www.edg.net.au.

As part of the commissioning of the communications cabling, undertake any necessary adjustments to components of the communications cabling installation which have integral adjustment capacity.

Upon the completion of the commissioning of the communications cabling provide a written and signed statement that the communications cabling installation:

- Has been fully programmed as necessary.
- Has been tested.
- Complies with the intent of the contract.
- Complies with the relevant authority requirements.
- Complies with the relevant standards and codes.
- Is fit for purpose and suitable for the intended use.

Include a copy of the communications installation statement of compliance in the operation and maintenance manual. A typical communications installation statement of compliance form is available from the Electrical Design Group web site www.edg.net.au

6.4 PATCH PANELS

Provide UTP patch panels as modular, 1RU high, 24 port, Cat 6, RJ45 19inch rack mounted, black fully numbered with outlets to the same specification and performance as the respective service outlets with the worst pair NEXT loss values for the outlet greater than 54dB at 100MHz and greater than 46dB at 250MHz. The rear of the patch panels are to be provided with integrated cable management supports, strain relief posts, colour coded wiring guides and IDC's to facilitate cable termination. Provide patch panels with modular ports that can be removed and that facilitate access to the IDC's without having to remove the entire patch panel.

Provide sufficient patch panels to accommodate all of the facility cabling with a dedicated patch panel port for each service outlet.

Use Panduit colour coded modular connectors.

6.5 PATCH LEADS

Provide an ultra-thin patch lead with the appropriate lengths and colour as follows for each outlet. Confirm the outlet use with the operators IT staff.

Colour	Usage
Blue	Data
Yellow	VOIP
White	WAP
Green	CCTV
Black	Servers and uplinks only
Red	Cross over only (Do not use IT only)
Purple	POS (Point of Sales)
Orange	Audio
Grey	Gaming
Pink	ATM