P & I Design Ltd

Process Instrumentation Consultancy & Design

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Web Site: www.pidesign.co.uk

INTER TERMINALS IMMINGHAM LTD

EAST TERMINAL

GASOLINE OVERFILL PROTECTION SAFETY

INSTRUMENT SYSTEM IMMEAS-SIS1

TESTING MANUAL

Contents

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IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

No4 SWITCHROOM TANK OVERFILL PROTECTION

SAFETY INSTRUMENT SYSTEM LOGIC PANEL

FACTORY ACCEPTANCE TEST PROCEDURE

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	05.03.14	D.B.Faulkner	DBF	DSR	Original Issue	
						Document No. SI483005_RPT

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1.0 INTRODUCTION

This procedure details the requirements for the testing and acceptance of the Immingham Storage Co Ltd, East Terminal, No.4 Switchroom Safety Instrument System logic panel.

This FAT is part of the life cycle approach required for Safety Instrument Systems as required in BS EN 61511-1:2004 Section 13 where the objectives are to ensure the logic solver satisfies the requirements defined in the Safety Requirements Specification and all elements perform correctly. No software is employed in this SIS; hence the tests involve hardware checks only.

Test results including documentation verification are recorded in this report and documentation listed in section 2.0. All results to be initialled and dated. Any failure during the test must be documented and analysed together with details of the appropriate corrective action.

The testing shall be completed in the section and step order laid out in this report.

The logic panel will be 'Cold' tested prior to powered functional testing.
This report will be used to control and record the method statements and functional tests. Controlled copies of listed documentation will be used to record, by highlighting (yellow), satisfactory terminations and functions. Errors and omissions will be corrected and noted in red. The controlled documentation will constitute a significant proportion of the testing records and provides an audit trail to the 'As Built' issue.

The testing procedure will request confirmation of functions, a change of status not requested will require investigation.

Reference material required –

Quality	Description	Revision
QIE2006	Quality Instruction QIE2006 Logic Drawings	
Manufacturers Documentation	**Description**	**Revision**
	E&H FTL325P Nivotester Manual	
	PILZ PNOZ s2 Manual	

2.0 DOCUMENTATION VERIFICATION

Purpose of Test		
Verify Correct Documentation used for testing.		
Method of Test		
Confirm documentation and revisions used for testing. Record permit number and type (cold/hot/confined space)		
Permit To Work Number	N/A	**Permit To Work Type** N/A
Safety Instrument System Documentation Manual SI483001_MNL Revision		N/A.
Drawing Number	**Title**	**Revision**
SI483005_DWG	SIS Logic Panel External Layout	B
SI483006_DWG	SIS Logic Panel Internal Layout	B
SI483007_DWG	SIS Logic Drawing 1 , Power Distribution	B
SI483008_DWG	SIS Logic Drawing 2 , ESD	B
SI483009_DWG	SIS Logic Drawing 3 , Tank 561	B
SI483010_DWG	SIS Logic Drawing 4 , Tank 564	B
SI483011_DWG	SIS Logic Drawing 5 , Tank 568	B
Schedules	**Title**	**Revision**
SI483003_SCH	No.4 East 500 Series Tanks Safety Functions Matrix	A
SI483008_SCH	No.5 SIS Logic Panel Label Schedule	A
Instrument Specifications	**Title**	**Revision**
SI277001_SPC	Tank Level Switch (Liquiphant)	B
Reports	**Title**	**Revision**
SI483002_RPT	500 Series Tank Farm Safety Requirement Specification	
SI483003_RPT	500 Series Tank Farm Management of Functional Safety	
SI483004_RPT	500 Series Safety Instrument System	
Actions/Comments		
	Sign	**Date**
Tested by		21/3/14

3.0 INSPECTION

3.1 EQUIPMENT CONFORMS TO INSTRUMENT SPECIFICATIONS

Equipment Required	
Hand Tools, yellow highlighter, red pen	
Purpose of Test	
To verify the fitted equipment is as specified. To verify the fitted equipment is set up as specified.	
Method Of Test	**Result/Date**
3.1.1 Controlled copies of listed specifications will be used to record, by highlighting (yellow), correct equipment is installed as per Tag number listed on specification. Errors and omissions will be corrected and noted in red. Record serial numbers of equipment on controlled copy specifications . Switches and dials to be adjusted to correct settings as detailed on drawings, verify set correctly by highlighting (yellow) on controlled copy drawings.	
1. SI277001_SPC - Tank Level Switch (Liquiphant)	
Actions/Comments	
	Sign / **Date**
Tested by	21/3/14

3.2 LOGIC PANEL CONSTRUCTION INSPECTION

Equipment Required	
Hand Tools, yellow highlighter, red pen.	
Purpose of Test	
To verify the logic panel construction is satisfactory to proceed to powered functional testing. The logic panel has been constructed and wired by a competent & reputable panel building company; initial quality checks have been carried out prior to being available for witnessed factory testing.	
Method Of Test	**Result/Date**
3.2.1 Controlled copies of listed logic drawings will be used to record, by highlighting (yellow), satisfactory terminations and functions. Errors and omissions will be corrected and noted in red.	
1. External panel layout and identification conforms to SI483005_DWG and SI483008_SCH.	✓
2. Internal panel layout and identification conforms to SI483006_DWG.	✓
3. Panel physical construction and paintwork satisfactory.	✓
4. Gland plates correctly fitted and satisfactory.	✓
5. Doors and locks operational.	✓
6. Equipment mountings secure.	✓
7. Panel earthing correct.	✓
8. All equipment voltage rating correct and conforms to specifications.	✓
Actions/Comments	

	Sign	**Date**
Tested by		21/3/14

3.3 LOGIC PANEL WIRING INSPECTION

Equipment Required	
Hand Tools, yellow highlighter, red pen.	
Purpose of Test	
To verify the logic panel internal wiring is satisfactory to proceed to powered functional testing. The logic panel has been constructed and wired by a competent & reputable panel building company; initial quality checks have been carried out prior to being available for witnessed factory testing.	
Method Of Test	**Result**
3.3.1 A random sample of the following tests to be carried out. During the procedure of functional testing the controlled copies of listed logic drawings will be used to record, by highlighting (yellow), satisfactory compliance with actions 1 to 6. On completion of all functional testing, all logic drawings should be fully highlighted. Errors and omissions will be corrected and noted in red.	
1. Terminals type and numbering conforms to logic drawings.	✓
2. Panel wire feruling conforms to logic drawings.	✓
3. Panel wire gauge and colour conforms to panel specification.	✓
4. Fuse and MCB ratings conform to logic drawings.	✓
5. Termination and crimps tight.	✓
6. Point to point wiring correct to logic drawings.	✓
Actions/Comments	

	Sign	**Date**
Tested by		21/3/14

4 FUNCTIONAL TESTING

4.1 PANEL INFRASTRUCTURE

Equipment Required	
Multi-meter, hand tools, yellow highlighter, red pen.	
Purpose of Test	
To verify the functionality of the panel infrastructure.	
Method Of Test	
	Result
1. Initial setup, all MCB's to the off position, all 24Vdc, 0Vdc fuses and links removed. Connect a suitably protected 240Vac supply to the panel isolator incoming terminals.	✓
2. Select internal isolator to off position, establish ac power to logic panel. Confirm no Vac at MCB's, select internal isolator to on position, confirm and record 240 Vac power on all MCB's.	ISO On 240 .....Vac ISO Off ....0.....Vac
3. Confirm and record 24Vdc on all TB24V terminals to associated TB0V terminal when MCB 1 on, confirm 0Vdc on all TB24V terminals to associated TB0V terminal when MCB 1 off.	MCB On 24.....Vdc MCB Off ....0.....Vdc
4. Confirm socket energised when MCB 2 on, confirm de-energised when MCB 2 off..	✓
5. Confirm panel internal light illuminated when MCB 3 on, confirm extinguished when MCB 3 off.	✓
6. Confirm power on load side of MCB 4 when MCB 4 on, confirm no power on load side when MCB 4 off.	MCB On 240....Vac MCB Off .0.....Vac
7. Confirm power on load side of MCB 5 when MCB 5 on, confirm no power on load side when MCB 5 off.	MCB On 240...Vac MCB Off ...0.....Vac
8. Insert each 24Vdc fuse and 0Vdc link in turn confirming 24Vdc across load side and associated panel equipment powers up where applicable.	✓
Actions/Comments	
	Sign / **Date**
Tested by	[signature] 21/4/14

4.2 LOOP TESTING

4.2.1 MANUAL SHUTDOWN – ESD

Equipment Required	
Multi-meter, hand tools, links, yellow highlighter, red pen.	
Purpose of Test	
To verify the functionality of the ESD logic trip and reset actions. To verify correct lamp status and lamp test action. To verify the functionality of an ESD fuse failure. To verify the functionality of an ESD open circuit failure.	
Method Of Test	
4.2.1.1 Simulate a volt free input to manual shutdowns in the system by applying and removing a link on the associated incoming terminals. Input linked manual shutdown relay energised, input open circuit manual shutdown relay de-energised. Each relay to be tested for energised to de-energised to simulate external ESD pushbutton action. **4.2.1.2** Open circuit manual shutdown incoming and remote reset link on incoming terminals, link ESD input confirming relay does not re-energise until remote reset input is replaced. **4.2.1.3** Remove and replace associated fuse for ESD, confirm ESD relays de-energised whilst removed. **4.2.1.4** Confirm ESD status lamp illuminated whilst relay de-energised, extinguished whilst relay energised. confirm ESD status lamp illuminates whist lamp test pushbutton depressed when relay energised.	Result
1. ISCo Site ESD R124.	✓
2. ISCo Site ESD R124A.	✓
Actions/Comments	

Approvals (Note: Signature indicates acceptance of test with actions/comments noted)	**Sign**	**Date**
Tested by		21/3/14

4.2.2 MANUAL SHUTDOWN - BUND ISOLATION PUSHBUTTONS

Equipment Required	
Multi-meter, hand tools, links, yellow highlighter, red pen.	
Purpose of Test	
To verify the functionality of the bund isolation pushbutton logic. To verify correct BPCS interface status. To verify the functionality of an ESD fuse failure. To verify the functionality of an ESD open circuit failure.	
Method Of Test	
4.2.2.1 Simulate a volt free input to each isolation relay in the system. Incoming terminals linked isolation relay energised, incoming terminals open circuit isolation relay de-energised. Each relay to be tested for energised to de-energised to simulate isolation pushbutton action. **4.2.2.2** Confirm BPCS status on outgoing terminals, outgoing terminals to BPCS closed circuit whilst relay energised, open circuit whilst relay de-energised. **4.2.2.3** Remove and replace associated fuse for each isolation, confirm isolation relay de-energised whilst removed.	Result
1. Tank 561 Isolation R296.	✓
2. Tank 564 Isolation R376.	✓
3. Tank 568 Isolation R456.	✓
Actions/Comments	

	Sign	**Date**
Tested by		21/8/14

4.2.3 SYSTEM TRIP RESET

Equipment Required	
Multi-meter, hand tools, links, yellow highlighter, red pen.	
Purpose of Test	
To verify the functionality of the system reset logic. To verify the functionality of an fuse failure.	
Method Of Test	
4.2.3.1 Operate local reset pushbutton, confirming system trip reset relays energised whilst reset depressed. Simulate a volt free input to remote reset incoming terminals, incoming terminals linked reset relays energised, incoming terminals open circuit reset relays de-energised. **4.2.3.2** Remove and replace fuse confirm relay de-energised whilst removed and reset pushbutton activated.	Result
1. Reset Relay R84.	✓
2. Reset Relay R85.	✓
3. Reset Relay R86.	✓
Actions/Comments	

Approvals (Note: Signature indicates acceptance of test with actions/comments noted)	**Sign**	**Date**
Tested by		21/3/14

4.2.4 VALVE FEEDBACK STATUS

Equipment Required	
Multi-meter, hand tools, links, yellow highlighter, red pen.	
Purpose of Test	
To verify the functionality of the limit switch feedback logic. To verify the functionality of the limit switch feedback BPCS interface. To verify correct lamp status and lamp test action. To verify the functionality of a fuse failure. To verify the functionality of open circuit failure.	
Method Of Test	
4.2.4.1 Simulate a volt free input to each limit switch relay in the system. Incoming terminals linked relay energised, incoming terminals open circuit relay de-energised. **4.2.4.2** Confirm BPCS status on outgoing terminals, outgoing terminals to BPCS closed circuit whilst relay energised, open circuit whilst relay de-energised. **4.2.4.3** Remove and replace associated fuse for each limit switch, confirm relay de-energised whilst removed. **4.2.4.4** Confirm limit switch status lamp illuminated whilst relay energised, extinguished whilst relay de-energised. confirm limit switch status lamp illuminates whist lamp test pushbutton depressed when relay de-energised.	Result
1. ZSO56101 Relay R299.	✓
2. ZSC56101 Relay R304.	✓
3. ZSO56401 Relay R379.	✓
4. ZSC56401 Relay R384.	✓
5. ZSO56801 Relay R459.	✓
6. ZSC56801 Relay R464.	✓
Actions/Comments	

	Sign	**Date**
Tested by		21/3/14

4.2.5 HIGH LEVELS

Equipment Required	
Multi-meter, hand tools, links, yellow highlighter, red pen, SI277001_SPC E&H level switch probe.	
Purpose of Test	
To verify the functionality of each individual high level logic. To verify correct healthy to trip condition of level to open/close circuit self test. To verify correct BPCS interface status. To verify correct Hi Hi Level Annunciator Alarm Status To verify correct lamp status and lamp test action. To verify the functionality of a fuse failure. To verify the functionality of an open circuit failure. To verify the functionality of a short circuit failure.	
Method Of Test	
4.2.5.1 Connect an E&H Liquiphant level probe as Specification SI277001_SPC to incoming terminals. Ensure the probe tip is not covered and the internal switch unit is set to max/>0.7. Immerse and uncover probe tip, confirm relay de-energised whilst immersed. < 2 seconds response time required. **4.2.5.2** Confirm BPCS status on outgoing terminals, closed circuit whilst relay energised, open circuit whilst relay de-energised. **4.2.5.3** Confirm high level alarm status on outgoing annunciator terminals, closed circuit whilst relay energised, open circuit whilst relay de-energised. **4.2.5.4** Confirm high level lamp extinguished whilst relay energised, illuminated whilst relay de-energised, confirm high level lamp illuminates whist lamp test pushbutton depressed and relay energised. **4.2.5.5** Remove and replace associated fuse for each level switch, confirm relay de-energised whilst removed. **4.2.5.6** Open circuit field input to each level switch, confirm relay de-energised whilst open circuit. **4.2.5.7** Short circuit field input to each level switch, confirm relay de-energised whilst short circuit.	Result
1. Tank 561 High Level R283.	✓
2. Tank 564 High Level R363.	✓
3. Tank 568 High Level R443.	✓
Actions/Comments	
NO NIVOTESTERS AT FAT	

	Sign	**Date**
Tested by	[signature]	21/3/14

4.2.7 SAFETY RELAY

Equipment Required	
Multi-meter, hand tools, links, yellow highlighter, red pen, SI277001_SPC E&H level switch probe.	
Purpose of Test	
To verify correct healthy functionality of each individual safety relay. To verify correct healthy to trip condition of each individual safety relay. To verify correct reset actions of each individual safety relay. To verify correct BPCS interface status. To verify correct lamp status and lamp test action. To verify the functionality of a fuse failure.	
Method Of Test	
4.2.7.1 Simulate level switch probe healthy by connecting an E&H Liquiphant level probe as Specification SI277001_SPC to incoming terminals. Ensure the probe tip is not covered and the internal switch unit is set to max/>0.7. **4.2.7.2** Simulate all valve limit switch feedback as valve closed by applying a link to incoming terminals. **4.2.7.3** Momentary depress reset pushbutton, confirm all safety relays energise. **4.2.7.4** Confirm safety relay BPCS status on outgoing terminals, closed circuit whilst safety relay energised, open circuit whilst safety relay de-energised. **4.2.7.5** Confirm safety relay lamp extinguished whilst relay energised, illuminated whilst relay de-energised, confirm safety relay lamp illuminates whist lamp test pushbutton depressed and relay energised. **4.2.7.6** Simulate a high level by immersing probe tip. Confirm safety relay de-energises. **4.2.7.7** Simulate level switch probe healthy by uncovering the probe tip. Confirm safety relay remains de-energised. **4.2.7.8** Simulate associated valve limit switch feedback as valve not closed by removing link applied to incoming terminals. **4.2.7.9** Momentary depress reset pushbutton, confirm safety relays remains de-energised. **4.2.7.10** Simulate associated valve limit switch feedback as valve closed by applying a link to incoming terminals. **4.2.7.11** Momentary depress reset pushbutton, confirm safety relay energised. **4.2.7.12** Remove and replace associated fuse for each safety relay, confirm relay de-energised whilst removed.	Result
1. Tank 561 R250.	✓
2. Tank 564 R330.	✓
3. Tank 568 R410.	✓
Actions/Comments	
NO INVESTIGATIONS AT FAT	

	Sign	**Date**
Tested by		21/3/14

4.2.8 IMPORT VALVES

Equipment Required	
Multi-meter, hand tools, links, yellow highlighter, red pen, SI277001_SPC E&H level switch probe.	
Purpose of Test	
To verify correct healthy functionality of each individual import valve logic. To verify correct healthy to trip condition of each individual import valve logic. To verify the functionality of a fuse failure.	
Method Of Test	
4.2.8.1 Simulate level switch probe healthy by connecting an E&H Liquiphant level probe as Specification SI277001_SPC to incoming terminals. Ensure the probe tip is not covered and the internal switch unit is set to max/>0.7. **4.2.8.2** Simulate all manual shutdown systems healthy by applying a link to incoming terminals. **4.2.8.3** Simulate all valve limit switch feedback as valve closed by applying a link to incoming terminals. **4.2.8.4** Momentary depress reset pushbutton, confirm all safety relays energise. **4.2.8.5** Confirm 24Vdc present at all XSV outgoing terminals. **4.2.8.6** Disconnect BPCS Open Command Wire Link. Confirm associated XSV outgoing terminals de-energised whilst removed and energised when connected. **4.2.8.7** Remove BPCS Open Command Wire Link, apply a 24Vdc supply to incoming BPCS Open commands terminals. Confirm associated XSV outgoing terminals energised whilst BPCS Open Command 24Vdc applied and de-energised when BPCS Open Command 24Vdc removed. **4.2.8.8** Remove BPCS Open Command Wire Link, apply a 24Vdc supply to incoming BPCS Open commands terminals. Confirm associated XSV outgoing terminals energised whilst BPCS Open Command 24Vdc applied and de-energised when BPCS Open Command 24Vdc removed. **4.2.8.9** Trip each interlock as detailed on SI483003_SCH in turn confirming associated XSV outgoing terminals de-energise in trip position and re-energise once healthy and reset. **4.2.8.10** Remove and replace associated fuse for each XSV, confirming associated XSV outgoing terminals de-energise with fuse removed.	Result
1. XSV56101.	✓
2. XSV56401.	✓
3. XSV56801.	✓
Actions/Comments	
NO NIJOTESTED AT FAT.	
	Sign / **Date**
Tested by	21/3/14

5.0 CHALLENGE TESTING

Equipment Required	
Multi-meter, hand tools, links, yellow highlighter, red pen.	
Purpose of Test	
To verify the actions of operator interactions do not affect the functionality of the system.	
Method Of Test	
5.0.1 Verify rising edge action of safety relay reset logic by depressing reset pushbutton whilst re-establishing level probe connection at incoming terminals with associated valve closed limit on. Confirm safety relay does not energise until reset pushbutton released and repressed. **5.0.2** Verify no impact on functionality by repeating import valve loop test with lamp test pushbutton depressed / linked out. Confirm XSV output actions correct.	Result
1. Tank 561 R250.	✓
2. Tank 564 R330.	✓
3. Tank 568 R410.	✓
4. XSV56101.	✓
5. XSV56401.	✓
6. XSV56801.	✓
Actions/Comments	
NO INJECTORS AT FAT	

	Sign	**Date**
Tested by	[signature]	21/3/14

6.0 ADDITIONAL TESTING

Equipment Required	
As required.	
Purpose of Test	
To verify the actions of additional tests requested by client. To verify the actions of additional challenge testing as appropriate.	
Method Of Test	
6.0.1 Detail additional tests carried out.	Result
1.	
2.	
3.	
4.	
5.	
6.	
7.	
8.	
9.	
10.	
Actions/Comments	

	Sign	**Date**
Tested by		

7.0 HANDOVER AND LIFE CYCLE

Equipment Required	
None specific.	
Purpose of Test	
Return logic panel to working condition as found prior to testing. Update documentation and confirm testing complete to move on to next phase of proof testing.	
Method Of Test	
7.0.1 Remove all test links and test equipment. **7.0.2** Replace all removable links as found. **7.0.3** Replace incoming and outgoing terminals as found. **7.0.4** Replace or secure covers and guards. **7.0.5** Complete handover and deviation list. **7.0.6** Update documentation as required.	Result
1. All test links removed.	✓
2. All removable links as found.	✓
3. All incoming and outgoing terminals returned to as found.	✓
4. All covers and guards replaced or secured inside panel.	✓
5. Handover and deviation list completed.	✓
6. Documentation update as required.	✓
Actions/Comments	
5. SI483005_HDR_A 6. AS BUILT TO MARKUPS.	

	Sign	Date
Tested by		21/3/14

CLIENT: Immingham Storage Co Ltd	**PROJECT REF:** SI483	**DOC REF:** SI483001_HDR_A
PROJECT: SIS Restructuring	**LOCATION:** ISCo East	**DATE:** 21.03.14
PLANT SECTION: No4 Switchroom	**TESTING PHASE :** FAT	**PAGE:** 1 **OF** 1

This certificate covers the acceptance of the following works:-
Factory Acceptance test (FAT) of No4 Switchroom Tank Overfill Protection Safety Instrument System (SIS) Logic Panel.

The panel has completed the FAT phase and has been released for site installation.

In accordance with the following specifications and conditions of contract:-
P0783002_QUO_A - SIS Restructuring - 4 East Tanks

We duly handover the work specified subject to the following exceptions:-
SI483002_HDR_A - No4 Switchroom SIS Logic Panel FAT Deviation Record Sheet

Approvals

P & I DESIGN LTD: D.B.Faulkner DATE: 21.03.14

CLIENT: DATE:

CLIENT: Immingham Storage Co Ltd **PROJECT REF:** SI483 **DOC REF:** SI483002_HDR_A

PROJECT: SIS Restructuring **LOCATION:** ISCo East **DATE:** 21.03.14

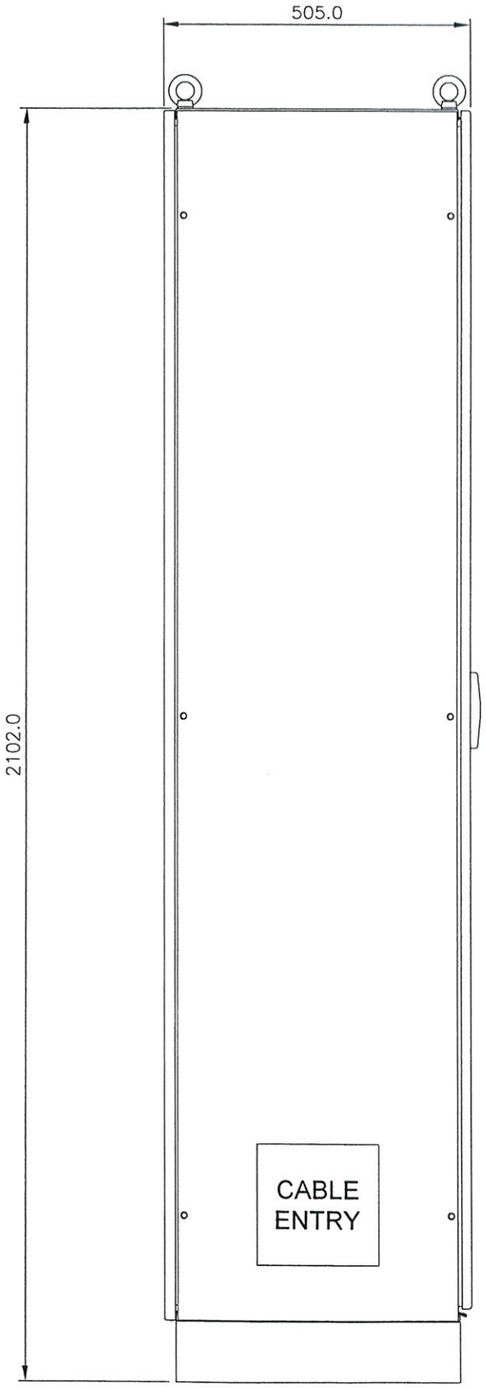
PLANT SECTION: No4 Switchroom **TESTING PHASE :** FAT **PAGE:** 1 **OF** 1

Raised By	Date	Responsible Engineer	Ref	Deviation Details	Complete (Sign)
FAT	21.03.14	P&I	1	250mA fuses fitted were 200mA specified. Action – P&I to confirm compliance with solenoids. Change at SAT if required.	
FAT	21.03.14	P&I	2	No Nivotesters fitted at FAT, existing units to be recovered from site. Action – Full test at SAT	
FAT	21.03.14	P&I	3	High Level Safety Relays reset action changed. Action – Documentation to update.	

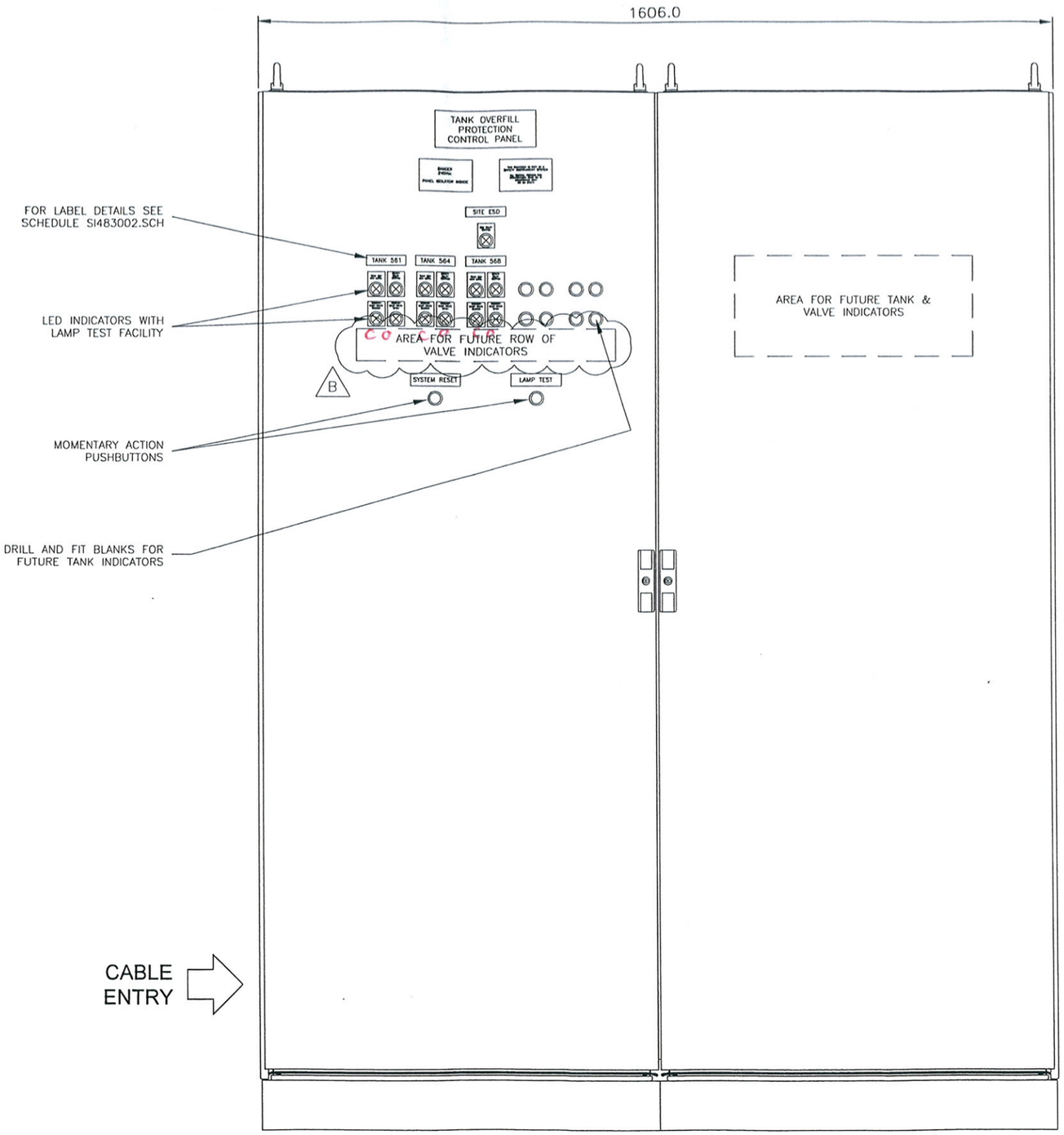
APPROVALS

P & I DESIGN LTD: D.B.Faulkner DATE: 21.03.14

CLIENT: DATE:



SIDE ELEVATION



FRONT ELEVATION

ENCLOSURE	RITTAL TSB
	ENCLOSURE 8805.500
	SIDE PANEL 8105.235
	PLINTH FRONT 8601.800
	PLINTH SIDE 8601.050
PAINT FINISH	RAL 7035
PROTECTION	IP55
LABELS	W/B/W TRAFFOLITE
CABLE INCOMING	SIDE ENTRY
CABLE OUTGOING	SIDE EXIT
SUPPLY	230Vac 50hz

CONTROLLED
21 MAR 2014
FAT
COPY

PHOTO'S IN PROJECT FOLDER.

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR TENDER
B	29/01/14	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR CONSTRUCTION

PLANT	IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE	No.4 SWITCHROOM TANK OVERFILL SIS PANEL EXTERNAL LAYOUT

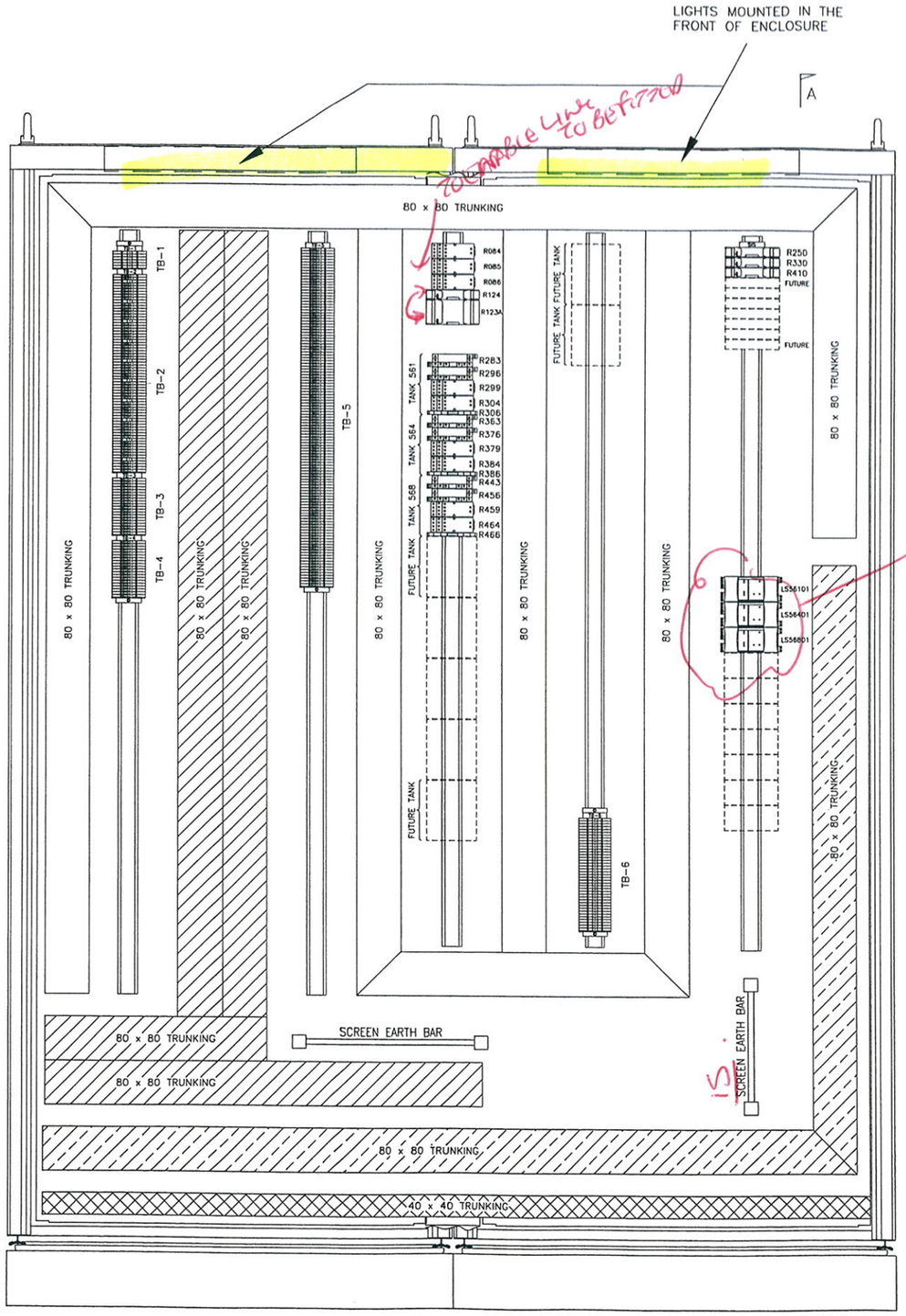
simon — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW

P & I Design Ltd
Tel. 01642 617444
www.pidesign.co.uk

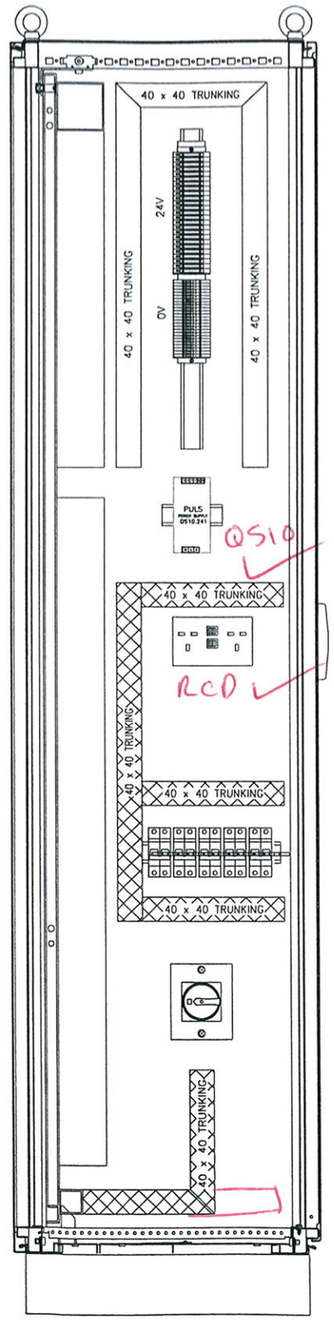
SHEET 1 OF 1

CLIENT DRG. No.

P&I DRG No. SI483005_DWG



VIEW ON BACK PLATE



VIEW ON ARROW A-A

RELAY No.	TYPE
R084	FINDER 4-POLE
R085	FINDER 4-POLE
R086	FINDER 4-POLE
R124	PILZ PNOZs2
R124A	PILZ PNOZs11
R250	PILZ PNOZs2
R330	PILZ PNOZs2
R410	PILZ PNOZs2
R283	OMRON 4-POLE
R296	OMRON 4-POLE
R299	FINDER 4-POLE
R304	FINDER 4-POLE
R306	LUTZ 1-POLE
R363	OMRON 4-POLE
R376	OMRON 4-POLE
R379	FINDER 4-POLE
R384	FINDER 4-POLE
R386	LUTZ 1-POLE
R443	OMRON 4-POLE
R456	OMRON 4-POLE
R459	FINDER 4-POLE
R464	FINDER 4-POLE
R466	LUTZ 1-POLE

NOTES

RELAYS

A) SAFETY RELAYS :-

PILZ TYPE PNOZ s2 (Order No. 750 102)

B) EXPANSION RELAYS :-

PILZ TYPE PNOZ s11 (Order No. 750 111)

C) 4-POLE GUIDED CONTACT RELAYS :-

BASE - OMRON TYPE P7SA-10F-ND

RELAY - OMRON G7SA-3A1B

D) STANDARD 4-POLE RELAYS :-

BASE - FINDER TYPE 94.04.0 (Block)

RELAY - FINDER 55.34.9.024.0940

55.34.9.024.0094.

E) SINGLE POLE RELAYS :-

LUTZ - TYPE RE 7-2312 DC 24V (Order No. 760022)

TERMINAL BLOCKS

BLOCK	QTY	DESCRIPTION
TB-24V	25	WSI 6 (Wiedmuller 1011000000)
TB-0V	25	WTR 2.5 (Wiedmuller 1011000000)
TB-1	6	WDU 2.5 (Wiedmuller 1020000000)
TB-2	60	WTR 2.5 (Wiedmuller 1011000000)
	10	WDU 2.5 (Wiedmuller 1020000000)
TB-3	20	WTR 2.5 (Wiedmuller 1011000000)
TB-4	20	WTR 2.5 (Wiedmuller 1011000000)
TB-5	120	WTR 2.5 (Wiedmuller 1011000000)
TB-6	40	WDU 2.5 (Wiedmuller 1020000000)

WIRING DETAILS

DESCRIPTION	
ELECTRICAL 440V / 240V AC:	
SIZE:	n/a
COLOUR:	n/a
INSTRUMENT 230Vac SUPPLIES:	
SIZE:	Suitably Rated with Minimum 0.5mm²
COLOUR:	Live (Brown) / Neutral (Blue) / Earth (Green/Yellow)
INSTRUMENT 110Vdc SUPPLIES:	
SIZE:	n/a
COLOUR:	n/a
24V DC SUPPLIES:	
SIZE:	Suitably Rated with Minimum 0.5mm²
COLOUR:	Positive (Red) / 0V (Black)
DIGITAL SWITCHED AC:	
SIZE:	n/a
COLOUR:	n/a
DIGITAL SWITCHED DC:	
SIZE:	0.5mm²
COLOUR:	White
ANALOGUE:	
SIZE:	0.5mm² N/A.
COLOUR:	Grey
CRIMPS:	
TYPE:	Bootlace or Twin Grip Insulated
FERRULES:	
TYPE:	Heat Shrink Thermal Printed Sleeves

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GREY TRUNKING - FIELD CABLES (24Vdc)

BLACK TRUNKING - 230Vac

GREY TRUNKING - PANEL WIRING (24Vdc)

BLUE TRUNKING - FIELD WIRING (I.S.)

B) a) RELAY & TERMINAL QUANTITY REDUCED AS EXPORT VALVE LOGIC REMOVED.
b) RELAY NUMBERS REVISED TO MATCH SPLIT SIS & BPCS LOGIC ON THE WIRING DRAWINGS.

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	05/12/13	P.P.	P.P.	D.BT	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.BT	M.M.	ISSUED FOR CONSTRUCTION

PLANT: IMMINGHAM STORAGE Co. - EAST TERMINAL

TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL INTERNAL LAYOUT (OPTION 1)

simon — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW

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Tel. 01642 617444
www.pidesign.co.uk

SHEET 1 OF 1

CLIENT DRG. No.

P&I DRG No. SI483006_DWG

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

GENERAL
ACTIVATED VALVE; SOLENOID VALVE; DOUBLE WOUND TRANSFORMER; LAMP; BEACON; SOUNDER; VOLTMETER; HOURS RUN METER; AMMETER; FREQUENCY METER

ISOLATORS & TERMINALS
XX TERMINAL; FUSE LINK; NEUTRAL LINK REMOVABLE; TERMINAL WITH DISCONNECT LINK; PLUG AND SOCKET; ISOLATOR; FUSED SWITCH (NO-LOAD); FUSED SWITCH (ON-LOAD); FUSED SWITCH (ON LOAD (DOUBLE BREAK)

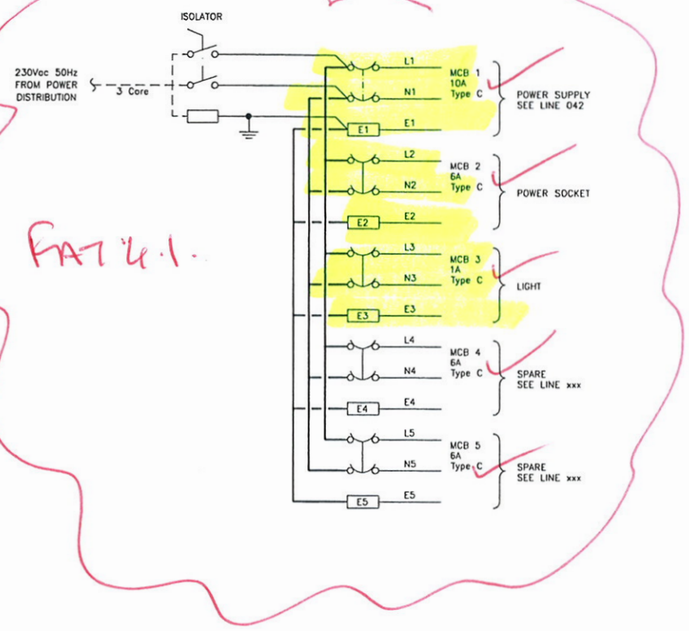
RELAYS & TIMERS
Rxx RELAY; Rxx T TIMED RELAY; NORMALLY OPEN; NORMALLY CLOSED; CHANGEOVER CONTACT; INSTANT OPEN DELAYED CLOSED; INSTANT CLOSE DELAYED OPEN; DELAYED OFF (N/C); DELAYED ON (N/O)

CONTACTORS & OVERLOADS
NORMALLY OPEN; NORMALLY CLOSED; MAGNETIC OVERLOAD RELAY; Cxx CONTACTOR; THERMAL OVERLOAD RELAY; MECHANICAL INTERLOCK

SWITCHES
KEY OPERATED; STOPLOCK PUSHBUTTON; PUSHBUTTON STOP; PUSHBUTTON START; NORMALLY OPEN; NORMALLY OPEN HELD CLOSED; NORMALLY CLOSED; NORMALLY CLOSED HELD OPEN; HS 1 2 3 SWITCH CONTACT MULTI POSITION TYPICAL 3 CIRCUIT; OPENS ON RISING PRESSURE; CLOSES ON RISING PRESSURE; OPENS ON RISING LEVEL; CLOSES ON RISING LEVEL; OPENS ON RISING TEMPERATURE; CLOSES ON RISING TEMPERATURE; OPENS ON INCREASING FLOW; CLOSES ON INCREASING FLOW

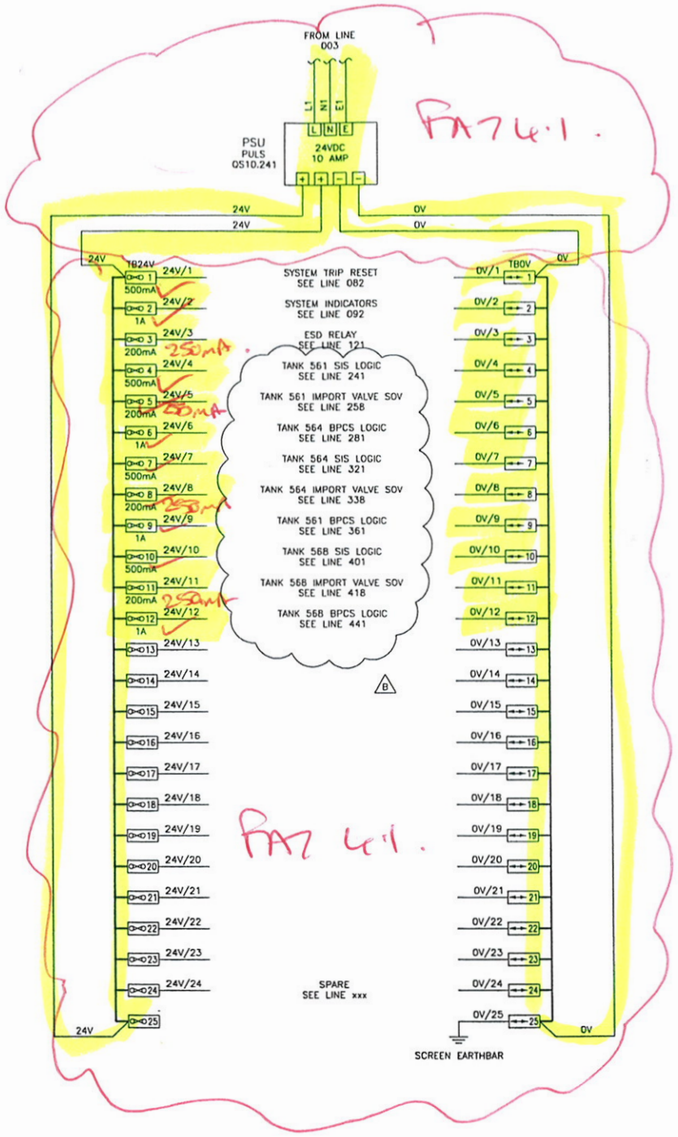
RELAY TERMINAL NUMBERING APPLICABLE ON THIS DRAWING

AC POWER DISTRIBUTION



FAT 4.1.

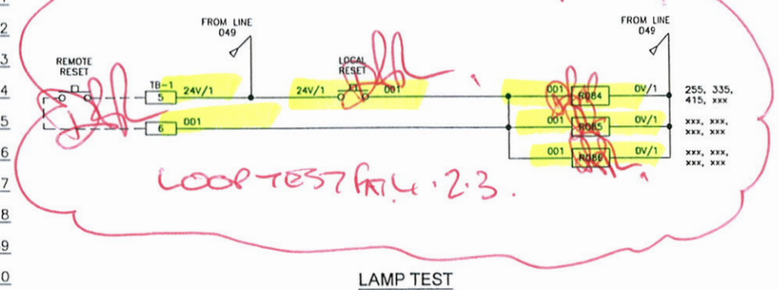
DC POWER DISTRIBUTION



FAT 4.1.

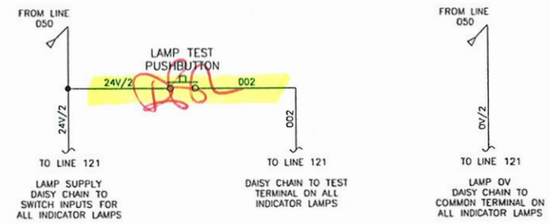
FAT 4.1.

SYSTEM TRIP RESET



LOOP TEST FAT 4.1.2.3.

LAMP TEST



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LAST NUMBER USED : 002
SPARE TO : 020

NOTES
1) LED INDICATORS FITTED WITH INTERNAL DIODES

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REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR TENDER
B	29/01/14	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR CONSTRUCTION

PLANT: IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 1 : POWER DISTRIBUTION
SIMON — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW
P & I Design Ltd, Tel. 01642 617444, www.pidesign.co.uk
SHEET 1 OF 1
CLIENT DRG. No.
P&I DRG No. SI483007_DWG

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

GENERAL
ACTIVATED VALVE · SOLENOID VALVE · DOUBLE WOUND TRANSFORMER · LAMP · BEACON · SOUNDER · VOLTMETER · HOURS RUN METER · AMMETER · FREQUENCY METER

ISOLATORS & TERMINALS
XX TERMINAL · FUSE LINK · NEUTRAL LINK REMOVABLE · TERMINAL WITH DISCONNECT LINK · PLUG AND SOCKET · ISOLATOR · FUSED SWITCH (NO-LOAD) · FUSED SWITCH (ON-LOAD) · FUSED SWITCH (ON LOAD (DOUBLE BREAK)

RELAYS & TIMERS
Rxx RELAY · Rxx T TIMED RELAY · NORMALLY OPEN · NORMALLY CLOSED · CHANGEOVER CONTACT · INSTANT OPEN DELAYED CLOSED · INSTANT CLOSE DELAYED OPEN · DELAYED OFF (N/C) · DELAYED ON (N/O)

CONTACTORS & OVERLOADS
NORMALLY OPEN · NORMALLY CLOSED · MAGNETIC OVERLOAD RELAY · Cxx CONTACTOR · THERMAL OVERLOAD RELAY · MECHANICAL INTERLOCK

SWITCHES
KEY OPERATED · STOPLOCK PUSHBUTTON · PUSHBUTTON STOP · PUSHBUTTON START · NORMALLY OPEN · NORMALLY OPEN HELD CLOSED · NORMALLY CLOSED · NORMALLY CLOSED HELD OPEN · HS 1 2 3 SWITCH CONTACT MULTI POSITION TYPICAL 3 CIRCUIT · OPENS ON RISING PRESSURE · CLOSES ON RISING PRESSURE · OPENS ON RISING LEVEL · CLOSES ON RISING LEVEL · OPENS ON RISING TEMPERATURE · CLOSES ON RISING TEMPERATURE · OPENS ON INCREASING FLOW · CLOSES ON INCREASING FLOW

RELAY TERMINAL NUMBERING APPLICABLE ON THIS DRAWING

SITE ESD

FROM LINE 051 · LAMP SUPPLY FROM LINE 096 · LAMP TEST FROM LINE 096 · FROM LINE 051 · LAMP COMMON FROM LINE 096

SITE ESD · 24V/3 · 021 · 2 · 3 · 4 · 022 · REMOVE LINK FOR REMOTE RESET

R124 PILZ PNOZ s2 · A1 · A2 · 0V/3 · S34 RESET · RESET MODE AUTO

AUXILIARY CONTACTS · 24V/2 · 42 · 41 · 023 · 002 · NOTE 1 · R · 0V/2 · ESD RELAY TRIPPED LAMP

XV56101 IMPORT VALVE	SEE LINE 259	078	14	13	079	SEE LINE 259
XV56401 IMPORT VALVE	SEE LINE 339	138	24	23	139	SEE LINE 339
XV56801 IMPORT VALVE	SEE LINE 419	198	34	33	199	SEE LINE 419

SAFETY CONTACTS

INTERFACE CONNECTOR

R124A PILZ PNOZ s11

SAFETY CONTACTS

14	13	24	23	34	33	44	43	64	63	74	73
84	83	94	93	52	51						

AUXILIARY CONTACTS

B

LAMP SUPPLY TO LINE 281 · LAMP TEST TO LINE 281 · LAMP COMMON TO LINE 281

LAST NUMBER USED : 023
SPARE TO : 030

LAST NUMBER USED : xxx
SPARE TO : 040

LAST NUMBER USED : xxx
SPARE TO : 070

CONTROLLED
21 MAR 2014
COPY

NOTES
1) LED INDICATORS FITTED WITH INTERNAL DIODES

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REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR CONSTRUCTION

PLANT: IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 2 : ESD

SIMON · IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW

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SHEET 1 OF 1

CLIENT DRG. No.

P&I DRG No. SI483008_DWG

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

GENERAL: ACTIVATED VALVE; SOLENOID VALVE; DOUBLE WOUND TRANSFORMER; LAMP; BEACON; SOUNDER; VOLTMETER; HOURS RUN METER; AMMETER; FREQUENCY METER

ISOLATORS & TERMINALS: XX TERMINAL; FUSE LINK; NEUTRAL LINK REMOVABLE; TERMINAL WITH DISCONNECT LINK; PLUG AND SOCKET; ISOLATOR; FUSED SWITCH (NO-LOAD); FUSED SWITCH (ON-LOAD); FUSED SWITCH (ON LOAD (DOUBLE BREAK)

RELAYS & TIMERS: Rxx RELAY; Rxx T TIMED RELAY; NORMALLY OPEN; NORMALLY CLOSED; CHANGEOVER CONTACT; INSTANT OPEN DELAYED CLOSED; INSTANT CLOSE DELAYED OPEN; DELAYED OFF (N/C); DELAYED ON (N/O)

CONTACTORS & OVERLOADS: NORMALLY OPEN; NORMALLY CLOSED; MAGNETIC OVERLOAD RELAY; THERMAL OVERLOAD RELAY; Cxx CONTACTOR; MECHANICAL INTERLOCK

SWITCHES: KEY OPERATED; STOPLOCK PUSHBUTTON; PUSHBUTTON STOP; PUSHBUTTON START; NORMALLY OPEN; NORMALLY OPEN HELD CLOSED; NORMALLY CLOSED; NORMALLY CLOSED HELD OPEN; HS 1 2 3 SWITCH CONTACT MULTI POSITION TYPICAL 3 CIRCUIT; OPENS ON RISING PRESSURE; CLOSES ON RISING PRESSURE; OPENS ON RISING LEVEL; CLOSES ON RISING LEVEL; OPENS ON RISING TEMPERATURE; CLOSES ON RISING TEMPERATURE; OPENS ON INCREASING FLOW; CLOSES ON INCREASING FLOW

RELAY TERMINAL NUMBERING APPLICABLE ON THIS DRAWING: OMRON G5TA-3A1B RELAY CONNECTION DETAILS; FINDER 4-POLE RELAY CONNECTION DETAILS

TANK 561 - SIS LOGIC

LS56101 — TANK 561 HIGH HIGH LEVEL SWITCH
DIP SWITCH SETTINGS: MODE SET – 2; CH1 Switch 1 – ON; CH1 Switch 2 – OFF; CH2 Switch 1 – ON; CH3 Switch 1 – ON
Endress+Hauser FTL325P
R250: A1, A2, 13, 14, 23, 24, 33, 34, 41, 42
SAFETY CONTACTS; AUXILIARY CONTACTS
PILZ PNOZ s2
SYSTEM RESET; XSV56101 CLOSED LIMIT ZSC56101
RESET MODE AUTO
IMPORT VALVE SAFETY SOLENOID XSV56101
SAFETY EARTH
BPCS OPEN COMMAND; TANK ISOLATION; ESD; LINK; WIRE LINK NOTE 3
SEE LINE 283; SEE LINE 290; SEE LINE 291; SEE LINE 292

LOOP TEST 4.2.5
NOTAFIED AT FAT. TO TB FOR TESTING.
LOOP TEST 4.2.7 FAT.
RISING EDGE.
LOOP TEST 4.2.8 FAT.
P&D ex.

LAST NUMBER USED : 080
SPARE TO : 090

TANK 561 - BPCS LOGIC

LS561001; RELAY 3; SEE LINES 242 to 253 FOR FULL SWITCH CONNECTIONS
OMRON G7SA-3A1B GUIDED CONTACT RELAY
R283; R283/1; R283/2; R283/3
TANK HIGH HIGH LEVEL TO ANNUNCIATOR
TANK HIGH HIGH LEVEL TO BPCS
TANK HIGH HIGH LEVEL LAMP
R250; SEE LINES 249 to 270 FOR FULL RELAY CONNECTIONS
SAFETY RELAY TRIPPED TO BPCS
SAFETY RELAY TRIPPED LAMP
TANK 561 ISOLATION PUSHBUTTONS
OMRON RELAY G7SA-3A1B
R296; R296/1; R296/2
TANK ISOLATION P/B OPERATED TO BPCS
IMPORT VALVE OPEN LIMIT SWITCH ZSO56101 NOTE 2
R299; R299/1; R299/2
IMPORT VALVE OPEN TO BPCS
IMPORT VALVE OPEN
IMPORT VALVE CLOSED LIMIT SWITCH ZSC56101 NOTE 2
R304; R304/1; R304/2
IMPORT VALVE CLOSED TO BPCS
IMPORT VALVE CLOSED
OPEN IMPORT VALVE COMMAND FROM BPCS
R306
LAMP SUPPLY TO LINE 361; LAMP TEST TO LINE 361; LAMP COMMON TO LINE 361

LOOP TEST 4.2.5.
LOOP TEST 4.2.7 FAT.
LOOP TEST 4.2.2 FAT.
LOOP TEST 4.2.4 FAT.
LOOP TEST 4.2.4 FAT.
LOOP TEST 4.2.6.

LAST NUMBER USED : 113
SPARE TO : 130

CONTROLLED 21 MAR 2014 FAT COPY

NOTES
1) LED INDICATORS FITTED WITH INTERNAL DIODES.
2) VALVE LIMIT SWITCHES SHOWN WITH VALVE IN CLOSED POSITION.
3) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

B a) DRAWING RE-ARRANGED TO SPLIT SIS & BPCS LOGIC.
b) EXPORT VALVE REMOVED

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REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.S.	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.S.	M.M.	ISSUED FOR CONSTRUCTION

PLANT: IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 3 : TANK 561
simon — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QR
P & I Design Ltd, Tel. 01642 617444, www.pidesign.co.uk
SHEET 1 OF 1
CLIENT DRG. No.
P&I DRG No. SI4B3009_DWG

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

GENERAL: ACTIVATED VALVE; SOLENOID VALVE; DOUBLE WOUND TRANSFORMER; LAMP; BEACON; SOUNDER; VOLTMETER; HOURS RUN METER; AMMETER; FREQUENCY METER

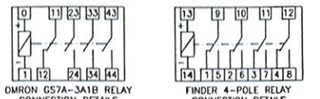
ISOLATORS & TERMINALS: XX TERMINAL; FUSE LINK; NEUTRAL LINK REMOVABLE; TERMINAL WITH DISCONNECT LINK; PLUG AND SOCKET; ISOLATOR; FUSED SWITCH (NO-LOAD); FUSED SWITCH (ON-LOAD); FUSED SWITCH (ON LOAD (DOUBLE BREAK)

RELAYS & TIMERS: Rxx RELAY; Rxx T TIMED RELAY; NORMALLY OPEN; NORMALLY CLOSED; CHANGEOVER CONTACT; INSTANT OPEN DELAYED CLOSED; INSTANT CLOSE DELAYED OPEN; DELAYED OFF (N/C); DELAYED ON (N/O)

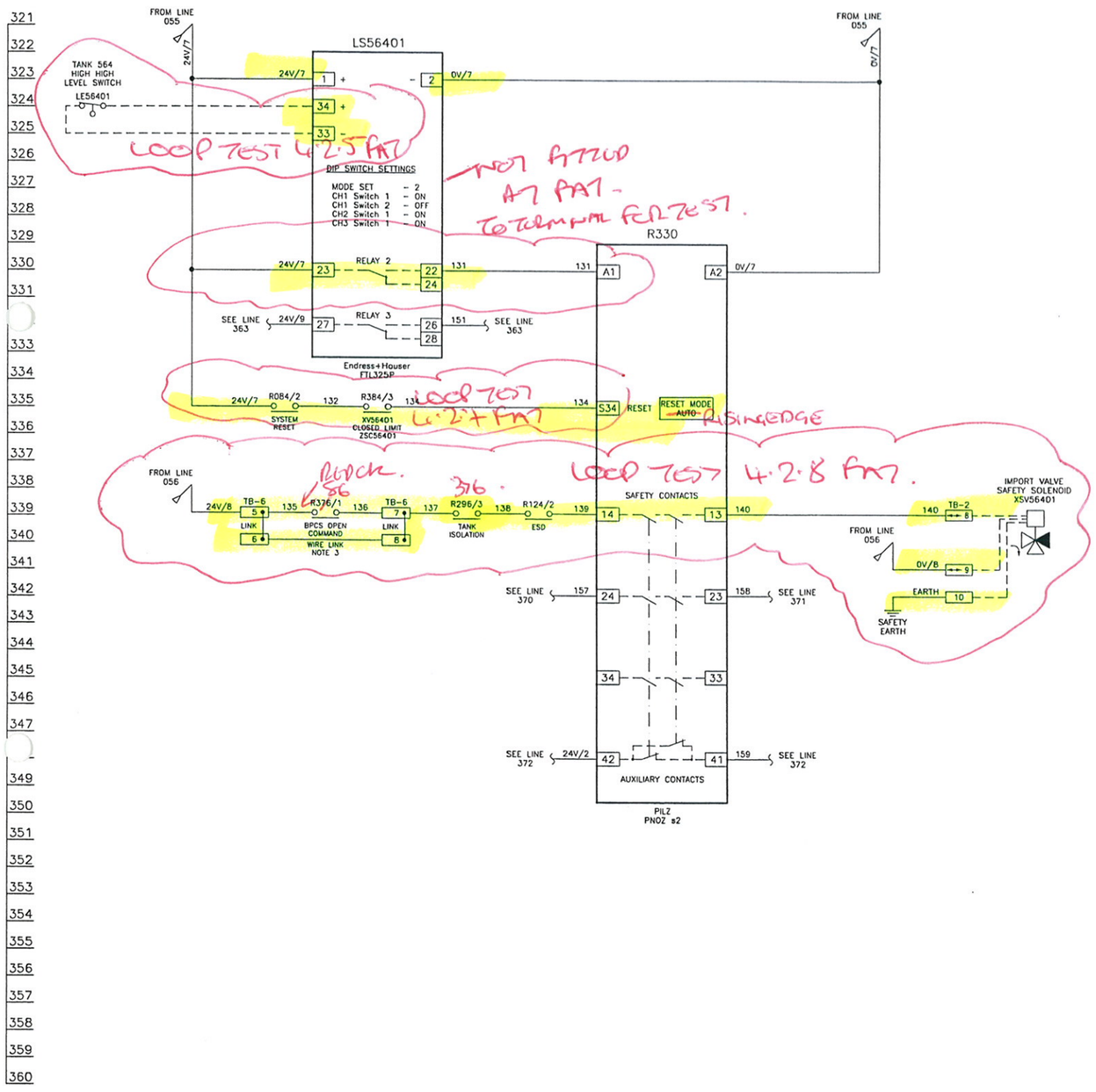
CONTACTORS & OVERLOADS: NORMALLY OPEN; NORMALLY CLOSED; MAGNETIC OVERLOAD RELAY; Cxx CONTACTOR; THERMAL OVERLOAD RELAY; MECHANICAL INTERLOCK

SWITCHES: KEY OPERATED; STOPLOCK PUSHBUTTON; PUSHBUTTON STOP; PUSHBUTTON START; NORMALLY OPEN; NORMALLY OPEN HELD CLOSED; NORMALLY CLOSED; NORMALLY CLOSED HELD OPEN; HS 1 2 3 SWITCH CONTACT MULTI POSITION TYPICAL 3 CIRCUIT; OPENS ON RISING PRESSURE; CLOSES ON RISING PRESSURE; OPENS ON RISING LEVEL; CLOSES ON RISING LEVEL; OPENS ON RISING TEMPERATURE; CLOSES ON RISING TEMPERATURE; OPENS ON INCREASING FLOW; CLOSES ON INCREASING FLOW

RELAY TERMINAL NUMBERING APPLICABLE ON THIS DRAWING

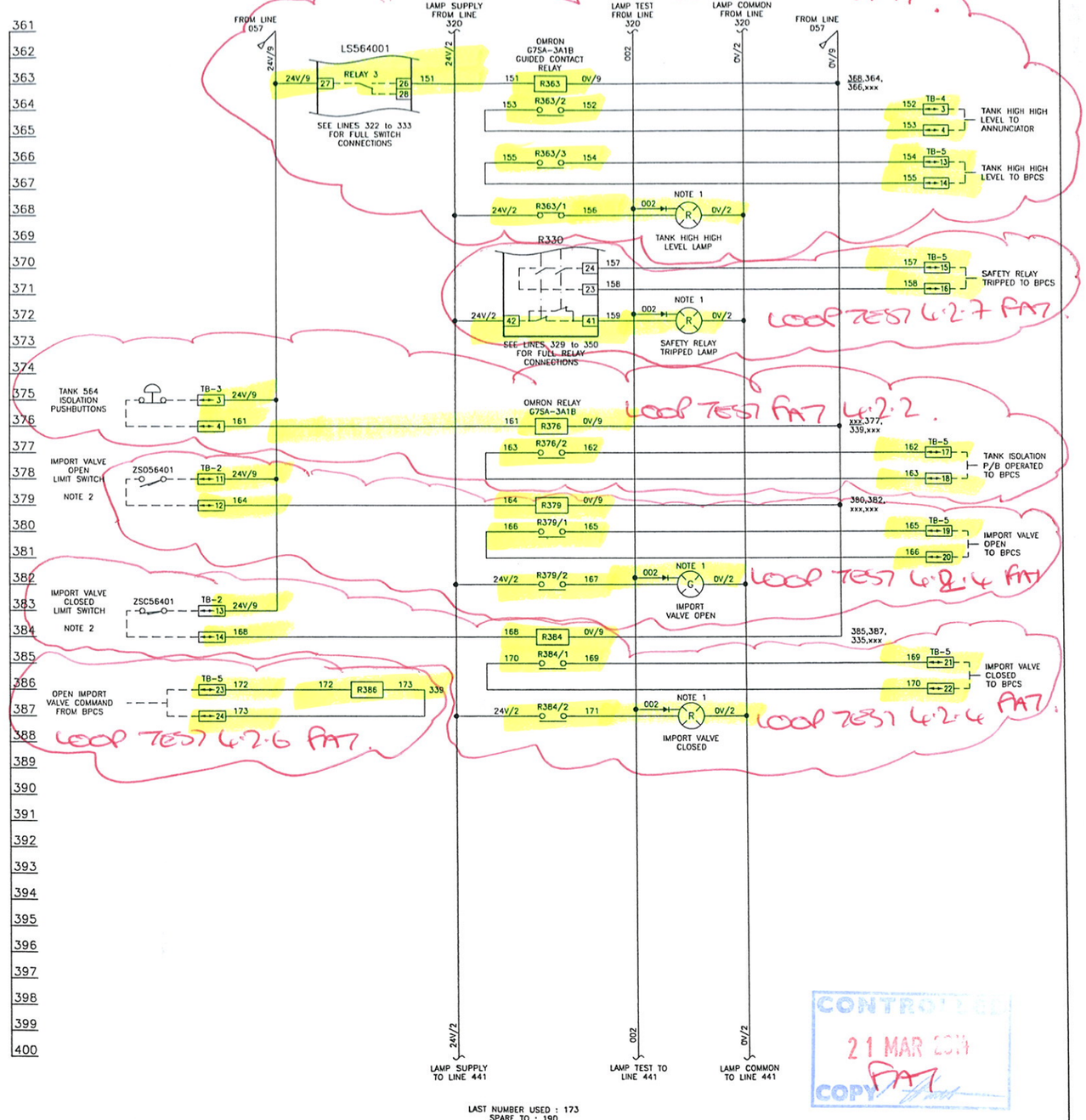


TANK 564 - SIS LOGIC



LAST NUMBER USED : 140
SPARE TO : 150

TANK 564 - BPCS LOGIC



LAST NUMBER USED : 173
SPARE TO : 190

CONTROLLED COPY 21 MAR 2014 FAT

NOTES
1) LED INDICATORS FITTED WITH INTERNAL DIODES.
2) VALVE LIMIT SWITCHES SHOWN WITH VALVE IN CLOSED POSITION.
3) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

B a) DRAWING RE-ARRANGED TO SPLIT SIS & BPCS LOGIC.
b) EXPORT VALVE REMOVED

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F.	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.F.	M.M.	ISSUED FOR CONSTRUCTION

PLANT: IMMINGHAM STORAGE Co. - EAST TERMINAL
TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 4 : TANK 564

simon — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW

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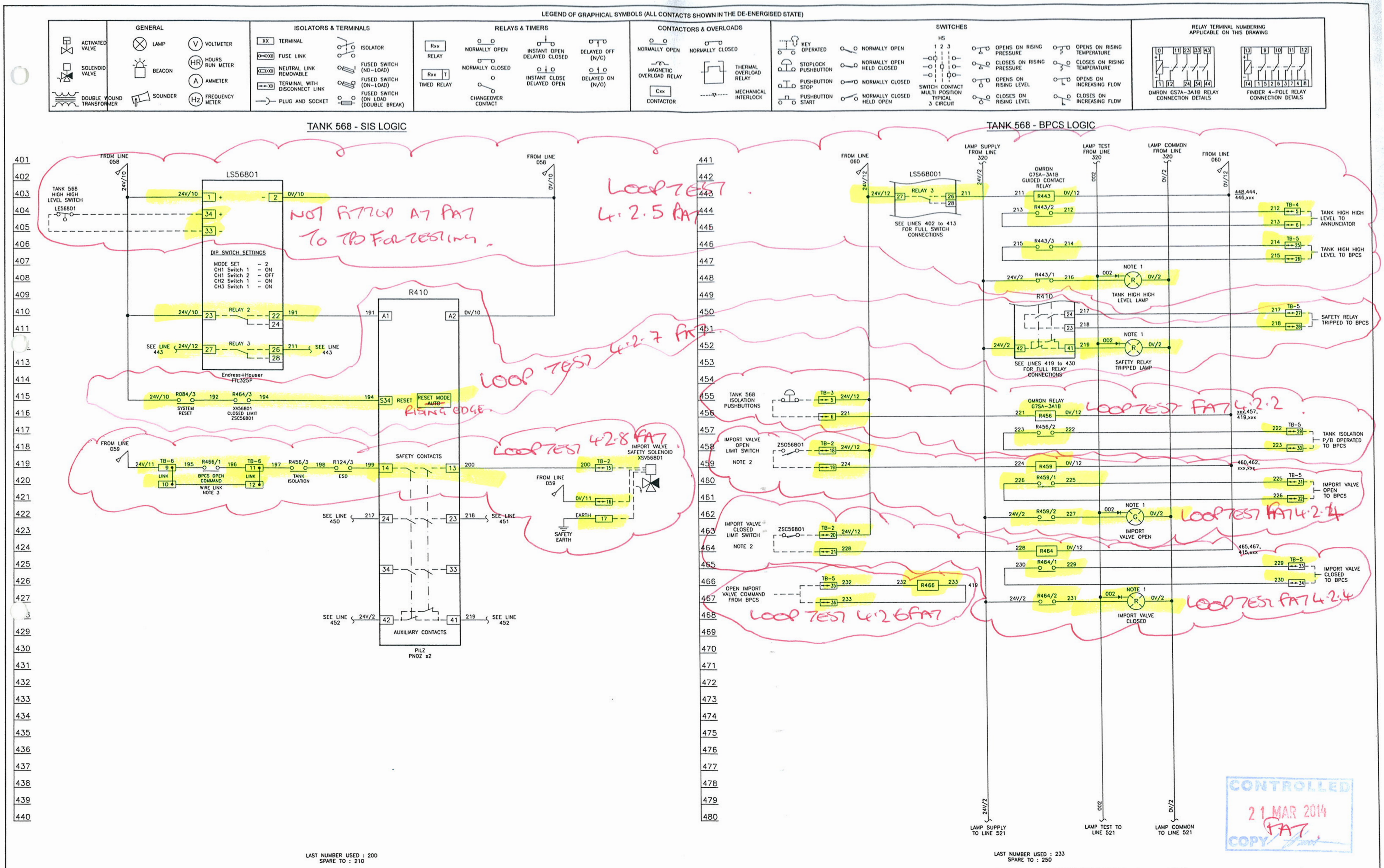
SHEET 1 OF 1

CLIENT DRG. No.

P&I DRG No. SI4B3010_DWG



NOTES

1) LED INDICATORS FITTED WITH INTERNAL DIODES.

2) VALVE LIMIT SWITCHES SHOWN WITH VALVE IN CLOSED POSITION.

3) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

B a) DRAWING RE-ARRANGED TO SPLIT SIS & BPCS LOGIC.
b) EXPORT VALVE REMOVED.

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	16/12/13	P.P.	P.P.	D.B.F.	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.F.	M.M.	ISSUED FOR CONSTRUCTION

PLANT: IMMINGHAM STORAGE Co. - EAST TERMINAL

TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 5 : TANK 568

SIMON

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Tel. 01642 617444
www.pidesign.co.uk

SHEET 1 OF 1

CLIENT DRG. No.

P&I DRG No. SI483011_DWG

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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

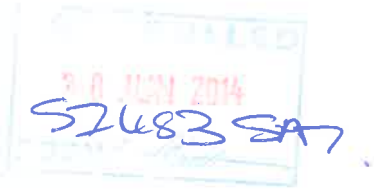
IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

OPERATION, MAINTENANCE AND MODIFICATION LIFECYCLE



Rev	Date	By	Checked	Approved	Description	Client Ref.
A	05.03.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483015_RPT**

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CONTENTS

1 REVISION HISTORY

Rev	Description
A	SI483 SIS Restructuring Project Original Issue

This document will be revised with any additions to or removals from the SIS throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides an overview and summery report to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16
Modification	-	BS EN 61511 Clause 17

Audience
This document has been produced for use by competent persons knowledgeable in testing Safety Instrument Systems.

Brief System Description
IME-SIS2 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.
Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Lifecycle
System performance data is collected to analyse and review the performance of the system and components against the criteria used for design.
The correct documenting of system testing provides historical system performance data in order that testing frequencies and procedures can be reviewed as required.
The system is owned by ISCo. The lifecycle is the responsibility of the system owners.

Operation and Maintenance Lifecycle Phases
Document Verification
Hardware Verification
Shutdown Conditions Proof Testing
Process Conditions Proof Testing
Preventative Maintenance
Equipment Failure Proof Testing
Fault Reporting
Functional Safety Meetings / Reviews /Faults and Activations
Stage 4 Function Safety Assessment

Modification Lifecycle Phases
Management of change
Stage 5 Function Safety Assessment
(Testing phases to be allocated at Stage 5 FSA as required)

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work
RAMS	Risk Assessment and Method Statement

5 LIFECYCLE PHASE – STAGE 4

5.1 Proof Testing

BS EN 61511-1:2004 Clause 3.2.58 - Proof testing is a test performed to reveal undetected faults in a safety instrumented system (SIS) so that, if necessary, the SIS can be restored to its designed functionality. By revealing all undetected faults, the PFD is effectively 'reset' back to the designed value.

The purpose of the this proof testing is to reveal dangerous undetected failures and confirm the correct operation of known safe detected failures so that, if necessary, the SIS can be restored to its designed functionality. During normal operation, components of the SIS are subject to the possibility of random hardware failures. These failures may be safe failures that could lead to spurious trips or dangerous failures that may prevent the SIS operating correctly when required. Dangerous failures may not be revealed and therefore there may be no indication that these failures exist. The failure modes of all components cannot be fully accounted for therefore these can only be confidently revelled by carrying out a full end to end proof test by simulating the process conditions as closely as possible. Detected failure diagnostics not functioning correctly could result in the system not being available to operations when there is a process requirement.

Testing will be carried out in accordance with the following guidance:-

Proof testing of safety instrumented systems in the onshore chemical / specialist industry – HSE_tech_gen_48 and Principles for proof testing of safety instrumented systems in the chemical industry. Contract Research Report - 428/2002. Prepared by ABB Ltd. for the Health and Safety Executive.

The following is an extraction from the report 428/2002, Section 4.2.4 Conclusions and Recommendations:

Based on the research, the following recommendations are made:

- a method of SIS initiation should be adopted which adequately establishes that the SIS would operate under operating conditions;
- where reasonably practicable, SIS initiation should be via manipulation of the process variable using process fluids. The provision of facilities for achieving this should be considered during design of SIS;
- the initiation of SIS should not involve placing the process in a state where failure of the SIS under test could lead to a hazardous situation;
- SIS should be proof tested as found rather than being disturbed, thereby reducing the potential for unrealistic tests, loss of as found system failure data and introduction of faults on system reinstatement.

In the testing procedures we have followed these recommendation as far as possible.

Trip Initiation

The methods of initiating SIS are many and varied but whatever the method it must provide adequate confidence that the SIS would be initiated if required under operating conditions. A distinction must be drawn between manipulation of the process variable and manipulation of the process. Manipulation of the process variable without driving the process into a potentially hazardous situation should be achieved where reasonably practicable. Manipulation of the process may be necessary to provide a realistic test of functionality but this must be accompanied by a risk assessment to ensure that the probability of achieving an unsafe state remains acceptably low. Equally, any departure from realistic operating conditions during proof testing must be accounted for within the safety integrity assessment of the SIS.

It is not considered that testing of the level switches by raising the levels in the tanks will be routinely carried out. It is recommended however, that during hydrostatic testing or insurance inspections on each tank, the water level be taken up to and beyond the high level switch to prove operation of the switch in-situ. This test to be documented in accordance with the testing procedures.

5.1.1 Document Verification

Check of documentation to verify correct documentation used for testing and identify modifications to the system since the last testing phase.

5.1.2 Hardware Verification

Check to verify no unauthorised modifications have been carried out and verify physical condition and fitness for purpose.

5.1.3 Shutdown Conditions Proof Testing

Functional test of the system whilst the process is not active, e.g no flow thought final element valves, process not taken to trip point. Test switches and /or process simulation to use to complete test, this is a partial test only and may not reveal all undetected faults. System diagnostics are tested at this phase.

5.1.4 Process Conditions Proof Testing

Functional test of the SIS whilst the process is active. e.g Process is allowed to reach the trip point activating SIF to bring the process to a safe state.

5.2 Equipment Failure Proof Testing

Functional test of SIS failure modes whilst the process is not active. Testing initiated following like for like component replacement or as scheduled following as found shutdown or process conditions proof testing. Failure mode system diagnostics tested at this phase.

BS EN 61511-1:2004 Clause 5.2.6.2.2 - Management of modification procedures shall be in place to initiate, document, review, implement and approve changes to the safety instrumented system other than replacement in kind (i.e. like for like).

5.3 Preventative Maintenance

Preventative Maintenance required to keep the hardware operational and satisfy regulations.
No specific preventative maintenance activities identified.
Regulations - ATEX electrical inspections to be carried out in line with the terminals schedule.

5.4 Functional Safety Meetings / Reviews / Faults and Activations

A review should be carried following any genuine activation, spurious trip or on detection of a system fault.

5.5 Fault Reporting

Reports require generating for any system activations or on detection of faults (safe failures).
Reports should include as a minimum : -
Operations report – What happened, when, process conditions, equipment identification.
Engineers report – Rectification actions, technical description of fault, tag no's.
Manufacturers report – Assessment on the failure of a piece of the vendors equipment.

5.6 Stage 4 Operation and Maintenance Functional Safety Assessment

Stage 4 Operation and Maintenance - Function Safety Assessments to be carried out as scheduled.

6 LIFECYCLE PHASE – STAGE 5

6.1 Stage 5 Modification Functional Safety Assessment

Stage 5 Modification - Function Safety Assessment to be carried out prior to any system modification, testing phases to be allocated at Stage 5 FSA as required.

7 RESPONSIBILITIES

The system is owned by ISCo (System Keeper). The testing and acceptance is the responsibility of the system owners. The testing is to be performed by a competent technician appointed by the system keeper. It is the responsibility of ISCo to make the tanks available for testing. ISCo is responsible for the issuing, accepting and signing off of "Permits to Work" under their current health and safety procedures. ISCo is responsible for initiating testing prior to and following maintenance.

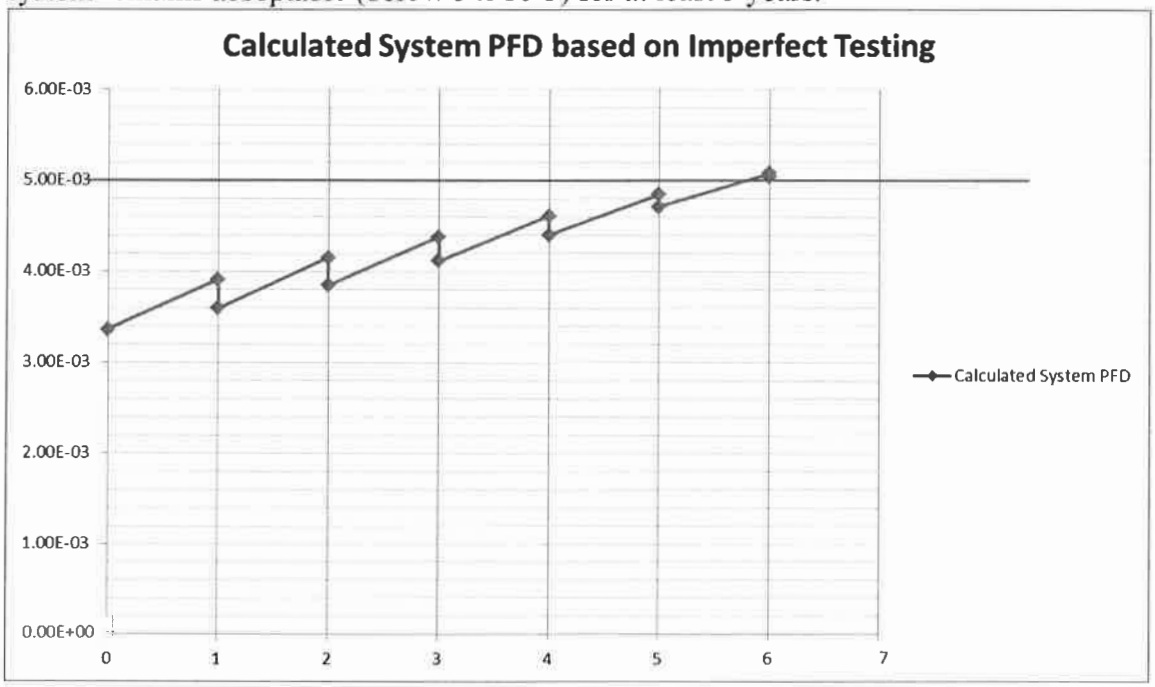
It is the responsibility of the system keeper to report any defects of SIL rated equipment to the manufacturer. The system keeper is also responsible for maintaining the life cycle documentation relating to this procedure.

8 SCHEDULING

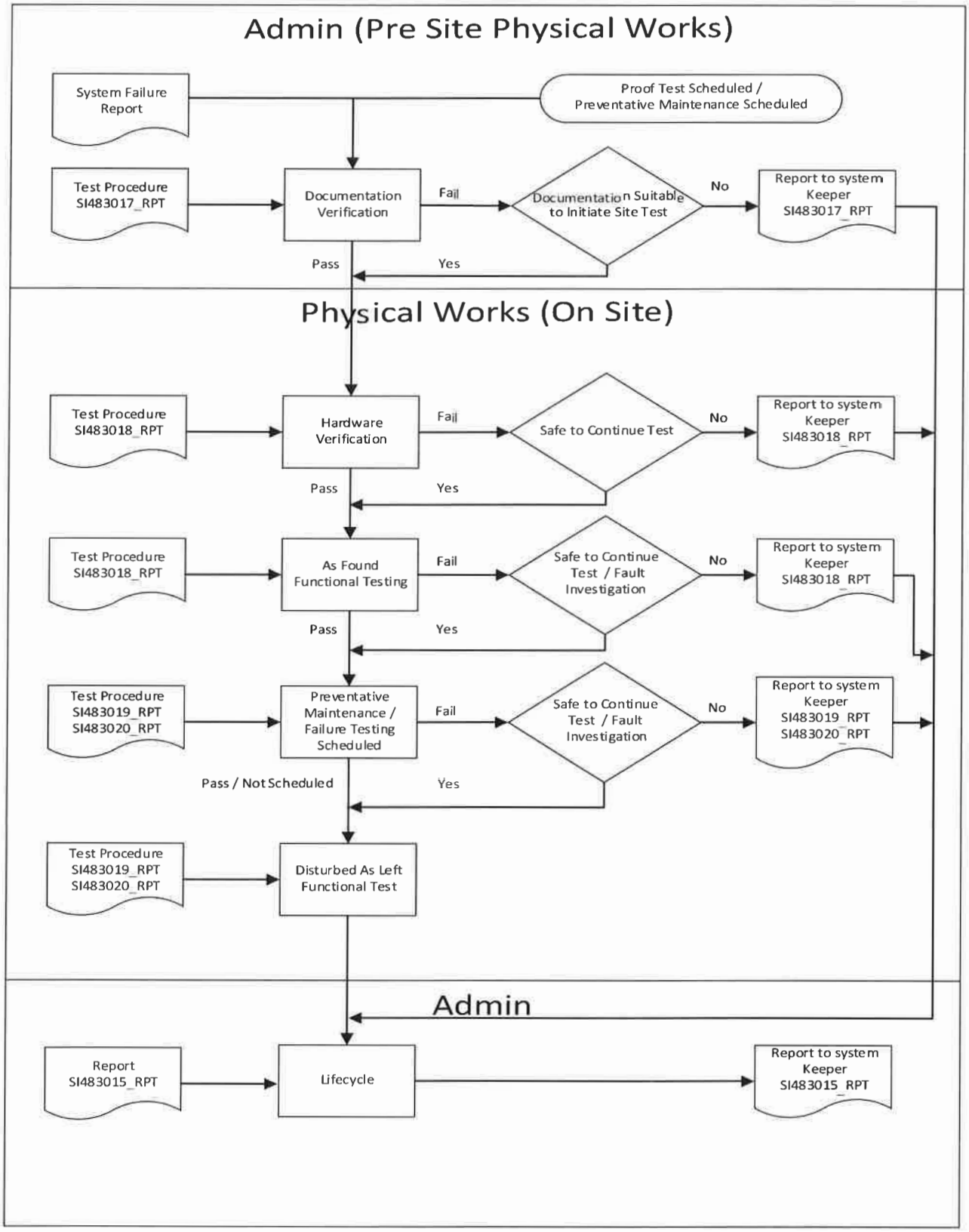
Reference \ Frequency		Prior to Proof Testing	12 Monthly	60 Monthly	Following System Fault	Following System Activation	Authorised Modification
SI483017_RPT - Documentation Verification		✓	✓		✓		
SI483018_RPT - Shutdown Conditions Proof Testing	Test Switch		✓		✓		
	Full Test			✓	✓		
SI483021_RPT - Process Conditions Proof Testing				✓			
SI483019_RPT - Equipment Failure Proof Testing					✓		
SI483020_RPT - Preventative Maintenance							
Fault Reporting					✓	✓	
Stage 4 Functional Safety Assessment				✓			
Stage 5 Functional Safety Assessment							✓
SI483015_RPT - Operation, Maintenance and Modification Lifecycle		✓	✓	✓	✓	✓	✓

N.B Testing required if any part of the system disturbed, replaced or maintained outside of the above schedule.

The Safe Fail Fraction of the Liquiphant level switch is 91%. Thus as a worst case, if all dangerous undetected failures are not detected during the annual test, the proof test coverage can be assumed as 91%. For this case, the following graph shows that the PFDcalc for the system remains acceptable (below 5 x 10-3) for at least 5 years.



Proof Testing Flowchart



9 LIFECYCLE SUMMARY

Lifecycle Phase	Dates	Brief Description	Next Scheduled Date
FAT.	21.03.14.	LOGIC SOLVER FAT.	N/A.
INSTALLATION. CONFORMANCE.	02.07.14.	PRE SAT. INSTALLATION CHECKS.	N/A.
SAT. PROOF TESTING	03.07.14.	SAT + 2014 PROOF TESTING.	PROOF TESTING. 2015

9.1 DOCUMENT VERIFICATION & REVIEW

Testing Phase	Test Procedure & Section No	Testing Dates	Pass (✓), Fail (x), Not Tested (N)			
			SI483001_REG Report Register	SI483002_REG Instrument Specification Register	SI483003_REG Drawing Register	SI483004_REG Calculation Register
SAT 2014 Proof Test	SI483017_RPT A ALL SECTIONS	2/7/14.	✓ A.	✓ A.	✓ C.	✓ A.

9.2 COMMON INFRASTRUCTURE - IME-SIS1

Testing Phase	Test Procedure & Section No	Testing Dates	Pass (✓), Fail (x), Not Tested (N)				
			No4 Switchroom Logic Solver	JB4/197 Level Switch JB	JB4/198 Level Switch JB	JB4/199 Tank Valve JB	JB4/200 Tank Valve JB
FAT.	SI483005-RPT-A FAT. ALL SECTIONS	21.03.14.	✓	N	N	N	N.
SAT 2014 Proof Test	SI483018-RPT-A Shutdown Cons Section 6.	02.07.14.	✓	✓	✓	✓	✓
SAT. 2014 Proof Test.	SI483020-RPT-A PRV MAIN. SECTION 6	02.07.14.	N	✓ COMPLEX	✓ COMPLEX	✓ COMPLEX	✓ COMPLEX

9.3 TK561-SIF1 - TANK 561 OVERFILL PROTECTION

Testing Phase	Test Procedure & Section No	Testing Dates	Pass (✓), Fail (x), Not Tested (N)				
			LS56101	LE56101	R250	XV56101	JB XV56101
SAT/2014 PROOF TEST.	SI483018_RPT-A SHUTDOWN COMMS SECTION 6, T.1	03.07.14	✓	✓	✓	X	✓
SAT/2014 PROOF TEST	SI483015_RPT-A. EQUIPMENT FAIL SECTION 7.1, 8.1 .	03.07.14	✓	✓	✓	✓ (AS ABOVE)	✓ .

9.4 TK564-SIF1 - TANK 564 OVERFILL PROTECTION

Testing Phase	Test Procedure & Section No	Testing Dates	Pass (✓), Fail (x), Not Tested (N)				
			LS56401	LE56401	R330	XV56401	JB4/145
SAT / Proof Testing 2014.	SI483018_RPT_A SHUTDOWN CONS SECTION 6, 7.2.	03.07.14	✓	✓	✓	X	✓
— " —	SI483019_RPT_A EQUIPMENT FAIL SECTION 7.1, 8.2.	03.07.14	✓	✓	✓	✓ (X ASBUILT)	✓

9.5 TK568-SIF1 - TANK 568 OVERFILL PROTECTION

Testing Phase	Test Procedure & Section No	Testing Dates	Pass (✓), Fail (x), Not Tested (N)				
			LS56801	LE56801	R410	XV56801	JB4/149
SAT/Proof Test 2014	SI483018_RPT_A. SHUTDOWN CONFIG SECTION 6.7.3.	03.07.14	✓	✓	✓	X	✓
— " —	SI483019_RPT_A. EQUIPMENT FAIL. SECTION 7.1, 8.2	03.07.14	✓	✓	✓	✓ (X ABOVE)	✓

10 SYSTEM MODIFICATIONS

Modification Initiation Date	Brief Description	Project Reference / Modification Sheet No	Status (proposed, in progress, completed).

11 FAULTS AND ACTIVATIONS

Fault / Activation Date	Report Reference	Brief Description	Action

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

IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

DOCUMENTATION VERIFICATION PROCEDURE

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483017_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for documentation verification to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16

Audience
This document has been produced for use by competent persons knowledgeable in testing Safety Instrumented Systems.

Brief System Description
IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.
Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure
This procedure outlines the necessary steps required to verify the correct documentation used for testing and identify modifications to the system since the last testing phase.

Detailed in this report are the methods of test for documentation associated with IME-SIS1. The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

All faults should be reported to the system keeper. If further work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work

5 PREPARATION

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483001_REG - IME-SIS1 Report Register
SI483002_REG - IME-SIS1 Instrument Specification Register
SI483003_REG - IME-SIS1 Drawing Register
SI483004_REG - IME-SIS1 Calculation Register

A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached.

6 DOCUMENTATION VERIFICATION

Purpose of Test
Pre physical on site testing check of documentation to verify correct documentation to be used for testing and identify modifications to the system since last testing phase. *Incorrect or updated documentation may lead to incomplete testing or undesirable effects on other site systems and terminal operation.*
Controlled Copy Documentation Required
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle SI483001_REG - IME-SIS1 Report Register SI483002_REG - IME-SIS1 Instrument Specification Register SI483003_REG - IME-SIS1 Drawing Register SI483004_REG - IME-SIS1 Calculation Register

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
6.1	Compare system documentation to registers. Highlight documentation checked on controlled copy of registers. Review changes since last testing phase as documented in SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.	Documentation available and auditable. Documentation revisions reflect installed system. *Comment any issues in section 6.2 and review / rectify prior to starting site work*	✓
6.2	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

SI483 SAT - AS BUILDS REQ

Tested by	Position	Qualification	Sign	Date
[illegible]	INST ENG	ISA SIS FS		2/7/14

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

P & I Design Ltd. *Report Register*

CLIENT:
Immingham Storage Co Ltd
Immingham East Terminal

ISSUE	DATE	BY	CHKD	APPD
A	25.06.14	DBF	MM	MM

CLIENT REF.
IME-SIS1
P & I REF.
SI483001 REG
SHT 1 **OF** 1

REPORT NO	REVISION ISSUE 0 A B C D E	DESCRIPTION
SI057001_RPT	G	Layers of Protection Analysis
SI277001_RPT	E	Gasoline Tank Overfill Protection S.I.S System
SI277010_RPT	F	Safety Requirement Specification
SI277014_RPT	C	Stage 3 Function Safety Assessment
SI277016_RPT	D	Stage 3 Function Safety Assessment
SI277101_RPT	B	Safety Compliance Document
SI277102_RPT	B	Management of Functional Safety
SI483001_RPT	A	SIS Restructuring Modification Report
SI483012_RPT	A	IME-SIS1 RAMS
SI483015_RPT	A	IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483017_RPT	A	IME-SIS1 Documentation Verification Procedure
SI483018_RPT	A	IME-SIS1 Shutdown Conditions Proof Testing Procedure
SI483019_RPT	A	IME-SIS1 Equipment Failure Proof Testing Procedure
SI483020_RPT	A	IME-SIS1 Preventative Maintenance Procedure

2/7/14.

CONTROLLED COPY 30 JUN 2014

SI483017_RPT

SI483017_RPT.

P & I Design Ltd

Instrument Specification Register

CLIENT:
Immingham Storage Co Ltd
East Terminal

ISSUE	DATE	BY	CHKD	APPD
A	07.02.14	DBF	MM	MM

CLIENT REF.
IME-SIS1
P & I REF.
SI483002_REG
SHT 1 **OF** 2

P&I REF.	REVISION ISSUE 0 A B C D E	SUPPLIER	TAG No.	ITEM
SI483001_SPC	A	Endress & Hauser	LE56101	Tank 561 High High Level Probe
SI483001_SPC	A	Endress & Hauser	LS56101	Tank 561 High High Level Switch - Isolating Unit
SI483002_SPC	A	Endress & Hauser	LE56401	Tank 564 High High Level Probe
SI483002_SPC	A	Endress & Hauser	LS56401	Tank 564 High High Level Switch - Isolating Unit
SI483003_SPC	A	Endress & Hauser	LE56801	Tank 568 High High Level Switch - Isolating Unit
SI483003_SPC	A	Endress & Hauser	LS56801	Tank 568 High High Level Switch - Isolating Unit
SI277016_SPC	B	Installation Contractor	JB4_200	Valve Junction Box
SI277015_SPC	B	Installation Contractor	JB4_199	Valve Junction Box
SI277017_SPC	B	Installation Contractor	JB4_197	Level Junction Box
SI277018_SPC	B	Installation Contractor	JB4_198	Level Junction Box

SOLVE TO SIGN.

2/7/14

CONTROLLED COPY 30 JUN 2014

SI483 SA7.

SI483002A7.

P & I Design Ltd.

Drawing Register

IME-SIS1.

CLIENT:	REV	DATE	BY	CHKD	APPD	CLIENT REF.
Immingham Storage Co Ltd	A	17.12.13	DBF	MM	MM	No4 Switchroom SIS
ISCo East Terminal	B	04.02.14	DBF	MM	MM	**P & I REF.**
	C	25.06.14	DBF	MM	MM	SI483003_REG

SHT 1 OF 2 1.

DOCUMENT NO	REVISION	DESCRIPTION
ISSUE	A B C D E	
DRAWINGS		
Cable Overviews		
SI483001_DWG	A B	Tanks 561, 564 & 568 Cable Overview
Logic Drawings		
SI483005_DWG	A B C	SIS Logic Panel External Layout
SI483006_DWG	A B C	SIS Logic Panel Internal Layout
SI483007_DWG	A B C	SIS Logic Drawing 1 , Power Distribution
SI483008_DWG	A B C	SIS Logic Drawing 2 , ESD
SI483009_DWG	A B C	SIS Logic Drawing 3 , Tank 561
SI483010_DWG	A B C	SIS Logic Drawing 4 , Tank 564
SI483015_DWG	A B C	SIS Logic Drawing 5 , Tank 568
Loops Sheets		
SI483020_DWG	A	LE56101 Tank 561 HiHi Level Switch Loop Sheet
SI483021_DWG	A	XV56101 Tank 561 Valve Loop Sheet
SI483022_DWG	A	LE56401 Tank 564 HiHi Level Switch Loop Sheet
SI483023_DWG	A	XV56401 Tank 564 Valve Loop Sheet
SI483024_DWG	A	LE564801 Tank 568 HiHi Level Switch Loop Sheet
SI483025_DWG	A	XV56801 Tank 568 Valve Loop Sheet
SI483026. DWG	A.	ESD Loop Sheet Rele.
SCHEDULES		
Cable Schedules		
SI483001_SCH	A B C.	SIS Restructuring Cable Schedule
Junction Box Schedules		
SI483004_SCH	A	JB4_197 Tank Level Switch JB Connection Schedule
SI483005_SCH	A	JB4_198 Tank Level Switch JB Connection Schedule
SI483006_SCH	A	JB4-199 Valve Control JB Connection Schedule
SI483007_SCH	A	JB4-200 Valve Control JB Connection Schedule
~~SI483010_SCH~~	~~A~~	~~No4 East 500 Series Tank Overfill Protection Instrument Schedule~~
Instrument Schedules		
SI483010_SCH	A	~~No4 East 500~~ Series Tank Overfill Protection Instrument Schedule
		IME-SIS1.
Trip / Function Matrix Schedules		
SI483003_SCH	A	No.4 East 500 Series Tanks Logic Solver Functions Matrix
SI483012_SCH	A	~~No.4 East 500~~ Series Tanks Overfill Protection Functions Matrix
		IME-SIS1.

REVISION HISTORY	
Rev	Description
A	Original Issue for Tender
B	Logic Drawings Issued for Construction (Panel Builder) Electrical Installation (Loops, cable SCH, JB SCH Issued for Construction (Installation Contractor) Original Issue For Review - Instrument SCH, Matrix SCH
C	Logic Panel As Built Post FAT
D	
E	

CLIENT:	ISSUE	DATE	BY	CHKD	APPD	CLIENT REF.
Immingham Storage Co Ltd	A	09.04.14	DBF	MM	MM	IME-SIS1
East Terminal						**P & I REF.**
						SI483004_REG
						SHT 1 **OF** 1

CALC NO	REVISION ISSUE 0	A	B	C	D	E	DESCRIPTION
SI483001_CAL		A					LE56101 E&H Liquiphant IS Descriptive System Document
SI483002_CAL		A					LE56401 E&H Liquiphant IS Descriptive System Document
SI483003_CAL		A					LE56801 E&H Liquiphant IS Descriptive System Document

S/DRIVE. TO sign.

DBF

CONTROLLED
30 JUN 2014
COPY

SI483 SA7.

SI483017_RPT.

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

IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

SHUTDOWN CONDITIONS PROOF TESTING PROCEDURE

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483018_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for shutdown condition functional proof testing to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16

Audience

This document has been produced for use by competent persons knowledgeable in testing Safety Instrumented Systems.

Brief System Description

IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.

Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure

This procedure outlines the necessary steps required to verify the correct equipment is installed, the physical condition of the installed equipment and the functional operation performs the SIF's as designed.

Detailed in this report are the methods of test for each SIF.

The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

This report details shutdown condition testing whilst no transfer to the tanks is in operation.

All faults should be reported to the system keeper, with minor repairs carried out if practicable. If further maintenance work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
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MTBF	Mean Time Between Failures
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PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work
RAMS	Risk Assessment and Method Statement

5 PREPARATION

All Health and Safety / Permit To Work systems must be implemented before commencing testing. SI483012_RPT - IME-SIS1 RAMS is to be submitted for approval prior to the site testing.

IME-SIS1 is completely independent of the BPCS, no overrides or special preparations are required to facilitate uncompromised testing.

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483018_RPT - IME-SIS1 Shutdown Conditions Proof Testing
SI483010_SCH - IME-SIS1 Instrument Schedule
SI483012_SCH - IME-SIS1 Trip Matrix
SI483001_DWG - Tanks 561, 564 & 568 Cable Overview
IME-K-0028 – Tank 561 P&ID
IME-K-0052 – Tank 564 P&ID
IME-K-0050 – Tank 568 P&ID

SI483017_RPT - IME-SIS1 Documentation Verification to be completed prior to each period of testing to confirm correct revisions of documentation.

A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached. In addition to procedures documented in this report calibration certificates, engineers reports are to be issued to each item as applicable.

6 HARDWARE VERIFICATION

Purpose of Test
To verify the correct equipment is fitted and no unauthorised modifications have been carried out. To verify equipment physical condition and fitness for purpose. *Equipment may not function correctly if damaged or modified.* *Equipment not identified as SIS may not be reported to the system keeper following works by maintenance / contractors.* *To ensure correct designed/rated equipment is installed.*
Controlled Copy Documentation Required
SI483010_SCH - IME-SIS1 Instrument Schedule SI483012_SCH – IME-SIS1 Trip Matrix SI483001_DWG - Tanks 561, 564 & 568 Cable Overview IME-K-0028 – Tank 561 P&ID IME-K-0052 – Tank 564 P&ID IME-K-0050 – Tank 568 P&ID

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
6.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 6.6 and review / rectify prior to starting testing.*	✓
6.2	Confirm plant preparations satisfactory. *Record PTW No* COLD 07146	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 6.6 and review / rectify prior to starting site work*	✓
6.3	Confirm equipment has not been replaced by comparing against information on SCH. Record method used to identify equipment on controlled copy of SCH Highlight column, e.g. SIS Tag / Serial No etc.	Equipment identified as SCH, Labelling and tagging correct. SIS identification correct. *Comment observations in section 6.6.*	✓
6.4	Confirm no visible signs of system and equipment modification, relocation, or not fit for purpose by comparing against controlled copy of SCH, P&ID and configuration. Highlight equipment checked on controlled copy of SCH & P&ID.	No visible signs of unauthorised modification or relocation. Equipment is clean and of sound physical condition, mountings, cable entries and process connections are fit for designed purpose with unrestricted access. *Comment observations in section 6.6.*	SI483. SAT. AUTHORISED MODIFICATION ✓
6.5	Confirm no visible signs of additional plant or parallel systems which could affect the SIS or invalidate testing.	No new additional plant equipment or BPCS systems. *Comment any issues in section 6.6.and review / rectify prior to starting functional testing.*	AS6.4 ✓

Hardware Verification Continued on page 8

6 *Hardware Verification Continued .....*

6.6	Comments/Defects/ Remedial Actions – Report ALL to System Keeper

AS BUILDS REC.

Tested by	Position	Qualification	Sign	Date
D BRAMLEY	INST ENG	ISA SIS FS		2/7/14

System Keeper Acknowledgement

***(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal** procedures for rectification works and/or isolation of plant as required)*

Accepted by	Position	Qualification	Sign	Date

7 AS FOUND FUNCTIONAL PROOF TESTING PROCEDURE

7.1 TK561-SIF1 - Tank 561 As Found Functional Testing

Purpose of Test
To verify the as found operation of LE56101 Tank 561 Independent high high level trip closes XV56101 FINAL ELEMENT valve. To verify the as found Manual Shutdown functions of Tank 561 FINAL ELEMENT XV56101 valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.1.12 and review / rectify prior to starting testing.*	✓
7.1.2	Confirm plant preparations satisfactory. *Record PTW No.* COLD 09416.	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.1.12 and review / rectify prior to starting testing.*	✓
7.1.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI4830 13_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.1.12.*	✓
7.1.3	XV56101 is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.1.7 if found open) FOUND OPEN.	Valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	N/A.
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.1.12.*	N/A.
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI4830 12_SCH Sheet 1. *Comment differences from SCH in section 7.1.12.*	N/A.

Tank 561 As Found Functional Testing Continued on page 10

7.1 Tank 561 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* WET DIP IN WATER	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.1.12.*	✓
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	✓
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.1.12*	✓
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.1.12*	X
7.1.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.1.12*	✓
7.1.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.1.12*	✓
		Valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.1.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.1.12.*	✓
7.1.8	Operate HS561 Tank 561 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.1.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	✓

Tank 561 As Found Functional Testing Continued on page 11

7.1 Tank 561 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.9	Release HS561 Tank 561 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.1.12.*	✓
7.1.10	Operations to initiate Terminal Shutdown system. *Record method of test* NORTH EAST SWITCHROOM ESD. IB-SES	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 2 *Comment differences from SCH in section 7.1.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	✓
7.1.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.1.12.*	✓ DJR
7.1.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

7.1.5. TRAVEL = 153 SECONDS.
TOTAL = 228 SECONDS.
>180 SECONDS.

Tested by	Position	Qualification	Sign	Date
D SPAULDING	INST ENG	ISA SIS FS	DJR	3/7/14

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7.2 TK564-SIF1 - Tank 564 As Found Functional Testing

Purpose of Test
To verify the as found operation of LE56401 Tank 564 Independent high high level trip closes XV56401 FINAL ELEMENT valve. To verify the as found Manual Shutdown functions of Tank 564 FINAL ELEMENT XV56401 valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.2.12 and review / rectify prior to starting testing.*	✓
7.2.2	Confirm plant preparations satisfactory. *Record PTW No.* CORO 09416	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.2.12 and review / rectify prior to starting testing.*	✓
7.2.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.2.12.*	✓
7.2.4	XV56401 is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.2.7 if found open)	Valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.2.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	✓

Tank 564 As Found Functional Testing Continued on page 13

7.2 *Tank 564 As Found Functional Testing Continued…*

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* WET DIP IN WATER	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.2.12.*	✓
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	✓
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.2.12*	✓
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.2.12*	X
7.2.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.2.12*	✓
7.2.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.2.12*	✓
		Valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.2.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	✓
7.2.8	Operate HS564 Tank 564 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	✓

Tank 564 As Found Functional Testing Continued on page 14

7.2 Tank 564 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.9	Release HS564 Tank 564 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.2.12.*	✓
7.2.10	Operations to initiate Terminal Shutdown system. *Record method of test* NOR EAST SHUTDOWN - IB-SES.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	✓
7.2.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.2.12.*	✓ DBF
7.2.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

7.2.5 - TRAVEL 125s TOTAL 215s >180s.

Tested by	Position	Qualification	Sign	Date
DBFULLER	INST ENG	ISA SIS FS		3/7/14

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7.3 TK568-SIF1 - Tank 568 As Found Functional Testing

Purpose of Test
To verify the as found operation of LE56801 Tank 568 Independent high high level trip closes XV56801 FINAL ELEMENT Import / Export valve. To verify the as found Manual Shutdown functions of Tank 568 FINAL ELEMENT XV56801 Import / Export valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.3.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.3.12 and review / rectify prior to starting testing.*	✓
7.3.2	Confirm plant preparations satisfactory. *Record PTW No* CORO – 09416	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.3.12 and review / rectify prior to starting testing.*	✓
7.3.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.3.12.*	✓
7.3.4	XV56801 valve is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.3.7 if found open)	Valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.3.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	✓

Tank 568 As Found Functional Testing Continued on page 16

7.3 Tank 568 As Found Functional Testing Continued…

7.3.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* WET DIP IN WATER	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.3.12.*	✓
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	✓
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.3.12*	✓
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.3.12*	X.
7.3.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.3.12*	✓
7.3.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.3.12*	✓
		Valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.3.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	✓
7.3.8	Operate HS568 Tank 568 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	✓

Tank 568 As Found Functional Testing Continued on page 17

7.3 Tank 568 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.3.9	Release HS568 Tank 568 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.3.12.*	✓
7.3.10	Operations to initiate Terminal Shutdown system. *Record method of test* ACK OTS SHUTDOWN.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	✓
7.3.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.3.12.*	✓
7.3.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

7.3.5. TRAVEL TOTAL.
120s 240s.
>180s.

Tested by	Position	Qualification	Sign	Date
D BRADLEY	INST ENG	ISA SIS FS		3/7/14

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

HEALTHY STATE

DESCRIPTION	TAG	ACTION
FINAL ELEMENTS		
Valves		
Tank 561 Import / Export Valve	XV56101	Enabled
Tank 564 Import / Export Valve	XV56401	Enabled
Tank 568 Import / Export Valve	XV56801	Enabled
DIAGNOSTICS		
No4 East Switchroom SIS Logic Solver		
ESD Relay Tripped		Lamp
Tank 561 High High Level	LSHH56101	Lamp
Tank 561 Safety Relay Tripped		Lamp
Tank 561 Import / Export Valve Closed	XV56101	Lamp
Tank 561 Import / Export Valve Open	XV56101	Lamp
Tank 564 High High Level	LSHH56401	Lamp
Tank 564 Safety Relay Tripped		Lamp
Tank 564 Import / Export Valve Closed	XV56401	Lamp
Tank 564 Import / Export Valve Open	XV56401	Lamp
Tank 568 High High Level	LSHH56801	Lamp
Tank 568 Safety Relay Tripped		Lamp
Tank 568 Import / Export Valve Closed	XV56801	Lamp
Tank 568 Import / Export Valve Open	XV56801	Lamp
No3 East Control Room Annunciator (4)		
Site ESD (Window 3/3)		Reset
Tank 561 High High Level (Window 7/9)	LSHH56101	Reset
Tank 564 High High Level (Window 10/2)	LSHH56401	Reset
Tank 568 High High Level (Window 10/6)	LSHH66901	Reset
SI468007_SCH - Radio Message Schedule		Reset
SIS RESET		
No4 East Switchroom SIS Logic Solver		
Tank 561 Safety Relay	SYSTEM RESET	Enabled
Tank 564 Safety Relay	SYSTEM RESET	Enabled
Tank 568 Safety Relay	SYSTEM RESET	Enabled

DESCRIPTION	TAG	TYPE	CALIBRATION	UNITS	SET	ORIGIN
SIS AUTOMATIC SHUTDOWN	**IME-SIS1**		**SIL 2**			
Tank 561 Independent High Level	LE56101	Probe	1000 (3)	mm	<97%	SRS
Tank 564 Independent High Level	LE56401	Probe	1000 (3)	mm	<97%	SRS
Tank 568 Independent High Level	LE56801	Probe	1000 (3)	mm	<97%	SRS
ROSOV MANUAL SHUTDOWN						
Terminal Shutdown			N/A		HEALTHY	SRS
Tank 561 Bund Isolation	HS561	Button	N/A		HEALTHY	SRS
Tank 564 Bund Isolation	HS564	Button	N/A		HEALTHY	SRS
Tank 568 Bund Isolation	HS568	Button	N/A		HEALTHY	SRS
BPCS CONTROL						
Local Pneumatic Control Station	XV56101	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS
Local Pneumatic Control Station	XV56401	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS
Local Pneumatic Control Station	XV56801	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS
DIAGNOSTICS						
Tank 561 Import Valve Closed	ZSC56101	Limits	N/A	N/A	Closed	SRS
Tank 561 Import Valve Open	ZSO56101	Limits	N/A	N/A	Open	SRS
Tank 564 Import Valve Closed	ZSC56401	Limits	N/A	N/A	Closed	SRS
Tank 564 Import Valve Open	ZSO56401	Limits	N/A	N/A	Open	SRS
Tank 568 Import Valve Closed	ZSC56801	Limits	N/A	N/A	Closed	SRS
Tank 568 Import Valve Open	ZSO56801	Limits	N/A	N/A	Open	SRS
SIS Logic Solver Lamp Test		Button	N/A	N/A	Test	SRS

NOTES

* Reset if Enabled & Pushbutton Activated
* Reset if Enabled & Pushbutton Activated
* Reset if Enabled & Pushbutton Activated

3/7/14.

CONTROLLED COPY 30 JUN 2014

SI483 SAT

SI483018 FAT

ABBREVIATIONS
SIS - Safety Instrument System
IHL Independent High Level
BPCS - Basic Process Control System
ESD - Emergency Shutdown
LB - Line Break /SC - Short Circuit
H - Hardwired / S - Software

NOTES
(1) ESD trips other terminal systems - see xxxxx
(2) Self test. 2 pulse trip and fault condition.
(3) Switch length
(4) Full Annunciator functionality in SI468001_MNL

REFERENCE DOCUMENTS	
SRS	SI277010_RPT
Overfill Protection Trip Matrix	SI003100_SCH

REV	DATE	BY	DRN	CHK'D		APPD		DESCRIPTION
A	03/02/14	DBF	DBF	MM		MM		Original Issue for Review

PLANT	Immingham Storage Co Ltd - East Terminal
TITLE	IME-SIS1 Tip Matrix
CLIENT DRG	
	SHEET 1 OF 2
	REF NO SI4 83012 SCH

SAFETY FUNCTION

FINAL ELEMENTS — Valves; DIAGNOSTICS — No4 East Switchroom SIS Logic Solver; No3 East Control Room Annunciator (4)

DESCRIPTION	TAG	TYPE	CALIBRATION	UNITS	SET	ORIGIN	Close / Inhibit XV56101 Tank 561 Import / Export Valve	Close / Inhibit XV56401 Tank 564 Import / Export Valve	Close / Inhibit XV56801 Tank 568 Import / Export Valve	Lamp ESD Relay Tripped	Lamp LSHH56101 Tank 561 High High Level	Lamp Tank 561 Safety Relay Tripped	Lamp XV56101 Tank 561 Import / Export Valve Closed	Lamp XV56101 Tank 561 Import / Export Valve Open	Lamp LSHH56401 Tank 564 High High Level	Lamp Tank 564 Safety Relay Tripped	Lamp XV56401 Tank 564 Import / Export Valve Closed	Lamp XV56401 Tank 564 Import / Export Valve Open	Lamp LSHH56801 Tank 568 High High Level	Lamp Tank 568 Safety Relay Tripped	Lamp XV56801 Tank 568 Import / Export Valve Closed	Lamp XV56801 Tank 568 Import / Export Valve Open	Activated Site ESD (Window 3/3)	Activated LSHH56101 Tank 561 High High Level (Window 7/9)	Activated LSHH56401 Tank 564 High High Level (Window 10/2)	Activated LSHH56801 Tank 568 High High Level (Window 10/6)	Activated SI468007_SCH - Radio Message Schedule	NOTES
SIS AUTOMATIC SHUTDOWN	IME-SIS1		SIL2			LOPA																						
Tank 561 Independent High Level	LE56101	Probe	1000 (3)	mm	>97%	SRS	H				Red	Red	Red											H			S	Safety Relay Reset Required - See Sht 1
Tank 564 Independent High Level	LE56401	Probe	1000 (3)	mm	>97%	SRS		H							Red	Red	Red								H		S	Safety Relay Reset Required - See Sht 1
Tank 568 Independent High Level	LE56801	Probe	1000 (3)	mm	>97%	SRS			H										Red	Red	Red					H	S	Safety Relay Reset Required - See Sht 1
ROSOV MANUAL SHUTDOWN																												
Site ESD	N/A	N/A	N/A	N/A	Tripped	SRS	H (1)	H (1)	H (1)	Red			Red				Red				Red		H				S	
Tank 561 Bund Isolation	HS561	Button	N/A	N/A	Activated	SRS	H						Red															
Tank 564 Bund Isolation	HS564	Button	N/A	N/A	Activated	SRS		H									Red											
Tank 568 Bund Isolation	HS568	Button	N/A	N/A	Activated	SRS			H												Red							
TEST FUNCTIONS																												
Tank 561 Test Button (2)	LS56101	Switch	N/A	N/A	Test	SRS	H				Red	Red	Red											H			S	Safety Relay Reset Required - See Sht 1
Tank 564 Test Button (2)	LS56401	Switch	N/A	N/A	Test	SRS		H							Red	Red	Red								H		S	Safety Relay Reset Required - See Sht 1
Tank 568 Test Button (2)	LS56801	Switch	N/A	N/A	Test	SRS			H										Red	Red	Red					H	S	Safety Relay Reset Required - See Sht 1
FAILURE MODES DETECTED																												
ESD Logic 24V/3 Failure	ESD	Fuse	N/A	N/A	Fail	SRS	H (1)	H (1)	H (1)	Red			Red				Red				Red		H				S	
Tank 561 IHL Short Circuit	LE56101	SC	N/A	N/A	SC	SRS	H				Red	Red	Red											H			S	Safety Relay Reset Required - See Sht 1
Tank 561 IHL Open Circuit	LE56101	LB	N/A	N/A	LB	SRS	H				Red	Red	Red											H			S	Safety Relay Reset Required - See Sht 1
Tank 561 SIS Logic 24V/4 Failure	LS56401	Fuse	N/A	N/A	Fail	SRS	H				Red	Red	Red											H			S	Safety Relay Reset Required - See Sht 1
Tank 561 Valve 24V/5 Failure	XV56101	Fuse	N/A	N/A	Fail	SRS	H						Red															
Tank 561 BPCS Logic 24V/6 Failure		Fuse	N/A	N/A	Fail	SRS	H				Red													H			S	
Tank 561 Valve Air Failure	XV56101	N/A	N/A	N/A	Iso & Vent	SRS	H						Red															
Tank 564 IHL Short Circuit	LE56401	SC	N/A	N/A	SC	SRS		H							Red	Red	Red								H		S	Safety Relay Reset Required - See Sht 1
Tank 564 IHL Open Circuit	LE56401	LB	N/A	N/A	LB	SRS		H							Red	Red	Red								H		S	Safety Relay Reset Required - See Sht 1
Tank 564 SIS Logic 24V/7 Failure	LS56401	Fuse	N/A	N/A	Fail	SRS		H							Red	Red	Red								H		S	Safety Relay Reset Required - See Sht 1
Tank 564 Valve 24V/8 Failure	XV56101	Fuse	N/A	N/A	Fail	SRS		H									Red											
Tank 564 BPCS Logic 24V/9 Failure		Fuse	N/A	N/A	Fail	SRS		H							Red										H		S	
Tank 564 Valve Air Failure	XV56401	N/A	N/A	N/A	Iso & Vent	SRS		H									Red											
Tank 568 IHL Short Circuit	LE56801	SC	N/A	N/A	SC	SRS			H										Red	Red	Red					H	S	Safety Relay Reset Required - See Sht 1
Tank 568 IHL Open Circuit	LE56801	LB	N/A	N/A	LB	SRS			H										Red	Red	Red					H	S	Safety Relay Reset Required - See Sht 1
Tank 568 SIS Logic 24V/10 Failure	LS56801	Fuse	N/A	N/A	Fail	SRS			H										Red	Red	Red					H	S	Safety Relay Reset Required - See Sht 1
Tank 568 Valve 24V/11 Failure	XV56801	Fuse	N/A	N/A	Fail	SRS			H												Red							
Tank 568 BPCS Logic 24V/12 Failure		Fuse	N/A	N/A	Fail	SRS			H										Red							H	S	
Tank 568 Valve Air Failure	XV56801	N/A	N/A	N/A	Iso & Vent	SRS			H												Red							
BPCS CONTROL																												
Local Pneumatic Control Station	XV56101	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS	H																					
Local Pneumatic Control Station	XV56401	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS		H																				
Local Pneumatic Control Station	XV56801	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS			H																			

3/7/14

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ABBREVIATIONS
- SIS - Safety Instrument System
- IHL Independent High Level
- BPCS - Basic Process Control System
- ESD - Emergency Shutdown
- LB - Line Break / SC - Short Circuit
- H - Hardwired / S - Software

NOTES
(1) ESD trips other terminal systems - see xxxxx
(2) Self test, 2 pulse trip and fault condition.
(3) Switch lengh
(4) Full Annunciator functionality in SI468001_MNL

REFERENCE DOCUMENTS	
SRS	SI277010_RPT
Overfill Protection Trip Matrix	SI003100_SCH

REV	DATE	BY	DRN	CHK'D	APPD	DESCRIPTION
A	03/02/14	DBF	DBF	MM	MM	Original Issue for Review

PLANT: Immingham Storage Co Ltd - East Terminal
TITLE: IME-SIS1 Trip Matrix

P & I DESIGN

simon

CLIENT DRG

SHEET 2 OF 2
REF NO SI483012_SCH

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
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IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

EQUIPMENT FAILURE

PROOF TESTING PROCEDURE

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483019_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for equipment failure functional proof testing to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause

Audience

This document has been produced for use by competent persons knowledgeable in testing Safety Instrument Systems.

Brief System Description

IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.
Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure

This procedure outlines the necessary steps required to verify the correct equipment is installed, the physical condition of the installed equipment and the functional operation performs the SIF's as designed.

Detailed in this report are the methods of test for each SIF.

The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

This report details equipment failure testing whilst no transfer to the tanks is in operation.

All faults should be reported to the system keeper, with minor repairs carried out if practicable. If further maintenance work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work
RAMS	Risk Assessment and Method Statement

5 PREPARATION

All Health and Safety / Permit To Work systems must be implemented before commencing testing. SI483012_RPT - IME-SIS1 RAMS is to be submitted for approval prior to the site testing.

IME-SIS1 is completely independent of the BPCS, no overrides or special preparations are required to facilitate uncompromised testing.

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483019_RPT - IME-SIS1 Equipment Failure Proof Testing Procedure
SI483010_SCH - IME-SIS1 Instrument Schedule
SI483012_SCH - IME-SIS1 Trip Matrix
SI483001_DWG - Tanks 561, 564 & 568 Cable Overview
SI483020_DWG - LE56101 Tank 561 HiHi Level Switch Loop Sheet
SI483021_DWG - XV56101 Tank 561 Valve Loop Sheet
SI483022_DWG - LE56401 Tank 564 HiHi Level Switch Loop Sheet
SI483023_DWG - XV56401 Tank 564 Valve Loop Sheet
SI483024_DWG - LE564801 Tank 568 HiHi Level Switch Loop Sheet
SI483025_DWG - XV56801 Tank 568 Valve Loop Sheet
SI483026_DWG – No4 East SIS Logic Solver ESD Loop Sheet
IME-K-0028 – Tank 561 P&ID
IME-K-0052 – Tank 564 P&ID
IME-K-0050 – Tank 568 P&ID

SI483017_RPT - IME-SIS1 Documentation Verification to be completed prior to each period of testing to confirm correct revisions of documentation.

SI208018_RPT - IME-SIS1 Shutdown Conditions Proof Testing Procedure to be completed prior to each period of testing to confirm the as found condition.

SECTION 6 – HARDWARE VERIFICATION not required if equipment failure testing is part of a scheduled proof test.
Hardware verification to be completed for the relevant equipment following authorised modifications or like for like equipment replacement following failure

A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached. In addition to procedures documented in this report calibration certificates, engineers reports are to be issued to each item as applicable.

6 HARDWARE VERIFICATION

Purpose of Test			
To verify the correct equipment is fitted and no unauthorised modifications have been carried out. To verify equipment physical condition and fitness for purpose. *Equipment may not function correctly if damaged or modified.* *Equipment not identified as SIS may not be reported to the system keeper following works by maintenance / contractors.* *To ensure correct designed/rated equipment is installed.*			
Controlled Copy Documentation Required			
SI483010_SCH - IME-SIS1 Instrument Schedule SI483012_SCH – IME-SIS1 Trip Matrix SI483001_DWG - Tanks 561, 564 & 568 Cable Overview IME-K-0028 – Tank 561 P&ID IME-K-0052 – Tank 564 P&ID IME-K-0050 – Tank 568 P&ID			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
6.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 6.6 and review / rectify prior to starting testing.*	
6.2	Confirm plant preparations satisfactory. *Record PTW No……*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 6.6 and review / rectify prior to starting site work*	
6.3	Confirm equipment has not been replaced by comparing against information on SCH. Record method used to identify equipment on controlled copy of SCH Highlight column, e.g. SIS Tag / Serial No etc.	Equipment identified as SCH, Labelling and tagging correct. SIS identification correct. *Comment observations in section 6.6.*	
6.4	Confirm no visible signs of system and equipment modification, relocation, or not fit for purpose by comparing against controlled copy of SCH, P&ID and configuration. Highlight equipment checked on controlled copy of SCH & P&ID.	No visible signs of unauthorised modification or relocation. Equipment is clean and of sound physical condition, mountings, cable entries and process connections are fit for designed purpose with unrestricted access. *Comment observations in section 6.6.*	
6.5	Confirm no visible signs of additional plant or parallel systems which could affect the SIS or invalidate testing.	No new additional plant equipment or BPCS systems. *Comment any issues in section 6.6.and review / rectify prior to starting functional testing.*	

Hardware Verification Continued on page 8

6 *Hardware Verification Continued .....*

6.6	Comments/Defects/ Remedial Actions – Report ALL to System Keeper

SI483018_RPT. 3/7/14

Tested by	Position	Qualification	Sign	Date

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7 FAILURE MODE TESTING PROCEDURE

7.1 Failure Mode Functional Testing

Purpose of Test			
To verify the correct FAILURE MODES of IME-SIS1. To verify correct failure DIAGNOSTICS information. *Incorrect system / component configuration may not detect fault modes.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*			
Controlled Copy Documentation Required			
SI483012_SCH - IME-SIS1 Trip Matrix SI483001_DWG - Tanks 561, 564 & 568 Cable Overview SI483020_DWG - LE56101 Tank 561 HiHi Level Switch Loop Sheet SI483021_DWG - XV56101 Tank 561 Valve Loop Sheet SI483022_DWG - LE56401 Tank 564 HiHi Level Switch Loop Sheet SI483023_DWG - XV56401 Tank 564 Valve Loop Sheet SI483024_DWG - LE564801 Tank 568 HiHi Level Switch Loop Sheet SI483025_DWG - XV56801 Tank 568 Valve Loop Sheet SI483026_DWG - No2 East SIS Logic Solver ESD Loop Sheet			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
7.1.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.1.5 and review / rectify prior to starting testing.*	✓
7.1.2	Confirm plant preparations satisfactory. *Record PTW No.* C020 09416	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.1.5 and review / rectify prior to starting testing.*	✓
7.1.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.1.5.*	✓
7.1.4	Initiate and reset each applicable FAILURE MODE DETECTED as detailed on SI483012_SCH Sheet 2. Highlight tests completed on controlled copy of SCH.	ACTION and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. System healthy and reset as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.1.5*	✓

Failure Mode Functional Testing Continued on page 10

7.1 Failure Mode Functional Testing Continued…..

7.1.5	Comments/Defects/ Remedial Actions – Report ALL to System Keeper

Tested by	Position	Qualification	Sign	Date
[illegible]	INSTENG	SIS FATS		3/7/14

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

8 AS LEFT FUNCTIONAL PROOF TESTING PROCEDURE

8.1 TK561-SIF1 - Tank 561 As Left Functional Testing

Purpose of Test
To verify the as left operation of LE56101 Tank 561 Independent high high level trip closes XV56101 FINAL ELEMENT valve following system disturbance. To verify the as left Manual Shutdown functions of Tank 561 FINAL ELEMENT XV56101. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.1.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 8.1.12 and review / rectify prior to starting testing.*	✓
8.1.2	Confirm plant preparations satisfactory. *Record PTW No:……*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 8.1.12 and review / rectify prior to starting testing.*	✓
8.1.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if left in tripped state in section 8.1.12.*	✓
8.1.4	Open XV56101.	Valve action left smooth. *Comment poor action / sticking in section 8.1.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 8.1.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 8.1.12.*	✓

Tank 561 As Left Functional Testing Continued on page 12

8.1 Tank 561 As Left Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.1.5	Refer to SI483015_RPT Wet test of probe required if probe replaced or disturbed. Wet test required, remove probe from tank and immerse in suitable liquid. Wet test not required use Nivotester test button. *Record method of test* NIVOTESTER	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 8.1.12.*	✓
		FINAL ELEMENT valve action left smooth. *Comment poor action / sticking in section 8.1.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 8.1.12*	✓
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 8.1.12*	✓
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 8.1.12*	X
8.1.6	Remove probe from liquid / release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 8.1.12*	✓
8.1.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 8.1.12*	✓
		Valve action left smooth. *Comment poor action / sticking in section 8.1.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 8.1.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 8.1.12.*	✓
8.1.8	Operate HS561 Tank 561 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 8.1.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 8.1.12*	✓

Tank 561 As Left Functional Testing Continued on page 13

8.1 Tank 561 As Left Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.1.9	Release HS561 Tank 561 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 8.1.12.*	✓
8.1.10	Operations to initiate Terminal Shutdown system. *Record method of test* NO6 EAST ESD - IB - SES	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 8.1.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 8.1.12*	✓
8.1.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 8.1.12.*	✓ [signature]
8.1.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

8.1.5 SEE SI483018_RPT.

Tested by	Position	Qualification	Sign	Date
D.B.FALLEN?	INST ENG	SIS ISAFS	[signature]	3/7/14

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

8.2 TK564-SIF1 - Tank 564 As Left Functional Testing

Purpose of Test
To verify the as left operation of LE56401 Tank 564 Independent high high level trip closes XV56401 FINAL ELEMENT Import / Export valve following system disturbance. To verify the as left Manual Shutdown functions of Tank 564 FINAL ELEMENT XV56401. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.2.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 8.2.12 and review / rectify prior to starting testing.*	✓
8.2.2	Confirm plant preparations satisfactory. *Record PTW No...* 09416 COLD	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 8.2.12 and review / rectify prior to starting testing.*	✓
8.2.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if left in tripped state in section 8.2.12.*	✓
8.2.4	Open XV56401.	Valve action left smooth. *Comment poor action / sticking in section 8.2.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 8.2.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 8.2.12.*	✓

Tank 564 As Left Functional Testing Continued on page 15

8.2 Tank 564 As Left Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.2.5	Refer to SI483015_RPT Wet test of probe required if probe replaced or disturbed. Wet test required, remove probe from tank and immerse in suitable liquid. Wet test not required use Nivotester test button. *Record method of test* NIVOTESTER	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 8.2.12.*	✓
		FINAL ELEMENT valve action left smooth. *Comment poor action / sticking in section 8.2.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 8.2.12*	✓
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 8.2.12*	✓
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 8.2.12*	X
8.2.6	Remove probe from liquid / release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 8.2.12*	✓
8.2.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 8.2.12*	✓
		Valve action left smooth. *Comment poor action / sticking in section 8.2.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 8.2.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI4830 2_SCH Sheet 1. *Comment differences from SCH in section 8.2.12.*	✓
8.2.8	Operate HS564 Tank 564 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI4830 2_SCH Sheet 2. *Comment differences from SCH in section 8.2.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failuresin section 8.2.12*	✓

Tank 564 As Left Functional Testing Continued on page 16

8.2 Tank 564 As Left Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.2.9	Release HS564 Tank 564 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 8.2.12.*	✓
8.2.10	Operations to initiate Terminal Shutdown system. *Record method of test* NOV EAST ESD. IB-SES.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 8.2.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 8.2.12*	✓
8.2.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 8.2.12.*	✓
8.2.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

8.2.5. - SCE 321683 018_RPT.

Tested by	Position	Qualification	Sign	Date
[illegible]	INST ENG	IBA SIS FS		3/7/14.

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

8.3 TK568-SIF1 - Tank 568 As Left Functional Testing

Purpose of Test
To verify the as left operation of LE56801 Tank 568 Independent high high level trip closes XV56801 FINAL ELEMENT Import / Export valve following system disturbance. To verify the as left Manual Shutdown functions of Tank 568 FINAL ELEMENT XV56801. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.3.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 8.3.12 and review / rectify prior to starting testing.*	✓
8.3.2	Confirm plant preparations satisfactory. *Record PTW No.* 09416	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 8.3.12 and review / rectify prior to starting testing.*	✓
8.3.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if left in tripped state in section 8.3.12.*	✓
8.3.4	Open XV56801.	Valve action left smooth. *Comment poor action / sticking in section 8.3.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 8.3.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 8.3.12.*	✓

Tank 568 As Left Functional Testing Continued on page 18

8.3 Tank 568 As Left Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.3.5	Refer to SI483015_RPT Wet test of probe required if probe replaced or disturbed. Wet test required, remove probe from tank and immerse in suitable liquid. Wet test not required use Nivotester test button. *Record method of test* N.V.O.TESTER	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 8.3.12.*	✓
		FINAL ELEMENT valve action left smooth. *Comment poor action / sticking in section 8.3.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 8.3.12*	✓
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 8.3.12*	✓
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 8.3.12*	✗
8.3.6	Remove probe from liquid / release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 8.3.12*	✓
8.3.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 8.3.12*	✓
		Valve action left smooth. *Comment poor action / sticking in section 8.3.12.*	✓
		Opening time – No specific requirement. *Comment times > 120 seconds in section 8.3.12.*	✓
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 8.3.12.*	✓
8.3.8	Operate HS568 Tank 568 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 8.3.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 8.3.12*	✓

Tank 568 As Left Functional Testing Continued on page 19

8.3 Tank 568 As Left Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
8.3.8	Release HS568 Tank 568 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 8.3.12.*	✓
8.3.9	Operations to initiate Terminal Shutdown system. *Record method of test* NCH BASIC ESD - IB SES.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 8.3.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 8.3.12*	✓
8.3.10	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 8.3.12.*	✓ DBA
8.3.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

8.3.5 - SEE SI 483018_RPT.

Tested by	Position	Qualification	Sign	Date
DB FAWCETT	INST ENG	ISA SISFS		3/7/14

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

HEALTHY STATE

DESCRIPTION	TAG	TYPE	CALIBRATION	UNITS	SET	ORIGIN	FINAL ELEMENTS	Valves	Tank 561 Import / Export Valve	Tank 564 Import / Export Valve	Tank 568 Import / Export Valve		DIAGNOSTICS	No4 East Switchroom SIS Logic Solver	ESD Relay Tripped	Tank 561 High High Level	Tank 561 Safety Relay Tripped	Tank 561 Import / Export Valve Closed	Tank 561 Import / Export Valve Open	Tank 564 High High Level	Tank 564 Safety Relay Tripped	Tank 564 Import / Export Valve Closed	Tank 564 Import / Export Valve Open	Tank 568 High High Level	Tank 568 Safety Relay Tripped	Tank 568 Import / Export Valve Closed	Tank 568 Import / Export Valve Open	No3 East Control Room Annunciator (4)	Site ESD (Window 3/3)	Tank 561 High High Level (Window 7/9)	Tank 564 High High Level (Window 10/2)	Tank 568 High High Level (Window 10/6)	SI468007_SCH - Radio Message Schedule	SIS RESET	No4 East Switchroom SIS Logic Solver	Tank 561 Safety Relay	Tank 564 Safety Relay	Tank 568 Safety Relay	NOTES
TAG									XV56101	XV56401	XV56801					LSHH56101		XV56101	XV56101	LSHH56401		XV56401	XV56401	LSHH56801		XV56801	XV56801			LSHH56101	LSHH56401	LSHH56801				SYSTEM RESET	SYSTEM RESET	SYSTEM RESET	
ACTION									Enabled	Enabled	Enabled				Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp		Reset	Reset	Reset	Reset	Reset			Enabled	Enabled	Enabled	
SIS AUTOMATIC SHUTDOWN	**IME-SIS1**		**SIL 2**																																				
Tank 561 Independent High Level	LE56101	Probe	1000 (3)	mm	<97%	SRS			H								Red(*)																			H			* Reset if Enabled & Pushbutton Activated
Tank 564 Independent High Level	LE56401	Probe	1000 (3)	mm	<97%	SRS				H											Red(*)																H		* Reset if Enabled & Pushbutton Activated
Tank 568 Independent High Level	LE56801	Probe	1000 (3)	mm	<97%	SRS					H														Red(*)													H	* Reset if Enabled & Pushbutton Activated
ROSOV MANUAL SHUTDOWN																																							
Terminal Shutdown			N/A		HEALTHY	SRS			H(1)	H(1)	H(1)																												
Tank 561 Bund Isolation	HS561	Button	N/A		HEALTHY	SRS			H																														
Tank 564 Bund Isolation	HS564	Button	N/A		HEALTHY	SRS				H																													
Tank 568 Bund Isolation	HS568	Button	N/A		HEALTHY	SRS					H																												
BPCS CONTROL																																							
Local Pneumatic Control Station	XV56101	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS			H																														
Local Pneumatic Control Station	XV56401	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS				H																													
Local Pneumatic Control Station	XV56801	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS					H																												
DIAGNOSTICS																																							
Tank 561 Import Valve Closed	ZSC56101	Limits	N/A	N/A	Closed	SRS												Red																		H			
Tank 561 Import Valve Open	ZSO56101	Limits	N/A	N/A	Open	SRS													Green																				
Tank 564 Import Valve Closed	ZSC56401	Limits	N/A	N/A	Closed	SRS																Red															H		
Tank 564 Import Valve Open	ZSO56401	Limits	N/A	N/A	Open	SRS																	Green																
Tank 568 Import Valve Closed	ZSC56801	Limits	N/A	N/A	Closed	SRS																				Red												H	
Tank 568 Import Valve Open	ZSO56801	Limits	N/A	N/A	Open	SRS																					Green												
SIS Logc Solver Lamp Test		Button	N/A	N/A	Test	SRS									Red	Red	Red	Red	Green	Red	Red	Red	Green	Red	Red	Red	Green												

3/7/14.

CONTROLLED COPY 30 JUN 2014

ABBREVIATIONS	NOTES	REFERENCE DOCUMENTS		REV	DATE	BY	DRN	CHK'D	APPD	DESCRIPTION
SIS - Safety Instrument System	(1) ESD trips other terminal systems - see xxxxx	SRS	SI277010_RPT	A	03/02/14	DBF	DBF	MM	MM	Original Issue for Review
IHL Independent High Level	(2) Self test, 2 pulse trip and fault condition.	Overfill Protection Trip Matrix	SI003100_SCH							
BPCS - Basic Process Control System	(3) Switch length									
ESD - Emergency Shutdown	(4) Full Annunciator functionality in SI468001_MNL									
LB - Line Break / SC - Short Circuit										
H - Hardwired / S - Software										

PLANT Immingham Storage Co Ltd - East Terminal

TITLE IME-SIS1 Tip Matrix

P & I DESIGN

simon

CLIENT DRG

SHEET 1 OF 2

REF NO. SI483012_SCH

SAFETY FUNCTION

DESCRIPTION	TAG	ACTION
FINAL ELEMENTS		
Valves		
Tank 561 Import / Export Valve	XV56101	Close / Inhibit
Tank 564 Import / Export Valve	XV56401	Close / Inhibit
Tank 568 Import / Export Valve	XV56801	Close / Inhibit
DIAGNOSTICS		
No4 East Switchroom SIS Logic Solver		
ESD Relay Tripped		Lamp
Tank 561 High High Level	LSHH56101	Lamp
Tank 561 Safety Relay Tripped		Lamp
Tank 561 Import / Export Valve Closed	XV56101	Lamp
Tank 561 Import / Export Valve Open	XV56101	Lamp
Tank 564 High High Level	LSHH56401	Lamp
Tank 564 Safety Relay Tripped		Lamp
Tank 564 Import / Export Valve Closed	XV56401	Lamp
Tank 564 Import / Export Valve Open	XV56401	Lamp
Tank 568 High High Level	LSHH56801	Lamp
Tank 568 Safety Relay Tripped		Lamp
Tank 568 Import / Export Valve Closed	XV56801	Lamp
Tank 568 Import / Export Valve Open	XV56801	Lamp
No3 East Control Room Annunciator (4)		
Site ESD (Window 3/3)		Activated
Tank 561 High High Level (Window 7/9)	LSHH56101	Activated
Tank 564 High High Level (Window 10/2)	LSHH56401	Activated
Tank 568 High High Level (Window 10/6)	LSHH56801	Activated
SI468007_SCH - Radio Message Schedule		Activated

DESCRIPTION	TAG	TYPE	CALIBRATION	UNITS	SET	ORIGIN	NOTES
SIS AUTOMATIC SHUTDOWN	**IME-SIS1**		**SIL2**			**LOPA**	
Tank 561 Independent High Level	LE56101	Probe	1000 (3)	mm	>97%	SRS	Safety Relay Reset Required - See Sht 1
Tank 564 Independent High Level	LE56401	Probe	1000 (3)	mm	>97%	SRS	Safety Relay Reset Required - See Sht 1
Tank 568 Independent High Level	LE56801	Probe	1000 (3)	mm	>97%	SRS	Safety Relay Reset Required - See Sht 1
ROSOV MANUAL SHUTDOWN							
Site ESD	N/A	N/A	N/A	N/A	Tripped	SRS	
Tank 561 Bund Isolation	HS561	Button	N/A	N/A	Activated	SRS	
Tank 564 Bund Isolation	HS564	Button	N/A	N/A	Activated	SRS	
Tank 568 Bund Isolation	HS568	Button	N/A	N/A	Activated	SRS	
TEST FUNCTIONS							
Tank 561 Test Button (2)	LS56101	Switch	N/A	N/A	Test	SRS	Safety Relay Reset Required - See Sht 1
Tank 564 Test Button (2)	LS56401	Switch	N/A	N/A	Test	SRS	Safety Relay Reset Required - See Sht 1
Tank 568 Test Button (2)	LS56801	Switch	N/A	N/A	Test	SRS	Safety Relay Reset Required - See Sht 1
FAILURE MODES DETECTED							
ESD Logic 24V/3 Failure	ESD	Fuse	N/A	N/A	Fail	SRS	
Tank 561 IHL Short Circuit	LE56101	SC	N/A	N/A	SC	SRS	Safety Relay Reset Required - See Sht 1
Tank 561 IHL Open Circuit	LE56101	LB	N/A	N/A	LB	SRS	Safety Relay Reset Required - See Sht 1
Tank 561 SIS Logic 24V/4 Failure	LS56401	Fuse	N/A	N/A	Fail	SRS	Safety Relay Reset Required - See Sht 1
Tank 561 Valve 24V/5 Failure	XV56101	Fuse	N/A	N/A	Fail	SRS	
Tank 561 BPCS Logic 24V/6 Failure		Fuse	N/A	N/A	Fail	SRS	
Tank 561 Valve Air Failure	XV56101	N/A	N/A	N/A	Iso & Vent	SRS	
Tank 564 IHL Short Circuit	LE56401	SC	N/A	N/A	SC	SRS	Safety Relay Reset Required - See Sht 1
Tank 564 IHL Open Circuit	LE56401	LB	N/A	N/A	LB	SRS	Safety Relay Reset Required - See Sht 1
Tank 564 SIS Logic 24V/7 Failure	LS56401	Fuse	N/A	N/A	Fail	SRS	Safety Relay Reset Required - See Sht 1
Tank 564 Valve 24V/8 Failure	XV56101	Fuse	N/A	N/A	Fail	SRS	
Tank 564 BPCS Logic 24V/9 Failure		Fuse	N/A	N/A	Fail	SRS	
Tank 564 Valve Air Failure	XV56401	N/A	N/A	N/A	Iso & Vent	SRS	
Tank 568 IHL Short Circuit	LE56801	SC	N/A	N/A	SC	SRS	Safety Relay Reset Required - See Sht 1
Tank 568 IHL Open Circuit	LE56801	LB	N/A	N/A	LB	SRS	Safety Relay Reset Required - See Sht 1
Tank 568 SIS Logic 24V/10 Failure	LS56801	Fuse	N/A	N/A	Fail	SRS	Safety Relay Reset Required - See Sht 1
Tank 568 Valve 24V/11 Failure	XV56801	Fuse	N/A	N/A	Fail	SRS	
Tank 568 BPCS Logic 24V/12 Failure		Fuse	N/A	N/A	Fail	SRS	
Tank 568 Valve Air Failure	XV56801	N/A	N/A	N/A	Iso & Vent	SRS	
BPCS CONTROL							
Local Pneumatic Control Station	XV56101	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS	
Local Pneumatic Control Station	XV56401	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS	
Local Pneumatic Control Station	XV56801	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS	

3/7/14

CONTROLLED
30 JUN 2014
SI468SA7
SI468014_RP7.

ABBREVIATIONS
SIS - Safety Instrument System
IHL Independent High Level
BPCS - Basic Process Control System
ESD - Emergency Shutdown
LB - Line Break / SC - Short Circuit
H - Hardwired / S - Software

NOTES
(1) ESD trips other terminal systems - see xxxxx
(2) Self test, 2 pulse trip and fault condition.
(3) Switch length
(4) Full Annunciator functionality in SI468001_M_NL

REFERENCE DOCUMENTS	
SRS	SI277010_RPT
Overfill Protection Trip Matrix	SI003100_SCH

REV	DATE	BY	DRN	CHK'D		APPD		DESCRIPTION
A	03/02/14	DBF	DBF	MM		MM		Original Issue for Review

PLANT Immingham Storage Co Ltd - East Terminal

TITLE IME-SIS1 Tip Matrix

P & I DESIGN

SHEET 2 OF 2

CLIENT DRG

REF NO. SI468012SCH

CLIENT: Immingham Storage Co Ltd | **PROJECT REF**:SI483 | **DOC REF**:SI483004_HDR

PROJECT: SIS Restructuring | **LOCATION**:ISCo East | **DATE**: 01.07.14

PLANT SECTION: No4 East / 500 Series | **PLANT UNIT**:Tanks 561/564/568 | **PAGE**: 1 OF 1

TESTING PHASE: Pre SAT Installation | **SYSTEM**: IME-SIS1

TEST REF	DRAWING NUMBER	INSTALLATION DESCRIPTION	COLD TEST	DATE	HOT TEST	DATE
CC DWG	SI483001_DWG_B	Tanks 561, 564 & 568 Cable Overview	*DBF*	*02.07.14*	*DBF*	*02.07.14*

TEST REF	DRAWING NUMBER	LOOP DESCRIPTION	COLD TEST	DATE	HOT TEST	DATE
LE56101 PICAL Loop Sheet	SI483020_DWG_A	LE56101 Tank 561 HiHi Level Switch Loop Sheet	*DBF*	*02.07.14*	*DBF*	*02.07.14*
XV56101 PICAL Loop Sheet	SI483021_DWG_A	XV56101 Tank 561 Valve Loop Sheet	*DBF*	*02.07.14*	*DBF*	*02.07.14*
LE56401 PICAL Loop Sheet	SI483022_DWG_A	LE56401 Tank 564 HiHi Level Switch Loop Sheet	*DBF*	*02.07.14*	*DBF*	*02.07.14*
XV56401 PICAL Loop Sheet	SI483023_DWG_A	XV56401 Tank 564 Valve Loop Sheet	*DBF*	*02.07.14*	*DBF*	*02.07.14*
LE56801 PICAL Loop Sheet	SI483024_DWG_A	LE564801 Tank 568 HiHi Level Switch Loop Sheet	*DBF*	*02.07.14*	*DBF*	*02.07.14*
XV56801 PICAL Loop Sheet	SI483025_DWG_A	XV56801 Tank 568 Valve Loop Sheet	*DBF*	*02.07.14*	*DBF*	*02.07.14*

COMMENTS

Installation functional prior to formal SIS Proof Testing

APPROVALS

P & I DESIGN LTD: DATE: 2/7/14

CLIENT: DATE:

P & I Design Ltd

2 Reed Street, Gladstone Industrial Estate, Thornaby,
Cleveland TS17 7AF. Tel: (01642) 617444 Fax: (01642) 616447
Website: www.pidesign.co.uk Email: sales@pidesign.co.uk

Instrument Loop Test Sheet Certificate

Certificate Number: LE56101

Client:	Immingham Storage Co. Ltd	**Date:**	2/7/14.	**Loop No:**	LE56101
Location:	ISCo East	**Service:**	Tank 561 High High Level		
Project No:	SI483	**Project:**	SIS Restructuring	**Loop Drg No:**	SI483020_DWG_A

Cap No	Serial No	Test Equipment	Cap No	Serial No	Test Equipment
1			3		
2			4		

Test Equipment Traceable to NPL Standards.

Method of Test

Prepared By: D.B.Faulkner **Approved By:** M.Morgan

This equipment is part of a SAFETY INSTRUMENT SYSTEM. All testing, repairs and modifications must be in accordance with BS EN 61511
Refer to SI483003_RPT - 500 Series Tank Farm Management of Functional Safety report prior to commencing testing.
Note - Listed trips also trip other equipment/processes on the terminal and will activate the terminal annunciator system.
1. Confirm no affected operations in progress and permit to work issued. Record Permit No . 07446
2. Confirm level below trip point, SIS reset and system healthy.
3. Remove probe and immerse in suitable liquid AND/OR operate Nivotester pushbutton. Record method used.
4. Confirm correct annunciator, VTW and Radio broadcast actions.
5. Reinstall probe if removed, confirm healthy and reset SIS.
Report Faults and anomalies

Loop Test

Checked By: **Witnessed By:** **Accepted By:**

Tag No	LE56101
Cal Cert No	
	Testing Method
Immersed	
Test PB	✓
Notes	

Alarms & Trips

Alarms & Trips Source Reference: SI483012_SCH_A

Tag No	LE56101	LS56101	OpenCirc	ShortCirc	FuseFail
Cal Cert No					
Function	AUTO	TEST	FailMode	FailMode	FailMode
Hardware/Software	H	H	H	H	H
Process Desired	HiHi	HiHi	HiHi	HiHi	HiHi
Instrument Desired	HiHi	HiHi	HiHi	HiHi	HiHi
Process Actual		✓	✓	✓	✓
Instrument Actual		✓	✓	✓	✓
Diagnostics as SI483012_SCH_A desired	✓				
Diagnostics as SI483012_SCH_A actual		✓	✓	✓	✓
Annunciator, VTW, Radio desired	✓				
Annunciator, VTW, Radio actual		✓	✓	✓	✓

Control Valve: Fail Action:- N/A

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Website: www.pidesign.co.uk Email: sales@pidesign.co.uk

Instrument Loop Test Sheet Certificate

Certificate Number: LE56401

Client:	Immingham Storage Co. Ltd	**Date:**	2/7/14.	**Loop No:**	LE56401
Location:	ISCo East	**Service:**	Tank 564 High High Level		
Project No:	SI483	**Project:**	SIS Restructuring	**Loop Drg No:**	SI483022_DWG_A

Cap No	Serial No	Test Equipment	Cap No	Serial No	Test Equipment
1			3		
2			4		

Test Equipment Traceable to NPL Standards.

Method of Test

Prepared By: D.B.Faulkner **Approved By:** M.Morgan

This equipment is part of a SAFETY INSTRUMENT SYSTEM, All testing, repairs and modifications must be in accordance with BS EN 61511
Refer to SI483003_RPT - 500 Series Tank Farm Management of Functional Safety report prior to commencing testing.
Note - Listed trips also trip other equipment/processes on the terminal and will activate the terminal annunciator system.
1. Confirm no affected operations in progress and permit to work issued. Record Permit No 07616.
2. Confirm level below trip point, SIS reset and system healthy.
3. Remove probe and immerse in suitable liquid AND/OR operate Nivotester pushbutton. Record method used.
4. Confirm correct annunciator, VTW and Radio broadcast actions.
5. Reinstall probe if removed, confirm healthy and reset SIS.
Report Faults and anomalies

Loop Test

Checked By: **Witnessed By:** **Accepted By:**

Tag No	LE56401
Cal Cert No	
	Testing Method
Immersed	
Test PB	✓
Notes	

Alarms & Trips

Alarms & Trips Source Reference: SI483012_SCH_A

Tag No	LE56401	LS56401	OpenCirc	ShortCirc	FuseFail
Cal Cert No					
Function	AUTO	TEST	FailMode	FailMode	FailMode
Hardware/Software	H	H	H	H	H
Process Desired	HiHi	HiHi	HiHi	HiHi	HiHi
Instrument Desired	HiHi	HiHi	HiHi	HiHi	HiHi
Process Actual		✓	✓	✓	✓
Instrument Actual		✓	✓	✓	✓
Diagnostics as SI483012_SCH_A desired	✔				
Diagnostics as SI483012_SCH_A actual		✓	✓	✓	✓
Annunciator, VTW, Radio desired	✔				
Annunciator, VTW, Radio actual		✓	✓	✓	✓

Control Valve: Fail Action:- N/A

P & I Design Ltd

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Website: www.pidesign.co.uk Email: sales@pidesign.co.uk

Instrument Loop Test Sheet Certificate

Certificate Number: LE56801

Client:	Immingham Storage Co Ltd	**Date:**	2/7/14	**Loop No:**	LE56801
Location:	ISCo East	**Service:**	Tank 568 High High Level		
Project No:	SI483	**Project:**	SIS Restructuring	**Loop Drg No:**	SI483024_DWG_A

Cap No	Serial No	Test Equipment	Cap No	Serial No	Test Equipment
1			3		
2			4		

Test Equipment Traceable to NPL Standards.

Method of Test

Prepared By: D.B Faulkner **Approved By:** M Morgan

This equipment is part of a SAFETY INSTRUMENT SYSTEM, All testing, repairs and modifications must be in accordance with BS EN 61511
Refer to SI483003_RPT - 500 Series Tank Farm Management of Functional Safety report prior to commencing testing
Note - Listed trips also trip other equipment/processes on the terminal and will activate the terminal annunciator system.
1. Confirm no affected operations in progress and permit to work issued. Record Permit No 09446.
2. Confirm level below trip point, SIS reset and system healthy
3. Remove probe and immerse in suitable liquid AND/OR operate Nivotester pushbutton. Record method used
4. Confirm correct annunciator, VTW and Radio broadcast actions
5. Reinstall probe if removed, confirm healthy and reset SIS
Report Faults and anomalies

Loop Test

Checked By: **Witnessed By:** **Accepted By:**

Tag No	LE56801			
Cal Cert No				
	Testing Method			
Immersed				
Test PB	✓			
Notes				

Alarms & Trips

Alarms & Trips Source Reference: SI483012_SCH_A

Tag No	LE56801	LS56801	OpenCirc	ShortCirc	FuseFail
Cal Cert No					
Function	AUTO	TEST	FailMode	FailMode	FailMode
Hardware/Software	H	H	H	H	H
Process Desired	HiHi	HiHi	HiHi	HiHi	HiHi
Instrument Desired	HiHi	HiHi	HiHi	HiHi	HiHi
Process Actual		✓	✓	✓	✓
Instrument Actual		✓	✓	✓	✓
Diagnostics as SI483012_SCH_A desired	✓				
Diagnostics as SI483012_SCH_A actual		✓	✓	✓	✓
Annunciator, VTW, Radio desired	✓				
Annunciator, VTW, Radio actual		✓	✓	✓	✓

Control Valve: Fail Action:- N/A

P & I Design Ltd

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Cleveland TS17 7AF. Tel: (01642) 617444 Fax: (01642) 616447
Website: www.pidesign.co.uk Email: sales@pidesign.co.uk

Instrument Loop Test Sheet Certificate

Certificate Number: XV56101

Client:	Immingham Storage Co. Ltd	**Date:**	2/7/14	**Loop No:**	XV56101
Location:	ISCo East	**Service:**	Tank 561 Import Valve		
Project No:	SI483	**Project:**	SIS Restructuring	**Loop Drg No:**	SI483021_DWG_A

Cap No	Serial No	Test Equipment	Cap No	Serial No	Test Equipment
1	#Error	#Error	3	#Error	#Error
2	#Error	#Error	4	#Error	#Error

Test Equipment Traceable to NPL Standards.

Method of Test

Prepared By: D.B.Faulkner **Approved By:** M.Morgan

This equipment is part of a SAFETY INSTRUMENT SYSTEM, All testing, repairs and modifications must be in accordance with BS EN 61511
Refer to SI483003_RPT - 500 Series Tank Farm Management of Functional Safety report prior to commencing testing.
Note - Listed trips also trip other equipment/processes on the terminal and will activate the terminal annunciator system.
1. Confirm no affected operations in progress and permit to work issued. Record Permit No 07446
2. Confirm all alarms & trips healthy. Select OPEN on local hand switch, confirm valve physically opens. Record times, OPEN selected to fully open (C>O), traveling time (TravO) and comment movement.
3. Trip valve via SIS HIHI level by operation of Nivotester test facility. Confirm valve physically closes, record times from trip to fully closed (O>C), travelling time (TravC) and comment movement. Reset SIS, confirm valve physically opens, record times from reset to fully open (C>O), travelling time (TravO) and comment movement
4. Activate Local Bund Isolation Pushbutton confirming valve physically closes on activation and reopens on Isolation healthy.
5. Activate Site ESD confirming valve physically closes on activation and reopens on ESD healthy.

Loop Test

Checked By: **Witnessed By:** **Accepted By:**

Tag No	XV56101	XV56101	XV56101	XV56101	XV56101	XV56101	XV56101	XV56101	XV56101
Cal Cert No									
	Desired Position	Actual Position	Beacon Colour	Valve Action	Desired Seconds	HS Seconds	Trip Seconds	Movement Desired	Movement Actual
HS Close	Close	CLOSE	RED	C>O	N/A	65.		Smooth	SMOOTH
HS Open	Open	OPEN	WHITE.	O>C	<180	240	228	Smooth	—
				TravO	N/A	55.		Smooth	—
				TravC	>60 90	165.	153	Smooth	—
Notes									
Notes									

Alarms & Trips

Alarms & Trips Source Reference: SI483012_SCH_A

Tag No	LS56101	HS561	ESD	FuseFail	AirFail	A&T SCH
Cal Cert No						
Function	TEST	MAN	MAN	FailMode	FailMode	Diagnostic
Hardware/Software	H	H	H	H	H	H
Process Desired	Close XV	Close XV	Close XV	Close XV	Close Xv	A&T SCH
Instrument Desired	Close XV	Close XV	Close XV	Close Xv	Close XV	A&T SCH
Process Actual	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	AS SCH
Instrument Actual	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	AS SCH
XV closed/inhibited from opening desired	✔	✔	✔	✔	✔	
XV closed/inhibited from opening actual	✔	✔	✔	✔	✔	
Diagnostics as SI483012_SCH_A desired	✔	✔	✔	✔	✔	✔
Diagnostics as SI483012_SCH_A actual	✔	✔	✔	✔	✔	✔

Control Valve: Fail Action:- Fail on air and power failure ✔

P & I Design Ltd

2 Reed Street, Gladstone Industrial Estate, Thornaby,
Cleveland TS17 7AF. Tel: (01642) 617444 Fax: (01642) 616447
Website: www.pidesign.co.uk Email: sales@pidesign.co.uk

Instrument Loop Test Sheet Certificate

Certificate Number: XV56401

Client:	Immingham Storage Co. Ltd	**Date:**	2/7/14	**Loop No:**	XV56401
Location:	ISCo East	**Service:**	Tank 564 Import Valve		
Project No:	SI483	**Project:**	SIS Restructuring	**Loop Drg No:**	SI483023_DWG_A

Cap No	Serial No	Test Equipment	Cap No	Serial No	Test Equipment
1	#Error	#Error	3	#Error	#Error
2	#Error	#Error	4	#Error	#Error

Test Equipment Traceable to NPL Standards.

Method of Test

Prepared By: D.B.Faulkner **Approved By:** M.Morgan

This equipment is part of a SAFETY INSTRUMENT SYSTEM, All testing, repairs and modifications must be in accordance with BS EN 61511
Refer to SI483003_RPT - 500 Series Tank Farm Management of Functional Safety report prior to commencing testing.
Note - Listed trips also trip other equipment/processes on the terminal and will activate the terminal annunciator system.
1. Confirm no affected operations in progress and permit to work issued. Record Permit No 07616
2. Confirm all alarms & trips healthy. Select OPEN on local hand switch, confirm valve physically opens. Record times, OPEN selected to fully open (C>O), traveling time (TravO) and comment movement.
3. Trip valve via SIS HIHI level by operation of Nivotester test facility. Confirm valve physically closes, record times from trip to fully closed (O>C), travelling time (TravC) and comment movement. Reset SIS, confirm valve physically opens, record times from reset to fully open (C>O), travelling time (TravO) and comment movement
4. Activate Local Bund Isolation Pushbutton confirming valve physically closes on activation and reopens on Isolation healthy.
5. Activate Site ESD confirming valve physically closes on activation and reopens on ESD healthy.

Loop Test

Checked By: DM **Witnessed By:** **Accepted By:**

Tag No	XV56401	XV56401	XV56401	XV56401	XV56401	XV56401	XV56401	XV56401	XV56401
Cal Cert No									
	Desired Position	Actual Position	Beacon Colour	Valve Action	Desired Seconds	HS Seconds	Trip Seconds	Movement Desired	Movement Actual
HS Close	Close	CLOSE	RED	C>O	N/A	38	40	Smooth	SMOOTH
HS Open	Open	OPEN	WHITE	O>C	<180	95	215	Smooth	—
				TravO	N/A	28	30	Smooth	—
				TravC	~~60~~ 90	50	125	Smooth	—
Notes									
Notes									

Alarms & Trips

Alarms & Trips Source Reference: SI483012_SCH_A

Tag No	LS56401	HS564	ESD	FuseFail	AirFail	A&T SCH
Cal Cert No						
Function	TEST	MAN	MAN	FailMode	FailMode	Diagnostic
Hardware/Software	H	H	H	H	H	H
Process Desired	Close XV	Close XV	Close XV	Close XV	Close Xv	A&T SCH
Instrument Desired	Close XV	Close XV	Close XV	Close Xv	Close XV	A&T SCH
Process Actual	✓	✓	✓	✓	✓	AS SCH
Instrument Actual	✓	✓	✓	✓	✓	AS SCH
XV closed/inhibited from opening desired	✔	✔	✔	✔	✔	
XV closed/inhibited from opening actual	✓	✓	✓	✓	✓	
Diagnostics as SI483012_SCH_A desired	✔	✔	✔	✔	✔	✔
Diagnostics as SI483012_SCH_A actual	✓	✓	✓	✓	✓	✓

Control Valve: Fail Action:- Fail on air and power failure ✓

P & I Design Ltd

2 Reed Street, Gladstone Industrial Estate, Thornaby,
Cleveland TS17 7AF. Tel: (01642) 617444 Fax: (01642) 616447
Website: www.pidesign.co.uk Email: sales@pidesign.co.uk

Instrument Loop Test Sheet Certificate

Certificate Number: XV56801

Client:	Immingham Storage Co. Ltd	**Date:**	2/7/14.	**Loop No:**	XV56801
Location:	ISCo East	**Service:**	Tank 568 Import Valve		
Project No:	SI483	**Project:**	SIS Restructuring	**Loop Drg No:**	SI483025_DWG_A

Cap No	Serial No	Test Equipment	Cap No	Serial No	Test Equipment
1	#Error	#Error	3	#Error	#Error
2	#Error	#Error	4	#Error	#Error

Test Equipment Traceable to NPL Standards.

Method of Test

Prepared By: D.B.Faulkner **Approved By:** M.Morgan

This equipment is part of a SAFETY INSTRUMENT SYSTEM, All testing, repairs and modifications must be in accordance with BS EN 61511
Refer to SI483003_RPT - 500 Series Tank Farm Management of Functional Safety report prior to commencing testing.
Note - Listed trips also trip other equipment/processes on the terminal and will activate the terminal annunciator system.
1. Confirm no affected operations in progress and permit to work issued. Record Permit No 09416
2. Confirm all alarms & trips healthy. Select OPEN on local hand switch, confirm valve physically opens. Record times, OPEN selected to fully open (C>O), traveling time (TravO) and comment movement.
3. Trip valve via SIS HIHI level by operation of Nivotester test facility. Confirm valve physically closes, record times from trip to fully closed (O>C), travelling time (TravC) and comment movement. Reset SIS, confirm valve physically opens, record times from reset to fully open (C>O), travelling time (TravO) and comment movement
4. Activate Local Bund Isolation Pushbutton confirming valve physically closes on activation and reopens on Isolation healthy.
Report Faults and anomalies

Loop Test

Checked By: **Witnessed By:** **Accepted By:**

Tag No	XV56801	XV56801	XV56801	XV56801	XV56801	XV56801	XV56801	XV56801	XV56801
Cal Cert No									
	Desired Position	Actual Position	Beacon Colour	Valve Action	Desired Seconds	HS Seconds	Trip Seconds	Movement Desired	Movement Actual
HS Close	Close	CLOSE	RED	C>O	N/A	30	30	Smooth	SMOOTH
HS Open	Open	OPEN	WHITE.	O>C	<180	85	240	Smooth	—
				TravO	N/A	25	25	Smooth	—
				TravC	~~>60~~ 90	75	120	Smooth	—
Notes									
Notes									

Alarms & Trips

Alarms & Trips Source Reference: SI483012_SCH_A

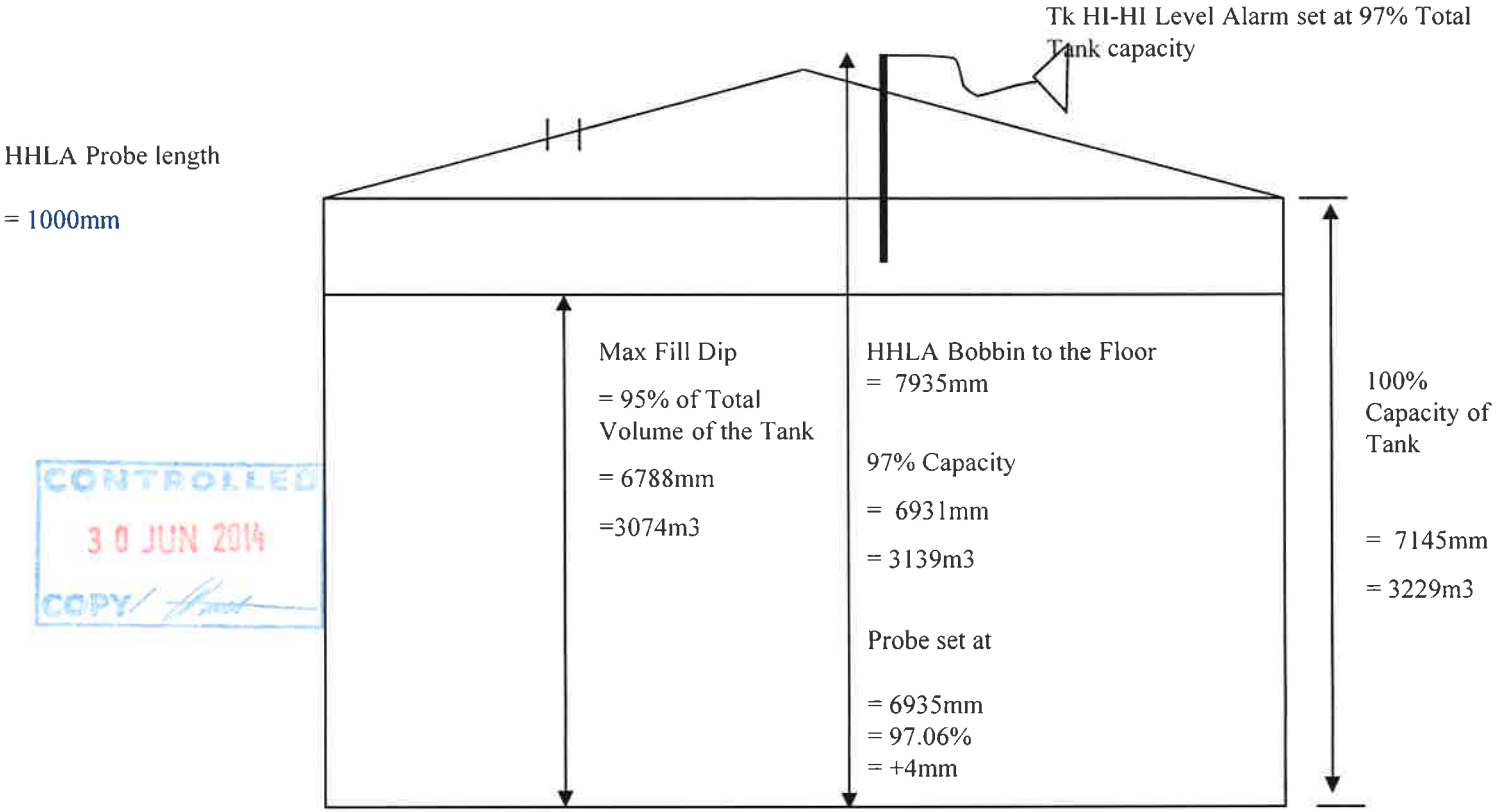
Tag No	LS56801	HS568	ESD	FuseFail	AirFail	A&T SCH
Cal Cert No						
Function	TEST	MAN	MAN	FailMode	FailMode	Diagnostic
Hardware/Software	H	H	H	H	H	H
Process Desired	Close XV	Close XV	Close XV	Close XV	Close Xv	A&T SCH
Instrument Desired	Close XV	Close XV	Close XV	Close Xv	Close XV	A&T SCH
Process Actual	✓	✓	✓	✓	✓	AS SCH
Instrument Actual	✓	✓	✓	✓	✓	AS SCH
XV closed/inhibited from opening desired	✔	✔	✔	✔	✔	
XV closed/inhibited from opening actual	✓	✓	✓	✓	✓	
Diagnostics as SI483012_SCH_A desired	✔	✔	✔	✔	✔	✔
Diagnostics as SI483012_SCH_A actual	✓	✓	✓	✓	✓	✓

Control Valve: Fail Action:- Fail on air and power failure

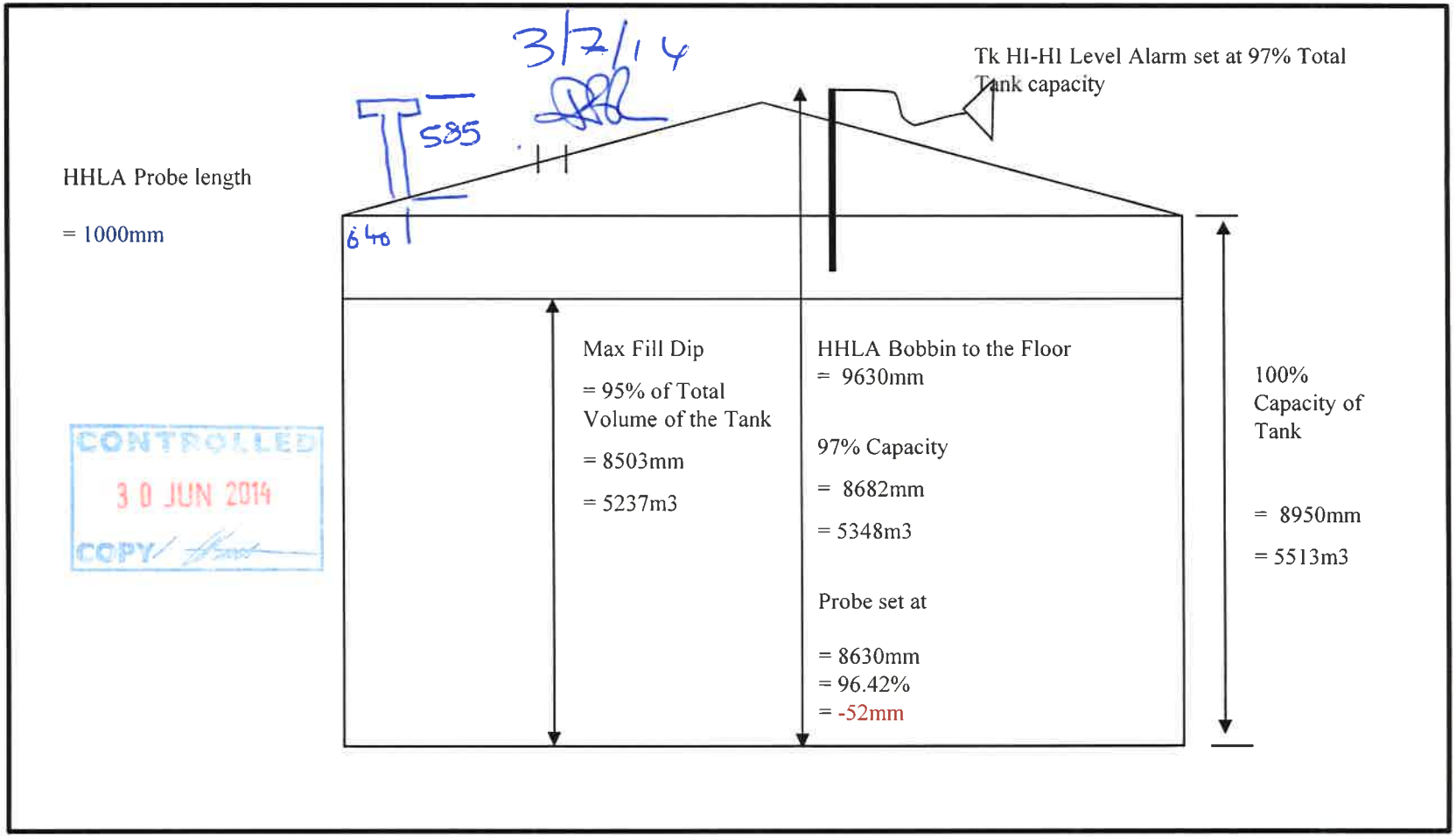
2.2 Valves

Tank 561 Import/Export Valve	**Serial No.**	**Model No.**	
XV56101 - Body		P-03-4000-1025	✓ PASS.
XV56101 - Actuator		150TN9MDN250LF2/ CF8M	✓ PASS
ZS56101 - Limit Switch Box		2245AB1A00022 AAAA R1	✓ PASS
SOV56101 - Body	1108		✓ PASS
SOV56101 - Coil	110625.		✓ PASS
XV56101 - Local JB	011152-10		✓ PASS.
Tank 562 Import/Export Valve	**Serial No.**	**Model No.**	
XV56201 - Body			
XV56201 - Actuator			
ZS56201 - Limit Switch Box			
SOV56201 - Body			
SOV56201 - Coil			
XV56201 - Local JB			
Tank 563 Import/Export Valve	**Serial No.**	**Model No.**	
XV56301 - Body			
XV56301 - Actuator			
ZS56301 - Limit Switch Box			
SOV56301 - Body			
SOV56301 - Coil			
XV56301 - Local JB			
Tank 564 Import/Export Valve	**Serial No.**	**Model No.**	
XV56401 - Body		150TN4MDN200	✓ PASS
XV56401 - Actuator	Q1125000FG.	AC72500R.	✓ PASS
ZS56401 - Limit Switch Box		2245AB1A00022 AAAA R1.	✓ PASS
SOV56401 - Body	1108		✓ PASS
SOV56401 - Coil	110624.		✓ PASS
XV56401 - Local JB	08\11510.		✓ PASS

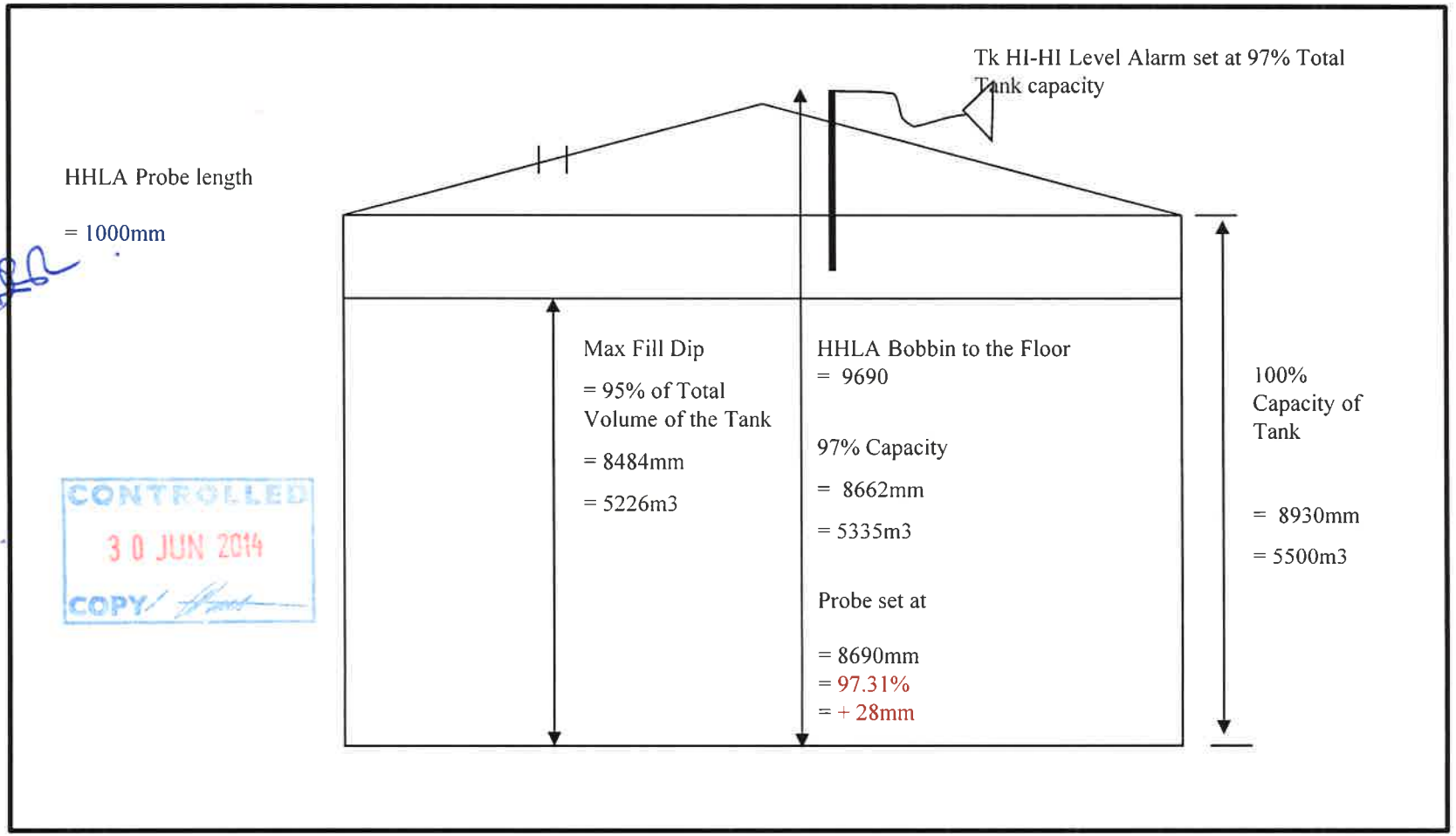
TANK 561



TANK 564



TANK 568



3/7/14

505 130 340

NOTE NOT BUNN NOZZLE NOT TO SCALE NOZZLE.

CLIENT: Immingham Storage Co Ltd **PROJECT REF**:SI483 **DOC REF**:SI483005_HDR_A

PROJECT: SIS Restructuring **LOCATION**:ISCo East **DATE**: 01.07.14

PLANT SECTION: No4 East / 500 Series **PLANT UNIT**:Tanks 561/564/568 **PAGE**: 1 OF 1

TESTING PHASE: SAT **SYSTEM**: IME-SIS1

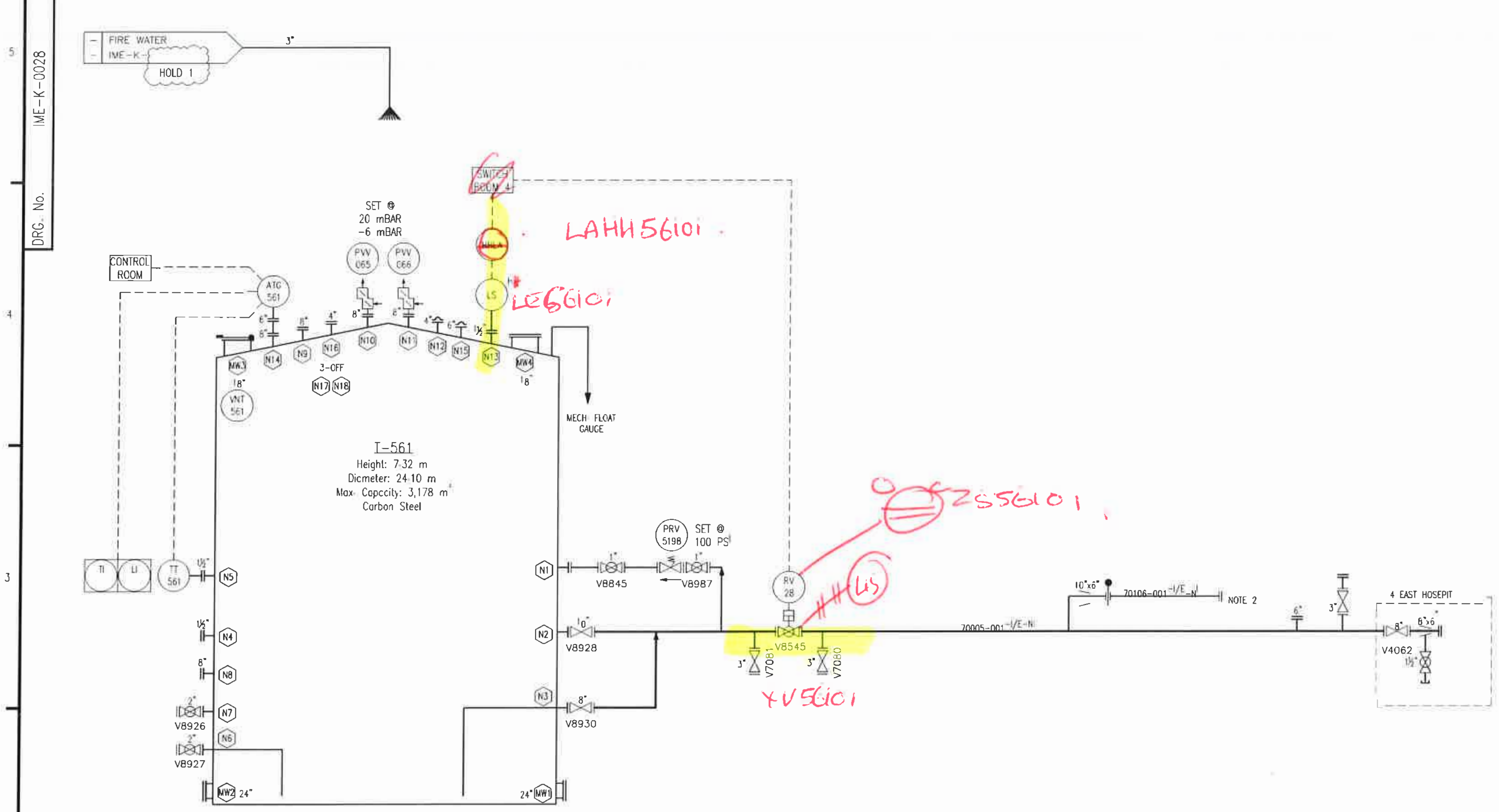
Raised By	Date	Responsible Engineer	Ref	Deviation Details	Complete (Sign)
SAT	03.07.14	ISCo	1	SI483018_RPT SAT Section 7.1.5 XV56101 Trip time above acceptance criteria. Trip to valve closed time > 180s. Action – Review acceptance criteria.	
SAT	03.07.14	ISCo	2	SI483018_RPT SAT Section 7.2.5 XV56401 Trip time above acceptance criteria. Trip to valve closed time > 180s. Action – Review acceptance criteria.	
SAT	03.07.14	ISCo	3	SI483018_RPT SAT Section 7.3.5 XV56801 Trip time above acceptance criteria. Trip to valve closed time > 180s. Action – Review acceptance criteria.	
SAT	03.07.14	ISCo	4	No Thermal relief round XV if closed. Over pressurisation of pipeline possible under closed conditions. No remote monitoring of XV Open / Closed status. Action – Consider remote alert if XV closes or consider thermal relief modifications.	
SAT	03.07.14	ISCo	5	No Tag numbers on P&ID's Action – As Build P&ID's.	
SAT	03.07.14	ISCo	6	Front of panel lamp display difficult for operations unfamiliar with valve tag no's to determine physical plant configuration. Action – Consider Mimic in Switchroom or local / remote dynamic mimic (SCADA)	

APPROVALS

P & I DESIGN LTD: D.B.Faulkner DATE:

CLIENT: DATE:

IF IN DOUBT ASK



LEGEND

GATE VALVE
BALL VALVE
GLOBE VALVE
BUTTERFLY VALVE
NEEDLE VALVE
DIAPHRAGM VALVE
PLUG VALVE
NON RETURN VALVE
PRESSURE REDUCING VALVE
PRESSURE CONTROL VALVE
PRESSURE RELIEF VALVE
THERMAL PRESSURE RELIEF VALVE
TANK PRESS/VAC VALVE
ACTUATED VALVE
SOLENOID VALVE
3-WAY VALVE
FLEXI HOSE
HOSE COUPLING (FEMALE)
HOSE COUPLING (MALE)
SPECTACLE BLIND
FLAME ARRESTER/DETONATION TRAP
FILTER/STRAINER
Y-TYPE STRAINER
TEMPORARY STRAINER
DIFFUSER
TANK DIP HATCH
HORN/KLAXON
TANK ROOF FREE VENT
FIRE HYDRANT (2 CONNECTION SHOWN)
DOUBLE DIAPHRAGM PUMP (AIR OPERATED)
CENTRIFUGAL PUMP OR FAN
METERING/DOSING PUMP
PULSATION DAMPENER
MOTOR
FLOW ELEMENT
ORIFICE PLATE
STEAM TRAP
SWIVEL JOINT
SIGHT GLASS

CG	CONTENTS GAUGE
DCV	DIGITAL CONTROL VALVE
EPB	EMERGENCY SHUTDOWN BUTTON
ESD	EMERGENCY SHUTDOWN SYSTEM
ESV	EMERGENCY SHUTDOWN VALVE
ET	EARTH PROVER/POINT
FC	FLOW CONTROL
FCV	FLOW CONTROL VALVE
FE	FLOW ELEMENT
FI	FLOW INDICATOR
FM	FLOW METER
FR	FLOW RECORDER
FT	FLOW TRANSMITTER
GO	GEAR OPERATED
HS	HAND SWITCH
H	HIGH
HH	HIGH HIGH
L	LOW
LL	LOW LOW
LA	LEVEL ALARM
LC	LOCKED CLOSED
LI	LEVEL INDICATOR
LO	LOCKED OPEN
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
M	MOTOR
NC	NORMALLY CLOSED
PB	PUSH BUTTON
PHA	PH ALARM
PHI	PH INDICATOR
PI	PRESSURE INDICATOR
PT	PRESSURE TRANSMITTER
PVV	PRESS/VAC VALVE
RL	RUN LIGHT
ROP	RESTRICTION ORIFICE PLATE
SG	SIGHT GLASS
SV	SOLENOID VALVE
TI	TEMPERATURE INDICATOR
TR	TEMPERATURE RECORDER
TRV	THERMAL PRESSURE RELIEF VALVE
TS	TEMPERATURE SWITCH
TT	TEMPERATURE TRANSMITTER
XV	ACTUATED VALVE

LINE IDENTIFICATION PHILOSOPHY

NEW PIPEWORK
LAGGED LINE
LINE LAGGED & STEAM OR ELECTRICALLY TRACED
JACKETED PIPEWORK
EXISTING PIPEWORK
FUTURE PIPEWORK
UNDERGROUND PIPEWORK
REDUNDANT PIPEWORK TO BE REMOVED
ELECTRICAL SIGNAL
PNEUMATIC SIGNAL

LINE NUMBER IDENTIFICATION

FLUID CODE (SEE BELOW)
DEDICATED LINE No.
LINE SIZE
PIPE SPEC
?"-XX-YYYY-ZZZZ
(e.g. 8"-MS-4001-AA01)

INSTRUMENT IDENTIFICATION

INSTRUMENT SITED LOCAL TO MEASURING POINT
INSTRUMENT SITED ON THE MAIN CONTROL ROOM PANEL FACE
INSTRUMENT SITED ON A LOCAL PANEL FACE

FLUID CODE IDENTIFICATION

PRODUCTS

DSL	DIESEL
FAM	FATTY ACID METHYL ESTER (FAME)
GEN	GENERAL PURPOSE
GP	GENERAL PURPOSE (JETTY LINES)
MS	GASOLINE
HFO	HEAVY FUEL OIL
GO	GAS OIL
TD	TANK DRAIN

UTILITIES

CA	COMPRESSED AIR
CON	CONDENSATE
FF	FIRE FOAM
FW	FIRE WATER
HPS	HIGH PRESSURE STEAM
IA	INSTRUMENT AIR
IPS	INTERMEDIATE PRESSURE STEAM
LPS	LOW PRESSURE STEAM
N	NITROGEN
TW	TOWNS WATER

DOCUMENT REVIEW

A SIGNATURE INDICATES THAT AN AUTHORISED PERSON FROM THE SECTION LISTED PARTICIPATED IN A REVIEW OF THIS DRAWING

SECTION	REV. 2	DATE
ENG DESIGN TERMINAL ENG	PJC	23/01/14

CONTROLLED COPY
30 JUN 2014
S2683 SA7.

NOTES:
HOLD 1: FIREMAIN P&ID UNDER CONSTRUCTION
NOTE 1: ALL PRV ISOLATION VALVES ARE LOCKED OPEN
NOTE 2: BLANK FITTED SOUTH-SIDE OF #4 HOSEPIT

REV	AMENDMENTS	BY	DATE	CHK
2	PRV5198 REPLACED PRV5477	SGH	23-01-14	
1	VALVES UPDATED AND PRV5477 RELIEVING INTO TANK	SGH	11-12-13	

Simon Storage
Immingham Storage Company Ltd
Immingham East Terminal
Immingham Dock
Immingham
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E info@simonstorage.com
W www.simonstorage.com

bulk liquid & gas network

DRAWN SGH
CHECKED -
SCALE NTS
A1
APPROVED -
DATE 07/11/13

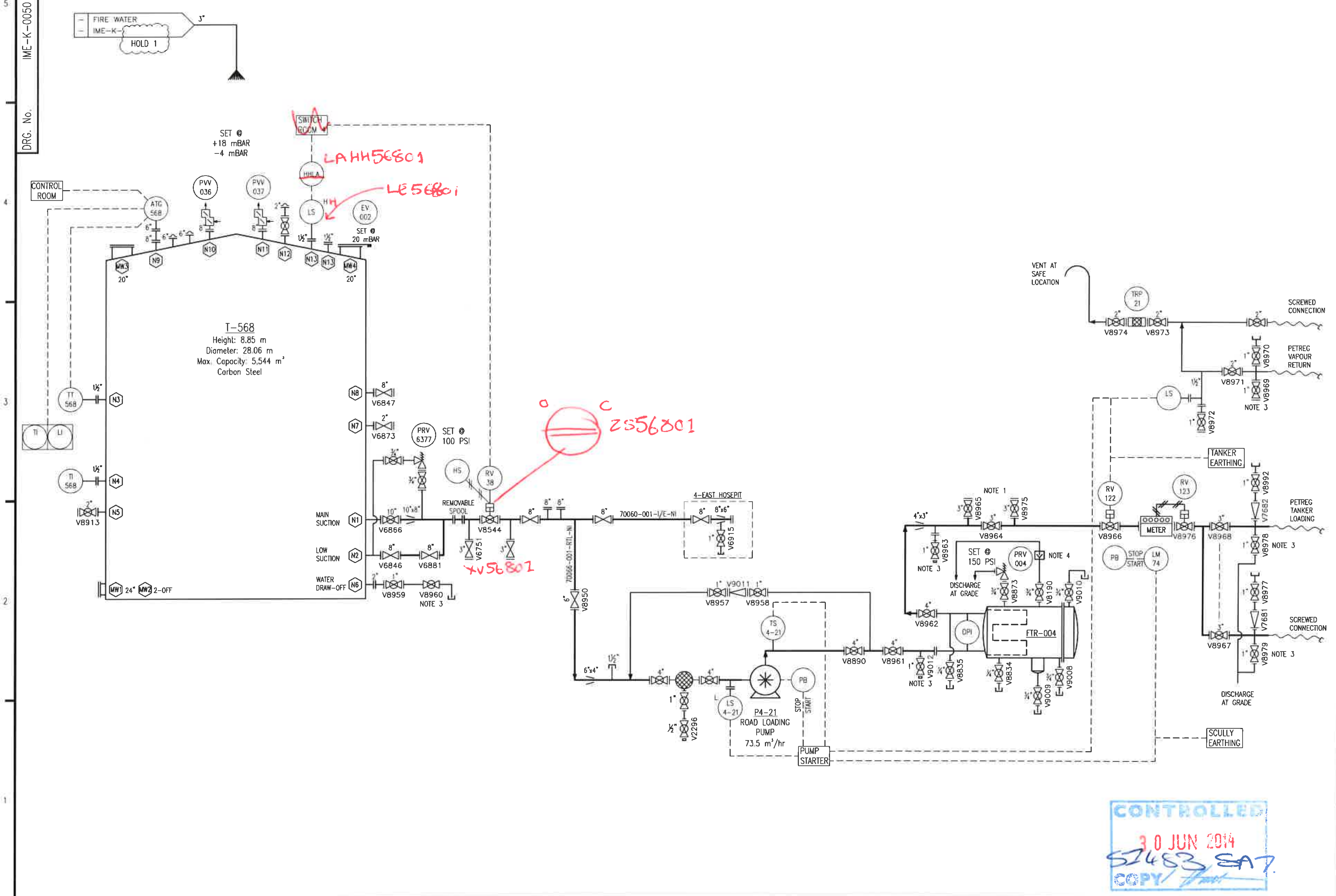
PROJECT
MASTER P&ID

TITLE
T-561 PIPING & INSTRUMENTATION DIAGRAM

DRG. No. IME-K-0028 REV. 2

DRG. No. IME-K-0028 REV. 2

IF IN DOUBT ASK



LEGEND

- GATE VALVE
- BALL VALVE
- GLOBE VALVE
- BUTTERFLY VALVE
- NEEDLE VALVE
- DIAPHRAGM VALVE
- PLUG VALVE
- NON RETURN VALVE
- PRESSURE REDUCING VALVE
- PRESSURE CONTROL VALVE
- PRESSURE RELIEF VALVE
- THERMAL PRESSURE RELIEF VALVE
- TANK PRESS/VAC VALVE
- ACTUATED VALVE
- SOLENOID VALVE
- 3-WAY VALVE
- FLEXI HOSE
- HOSE COUPLING (FEMALE)
- HOSE COUPLING (MALE)
- SPECTACLE BLIND
- FLAME ARRESTER/DETONATION TRAP
- FILTER/STRAINER
- Y-TYPE STRAINER
- TEMPORARY STRAINER
- DIFFUSER
- TANK DIP HATCH
- HORN/KLAXON
- TANK ROOF FREE VENT
- FIRE HYDRANT (2 CONNECTION SHOWN)
- DOUBLE DIAPHRAGM PUMP (AIR OPERATED)
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- METERING/DOSING PUMP
- PULSATION DAMPENER
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FCV	FLOW CONTROL VALVE
FE	FLOW ELEMENT
FI	FLOW INDICATOR
FM	FLOW METER
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FT	FLOW TRANSMITTER
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HH	HIGH HIGH
L	LOW
LL	LOW LOW
LA	LEVEL ALARM
LC	LOCKED CLOSED
LI	LEVEL INDICATOR
LO	LOCKED OPEN
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
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NC	NORMALLY CLOSED
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TRV	THERMAL PRESSURE RELIEF VALVE
TS	TEMPERATURE SWITCH
TT	TEMPERATURE TRANSMITTER
XV	ACTUATED VALVE

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- JACKETED PIPEWORK
- EXISTING PIPEWORK
- FUTURE PIPEWORK
- UNDERGROUND PIPEWORK
- REDUNDANT PIPEWORK TO BE REMOVED
- ELECTRICAL SIGNAL
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LINE SIZE
DEDICATED LINE No.
PIPE SPEC
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TW	TOWNS WATER

DOCUMENT REVIEW

A SIGNATURE INDICATES THAT AN AUTHORISED PERSON FROM THE SECTION LISTED PARTICIPATED IN A REVIEW OF THIS DRAWING.

SECTION	REV. 1	DATE
ENG. DESIGN	PJC	21/10/13
TERMINAL ENG.	AB	03/03/14

NOTES:

HOLD 1: FIREMAIN P&ID UNDER CONSTRUCTION

NOTE 1: VALVES FOR METER PROVING

NOTE 2: ALL PRV ISOLATION VALVES ARE LOCKED OPEN

NOTE 3: SPRING RETURN VALVE

NOTE 4: AIR ELIMINATOR. REF: IE-MECH E0114

REV	AMENDMENTS	BY	DATE	CHK
1	UPDATED FROM IMMEAS2024-13 (AV. GAS)	SGH	14/02/14	

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Immingham East Terminal
Immingham Dock
Immingham
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E info@simonstorage.com
W www.simonstorage.com

simon

bulk liquid & gas network

DRAWN	SGH	SCALE	NTS @ A1
CHECKED	-	APPROVED	-
		DATE	16/10/13

PROJECT: MASTER P&ID

TITLE: T-568 PIPING & INSTRUMENTATION DIAGRAM

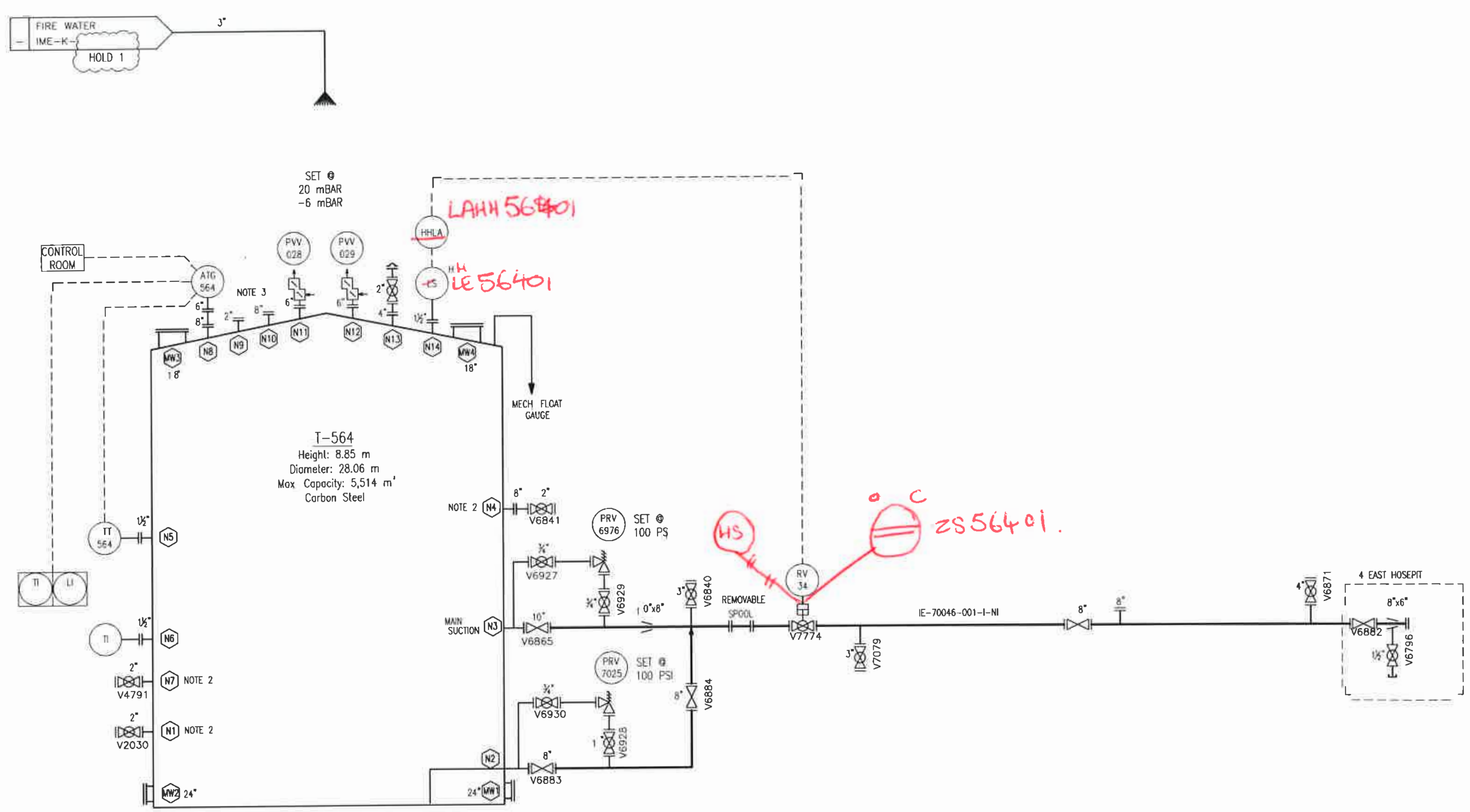
DRG. No. IME-K-0050 REV. 1

REV. 1 DRG. No. IME-K-0050

CAD REF: IME-K-0049

REV. 0

DRG. No. IME-K-0052



LEGEND

Symbol	Description
	GATE VALVE
	BALL VALVE
	GLOBE VALVE
	BUTTERFLY VALVE
	NEEDLE VALVE
	DIAPHRAGM VALVE
	PLUG VALVE
	NON RETURN VALVE
	PRESSURE REDUCING VALVE
	PRESSURE CONTROL VALVE
	PRESSURE RELIEF VALVE
	THERMAL PRESSURE RELIEF VALVE
	TANK PRESS/VAC VALVE
	ACTUATED VALVE
	SOLENOID VALVE
	3-WAY VALVE
	FLEXI HOSE
	HOSE COUPLING (FEMALE)
	HOSE COUPLING (MALE)
	SPECTACLE BLIND
	FLAME ARRESTER/DETONATION TRAP
	FILTER/STRAINER
	Y-TYPE STRAINER
	TEMPORARY STRAINER
	DIFFUSER
	TANK DIP HATCH
	HORN/KLAXON
	TANK ROOF FREE VENT
	FIRE HYDRANT (2 CONNECTION SHOWN)
	DOUBLE DIAPHRAGM PUMP (AIR OPERATED)
	CENTRIFUGAL PUMP OR FAN
	METERING/DOSING PUMP
	PULSATION DAMPENER
	MOTOR
	FLOW ELEMENT
	ORIFICE PLATE
	STEAM TRAP
	SWIVEL JOINT
	SIGHT GLASS

Abbreviation	Meaning
CG	CONTENTS GAUGE
DCV	DIGITAL CONTROL VALVE
EPB	EMERGENCY SHUTDOWN BUTTON
ESD	EMERGENCY SHUTDOWN SYSTEM
ESV	EMERGENCY SHUTDOWN VALVE
ET	EARTH PROVER/POINT
FC	FLOW CONTROL
FCV	FLOW CONTROL VALVE
FE	FLOW ELEMENT
FI	FLOW INDICATOR
FM	FLOW METER
FR	FLOW RECORDER
FT	FLOW TRANSMITTER
GO	GEAR OPERATED
HS	HAND SWITCH
H	HIGH
HH	HIGH HIGH
L	LOW
LL	LOW LOW
LA	LEVEL ALARM
LC	LOCKED CLOSED
LI	LEVEL INDICATOR
LO	LOCKED OPEN
LS	LEVEL SWITCH
LT	LEVEL TRANSMITTER
M	MOTOR
NC	NORMALLY CLOSED
PB	PUSH BUTTON
PHA	PH ALARM
PHI	PH INDICATOR
PI	PRESSURE INDICATOR
PT	PRESSURE TRANSMITTER
PVV	PRESS/VAC VALVE
RL	RUN LIGHT
ROP	RESTRICTION ORIFICE PLATE
SG	SIGHT GLASS
SV	SOLENOID VALVE
TI	TEMPERATURE INDICATOR
TR	TEMPERATURE RECORDER
TRV	THERMAL PRESSURE RELIEF VALVE
TS	TEMPERATURE SWITCH
TT	TEMPERATURE TRANSMITTER
XV	ACTUATED VALVE

LINE IDENTIFICATION PHILOSOPHY

- NEW PIPEWORK
- LAGGED LINE
- LINE LAGGED & STEAM OR ELECTRICALLY TRACED
- JACKETED PIPEWORK
- EXISTING PIPEWORK
- FUTURE PIPEWORK
- UNDERGROUND PIPEWORK
- REDUNDANT PIPEWORK TO BE REMOVED
- ELECTRICAL SIGNAL
- PNEUMATIC SIGNAL

LINE NUMBER IDENTIFICATION

FLUID CODE (SEE BELOW) — DEDICATED LINE No. — LINE SIZE — PIPE SPEC

?"-XX-YYYY-ZZZZ
(e.g. 8"-MS-4001-AA01)

INSTRUMENT IDENTIFICATION

- INSTRUMENT SITED LOCAL TO MEASURING POINT
- INSTRUMENT SITED ON THE MAIN CONTROL ROOM PANEL FACE
- INSTRUMENT SITED ON A LOCAL PANEL FACE

FLUID CODE IDENTIFICATION

PRODUCTS

Code	Fluid
DSL	DIESEL
FAM	FATTY ACID METHYL ESTER (FAME)
GEN	GENERAL PURPOSE
GP	GENERAL PURPOSE (JETTY LINES)
MS	GASOLINE
HFO	HEAVY FUEL OIL
GO	GAS OIL
TD	TANK DRAIN

UTILITIES

Code	Fluid
CA	COMPRESSED AIR
CON	CONDENSATE
FF	FIRE FOAM
FW	FIRE WATER
HPS	HIGH PRESSURE STEAM
IA	INSTRUMENT AIR
IPS	INTERMEDIATE PRESSURE STEAM
LPS	LOW PRESSURE STEAM
N	NITROGEN
TW	TOWNS WATER

CONTROLLED
30 JUN 2014
57483 SA7
COPY

DOCUMENT REVIEW

A SIGNATURE INDICATES THAT AN AUTHORISED PERSON FROM THE SECTION LISTED PARTICIPATED IN A REVIEW OF THIS DRAWING

SECTION	REV. 0	DATE
ENG DESIGN	PJC	30/10/13
TERMINAL ENG	-	-

NOTES:

HOLD 1: FIREMAIN P&ID UNDER CONSTRUCTION

NOTE 1: ALL PRV ISOLATION VALVES ARE LOCKED OPEN

NOTE 2: DRAIN VALVES TO TANK PERIMETER

NOTE 3: DISCONNECTED TS (2") AND RADAR GAUGE (8")

REV	AMENDMENTS	BY	DATE	CHK

Simon Storage
Immingham Storage Company Ltd
Immingham East Terminal
Immingham Dock
Immingham
DN40 2QW
T 01469 563900
E info@simonstorage.com
W www.simonstorage.com

DRAWN	SGH	SCALE	NTS	@ A1
CHECKED	-	APPROVED	-	DATE 28/10/13

bulk liquid & gas network

PROJECT: MASTER P&ID

TITLE: T-564 PIPING & INSTRUMENTATION DIAGRAM

DRG No. IME-K-0052 REV 0

CAD REF: IME-K-0052

EXISTING SIS TANK OVERFILL MONITORING PANEL

NON-SIS TANK OVERFILL PROTECTION PANEL

X40379 12 Core

NEW SIS TANK OVERFILL MONITORING PANEL

SIS TANK OVERFILL PROTECTION PANEL

P40381 3 Core

SWITCHROOM POWER DISTRIBUTION BOARD

X40380 19 Core

SWITCHROOM ANNUNCIATOR NODE

CABLE C40366 TO BE MOVED FROM EXISTING SIS PANEL TO NEW SIS PANEL

THIS CABLE WILL PROBABLY NOT BE LONG ENOUGH TO REACH THE NEW PANEL. CONSIDER SPLICING IN THE SWITCHROOM OR PULLING BACK TO THE NEW VALVE JUNCTION BOX IN AREA L/M/O (ADJACENT TO JB4/B1)

C40366 7 Core

X40330 10 Pair

C40283 37 Core

C40282 48 Core

X40340 10 Pair

X40375 10 Pair Blue Sheath

C40378 37 Core

C40377 48 Core

X40376 10 Pair Blue Sheath

No.4 SWITCHROOM

FIELD - TANK 551

FIELD -TANK 564 & 568

JB4/84 TANK LEVEL SWITCH JUNCTION BOX

JB4/197 TANK LEVEL SWITCH JUNCTION BOX

JB4/81 TANK VALVE JUNCTION BOX

JB4/199 TANK VALVE JUNCTION BOX

JB4/82 TANK VALVE JUNCTION BOX

JB4/200 TANK VALVE JUNCTION BOX

JB4/85 TANK LEVEL SWITCH JUNCTION BOX

JB4/198 TANK LEVEL SWITCH JUNCTION BOX

CABLE X40336 TO BE MOVED FROM JB4/84 TO NEW TANK LEVEL JUNCTION BOX

CABLES C40283 & C40295 TO BE MOVED FROM JB4/82 TO NEW VALVE JUNCTION BOX

CABLES X40341 & X40345 TO BE MOVED FROM JB4/85 TO NEW TANK LEVEL JUNCTION BOX

C40366 7 Core

X40336 1 Pair

XV56101 LOCAL J/B

LIQUIPHANT LE 561

C40367 3 Core

C40368 4 Core

ZS 56101

TANK 561

XV56101 IMPORT/EXPORT VALVE

C40283 7 Core

X40341 1 Pair

XV56401 LOCAL J/B

LIQUIPHANT LE 564

C40284 3 Core

C40285 4 Core

ZS 56401

TANK 564

XV56401 TANK 8" IMPORT/EXPORT VALVE

C40295 7 Core

X40345 1 Pair

XV56801 LOCAL J/B

LIQUIPHANT LE 568

C40296 3 Core

C40297 4 Core

ZS 56801

TANK 568

XV56801 TANK 8" IMPORT/EXPORT VALVE

PROJECT DRAWING

BASED ON MASTER DRAWINGS SI277002_DWG & SI277003_DWG

MODS TO BE TRANSFERED TO MASTER DRAWINGS ON COMPLETION OF THIS PROJECT

NOTES

1) NEW CABLES, PANELS, JUNCTION BOXES AND INSTALLATION WORK SHOWN IN RED

IF NOT SIGNED THISDOCUMENT IS UNCONTROLLED

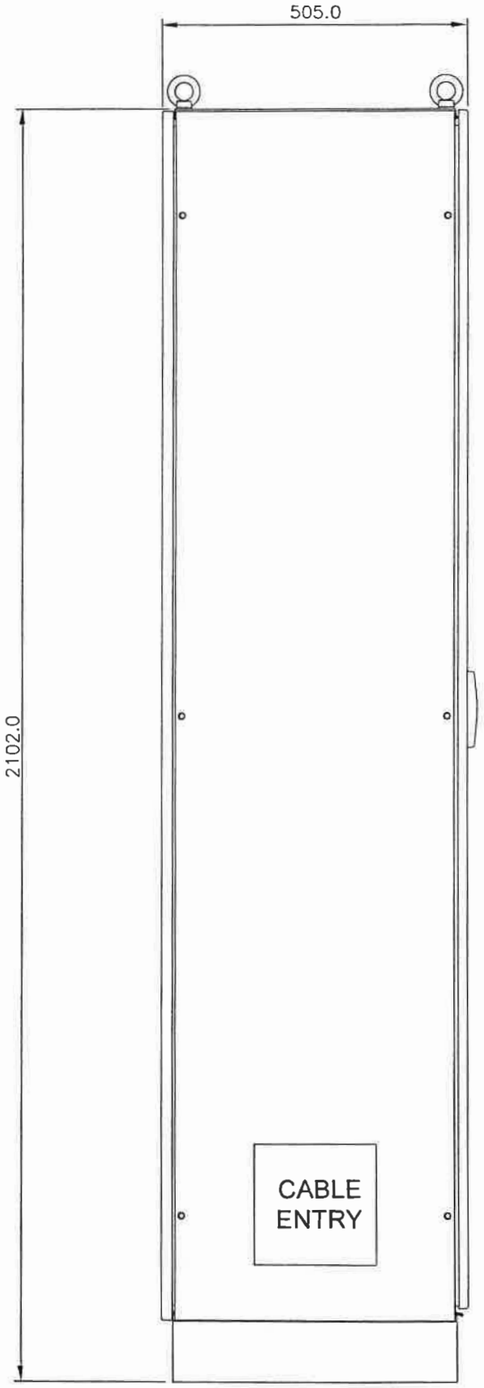
REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR TENDER
B	04/02/14	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR CONSTRUCTION

CONTROLLED 30 JUN 2014 COPY

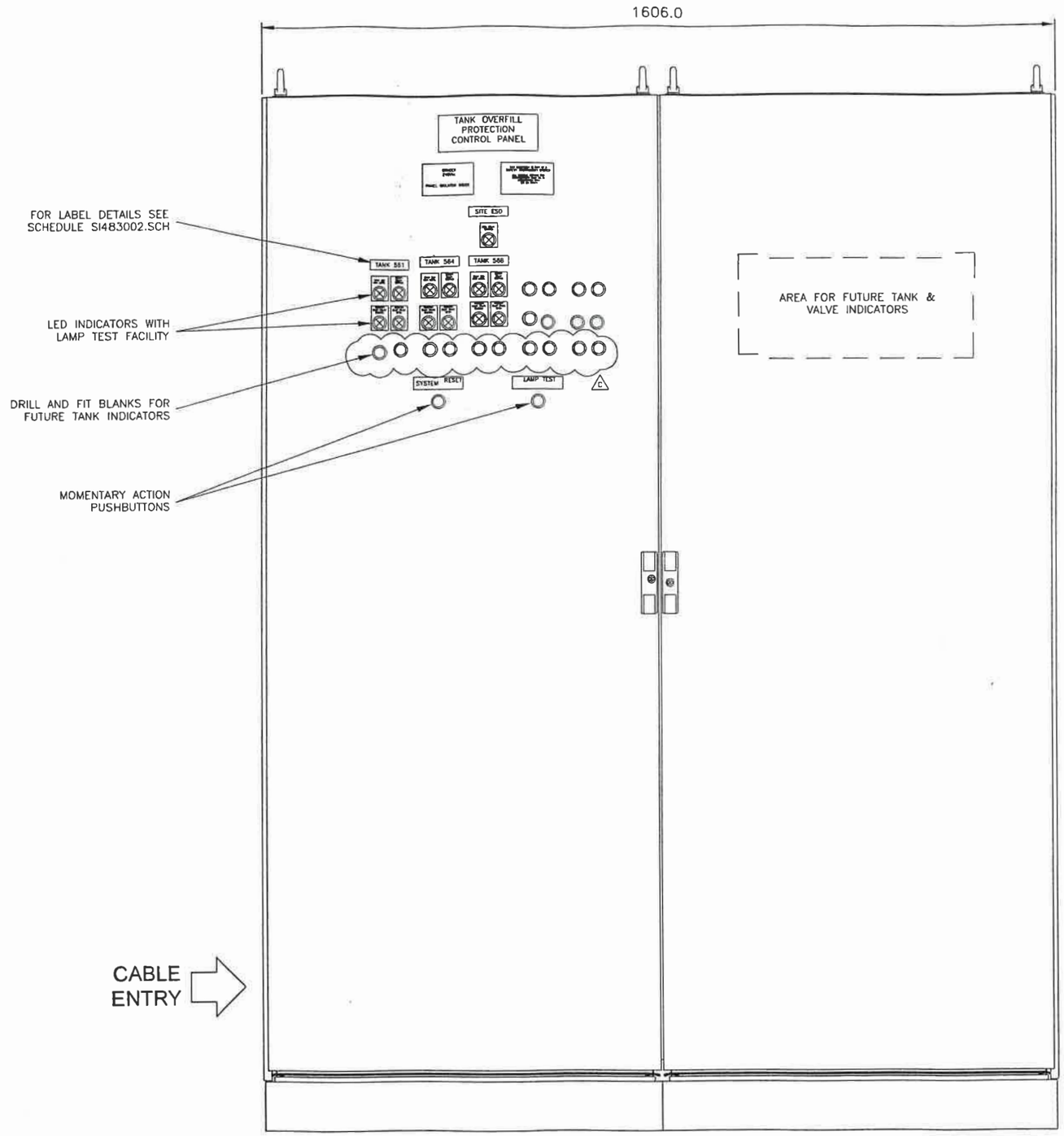
PLANT	IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE	SIS RESTRUCTURING CABLE OVERVIEW TANKS561, 564 & 568
	SHEET 1 OF 1
CLIENT DRG. No.	P&I DRG No. SI4B3001_DWG

SIMON IMMINGHAM STORAGE Co Ltd IMMINGHAM EAST TERMINAL IMMINGHAM DOCK, IMMINGHAM N.E. LINCOLNSHIRE. DN40 2QW

P&I DESIGN P & I Design Ltd Tel. 01642 617444 www.pidesign.co.uk



SIDE ELEVATION



FRONT ELEVATION

ENCLOSURE	~~RITTAL 158~~
	~~ENCLOSURE 8805.500~~
	~~SIDE PANEL 8105.235~~
	~~PLINTH FRONT 8601.800~~
	~~PLINTH SIDE 8601.050~~
PAINT FINISH	~~RAL 7035~~
PROTECTION	~~IP55~~
LABELS	~~W/B/W TRAFFOLITE~~
CABLE INCOMING	~~SIDE ENTRY~~
CABLE OUTGOING	~~SIDE EXIT~~
SUPPLY	~~230Vac 50Hz~~

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F	M.M	~~ISSUED FOR TENDER~~
B	29/01/14	P.P.	P.P.	D.B.F	M.M	~~ISSUED FOR CONSTRUCTION~~
C	25/03/14	D.B.F	P.P.	D.B.F	M.M	~~POST FAT ISSUE~~

PLANT: ~~IMMINGHAM STORAGE Co. - EAST TERMINAL~~

TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL EXTERNAL LAYOUT

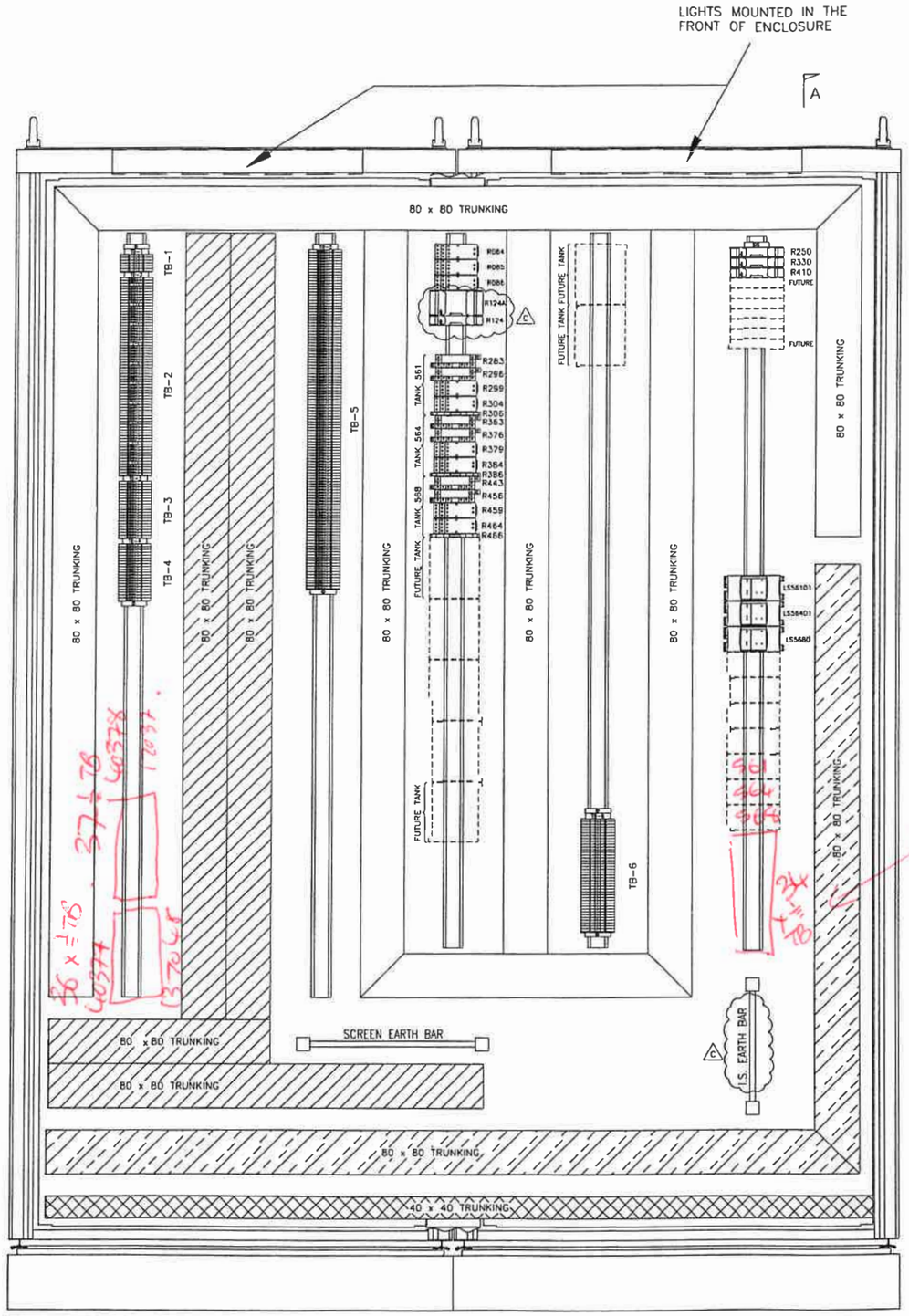
SIMON — ~~IMMINGHAM STORAGE CO LTD, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QR~~

P & I DESIGN — *P & I Design Ltd* Tel 01642 617444 www.pidesign.co.uk

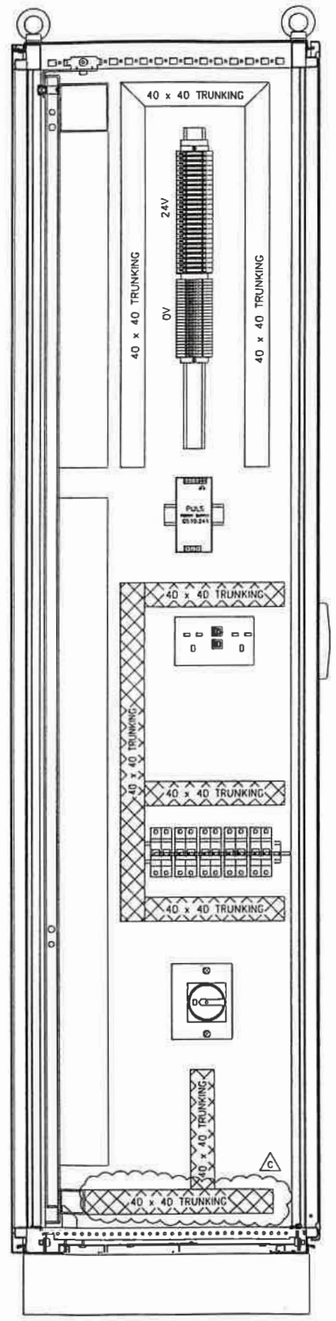
SHEET 1 OF 1

CLIENT DRG. No.

P&I DRG No. SI483005_DWG



VIEW ON BACK PLATE



VIEW ON ARROW A–A

RELAY No.	TYPE
R084	FINDER 4-POLE
R085	FINDER 4-POLE
R086	FINDER 4-POLE
R124	PILZ PNOZs2
R124A	PILZ PNOZs11
R250	PILZ PNOZs2
R330	PILZ PNOZs2
R410	PILZ PNOZs2
R283	OMRON 4-POLE
R296	OMRON 4-POLE
R299	FINDER 4-POLE
R304	FINDER 4-POLE
R306	LUTZ 1-POLE
R363	OMRON 4-POLE
R376	OMRON 4-POLE
R379	FINDER 4-POLE
R384	FINDER 4-POLE
R386	LUTZ 1-POLE
R443	OMRON 4-POLE
R456	OMRON 4-POLE
R459	FINDER 4-POLE
R464	FINDER 4-POLE
R466	LUTZ 1-POLE

NOTES

RELAYS

A) SAFETY RELAYS :-
PILZ TYPE PNOZ s2 (Order No. 750 102)

B) EXPANSION RELAYS :-
PILZ TYPE PNOZ s11 (Order No. 750 111)

C) 4-POLE GUIDED CONTACT RELAYS :-
BASE – OMRON TYPE P7SA-10F-ND
RELAY – OMRON G7SA-3A1B

D) STANDARD 4-POLE RELAYS :-
BASE – FINDER TYPE 94.04.0 (Black)
RELAY – FINDER 55.34.9.024.0094 C

E) SINGLE POLE RELAYS :-
LUTZ – TYPE RE 7-2312 DC 24V (Order No. 760022)

TERMINAL BLOCKS

BLOCK	QTY	DESCRIPTION
TB-24V	25	WSI 6 (Wiedmuller 1011000000)
TB-0V	25	WTR 2.5 (Wiedmuller 1011000000)
TB-1	6	WDU 2.5 (Wiedmuller 1020000000)
TB-2	60	WTR 2.5 (Wiedmuller 1011000000)
	10	WDU 2.5 (Wiedmuller 1020000000)
TB-3	21	WTR 2.5 (Wiedmuller 1011000000)
TB-4	20	WTR 2.5 (Wiedmuller 1011000000)
TB-5	120	WTR 2.5 (Wiedmuller 1011000000)
TB-6	40	WDU 2.5 (Wiedmuller 1020000000)

C

WIRING DETAILS

DESCRIPTION	
ELECTRICAL 440V / 240V AC:	
SIZE:	n/a
COLOUR:	n/a
INSTRUMENT 230Vac SUPPLIES:	
SIZE:	Suitably Rated with Minimum 0.5mm²
COLOUR:	Live (Brown) / Neutral (Blue) / Earth (Green/Yellow)
INSTRUMENT 110Vdc SUPPLIES:	
SIZE:	n/a
COLOUR:	n/a
24VDC SUPPLIES:	
SIZE:	Suitably Rated with Minimum 0.5mm²
COLOUR:	Positive (Red) / 0V (Black)
DIGITAL SWITCHED AC:	
SIZE:	n/a
COLOUR:	n/a
DIGITAL SWITCHED DC:	
SIZE:	0.5 mm²
COLOUR:	White
ANALOGUE:	
SIZE:	0.5mm²
COLOUR:	Grey
CRIMPS:	
TYPE:	Boot lace or Twin Grip Insulated
FERRULES:	
TYPE:	Heat Shrink Thermal Printed Sleeves

GREY TRUNKING – FIELD CABLES (24Vdc)
BLACK TRUNKING – 230Vac
GREY TRUNKING – PANEL WIRING (24Vdc)
BLUE TRUNKING – FIELD WIRING (I.S.)

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30 JUN 2014
COPY

a) RELAY & TERMINAL QUANTITY REDUCED AS EXPORT VALVE LOGIC REMOVED.
b) RELAY NUMBERS REVISED TO MATCH SPLIT SIS & BPCS LOGIC ON THE WIRING DRAWINGS.

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REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	05/12/13	P.P.	P.P.	D.B.F.	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.F.	M.M.	ISSUED FOR CONSTRUCTION
C	25/03/14	D.B.F.	P.P.	D.B.F.	M.M.	POST FAT ISSUE

PLANT: IMMINGHAM STORAGE Co – EAST TERMINAL
TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL INTERNAL LAYOUT(OPTION 1)
SIMON — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE, DN40 2QW
P & I DESIGN — P & I Design Ltd, Tel 01642 617444, www.pidesign.co.uk
SHEET 1 OF 1
CLIENT DRG No
P&I DRG No – SI483006-DWG

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

GENERAL: ACTIVATED VALVE; SOLENOID VALVE; DOUBLE WOUND TRANSFORMER; LAMP; BEACON; SOUNDER; VOLTMETER; HOURS RUN METER; AMMETER; FREQUENCY METER

ISOLATORS & TERMINALS: XX TERMINAL; FUSE LINK; NEUTRAL LINK REMOVABLE; TERMINAL WITH DISCONNECT LINK; PLUG AND SOCKET; ISOLATOR; FUSED SWITCH (NO-LOAD); FUSED SWITCH (ON-LOAD); FUSED SWITCH (ON LOAD (DOUBLE BREAK)

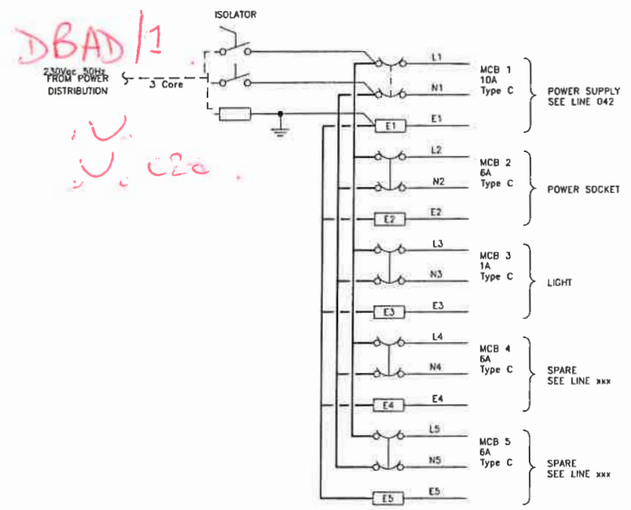
RELAYS & TIMERS: Rxx RELAY; Rxx T TIMED RELAY; NORMALLY OPEN; NORMALLY CLOSED; CHANGEOVER CONTACT; INSTANT OPEN DELAYED CLOSED; INSTANT CLOSE DELAYED OPEN; DELAYED OFF (N/C); DELAYED ON (N/O)

CONTACTORS & OVERLOADS: NORMALLY OPEN; NORMALLY CLOSED; MAGNETIC OVERLOAD RELAY; Cxx CONTACTOR; THERMAL OVERLOAD RELAY; MECHANICAL INTERLOCK

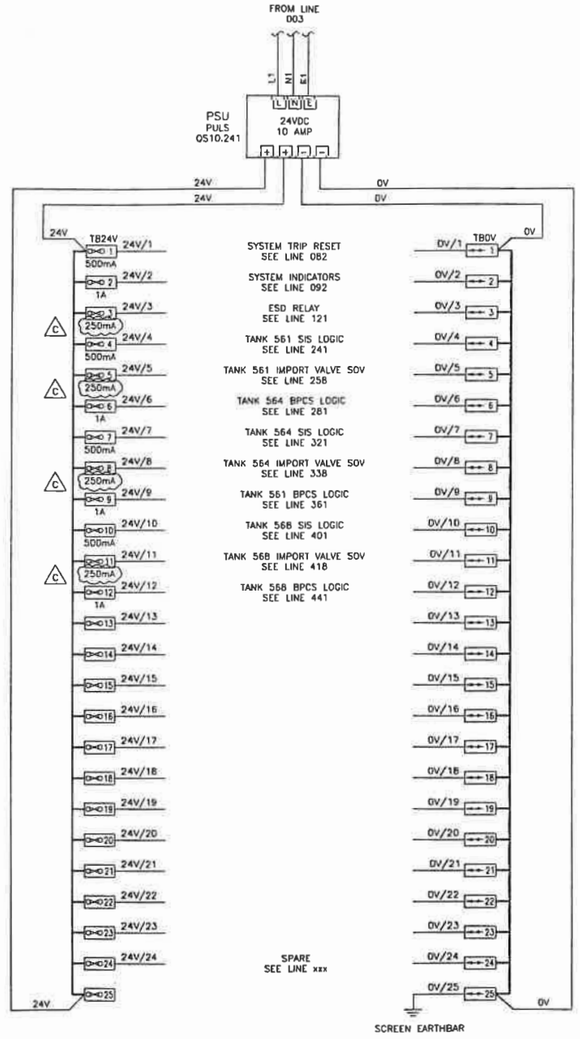
SWITCHES: KEY OPERATED; STOPLOCK PUSHBUTTON; PUSHBUTTON STOP; PUSHBUTTON START; NORMALLY OPEN; NORMALLY OPEN HELD CLOSED; NORMALLY CLOSED; NORMALLY CLOSED HELD OPEN; HS 1 2 3 SWITCH CONTACT MULTI POSITION TYPICAL 3 CIRCUIT; OPENS ON RISING PRESSURE; CLOSES ON RISING PRESSURE; OPENS ON RISING LEVEL; CLOSES ON RISING LEVEL; OPENS ON RISING TEMPERATURE; CLOSES ON RISING TEMPERATURE; OPENS ON INCREASING FLOW; CLOSES ON INCREASING FLOW

RELAY TERMINAL NUMBERING APPLICABLE ON THIS DRAWING

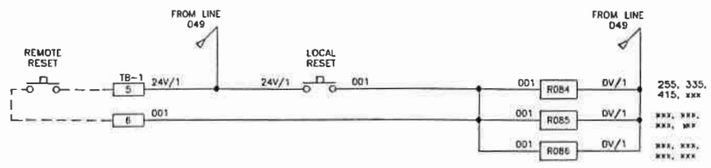
AC POWER DISTRIBUTION



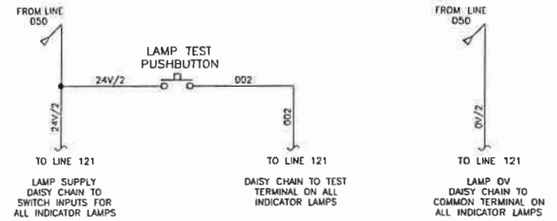
DC POWER DISTRIBUTION



SYSTEM TRIP RESET



LAMP TEST



LAST NUMBER USED : 002
SPARE TO : 020

NOTES
1) LED INDICATORS FITTED WITH INTERNAL DIODES

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REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P	P.P	D.B.T	M.M	ISSUED FOR TENDER
B	29/01/14	P.P	P.P	D.B.T	M.M	ISSUED FOR CONSTRUCTION
C	25/03/14	P.P	P.P	D.B.T	M.M	POST FAT ISSUE

PLANT: IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 1 : POWER DISTRIBUTION
simon — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2NW
P & I Design Ltd, Tel 01642 617444, www pidesign co uk
SHEET 1 OF 1
CLIENT DRG. No.
P&I DRG No. SI4B3007 DWG

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

GENERAL: ACTIVATED VALVE; SOLENOID VALVE; DOUBLE WOUND TRANSFORMER; LAMP; BEACON; SOUNDER; VOLTMETER; HOURS RUN METER; AMMETER; FREQUENCY METER

ISOLATORS & TERMINALS: TERMINAL; FUSE LINK; NEUTRAL LINK REMOVABLE; TERMINAL WITH DISCONNECT LINK; PLUG AND SOCKET; ISOLATOR; FUSED SWITCH (NO-LOAD); FUSED SWITCH (ON-LOAD); FUSED SWITCH (ON LOAD (DOUBLE BREAK)

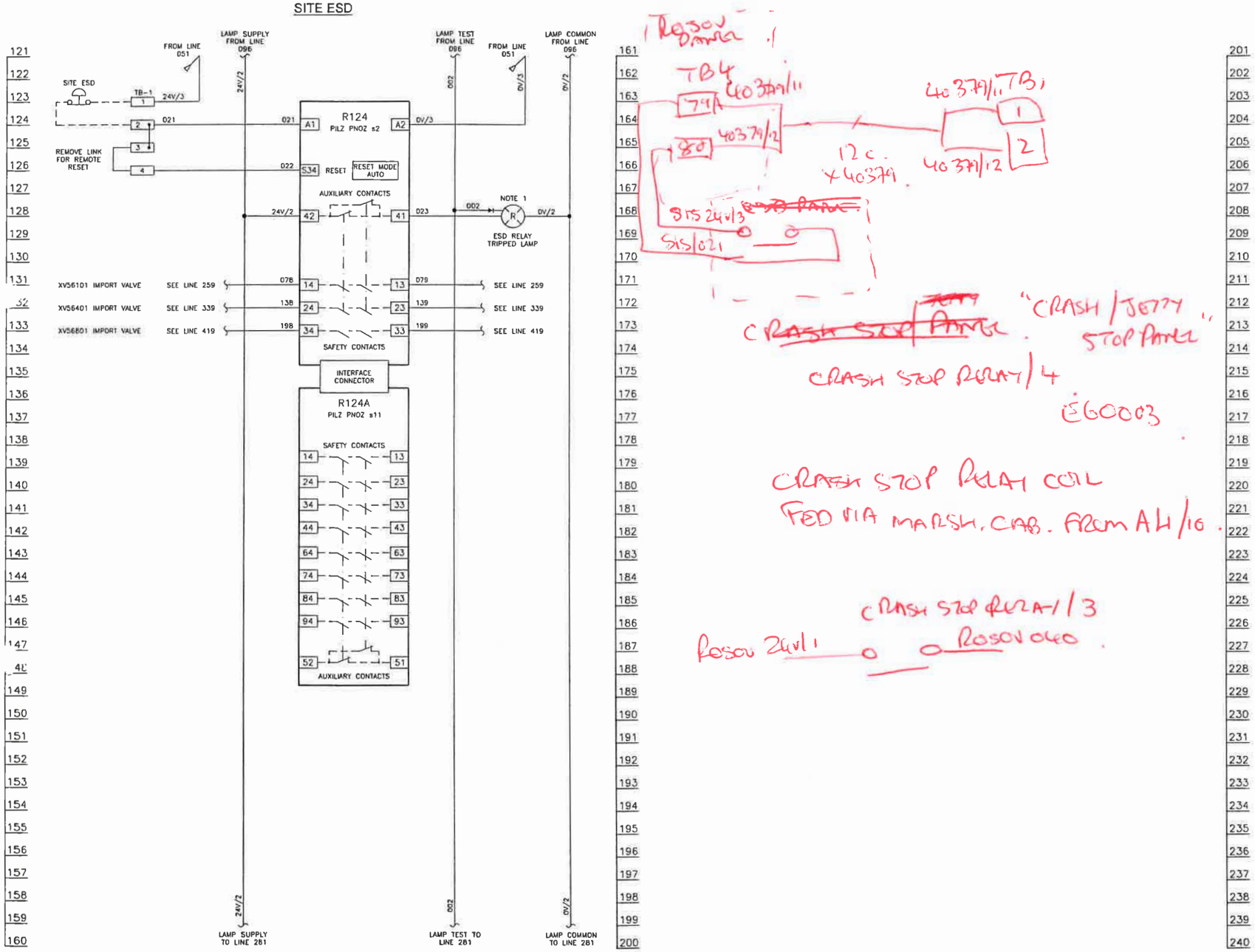
RELAYS & TIMERS: RELAY; TIMED RELAY; NORMALLY OPEN; NORMALLY CLOSED; CHANGEOVER CONTACT; INSTANT OPEN DELAYED CLOSED; INSTANT CLOSE DELAYED OPEN; DELAYED OFF (N/C); DELAYED ON (N/O)

CONTACTORS & OVERLOADS: NORMALLY OPEN; NORMALLY CLOSED; MAGNETIC OVERLOAD RELAY; CONTACTOR; THERMAL OVERLOAD RELAY; MECHANICAL INTERLOCK

SWITCHES: KEY OPERATED; STOPLOCK PUSHBUTTON; PUSHBUTTON STOP; PUSHBUTTON START; NORMALLY OPEN; NORMALLY OPEN HELD CLOSED; NORMALLY CLOSED; NORMALLY CLOSED HELD OPEN; HS 1 2 3 SWITCH CONTACT MULTI POSITION TYPICAL 3 CIRCUIT; OPENS ON RISING PRESSURE; CLOSES ON RISING PRESSURE; OPENS ON RISING LEVEL; CLOSES ON RISING LEVEL; OPENS ON RISING TEMPERATURE; CLOSES ON RISING TEMPERATURE; OPENS ON INCREASING FLOW; CLOSES ON INCREASING FLOW

RELAY TERMINAL NUMBERING APPLICABLE ON THIS DRAWING

SITE ESD



Rosov Panel
TB4
40379/11
79A
40379/2
180
12c
X40379
SIS 24V/3
SIS 021
40379/11 TB1
1
2
40379/12
CRASH STOP PANEL
"CRASH / JETTY STOP PANEL"
CRASH STOP RELAY 4
EG0003
CRASH STOP RELAY COIL
FED VIA MARSH. CAB. FROM AH/10.
CRASH STOP RELAY 3
Rosov 24V1
Rosov 040

LAST NUMBER USED : 023
SPARE TO : 030

LAST NUMBER USED : xxx
SPARE TO : 040

NO DRAWING CHANGES

LAST NUMBER USED : xxx
SPARE TO : 070

NOTES
1) LED INDICATORS FITTED WITH INTERNAL DIODES

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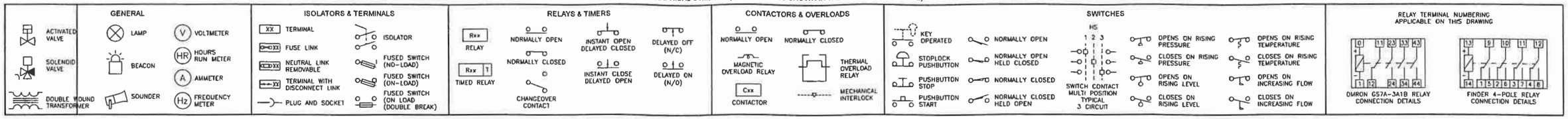
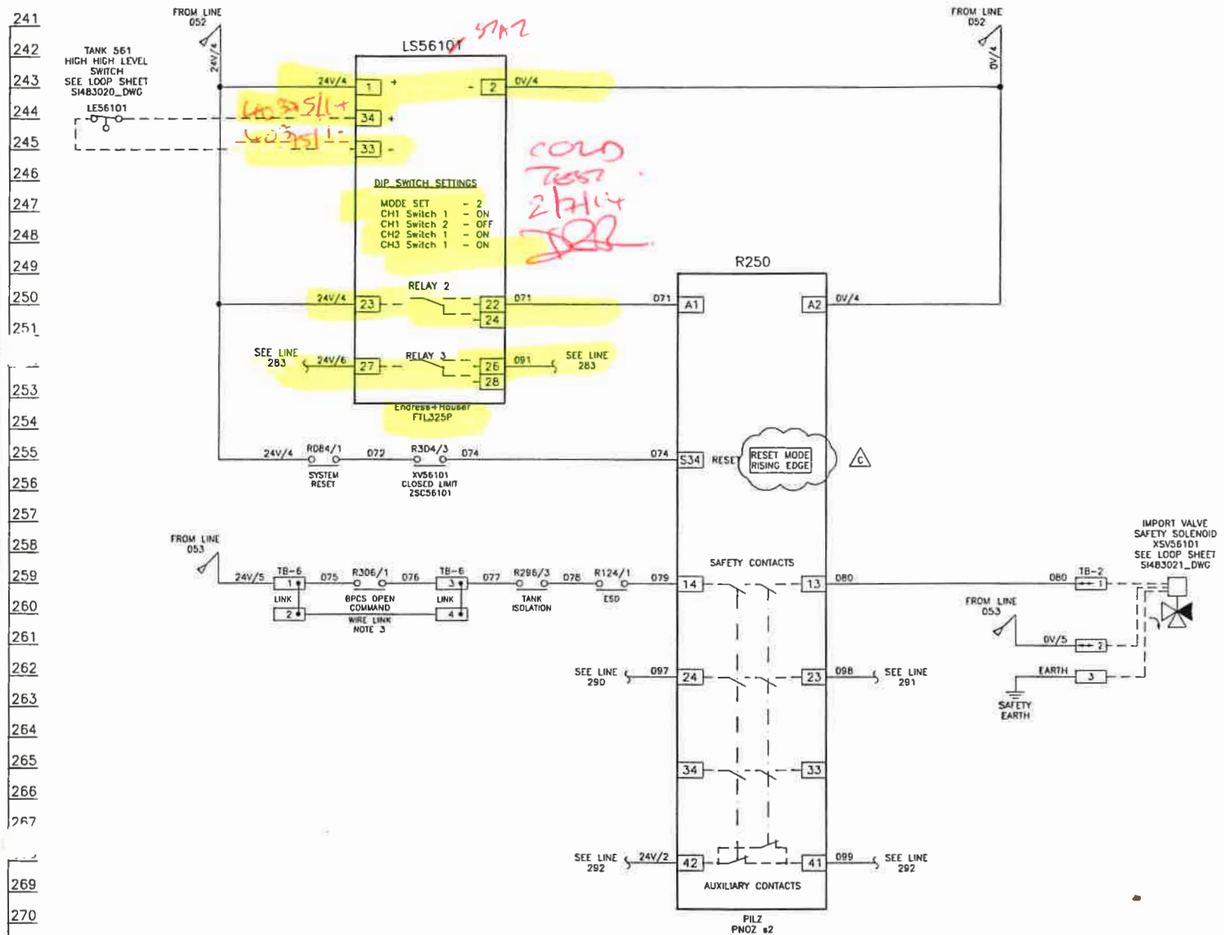
REV	DATE	BY	DRN	CHK'D		APP'D		DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F	D.B.F	M.M.	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.F	D.B.F	M.M.	M.M.	ISSUED FOR CONSTRUCTION
C	25/03/14	D.B.F	P.P.	D.B.F		M.M.		POST FAT ISSUE

PLANT: IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 2 : ESD
SIMON — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW
P & I Design Ltd — Tel 01642 617444 — www.pidesign.co.uk
SHEET 1 OF 1
CLIENT DRG. No.
P&I DRG No. S1483008_DWG

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

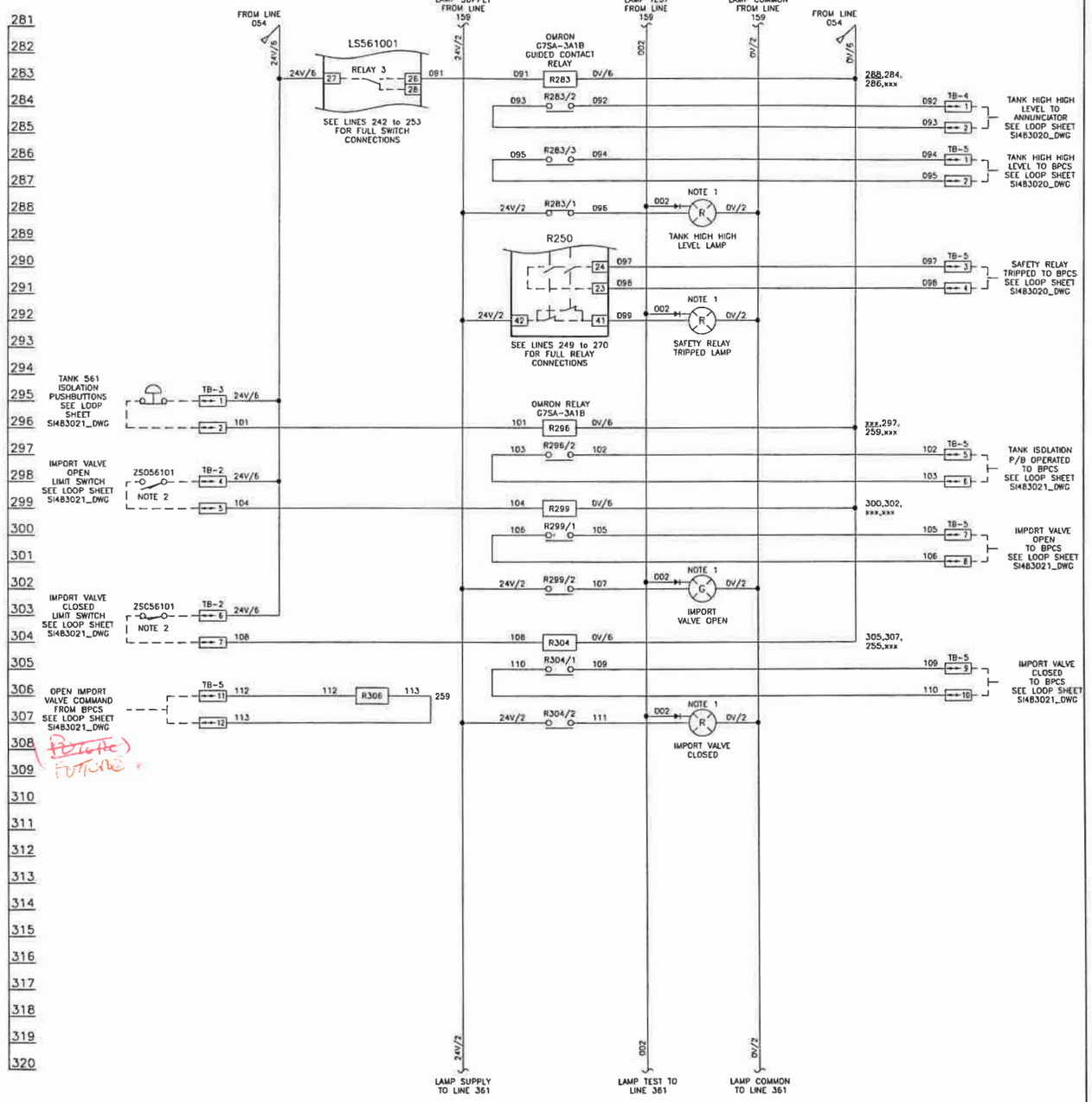


TANK 561 - SIS LOGIC



LAST NUMBER USED : 080
SPARE TO : 090

TANK 561 - BPCS LOGIC



LAST NUMBER USED : 113
SPARE TO : 130

NOTES

1) LED INDICATORS FITTED WITH INTERNAL DIODES.
2) VALVE LIMIT SWITCHES SHOWN WITH VALVE IN CLOSED POSITION.
3) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

CONTROLLED COPY 30 JUN 2014

a) DRAWING RE-ARRANGED TO SPLIT SIS & BPCS LOGIC.
b) EXPORT VALVE REMOVED

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR CONSTRUCTION
C	25/03/14	P.P.	P.P.	D.B.F	M.M.	POST FAT ISSUE

PLANT	IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE	No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 3 : TANK 561
CLIENT DRG. No.	P&I DRG No. SI483009_DWG
SHEET 1 OF 1	

SIMON — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW

P & I Design Ltd
Tel. 01642 617444
www.pidesign.co.uk

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

GENERAL
- ACTUATED VALVE
- SOLENOID VALVE
- DOUBLE WOUND TRANSFORMER
- LAMP
- BEACON
- SOUNDER
- VOLTMETER
- HOURS RUN METER
- AMMETER
- FREQUENCY METER

ISOLATORS & TERMINALS
- XX TERMINAL
- FUSE LINK
- NEUTRAL LINK REMOVABLE
- TERMINAL WITH DISCONNECT LINK
- PLUG AND SOCKET
- ISOLATOR
- FUSED SWITCH (NO-LOAD)
- FUSED SWITCH (ON-LOAD)
- FUSED SWITCH (ON LOAD (DOUBLE BREAK)

RELAYS & TIMERS
- Rxx RELAY
- Rxx T TIMED RELAY
- NORMALLY OPEN
- NORMALLY CLOSED
- CHANGEOVER CONTACT
- INSTANT OPEN DELAYED CLOSED
- INSTANT CLOSE DELAYED OPEN
- DELAYED OFF (N/C)
- DELAYED ON (N/O)

CONTACTORS & OVERLOADS
- NORMALLY OPEN
- NORMALLY CLOSED
- MAGNETIC OVERLOAD RELAY
- Cxx CONTACTOR
- THERMAL OVERLOAD RELAY
- MECHANICAL INTERLOCK

SWITCHES
- KEY OPERATED
- STOPLOCK PUSHBUTTON
- PUSHBUTTON STOP
- PUSHBUTTON START
- NORMALLY OPEN
- NORMALLY OPEN HELD CLOSED
- NORMALLY CLOSED
- NORMALLY CLOSED HELD OPEN
- HS 1 2 3 SWITCH CONTACT MULTI POSITION TYPICAL 3 CIRCUIT
- OPENS ON RISING PRESSURE
- CLOSES ON RISING PRESSURE
- OPENS ON RISING LEVEL
- CLOSES ON RISING LEVEL
- OPENS ON RISING TEMPERATURE
- CLOSES ON RISING TEMPERATURE
- OPENS ON INCREASING FLOW
- CLOSES ON INCREASING FLOW

RELAY TERMINAL NUMBERING APPLICABLE ON THIS DRAWING

OMRON G5A-3A1B RELAY CONNECTION DETAILS

FINDER 4-POLE RELAY CONNECTION DETAILS

TANK 564 - SIS LOGIC

TANK 564 HIGH HIGH LEVEL SWITCH SEE LOOP SHEET SI483022_DWG

LS56401

DIP SWITCH SETTINGS
MODE SET - 2
CH1 Switch 1 - ON
CH1 Switch 2 - OFF
CH2 Switch 1 - ON
CH3 Switch 1 - ON

Endress+Houser FTL325P

RELAY 2

RELAY 3

R330

SYSTEM RESET

XV56401 CLOSED LIMIT ZSC56401

RESET MODE RISING EDGE

SAFETY CONTACTS

R386/1 BPCS OPEN/COMMAND WIRE LINK NOTE 3

R376/3 TANK ISOLATION

R124/2 ESD

IMPORT VALVE SAFETY SOLENOID XSV56401 SEE LOOP SHEET SI483023_DWG

EARTH

SAFETY EARTH

AUXILIARY CONTACTS

PILZ PNOZ x2

LAST NUMBER USED : 140
SPARE TO : 150

TANK 564 - BPCS LOGIC

LS564001

SEE LINES 322 to 333 FOR FULL SWITCH CONNECTIONS

OMRON G7SA-3A1B GUIDED CONTACT RELAY

R363 R363/1 R363/2 R363/3

TANK HIGH HIGH LEVEL LAMP

SEE LINES 329 to 350 FOR FULL RELAY CONNECTIONS

SAFETY RELAY TRIPPED LAMP

TANK 564 ISOLATION PUSHBUTTONS SEE LOOP SHEET SI483023_DWG

OMRON RELAY G7SA-3A1B R376 R376/2

IMPORT VALVE OPEN LIMIT SWITCH SEE LOOP SHEET SI483023_DWG

ZSO56401 NOTE 2

R379 R379/1 R379/2

IMPORT VALVE OPEN

IMPORT VALVE CLOSED LIMIT SWITCH SEE LOOP SHEET SI483023_DWG

ZSC56401 NOTE 2

R384 R384/1 R384/2

IMPORT VALVE CLOSED

OPEN IMPORT VALVE COMMAND FROM BPCS SEE LOOP SHEET SI483023_DWG

R386

LAMP SUPPLY TO LINE 441

LAMP TEST TO LINE 441

LAMP COMMON TO LINE 441

LAST NUMBER USED : 173
SPARE TO : 190

NOTES
1) LED INDICATORS FITTED WITH INTERNAL DIODES.
2) VALVE LIMIT SWITCHES SHOWN WITH VALVE IN CLOSED POSITION.
3) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

CONTROLLED COPY 30 JUN 2014

a) DRAWING RE-ARRANGED TO SPLIT SIS & BPCS LOGIC.
b) EXPORT VALVE REMOVED

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	17/12/13	P.P.	P.P.	D.B.F	D.B.F	M.M.	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.F	D.B.F	M.M.	M.M.	ISSUED FOR CONSTRUCTION
C	25/03/14	P.P.	P.P.	D.B.F	D.B.F	M.M.	M.M.	POST FAT ISSUE

PLANT	IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE	No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 4 : TANK 564

SIMON — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE, DN40 2QW

P & I Design Ltd
Tel. 01642 617444
www.pidesign.co.uk

SHEET 1 OF 1

CLIENT DRG. No.

P&I DRG No. SI483010_DWG

INSTRUMENT SCHEDULE

Instrument Tag. No.	Service	Instrument Spec. _SPC	Manufacturer	Model Number	Serial Number	Atex Certification	Atex Certificate No	Site Specific SIS Tag (ATEX Tag)	P & I Drawing Client (REV)	Loop Drawing _DWG	I/O Requirement SIS Logic Solver DI	DO	AI	AO	Address	Comms	Notes D = Digital, A = Analogue, I = In, O = Out S = Software, H = Hardwired,
TANK 561	Gasoline Storage Tank								SI483001_DWG (1)								(1) Tanks 561, 564 & 568 Cable Overview
Sensing Element	Independent High High Level Probe																
LE561	Liquiphant Probe	SI277001	Endress & Hauser	FTL51-GAC2BB7G4A	A40BE201027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1765 (E10001)		SI483020	1						A4 0BDA01027
LS561	Nivotester	SI277001	Endress & Hauser	FTL 325P H3 E3	A4029A01093	Ex II(1)GD [EEx ia/ib] IIC/IIB	DMT01ATEXE052	N/A		SI483020		2					
R250	Safety Relay		PILZ	PNOZ s2	750102 138641	N/A	N/A	N/A		SI483020		1					
Final Element	Pipeline Import Block Valve																
XV56101	Valve Body			150 TM9N DN250	197181	N/A	N/A	V8545	E10098	SI483021							
XV56101	Valve Actuator				P03400010256	N/A	N/A	E10093 RV28		SI483021							P-03-4000-10256
ZS56101	Limit Switch Box		Westlock		N/A			E10094 (E0519)		SI483021	2	2					
SOV56101	Solenoid Body		Seitz	CP 0632 CPU				E10095		SI483021							
SOV56101	Solenoid Coil		Seitz		121.104.024C			E 10096 (E0518)		SI483021	1	1					
JB XV5601	Local Junction Box				01152-10			E10097 (E0517)		SI483021							
Manual Shutdown	Bund Isolation																
HS561	Bund Isolation Station									SI483021	1	1					Located in JB4/87
Local	Local Selector Switch					N/A	N/A	N/A		SI483021							"OPEN" "CLOSED"
TANK 564	Gasoline Storage Tank								SI483001_DWG (1)								(1) Tanks 561, 564 & 568 Cable Overview
Sensing Element	Independent High High Level Probe																
LE564	Liquiphant Probe	SI277001	Endress & Hauser	FTL51-GAC2BB7G4A	A40BD901 027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1771 (E10016)		SI483022	1						
LS564	Nivotester	SI277001	Endress & Hauser	FTL 325P H3 E3	A4029801 093	Ex II(1)GD [EEx ia/ib] IIC/IIB	DMT01ATEXE052	N/A		SI483022		2					
R330	Safety Relay		PILZ	PNOZ s2	750102 131135	N/A	N/A	N/A		SI483022		1					
Final Element	Pipeline Import Block Valve																
XV56401	Valve Body			150 TM9XN DN200	LF2 204248	N/A	N/A	E10099		SI483023							V 7774
XV56401	Valve Actuator		Actreg		N/A	N/A	N/A	E10033		SI483023							RV 54
ZS56401	Limit Switch Box		Westlock	2245	N/A			E10034 (E0516)		SI483023	2	2					
SOV56401	Solenoid Body		Seitz	CP 0632 CPU				E10035		SI483023							
SOV56401	Solenoid Coil		Seitz		121.104.024C			E10036 (E0515)		SI483023	1	1					FNº 110624
JB4/145	Local Junction Box				08/11510			E10037 (E1841)		SI483023							
Manual Shutdown	Bund Isolation																
HS564	Bund Isolation Station	AS HS561								SI483023	1	1					Located in JB4/88
Local	Local Selector Switch					N/A	N/A	N/A		SI483023							"XV56101 MANUAL OPERATION"
TANK 568	Gasoline Storage Tank								SI483001_DWG (1)								(1) Tanks 561, 564 & 568 Cable Overview
Sensing Element	Independent High High Level Probe																
LE568	Liquiphant Probe	SI277001	Endress & Hauser	FTL51-GAC2BB7G4A	A40BDF01027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1772 (E10010)		SI483024	1						
LS568	Nivotester	SI277001	Endress & Hauser	FTL 325P H3 E3	~~A4029101093~~ A4029501093	Ex II(1)GD [EEx ia/ib] IIC/IIB	DMT01ATEXE052	N/A		SI483024		2					A4029501093
R410	Safety Relay		PILZ	PNOZ s2	750102 138629	N/A	N/A	N/A		SI483024		1					
Final Element	Pipeline Import Block Valve																
XV56801	Valve Body			~~LF2-204248~~		N/A	N/A	E10106		SI483025							V 8544
XV56801	Valve Actuator		Actreg		N/A	N/A	N/A	E10038		SI483025							RV 38
ZS56801	Limit Switch Box		Westlock	2245	N/A			E10039 (E3240)		SI483025	2	2					WHITE OPEN RED CLOSED
SOV56801	Solenoid Body				~~CP 0632 CPU~~			E10042		SI483025							
SOV56801	Solenoid Coil				121.104.024C			E10043 (E3250)		SI483025	1	1					FNº 110727
JB4/149	Local Junction Box				08/11521			E10044 (E1838)		SI483025							
Manual Shutdown	Bund Isolation																
HS568	Bund Isolation Station									SI483025	1	1					Located in JB4/88
Local	Local Selector Switch					N/A	N/A	N/A		SI483025							"XV56801 MANUAL OPERATION"
Infrastructure	500 Series Field Equipment																
JB4/87	Bund Isolation Panel			XLH													SIS LABEL REMOVED
JB4/88	Bund Isolation Panel																
JB4/197	Bund TBC SIS IHLA JB																NO SIS TAG
JB4/198	Bund TBC SIS IHLA JB																
JB4/199	Bund TBC SIS Valves JB																
JB4/200	Bund TBC SIS Valves JB																NO SIS TAG
Spares																	
TOTALS											15	21					

NOTES	REVISION	DATE	BY	CHECKED		APPROVED		DESCRIPTION	PLANT	ISCo East Terminal
	A	04.02.14	DBF	MM		MM		Original Issue for Review	TITLE	500 Series SIS Instrument Schedule
									SHEET 1 OF 1	REF NO. SI483010_SCH

P & I DESIGN

simon bulk liquid storage network

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JB4/199 . 45 TERMINALS

LEGEND OF GRAPHICAL SYMBOLS (ALL CONTACTS SHOWN IN THE DE-ENERGISED STATE)

GENERAL: ACTIVATED VALVE; SOLENOID VALVE; DOUBLE WOUND TRANSFORMER; LAMP; BEACON; SOUNDER; VOLTMETER (V); HOURS RUN METER (HR); AMMETER (A); FREQUENCY METER (Hz)

ISOLATORS & TERMINALS: XX TERMINAL; FUSE LINK; NEUTRAL LINK REMOVABLE; TERMINAL WITH DISCONNECT LINK; PLUG AND SOCKET; ISOLATOR; FUSED SWITCH (NO-LOAD); FUSED SWITCH (ON-LOAD); FUSED SWITCH (ON LOAD (DOUBLE BREAK)

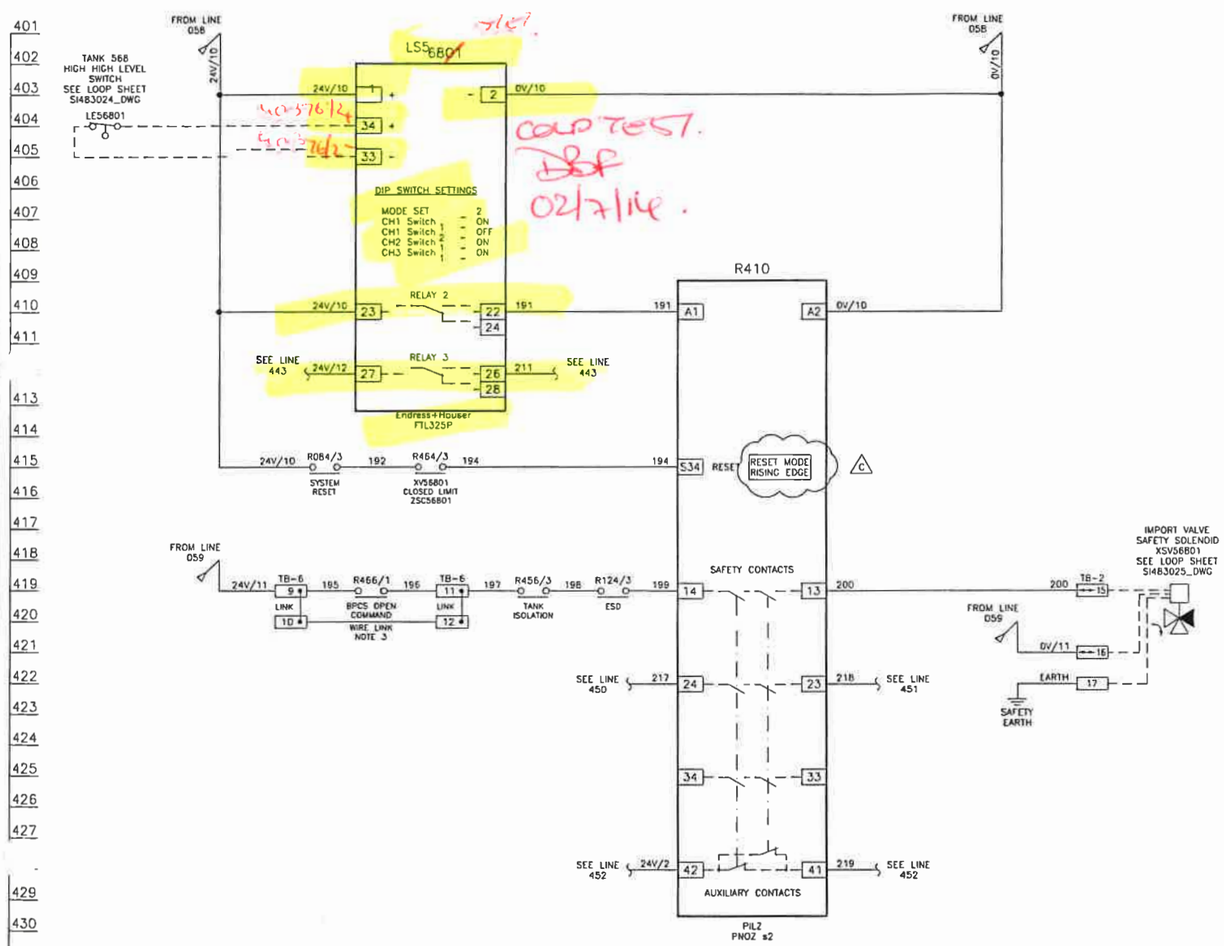
RELAYS & TIMERS: Rxx RELAY; Rxx T TIMED RELAY; NORMALLY OPEN; NORMALLY CLOSED; CHANGEOVER CONTACT; INSTANT OPEN DELAYED CLOSED; INSTANT CLOSE DELAYED OPEN; DELAYED OFF (N/C); DELAYED ON (N/O)

CONTACTORS & OVERLOADS: NORMALLY OPEN; NORMALLY CLOSED; MAGNETIC OVERLOAD RELAY; Cxx CONTACTOR; THERMAL OVERLOAD RELAY; MECHANICAL INTERLOCK

SWITCHES: KEY OPERATED; STOPLOCK PUSHBUTTON; PUSHBUTTON STOP; PUSHBUTTON START; NORMALLY OPEN; NORMALLY OPEN HELD CLOSED; NORMALLY CLOSED; NORMALLY CLOSED HELD OPEN; HS 1 2 3 SWITCH CONTACT MULTI POSITION TYPICAL 3 CIRCUIT; OPENS ON RISING PRESSURE; CLOSES ON RISING PRESSURE; OPENS ON RISING LEVEL; CLOSES ON RISING LEVEL; OPENS ON RISING TEMPERATURE; CLOSES ON RISING TEMPERATURE; OPENS ON INCREASING FLOW; CLOSES ON INCREASING FLOW

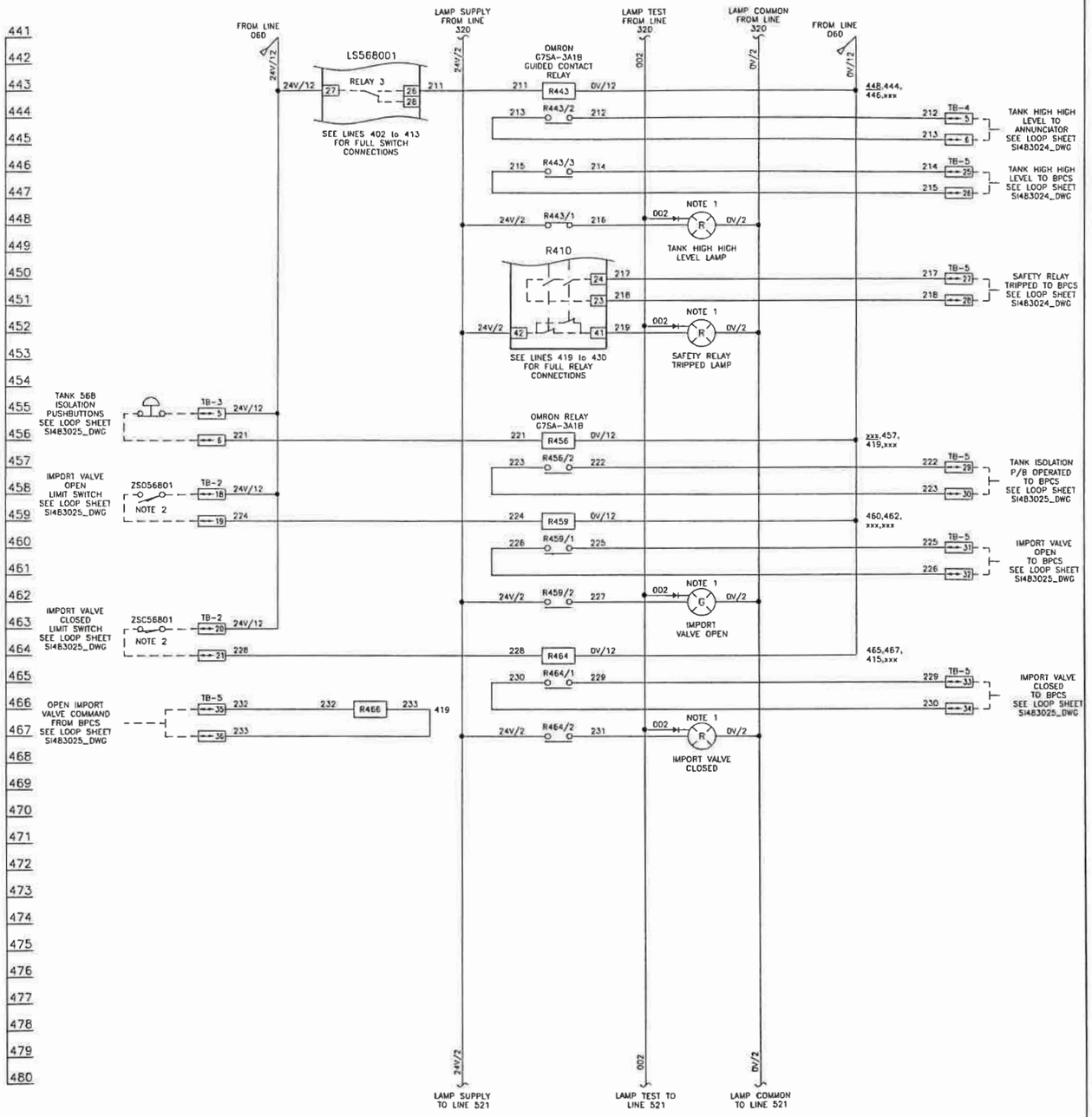
RELAY TERMINAL NUMBERING APPLICABLE ON THIS DRAWING: OMRON G5TA-3A1B RELAY CONNECTION DETAILS; FINDER 4-POLE RELAY CONNECTION DETAILS

TANK 568 - SIS LOGIC



LAST NUMBER USED : 200
SPARE TO : 210

TANK 568 - BPCS LOGIC



LAST NUMBER USED : 233
SPARE TO : 250

NOTES
1) LED INDICATORS FITTED WITH INTERNAL DIODES.
2) VALVE LIMIT SWITCHES SHOWN WITH VALVE IN CLOSED POSITION.
3) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

CONTROLLED COPY 30 JUN 2014

a) DRAWING RE-ARRANGED TO SPLIT SIS & BPCS LOGIC.
b) EXPORT VALVE REMOVED

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	16/12/13	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR TENDER
B	03/02/14	P.P.	P.P.	D.B.F	M.M.	ISSUED FOR CONSTRUCTION
C	25/03/14	P.P.	P.P.	D.B.F	M.M.	POST FAT ISSUE

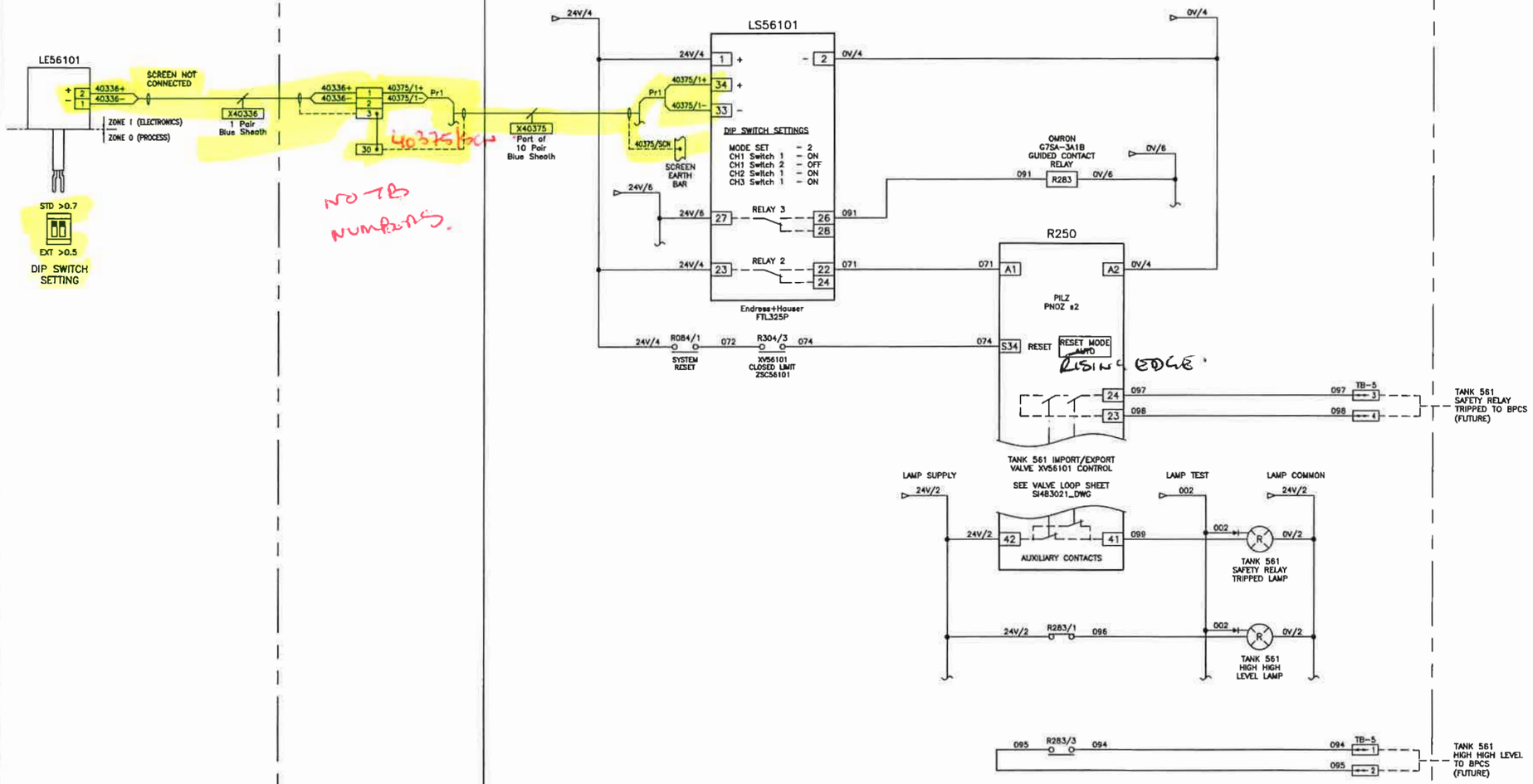
PLANT: IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE: No.4 SWITCHROOM TANK OVERFILL SIS PANEL LOGIC DRAWING 5 : TANK 568
SIMON — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE, DN40 2QW
P & I Design Ltd, Tel. 01642 617444, www.pidesign.co.uk
SHEET 1 OF 1
CLIENT DRG. No.
P&I DRG No. SI4B3011_DWG

ZONE 1 II B T4 (UNLESS SPECIFIED OTHERWISE)	SAFE AREA	
FIELD	No.4 SWITCHROOM	
TANK 561 Bund C	JB4/197 TANK LEVEL SIS JUNCTION BOX	TANK OVERFILL SIS MONITORING PANEL

TOP TANK 563

NO TB NUMBERS.

REFER TO LOGIC DRAWING SI483009_DWG FOR FULL FUNCTIONALITY



ANNUNCIATOR SYSTEM PANEL	OPS OFFICE

REFER TO ANNUNCIATOR & RADIO MESSAGING SYSTEM MANUAL FOR FULL DETAILS - SI468001_MNL

WORKING COPY

CERTIFIED EQUIPMENT			
TAG No.	CERTIFICATE No.	ATEX CERTIFICATION	I.S. CALCULATION
LE56101	KEMA 99 ATEX 0523	Ex II 1/2 G EEx ia IIC T6	SI277009_CAL
LS56101	DMT 01 ATEX E 052	Ex II (1) GD [EEx ia] IIC	
JB4/197			

CONTROLLED 30 JUN 2014 COPY

BASED ON MASTER DRAWING SI277055_DWG

MODS TO BE TRANSFERED TO MASTER DRAWING ON COMPLETION OF THIS PROJECT

PROJECT DRAWING

simon bulk liquid & gas network

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	13/02/14	P.P.	P.P.	D.B.F.	M.M.	ISSUED FOR CONSTRUCTION

PLANT	IMMINGHAM STORAGE Co. - EAST TERMINAL
TITLE	TANK OVERFILL PROTECTION SAFETY INSTRUMENT SYSTEM LE56101 - TANK 561 HIGH HIGH LEVEL LOOP SHEET
	IMMINGHAM STORAGE Co. LTD, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW
	P & I Design Ltd Tel. 01642 617444 www.pidesign.co.uk
INSTRUMENT LOOP SHEET FOR USE IN HAZARDOUS AREA	SHEET 1 OF 1
CLIENT DRG. No.	P&I DRG No. SI483020_DWG

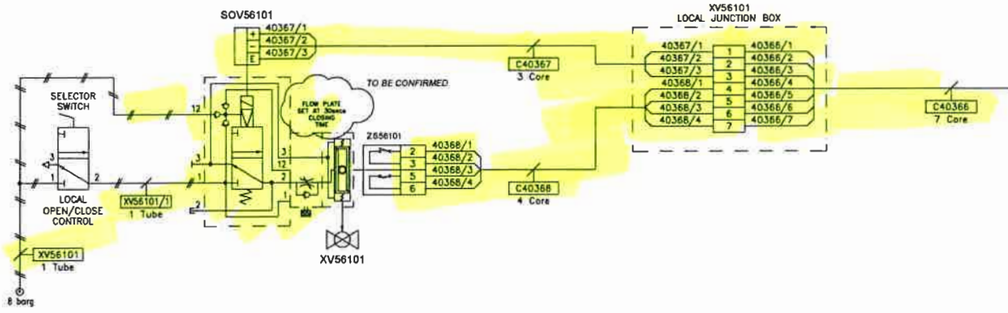
ZONE 1 II B T4 (UNLESS SPECIFIED OTHERWISE)

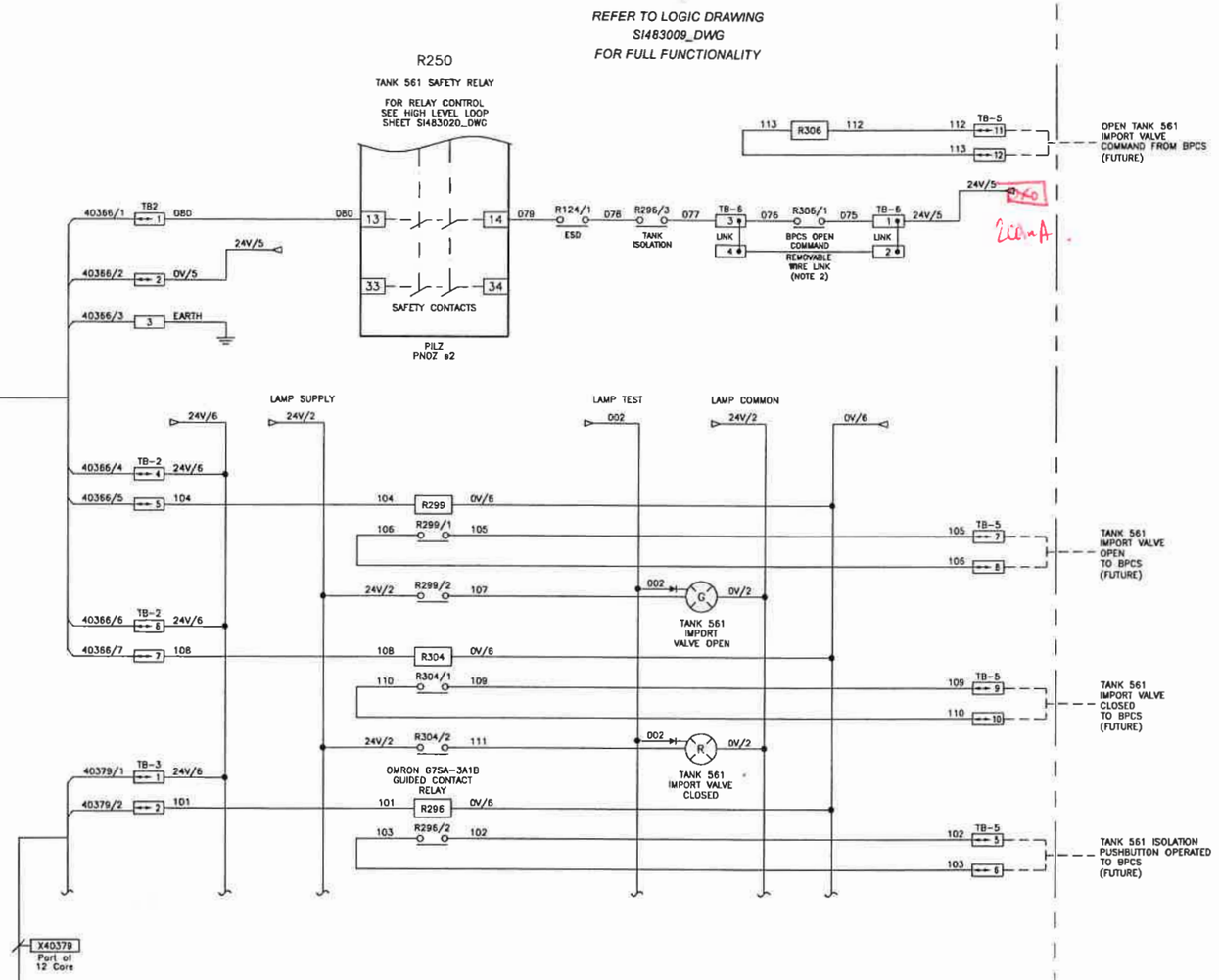
FIELD BUND 0

SAFE AREA

No.4 SWITCHROOM : TANK OVERFILL SIS PANEL

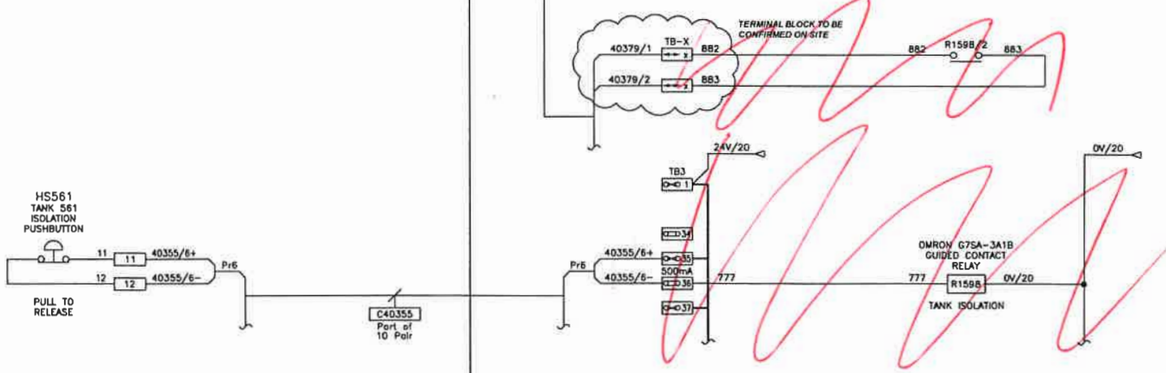
BPCS (FUTURE)





JB4/87 : TANK ISOLATION JUNCTION BOX

No.4 SWITCHROOM : TANK OVERFILL ROSOV PANEL



TB4
40379/1+ 69 — 40355/6+
40379/2- 70 — 40355/6-

PROJECT DRAWING

BASED ON MASTER DRAWING SI277129_DWG

MODS TO BE TRANSFERED TO MASTER DRAWING ON COMPLETION OF THIS PROJECT

CERTIFIED EQUIPMENT

TAG No.	CERTIFICATE No.	ATEX CERTIFICATION	I.S. CALCULATION
SOV56101	PTB 02 ATEX 2125X	Ex II 2 G EEx em II T6	N/A
Z556101	EPSILON 08 ATEX 2370X	Ex II 2 G EEx d IIB+H_2 T6	N/A
JB4/87	PTB 02 ATEX 1014	Ex II 2 GD EEx e ia II T6	N/A
LOCAL J/B	SIRA 06 ATEX 3185	Ex II 2 GD EEx e II T6	N/A

NOTES

1) LED INDICATORS FITTED WITH INTERNAL DIODES.

2) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

CONTROLLED
30 JUN 2014
COPY

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	13/02/14	P.P.	P.P.	D.B.F.	M.M.	ISSUED FOR CONSTRUCTION

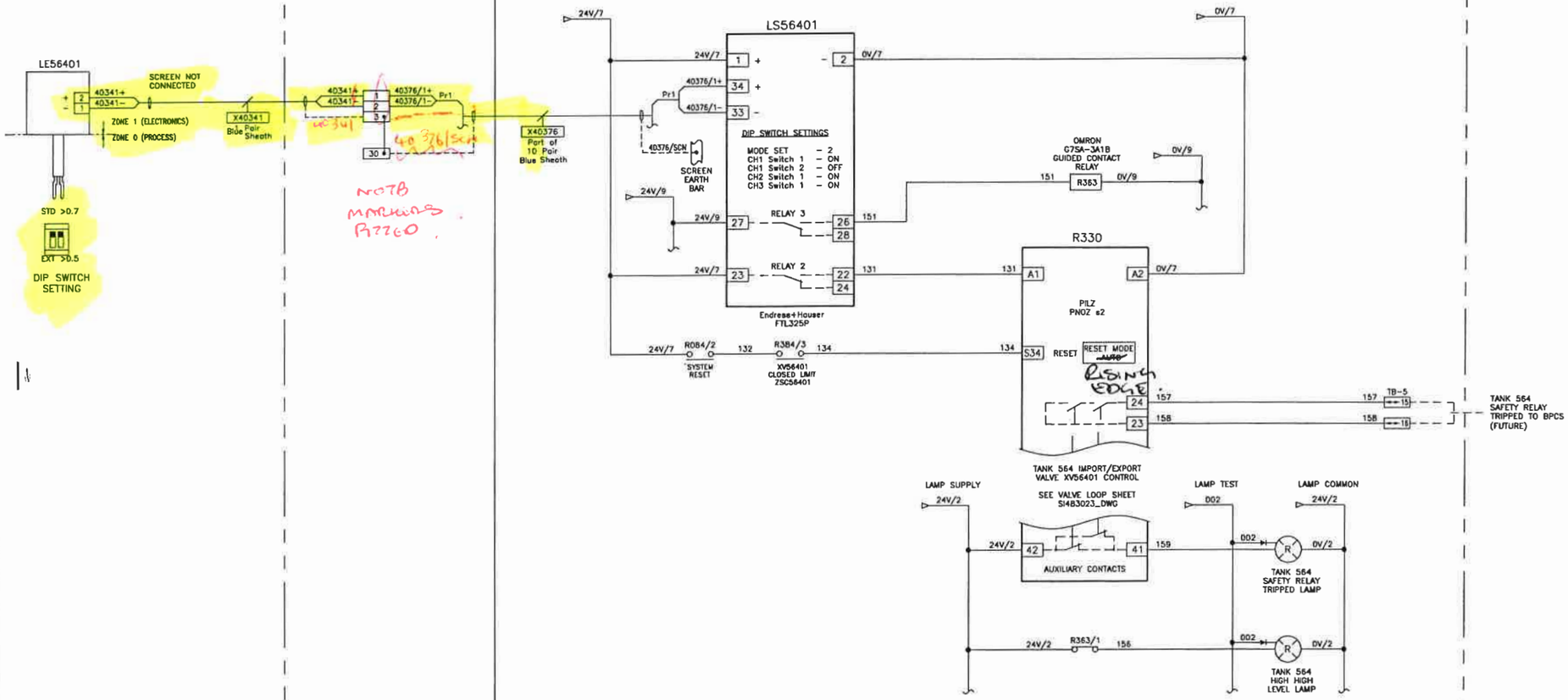
PLANT	IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE	TANK OVERFILL PROTECTION SAFETY INSTRUMENT SYSTEM XV56101 – TANK 561 IMPORT/EXPORT VALVE LOOP SHEET
	IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 3DW
	P & I Design Ltd Tel. 01642 617444 www.pidesign.co.uk
INSTRUMENT LOOP SHEET FOR USE IN HAZARDOUS AREA	SHEET 1 OF 1
CLIENT DRG. No.	P&I DRG No. SI483021_DWG

ZONE 1 II B T4 (UNLESS SPECIFIED OTHERWISE) | SAFE AREA

FIELD | No.4 SWITCHROOM

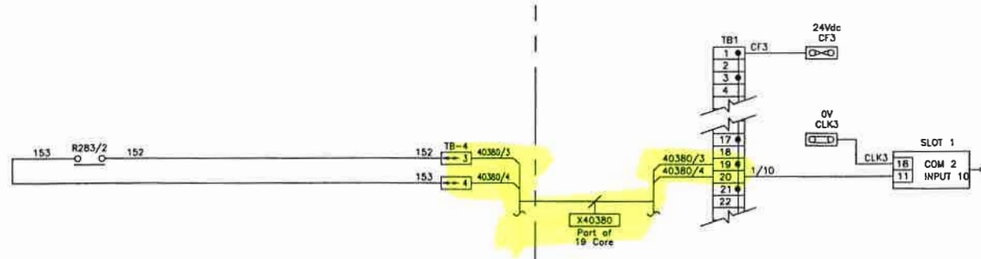
TANK 564 | JB4/198 TANK LEVEL SIS JUNCTION BOX | TANK OVERFILL SIS MONITORING PANEL | BPCS (FUTURE)

REFER TO LOGIC DRAWING SI483010_DWG FOR FULL FUNCTIONALITY



WORKING COPY

ANNUNCIATOR SYSTEM PANEL | OPS OFFICE



REFER TO ANNUNCIATOR & RADIO MESSAGING SYSTEM MANUAL FOR FULL DETAILS - SI468001_MNL

CERTIFIED EQUIPMENT

TAG No.	CERTIFICATE No.	ATEX CERTIFICATION	I.S. CALCULATION
LE56401	KEMA 99 ATEX 0523	Ex II 1/2 G EEx ia IIC T6	SI277009_CAL
LS56401	DMT 01 ATEX E 052	Ex II(1) GD[EEx ia] IIC	
JB4/198			

CONTROLLED COPY 30 JUN 2014

BASED ON MASTER DRAWING SI277058_DWG

MODS TO BE TRANSFERED TO MASTER DRAWING ON COMPLETION OF THIS PROJECT

PROJECT DRAWING

simon bulk liquid & gas network

IF NOT SIGNED THIS DOCUMENT ISUNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	13/02/14	P.P.	P.P.	D.B.F.	I.M.	ISSUED FOR CONSTRUCTION

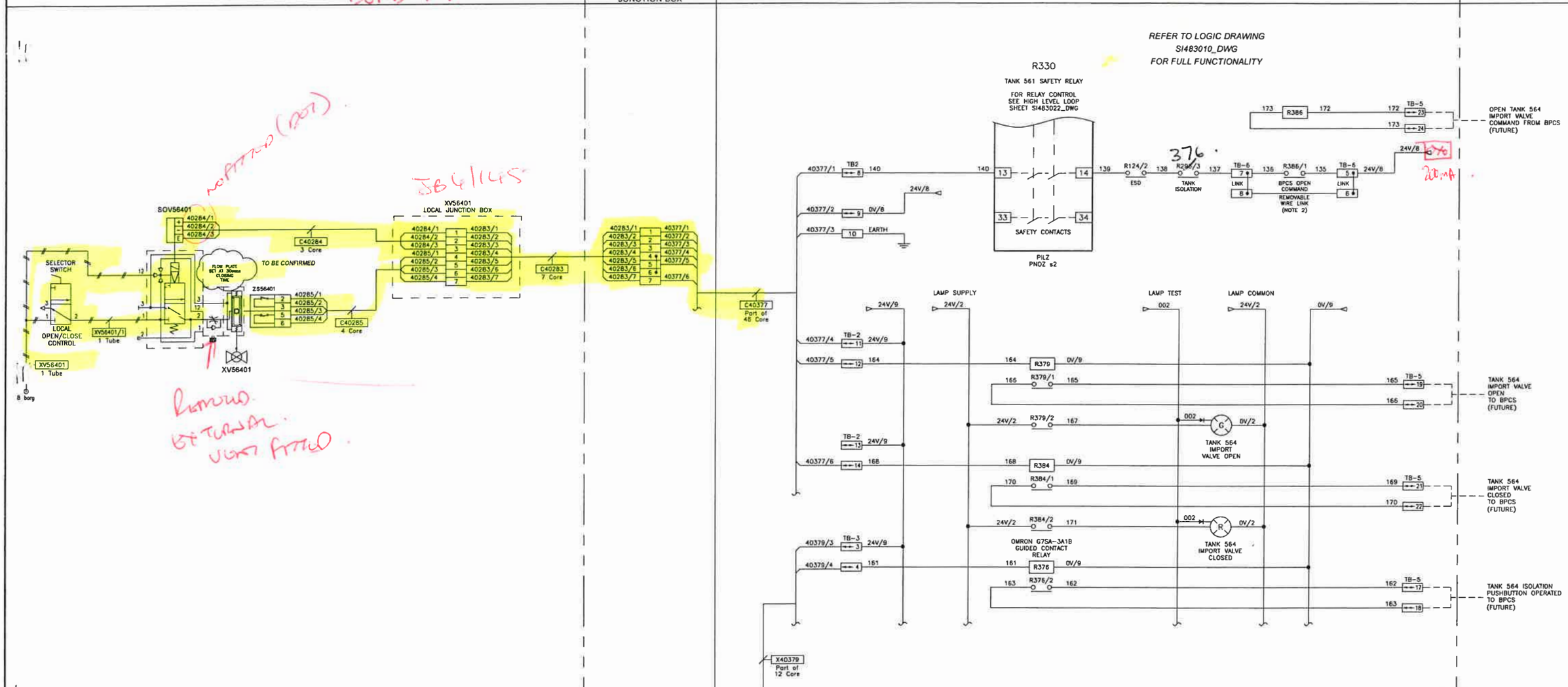
PLANT	IMMINGHAMSTORAGE Co. - EAST TERMINAL
TITLE	TANK OVERFILL PROTECTION SAFETY INSTRUMENTSYSTEM LE56401 - TANK 564 HIGH HIGH LEVEL LOOP SHEET
CLIENT DRG. No.	SHEET 1 OF 1
	P&I DRG No. SI483022_DWG

simon — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW

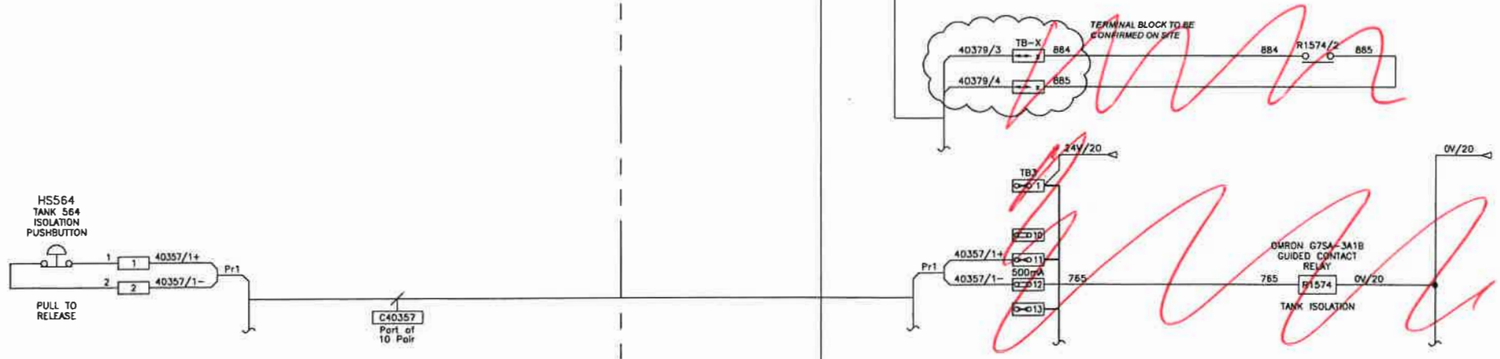
P & I Design Ltd
Tel 01642 617444
www.pidesign.co.uk

ZONE 1 II B T4 (UNLESS SPECIFIED OTHERWISE) | SAFE AREA

FIELD | JB4/200 TANK VALVE JUNCTION BOX | No.4 SWITCHROOM : TANK OVERFILL SIS PANEL | BPCS (FUTURE)



JB4/88 : TANK ISOLATION JUNCTION BOX | No.4 SWITCHROOM : TANK OVERFILL ROSOV PANEL



WORKING COPY

PROJECT DRAWING

BASED ON MASTER DRAWING SI277111_DWG

MODS TO BE TRANSFERED TO MASTER DRAWING ON COMPLETION OF THIS PROJECT

CERTIFIED EQUIPMENT

TAG No.	CERTIFICATE No.	ATEX CERTIFICATION	I.S. CALCULATION
SOV56401	PTB 02 ATEX 2125X	Ex II 2 G EEx em II T6	N/A
ZS56401	EPSILON 08 ATEX 2370X	Ex II 2 G EEx d IIB+H_2 T6	N/A
JB4/88	PTB 02 ATEX 1014	Ex II 2 GD EEx e ia II T6	N/A
LOCAL J/B	SIRA 06 ATEX 3185	Ex II 2 GD EEx e II T6	N/A
JB4/200			

NOTES

1) LED INDICATORS FITTED WITH INTERNAL DIODES.

2) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

CONTROLLED COPY 30 JUN 2014

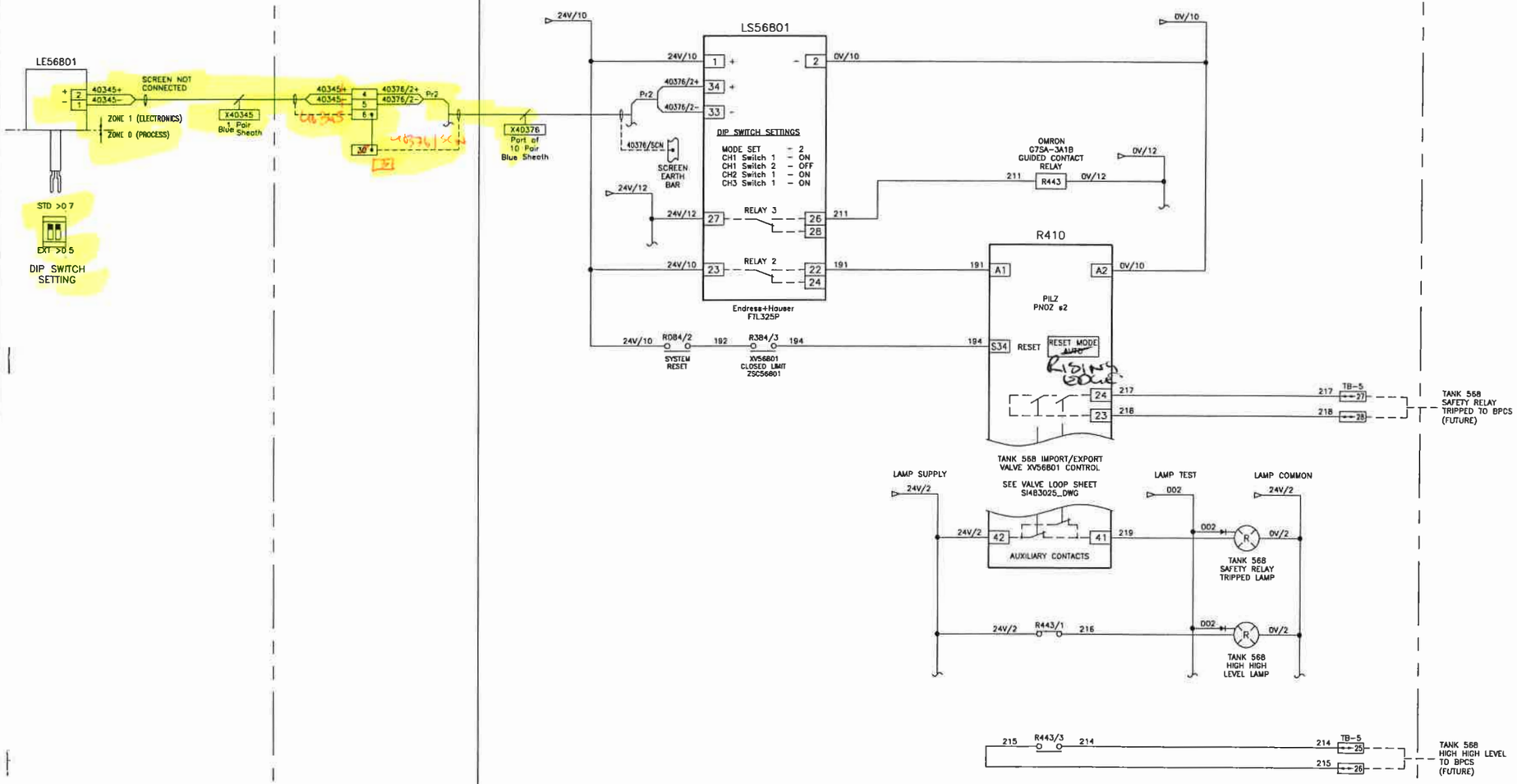
IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	13/02/14	P.P.	P.P.	D.B.		ISSUED FOR CONSTRUCTION

PLANT	IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE	TANK OVERFILL PROTECTION SAFETY INSTRUMENT SYSTEM XV56401 – TANK 564 IMPORT/EXPORT VALVE LOOP SHEET
	IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QW
	P & I Design Ltd Tel. 01642 617444 www.pidesign.co.uk
INSTRUMENT LOOP SHEET FOR USE IN HAZARDOUS AREA	SHEET 1 OF 1
CLIENT DRG. No.	P&I DRG No. SI483023_DWG

ZONE 1 II B T4 (UNLESS SPECIFIED OTHERWISE)		SAFE AREA	
FIELD		No.4 SWITCHROOM	
TANK 568 Bund 4	JB4/198 TANK LEVEL SIS JUNCTION BOX	TANK OVERFILL SIS MONITORING PANEL	BPCS (FUTURE)

REFER TO LOGIC DRAWING SI483011_DWG FOR FULL FUNCTIONALITY



WORKING COPY

CERTIFIED EQUIPMENT			
TAG No.	CERTIFICATE No.	ATEX CERTIFICATION	I.S. CALCULATION
LE56801	KEMA 99 ATEX 0523	Ex II 1/2 G EEx ia IIC T6	SI277009_CAL
LS56801	DMT 01 ATEX E 052	Ex II (1) GD [EEx ia] IIC	
JB4/198			

CONTROLLED COPY 30 JUN 2014

BASED ON MASTER DRAWING SI277062_DWG

MODS TO BE TRANSFERED TO MASTER DRAWING ON COMPLETION OF THIS PROJECT

PROJECT DRAWING

simon bulk liquid & gas network

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	13/02/14	P.P.	P.P.	D.B.	M.M.	ISSUED FOR CONSTRUCTION

PLANT	IMMINGHAM STORAGE Co. – EAST TERMINAL
TITLE	TANK OVERFILL PROTECTION SAFETY INSTRUMENT SYSTEM LE56801 – TANK 568 HIGH HIGH LEVEL LOOP SHEET
simon	IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE. DN40 2QR
P&I DESIGN	P & I Design Ltd Tel 01642 617444 www.pidesign.co.uk
INSTRUMENT LOOP SHEET FOR USE IN HAZARDOUS AREA	SHEET 1 OF 1
CLIENT DRG. No.	P&I DRG No. SI483024_DWG

ZONE 1 II B T4 (UNLESS SPECIFIED OTHERWISE)

FIELD - Bunk.

JB4/200 TANK VALVE JUNCTION BOX

SAFE AREA

No.4 SWITCHROOM : TANK OVERFILL SIS PANEL

BPCS (FUTURE)

NO FERRULES (SMALL ONES ONLY) DO?

JB4/149

SOV56801

40296/1
40296/2
40296/3

C40296
3 Core

XV56801
LOCAL JUNCTION BOX

40296/1 1 40295/1
40296/2 2 40295/2
40296/3 3 40295/3
40297/1 4 40295/4
40297/2 5 40295/5
40297/3 6 40295/6
40297/4 7 40295/7

C40295
7 Core

40295/1 8 40377/7
40295/2 9 40377/8
40295/3 10 40377/9
40295/4 11 40377/10
40295/5 12 40377/11
40295/6 13 40377/12
40295/7 14

C40377
Part of 48 Core

SELECTOR SWITCH

LOCAL OPEN/CLOSE CONTROL

XV56801/1
1 Tube

XV56801
1 Tube

FLOW PLATE SET AT 30mm CLOSING TMC

TO BE CONFIRMED

ZS56801

40297/1
40297/2
40297/3
40297/4

C40297
4 Core

XV56801

8 borg

MARKINGS MISSING.

EXTERNAL VENT FITTED

FLOW PLATE REMOVED

REFER TO LOGIC DRAWING SI483011_DWG FOR FULL FUNCTIONALITY

R410

TANK 561 SAFETY RELAY

FOR RELAY CONTROL SEE HIGH LEVEL LOOP SHEET SI483024_DWG

13 14 33 34

SAFETY CONTACTS

PILZ PNOZ s2

40377/7 TB2 15 200

40377/8 16 0V/11

40377/9 17 EARTH

24V/11

200

199 R124/3 ESD

198 R456/3 TANK ISOLATION

197 TB-6 11 LINK 12

196 R466/1 BPCS OPEN COMMAND REMOVABLE WIRE LINK (NOTE 2)

195 TB-6 9 LINK 10

24V/11

233 R466 232

232 TB-5 35

233 36

OPEN TANK 568 IMPORT VALVE COMMAND FROM BPCS (FUTURE)

200mA

LAMP SUPPLY 24V/2

LAMP TEST 002

LAMP COMMON 0V/2

24V/12

40377/10 TB-2 18

40377/11 19

224 R459 0V/12

226 R459/1 225

225 TB-5 31

226 32

TANK 568 IMPORT VALVE OPEN TO BPCS (FUTURE)

24V/2 R459/2 227

002 G 0V/2

TANK 568 IMPORT VALVE OPEN

TB-2 20

40377/12 21

228 R464 0V/12

230 R464/1 229

229 TB-5 33

230 34

TANK 568 IMPORT VALVE CLOSED TO BPCS (FUTURE)

24V/2 R464/2 231

002 R 0V/2

OMRON G7SA-3A1B GUIDED CONTACT RELAY

TANK 568 IMPORT VALVE CLOSED

40379/5 TB-3 5

40379/6 6

221 R456 0V/12

223 R456/2 222

222 TB-5 29

223 30

TANK 568 ISOLATION PUSHBUTTON OPERATED TO BPCS (FUTURE)

X40379
Part of 12 Core

JB4/88 : TANK ISOLATION JUNCTION BOX

No.4 SWITCHROOM : TANK OVERFILL ROSOV PANEL

HS568
TANK 568 ISOLATION PUSHBUTTON

7 40357/4+

8 40357/4-

Pr4

PULL TO RELEASE

C40357
Part of 10 Pair

TERMINAL BLOCK TO BE CONFIRMED ON SITE

40379/5 TB-X 1 886

40379/6 2 887

886 R1580/2 887

40379/5 TB4 40357/4+

40379/6 73 74 40357/4-

24V/20

TB3 1

16

40357/4+ 17

Pr4 40357/4- 500mA 18

768 R1580 0V/20

OMRON G7SA-3A1B GUIDED CONTACT RELAY

TANK ISOLATION

0V/20

REFER TO LOGIC DRAWING SI277023_DWG FOR FULL FUNCTIONALITY

PROJECT DRAWING

BASED ON MASTER DRAWING SI277115_DWG

MODS TO BE TRANSFERED TO MASTER DRAWING ON COMPLETION OF THIS PROJECT

CERTIFIED EQUIPMENT

CERTIFICATE No.	ATEX CERTIFICATION	I.S. CALCULATION
PTB 02 ATEX 2125X	Ex II 2 G EEx em II T6	N/A
EPSILON 08 ATEX 2370X	Ex II 2 G EEx d IIB+H_2 T6	N/A
PTB 02 ATEX 1014	Ex II 2 GD EEx e ia II T6	N/A
SIRA 06 ATEX 3185	Ex II 2 GD EEx e II T6	N/A

NOTES

1) LED INDICATORS FITTED WITH INTERNAL DIODES.

2) REMOVABLE WIRE LINK. LINK REMOVED IF BPCS ACTION REQUIRED. LINK REFITTED FOR SIS TESTING.

CONTROLLED 30 JUN 2014 COPY

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	13/02/14	P.P.	P.P.	D.B.F.		ISSUED FOR CONSTRUCTION

PLANT: IMMINGHAM STORAGE Co. – EAST TERMINAL

TITLE: TANK OVERFILL PROTECTION SAFETY INSTRUMENT SYSTEM XV56801 – TANK 568 IMPORT/EXPORT VALVE LOOP SHEET

SIMON — IMMINGHAM STORAGE Co Ltd, IMMINGHAM EAST TERMINAL, IMMINGHAM DOCK, IMMINGHAM, N.E. LINCOLNSHIRE, DN40 2QW

P & I Design Ltd Tel. 01642 617444 www.pidesign.co.uk

INSTRUMENT LOOP SHEET FOR USE IN HAZARDOUS AREA

SHEET 1 OF 1

CLIENT DRG. No.

P&I DRG No. SI483025_DWG

P & I Design Ltd

Process Instrumentation Consultancy & Design

2 Reed Street, Gladstone Industrial Estate,
Thornaby, TS17 7AF, United Kingdom.
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IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

DOCUMENTATION VERIFICATION PROCEDURE

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483017_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for documentation verification to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16

Audience
This document has been produced for use by competent persons knowledgeable in testing Safety Instrumented Systems.

Brief System Description
IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.
Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure
This procedure outlines the necessary steps required to verify the correct documentation used for testing and identify modifications to the system since the last testing phase.

Detailed in this report are the methods of test for documentation associated with IME-SIS1. The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

All faults should be reported to the system keeper. If further work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work

5 PREPARATION

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483001_REG - IME-SIS1 Report Register
SI483002_REG - IME-SIS1 Instrument Specification Register
SI483003_REG - IME-SIS1 Drawing Register
SI483004_REG - IME-SIS1 Calculation Register

A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached.

6 DOCUMENTATION VERIFICATION

Purpose of Test
Pre physical on site testing check of documentation to verify correct documentation to be used for testing and identify modifications to the system since last testing phase. *Incorrect or updated documentation may lead to incomplete testing or undesirable effects on other site systems and terminal operation.*
Controlled Copy Documentation Required
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle SI483001_REG - IME-SIS1 Report Register SI483002_REG - IME-SIS1 Instrument Specification Register SI483003_REG - IME-SIS1 Drawing Register SI483004_REG - IME-SIS1 Calculation Register

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
6.1	Compare system documentation to registers. Highlight documentation checked on controlled copy of registers. Review changes since last testing phase as documented in SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.	Documentation available and auditable. Documentation revisions reflect installed system. *Comment any issues in section 6.2 and review / rectify prior to starting site work*	✓
6.2	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

Tested by	Position	Qualification	Sign	Date
DBFALKNER	INST ENG (RTJ)	ISA FSS.		03/07/15

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

P & I Design Ltd. *Report Register*

CLIENT:	ISSUE	DATE	BY	CHKD	APPD	CLIENT REF.
Immingham Storage Co Ltd	A	25.06.14	DBF	MM	MM	IME-SIS1
Immingham East Terminal						**P & I REF.**
						SI483001_REG
						SHT 1 **OF** 1

REPORT NO	REVISION ISSUE 0 A B C D E	DESCRIPTION
SI057001_RPT	G	Layers of Protection Analysis
SI277001_RPT	E	Gasoline Tank Overfill Protection S.I.S System
SI277010_RPT	F	Safety Requirement Specification
SI277014_RPT	C	Stage 3 Function Safety Assessment
SI277016_RPT	D	Stage 3 Function Safety Assessment
SI277101_RPT	B	Safety Compliance Document
SI277102_RPT	B	Management of Functional Safety
SI483001_RPT	A	SIS Restructuring Modification Report
SI483012_RPT	A	IME-SIS1 RAMS
SI483015_RPT	A	IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483017_RPT	A	IME-SIS1 Documentation Verification Procedure
SI483018_RPT	A	IME-SIS1 Shutdown Conditions Proof Testing Procedure
SI483019_RPT	A	IME-SIS1 Equipment Failure Proof Testing Procedure
SI483020_RPT	A	IME-SIS1 Preventative Maintenance Procedure

P & I Design Ltd

Instrument Specification Register

CLIENT:
Immingham Storage Co Ltd
East Terminal

ISSUE	DATE	BY	CHKD	APPD
A	07.02.14	DBF	MM	MM

CLIENT REF.
IME-SIS1
P & I REF.
SI483002_REG
SHT 1 **OF** 2

P&I REF.	REVISION ISSUE 0 A B C D E	SUPPLIER	TAG No.	ITEM
SI483001_SPC	A	Endress & Hauser	LE56101	Tank 561 High High Level Probe
SI483001_SPC	A	Endress & Hauser	LS56101	Tank 561 High High Level Switch - Isolating Unit
SI483002_SPC	A	Endress & Hauser	LE56401	Tank 564 High High Level Probe
SI483002_SPC	A	Endress & Hauser	LS56401	Tank 564 High High Level Switch - Isolating Unit
SI483003_SPC	A	Endress & Hauser	LE56801	Tank 568 High High Level Probe
SI483003_SPC	A	Endress & Hauser	LS56801	Tank 568 High High Level Switch - Isolating Unit
SI277016_SPC	B	Installation Contractor	JB4_200	Valve Junction Box
SI277015_SPC	B	Installation Contractor	JB4_199	Valve Junction Box
SI277017_SPC	B	Installation Contractor	JB4_197	Level Junction Box
SI277018_SPC	B	Installation Contractor	JB4_198	Level Junction Box

P & I Design Ltd. *Drawing Register*

CLIENT:	REV	DATE	BY	CHKD	APPD	CLIENT REF.
Immingham Storage Co Ltd	A	17.12.13	DBF	MM	MM	IME-SIS1
ISCo East Terminal	B	04.02.14	DBF	MM	MM	**P & I REF.**
	C	25.06.14	DBF	MM	MM	SI483003_REG
	D	31.10.14	DBF	MM	MM	**SHT** 1 **OF** 7

DOCUMENT NO	REVISION ISSUE A B C D E	DESCRIPTION
DRAWINGS		
System Overviews		
SI057001_DWG	B	Gasoline Import Pipeline Routing Diagarm
Cable Overviews		
SI483001_DWG	A B C	SIS Overfill Protection Cable Overview
Logic Drawings		
SI483005_DWG	A B C D	SIS Logic Panel External Layout
SI483006_DWG	A B C D	SIS Logic Panel Internal Layout
SI483007_DWG	A B C D	SIS Logic Drawing 1 , Power Distribution
SI483008_DWG	A B C D	SIS Logic Drawing 2 , ESD
SI483009_DWG	A B C D	SIS Logic Drawing 3 , Tank 561
SI483010_DWG	A B C D	SIS Logic Drawing 4 , Tank 564
SI483011_DWG	A B C D	SIS Logic Drawing 5 , Tank 568
Loops Sheets		
SI483019_DWG	A	No4 East SIS ESD Loop Sheet
SI483020_DWG	A B	LE56101 Tank 561 HiHi Level Switch Loop Sheet
SI483021_DWG	A B	XV56101 Tank 561 Valve Loop Sheet
SI483022_DWG	A B	LE56401 Tank 564 HiHi Level Switch Loop Sheet
SI483023_DWG	A B	XV56401 Tank 564 Valve Loop Sheet
SI483024_DWG	A B	LE564801 Tank 568 HiHi Level Switch Loop Sheet
SI483025_DWG	A B	XV56801 Tank 568 Valve Loop Sheet
SCHEDULES		
Cable Schedules		
SI483001_SCH	A B	SIS Restructuring Cable Schedule
Junction Box Schedules		
SI483004_SCH	A	JB4_197 Tank Level Switch JB Connection Schedule
SI483005_SCH	A	JB4_198 Tank Level Switch JB Connection Schedule
SI483006_SCH	A	JB4-199 Valve Control JB Connection Schedule
SI483007_SCH	A	JB4-200 Valve Control JB Connection Schedule
SI483010_SCH	A	No4 East 500 Series Tank Overfill Protection Instrument Schedule
Instrument Schedules		
SI483010_SCH	A	No4 East 500 Series Tank Overfill Protection Instrument Schedule
Trip / Function Matrix Schedules		
SI483003_SCH	A	No.4 East 500 Series Tanks Logic Solver Functions Matrix
SI483012_SCH	A	No.4 East 500 Series Tanks Overfill Protection Functions Matrix

REVISION HISTORY	
Rev	Description
A	Original Issue for Tender
B	Logic Drawings Issued for Construction (Panel Builder) Electrical Installation (Loops, cable SCH, JB SCH Issued for Construction (Installation Contractor) Original Issue For Review - Instrument SCH, Matrix SCH
C	Logic Panel As Built Post FAT
D	As Built Post SAT
E	

P & I Design Ltd. *Calculation Register*

CLIENT:	ISSUE	DATE	BY	CHKD	APPD	CLIENT REF.
Immingham Storage Co Ltd East Terminal	A	09.04.14	DBF	MM	MM	IME-SIS1 **P & I REF.** SI483004_REG **SHT 1 OF 1**

CALC NO	REVISION ISSUE 0 A B C D E	DESCRIPTION
SI483001_CAL	A	LE56101 E&H Liquiphant IS Descriptive System Document
SI483002_CAL	A	LE56401 E&H Liquiphant IS Descriptive System Document
SI483003_CAL	A	LE56801 E&H Liquiphant IS Descriptive System Document

P & I Design Ltd

Process Instrumentation Consultancy & Design

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

IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

SHUTDOWN CONDITIONS PROOF TESTING PROCEDURE

2015 Proof Test

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483018_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for shutdown condition functional proof testing to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16

Audience

This document has been produced for use by competent persons knowledgeable in testing Safety Instrumented Systems.

Brief System Description

IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.
Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure

This procedure outlines the necessary steps required to verify the correct equipment is installed, the physical condition of the installed equipment and the functional operation performs the SIF's as designed.

Detailed in this report are the methods of test for each SIF.

The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

This report details shutdown condition testing whilst no transfer to the tanks is in operation.

All faults should be reported to the system keeper, with minor repairs carried out if practicable. If further maintenance work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work
RAMS	Risk Assessment and Method Statement

5 PREPARATION

All Health and Safety / Permit To Work systems must be implemented before commencing testing. SI483012_RPT - IME-SIS1 RAMS is to be submitted for approval prior to the site testing.

IME-SIS1 is completely independent of the BPCS, no overrides or special preparations are required to facilitate uncompromised testing.

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483018_RPT - IME-SIS1 Shutdown Conditions Proof Testing
SI483010_SCH - IME-SIS1 Instrument Schedule
SI483012_SCH - IME-SIS1 Trip Matrix
SI483001_DWG - Tanks 561, 564 & 568 Cable Overview
IME-K-0028 – Tank 561 P&ID
IME-K-0052 – Tank 564 P&ID
IME-K-0050 – Tank 568 P&ID

SI483017_RPT - IME-SIS1 Documentation Verification to be completed prior to each period of testing to confirm correct revisions of documentation.

A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached. In addition to procedures documented in this report calibration certificates, engineers reports are to be issued to each item as applicable.

6 HARDWARE VERIFICATION

Purpose of Test			
To verify the correct equipment is fitted and no unauthorised modifications have been carried out. To verify equipment physical condition and fitness for purpose. *Equipment may not function correctly if damaged or modified.* *Equipment not identified as SIS may not be reported to the system keeper following works by maintenance / contractors.* *To ensure correct designed/rated equipment is installed.*			
Controlled Copy Documentation Required			
SI483010_SCH - IME-SIS1 Instrument Schedule SI483012_SCH – IME-SIS1 Trip Matrix SI483001_DWG - Tanks 561, 564 & 568 Cable Overview IME-K-0028 – Tank 561 P&ID IME-K-0052 – Tank 564 P&ID IME-K-0050 – Tank 568 P&ID			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
6.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 6.6 and review / rectify prior to starting testing.*	
6.2	Confirm plant preparations satisfactory. *Record PTW No.* COLD 05965	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 6.6 and review / rectify prior to starting site work*	
6.3	Confirm equipment has not been replaced by comparing against information on SCH. Record method used to identify equipment on controlled copy of SCH Highlight column, e.g. SIS Tag / Serial No etc.	Equipment identified as SCH, Labelling and tagging correct. SIS identification correct. *Comment observations in section 6.6.*	
6.4	Confirm no visible signs of system and equipment modification, relocation, or not fit for purpose by comparing against controlled copy of SCH, P&ID and configuration. Highlight equipment checked on controlled copy of SCH & P&ID.	No visible signs of unauthorised modification or relocation. Equipment is clean and of sound physical condition, mountings, cable entries and process connections are fit for designed purpose with unrestricted access. *Comment observations in section 6.6.*	
6.5	Confirm no visible signs of additional plant or parallel systems which could affect the SIS or invalidate testing.	No new additional plant equipment or BPCS systems. *Comment any issues in section 6.6.and review / rectify prior to starting functional testing.*	

Hardware Verification Continued on page 8

6 *Hardware Verification Continued .....*

6.6	Comments/Defects/ Remedial Actions – Report ALL to System Keeper

Tested by	Position	Qualification	Sign	Date
D FAULKNER	INST ENG (PH2)	ISA FBS		09/07/15

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7 AS FOUND FUNCTIONAL PROOF TESTING PROCEDURE

7.1 TK561-SIF1 - Tank 561 As Found Functional Testing

Purpose of Test			
To verify the as found operation of LE56101 Tank 561 Independent high high level trip closes XV56101 FINAL ELEMENT valve. To verify the as found Manual Shutdown functions of Tank 561 FINAL ELEMENT XV56101 valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*			
Controlled Copy Documentation Required			
SI483012_SCH – IME-SIS1 Trip Matrix			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
7.1.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.1.12 and review / rectify prior to starting testing.*	DR
7.1.2	Confirm plant preparations satisfactory. *Record PTW No.* COR 05965	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.1.12 and review / rectify prior to starting testing.*	DR
7.1.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.1.12.*	✓
7.1.3	XV56101 is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.1.7 if found open) FOUND OPEN	Valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	N/A
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.1.12.*	N/A
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.1.12.*	N/A

Tank 561 As Found Functional Testing Continued on page 10

7.1 Tank 561 As Found Functional Testing Continued...

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* NIVOTESTER	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.1.12.*	✓ DRR
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	✓ DRR
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	✓ DRR
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.1.12*	90 ✓ DRR
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.1.12*	160 ✓ DRR
7.1.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.1.12*	✓ DRR
7.1.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.1.12*	✓ DRR
		Valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	✓ DRR
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.1.12.*	✓ DRR
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.1.12.*	✓ DRR
7.1.8	Operate HS561 Tank 561 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.1.12.*	✓ DRR
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	✓ DRR

Tank 561 As Found Functional Testing Continued on page 11

7.1 Tank 561 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.9	Release HS561 Tank 561 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.1.12.*	[signature]
7.1.10	Operations to initiate Terminal Shutdown system. *Record method of test* N24 EAST TEST BY IB (SES).	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.1.12.*	[signature]
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	[signature]
7.1.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.1.12.*	[signature]
7.1.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

Tested by	Position	Qualification	Sign	Date
D BRAN LEWER	INST ENG (PT)	ISA FSS	[signature]	09/07/15

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7.2 TK564-SIF1 - Tank 564 As Found Functional Testing

Purpose of Test
To verify the as found operation of LE56401 Tank 564 Independent high high level trip closes XV56401 FINAL ELEMENT valve. To verify the as found Manual Shutdown functions of Tank 564 FINAL ELEMENT XV56401 valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.2.12 and review / rectify prior to starting testing.*	
7.2.2	Confirm plant preparations satisfactory. COLD. *Record PTW No* 05965	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.2.12 and review / rectify prior to starting testing.*	
7.2.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.2.12.*	
7.2.4	XV56401 is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.2.7 if found ope n) found CLOSED. TANK OUT OF SERVICE.	Valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.2.12.*	
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	

Tank 564 As Found Functional Testing Continued on page 13

7.2 Tank 564 As Found Functional Testing Continued...

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* NIVOTESTER	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.2.12.*	
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.2.12*	✓ 90
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.2.12*	✓ 164
7.2.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.2.12*	
7.2.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.2.12*	
		Valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.2.12.*	
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	
7.2.8	Operate HS564 Tank 564 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.2.12.*	
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	

Tank 564 As Found Functional Testing Continued on page 14

7.2 Tank 564 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.9	Release HS564 Tank 564 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.2.12.*	
7.2.10	Operations to initiate Terminal Shutdown system. *Record method of test* NOC EAST SHUTDOWN. IB (SES)	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.2.12.*	
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	
7.2.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.2.12.*	
7.2.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

Tested by	Position	Qualification	Sign	Date
D FAULKNER	INST ENG (H)	ISA FSS		09/07/15

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7.3 TK568-SIF1 - Tank 568 As Found Functional Testing

Purpose of Test
To verify the as found operation of LE56801 Tank 568 Independent high high level trip closes XV56801 FINAL ELEMENT Import / Export valve. To verify the as found Manual Shutdown functions of Tank 568 FINAL ELEMENT XV56801 Import / Export valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.3.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.3.12 and review / rectify prior to starting testing.*	
7.3.2	Confirm plant preparations satisfactory. *Record PTW No..* 05965	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.3.12 and review / rectify prior to starting testing.*	
7.3.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.3.12.*	
7.3.4	XV56801 valve is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.3.7 if found open) FOUND OPEN	Valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	N/A
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.3.12.*	N/A
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	N/A

Tank 568 As Found Functional Testing Continued on page 16

7.3 Tank 568 As Found Functional Testing Continued…

7.3.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* ... NIVOTESTER ...	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.3.12.*	
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.3.12*	90s
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.3.12*	170
7.3.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.3.12*	
7.3.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.3.12*	
		Valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.3.12.*	
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	
7.3.8	Operate HS568 Tank 568 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.3.12.*	
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	

Tank 568 As Found Functional Testing Continued on page 17

7.3 Tank 568 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.3.9	Release HS568 Tank 568 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.3.12.*	✓
7.3.10	Operations to initiate Terminal Shutdown system. *Record method of test* NET CAST SHUTDOWN IB (SES)	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.3.12.*	✓
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	
7.3.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.3.12.*	
7.3.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

Tested by	Position	Qualification	Sign	Date
DBFAULKNER	INSTENG(PT)	ISA FSS		09/07/15.

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

HEALTHY STATE

ACTION	TAG	DESCRIPTION
		FINAL ELEMENTS
		Valves
Enabled	XV56101	Tank 561 Import / Export Valve
Enabled	XV56401	Tank 564 Import / Export Valve
Enabled	XV56801	Tank 568 Import / Export Valve
		DIAGNOSTICS
		No4 East Switchroom SIS Logic Solver
Lamp		ESD Relay Tripped
Lamp	LSHH56101	Tank 561 High High Level
Lamp		Tank 561 Safety Relay Tripped
Lamp	XV56101	Tank 561 Import / Export Valve Closed
Lamp	XV56101	Tank 561 Import / Export Valve Open
Lamp	LSHH56401	Tank 564 High High Level
Lamp		Tank 564 Safety Relay Tripped
Lamp	XV56401	Tank 564 Import / Export Valve Closed
Lamp	XV56401	Tank 564 Import / Export Valve Open
Lamp	LSHH56801	Tank 568 High High Level
Lamp		Tank 568 Safety Relay Tripped
Lamp	XV56801	Tank 568 Import / Export Valve Closed
Lamp	XV56801	Tank 568 Import / Export Valve Open
		No3 East Control Room Annunciator (4)
Reset		Site ESD (Window 3/3)
Reset	LSHH56101	Tank 561 High High Level (Window 7/9)
Reset	LSHH56401	Tank 564 High High Level (Window 10/2)
Reset	LSHH56801	Tank 568 High High Level (Window 10/6)
Reset		SI468007_SCH - Radio Message Schedule
		SIS RESET
		No4 East Switchroom SIS Logic Solver
Enabled	SYSTEM RESET	Tank 561 Safety Relay
Enabled	SYSTEM RESET	Tank 564 Safety Relay
Enabled	SYSTEM RESET	Tank 568 Safety Relay

DESCRIPTION	TAG	TYPE	CALIBRATION	UNITS	SET	ORIGIN
SIS AUTOMATIC SHUTDOWN	**IME-SIS1**		**SIL 2**			
Tank 561 Independent High Level	LE56101	Probe	1000 (3)	mm	<97%	SRS
Tank 564 Independent High Level	LE56401	Probe	1000 (3)	mm	<97%	SRS
Tank 568 Independent High Level	LE56801	Probe	1000 (3)	mm	<97%	SRS
ROSOV MANUAL SHUTDOWN						
Terminal Shutdown			N/A		HEALTHY	SRS
Tank 561 Bund Isolation	HS561	Button	N/A		HEALTHY	SRS
Tank 564 Bund Isolation	HS564	Button	N/A		HEALTHY	SRS
Tank 568 Bund Isolation	HS568	Button	N/A		HEALTHY	SRS
BPCS CONTROL						
Local Pneumatic Control Station	XV56101	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS
Local Pneumatic Control Station	XV56401	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS
Local Pneumatic Control Station	XV56801	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS
DIAGNOSTICS						
Tank 561 Import Valve Closed	ZSC56101	Limits	N/A	N/A	Closed	SRS
Tank 561 Import Valve Open	ZSO56101	Limits	N/A	N/A	Open	SRS
Tank 564 Import Valve Closed	ZSC56401	Limits	N/A	N/A	Closed	SRS
Tank 564 Import Valve Open	ZSO56401	Limits	N/A	N/A	Open	SRS
Tank 568 Import Valve Closed	ZSC56801	Limits	N/A	N/A	Closed	SRS
Tank 568 Import Valve Open	ZSO56801	Limits	N/A	N/A	Open	SRS
SIS Logc Solver Lamp Test		Button	N/A	N/A	Test	SRS

NOTES
* Reset if Enabled & Pushbutton Activated
* Reset if Enabled & Pushbutton Activated
* Reset if Enabled & Pushbutton Activated

SI483018_RPT.

9/7/15.

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ABBREVIATIONS
SIS - Safety Instrument System
IHL Independent High Level
BPCS - Basic Process Control System
ESD - Emergency Shutdown
LB - Line Break / SC - Short Circuit
H - Hardwired / S - Software

NOTES
(1) ESD trips other terminal systems - see xxxxx
(2) Self test, 2 pulse trip and fault condition.
(3) Switch length
(4) Full Annunciator functionality in SI468001_MNL

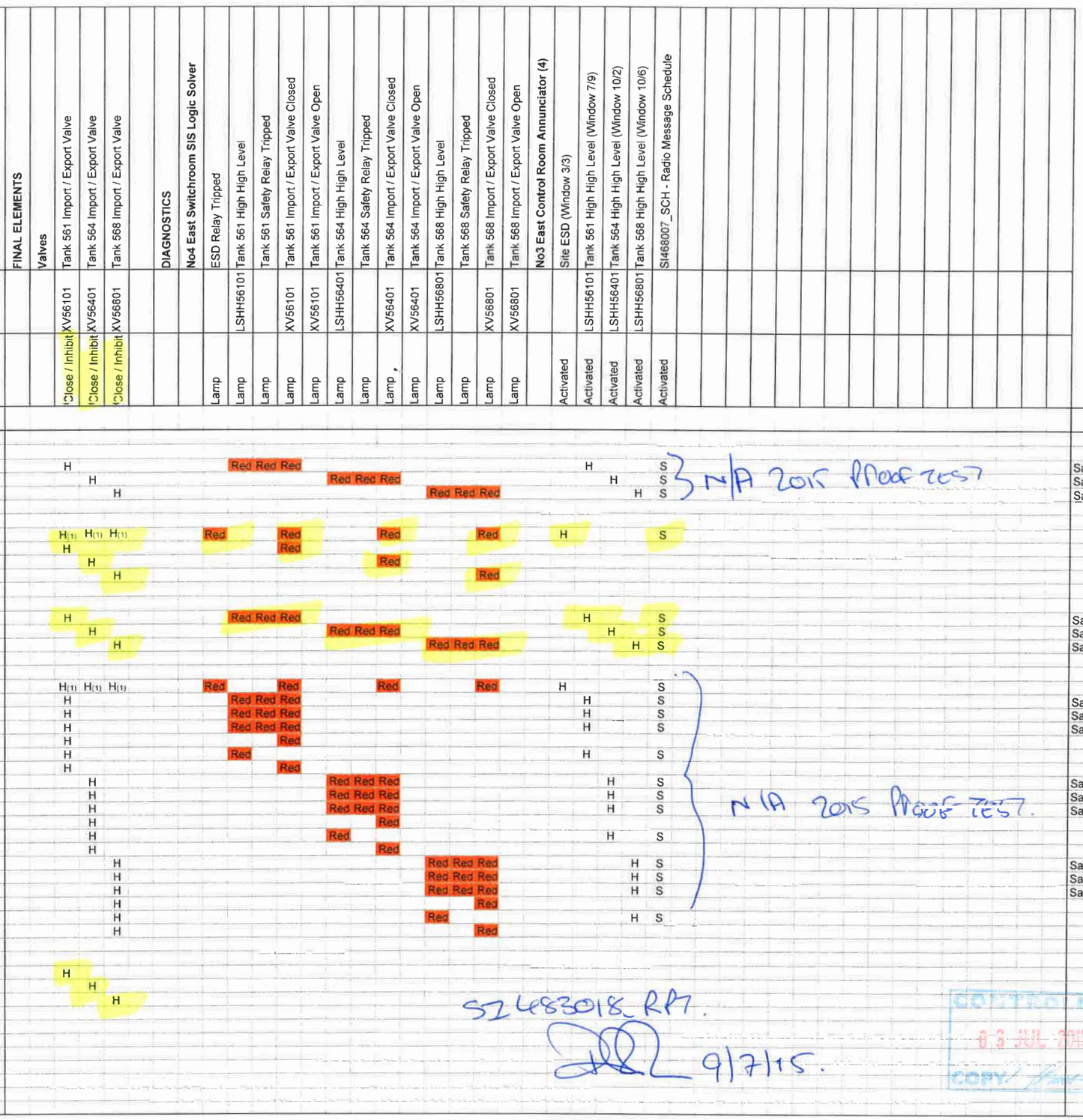
REFERENCE DOCUMENTS	
SRS	SI277010_RPT
Overfill Protection Trip Matrix	SI003100_SCH

REV	DATE	BY	DRN	CHK'D		APP'D		DESCRIPTION
A	03/02/14	DBF	DBF	MM	MM	MM	MM	Original Issue for Review

PLANT	Immingham Storage Co Ltd - East Terminal
TITLE	IME-SIS1 Tip Matrix
	P & I DESIGN
	SHEET 1 OF 2
CLIENT DRG	REF NO. SI483012_SCH

SAFETY FUNCTION

DESCRIPTION	TAG	TYPE	CALIBRATION	UNITS	SET	ORIGIN
SIS AUTOMATIC SHUTDOWN	**IME-SIS1**		**SIL2**			**LOPA**
Tank 561 Independent High Level	LE56101	Probe	1000 (3)	mm	>97%	SRS
Tank 564 Independent High Level	LE56401	Probe	1000 (3)	mm	>97%	SRS
Tank 568 Independent High Level	LE56801	Probe	1000 (3)	mm	>97%	SRS
ROSOV MANUAL SHUTDOWN						
Site ESD	N/A	N/A	N/A	N/A	Tripped	SRS
Tank 561 Bund Isolation	HS561	Button	N/A	N/A	Activated	SRS
Tank 564 Bund Isolation	HS564	Button	N/A	N/A	Activated	SRS
Tank 568 Bund Isolation	HS568	Button	N/A	N/A	Activated	SRS
TEST FUNCTIONS						
Tank 561 Test Button (2)	LS56101	Switch	N/A	N/A	Test	SRS
Tank 564 Test Button (2)	LS56401	Switch	N/A	N/A	Test	SRS
Tank 568 Test Button (2)	LS56801	Switch	N/A	N/A	Test	SRS
FAILURE MODES DETECTED						
ESD Logic 24V/3 Failure	ESD	Fuse	N/A	N/A	Fail	SRS
Tank 561 IHL Short Circuit	LE56101	SC	N/A	N/A	SC	SRS
Tank 561 IHL Open Circuit	LE56101	LB	N/A	N/A	LB	SRS
Tank 561 SIS Logic 24V/4 Failure	LS56401	Fuse	N/A	N/A	Fail	SRS
Tank 561 Valve 24V/5 Failure	XV56101	Fuse	N/A	N/A	Fail	SRS
Tank 561 BPCS Logic 24V/6 Failure		Fuse	N/A	N/A	Fail	SRS
Tank 561 Valve Air Failure	XV56101	N/A	N/A	N/A	Iso & Vent	SRS
Tank 564 IHL Short Circuit	LE56401	SC	N/A	N/A	SC	SRS
Tank 564 IHL Open Circuit	LE56401	LB	N/A	N/A	LB	SRS
Tank 564 SIS Logic 24V/7 Failure	LS56401	Fuse	N/A	N/A	Fail	SRS
Tank 564 Valve 24V/8 Failure	XV56101	Fuse	N/A	N/A	Fail	SRS
Tank 564 BPCS Logic 24V/9 Failure		Fuse	N/A	N/A	Fail	SRS
Tank 564 Valve Air Failure	XV56401	N/A	N/A	N/A	Iso & Vent	SRS
Tank 568 IHL Short Circuit	LE56801	SC	N/A	N/A	SC	SRS
Tank 568 IHL Open Circuit	LE56801	LB	N/A	N/A	LB	SRS
Tank 568 SIS Logic 24V/10 Failure	LS56801	Fuse	N/A	N/A	Fail	SRS
Tank 568 Valve 24V/11 Failure	XV56801	Fuse	N/A	N/A	Fail	SRS
Tank 568 BPCS Logic 24V/12 Failure		Fuse	N/A	N/A	Fail	SRS
Tank 568 Valve Air Failure	XV56801	N/A	N/A	N/A	Iso & Vent	SRS
BPCS CONTROL						
Local Pneumatic Control Station	XV56101	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS
Local Pneumatic Control Station	XV56401	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS
Local Pneumatic Control Station	XV56801	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS



NOTES
Safety Relay Reset Required - See Sht 1
Safety Relay Reset Required - See Sht 1
Safety Relay Reset Required - See Sht 1
Safety Relay Reset Required - See Sht 1
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Safety Relay Reset Required - See Sht 1

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ABBREVIATIONS
SIS - Safety Instrument System
IHL Independent High Level
BPCS - Basic Process
Control System
ESD - Emergency Shutdown
LB - Line Break / SC - Short Circuit
H - Hardwired / S - Software

NOTES
(1) ESD trips other terminal systems - see xxxxx
(2) Self test, 2 pulse trip and fault condition
(3) Switch lengh
(4) Full Annunciator functionality in SI468001_MNL

REFERENCE DOCUMENTS	
SRS	SI277010_RPT
Overfill Protection Trip Matrix	SI003100_SCH

REV	DATE	BY	DRN	CHK'D	APP'D	DESCRIPTION
A	03/02/14	DBF	DBF	MM	MM	Original Issue for Review

PLANT	Immingham Storage Co Ltd - East Terminal
TITLE	IME-SIS1 Tip Matrix
	P & I DESIGN
	SHEET 2 OF 2
CLIENT DRG	REF NO. SI483012_SCH

INSTRUMENT SCHEDULE

Instrument Tag. No.	Service	Instrument Spec. _SPC	Manufacturer	Model Number	Serial Number	Atex Certification	Atex Certificate No	Site Specific SIS Tag (ATEX Tag)	P & I Drawing Client (REV)	Loop Drawing _DWG	I/O Requirement No4 East SIS Overfill Protection Logic Solver DI	DO	AI	AO	Address	Comms	Notes D = Digital, A = Analogue, I = In, O = Out S = Software, H = Hardwired,
TANK 561	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56101	Liquiphant Probe	SI483001	Endress & Hauser	FTL51-GAC2BB7G4A	A40BDA01027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1765 (E10001)	IME-K-0028	SI483020	1						
LS56101	Nivotester	SI483001	Endress & Hauser	FTL 325P H3 E3	A4029A01093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0028	SI483020		2					
R250	Safety Relay		PILZ	PNOZ s2	750102 138641	N/A	N/A	N/A	IME-K-0028	SI483020		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56101	Valve Body		Dafram	150 TM9N DN250	197181	N/A	N/A	E10098	IME-K-0028	SI483021							
XV56101	Valve Actuator		Actreg	ACT400R	P-03-4000-10256	N/A	N/A	E10093	IME-K-0028	SI483021							
ZS56101	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10094 (E0519)	IME-K-0028	SI483021	2	2					
SOV56101	Solenoid Body		Seitz	CP 0632 CPU oH		N/A	N/A	E10095	IME-K-0028	SI483021							
SOV56101	Solenoid Coil		Seitz	121.104.024C (Art.No)	110625 (F.no)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10096 (E0518)	IME-K-0028	SI483021	1	1					
JB XV5601	Local Junction Box		Feel	Range 9000	01152-10	Ex II 2 GD EExe II T6	SIRA06ATEX3185	E10097 (E0517)	IME-K-0028	SI483021							
Manual Shutdown	**Bund Isolation**																
HS561	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483021	1	1					Located in JB4/87
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483021							
TANK 564	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56401	Liquiphant Probe	SI483002	Endress & Hauser	FTL51-GAC2BB7G4A	A40BD901027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1771 (E10016)	IME-K-0052	SI483022	1						
LS56401	Nivotester	SI483002	Endress & Hauser	FTL 325P H3 E3	A4029801093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0052	SI483022		2					
R330	Safety Relay		PILZ	PNOZ s2	750102 139139	N/A	N/A	N/A	IME-K-0052	SI483022		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56401	Valve Body		Dafram	150 TM9XN DN200	LF2 204248	N/A	N/A	E10099	IME-K-0052	SI483023							
XV56401	Valve Actuator		Actreg	ACT2500R	N/A	N/A	N/A	E10033	IME-K-0052	SI483023							
ZS56401	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10034 (E0516)	IME-K-0052	SI483023	2	2					
SOV56401	Solenoid Body		Seitz	CP 0632 CPU oH	1108 (F.No)	N/A	N/A	E10035	IME-K-0052	SI483023							
SOV56401	Solenoid Coil		Seitz	121.104.024C (Art.No)	110624 (F.No)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10036 (E0515)	IME-K-0052	SI483023	1	1					
JB4/145	Local Junction Box		Feel	Range 9000	08/11510	Ex II 2 GD EExe II T6	SIRA02ATEX3111	E10037 (E1841)	IME-K-0052	SI483023							
Manual Shutdown	**Bund Isolation**																
HS564	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483023	1	1					Located in JB4/88
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483023							
TANK 568	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56801	Liquiphant Probe	SI483003	Endress & Hauser	FTL51-GAC2BB7G4A	A40BDF01027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1772 (E10010)	IME-K-0050	SI483024	1						
LS56801	Nivotester	SI483003	Endress & Hauser	FTL 325P H3 E3	A4029501093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0050	SI483024		2					
R410	Safety Relay		PILZ	PNOZ s2	750102 138629	N/A	N/A	N/A	IME-K-0050	SI483024		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56801	Valve Body		Dafram	150 TB9 XM DN200	LF2 204248	N/A	N/A	E10106	IME-K-0050	SI483025							
XV56801	Valve Actuator		Actreg	ACT2500R	N/A	N/A	N/A	E10038	IME-K-0050	SI483025							
ZS56801	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10039 (E3240)	IME-K-0050	SI483025	2	2					
SOV56801	Solenoid Body		Seitz	CP 0632 CPU oH	1109 (F.No)	N/A	N/A	E10042	IME-K-0050	SI483025							
SOV56801	Solenoid Coil		Seitz	121.104.024C (Art.No)	110727 (F.No)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10043 (E3250)	IME-K-0050	SI483025	1	1					
JB4/149	Local Junction Box		Feel	Range 9000	08/11521	Ex II 2 GD EExe II T6	SIRA02ATEX3111	E10044 (E1838)	IME-K-0050	SI483025							
Manual Shutdown	**Bund Isolation**																
HS568	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483025	1	1					Located in JB4/88
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483025							
ESD	**Terminal Shutdown**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
ESD	**Emergency Shutdown**																
R124	Safety Relay		PILZ	PNOZ s2	750102 138683	N/A	N/A	N/A		SI483026	1						
R124A	Safety Relay		PILZ	PNOZ s11	750111 126494	N/A	N/A	N/A		SI483026							
Infrastructure	**500 Series Field Equipment**																
JB4/87	Bund Isolation Panel		Copper Crouse Hinds	XLH	SJ 3338-08	Ex II 2 G Exde IIC T6	PTB02ATEX1014	E10041 (E1792)									
JB4/88	Bund Isolation Panel		Copper Crouse Hinds	EX-CELL	SJ 3339-08	Ex II 2 G Exde IIC T6	PTB02ATEX1014	E10040 (E3042)									
JB4/197	SIS Independent High High Level JB		Weidmuller	TB MH 262620S4E3	XA GBB001746	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3542)									
JB4/198	SIS Independent High High Level JB		Weidmuller	TB MH 262620S4E3	XA GBB001747	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3545)									
JB4/199	SIS Valves JB		Weidmuller	TB MH 303015S4E3	XA GBB009221	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3543)									
JB4/200	SIS Valves JB		Weidmuller	TB MH 453815S4E1	XA GBB009222	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3544)									
Spares																	
TOTALS											16	21					

NOTES	REVISION	DATE	BY	CHECKED		APPROVED		DESCRIPTION	PLANT	ISCo East Terminal
	A	04.02.14	DBF	MM	MM	MM	MM	Original Issue for Review	TITLE	IME-SIS1 Instrument Schedule
	B	31.10.14	DBF	DSR		DSR		As Built Post SAT		
									P & I DESIGN	simon exa liquid & gas network
									SHEET 1 OF 1	REF NO. SI483010_SCH

JB4/200

9/7/15.

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2015 proof 7057.

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IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

DOCUMENTATION VERIFICATION PROCEDURE

CONTROLLED COPY
11th JULY 2016
D.B.FAULKNER
PROOF TEST

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483017_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for documentation verification to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16

Audience

This document has been produced for use by competent persons knowledgeable in testing Safety Instrumented Systems.

Brief System Description

IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.

Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure

This procedure outlines the necessary steps required to verify the correct documentation used for testing and identify modifications to the system since the last testing phase.

Detailed in this report are the methods of test for documentation associated with IME-SIS1. The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

All faults should be reported to the system keeper. If further work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work

5 PREPARATION

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483001_REG - IME-SIS1 Report Register
SI483002_REG - IME-SIS1 Instrument Specification Register
SI483003_REG - IME-SIS1 Drawing Register
SI483004_REG - IME-SIS1 Calculation Register

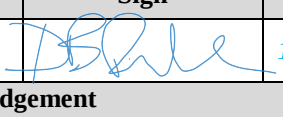
A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached.

6 DOCUMENTATION VERIFICATION

Purpose of Test
Pre physical on site testing check of documentation to verify correct documentation to be used for testing and identify modifications to the system since last testing phase. *Incorrect or updated documentation may lead to incomplete testing or undesirable effects on other site systems and terminal operation.*
Controlled Copy Documentation Required
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle SI483001_REG - IME-SIS1 Report Register SI483002_REG - IME-SIS1 Instrument Specification Register SI483003_REG - IME-SIS1 Drawing Register SI483004_REG - IME-SIS1 Calculation Register

Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
6.1	Compare system documentation to registers. Highlight documentation checked on controlled copy of registers. Review changes since last testing phase as documented in SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.	Documentation available and auditable. Documentation revisions reflect installed system. *Comment any issues in section 6.2 and review / rectify prior to starting site work*	*Pass* 
6.2	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

Documentation as the following registers –
SI483001_REG_A - IME-SIS1 Report Register
SI483002_REG_A - IME-SIS1 Specification Register
SI483003_REG_D - IME-SIS1 Drawing Register
SI483004_REG_A - IME-SIS1 Calculation Register

Tested by	**Position**	**Qualification**	**Sign**	**Date**
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*11.07.2016*

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	**Position**	**Qualification**	**Sign**	**Date**

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IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

SHUTDOWN CONDITIONS PROOF TESTING PROCEDURE

CONTROLLED COPY
11th JULY 2016
D.B.FAULKNER
PROOF TEST

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483018_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for shutdown condition functional proof testing to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16

Audience

This document has been produced for use by competent persons knowledgeable in testing Safety Instrumented Systems.

Brief System Description

IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.
Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure

This procedure outlines the necessary steps required to verify the correct equipment is installed, the physical condition of the installed equipment and the functional operation performs the SIF's as designed.

Detailed in this report are the methods of test for each SIF.

The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

This report details shutdown condition testing whilst no transfer to the tanks is in operation.

All faults should be reported to the system keeper, with minor repairs carried out if practicable. If further maintenance work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work
RAMS	Risk Assessment and Method Statement

5 PREPARATION

All Health and Safety / Permit To Work systems must be implemented before commencing testing. SI483012_RPT - IME-SIS1 RAMS is to be submitted for approval prior to the site testing.

IME-SIS1 is completely independent of the BPCS, no overrides or special preparations are required to facilitate uncompromised testing.

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483018_RPT - IME-SIS1 Shutdown Conditions Proof Testing
SI483010_SCH - IME-SIS1 Instrument Schedule
SI483012_SCH - IME-SIS1 Trip Matrix
SI483001_DWG - Tanks 561, 564 & 568 Cable Overview
IME-K-0028 – Tank 561 P&ID
IME-K-0052 – Tank 564 P&ID
IME-K-0050 – Tank 568 P&ID

SI483017_RPT - IME-SIS1 Documentation Verification to be completed prior to each period of testing to confirm correct revisions of documentation.

A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached. In addition to procedures documented in this report calibration certificates, engineers reports are to be issued to each item as applicable.

6 HARDWARE VERIFICATION

Purpose of Test
To verify the correct equipment is fitted and no unauthorised modifications have been carried out. To verify equipment physical condition and fitness for purpose. *Equipment may not function correctly if damaged or modified.* *Equipment not identified as SIS may not be reported to the system keeper following works by maintenance / contractors.* *To ensure correct designed/rated equipment is installed.*
Controlled Copy Documentation Required
SI483010_SCH - IME-SIS1 Instrument Schedule SI483012_SCH – IME-SIS1 Trip Matrix SI483001_DWG - Tanks 561, 564 & 568 Cable Overview IME-K-0028 – Tank 561 P&ID IME-K-0052 – Tank 564 P&ID IME-K-0050 – Tank 568 P&ID

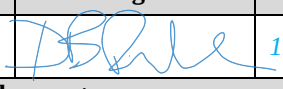
Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
6.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 6.6 and review / rectify prior to starting testing.*	*Pass*
6.2	Confirm plant preparations satisfactory. *Record PTW No…00453 (Hot)*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 6.6 and review / rectify prior to starting site work*	*Pass*
6.3	Confirm equipment has not been replaced by comparing against information on SCH. Record method used to identify equipment on controlled copy of SCH Highlight column, e.g. SIS Tag / Serial No etc.	Equipment identified as SCH, Labelling and tagging correct. SIS identification correct. *Comment observations in section 6.6.*	*Pass*
6.4	Confirm no visible signs of system and equipment modification, relocation, or not fit for purpose by comparing against controlled copy of SCH, P&ID and configuration. Highlight equipment checked on controlled copy of SCH & P&ID.	No visible signs of unauthorised modification or relocation. Equipment is clean and of sound physical condition, mountings, cable entries and process connections are fit for designed purpose with unrestricted access. *Comment observations in section 6.6.*	*Pass*
6.5	Confirm no visible signs of additional plant or parallel systems which could affect the SIS or invalidate testing.	No new additional plant equipment or BPCS systems. *Comment any issues in section 6.6.and review / rectify prior to starting functional testing.*	*Pass*

Hardware Verification Continued on page 8

6 Hardware Verification Continued .....

6.6	Comments/Defects/ Remedial Actions – Report ALL to System Keeper

No Critical Failures

Tested by	Position	Qualification	Sign	Date
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*15.07.16*

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7 AS FOUND FUNCTIONAL PROOF TESTING PROCEDURE

7.1 TK561-SIF1 - Tank 561 As Found Functional Testing

Purpose of Test			
To verify the as found operation of LE56101 Tank 561 Independent high high level trip closes XV56101 FINAL ELEMENT valve. To verify the as found Manual Shutdown functions of Tank 561 FINAL ELEMENT XV56101 valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*			
Controlled Copy Documentation Required			
SI483012_SCH – IME-SIS1 Trip Matrix			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
7.1.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.1.12 and review / rectify prior to starting testing.*	*Pass*
7.1.2	Confirm plant preparations satisfactory. *Record PTW No…00453 (Hot).*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.1.12 and review / rectify prior to starting testing.*	*Pass*
7.1.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.1.12.*	*Pass*
7.1.3	XV56101 is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.1.7 if found open)	Valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.1.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.1.12.*	*Pass*

Tank 561 As Found Functional Testing Continued on page 10

7.1 Tank 561 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test…Nivotester*	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.1.12.*	*Pass*
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	*Pass*
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.1.12*	*Pass* *107 Seconds*
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.1.12*	*Pass* *178 Seconds*
7.1.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.1.12*	*Pass*
7.1.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.1.12*	*Pass*
		Valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.1.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.1.12.*	*Pass*
7.1.8	Operate HS561 Tank 561 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.1.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	*Pass*

Tank 561 As Found Functional Testing Continued on page 11

7.1 Tank 561 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.9	Release HS561 Tank 561 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.1.12.*	*Pass*
7.1.10	Operations to initiate Terminal Shutdown system. *Record method of test* *Monday Morning Site Test*	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.1.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	*Pass*
7.1.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.1.12.*	*Pass*
7.1.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

No Critical Failures

Tested by	Position	Qualification	Sign	Date
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*15.07.16*

System Keeper Acknowledgement

(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7.2 TK564-SIF1 - Tank 564 As Found Functional Testing

Purpose of Test			
To verify the as found operation of LE56401 Tank 564 Independent high high level trip closes XV56401 FINAL ELEMENT valve. To verify the as found Manual Shutdown functions of Tank 564 FINAL ELEMENT XV56401 valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*			
Controlled Copy Documentation Required			
SI483012_SCH – IME-SIS1 Trip Matrix			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
7.2.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.2.12 and review / rectify prior to starting testing.*	*Pass*
7.2.2	Confirm plant preparations satisfactory. *Record PTW No…00453 (Hot)*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.2.12 and review / rectify prior to starting testing.*	*Pass*
7.2.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.2.12.*	*Pass*
7.2.4	XV56401 is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.2.7 if found open)	Valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.2.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	*Pass*

Tank 564 As Found Functional Testing Continued on page 13

7.2 Tank 564 As Found Functional Testing Continued…

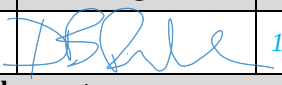
Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* *Nivotester*	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.2.12.*	*Pass*
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	*Pass*
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.2.12*	*Pass* *104 Seconds*
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.2.12*	*Fail* *235 Seconds*
7.2.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.2.12*	*Pass*
7.2.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.2.12*	*Pass*
		Valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.2.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	*Pass*
7.2.8	Operate HS564 Tank 564 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.2.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	*Pass*

Tank 564 As Found Functional Testing Continued on page 14

7.2 Tank 564 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.9	Release HS564 Tank 564 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.2.12.*	*Pass*
7.2.10	Operations to initiate Terminal Shutdown system. *Record method of test* *Monday Morning Site Test*	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.2.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	*Pass*
7.2.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.2.12.*	*Pass*
7.2.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

No Critical Failures
Failures
Total closure time > 180 Seconds. Time within process set point time of > 300 seconds.

Tested by	Position	Qualification	Sign	Date
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*15.07.16*

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7.3 TK568-SIF1 - Tank 568 As Found Functional Testing

Purpose of Test			
To verify the as found operation of LE56801 Tank 568 Independent high high level trip closes XV56801 FINAL ELEMENT Import / Export valve. To verify the as found Manual Shutdown functions of Tank 568 FINAL ELEMENT XV56801 Import / Export valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*			
Controlled Copy Documentation Required			
SI483012_SCH – IME-SIS1 Trip Matrix			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
7.3.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.3.12 and review / rectify prior to starting testing.*	*Pass*
7.3.2	Confirm plant preparations satisfactory. *Record PTW No… 00453 (Hot)*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.3.12 and review / rectify prior to starting testing.*	*Pass*
7.3.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.3.12.*	*Pass*
7.3.4	XV56801 valve is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.3.7 if found open)	Valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.3.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	*Pass*

Tank 568 As Found Functional Testing Continued on page 16

7.3 Tank 568 As Found Functional Testing Continued…

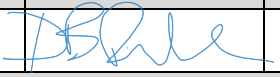
7.3.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* *Nivotester*	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.3.12.*	*Pass*
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	*Pass*
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.3.12*	*Pass* *129 Seconds*
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.3.12*	*Fail* *269 Seconds*
7.3.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.3.12*	*Pass*
7.3.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.3.12*	*Pass*
		Valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.3.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	*Pass*
7.3.8	Operate HS568 Tank 568 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.3.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	*Pass*

Tank 568 As Found Functional Testing Continued on page 17

7.3 Tank 568 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.3.9	Release HS568 Tank 568 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.3.12.*	*Pass*
7.3.10	Operations to initiate Terminal Shutdown system. *Record method of test* *Monday Morning Site Test .*	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.3.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	*Pass*
7.3.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.3.12.*	*Pass*
7.3.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

No Critical Failures
Failures
Total closure time > 180 Seconds. Time within process set point time of > 300 seconds.

Tested by	Position	Qualification	Sign	Date
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*15.07.16*

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

INSTRUMENT SCHEDULE

Instrument Tag. No.	Service	Instrument Spec. _SPC	Manufacturer	Model Number	Serial Number	Atex Certification	Atex Certificate No	Site Specific SIS Tag (ATEX Tag)	P & I Drawing Client (REV)	Loop Drawing _DWG	I/O Requirement No4 East SIS Overfill Protection Logic Solver						Notes D = Digital, A = Analogue, I = In, O = Out S = Software, H = Hardwired,
											DI	DO	AI	AO	Address	Comms	
TANK 561	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56101	Liquiphant Probe	SI483001	Endress & Hauser	FTL51-GAC2BB7G4A	A40BDA01027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1765 (E10001)	IME-K-0028	SI483020	1						
LS56101	Nivotester	SI483001	Endress & Hauser	FTL 325P H3 E3	A4029A01093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0028	SI483020		2					
R250	Safety Relay		PILZ	PNOZ s2	750102 138641	N/A	N/A	N/A	IME-K-0028	SI483020		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56101	Valve Body		Dafram	150 TM9N DN250	197181	N/A	N/A	E10098	IME-K-0028	SI483021							
XV56101	Valve Actuator	Tag numger on localhand switch, assemblycomponents notindividually tagged.	Actreg	ACT400R	P-03-4000-10256	N/A	N/A	E10093	IME-K-0028	SI483021							
ZS56101	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10094 (E0519)	IME-K-0028	SI483021	2	2					
SOV56101	Solenoid Body		Seitz	CP 0632 CPU oH		N/A	N/A	E10095	IME-K-0028	SI483021							
SOV56101	Solenoid Coil		Seitz	121.104.024C (Art.No)	110625 (F.no)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10096 (E0518)	IME-K-0028	SI483021	1	1					
JB XV5601 JB4/205	Local Junction Box		Feel	Range 9000	01152-10	Ex II 2 GD EExe II T6	SIRA06ATEX3185	E10097 (E0517)	IME-K-0028	SI483021							
Manual Shutdown	**Bund Isolation**																
HS561	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483021	1	1					Located in JB4/87
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483021							
TANK 564	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56401	Liquiphant Probe	SI483002	Endress & Hauser	FTL51-GAC2BB7G4A	A40BD901027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1771 (E10016)	IME-K-0052	SI483022	1						
LS56401	Nivotester	SI483002	Endress & Hauser	FTL 325P H3 E3	A4029801093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0052	SI483022		2					
R330	Safety Relay		PILZ	PNOZ s2	750102 139139	N/A	N/A	N/A	IME-K-0052	SI483022		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56401	Valve Body		Dafram	150 TM9XN DN200	LF2 204248	N/A	N/A	E10099	IME-K-0052	SI483023							
XV56401	Valve Actuator	Tag numger on localhand switch, assemblycomponents notindividually tagged.	Actreg	ACT2500R	N/A	N/A	N/A	E10033	IME-K-0052	SI483023							
ZS56401	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10034 (E0516)	IME-K-0052	SI483023	2	2					
SOV56401	Solenoid Body		Seitz	CP 0632 CPU oH	1108 (F.No)	N/A	N/A	E10035	IME-K-0052	SI483023							
SOV56401	Solenoid Coil		Seitz	121.104.024C (Art.No)	110624 (F.No)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10036 (E0515)	IME-K-0052	SI483023	1	1					
JB4/145	Local Junction Box		Feel	Range 9000	08/11510	Ex II 2 GD EExe II T6	SIRA02ATEX3111	E10037 (E1841)	IME-K-0052	SI483023							
Manual Shutdown	**Bund Isolation**																
HS564	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483023	1	1					Located in JB4/88
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483023							
TANK 568	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56801	Liquiphant Probe	SI483003	Endress & Hauser	FTL51-GAC2BB7G4A	A40BDF01027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1772 (E10010)	IME-K-0050	SI483024	1						
LS56801	Nivotester	SI483003	Endress & Hauser	FTL 325P H3 E3	A4029501093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0050	SI483024		2					
R410	Safety Relay		PILZ	PNOZ s2	750102 138629	N/A	N/A	N/A	IME-K-0050	SI483024		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56801	Valve Body		Dafram	150 TB9 XM DN200	LF2 204248	N/A	N/A	E10106	IME-K-0050	SI483025							
XV56801	Valve Actuator	Tag numger on localhand switch and actuator,assembly componentsnot individually tagged.	Actreg	ACT2500R	N/A	N/A	N/A	E10038	IME-K-0050	SI483025							
ZS56801	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10039 (E3240)	IME-K-0050	SI483025	2	2					
SOV56801	Solenoid Body		Seitz	CP 0632 CPU oH	1109 (F.No)	N/A	N/A	E10042	IME-K-0050	SI483025							
SOV56801	Solenoid Coil		Seitz	121.104.024C (Art.No)	110727 (F.No)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10043 (E3250)	IME-K-0050	SI483025	1	1					
JB4/149	Local Junction Box		Feel	Range 9000	08/11521	Ex II 2 GD EExe II T6	SIRA02ATEX3111	E10044 (E1838)	IME-K-0050	SI483025							
Manual Shutdown	**Bund Isolation**																
HS568	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483025	1	1					Located in JB4/88
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483025							
ESD	**Terminal Shutdown**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
ESD	**Emergency Shutdown**																
R124	Safety Relay		PILZ	PNOZ s2	750102 138683	N/A	N/A	N/A		SI483026	1						
R124A	Safety Relay		PILZ	PNOZ s11	750111 126494	N/A	N/A	N/A		SI483026							
Infrastructure	**500 Series Field Equipment**																
JB4/87	Bund Isolation Panel		Copper Crouse Hinds	XLH	SJ 3338-08	Ex II 2 G Exde IIC T6	PTB02ATEX1014	E10041 (E1792)									
JB4/88	Bund Isolation Panel		Copper Crouse Hinds	EX-CELL	SJ 3339-08	Ex II 2 G Exde IIC T6	PTB02ATEX1014	E10040 (E3042)									
JB4/197	SIS Independent High High Level JB		Weidmuller	TB MH 262620S4E3	XA GBB001746	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3542)									
JB4/198	SIS Independent High High Level JB		Weidmuller	TB MH 262620S4E3	XA GBB001747	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3545)									
JB4/199	SIS Valves JB		Weidmuller	TB MH 303015S4E3	XA GBB009221	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3543)									
JB4/200	SIS Valves JB		Weidmuller	TB MH 453815S4E1	XA GBB009222	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3544)									
Spares																	
TOTALS											16	21					

NOTES	REVISION	DATE	BY	CHECKED		APPROVED		DESCRIPTION
	A	04.02.14	DBF	MM	MM	MM	MM	Original Issue for Review
	B	31.10.14	DBF	DSR		DSR		As Built Post SAT

PLANT	ISCo East Terminal
TITLE	IME-SIS1 Instrument Schedule
P & I DESIGN	SIMON bulk liquid & gas network
SHEET 1 OF 1	REF N0. SI483010_SCH

P & I Design Ltd

Process Instrumentation Consultancy & Design

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Thornaby, TS17 7AF, United Kingdom.
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IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

DOCUMENTATION VERIFICATION PROCEDURE

CONTROLLED COPY
04th JULY 2017
D.B.FAULKNER
PROOF TEST

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483017_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for documentation verification to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16

Audience

This document has been produced for use by competent persons knowledgeable in testing Safety Instrumented Systems.

Brief System Description

IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.
Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure

This procedure outlines the necessary steps required to verify the correct documentation used for testing and identify modifications to the system since the last testing phase.

Detailed in this report are the methods of test for documentation associated with IME-SIS1. The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

All faults should be reported to the system keeper. If further work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work

5 PREPARATION

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483001_REG - IME-SIS1 Report Register
SI483002_REG - IME-SIS1 Instrument Specification Register
SI483003_REG - IME-SIS1 Drawing Register
SI483004_REG - IME-SIS1 Calculation Register

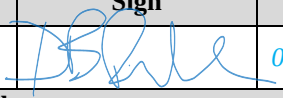
A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached.

6 DOCUMENTATION VERIFICATION

Purpose of Test			
Pre physical on site testing check of documentation to verify correct documentation to be used for testing and identify modifications to the system since last testing phase. *Incorrect or updated documentation may lead to incomplete testing or undesirable effects on other site systems and terminal operation.*			
Controlled Copy Documentation Required			
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle SI483001_REG - IME-SIS1 Report Register SI483002_REG - IME-SIS1 Instrument Specification Register SI483003_REG - IME-SIS1 Drawing Register SI483004_REG - IME-SIS1 Calculation Register			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
6.1	Compare system documentation to registers. Highlight documentation checked on controlled copy of registers. Review changes since last testing phase as documented in SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.	Documentation available and auditable. Documentation revisions reflect installed system. *Comment any issues in section 6.2 and review / rectify prior to starting site work*	*Pass*
6.2	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

Documentation as the following registers –
SI057001_REG_A – IME-SIS1 Drawing Register
SI057002_REG_A - IME-SIS1 Report Register
SI057003_REG_D - IME-SIS1 Specification Register
SI057004_REG_A - IME-SIS1 Calculation Register

Works scheduled on the following CMMS – Work orders
090932 IE-SIS-SIF-001-TK561-OFP
090936 IE-SIS-SIF-001-TK564-OFP
090937 IE-SIS-SIF-001-TK568-OFP

Tested by	**Position**	**Qualification**	**Sign**	**Date**
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*04.07.2017*

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	**Position**	**Qualification**	**Sign**	**Date**

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IMMINGHAM STORAGE Co LTD

IMMINGHAM EAST TERMINAL

IME-SIS1

SAFETY INSTRUMENT SYSTEM

SHUTDOWN CONDITIONS PROOF TESTING PROCEDURE

CONTROLLED COPY
04th JULY 2017
D.B.FAULKNER
PROOF TEST

Rev	Date	By	Checked	Approved	Description	Client Ref.
A	09.04.14	D.B.Faulkner	D.S.Regan	ISCo	Original Issue	
						Document No. **SI483018_RPT**

IF NOT SIGNED THIS DOCUMENT IS UNCONTROLLED

Contents

1 REVISION HISTORY

Rev	Description
A	Original Issue

This document will be revised with any additions to or removals from IME-SIS1 throughout the operational lifecycle of the system.

2 INTRODUCTION

This document provides a procedure for shutdown condition functional proof testing to ensure that the Safety Instrument System Life Cycle complies with the requirements of the standard BS EN 61511.

3 SCOPE

Client / Company	-	Immingham Storage Co Ltd
Location / Facility	-	ISCo East Terminal
Plant Unit	-	Tanks 561, 564 & 568
Service	-	No4 East Storage Tank Overfill Protection
SIS Tag No	-	IME-SIS1
SIF's Tag No's	-	TK561-SIF1, TK564-SIF1 & TK568-SIF1
SIL	-	2

Lifecycle Stages

Operation and Maintenance	-	BS EN 61511 Clause 16

Audience

This document has been produced for use by competent persons knowledgeable in testing Safety Instrumented Systems.

Brief System Description

IME-SIS1 under test is to prevent the overfill of storage tanks 561, 564 & 568 when on import duty. The system is classified as SIL2.
Full system description in documentation reference SI277001_RPT – IME-SIS1 Safety Instrument System and Piping & Instrument Diagrams – IME-K-0028 – Tank 561, IME-K-0052 – Tank 564 & IME-K-0050 – Tank 568.

Procedure

This procedure outlines the necessary steps required to verify the correct equipment is installed, the physical condition of the installed equipment and the functional operation performs the SIF's as designed.

Detailed in this report are the methods of test for each SIF.

The results of these tests will be recorded in this report, historical data will be recorded and approved as satisfactory in report reference SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle.

This report details shutdown condition testing whilst no transfer to the tanks is in operation.

All faults should be reported to the system keeper, with minor repairs carried out if practicable. If further maintenance work is required the system keeper will initiate it.

4 DEFINITIONS AND ABBREVIATIONS

The following definitions and abbreviations apply to this document.

BPCS	Basic Process Control System
Logic Solver	Part of the SIS that performs one or more logic functions, e.g. safety relay, trip amplifier
Proof Test	Periodic testing to detect failures in a safety instrumented system
Protection Layer	A mechanism that reduces risk by control, prevention or mitigation
Sensor	Part of the SIS which measures the process condition
SIF	Safety Instrumented Function – A function with a specified safety integrity level which is necessary to achieve functional safety
SIL	Safety integrity level – A numerical number, 1 to 4 stipulating the level of integrity the system shall perform to, 1 being the lowest 4 the highest
SIS	Safety Instrument System – A SIS comprises of sensors, logic solvers and final elements
1ooN	SIS made up of N independent channels, which are so connected, that any single channel is sufficient to perform the correct safety instrumented function
2ooN	SIS made up of N independent channels, which are so connected, that any two of the channels are required to perform the correct safety instrumented function
MTBF	Mean Time Between Failures
MTTR	Mean Time To Repair
PFD	Probability of Failing on Demand
SCADA	Supervisory Control and Data Acquisition (Visual display screen)
P&ID	Piping & Instrument Diagram
SCH	Schedule
PTW	Permit to Work
RAMS	Risk Assessment and Method Statement

5 PREPARATION

All Health and Safety / Permit To Work systems must be implemented before commencing testing. SI483012_RPT - IME-SIS1 RAMS is to be submitted for approval prior to the site testing.

IME-SIS1 is completely independent of the BPCS, no overrides or special preparations are required to facilitate uncompromised testing.

Controlled copies of the following documentation will be required :-
SI483015_RPT - IME-SIS1 Operation, Maintenance and Modification Lifecycle
SI483018_RPT - IME-SIS1 Shutdown Conditions Proof Testing
SI483010_SCH - IME-SIS1 Instrument Schedule
SI483012_SCH - IME-SIS1 Trip Matrix
SI483001_DWG - Tanks 561, 564 & 568 Cable Overview
IME-K-0028 – Tank 561 P&ID
IME-K-0052 – Tank 564 P&ID
IME-K-0050 – Tank 568 P&ID

SI483017_RPT - IME-SIS1 Documentation Verification to be completed prior to each period of testing to confirm correct revisions of documentation.

A controlled copy of this procedure will be used to carry out the testing and will form part of the lifecycle testing documentation.
Controlled copies of all documentation required for testing to be attached. In addition to procedures documented in this report calibration certificates, engineers reports are to be issued to each item as applicable.

6 HARDWARE VERIFICATION

Purpose of Test			
To verify the correct equipment is fitted and no unauthorised modifications have been carried out. To verify equipment physical condition and fitness for purpose. *Equipment may not function correctly if damaged or modified.* *Equipment not identified as SIS may not be reported to the system keeper following works by maintenance / contractors.* *To ensure correct designed/rated equipment is installed.*			
Controlled Copy Documentation Required			
SI483010_SCH - IME-SIS1 Instrument Schedule SI483012_SCH – IME-SIS1 Trip Matrix SI483001_DWG - Tanks 561, 564 & 568 Cable Overview IME-K-0028 – Tank 561 P&ID IME-K-0052 – Tank 564 P&ID IME-K-0050 – Tank 568 P&ID			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
6.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 6.6 and review / rectify prior to starting testing.*	*Pass*
6.2	Confirm plant preparations satisfactory. *Record PTW No…06561 (Hot)*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 6.6 and review / rectify prior to starting site work*	*Pass*
6.3	Confirm equipment has not been replaced by comparing against information on SCH. Record method used to identify equipment on controlled copy of SCH Highlight column, e.g. SIS Tag / Serial No etc.	Equipment identified as SCH, Labelling and tagging correct. SIS identification correct. *Comment observations in section 6.6.*	*Pass*
6.4	Confirm no visible signs of system and equipment modification, relocation, or not fit for purpose by comparing against controlled copy of SCH, P&ID and configuration. Highlight equipment checked on controlled copy of SCH & P&ID.	No visible signs of unauthorised modification or relocation. Equipment is clean and of sound physical condition, mountings, cable entries and process connections are fit for designed purpose with unrestricted access. *Comment observations in section 6.6.*	*Pass*
6.5	Confirm no visible signs of additional plant or parallel systems which could affect the SIS or invalidate testing.	No new additional plant equipment or BPCS systems. *Comment any issues in section 6.6.and review / rectify prior to starting functional testing.*	*Pass*

Hardware Verification Continued on page 8

6 Hardware Verification Continued .....

6.6	Comments/Defects/ Remedial Actions – Report ALL to System Keeper

Comments
Detailed CompEx inspection Carried out
No Critical Failures
Failures
LE56101 ATEX E1765 Ingress Protection Failure, housing cracked, moisture inside..
SOV56401 ATEX E0515 Ingress Protection Failure, O Ring fail, moisture inside.
Observations
XV56101 Bolt missing
Field Equipment identified by ATEX / SIS tag No

Tested by	Position	Qualification	Sign	Date
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*06.07.17*

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7 AS FOUND FUNCTIONAL PROOF TESTING PROCEDURE

7.1 TK561-SIF1 - Tank 561 As Found Functional Testing

Purpose of Test			
To verify the as found operation of LE56101 Tank 561 Independent high high level trip closes XV56101 FINAL ELEMENT valve. To verify the as found Manual Shutdown functions of Tank 561 FINAL ELEMENT XV56101 valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*			
Controlled Copy Documentation Required			
SI483012_SCH – IME-SIS1 Trip Matrix			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
7.1.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.1.12 and review / rectify prior to starting testing.*	*Pass*
7.1.2	Confirm plant preparations satisfactory. *Record PTW No…06561 (Hot).*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.1.12 and review / rectify prior to starting testing.*	*Pass*
7.1.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.1.12.*	*Pass*
7.1.3	XV56101 is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.1.7 if found open)	Valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.1.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.1.12.*	*Pass*

Tank 561 As Found Functional Testing Continued on page 10

7.1 Tank 561 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test…Nivotester*	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.1.12.*	*Pass*
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	*Pass*
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.1.12*	*Pass* *105 Seconds*
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.1.12*	*Pass* *168 Seconds*
7.1.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.1.12*	*Pass*
7.1.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.1.12*	*Pass*
		Valve action found smooth. *Comment poor action / sticking in section 7.1.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.1.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.1.12.*	*Pass*
7.1.8	Operate HS561 Tank 561 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.1.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	*Pass*

Tank 561 As Found Functional Testing Continued on page 11

7.1 Tank 561 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.1.9	Release HS561 Tank 561 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.1.12.*	*Pass*
7.1.10	Operations to initiate Terminal Shutdown system. *Record method of test* *Fire Alarm (Muster Test)*	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.1.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.1.12*	*Pass*
7.1.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.1.12.*	*Pass*
7.1.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

No Critical Failures
No Failures
No Observations

Tested by	Position	Qualification	Sign	Date
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*06.07.17*

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7.2 TK564-SIF1 - Tank 564 As Found Functional Testing

Purpose of Test			
To verify the as found operation of LE56401 Tank 564 Independent high high level trip closes XV56401 FINAL ELEMENT valve. To verify the as found Manual Shutdown functions of Tank 564 FINAL ELEMENT XV56401 valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*			
Controlled Copy Documentation Required			
SI483012_SCH – IME-SIS1 Trip Matrix			
Step	**Method of Test**	**Acceptance Criteria**	**Pass (✓) Fail (x) Initial**
7.2.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.2.12 and review / rectify prior to starting testing.*	*Pass*
7.2.2	Confirm plant preparations satisfactory. *Record PTW No…06561 (Hot)*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.2.12 and review / rectify prior to starting testing.*	*Pass*
7.2.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.2.12.*	*Pass*
7.2.4	XV56401 is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.2.7 if found open)	Valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.2.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	*Pass*

Tank 564 As Found Functional Testing Continued on page 13

7.2 Tank 564 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* *Nivotester*	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.2.12.*	*Pass*
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	*Pass*
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.2.12*	*Pass* *90 Seconds*
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.2.12*	*Pass* *178 Seconds*
7.2.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.2.12*	*Pass*
7.2.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.2.12*	*Pass*
		Valve action found smooth. *Comment poor action / sticking in section 7.2.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.2.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.2.12.*	*Pass*
7.2.8	Operate HS564 Tank 564 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.2.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	*Pass*

Tank 564 As Found Functional Testing Continued on page 14

7.2 Tank 564 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.2.9	Release HS564 Tank 564 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.2.12.*	*Pass*
7.2.10	Operations to initiate Terminal Shutdown system. *Record method of test* *Fire Alarm (Muster Test)*	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.2.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.2.12*	*Pass*
7.2.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.2.12.*	*Pass*
7.2.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

No Critical Failures
No Failures
No Observations

Tested by	Position	Qualification	Sign	Date
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*07.07.17*

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

7.3 TK568-SIF1 - Tank 568 As Found Functional Testing

Purpose of Test
To verify the as found operation of LE56801 Tank 568 Independent high high level trip closes XV56801 FINAL ELEMENT Import / Export valve. To verify the as found Manual Shutdown functions of Tank 568 FINAL ELEMENT XV56801 Import / Export valve. To verify the correct DIAGNOSTICS information. *If sensing element defective the tank could overfill if a demand is made on the overfill protection system.* *If manual shutdown systems defective the FINAL ELEMENT could fail to close if a demand is made on the terminal shutdown systems.* *If response target time is exceeded the tank could overfill following demand.* *If FINAL ELEMENT travel time is reduced excessive pipeline surge pressure could be generated.* *Diagnostic information not displayed correctly could result in undetected tank overfill, system unavailability or incorrect operational response.*
Controlled Copy Documentation Required
SI483012_SCH – IME-SIS1 Trip Matrix

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.3.1	Review procedure with operations and testing personnel.	All personnel familiarised with the scope of works and responsibilities. *Comment any issues in section 7.3.12 and review / rectify prior to starting testing.*	*Pass*
7.3.2	Confirm plant preparations satisfactory. *Record PTW No… 06561 (Hot)*	Conditions satisfied as detailed on PTW and RAMS. *Comment any issues in section 7.3.12 and review / rectify prior to starting testing.*	*Pass*
7.3.3	Confirm system healthy and reset.	System healthy and reset as detailed on SI483013_SCH Sheet 1. *Comment differences from SCH or if found in tripped state in section 7.3.12.*	*Pass*
7.3.4	XV56801 valve is normally in the open position, if found closed open via local manual isolation switch. (confirm acceptance criteria @ step 7.3.7 if found open)	Valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.3.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	*Pass*

Tank 568 As Found Functional Testing Continued on page 16

7.3 Tank 568 As Found Functional Testing Continued…

7.3.5	Refer to SI483015_RPT Wet test of probe required minimum of every 5 years. 5 yearly wet test due, remove probe from tank and immerse in suitable liquid. 5 yearly wet test not due not use Nivotester test button. *Record method of test* *Nivotester*	System trips closing and inhibiting from reopening FINAL ELEMENT valve and initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 2 *Comment differences from SCH in section 7.3.12.*	*Pass*
		FINAL ELEMENT valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	*Pass*
		FINAL ELEMENT valve traveling time >= 90 Seconds *Comment times < 90 Seconds in section 7.3.12*	*Pass* *96 Seconds*
		Time from test initiation to FINAL ELEMENT valve closed <= 180 Seconds *Comment times > 180 Seconds in section 7.3.12*	*Pass* *180 Seconds*
7.3.6	Remove probe from liquid/ release Nivotester test button.	System remains tripped inhibiting from reopening FINAL ELEMENT valves. DIAGNOSTICS as detailed on SI483012_SCH sheets 1 & 2 *Comment failure in section 7.3.12*	*Pass*
7.3.7	Operate Logic Solver Panel SYSTEM RESET pushbutton	System healthy and reset as detailed on SI483012_SCH Sheet 1. FINAL ELEMENT valve automatically reopens. *Comment differences from SCH in section 7.3.12*	*Pass*
		Valve action found smooth. *Comment poor action / sticking in section 7.3.12.*	*Pass*
		Opening time – No specific requirement. *Comment times > 120 seconds in section 7.3.12.*	*Pass*
		Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 1. *Comment differences from SCH in section 7.3.12.*	*Pass*
7.3.8	Operate HS568 Tank 568 Isolation Pushbutton.	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.3.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	*Pass*

Tank 568 As Found Functional Testing Continued on page 17

7.3 Tank 568 As Found Functional Testing Continued…

Step	Method of Test	Acceptance Criteria	Pass (✓) Fail (x) Initial
7.3.9	Release HS568 Tank 568 Isolation Pushbutton.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.3.12.*	*Pass*
7.3.10	Operations to initiate Terminal Shutdown system. *Record method of test* *Fire Alarm (Muster Test)*	Correct FINAL ELEMENT valve position and DIAGNOSTICS as detailed on SI483012_SCH Sheet 2. *Comment differences from SCH in section 7.3.12.*	*Pass*
		Time from test initiation to trip activation <=2 seconds. *Comment failures in section 7.3.12*	*Pass*
7.3.11	Operations to Reset Terminal Shutdown system.	FINAL ELEMENT valve automatically reopens initiating DIAGNOSTICS as detailed on SI483012_SCH Sheet 1 *Comment differences from SCH in section 7.3.12.*	*Pass*
7.3.12	Comments/Defects/ Remedial Actions – Report ALL to System Keeper		

No Critical Failures
No Failures
No Observations

Tested by	Position	Qualification	Sign	Date
D.B.Faulkner	*Instrument Engineer*	*ISA84 FSS*		*07.07.17*

System Keeper Acknowledgement
(Note: Signature confirms System keeper is advised of Comments/Defects/Remedial Actions and will initiate terminal procedures for rectification works and/or isolation of plant as required)

Accepted by	Position	Qualification	Sign	Date

INSTRUMENT SCHEDULE

Instrument Tag. No.	Service	Instrument Spec. _SPC	Manufacturer	Model Number	Serial Number	Atex Certification	Atex Certificate No	Site Specific SIS Tag (ATEX Tag)	P & I Drawing Client (REV)	Loop Drawing _DWG	I/O Requirement No4 East SIS Overfill Protection Logic Solver						Notes D = Digital, A = Analogue, I = In, O = Out S = Software, H = Hardwired,
											DI	DO	AI	AO	Address	Comms	
TANK 561	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56101	Liquiphant Probe	SI483001	Endress & Hauser	FTL51-GAC2BB7G4A	A40BDA01027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	E1765 (E10001)	IME-K-0028	SI483020	1						
LS56101	Nivotester	SI483001	Endress & Hauser	FTL 325P H3 E3	A4029A01093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0028	SI483020		2					
R250	Safety Relay		PILZ	PNOZ s2	750102 138641	N/A	N/A	N/A	IME-K-0028	SI483020		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56101	Valve Body		Dafram	150 TM9N DN250	197181	N/A	N/A	E10098	IME-K-0028	SI483021							
XV56101	Valve Actuator		Actreg	ACT400R	P-03-4000-10256	N/A	N/A	E10093	IME-K-0028	SI483021							
ZS56101	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10094 (E0519)	IME-K-0028	SI483021	2	2					
SOV56101	Solenoid Body		Seitz	CP 0632 CPU oH		N/A	N/A	E10095	IME-K-0028	SI483021							
SOV56101	Solenoid Coil		Seitz	121.104.024C (Art.No)	110625 (F.no)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10096 (E0518)	IME-K-0028	SI483021	1	1					
~~JB XV5601~~ JB4/205	Local Junction Box		Feel	Range 9000	01152-10	Ex II 2 GD EExe II T6	SIRA06ATEX3185	E10097 (E0517)	IME-K-0028	SI483021							
Manual Shutdown	**Bund Isolation**																
HS561	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483021	1	1					Located in JB4/87
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483021							
TANK 564	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56401	Liquiphant Probe	SI483002	Endress & Hauser	FTL51-GAC2BB7G4A	A40BD901027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	~~E1771 (E10016)~~ E10016 (E1771)	IME-K-0052	SI483022	1						
LS56401	Nivotester	SI483002	Endress & Hauser	FTL 325P H3 E3	A4029801093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0052	SI483022		2					
R330	Safety Relay		PILZ	PNOZ s2	750102 139~~139~~ 137	N/A	N/A	N/A	IME-K-0052	SI483022		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56401	Valve Body		Dafram	150 TM9XN DN200	LF2 204248	N/A	N/A	E10099	IME-K-0052	SI483023							
XV56401	Valve Actuator		Actreg	ACT2500R	N/A	N/A	N/A	E10033	IME-K-0052	SI483023							
ZS56401	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10034 (E0516)	IME-K-0052	SI483023	2	2					
SOV56401	Solenoid Body		Seitz	CP 0632 CPU oH	1108 (F.No)	N/A	N/A	E10035	IME-K-0052	SI483023							
SOV56401	Solenoid Coil		Seitz	121.104.024C (Art.No)	110624 (F.No)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10036 (E0515)	IME-K-0052	SI483023	1	1					
JB4/145	Local Junction Box		Feel	Range 9000	08/11510	Ex II 2 GD EExe II T6	SIRA02ATEX3111	E10037 (E1841)	IME-K-0052	SI483023							
Manual Shutdown	**Bund Isolation**																
HS564	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483023	1	1					Located in JB4/88
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483023							
TANK 568	**Gasoline Storage Tank**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
Sensing Element	**Independent High High Level Probe**																
LE56801	Liquiphant Probe	SI483003	Endress & Hauser	FTL51-GAC2BB7G4A	A40BDF01027	Ex II 1/2 G Ex ia IIC T 80 C	KEMA99ATEX0523	~~E1772 (E10010)~~ E10010 (E1772)	IME-K-0050	SI483024	1						
LS56801	Nivotester	SI483003	Endress & Hauser	FTL 325P H3 E3	A4029501093	Ex II(1)GD [EEx ia] IIC	DMT01ATEXE052	N/A	IME-K-0050	SI483024		2					
R410	Safety Relay		PILZ	PNOZ s2	750102 138629	N/A	N/A	N/A	IME-K-0050	SI483024		1					
Final Element	**Pipeline Import / Export Block Valve**																
XV56801	Valve Body		Dafram	150 TB9 XM DN200	LF2 204248	N/A	N/A	E10106	IME-K-0050	SI483025							
XV56801	Valve Actuator		Actreg	ACT2500R	N/A	N/A	N/A	E10038	IME-K-0050	SI483025							
ZS56801	Limit Switch Box		Westlock	2245	N/A	Ex d IIB+H2 T5	EPSILON08ATEX2370X	E10039 (E3240)	IME-K-0050	SI483025	2	2					
SOV56801	Solenoid Body		Seitz	CP 0632 CPU oH	1109 (F.No)	N/A	N/A	E10042	IME-K-0050	SI483025							
SOV56801	Solenoid Coil		Seitz	121.104.024C (Art.No)	110727 (F.No)	Ex II 2 G Ex emb II T6	PTB02ATEX2125X	E10043 (E3250)	IME-K-0050	SI483025	1	1					
JB4/149	Local Junction Box		Feel	Range 9000	08/11521	Ex II 2 GD EExe II T6	SIRA02ATEX3111	E10044 (E1838)	IME-K-0050	SI483025							
Manual Shutdown	**Bund Isolation**																
HS568	Bund Isolation Station		Copper Crouse Hinds	GHG4181101 R0003	N/A	EExde IIC Ex II 2G	PTB97ATEX1081U	N/A		SI483025	1	1					Located in JB4/88
Local	Local Selector Switch		N/A	N/A	N/A	N/A	N/A	N/A		SI483025							
ESD	**Terminal Shutdown**								**SI483001_DWG (1)**								**(1) Tanks 561, 564 & 568 Cable Overview**
ESD	**Emergency Shutdown**																
R124	Safety Relay		PILZ	PNOZ s2	750102 138683	N/A	N/A	N/A		SI483026	1						
R124A	Safety Relay		PILZ	PNOZ s11	750111 126494	N/A	N/A	N/A		SI483026							
Infrastructure	**500 Series Field Equipment**																
JB4/87	Bund Isolation Panel		Copper Crouse Hinds	XLH	SJ 3338-08	Ex II 2 G Exde IIC T6	PTB02ATEX1014	E10041 (E1792)									
JB4/88	Bund Isolation Panel		Copper Crouse Hinds	EX-CELL	SJ 3339-08	Ex II 2 G Exde IIC T6	PTB02ATEX1014	E10040 (E3042)									
JB4/197	SIS Independent High High Level JB		Weidmuller	TB MH 262620S4E3	XA GBB001746	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	SIS E10009 (E3542)									
JB4/198	SIS Independent High High Level JB		Weidmuller	TB MH 262620S4E3	XA GBB001747	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3545)									
JB4/199	SIS Valves JB		Weidmuller	TB MH 303015S4E3	XA GBB009221	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3543)									
JB4/200	SIS Valves JB		Weidmuller	TB MH 453815S4E1	XA GBB009222	Ex II 2 G Exia IIC T6	KEMA10ATEX0050	(E3544)									
Spares																	
TOTALS											16	21					

TESTING RESULTS NOTES
High Lighted Green = Pass / Verified
High Lighted Yellow = Comment
High Lighted Red = Fail / Comment in Red Test
Red Strikethrough = Correction made in Red Text
Blue Text = Comment / additional information

REVISION	DATE	BY	CHECKED		APPROVED		DESCRIPTION
A	04.02.14	DBF	MM	MM	DSR		Original Issue for Review
B	31.10.14	DBF	DSR				As Built Post SAT
CC	04.07.17	DBF					Controlled Copy 2017 Proof test

PLANT	ISCo East Terminal
TITLE	IME-SIS1 Instrument Schedule
P & I DESIGN	SIMON bulk liquid & gas network
SHEET 1 OF 1	REF N0. SI483010_SCH

HEALTHY STATE

						DESCRIPTION	**FINAL ELEMENTS**	**Valves**	Tank 561 Import / Export Valve	Tank 564 Import / Export Valve	Tank 568 Import / Export Valve		**DIAGNOSTICS**	**No4 East Switchroom SIS Logic Solver**	ESD Relay Tripped	Tank 561 High High Level	Tank 561 Safety Relay Tripped	Tank 561 Import / Export Valve Closed	Tank 561 Import / Export Valve Open	Tank 564 High High Level	Tank 564 Safety Relay Tripped	Tank 564 Import / Export Valve Closed	Tank 564 Import / Export Valve Open	Tank 568 High High Level	Tank 568 Safety Relay Tripped	Tank 568 Import / Export Valve Closed	Tank 568 Import / Export Valve Open	**No3 East Control Room Annunciator (4)**	Site ESD (Window 3/3)	Tank 561 High High Level (Window 7/9)	Tank 564 High High Level (Window 10/2)	Tank 568 High High Level (Window 10/6)	SI468007_SCH - Radio Message Schedule	**SIS RESET**	**No4 East Switchroom SIS Logic Solver**	Tank 561 Safety Relay	Tank 564 Safety Relay	Tank 568 Safety Relay	
						TAG			XV56101	XV56401	XV56801					LSHH56101		XV56101	XV56101	LSHH56401		XV56401	XV56401	LSHH56801		XV56801	XV56801			LSHH56101	LSHH56401	LSHH56801				SYSTEM RESET	SYSTEM RESET	SYSTEM RESET	
						ACTION			Enabled	Enabled	Enabled				Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp	Lamp		Reset	Reset	Reset	Reset	Reset			Enabled	Enabled	Enabled	
DESCRIPTION	**TAG**	**TYPE**	**CALIBRATION**	**UNITS**	**SET**	**ORIGIN**																																	**NOTES**
SIS AUTOMATIC SHUTDOWN	**IME-SIS1**		**SIL 2**																																				
Tank 561 Independent High Level	LE56101	Probe	1000 (3)	mm	<97%	SRS			H								Red(*)																			H			* Reset if Enabled & Pushbutton Activated
Tank 564 Independent High Level	LE56401	Probe	1000 (3)	mm	<97%	SRS				H											Red(*)																H		* Reset if Enabled & Pushbutton Activated
Tank 568 Independent High Level	LE56801	Probe	1000 (3)	mm	<97%	SRS					H														Red(*)													H	* Reset if Enabled & Pushbutton Activated
ROSOV MANUAL SHUTDOWN																																							
Terminal Shutdown			N/A		HEALTHY	SRS			H(1)	H(1)	H(1)																												
Tank 561 Bund Isolation	HS561	Button	N/A		HEALTHY	SRS			H																														
Tank 564 Bund Isolation	HS564	Button	N/A		HEALTHY	SRS				H																													
Tank 568 Bund Isolation	HS568	Button	N/A		HEALTHY	SRS					H																												
BPCS CONTROL																																							
Local Pneumatic Control Station	XV56101	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS			H																														
Local Pneumatic Control Station	XV56401	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS				H																													
Local Pneumatic Control Station	XV56801	Switch	"OPEN" or "CLOSE"	N/A	OPEN	SRS					H																												
DIAGNOSTICS																																							
Tank 561 Import Valve Closed	ZSC56101	Limits	N/A	N/A	Closed	SRS												Red																		H			
Tank 561 Import Valve Open	ZSO56101	Limits	N/A	N/A	Open	SRS													Green																				
Tank 564 Import Valve Closed	ZSC56401	Limits	N/A	N/A	Closed	SRS																Red															H		
Tank 564 Import Valve Open	ZSO56401	Limits	N/A	N/A	Open	SRS																	Green																
Tank 568 Import Valve Closed	ZSC56801	Limits	N/A	N/A	Closed	SRS																				Red												H	
Tank 568 Import Valve Open	ZSO56801	Limits	N/A	N/A	Open	SRS																					Green												
SIS Logc Solver Lamp Test		Button	N/A	N/A	Test	SRS									Red	Red	Red	Red	Green	Red	Red	Red	Green	Red	Red	Red	Green												

ABBREVIATIONS	NOTES	REFERENCE DOCUMENTS		REV	DATE	BY	DRN	CHK'D	APPD	DESCRIPTION
SIS - Safety Instrument System	(1) ESD trips other terminal systems - see xxxxx	SRS	SI277010_RPT	A	03/02/14	DBF	DBF	MM	MM	Original Issue for Review
IHL Independent High Level	(2) Self test, 2 pulse trip and fault condition.	Overfill Protection Trip Matrix	SI003100_SCH	CC	04/07/17	DBF				Controlled Copy 2017 Proof Test
BPCS - Basic Process Control System	(3) Switch length									
	(4) Full Annunciator functionality in SI468001_MNL									
ESD - Emergency Shutdown										
LB - Line Break / SC - Short Circuit										
H - Hardwired / S - Software										

PLANT Immingham Storage Co Ltd - East Terminal
TITLE IME-SIS1 Trip Matrix

P & I DESIGN

simon
bulk liquid & gas network

SHEET 1 OF 2
CLIENT DRG
REF N0. SI483012_SCH

SAFETY FUNCTION

DESCRIPTION	TAG	ACTION	NOTES
SIS AUTOMATIC SHUTDOWN	**IME-SIS1**		
Tank 561 Independent High Level	LE56101	Probe	1000 (3)	mm	>97%	SRS			H								Red	Red	Red														H			S	*2017 Proof Test*	
Tank 564 Independent High Level	LE56401	Probe	1000 (3)	mm	>97%	SRS				H										Red	Red	Red											H			S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 568 Independent High Level	LE56801	Probe	1000 (3)	mm	>97%	SRS					H												Red	Red	Red									H		S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
ROSOV MANUAL SHUTDOWN																																						
Site ESD	N/A	N/A	N/A	N/A	Tripped	SRS			H(1)	H(1)	H(1)			Red			Red			Red					Red					H					S	*Pass 06.07.17*	
Tank 561 Bund Isolation	HS561	Button	N/A	N/A	Activated	SRS			H								Red																				*Pass 06.07.17*	
Tank 564 Bund Isolation	HS564	Button	N/A	N/A	Activated	SRS				H										Red																	*Pass 06.07.17*	
Tank 568 Bund Isolation	HS568	Button	N/A	N/A	Activated	SRS					H														Red												*Pass 06.07.17*	
TEST FUNCTIONS																																						
Tank 561 Test Button (2)	LS56101	Switch	N/A	N/A	Test	SRS			H					Red	Red	Red																	H			S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 564 Test Button (2)	LS56401	Switch	N/A	N/A	Test	SRS				H							Red	Red	Red															H		S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 568 Test Button (2)	LS56801	Switch	N/A	N/A	Test	SRS					H												Red	Red	Red										H	S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
FAILURE MODES DETECTED																																						
ESD Logic 24V/3 Failure	ESD	Fuse	N/A	N/A	Fail	SRS			H(1)	H(1)	H(1)			Red			Red			Red					Red					H					S	*Pass 06.07.17*	
Tank 561 IHL Short Circuit	LE56101	SC	N/A	N/A	SC	SRS			H						Red	Red	Red															H			S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 561 IHL Open Circuit	LE56101	LB	N/A	N/A	LB	SRS			H						Red	Red	Red															H			S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 561 SIS Logic 24V/4 Failure	LS56401	Fuse	N/A	N/A	Fail	SRS			H						Red	Red	Red															H			S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 561 Valve 24V/5 Failure	XV56101	Fuse	N/A	N/A	Fail	SRS			H								Red																				*Pass 06.07.17*	
Tank 561 BPCS Logic 24V/6 Failure		Fuse	N/A	N/A	Fail	SRS			H						Red																	H			S	*Pass 06.07.17*	
Tank 561 Valve Air Failure	XV56101	N/A	N/A	N/A	Iso & Vent	SRS			H								Red																				*Pass 06.07.17*	
Tank 564 IHL Short Circuit	LE56401	SC	N/A	N/A	SC	SRS				H								Red	Red	Red													H			S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 564 IHL Open Circuit	LE56401	LB	N/A	N/A	LB	SRS				H								Red	Red	Red													H			S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 564 SIS Logic 24V/7 Failure	LS56401	Fuse	N/A	N/A	Fail	SRS				H								Red	Red	Red													H			S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 564 Valve 24V/8 Failure	XV56101	Fuse	N/A	N/A	Fail	SRS				H										Red																	*Pass 06.07.17*	
Tank 564 BPCS Logic 24V/9 Failure		Fuse	N/A	N/A	Fail	SRS				H								Red															H			S	*Pass 06.07.17*	
Tank 564 Valve Air Failure	XV56401	N/A	N/A	N/A	Iso & Vent	SRS				H										Red																	*Pass 06.07.17*	
Tank 568 IHL Short Circuit	LE56801	SC	N/A	N/A	SC	SRS					H												Red	Red	Red										H	S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 568 IHL Open Circuit	LE56801	LB	N/A	N/A	LB	SRS					H												Red	Red	Red										H	S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 568 SIS Logic 24V/10 Failure	LS56801	Fuse	N/A	N/A	Fail	SRS					H												Red	Red	Red										H	S	*Pass 06.07.17*	Safety Relay Reset Required - See Sht 1
Tank 568 Valve 24V/11 Failure	XV56801	Fuse	N/A	N/A	Fail	SRS					H														Red												*Pass 06.07.17*	
Tank 568 BPCS Logic 24V/12 Failure		Fuse	N/A	N/A	Fail	SRS					H												Red												H	S	*Pass 06.07.17*	
Tank 568 Valve Air Failure	XV56801	N/A	N/A	N/A	Iso & Vent	SRS					H														Red												*Pass 06.07.17*	
BPCS CONTROL																																						
Local Pneumatic Control Station	XV56101	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS			H																												*Pass 06.07.17*	
Local Pneumatic Control Station	XV56401	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS				H																											*Pass 06.07.17*	
Local Pneumatic Control Station	XV56801	Switch	"OPEN" or "CLOSE"	N/A	CLOSE	SRS					H																											*Pass 06.07.17*	

ABBREVIATIONS
SIS - Safety Instrument System
IHL Independent High Level
BPCS - Basic Process
Control System
ESD - Emergency Shutdown
LB - Line Break / SC - Short Circuit
H - Hardwired / S - Software

NOTES
(1) ESD trips other terminal systems - see xxxxx
(2) Self test, 2 pulse trip and fault condition.
(3) Switch lengh
(4) Full Annunciator functionality in SI468001_MNL

REFERENCE DOCUMENTS	
SRS	SI277010_RPT
Overfill Protection Trip Matrix	SI003100_SCH

REV	DATE	BY	DRN	CHK'D	APPD	DESCRIPTION
A	03/02/14	DBF	DBF	MM	MM	Original Issue for Review
CC	04/07/17	DBF	DBF			Controlled Copy 2017 Proof Test

PLANT Immingham Storage Co Ltd - East Terminal

TITLE IME-SIS1 Tip Matrix

P & I DESIGN

simon bulk liquid & gas network

SHEET 2 OF 2

CLIENT DRG

REF N0. SI483012_SCH