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Register Control System

<u>Register No</u>	<u>Description</u>	<u>Issue</u>
SI494001_REG	Report Register	A
SI494002_REG	Drawing Register	A
SI494003_REG	Calculation Register	A



Section 1

Reports



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INTER TERMINALS IMMINGHAM LTD

EAST TERMINAL

CABLE CALCULATIONS AND PROTECTION SETTINGS

FOR WORK ASSOCIATED WITH NUMBER 4 SWITCHBOARD

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	06.03.15	J Lonsdale	D Gibbs	MM	First Issue – For Comment	
B	03.07.15	J Lonsdale	MM	MM	For Construction	
						Document No. SI494001_CAL

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

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References

JD Lonsdale Report 4227-DOC-001



1 REVISION HISTORY

Rev	Description
A	Original Issue
B	For Construction

2 INTRODUCTION

Simon Storage, East Terminal, Immingham are installing within their No.4 Switchroom a new 415V switchboard. The supply to the switchboard originates from ABP No.5 Switchroom at 11kV and is transformed to 415V via a 750kVA transformer.

The transformer is located within the Simon Storage No.4 Switchroom.

The cabling from ABP to the transformer is to remain unchanged.

The original No.4 switchboard shall be removed and replaced. Subject to approval the existing cabling between the transformer and the switchboard (low voltage) shall be re-used.

The purpose of this document is to detail the following:

- Cabling between the transformer secondary and the new switchboard
- Cabling between new switchboard and existing Motor Control Centre (MCC) within No.4 Switchroom (this is to replace the existing bus duct)
- Cabling between the new switchboard and an existing standalone 200kW motor control panel that is equipped with a soft start
- Detail the protection settings to achieve coordination and discrimination with the items above

The relevant calculation and source data are referenced within.

Calculations have been performed in accordance with latest edition of Requirements for Electrical Installations, IET Wiring regulations, BS761: 17th Edition.

Amtech ProDesign software has been used and crosschecked manually with other data sources.

Co-ordination of protective devices has been performed Amtech HVnet and/ or ETAP.

Section 3 of this document provides details of the design parameters.

Section 4 of this document provides details of the sized cables.

Section 5 of this document provides details of the protective device coordination.

Section 6 of this document provides details of assumptions made or risks to the validity of the information within.



3 DESIGN PARAMETERS

Detailed below are the design parameters used in the calculations. For further details refer to Appendix 1 and 2.

All installations are indoors and an ambient temperature of 30°C has been assumed.

3.1 Supply

Parameter	Value	Comment
ABP Supply Voltage (kV)	11	
Frequency (Hz)	50	
ABP Fault Level (MVA)	184	
Transformer Size (kVA)	750	
Transformer Voltage (kV)	11/0.415	
Transformer Current (A)	39.6/1000	
Transformer Impedance (%)	4.31	
Function	Power supply to Simon Storage Number 4 Switchroom	

3.2 New Switchboard

Parameter	Value	Comment
Supply Voltage (V)	415	Three phase and neutral
Bus Bar Rating (A)	1600	Fault rating 50kA for 1s
Fault Level (kA)	21.7	ETAP calculation
Incomer Rating (A)	1600	MG NW16NH1 c/w earth fault
Largest Load	200kW	Motor control panel c/w soft start
Function	Sub main distribution	

3.3 Existing Pump P4-7 Control Panel

Parameter	Value	Comment
Supply Voltage (V)	415	Three phase and neutral
Bus Bar Rating (A)	TBA	
Fault Level (kA)	21.7	Based on section 3.1 fault level
Incomer Rating (A)	TBA	
Largest Load	200kW	Motor control panel c/w soft start
Function	Sub main distribution/ motor control	

3.4 Existing Motor Control Panel

Parameter	Value	Comment
Supply Voltage (kV)	415	Three phase and neutral - TBA
Bus Bar Rating (A)	TBA	
Fault Level (kA)	13.06	Amtech calculation
Incomer Rating (A)	400	Moeller NZM
Largest Load	200kW	Connected via a soft start
Function	Motor control	



3.5 Current Capacity and Voltage drop settings

Cables shall be sized to ensure they are within both current carrying and volt drop limits.

Private supply has been used for voltage drop limits set in accordance with BS 7671, Appendix 12.

For the purpose of this calculation this limit is 8% from source. The volt drop limit in sub-mains is 3% enabling the volt drop limit for a final circuit to be 5% in accordance with BS7671.

The design current for cable sizing has been set in accordance with the full load current (100%) of either the transformer secondary, switchboard/ distribution boards bus bar rating or motor name plate ratings. The rating used for calculation purposes in each case is detailed below. This is as opposed to sizing only for connected loads, which may prevent future loads from being connected.

Where used, a grouping value of 5 has been used. This permits a maximum of double-stacked cables.

3.6 Device coordination

Full discrimination is required so that in the event of a fault, the nearest upstream device will clear the fault whilst keeping disruption to the other healthy circuits to a minimum. Graphical data will be used to show that coordination and discrimination exists for overload, short time and instantaneous tripping between devices where applicable.

A maximum fault clearance time of 0.5s has been used when sizing cpc's.



4 CABLE DETAILS

Note: cable numbers shown reflect those shown in the attached appendices. They are subject to change to ensure that they conform to site standards for cable identification.

4.1 Tx to No.4

Source/ Destination: 750kVA Transformer/ New Switchboard No.4 Switchroom
Cable type: Single core, 90°C thermosetting insulation, LSF, non magnetic armour, table 4E3
Cable size: 240mm²
Number of cores: 1
Number of cables: 8 (2 per phase and 2 per neutral)
CPC: Separate 240mm² – *see also section 6*
Length: 10m
Protection: ACB on new switchboard (1600AI_n set at *see section 5*). Protection on the primary side at ABP No.5 Substation
Installation method: Ladder/ Flat Touching – no grouping
Comments: Cable c.s.a. increases to 300mm² if installed on tray
Calculations based on FLC of transformer secondary and not the switchboard busbar rating
Existing cables are assumed to be single core 400mm², 2 per phase with half size neutral.

4.2 No.4 to MCC

Source/ Destination: New Switchboard No.4 Switchroom/ Existing MCC No.4 Switchroom
Cable type: Single core, 90°C thermosetting insulation, LSF, non magnetic armour, table 4E3
Cable size: 240mm²
Number of cores: 1
Number of cables: 8 (2 per phase and 2 per neutral)
CPC: Separate 240mm² – *see also section 6*
Length: 10m
Protection: ACB on new switchboard (1250AI_n set at *see section 5*). Coordination with MCC incomer
Installation method: Ladder/ Trefoil – no grouping, spaced 2 diameters apart
Comments: Calculations based on FLC of transformer secondary and not the switchboard busbar rating.
Cables to replace existing busduct.



4.3 No.4 to P4-7 Starter

Source/ Destination:	New Switchboard No.4 Switchroom/ Existing P4-7 motor control panel No.4 Switchroom
Cable type:	Single core, tri-rated cable (unarmoured), table 4D4
Cable size:	185mm ²
Number of cores:	1
Number of cables:	3
CPC:	Separate 70mm ² – <i>see also section 6</i>
Length:	7m
Protection:	MCCB on new switchboard (400AI _n set at <i>see section 5</i>). Coordination with motor control panel
Installation method:	Perforated tray – no grouping
Comments:	Cabling to existing motor control panel adjacent to new switchboard

4.4 M40154

Source/ Destination:	P4-7 Starter/ Motor P4-7
Comments:	Existing cable. According to Simon Storage cable size is 185mm. CPC details not known.



5 PROTECTION SETTING AND COORDINATION

5.1 New Switchboard Incomer

Circuit Breaker: 1600A Merlin Gerin NW16H1 with Micrologic 6.0P trip unit
Settings: $I_r = 0.7$ (1120A)
 $t_r = 2$
 $I_{sd} = 3$
 $t_{sd} = 0.2$ (ON)

Ground

$I_g = A$
 $t_g = 0$ (OFF)

Comments:

5.2 Feed to Existing MCC

Circuit Breaker: 1250A Merlin Gerin NS1250N with Micrologic 2.0 trip unit
Settings: $I_r = 0.6$ (750A)
 $t_r = 0.5$
 $I_{sd} = 5$
 $t_{sd} = 0.2$ (ON)

Comments:

5.3 Feed to Pump P4-7 Control Panel

Circuit Breaker: 400A Merlin Gerin NSX400N with Micrologic 2.3 trip unit
Settings: $I_o = 360$
 $I_r = 0.94$
 $I_{sd} = 6$

Comments:



6 ASSUMPTIONS/ RISKS

The following assumptions have been made when calculating the cable size.

1. Confirmation of existing transformer secondary cabling required
2. Confirmation of existing earthing required – *cpc sizes shown in calculations are subject to change depending confirmation of existing installation earthing and protection*
3. Details of P4-7 cabling
4. P4-7 motor control panel will not be relocated
5. Transformer protection signals, cabling and emergency shutdown already exist and are connected back to the ABP Switchboard
6. All cable details to be checked prior to purchasing and installation



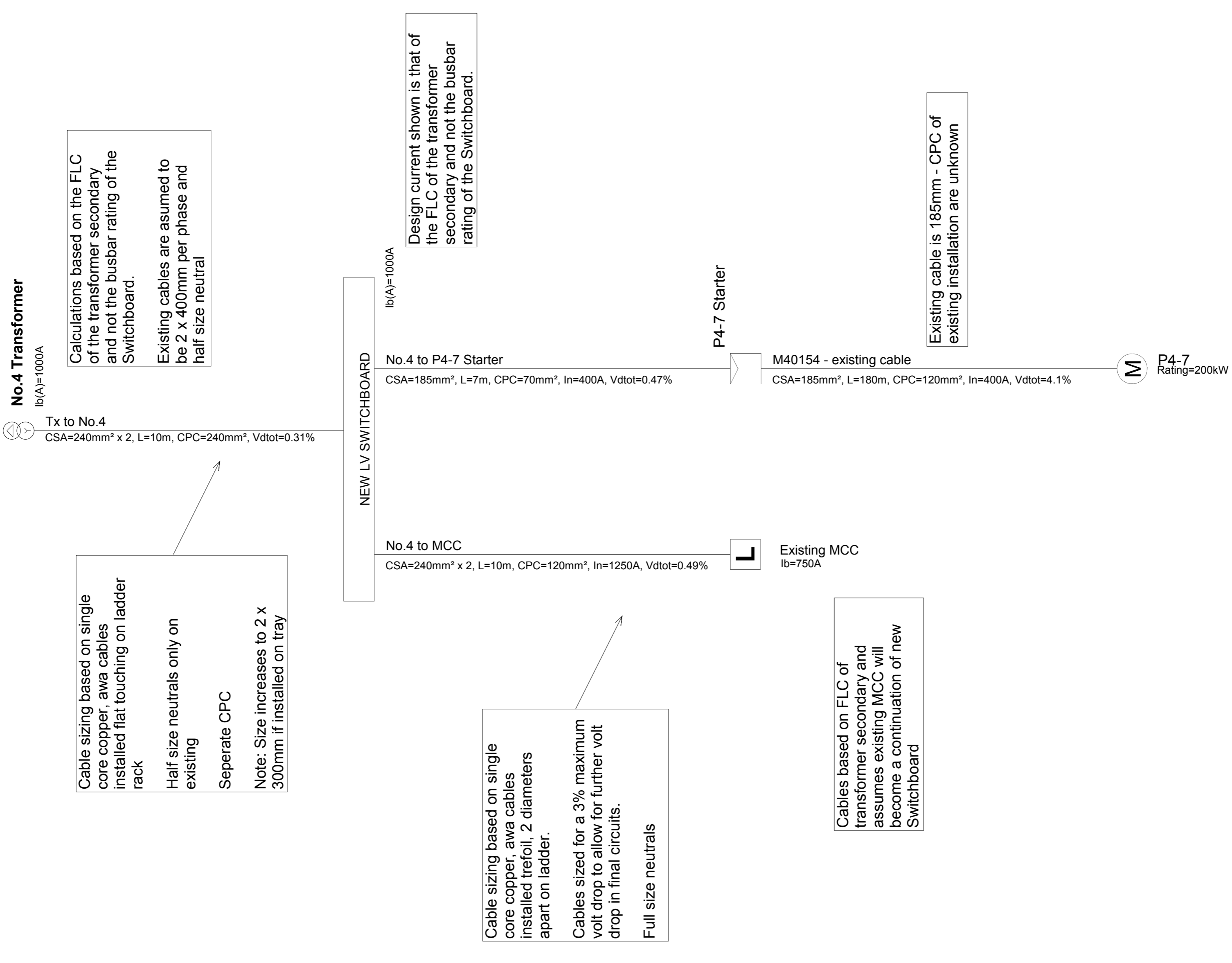
Appendix 1

4227-CALC-001 – East Terminal Cable Calculations



NOTES

1. Cables where applicable are installed on ladder / tray and installed no greater than two deep
2. Cable Type BS6724
3. All cables sizes and lengths to be checked by installation prior purchase and installation
4. Armour has not been used in cpc calculations



Cable sizing based on single core copper, awa cables installed flat touching on ladder rack
Half size neutrals only on existing
Seperate CPC
Note: Size increases to 2 x 300mm if installed on tray

Cable sizing based on single core copper, awa cables installed trefoli, 2 diameters apart on ladder.
Cables sized for a 3% maximum volt drop to allow for further volt drop in final circuits.
Full size neutrals

Cables based on FLC of transformer secondary and assumes existing MCC will become a continuation of new Switchboard

Design current shown is that of the FLC of the transformer secondary and not the busbar rating of the Switchboard.



Created By:	J Lonsdale	Date:	03/03/2015
Latest Revision:	D	Rev By:	JDL
Reference:	No.4 East Terminal Cables Simon Storage/ P&I Design		
Job No:	J4227		
Document Number:	4227-CALC-001		

Cable Calculation Report

Project Reference:	No.4 East Terminal Cables	Job Number:	J4227	Rev Date :	03/07/2015
Document No:	4227-CALC-001	Created On :	03/03/2015	Rev No:	D
Created By :	J Lonsdale	Modified By:	JDL		

Calculated in accordance with BS 7671

Active Source: No.4 Transformer

Circuit

Id No.: M40154 - existing cable	Name:
Connected From: P4-7 Starter	To: P4-7
Load Type: Motor, Soft Start, three phase	Design Current Ib (A): 333.8
Motor Starter Position: between and P4-7	
Comments:	

Protective Device

[a] = Auto, [f] = Fixed, [m] = Max.

Overcurrent protection:	Schneider Compact NSX MCCB NSX400N Micrologic 2.3
Rating In (A): 400 [f]	Overload Setting Ir (A): 333.84 [f]

Conductors

[a] = Auto, [f] = Fixed, [d] = Double

Multicore, 90°C thermosetting insulated, armoured LSF Cu Table 4E4	1 x 1 x 3c	Size (mm²): 185 [a]
		Length (m): 180
31 - On horizontal/vertical perforated tray	Arrangement: Horizontal Touching	

Rating Factors

Air Temperature (°C)	= 30.0	Ca	= 1.00	[BS 7671, Table 4B1]	
Circuits In Group	= 5	Cg	= .75	[BS 7671, Table 4C4]	Not Subject to Simultaneous Overload
No. of trays = 1	No. of circuits per tray = 5				
3rd Harmonics (%)	= .00	Ch	= 1.00		

Cable sizing (A)

Sized For: Phase Current Carrying Capacity

Auto-sized for current-carrying capacity and voltage drop limits.

Design Current Ib	= 333.8	Motor Overload Setting Ir = 333.84	[Ir ≥ Ib]	Voltage drop limit = 20.36 V (BS 7671:2008 (2015) App. 4)
Device Rating In	= 400			
Min. Cable Capacity Iz	= 445.1			[BS 7671, Appendix 4.5, Formula (3/4)]
Actual Cable Rating It	= 463.0			[It ≥ Iz]

Load Current and Voltage Drop	L1	L2	L3	Neutral
Design Current Ib (A/PF)	333.8 / 0.87	333.8 / 0.87	333.8 / 0.87	N/A
3rd Harmonic Current (A)	0.0	0.0	0.0	N/A
Voltage Drop - This circuit (V/%)	8.73 / 3.64	8.73 / 3.64	8.73 / 3.64	-----
Voltage Drop - From Source (V/%)	9.85 / 4.10	9.85 / 4.10	9.85 / 4.10	-----

Earth Fault

Circuit Protective Conductor (mm²)

Separate 120 [a]

[a] = Auto, [f] = Fixed

Earth Fault Loop Impedance (Ω)	Ze .01582 #	Z1 .02630	Z2 .07998	Zs .11837	Max. Zs .12250	Earth Fault Current (kA)
Disconnection time (s)	From characteristic: .08				Maximum for circuit: 5.00	
Circuit Protective Conductor (mm ²)	Separate 120 [a]					
CPC Adiabatic check (mm ²)	CPC Section = Separate 120		Total = 120.0		Min. Section = 3.79	
						1.92

Note: Earth Fault Current and Max Zs have been factored by Cmin # Local Earthing at Board

Phase Fault

Phase Fault Current Max./Min. (kA)	Source End: 19.045 / 18.934	Load End: 7.297 / 6.573
Protective Device Breaking Capacity (kA)	Icu: 50	Ics: 50
Adiabatic Check:	CPD Energy Let-through (A ² s): 3.44 x 10 ⁶	Adiabatic Limit k ² S ² (A ² s): 699.87 x 10 ⁶

Cable Calculation Report

Project Reference:	No.4 East Terminal Cables	Job Number:	J4227	Rev Date :	03/07/2015
Document No:	4227-CALC-001	Created On :	03/03/2015	Rev No:	D
Created By :	J Lonsdale	Modified By:	JDL		

Calculated in accordance with BS 7671

Active Source: No.4 Transformer

Circuit

Id No.: No.4 to MCC	Name:
Connected From: /1/L1,L2,L3	To: Existing MCC
Load Type: Fixed equipment three phase and neutral	Design Current Ib (A): 750.0
Comments:	

Protective Device

[a] = Auto, [f] = Fixed, [m] = Max.

Overcurrent protection:	Schneider Compact NS MCCB NS1250 N MLogic 2.0A
Rating In (A): 1250 [f]	Overload Setting Ir (A): 750 [f]

Conductors

[a] = Auto, [f] = Fixed, [d] = Double

Single-core, 90°C thermosetting insulated, non-mag arm LSF Cu Table 4E3	2 x 4 x 1c	Size (mm²): 240 [f]
Neutral: 240 mm ² [a]		Length (m): 10
34 - On a ladder	Configuration: Trefoil	Arrangement: Horizontal Trefoil Spaced

Rating Factors

Air Temperature (°C)	= 30.0	Ca	= 1.00	[BS 7671, Table 4B1]
Circuits In Group	= 1	Cg	= 1.00	[BS 7671, Table 4C5]
No. of ladders = 1		No. of circuits per ladder = 2		
3rd Harmonics (%)	= .00	Ch	= 1.00	

Cable sizing (A)

Sized For: Phase Current Carrying Capacity

Auto-sized for current-carrying capacity and voltage drop limits.

Design Current Ib	= 750.0		Voltage drop limit = 7.2 V (User defined)
Device Rating In	= 1250	Overload Setting Ir = 750	[Ir ≥ Ib]
Min. Cable Capacity Iz	= 375.0		[BS 7671, Appendix 4.5, Formula (1)]
Actual Cable Rating It	= 625.0		[It ≥ Iz]

Load Current and Voltage Drop	L1	L2	L3	Neutral
Design Current Ib (A/PF)	750.0 / 0.95	750.0 / 0.95	750.0 / 0.95	0.0
3rd Harmonic Current (A)	0.0	0.0	0.0	0.0
Voltage Drop - This circuit (V/%)	0.43 / .18	0.43 / .18	0.43 / .18	-----
Voltage Drop - From Source (V/%)	1.18 / .49	1.18 / .49	1.18 / .49	-----

Earth Fault

Circuit Protective Conductor (mm²)

Separate 120 [f]

[a] = Auto, [f] = Fixed

Earth Fault Loop Impedance (Ω)	Ze .01303 #	Z1 .00069	Z2 .00227	Zs .01544	Max. Zs .06909	Earth Fault Current (kA)	
Disconnection time (s)	From characteristic: .08						Maximum for circuit: 5.00
Circuit Protective Conductor (mm ²)	Separate 120 [f]						14.74
CPC Adiabatic check (mm ²)	CPC Section = Separate 120		Total = 120.0		Min. Section = 46.91		

Note: Earth Fault Current and Max Zs have been factored by Cmin # Local Earthing at Board

Phase Fault

Phase Fault Current Max./Min. (kA)	Source End: 20.748 / 19.410	Load End: 19.839 / 17.742
Protective Device Breaking Capacity (kA)	Icu: 50	Ics: 37.5
Adiabatic Check:	CPD Energy Let-through (A ² s): 45.00 x 10 ⁶	Adiabatic Limit k ² S ² (A ² s): 1,177.86 x 10 ⁶

Cable Calculation Report

Project Reference: No.4 East Terminal Cables **Job Number:** J4227
Document No: 4227-CALC-001 **Created On :** 03/03/2015 **Rev Date :** 03/07/2015
Created By : J Lonsdale **Modified By:** JDL **Rev No:** D

Calculated in accordance with BS 7671

Active Source: No.4 Transformer

Circuit

Id No.: No.4 to P4-7 Starter **Name:**
Connected From: /2/L1,L2,L3 **To:** P4-7 Starter
Load Type: Motor Starter Design Current Ib (A): 333.8
 Motor Starter Position: between and P4-7
 Comments:

Protective Device

[a] = Auto, [f] = Fixed, [m] = Max.

Overcurrent protection: Schneider Compact NSX MCCB NSX400N Micrologic 2.3
 Rating In (A): 400 [f] Overload Setting Ir (A): 333.84 [f]

Conductors

[a] = Auto, [f] = Fixed, [d] = Double

Single-core, 70°C thermoplastic non-arm Cu Table 4D1 **1 x 3 x 1c** **Size (mm²):** 185 [f]
Length (m): 7
 31 - On horizontal/vertical perforated tray Configuration: Flat Touching

Rating Factors

Air Temperature (°C) = 30.0 Ca = 1.00 [BS 7671, Table 4B1]
 Circuits In Group = 1 Cg = 1.00 [BS 7671, Table 4C5]
 3rd Harmonics (%) = .00 Ch = 1.00

Cable sizing (A)

Sized For: Phase Current Carrying Capacity

Auto-sized for current-carrying capacity and voltage drop limits.

Design Current Ib = 333.8 Voltage drop limit = 20.36 V (BS 7671:2008 (2015) App. 4)
 Device Rating In = 400 Motor Overload Setting Ir = 333.84 [Ir ≥ Ib]
 Min. Cable Capacity Iz = 333.8 [BS 7671, Appendix 4.5, Formula (1)]
 Actual Cable Rating It = 427.0 [It ≥ Iz]

Load Current and Voltage Drop	L1	L2	L3	Neutral
Design Current Ib (A/PF)	333.8 / 0.87	333.8 / 0.87	333.8 / 0.87	N/A
3rd Harmonic Current (A)	0.0	0.0	0.0	N/A
Voltage Drop - This circuit (V/%)	0.38 / .16	0.38 / .16	0.38 / .16	-----
Voltage Drop - From Source (V/%)	1.12 / .47	1.12 / .47	1.12 / .47	-----

Earth Fault

Circuit Protective Conductor (mm²)

Separate 70 [f]

[a] = Auto, [f] = Fixed

Earth Fault Loop Impedance (Ω)	Ze .01303 #	Z1 .00123	Z2 .00240	Zs .01582	Max. Zs .12250	Earth Fault Current (kA)	
Disconnection time (s)	From characteristic: .05				Maximum for circuit: 5.00		14.38
Circuit Protective Conductor (mm ²)	Separate 70 [f]						
CPC Adiabatic check (mm ²)	CPC Section = Separate 70		Total = 70.0		Min. Section = 10.99		

Note: Earth Fault Current and Max Zs have been factored by Cmin # Local Earthing at Board

Phase Fault

Phase Fault Current Max./Min. (kA)	Source End: 20.748 / 20.695	Load End: 19.045 / 18.934
Protective Device Breaking Capacity (kA)	Icu: 50	Ics: 50
Adiabatic Check:	CPD Energy Let-through (A ² s): 1.86 x 10 ⁶	Adiabatic Limit k ² S ² (A ² s): 452.63 x 10 ⁶

Cable Calculation Report

Project Reference:	No.4 East Terminal Cables	Job Number:	J4227	Rev Date :	03/07/2015
Document No:	4227-CALC-001	Created On :	03/03/2015	Rev No:	D
Created By :	J Lonsdale	Modified By:	JDL		

Calculated in accordance with BS 7671

Active Source: No.4 Transformer

Circuit

Id No.: Tx to No.4	Name:
Connected From: No.4 Transformer	To: / NEW LV SWITCHBOARD
Load Type: Distribution Board	Design Current Ib (A): 1,000.0
Comments:	

Protective Device

[a] = Auto, [f] = Fixed, [m] = Max.

Overcurrent protection:	(HV) Generic Relay BS142 Standard Inverse
Rating In (A):	40 [f] Overload Setting Ir (A): N/A
Earth fault protection:	: 0A

Conductors

[a] = Auto, [f] = Fixed, [d] = Double

Single-core, 90°C thermosetting insulated, non-mag arm LSF Cu Table 4E3	2 x 4 x 1c	Size (mm²): 240 [a]
Neutral: 240 mm ² [a]		Length (m): 10
34 - On a ladder	Configuration: Flat Touching	Arrangement: Horizontal Flat Touching

Rating Factors

Air Temperature (°C)	= 30.0	Ca	= 1.00	[BS 7671, Table 4B1]
Circuits In Group	= 1	Cg	= .97	[BS 7671, Table 4C5]
No. of ladders = 1		No. of circuits per ladder = 2		
3rd Harmonics (%)	= .00	Ch	= 1.00	

Cable sizing (A)

Sized For: Phase Current Carrying Capacity

Auto-sized for current-carrying capacity and voltage drop limits.

Design Current Ib	= 1,000.0	Overload Setting Ir	= N/A	[Ir ≥ Ib]
Device Rating In	= 1060.2			[BS 7671, Appendix 4.5, Formula (1)]
Min. Cable Capacity Iz	= 537.8			[It ≥ Iz]
Actual Cable Rating It	= 612.0			

Load Current and Voltage Drop	L1	L2	L3	Neutral
Design Current Ib (A/PF)	1000.0 / 0.95	1000.0 / 0.95	1000.0 / 0.95	0.0
3rd Harmonic Current (A)	0.0	0.0	0.0	0.0
Voltage Drop - This circuit (V/%)	0.74 / .31	0.74 / .31	0.74 / .31	-----
Voltage Drop - From Source (V/%)	.74 / .31	.74 / .31	.74 / .31	-----

Earth Fault

Circuit Protective Conductor (mm²)

Separate 240 [f]

[a] = Auto, [f] = Fixed

Earth Fault Loop Impedance (Ω)	Ze .01083	Z1 .00088	Z2 .00157	Zs .01303	Max. Zs .04213 *	Earth Fault Current (kA)
Disconnection time (s)	From characteristic: 2.83 *				Maximum for circuit: 5.00	
Circuit Protective Conductor (mm ²)	Separate 240 [f]					
CPC Adiabatic check (mm ²)	CPC Section = Separate 240		Total = 240.0		Min. Section = 205.48	17.47

Note: Earth Fault Current and Max Zs have been factored by Cmin

*Calculated for Earth Fault protection

Phase Fault

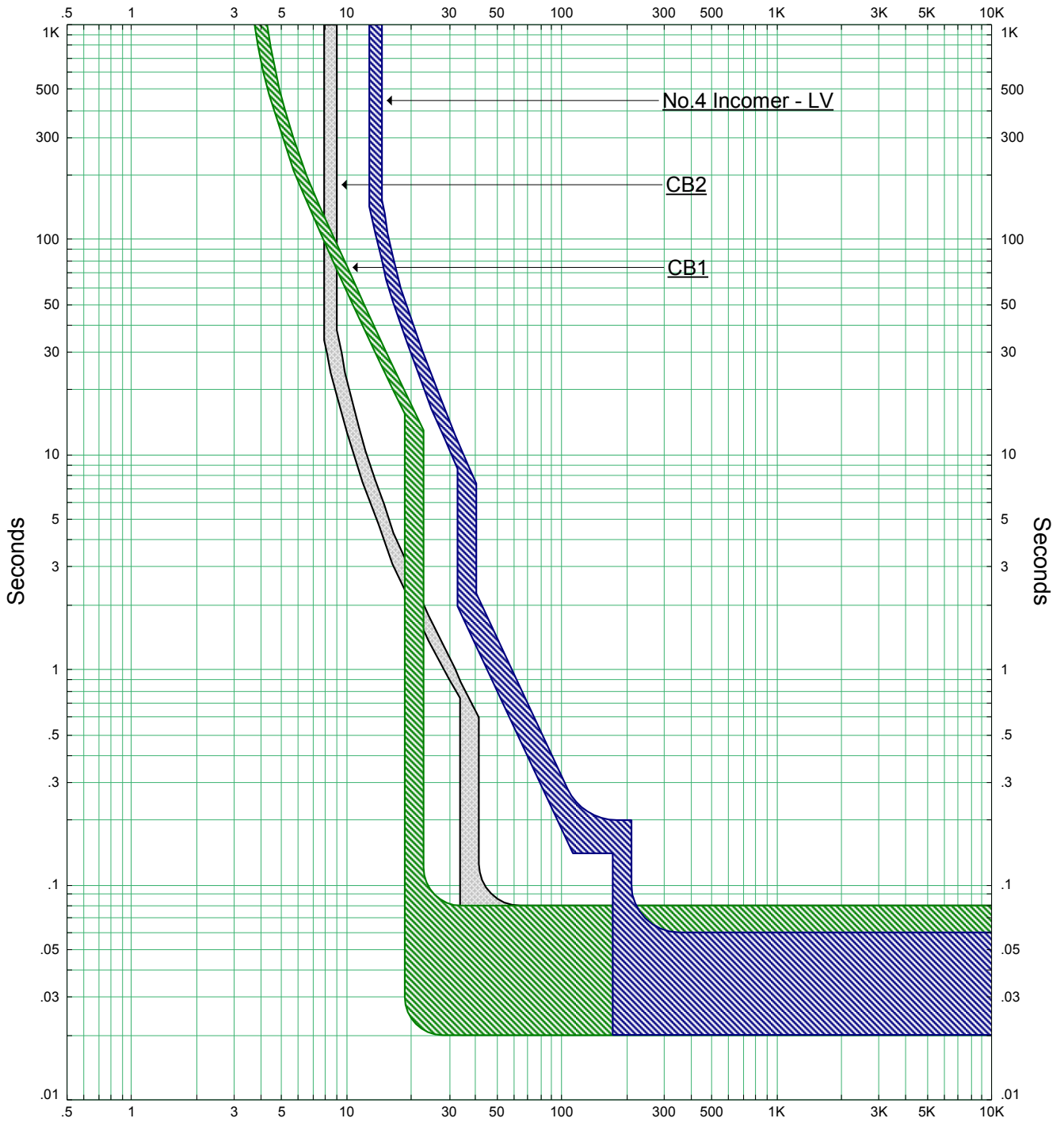
Phase Fault Current Max./Min. (kA)	Source End: 22.126 / 22.126	Load End: 20.748 / 19.410
Protective Device Breaking Capacity (kA)	Icu: 0	Ics: 0
Adiabatic Check:	Max. disconnection time (s) = (k ² S ² /I ²): 3.13	Actual disconnection time (s) = 2.72

Appendix 2

4227-CALC-003 – East Terminal Protection Settings



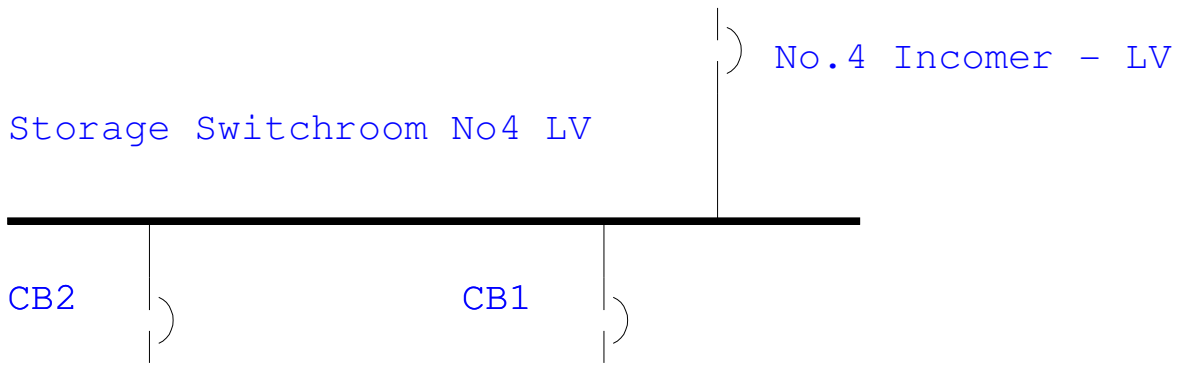
Amps X 100 Storage Switchroom No4 LV (Nom. kV=0.415, Plot Ref. kV=0.415)



Amps X 100 Storage Switchroom No4 LV (Nom. kV=0.415, Plot Ref. kV=0.415)

ETAP Star 12.6.5C

No.4 Switchroom	
Location: SIMON STORAGE EAST TERMINAL Contract: J4221	Date: 03-07-2015



Section 2
Drawings and Schedules



INSTRUMENT/ELECTRICAL CABLE SCHEDULE

CABLE		CONDUCTORS		CABLE ROUTE				APPROX. LENGTH METRES	REMARKS
REFERENCE	TYPE	AREA mm ²	No.	FROM	GLAND TYPE	TO	GLAND TYPE		
P41169	J01	400.0	1 Core	Transformer L1	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	Cables in Parallel - Existing cables to be re-terminated
P41170	J01	400.0	1 Core	Transformer L1	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	
P41171	J01	400.0	1 Core	Transformer L2	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	Cables in Parallel - Existing cables to be re-terminated
P41172	J01	400.0	1 Core	Transformer L2	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	
P41173	J01	400.0	1 Core	Transformer L3	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	Cables in Parallel - Existing cables to be re-terminated
P41174	J01	400.0	1 Core	Transformer L3	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	
P41175	J01	400.0	1 Core	Transformer N	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	
E41176	J01	240.0	1 Core	Transformer Earth	ATEX II 2 G EExed	LV Board Earth Bar	ATEX II 2 G EExed	10	Green/Yellow Outer Sheath
P41177	J01	240.0	1 Core	LV Board Compartment B2 (L1)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41178	J01	240.0	1 Core	LV Board Compartment B2 (L1)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41179	J01	240.0	1 Core	LV Board Compartment B2 (L2)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41180	J01	240.0	1 Core	LV Board Compartment B2 (L2)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41181	J01	240.0	1 Core	LV Board Compartment B2 (L3)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41182	J01	240.0	1 Core	LV Board Compartment B2 (L3)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41183	J01	240.0	1 Core	LV Board Compartment B2 (N)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41184	J01	240.0	1 Core	LV Board Compartment B2 (N)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
E41185	J01	240.0	1 Core	LV Board Earth Bar	ATEX II 2 G EExed	MCC Earth Bar	ATEX II 2 G EExed	10	Green/Yellow Outer Sheath
n/a		185.0	1Core	LV Board Compartment C1	ATEX II 2 G EExed	P4-7 Starter	ATEX II 2 G EExed	10	TPN tri-rated single cores bushed between boards
							TOTAL	180	



NOTES:

1) Refer to P&I Design Cable Specifications for details on Cable Type.

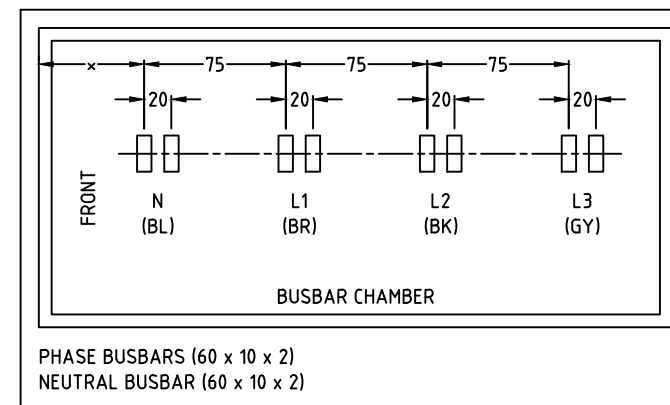
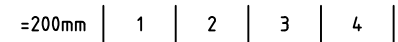
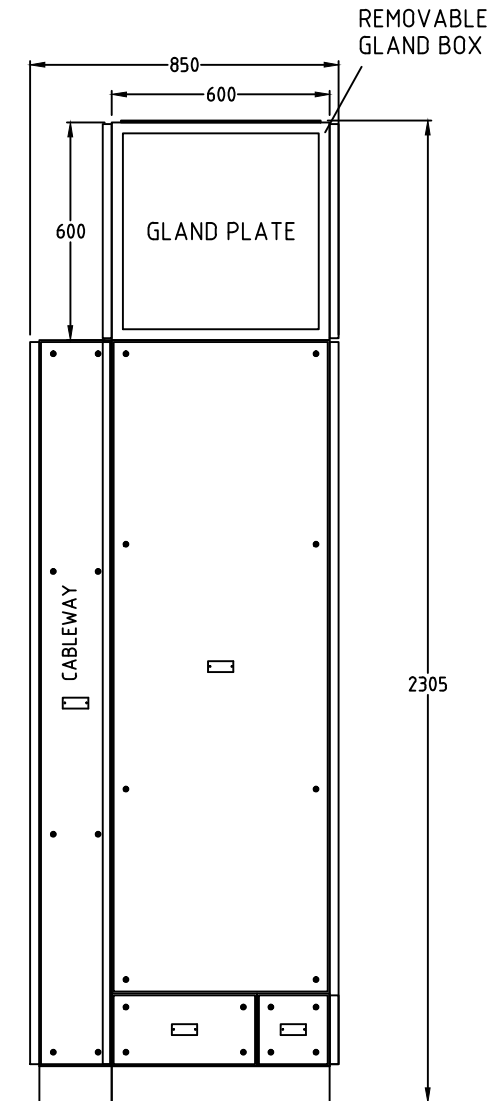
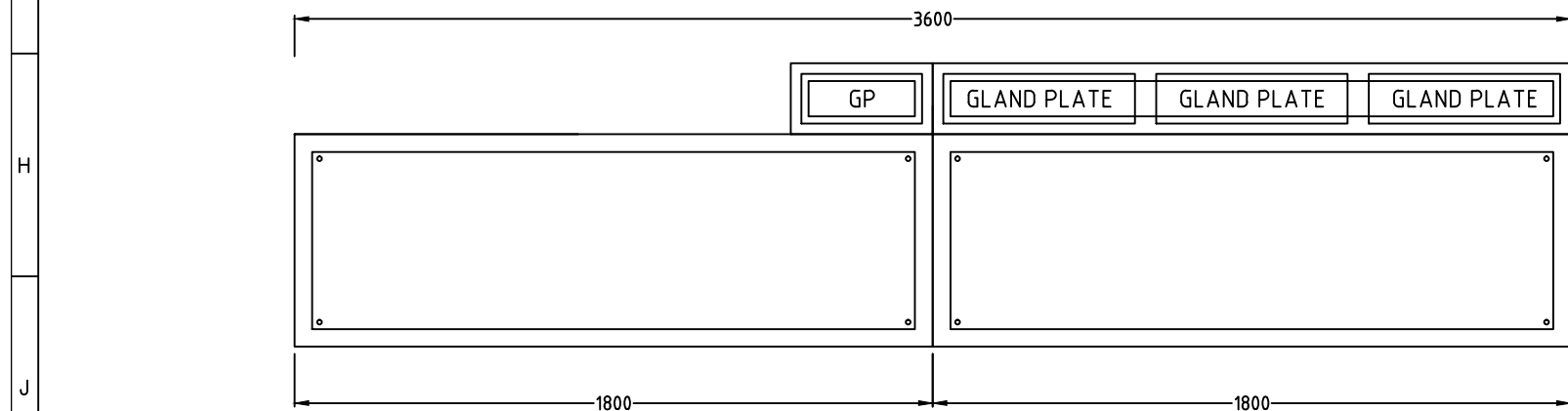
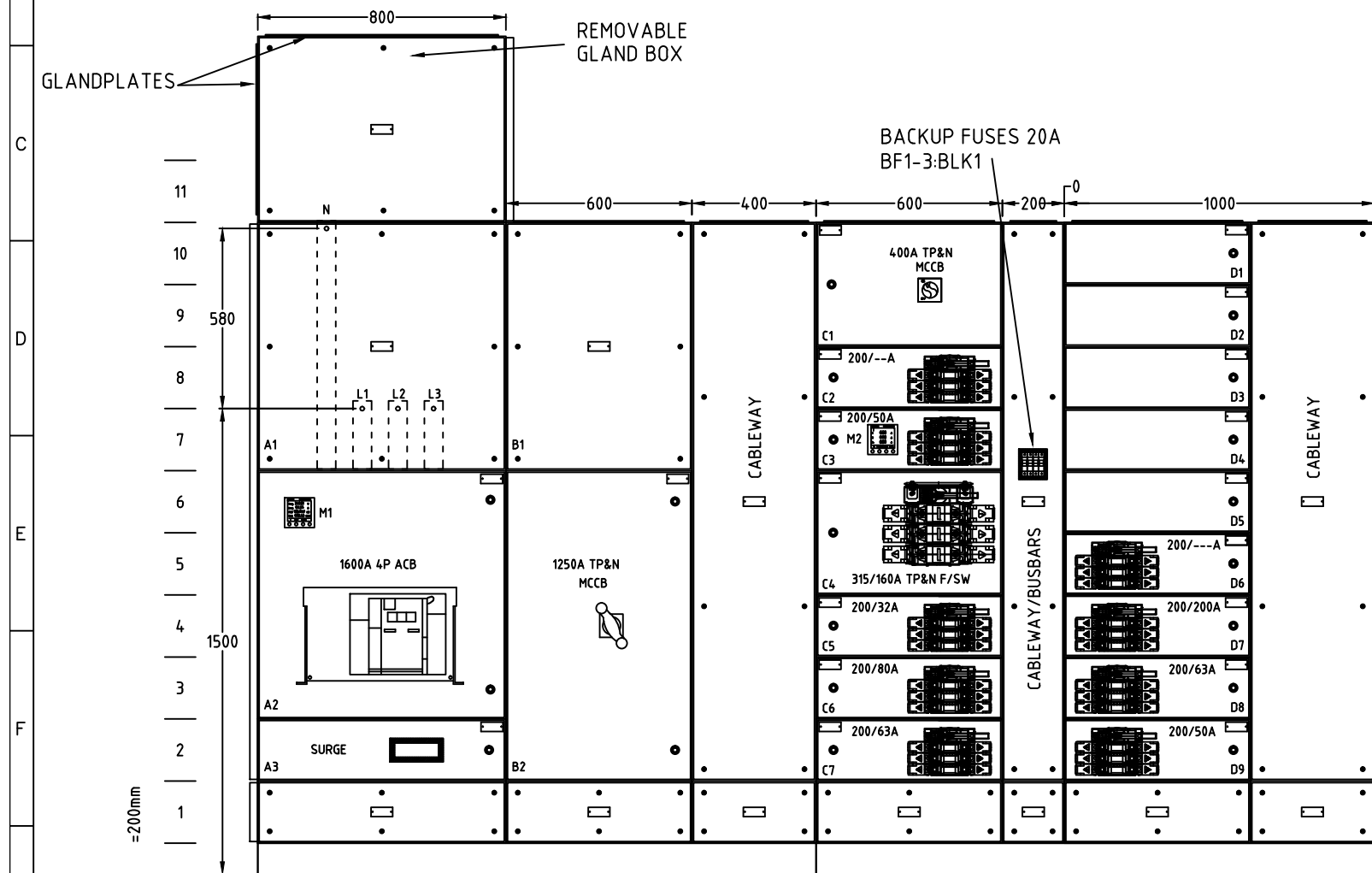
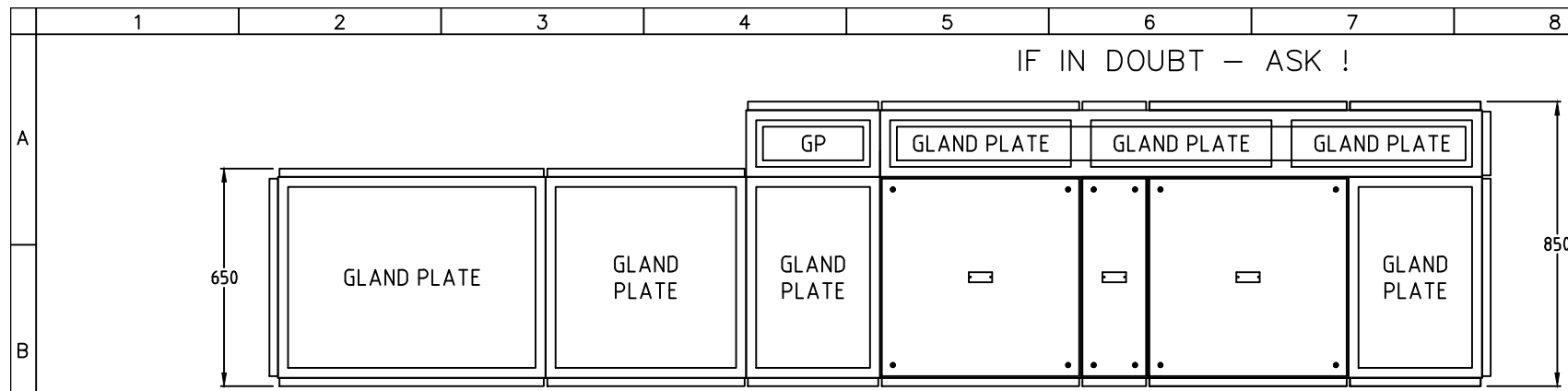
- Denotes Cable Modified
- Denotes Cable Deleted
- Denotes Cable Added
- Future Cables

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	09.04.15	MM	MM	PP	PP	Preliminary Issue
B	09.04.15	MM	MM	PP	PP	Issued for Tender
C	19.06.15	MM	MM	PP	PP	Issued for Construction
D	13.07.15	MM	MM	PP	MM	As Built

PLANT	Immingham Storage Co. - East Terminal	
TITLE	No. 4 Switchroom - Cable Schedule	
		
CLIENT DRG No		SHEET 1 OF 1
		REF No. SI494001_SCH

IF IN DOUBT - ASK !



BUSBAR ARRANGEMENT

PAINT FINISH	GREY TO RAL 7035
LABELS	W/B/W TRAFFOLITE
PROTECTION	IP54
CLASSIFICATION	FORM 4
	TYPE 2
BOARD ACCESS	FRONT
CABLE INCOMING	TOP ENTRY
	SIZE: T.B.C.
	TYPE: T.B.C.
CABLE OUTGOING	TOP EXIT
INCOMING GLAND PLATE	ALUMINIUM
OUTGOING GLAND PLATE	ALUMINIUM
MAINS SUPPLY	400V 50Hz TP&N
CONTROL SUPPLY	230/400V
FAULT RATING	50kA/1sec
BUSBARS	UNTINNED
BUSBARS (HORIZONTAL)	FROM FRONT N, L1, L2, L3
	RATING 1600A
BUSBARS (RISERS)	FROM FRONT N, L1, L2, L3
	RATING 1600A
EARTH BAR	INTERNAL
NEUTRAL BAR	INTERNAL
NEUTRAL / EARTH	INTERNAL
EXTENDABLE	BOTH SIDES
LOCKS	--
KEY No.	--
ADDITIONAL FEATURES	INCOMING CONNECTIONS TO BE AT HEIGHTS SHOWN
	EARTH BARS TOP & BOTTOM

REV	DATE	REVISION	DRN
E			
D	10.07.15	AS BUILT	RAH
C	01.05.15	600mm CABLE REMOVABLE BOX ADDED	RAH
B	22.04.15	AS CLIENTS REQUEST HEIGHT REDUCED BY 200 mm CONNECTION HEIGHTS ADDED	RAH
A	19.03.15	AS CLIENTS REQUEST 19.03.15	RAH
O	30.01.15	TO CLIENTS DRWG No.	RAH

CLIENT : P & I DESIGN LTD

ORDER No : 0494/3068

SITE : SIMON STORAGE
IMMINGHAM EAST TERMINAL

TITLE : GENERAL ARRANGEMENT
OF No. 4 SWITCHROOM
LV SWITCHBOARD

DRN BY	CHECKED	SCALE
RAH		☉ A3
DATE	DATE	WORKS No
30.01.15		EA657A
DRG No.	EA657A	1/4 REV D

 ARMAH Switchgear Ltd.
18 Tower Road
Glover West Industrial Estate
Washington
Tyne & Wear NE37 2SH.
Tel : (+44) 191 4192000
Fax : (+44) 191 4191000
e-mail : sales@armah.co.uk

IF IN DOUBT – ASK !

REF	DESCRIPTION	DEVICE TYPE	TRIP UNIT / FUSE TYPE	kA RATING	METER TYPE	SERVICE LABEL	CABLE SIZE
A1	MAIN INCOMING CABLE COMPARTMENT					MAIN INCOMING CABLES	
A2	ACB 1600/1600A 4P, FIXED, MANUALLY OPERATED	MERLIN GERIN NW 16 H1	MERLIN GERIN MICROLOGIC 6.0P	65kA	SCHNEIDER PM5110 (M1)	MAIN INCOMER	2 x1C 400mm ² PER PHASE
A3	160A FUSES & SURGE PROTECTION RELAY	FERRAZ	160A FUSES	80kA		SURGE PROTECTION	INTERNAL
B1	OUTGOING CABLE COMPARTMENT					OUTGOING CABLES	
B2	MCCB 1250/1250A TP C/W ROTARY HANDLE & NEUTRAL LINK	MERLIN GERIN NS1250N	MERLIN GERIN MICROLOGIC 5.0	50kA	NONE	T.B.C.	2 x1C 240mm ² PER PHASE
C1	MCCB 400/400A TP C/W ROTARY HANDLE & NEUTRAL LINK	MERLIN GERIN NSX400N	MERLIN GERIN MICROLOGIC 2.3	50kA	NONE	T.B.C.	1 x3C 185mm ²
C2	FUSES SWITCH 200/---A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	NON FITTED	80kA	NONE	T.B.C.	T.B.C.
C3	FUSES SWITCH 200/50A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	50A FUSES	80kA	SCHNEIDER PM5110 (M2)	T.B.C.	T.B.C.
C4	FUSES SWITCH 315/160A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	160A FUSES	80kA	NONE	T.B.C.	T.B.C.
C5	FUSES SWITCH 200/32A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	32A FUSES	80kA	NONE	T.B.C.	T.B.C.
C6	FUSES SWITCH 200/80A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	80A FUSES	80kA	NONE	T.B.C.	T.B.C.
C7	FUSES SWITCH 200/63A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	63A FUSES	80kA	NONE	T.B.C.	T.B.C.
D1	SPARE COMPARTMENT	NA					
D2	SPARE COMPARTMENT	NA			NONE	T.B.C.	T.B.C.
D3	SPARE COMPARTMENT	NA			NONE	T.B.C.	T.B.C.
D4	SPARE COMPARTMENT	NA			NONE	T.B.C.	T.B.C.
D5	SPARE COMPARTMENT	NA			NONE	T.B.C.	T.B.C.
D6	FUSES SWITCH 200/---A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	NON FITTED	80kA	NONE	T.B.C.	T.B.C.
D7	FUSES SWITCH 200/200A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	200A FUSES	80kA	NONE	T.B.C.	T.B.C.
D8	FUSES SWITCH 200/63A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	63A FUSES	80kA	NONE	T.B.C.	T.B.C.
D9	FUSES SWITCH 200/50A TP C/W ROTARY HANDLE & NEUTRAL LINK	SOCOMEK	50A FUSES	80kA	NONE	T.B.C.	T.B.C.

PAINT FINISH	GREY TO RAL 7035
LABELS	W/B/W TRAFFOLITE
PROTECTION	IP54
CLASSIFICATION	FORM 4
	TYPE 2
BOARD ACCESS	FRONT
CABLE INCOMING	TOP ENTRY
	SIZE: T.B.C.
	TYPE: T.B.C.
CABLE OUTGOING	TOP EXIT
INCOMING GLAND PLATE	ALUMINIUM
OUTGOING GLAND PLATE	ALUMINIUM
MAINS SUPPLY	400V 50Hz TP&N
CONTROL SUPPLY	230/400V
FAULT RATING	50kA/1sec
BUSBARS	UNTINNED
BUSBARS (HORIZONTAL)	FROM FRONT N, L1, L2, L3
	RATING 1600A
BUSBARS (RISERS)	FROM FRONT N, L1, L2, L3
	RATING 1600A
EARTH BAR	INTERNAL
NEUTRAL BAR	INTERNAL
NEUTRAL / EARTH	INTERNAL
EXTENDABLE	BOTH SIDES
LOCKS	--
KEY No.	--
ADDITIONAL FEATURES	

REV	DATE	REVISION	DRN
E			
D			
C	10.07.15	AS BUILT	RAH
B	22.04.15	AS CLIENTS REQUEST HEIGHT REDUCED BY 200 mm	RAH
A	18.03.15	AS CLIENTS REQUEST 18.03.15	RAH
O	30.01.15	TO CLIENTS DRWG No.	RAH

CLIENT : P & I DESIGN LTD
 ORDER No : 0494/3068
 SITE : SIMON STORAGE
 IMMINGHAM EAST TERMINAL

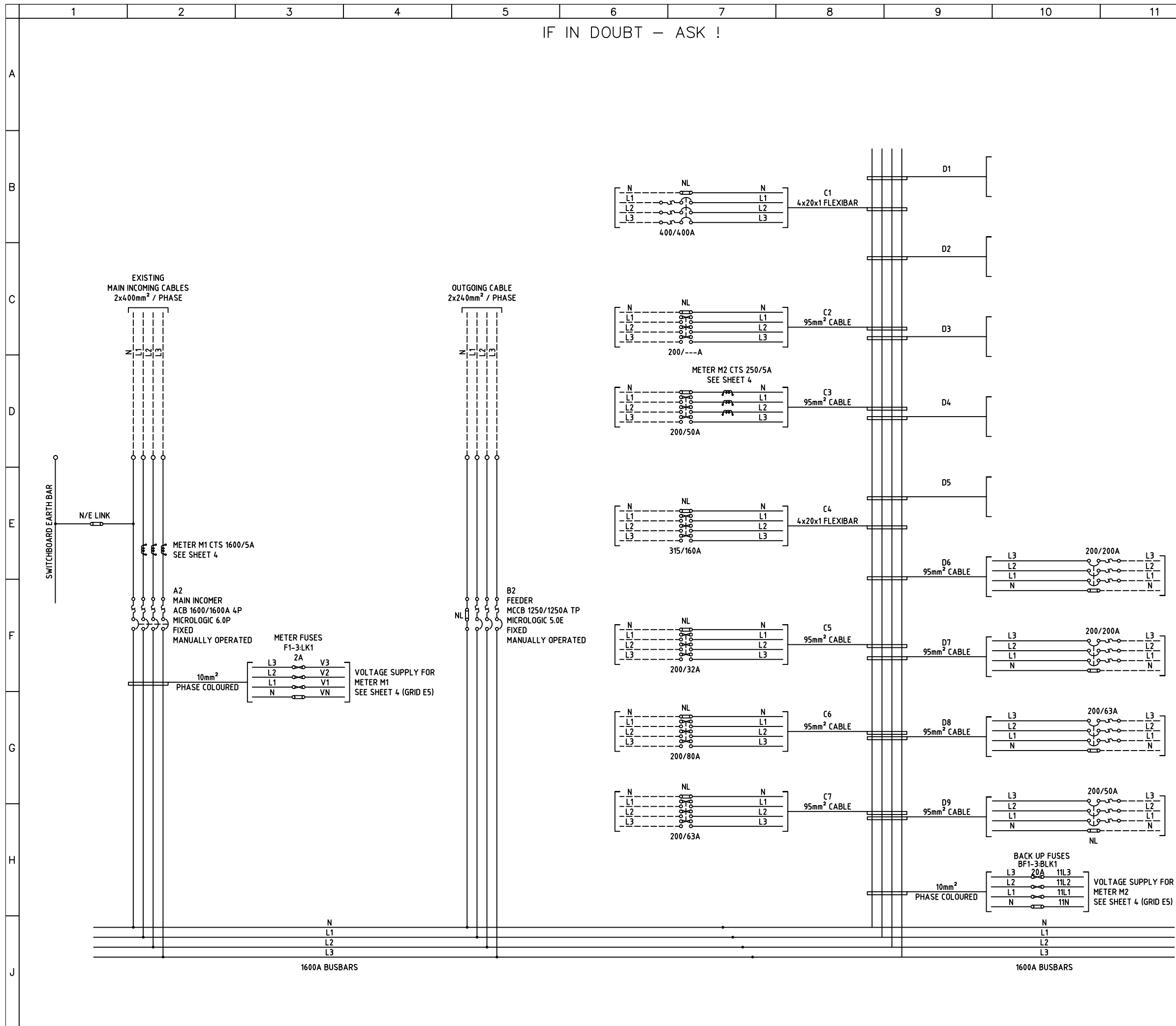
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 OF No. 4 SWITCHROOM
 LV SWITCHBOARD

DRN BY RAH	CHECKED	SCALE Ⓢ A3
DATE 30.01.15	DATE	WORKS No EA657A

DRG No.	EA657A	2/4	REV C
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 18 Tower Road
 Glover West Industrial Estate
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 Tyne & Wear NE37 2SH.
 Tel : (+44) 191 4192000
 Fax : (+44) 191 4191000
 e-mail : sales@armah.co.uk

IF IN DOUBT - ASK !



PAINT FINISH	GREY TO RAL 7035
LABELS	W/B/W TRAFFOLITE
PROTECTION	IP54
CLASSIFICATION	FORM 4
	TYPE 2
BOARD ACCESS	FRONT
CABLE INCOMING	TOP ENTRY
	SIZE: T.B.C.
	TYPE: T.B.C.
CABLE OUTGOING	TOP EXIT
INCOMING GLAND PLATE	ALUMINIUM
OUTGOING GLAND PLATE	ALUMINIUM
MAINS SUPPLY	400V 50Hz TP&N
CONTROL SUPPLY	230/400V
FAULT RATING	50kA/1sec
BUSBARS	UNTINNED
BUSBARS (HORIZONTAL)	FROM FRONT N, L1, L2, L3
	RATING 1600A
BUSBARS (RISERS)	FROM FRONT N, L1, L2, L3
	RATING 1600A
EARTH BAR	INTERNAL
NEUTRAL BAR	INTERNAL
NEUTRAL / EARTH	INTERNAL
EXTENDABLE	BOTH SIDES
LOCKS	--
KEY No.	--
ADDITIONAL FEATURES	

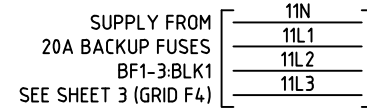
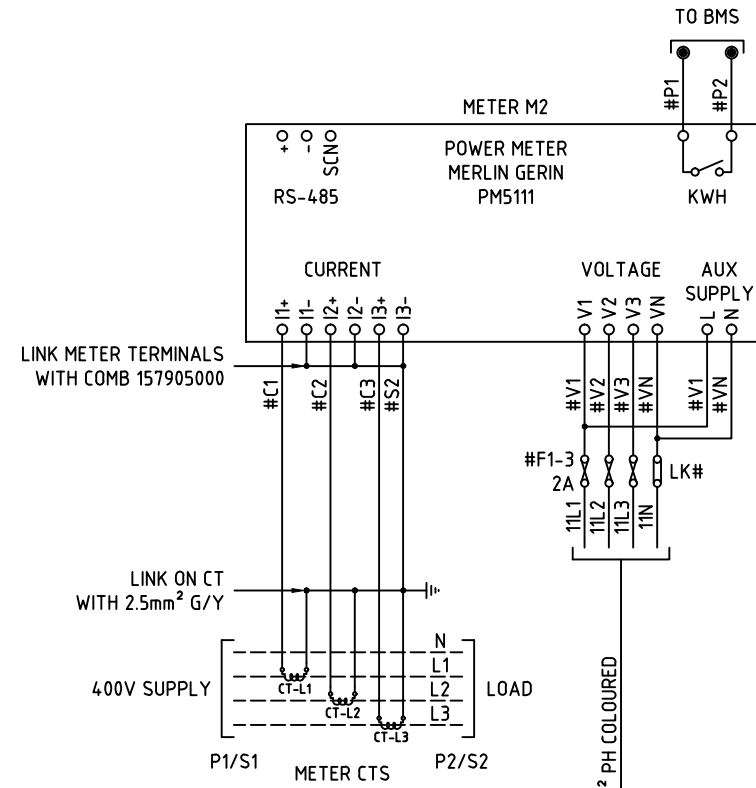
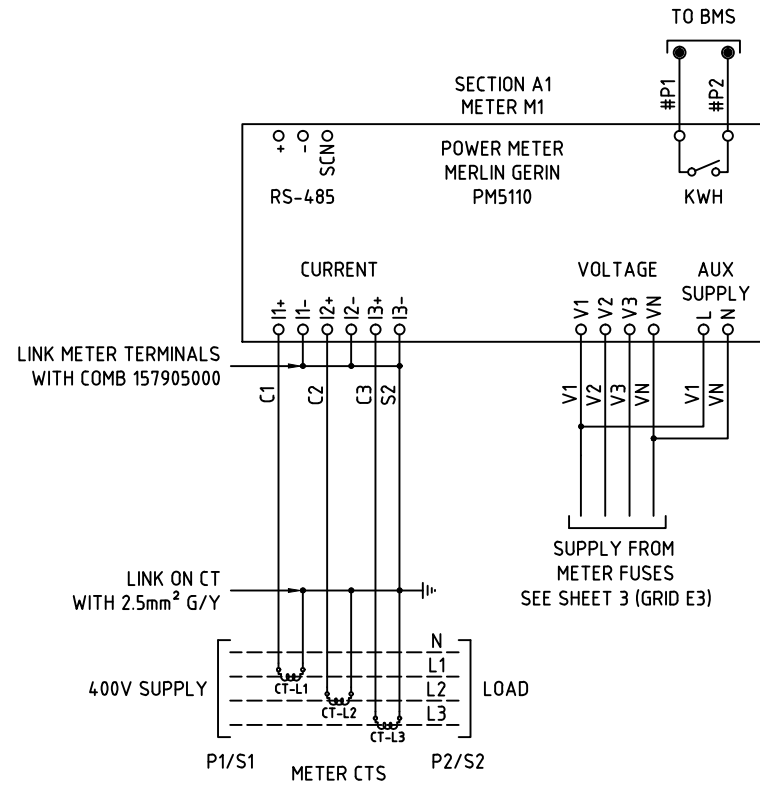
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D			
C	10.07.15	AS BUILT	RAH
B	22.04.15	AS CLIENTS REUEST HEIGHT REDUCED BY 200 mm	RAH
A	18.03.15	AS CLIENTS REQUEST 18.03.15	RAH
O	30.01.15	TO CLIENTS DRWG No.	RAH

CLIENT : P & I DESIGN LTD
 ORDER No : 0494/3068
 SITE : SIMON STORAGE
 IMMINGHAM EAST TERMINAL
 TITLE : POWER DISTRIBUTION
 OF No. 4 SWITCHROOM
 LV SWITCHBOARD

DRN BY	CHECKED	SCALE
RAH		☉ A3
DATE	DATE	WORKS No
30.01.15		EA657A
DRG No.	EA657A	REV
		3/4 C

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IF IN DOUBT - ASK !



NOTES:-

1. '#' TO BE REPLACED BY METER NUMBER REFERENCE, SEE EXAMPLES IN TABLE BELOW:

METER REF	M1	M2		
CURRENT REFERENCE	1C1	2C1		
	1C2	2C2		
	1C3	2C3		
	1S2	2S2		
VOLTAGE REFERENCE	1V1	2V1		
	1V2	2V2		
	1V3	2V3		
	1VN	2VN		
PULSE OUTPUT	1P1	2P1		
	1P2	2P2		
	1P3	2P3		
	1P4	2P4		
FUSE REFERENCE	1F1	2F1		
	1F2	2F2		
	1F3	2F3		
	1LK	2LK		

ETC...

PAINT FINISH	GREY TO RAL 7035
LABELS	W/B/W TRAFFOLITE
PROTECTION	IP54
CLASSIFICATION	FORM 4
	TYPE 2
BOARD ACCESS	FRONT
CABLE INCOMING	TOP ENTRY
	SIZE: T.B.C.
	TYPE: T.B.C.
CABLE OUTGOING	TOP EXIT
INCOMING GLAND PLATE	ALUMINIUM
OUTGOING GLAND PLATE	ALUMINIUM
MAINS SUPPLY	400V 50Hz TP&N
CONTROL SUPPLY	230/400V
FAULT RATING	50kA/1sec
BUSBARS	UNTINNED
BUSBARS (HORIZONTAL)	FROM FRONT N, L1, L2, L3
	RATING 1600A
BUSBARS (RISERS)	FROM FRONT N, L1, L2, L3
	RATING 1600A
EARTH BAR	INTERNAL
NEUTRAL BAR	INTERNAL
NEUTRAL / EARTH	INTERNAL
EXTENDABLE	BOTH SIDES
LOCKS	--
KEY No.	--
ADDITIONAL FEATURES	


REV	DATE	REVISION	DRN
E			
D			
C	10.07.15	AS BUILT	RAH
B	22.04.15	AS CLIENTS REQUEST HEIGHT REDUCED BY 200 mm	RAH
A	18.03.15	AS CLIENTS COMMENTS 18.03.15	RAH
O	30.01.15	TO CLIENTS DRWG No.	RAH

CLIENT : P & I DESIGN LTD
 ORDER No : 0494/3068
 SITE : SIMON STORAGE
 IMMINGHAM EAST TERMINAL

TITLE :
 METERING
 OF No. 4 SWITCHROOM
 LV SWITCHBOARD

DRN BY RAH	CHECKED	SCALE © A3
DATE 30.01.15	DATE	WORKS No EA657A

DRG No.	EA657A	4/4	REV C
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 e-mail : sales@armah.co.uk

Section 3

Installation, Testing and Handover



CLIENT: Inter Terminals – ISCo East	PROJECT REF: SI494	DOC REF: SI494001_HDR
PROJECT: No.4 Switchroom LV Board	LOCATION:	DATE: 10/06/15
PLANT SECTION:	PLANT UNIT:	PAGE: 1 OF 3

METHOD STATEMENT

The Instrument Installation will be ‘Cold’ tested prior to powered Functional testing.
 The PICAL System will be used to control and record the method statements and Functional tests.
 Instrument Installation Conformance Control Register QSF2059 will be used for overall signatory control.
 Controlled copies of relevant drawings will be used to record, by highlighting (yellow), satisfactory terminations.
 Errors and omissions will be corrected and noted in red.
 The controlled drawings will constitute a significant proportion of the testing records and provides an audit trail to the ‘As Built’ issue.

VISUAL INSPECTION

- | | |
|-------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> DOORS AND LOCKS OPERATIONAL | <input checked="" type="checkbox"/> EQUIPMENT MOUNTINGS SECURE |
| <input checked="" type="checkbox"/> GLAND PLATES FITTED | <input type="checkbox"/> CABLE SPECIFICATIONS CORRECT |
| <input type="checkbox"/> CABLE GLANDS TIGHT AND COMPLETE | <input checked="" type="checkbox"/> CABLES TERMINATED AND TIGHT |
| <input checked="" type="checkbox"/> CABLE NUMBERS AND CORES CORRECT | |
| <input checked="" type="checkbox"/> TERMINATION RAIL CORRECT | <input checked="" type="checkbox"/> TERMINATIONS CRIMPED & FERRULED |
| <input checked="" type="checkbox"/> FUSES FITTED | <input checked="" type="checkbox"/> FUSE SIZES CORRECT <i>(See also snag list)</i> |
| <input checked="" type="checkbox"/> EQUIPMENT EARTHING CORRECT | <input type="checkbox"/> SCREEN EARTHING CORRECT |
| <input type="checkbox"/> TUBE BULKHEADS TIGHT | <input type="checkbox"/> TUBES TERMINATED |
| <input checked="" type="checkbox"/> EQUIPMENT LABELS CORRECT <i>(See Snag list)</i> | <input type="checkbox"/> JUNCTION BOX LABELS CORRECT |

COLD TESTING

- | | |
|--------------------------------------------------------|-------------------------------------------------------|
| <input type="checkbox"/> MAINS DISTRIBUTION CORRECT | <input type="checkbox"/> 24V DC DISTRIBUTION CORRECT |
| <input type="checkbox"/> SIGNAL POINT TO POINT CORRECT | <input type="checkbox"/> COMMS POINT TO POINT CORRECT |
| <input type="checkbox"/> IS EARTHING PROVED | |

HOT TESTING

- | | |
|-------------------------------------------------------------------------------------|---------------------------------------------------|
| <input checked="" type="checkbox"/> MAINS POWER ESTABLISHED | <input type="checkbox"/> 24V DC POWER ESTABLISHED |
| <input checked="" type="checkbox"/> SIMULATION TESTS COMPLETED (REFER PICAL SHEETS) | |
| <input type="checkbox"/> PRESSURE TEST COMPLETE (REFER PICAL SHEETS) | |

COMMENTS

See Sheet 2 & 3.

APPROVALS

P & I DESIGN LTD:



DATE:

10/6/15.

CLIENT:

DATE:

CLIENT: Inter Terminals – ISCo East	PROJECT REF: SI494	DOC REF: SI494001_HDR
PROJECT: No.4 Switchroom LV Board	LOCATION:	DATE: 10/06/15
PLANT SECTION:	PLANT UNIT:	PAGE: 2 OF 3

Testing Performed

Dimensions

- Critical dimensions checked
 - Incomer top gland box = 600mm H
 - Floor to incomer phase connections 1500mm
 - Floor to incomer neutral connection = 2080mm
 - Overall board width = 3660mm
- Rear cableway for outgoing ways
 - With gland plates removed, clear space with plinth fitted = 100mm, if plinth removed this would be 150mm

Labelling

- Service label details to be supplied to Armah for fitting prior to delivery – see snag list

Device checks – Non powered

- Devices compared to drawings for compliance, the following anomalies were noted :-
 - Compartment B2 : 1250A MCCB has Micrologic 2.0E trip unit fitted, drawing states 5.0 – see snag list
 - Compartment C4 : 315/300A switch specified, actually 400/315A fitted. 400A rated carrier OK, check if 315A fuses OK with ISCo. – see snag list
 - Finger guards missing from most devices, on order awaiting delivery - see snag list

Device checks – Powered

- Board powered, all devices switched and outgoing terminals checked Phase to Neutral and Phase to Phase for correct voltage.
- Meters powered and confirmed to be operational
- 400A MCCB connected to load bank and meter confirmed to be measuring power consumption
- Fitted spare switches had temporary fuses installed for powered check and then fuses removed.
- Surge device fault rating 25kA, Armah to check if this is correct – see snag list

General

- Internal Neutral / Earth link removed at time of test, to be installed prior to delivery – see snag list



ARMAH Switchgear Ltd.

A Powerful Force Protecting Supplies

18 Tower Road, Glover West Industrial Estate, District 11, Washington, Tyne & Wear NE37 2SH

Telephone: (0191) 419 2000 Fax: (0191) 419 1000

Web Site: armah.co.uk

WORK INSTRUCTION TORQUE SETTINGS FOR BUSBAR BOLTS

BUSBAR BOLT SETTINGS (HIGH TENSILE GRADE 8.8 STEEL)		
---------------------------------------------------------------	--	--

BOLT SIZE	N.M.	AS SPANNER SIZE
M6	7.2	10mm
M8	17	13mm
M10	28	17mm
M12	45	19mm
M16	91	24mm

MINIMUM CLEARANCE PHASE TO PHASE AND PHASE TO EARTH = 20mm

THE ABOVE ARE MAXIMUM FIGURES BASED ON BOLT MANUFACTURERS RECOMMENDATIONS AND SHOULD NOT BE EXCEEDED

TOLERANCE ON THE ABOVE IS +10/-10%

ORIGINATED: Copper Development Association

Publication No: 22

ATTENTION

En cas de dépassement des couples de serrage, la fonction des rondelles de contact n'est plus assurée.

BEWARE

In case tightening torques are superior to what is stated below, contact washers efficiency cannot be insured any more.

ACHTUNG

Bei Überschreiten der Drehmomentkraft ist die Funktion der Anschlüsse nicht mehr gewährleistet.

SOLAMEC

Vis - Screw - Schraube Ø	Couple - Torque - Drehmoment (Nm)	
	Mini.	Maxi.
M5	2,4	3
M6	4,5	5,4
M8	8,3	13
M10	20	26
M12	40	45

515163-K

P & I Design Ltd

Process Instrumentation Consultancy & Design

2 Reed Street, Gladstone Industrial Estate,
Thornaby, TS17 7AF, United Kingdom.
Tel. +44 (0)1642 617444 Fax. +44 (0)1642 616447
Web Site: www.pidesign.co.uk

INTER TERMINALS LTD

IMMINGHAM STORAGE Co. LTD - EAST TERMINAL

No.4 SWITCHROOM LV BOARD

INSTRUMENT & ELECTRICAL INSTALLATION

SCOPE OF WORK

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.15	P.P.	M.M.	M.M.	Issued for Tender	
B	19.06.15	MM	PP	MM	Issued for Construction	Document No. SI494001_INS

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

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3.9	Contractor Supplied Equipment	8
3.10	Free Issue Equipment	8

APPENDIX

I Schedules & Specifications



1 REVISION HISTORY

Rev	Description
A	Original Issue
B	Issued for Construction
C	
D	



2 INTRODUCTION

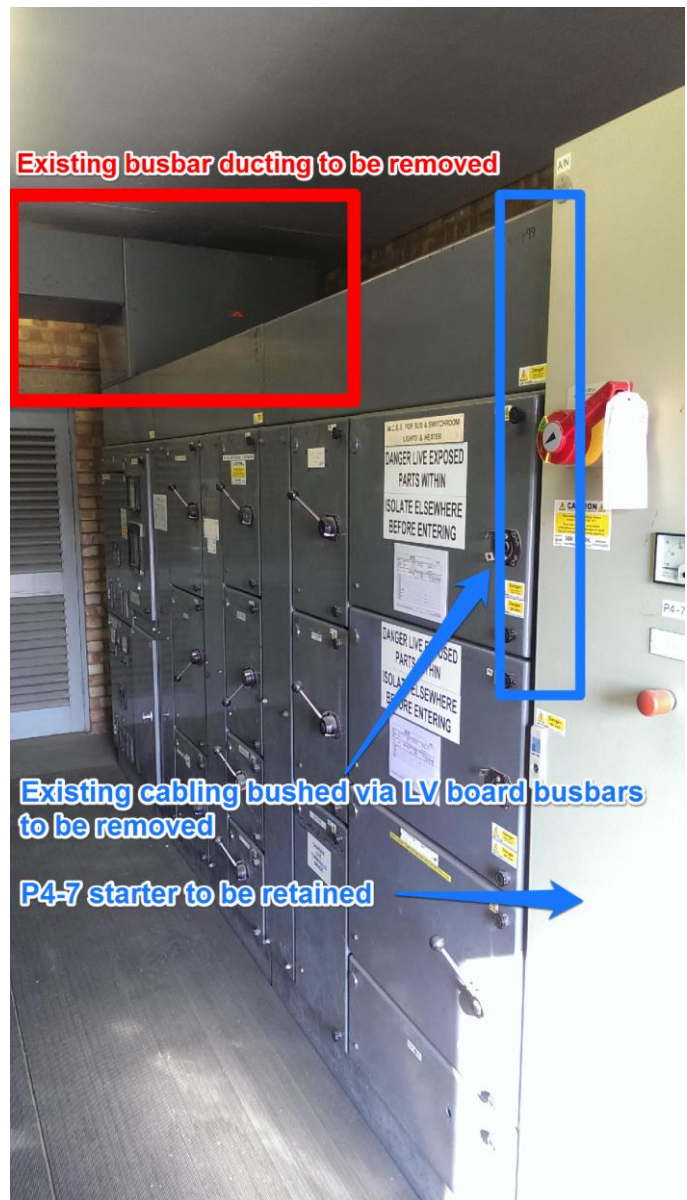
The project is to replace the existing LV Switchboard in No.4 switchroom at Inter Terminals Ltd, ISCo East Terminal. This document details the scope of work to provide the electrical installation for the works.

It is to be read in conjunction with specification SI003001_INS - Standard Specification for Instrument & Electrical Installations.

The existing LV board configuration is shown alongside.

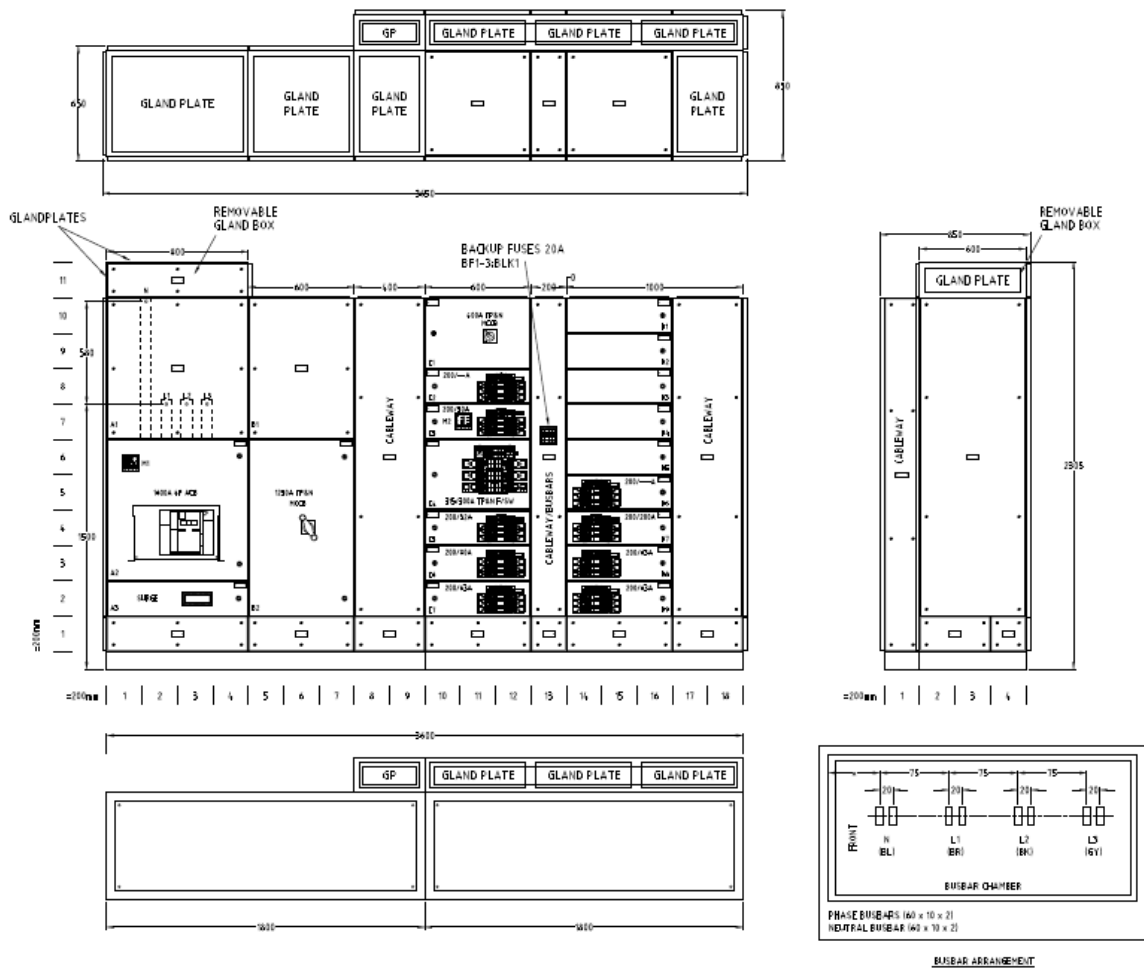
The works comprise briefly

- Removal of the existing LV switchboard and replacement with a new LV switchboard in the same physical location. The existing transformer will be retained.
- Removal of busbar and ducting between existing LV switchboard and Motor Control Centres in same switchroom and replacement with new cabling
- Removal and reinstatement of transformer LV cabling to new switchboard
- Provision of new cabling to starter P4-7 to replace existing cabling
- Migration of outgoing ways from distribution boards within existing LV switchboard to a DB in No.4 switchroom extension.
- Removal and reinstatement of all other outgoing cabling



Note : It will be necessary to provide complete electrical power isolation to No.4 switchroom for the duration of the works. This document does not cover the operational impact of this to the terminal, this will be dealt with separately. The installation contractor should however assume that the changeover works will be completed over the period of one weekend and cost this work element accordingly.

The replacement board (provisional) is shown below.



3 SCOPE OF WORK

The scope of work is as detailed in the following sections and as shown on the documentation listed below.

Cable Schedule SI494001_SCH

The installation contractor shall make an allowance to manage all aspects of the installation.

3.1 Scope of Work : Pre-shutdown

The following works to be completed prior to the shutdown:-

- All DB ways to be moved to No.4 switchroom extension.

3.2 Scope of Work : Existing Switchboard

The works comprise, briefly:-

- At shutdown, disconnect all incoming & outgoing cables from the switchboard ensuring all are clearly identified and then pulled back to a convenient location and protected as necessary ready for re-use.
- Remove busbars and chamber connections to MCC1/2.
- Remove cabling to P4-7 MCC.
- Remove the old switchboard (to be agreed with ISCo engineer as to responsibility and arrangements for disposal)

3.3 Scope of Work : New LV Switchboard

Works will include :-

- Take delivery, offload, position & secure the new switchboard. (**Note : The board manufacturer will deliver the board in a number of sections via Hiab vehicle. They have not included in their scope to re-connect the board on site but will supply drawings and torque settings. Further discussion is required with ISCo as to the logistics and timing of the shutdown required for changeover of boards. As a result of these discussions the installation contractor is to include all necessary labour and materials to effect the removal of existing and installation of new boards. This is to include sub-contract of the board manufacturer as necessary (Armah Switchgear Ltd) and any additional lifting requirements. A provisional sum shall be included in the tender for this activity if logistics have not been clarified at the time of tender submission.**)
- Reconnect the incoming & outgoing cables, noting new cable number identifiers to be added to transformer tails.
- Retain integrity of earthing network.
- Testing.



3.4 Scope of Work : MCC Feed

Supply and install cables 41177 to 41185 as shown on the attached cable schedule.

Note : Installation method

Power cables to be installed in trefoil on ladder rack (not tray), with no grouping i.e. spaced ≥ 2 diameters apart. (Table 4C5 installation method 34 – on ladder in trefoil formation)

3.5 Scope of Work : P4-7

Supply and install cable 41186 as shown on the attached cable schedule. The P4-7 starter was cabled directly from the existing LV board and the old entry point will require repairing to be finger protected as a minimum.

Note : Installation method

Installation on perforated tray acceptable for this cable (Table 4C4 installation method 31 – on horizontal / vertical perforated tray)

3.6 Scope of Work : Inter Terminals Computer Services supply

The existing supply is fed from the LV board to a wall mounted metering station. The metering will now be incorporated into the replacement LV board. There are two options for this supply :

1. If the feed cable ex-metering can be pulled back to the new board switch, then this shall be done and the short length to the meter from the existing board together with the meter and terminal box removed.
2. If however the cable is not of sufficient length to pull back, then the meter shall be removed and the two supply cables directly connected at the existing terminal box adjacent to the meter



3.7 Scope of Work : Earthing

Due to unavailability of an intrusive survey requiring a shutdown, it has not been possible to fully clarify the earthing arrangement for the existing switchboard. A new earth cable (E41185) is to be installed between the new LV board earth bar and the transformer casing earth point.

The copper earth tape to the existing board shall be removed, however at this time a review will be required to ensure earthing integrity to main switchroom earth bar etc. is maintained. This may result in some additional earthing cabling requirement **and a provisional sum shall be included for this activity.**

3.8 Scope of Work : Containment

Containment is to be assessed with the ISCo engineer and additional containment provided as agreed, if necessary.

3.9 Contractor Supplied Equipment

The contractor shall supply and install the following equipment. All equipment shall be suitably rated for the environment in which it is to be installed (site hazardous area drawing available on request). Where not fully specified, equipment shall conform with normal site standards for similar installations.

- None

3.10 Free Issue Equipment

The contractor shall supply labour and materials to take delivery, offload and position the following free issue equipment.

- 1 off LV Switchboard.



Appendix I

Schedules & Specifications

SI494001_SCH Rev C

Cable Specification - Type 'J'



INSTRUMENT/ELECTRICAL CABLE SCHEDULE



CABLE		CONDUCTORS		CABLE ROUTE				APPROX. LENGTH METRES	REMARKS
REFERENCE	TYPE	AREA mm ²	No.	FROM	GLAND TYPE	TO	GLAND TYPE		
P41169	J01	400.0	1 Core	Transformer L1	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	Cables in Parallel - Existing cables to be re-terminated
P41170	J01	400.0	1 Core	Transformer L1	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	
P41171	J01	400.0	1 Core	Transformer L2	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	Cables in Parallel - Existing cables to be re-terminated
P41172	J01	400.0	1 Core	Transformer L2	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	
P41173	J01	400.0	1 Core	Transformer L3	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	Cables in Parallel - Existing cables to be re-terminated
P41174	J01	400.0	1 Core	Transformer L3	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	
P41175	J01	400.0	1 Core	Transformer N	ATEX II 2 G EExed	LV Board Incomer	ATEX II 2 G EExed	10	
E41176	J01	240.0	1 Core	Transformer Earth	ATEX II 2 G EExed	LV Board Earth Bar	ATEX II 2 G EExed	10	Green/Yellow Outer Sheath
P41177	J01	240.0	1 Core	LV Board Compartment B2 (L1)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41178	J01	240.0	1 Core	LV Board Compartment B2 (L1)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41179	J01	240.0	1 Core	LV Board Compartment B2 (L2)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41180	J01	240.0	1 Core	LV Board Compartment B2 (L2)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41181	J01	240.0	1 Core	LV Board Compartment B2 (L3)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41182	J01	240.0	1 Core	LV Board Compartment B2 (L3)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41183	J01	240.0	1 Core	LV Board Compartment B2 (N)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
P41184	J01	240.0	1 Core	LV Board Compartment B2 (N)	ATEX II 2 G EExed	MCC Busbars	ATEX II 2 G EExed	10	
E41185	J01	240.0	1 Core	LV Board Earth Bar	ATEX II 2 G EExed	MCC Earth Bar	ATEX II 2 G EExed	10	Green/Yellow Outer Sheath
P41186	J04	185.0	4 Core	LV Board Compartment C1	ATEX II 2 G EExed	P4-7 Starter	ATEX II 2 G EExed	10	3 Ph + Earth
							TOTAL	180	

NOTES:
1) Refer to P&I Design Cable Specifications for details on Cable Type.

- Denotes Cable Modified
- Denotes Cable Deleted
- Denotes Cable Added
- Future Cables

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	09.04.15	MM	MM	PP	PP	Preliminary Issue
B	09.04.15	MM	MM	PP	PP	Issued for Tender
C	19.06.15	MM	MM	PP	MM	Issued for Construction

PLANT	Immingham Storage Co. - East Terminal	
TITLE	No. 4 Switchroom - Cable Schedule	
		
CLIENT DRG No		SHEET 1 OF 1
		REF No. SI494001_SCH

TYPE	J
DESCRIPTION	XLPE Insulated Power Cable - Armoured
MANUFACTURING SPECIFICATION	BS5467
SERVICE	Power Distribution / Control (Max. 440V ac.)
VOLTAGE	600/1000V.
CONDUCTORS	Stranded Copper
INSULATION	XLPE (Cross Linked Polyethylene)
CORE COLOUR CODE	1 core Brown 2 cores Brown, Blue 3 cores Brown, Black, Grey 4 cores Brown, Black, Grey, Blue 5 cores Brown, Black, Grey, Blue, Green/Yellow 7 cores } 12 cores White insulation with core number indelibly marked at 19 cores regular maximum intervals of 50mm 27 cores } 37 cores 48 cores }
SHEATH	Black PVC
ARMOUR BEDDING	PVC
ARMOUR	Single Core - Aluminium Wire Multi Core - Galvanised Steel Wire
NOTES	The cable type shall be followed by a number that defines the number of cores within a given cable. e.g. J12 indicates a twelve core type J cable.