

# WARREGO SCRAPER STATION HAZARDOUS AREA DOSSIER



FYFE REFERENCE: 18756-6-HAD-003

APA REFERENCE: HAD DATA REPOSITORY/ ADP\_0610\_WAR

Prepared by:

\_\_\_\_\_  
Arjun Patel  
Graduate Mechanical Engineer - Fyfe

Date: 7-Nov-2011

Reviewed by:

\_\_\_\_\_  
Tony Bird  
Principal Process Engineer - Fyfe

Date: 7-Nov-2011

Client Accepted:

\_\_\_\_\_  
Anthony Comerford  
Pipeline Engineer – APA Group

Date:

Manager:

\_\_\_\_\_  
Henry Dupal  
Engineering Manager - APA Group Northern Territory

Date:

## Credential Exposure

### PERSONNEL

**Tony Bird** from Fyfe Pty Ltd is a principal process engineer with over ten years of experience in hazardous area classifications of new and existing projects. His experience in the development of retrospective hazardous area classifications includes Palm Valley gas plant, Torrens Island power station, Pelican Point power station and numerous Santos facilities.

His experience covers oil and gas pipeline and facility projects during all stages of design from concept, feasibility, and FEED through to detailed design. He also has experience in procurement, construction supervision, commissioning and operations support of pipeline facilities.

Tony's responsibilities for this project included the examination of site, confirmation of installed equipment, and development of hazardous area classification and hazardous area mapping drawings.

**Neville Green** from Sitzler Pty Ltd is an electrical engineer with over ten years of experience in the design, construction, commissioning and inspection of installation in hazardous environment in the oil and gas industry. Neville has the following competencies in accordance to AS/NZS 4761(Refer attachments):

UTE NES 010 A	Report on integrity of explosion protected equipment in hazardous areas
UTE NES 107	Install explosion-protected equipment and wiring systems (Ex)
UTE NES 707	Design electrical installations in hazardous areas (Ex)

Neville's role was to perform close inspection of all electrical equipment in accordance to AS/NZS 60079 series on site to verify installation. His role was also to review inspection sheets and provide recommendations for remedial actions to ensure compliance.

**David Bourke** from Fyfe Pty Ltd is the surveyor who completed three dimensional (3D) scanning and photography of the facilities. The 3D images were used by Fyfe drafters to update site arrangement drawings. The 3D scan data is retained by Fyfe for future use if required by APA Group.

### METHODOLOGY

The Hazardous Area Verification Dossier is produced to ensure that the installation complies with the appropriate certification documents as well as with AS/NZS 2381.1 and any other relevant part of the AS/NZS 2381 and AS/NZS 60079 series. In addition equipment and installations where hazardous areas exist are required to comply with the applicable regulations of the applicable Australian State or Territory. It should be borne in mind that an installation can come under the jurisdiction of several authorities with different areas of responsibility, e.g. mining, electrical safety, handling and transport of flammable materials and occupational health and safety.

This dossier has been prepared in accordance with the following codes and standards:

- Dossiers AS 2381.1:2005 - Electrical equipment for explosive gas atmospheres - Selection, installation and maintenance Part 1: General requirements
- Hazardous area AS/NZS 60079.10.1:2009 - Explosive atmospheres: Classification of areas - Explosive gas atmospheres (IEC 60079-10-1, Ed. 1.0 (2008) MOD) (2009)
- AS/NZS 60079.17:2009 : Explosive atmospheres - Electrical installations inspection and maintenance (IEC 60079-17, Ed.4.0 (2007) MOD)

Note that a Hazardous Area Verification Dossier is a living document and should be updated by APA and / or its contractors. Any modifications to electrical equipment, including removing an instrument cover should be recorded and stored within the Dossier. Changes to the operation or equipment installed within the station will require a review of the hazardous area classification and may require revision of the classification, hazardous area mapping drawings, hazardous area equipment lists and associated certificates of conformity. An extract from AS 2381.1 (2005) is included to provide guidance to APA.

Equipment requires conformity to the following standards:

- AUS Ex
- IEC Ex

Previously AS / NZS Ex and FLP have been recognised certification standards for equipment in hazardous areas and may have been applicable at the time of construction / installation. Equipment that was identified as having any of the certification to show conformity to the above standards was deemed to be acceptable. Where no certification was available or certification was available to standards not recognised in Australia, a conformity assessment document (CAD) is required. The CAD shall be completed by a suitably qualified organisation and the associated residual risk shall be accepted by the head of APA. For new installations, equipment with the correct certificates of conformity should be used unless no item exists and then a CAD should be produced. No information on the date of installation/ of equipment purchase/manufacturer has been provided of the site. Therefore no checking has been undertaken to determine the currency of the certificate at the time of installation.

## **DISCLAIMER**

Opportunities for improvements (OFI) are provided for items associated with hazardous area and general engineering. The scope of work for the project was to identify hazardous area and provide visual inspection of the equipment. The visual inspection did not include opening of equipment and the OFIs are limited to the level of inspection. General engineering OFIs are non-exhaustive and require APA to confirm the OFI and the recommendation.

## **Extract from AS 2381.1 (2005)**

### **1.6 DOCUMENTATION**

*It is necessary to ensure that any installation complies with the appropriate certification documents as well as with this Standard and any other requirements specific to the plant on which the installation takes place.*

*To achieve this result, a verification dossier shall be prepared for every plant and shall be either kept on the premises or stored in another location in which case a document shall be left on the premises indicating who the owner or owners are and where that information is kept, so that when required, copies may be obtained. This dossier should contain the information detailed in the appropriate Parts of this series of Standards for the types of protection concerned.*

*Up-to-date information typically required is as follows:*

- a) Where applicable a statement of the identity of the person(s) having legal ownership of the installation or parts thereof and where the verification dossier is located.*
- b) The classification of hazardous areas and the Standards used for the classification.*
- c) Equipment group and temperature class.*
- d) Installation instructions.*
- e) Documentation/certification for electrical equipment, including those items with special conditions, for example, equipment with certificate numbers that have the suffix 'X'.*
- f) Descriptive system document for the intrinsically safe system.*
- g) Documentation relating to the suitability of the equipment for the area and environment to which it will be exposed, e.g. T rating, Ex rating, IP rating, corrosion resistance.*
- h) Documentation certifying that the equipment is rated for the voltages and frequency applied during normal operation.*
- i) Manufacturer's/qualified person's declaration, e.g. tradesperson's documentation and inspector's inspection reports.*
- j) Records sufficient to enable the explosion-protected equipment to be maintained in accordance with its type of protection (for example, list and location of equipment, spares, technical information).*
- k) Records covering any maintenance, overhaul and repair of the equipment.*
- l) Records of selection criteria for cable entry systems for compliance with the requirements for the particular explosion technique.*
- m) Drawings and schedules relating to circuit identification (see Clause 3.8.16).*
- n) In New Zealand, the Hazardous Area Statement of Periodic Verification on completion of a periodic inspection. (Refer to Appendix B).*



*Where alternative methods of equipment identification are used for inspection in accordance with Clause 4.3 then additional documentation to support the traceability of the equipment shall be provided.*

*It shall be the responsibility of the person(s) having legal ownership of the installation or parts thereof to ensure that the relevant information is produced but the preparation of the document may be delegated to expert bodies/organizations. The dossier may be kept as hard copy or in electronic form.*

## **1.7 QUALIFICATIONS OF PERSONNEL**

*The design, construction, maintenance, testing and inspection of installations covered by this Standard shall be carried out only by competent persons whose training has included instruction on the various types of protection and installation practices, relevant rules and regulations and on the general principles of area classification. The competency of the person shall be relevant to the type of work to be undertaken.*

*Appropriate continuing education or training should be undertaken by personnel on a regular basis.*

*Competency may be demonstrated in accordance with AS/NZS 4761, Competencies for working with electrical equipment for hazardous areas (EEHA), or equivalent training and assessment framework.*

This is a Statement that

## Neville Owain Green

has been assessed as having fulfilled the following requirements

UTE NES 010 A	Report on the integrity of explosion-protected equipment in hazardous areas
UTE NES 107 TA	Install explosion-protected equipment & wiring systems (Ex mixed)
UTE NES 107 WA	Install explosion-protected equipment & wiring systems (Ex n)
UTE NES 107 XA	Install explosion-protected equipment & wiring systems (Ex i)
UTE NES 107 YA	Install explosion-protected equipment & wiring systems (Ex e)
UTE NES 107 ZA	Install explosion-protected equipment & wiring systems (Ex d)
UTE NES 707 TA	Design electrical installations in hazardous areas (Ex mixed)
UTE NES 707 WA	Design electrical installations in hazardous areas (Ex n)
UTE NES 707 XA	Design electrical installations in hazardous areas (Ex i)
UTE NES 707 YA	Design electrical installations in hazardous areas (Ex e)
UTE NES 707 ZA	Design electrical installations in hazardous areas (Ex d)

in partial completion of the following qualification  
Certificate IV in Electrotechnology (Explosion-protection) UTE 4 07 99

  
Prepared by  
Sarah Petrides  
Administration Assistant

  
Approved by  
Sam Zacha  
Managing Director

National Provider Code 51160

Date of Issue: 5 December 2007



This statement of attainment is recognised within the Australian Qualifications Framework



*This is to certify that*  
**Neville Green**  
*of*  
**GPA Engineering Pty Ltd**

*Completed the 3 day*  
**Electrical Safety in  
Hazardous Areas**

*Training Course*  
26th to 28th February 2001

Signed: *CR Baker*

**Colin Baker** CEng, MIEE, MInstMC, FIICA  
Partner, Principal Consultant & H-Class Electrical Inspector

Certificate Number: 2001.02.26-28/05

This 24 hour short course is recognised by  
The Institution of Engineers, Australia, for Continuing Professional Development (CPD) purposes

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**Explosion Protection Technology**, 8 Kirkfell Court, Berwick, Victoria 3806, Australia

## Table of Contents

- 1 Site Information
- 2 Hazardous Area Classification Report
- 3 Observation for Improvement
- 4 Hazardous Area Mapping Drawings
- 5 Hazardous Area Equipment Register and Certificates of Conformity
- 6 Equipment Datasheets and Electrical Drawings
- 7 Calculations
- 8 Manufacturer's Data Report (MDR) and Installation, Operation and Maintenance (IOM) Manual
- 9 Maintenance Records
- 10 Inspection Records
- 11 Overhaul, Repair and Modification Records
- 12 Schedule of equipment and conditions requiring compliance status attention

### Revision History:

Rev.	Status	Date	Prepared	Reviewed	Approved
A	Preliminary issue for client's review	31-Oct-2011	CEK	TCB	
0	Original Issue	7-Nov-2011	AZP	TCB	EZG

## 1 Site Information

An inspection on the Warrego scraper station site was performed on the 5th of October 2011 by Tony Bird, a principal process engineer from Fyfe, Neville Green, an electrical engineer from Sitzler and David Bourke, a surveyor from Fyfe.

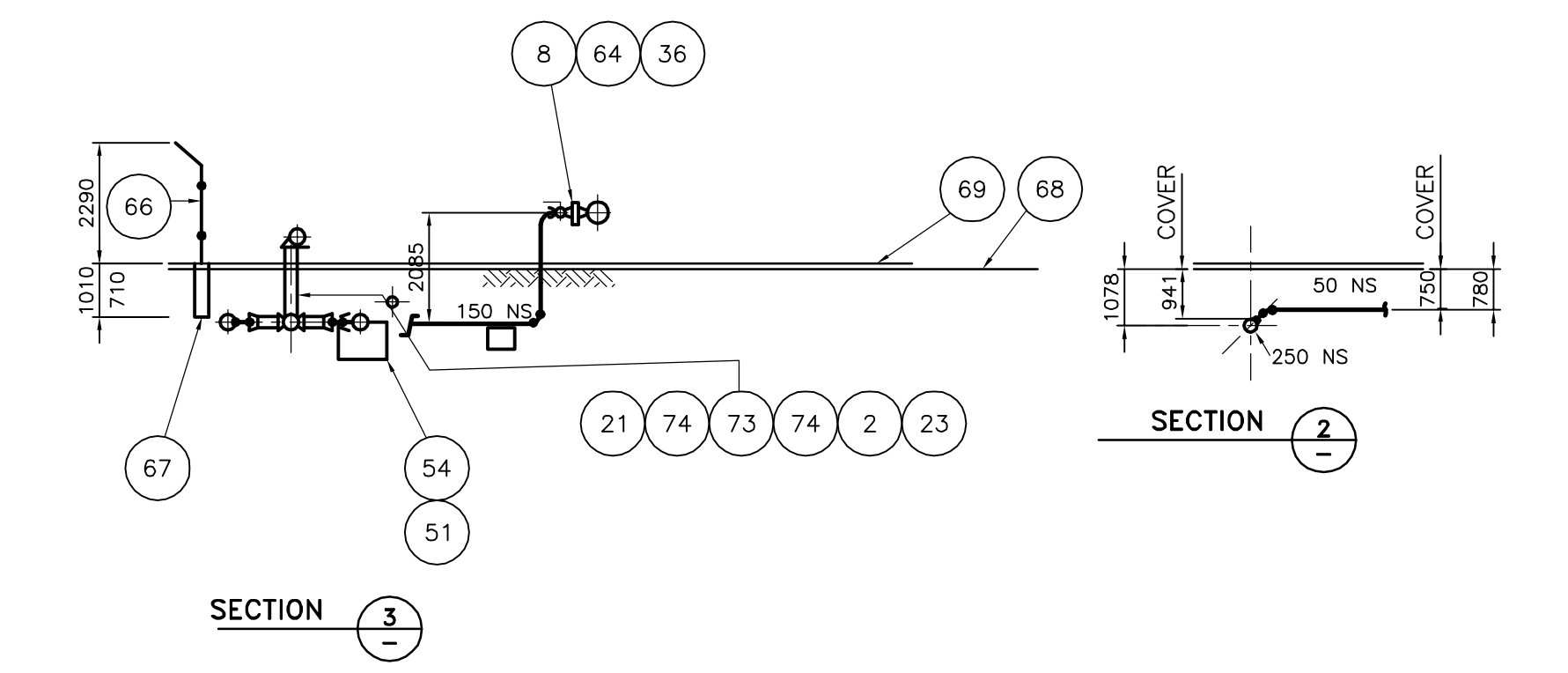
The scraper station at Warrego (KP 0610) is also the site of a compressor. The compressor is connected to underground connections either side of the mainline valve. An actuated valve with manual bypass / pressuring line is installed at each connection. The actuated valves are provided with an instrument gas connection from the Warrego compressor site.

The remainder of the Warrego compressor site is not considered within this hazardous area classification.



The site arrangement drawings and P&IDs for Warrego Scraper Station can be found overleaf.

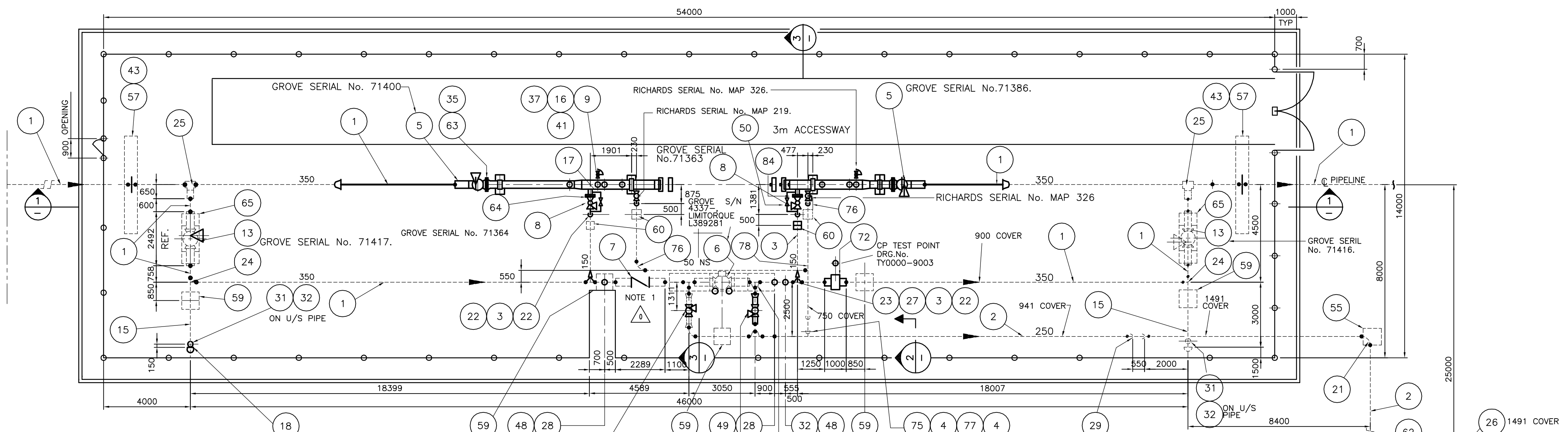
<b>Drawing Number</b>	<b>Description</b>	<b>Revision</b>
<b><i>APA Group Arrangement Drawing</i></b>		
AD 0610-6004	Warrego Scraper Station 350 NS Arrangement	0
<b><i>Fyfe Updated Plot Plan</i></b>		
AD 0610-6005	Scraper station 350 NS – Warrego	0
<b><i>P&amp;ID</i></b>		
AD 0610-7001	Warrego Compressor Station	1
AD 0610-7010	Warrego Scraper Station	1



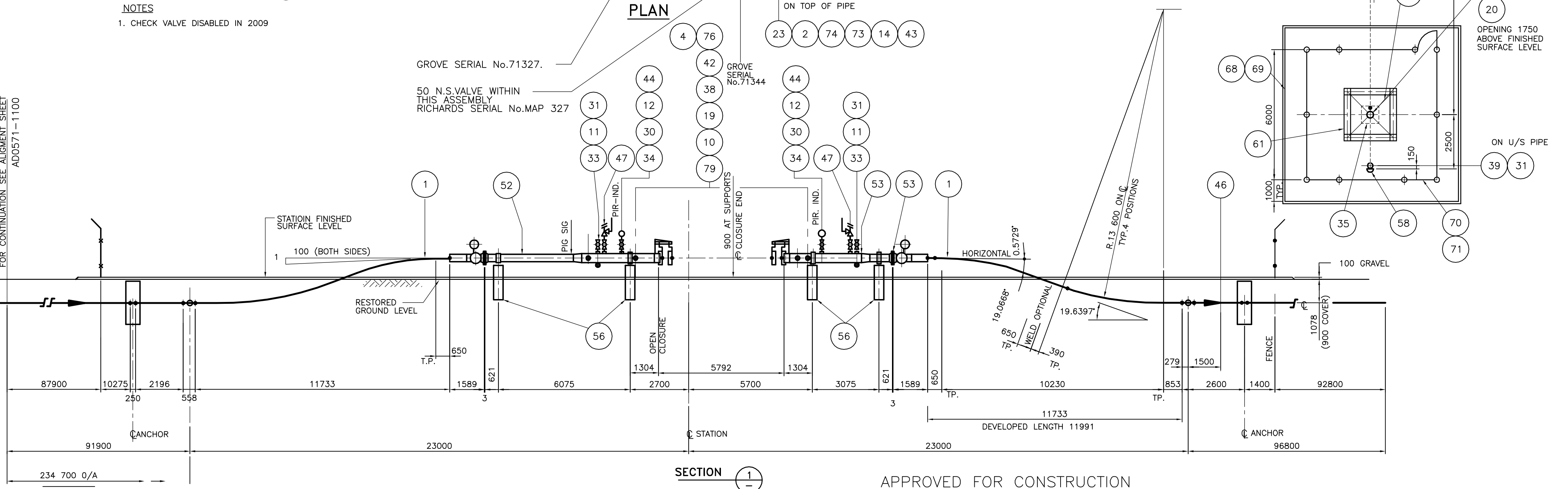
BILL OF MATERIAL			
ITEM	QTY.	DESCRIPTION	CODE NO
* INDICATES MATERIAL TO BE SUPPLIED BY PRINCIPAL			
70	1 SET	FENCE 2 RAIL TYPE 2.29m HIGH INCL 45° OVERHANG 24m O/A	
		LENGTH COMPRISING 5 CORNER / GATE, 5 INTERM. POSTS, MAN	
		GATE 0.9m OPENING WITH LOCK, CHAINWIRE MESH, BARB WIRES,	
		GALVANISED CYCLONE OR EQUIVALENT	
71	1 SET	FENCE FOUNDATIONS COMPRISING 5 - 250 DIA. x 1010 DEEP	
		CORNER/GATE POST FOOTINGS, 5-200 DIA. x 710 DEEP INTERM.	
		POST FOOTING, 20 MPa MASS CONCRETE	
72	1	INSULATING JOINT 350 NS 600#	C1004
73	2	VALVE BALL 200 NS 600# WE XS C/W 300 LG	C0163
		PUPS & GEAR OPERATOR MOUNTED ON EXTENSION	
		2100 ABOVE Q VALVE	
74	3	RED CON 250 x 200 NS XS	ASTM A234 WPB C0815
75	1	WOL 250-200 x 50 NS XS	ASTM A105 C0772
76	5	ELBOW 90° 50 NS XS	ASTM A234 WPB C0733
77	1	ELBOW 45° 50 NS XS	ASTM A234 WPB C0741
78	1	TEE EQUAL 50 NS XS	ASTM A234 WPB C0758
79	2 SETS	INSULATING KIT 50NS 600# RF	C1017

BILL OF MATERIAL			
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* INDICATES MATERIAL TO BE SUPPLIED BY PRINCIPAL			
60	4	FOUNDATION ITEM 6	DRG No AD0000-1001
61	1	FOUNDATION ITEM 3	DRG No AD0000-1003
62	1	PIPE BRACE	DRG No AD0000-6111
63	2 SETS	INSULATING KIT 350 NS 600# RF	C1010
64	2 SETS	INSULATING KIT 150 NS 600# RF	C1014
65	2	FOUNDATION ITEM 1	DRG No AD0000-1001
66	1 SET	FENCE RAILLESS TYPE 2.29m HIGH INCL 45° OVERHANG 136m O/A	
		LENGTH COMPRISING 4 CORNER, 4 GATE & 39 INTERM. POSTS,	
		STRUTS AS REQD, DOUBLE GATE 3.6m OPENING WITH DROP	
		BOLTS & LOCK, MAIN GATE WITH LOCK, CHAIN WIRE MESH	
		& BARB WIRES, GALV. CYCLONE OR EQUIVALENT	
67	1 SET	FENCE FOUNDATIONS COMPRISING 8 - 250 DIA. x 1010 DEEP	
		CORNER/GATE POSTS FOOTINGS, 39 - 200 DIA. x 710 DEEP	
		INTERM. POST FOOTINGS & ONE 300x 200 x 200 DEEP GATE	
		PAD WITH 2 HOLES FOR DROP BOLTS - 20 MPa MASS CONCRETE	
68	978m <sup>2</sup>	POLYTHENE SHEET 0.1mm THK. (COVERAGE AREA GIVEN)	
69	98.0m <sup>3</sup>	GRAVEL GRADED (COMPACTED VOLUME GIVEN)	

BILL OF MATERIAL			
ITEM	QTY.	DESCRIPTION	CODE NO
* INDICATES MATERIAL TO BE SUPPLIED BY PRINCIPAL			
1	252m	PIPE 350 NS 8.74 WT API 5L X-60	C0008
2	56m	PIPE 250 NS XS ASTM A106 B	C0062
3	8.3m	PIPE 150 NS XS ASTM A106 B	C0064
4	21m	PIPE 50 NS XS ASTM A106 B	C0067
5	2	VALVE BALL 350 NS 600# FE RF/WE FULL BORE C/W PUP 700 LG & WITH GEAR OPERATOR	C0166
6	1	VALVE BALL 350 NS 600# WE FULL BORE 2492 O/A	C0154
		LGTH. C/W PUPS & WITH GAS HYDRAULIC OPERATOR	
		MOUNTED ON EXTENSION 2100 ABOVE Q VALVE	
7	1	VALVE CHECK 350 NS 600# WE 8.74 WT SWING C/W PUPS 700 LG. - DISABLED IN 2009	C0401
8	2	VALVE BALL 150 NS 600# WE XS/FE RF WITH GEAR OPERATOR	C0180
9	2	VALVE BALL 80 NS 600# FE RF	C0212
10	2	VALVE BALL 50 NS 600# FE RF	C0213
11	2	VALVE BALL 25 NS 600# SW/NPT	C0240
12	2	VALVE GAUGE 15 NS 600# SCR NPT C/W BLEED, M/F	C0247
13	2	VALVE BALL 350 NS 600# WE FULL BORE 2492 O/A LGTH. C/W PUPS & WITH GEAR OPERATOR MOUNTED ON EXTENSION 2100 ABOVE Q VALVE	C0160
14	0.4m	PIPE 200 NS XS ASTM A106 B	C0063
15	5.5m	PIPE 350 NS 12.7 WT API 5L X-52	C0035
16	2	FLGE BLIND 80 NS 600#RF	ASTM A105 C0564
17	1	PIPE ASSY	DRG No AD0000-6156
18	2	CAP 350 NS XS MSS SP 75 WPHY-52	C0657
19	2	FLGE WN 50 NS 600# RF XS ASTM A105	C0541
20	1	CLOSURE 250 NS 600# WE XS VERT C/W DAWT	ASTM A105 C0985
21	2	ELBOW 90° LR 250 NS XS	ASTM A234 WPB C0728
22	4	ELBOW 90° LR 150 NS XS	ASTM A234 WPB C0730
23	4	TEE RED 350x250NS XS	MSS SP 75 WPHY-52 C0667
24	2	TEE EQUAL 350 NS XS	MSS SP 75 WPHY-52 C0662
25	2	TEE BARRED 350 NS	DRG No AD0000-6102
26	1	TEE EQUAL 250 NS XS	ASTM A234 WPB C0753
27	2	RED CON 250 x 150 NS XS	ASTM A234 WPB C0816
28	2	WOL 450-300x50 NS XS	ASTM A105 C0771
29	2	ELBOW 45° 250 NS XS	ASTM A234 WPB C0736
30	2	COUPLING 15 NS 3000# NPT	ASTM A105
31	5	PLUG HEX 25 NS SCR NPT	ASTM A105
32	3	TOL 900-300 x 25 NS 3000# NPT	ASTM A105
33	2	NIPPLE 25 NS x 100 SCH 160 PBE	ASTM A106 B
34	2	NIPPLE 15 NS x 75 SCH 160 POE/TOE	ASTM A106 B
35	40	STUDBOLT 1 3/8" UNC x 235	ASTM A193 B7
		C/W 2 NUTS	ASTM A194 2H
36	24	STUDBOLT 1" UNC x 170	ASTM A193 B7
		C/W 2 NUTS	ASTM A194 2H
37	32	STUDBOLT 3/4" UNC x 125	ASTM A193 B7
		C/W 2 NUTS	ASTM A194 2H
38	32	STUDBOLT 5/8" UNC x 110	ASTM A193 B7
		C/W 2 NUTS	ASTM A194 2H
39	1	TOL 250-150 x 25 NS 3000# NPT	ASTM A105
40	1	THERMOWELL 25 NS WITH PLUG	PART OF C.3078
41	4	GASKET 80 NS 600# 4.4 THK	METAFLEX SG
42	2	GASKET 50 NS 600# 4.4 THK	METAFLEX SG
43	2	FLGE ANCHOR 350 NS	DRG No AD0000-6101 C0994
44	2	PLUG HEX 15 NS SCR NPT.	ASTM A105
45	1	TEE RED 250 x 200 NS XS	ASTM A234 WPB C0766
46	1	PIG SIG EXTENDED 1.8m (350 NS)	C1020
47	2	PIPE ASSY	DRG No AS0000-6112
48	1	PIPE ASSY	DRG No AD0000-6104
49	1	PIPE ASSY	DRG No AD0000-6109
50	1	PIPE ASSY	DRG No AD0000-6157
51	4	PIPE CLAMP	DRG No AD0000-6110
52	1	TRAP RECEIV. 350 NS	DRG No AD0000-6122
53	1	TRAP LAUN 350 NS	DRG No AD0000-6121
54	1	FOUNDATION ITEM 1	DRG No AD0000-1003
55	2	FOUNDATION ITEM 2	DRG No AD0000-1003
56	4	FOUNDATION ITEM 3	DRG No AD0000-1001
57	2	ANCH BLOCK ITEM 3	DRG No AD0000-1001
58	1	CAP 250 NS XS	ASTM A234 WPB C0744
59	5	FOUNDATION ITEM 5	DRG No AD0000-1001



NOTES  
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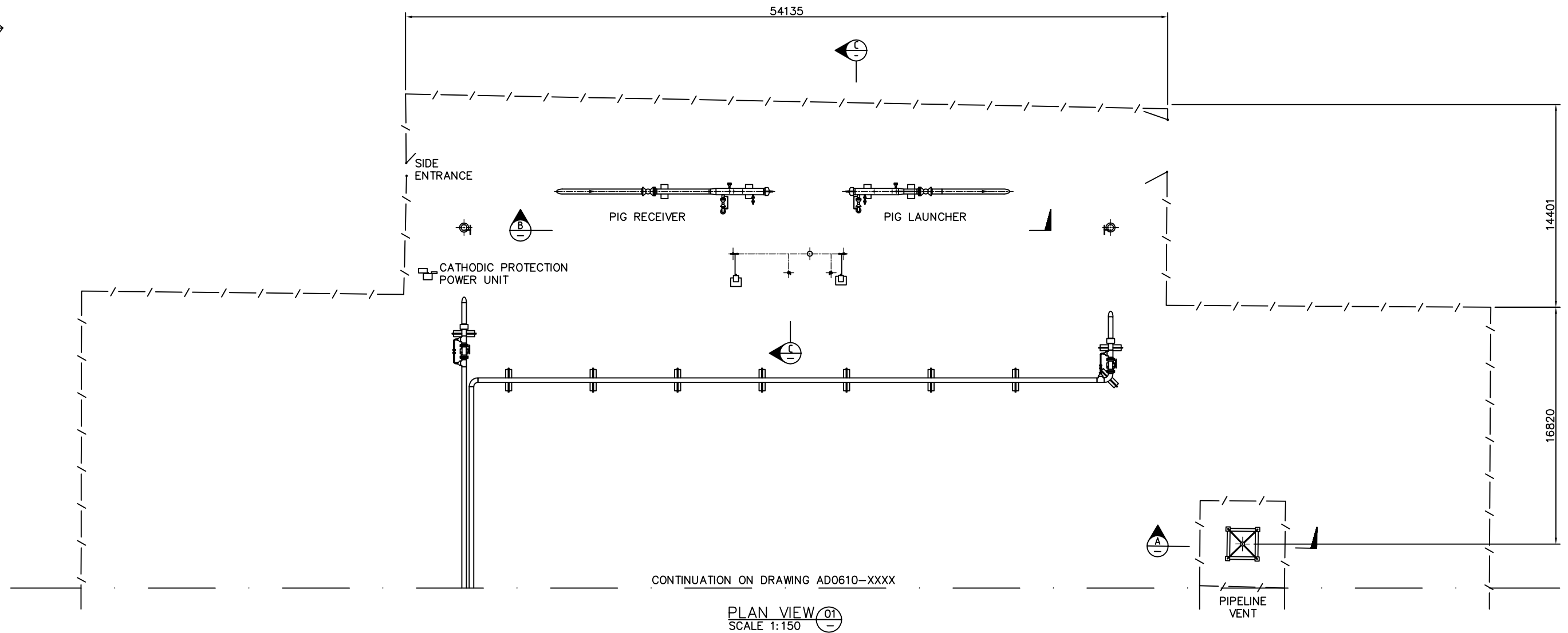
APPROVED FOR CONSTRUCTION

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**N.T. GAS**  
Pty. Limited  
ACN 050 221 415

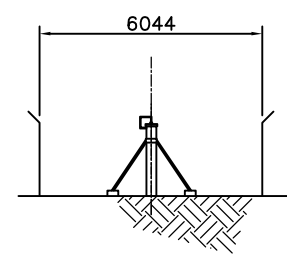
16 Georgia Crescent PALMERSTON NT  
PO Box 7 PALMERSTON NT 0831  
Telephone: (08) 8935 1611  
Facsimile: (08) 8932 1663

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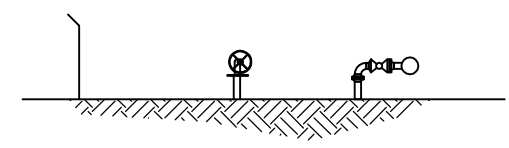
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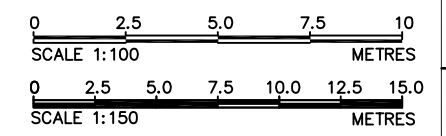
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SECTION B  
SCALE: 1:150



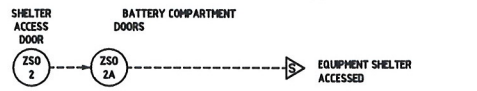
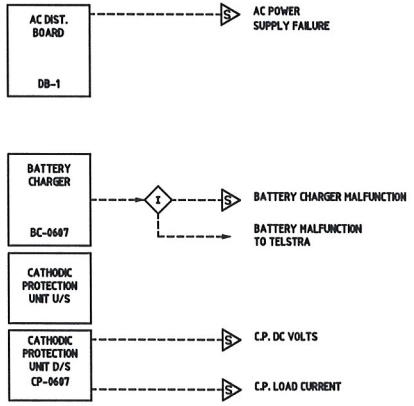
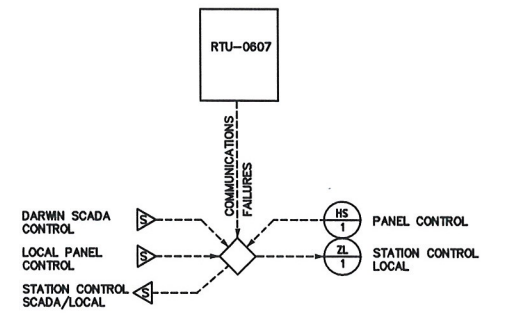
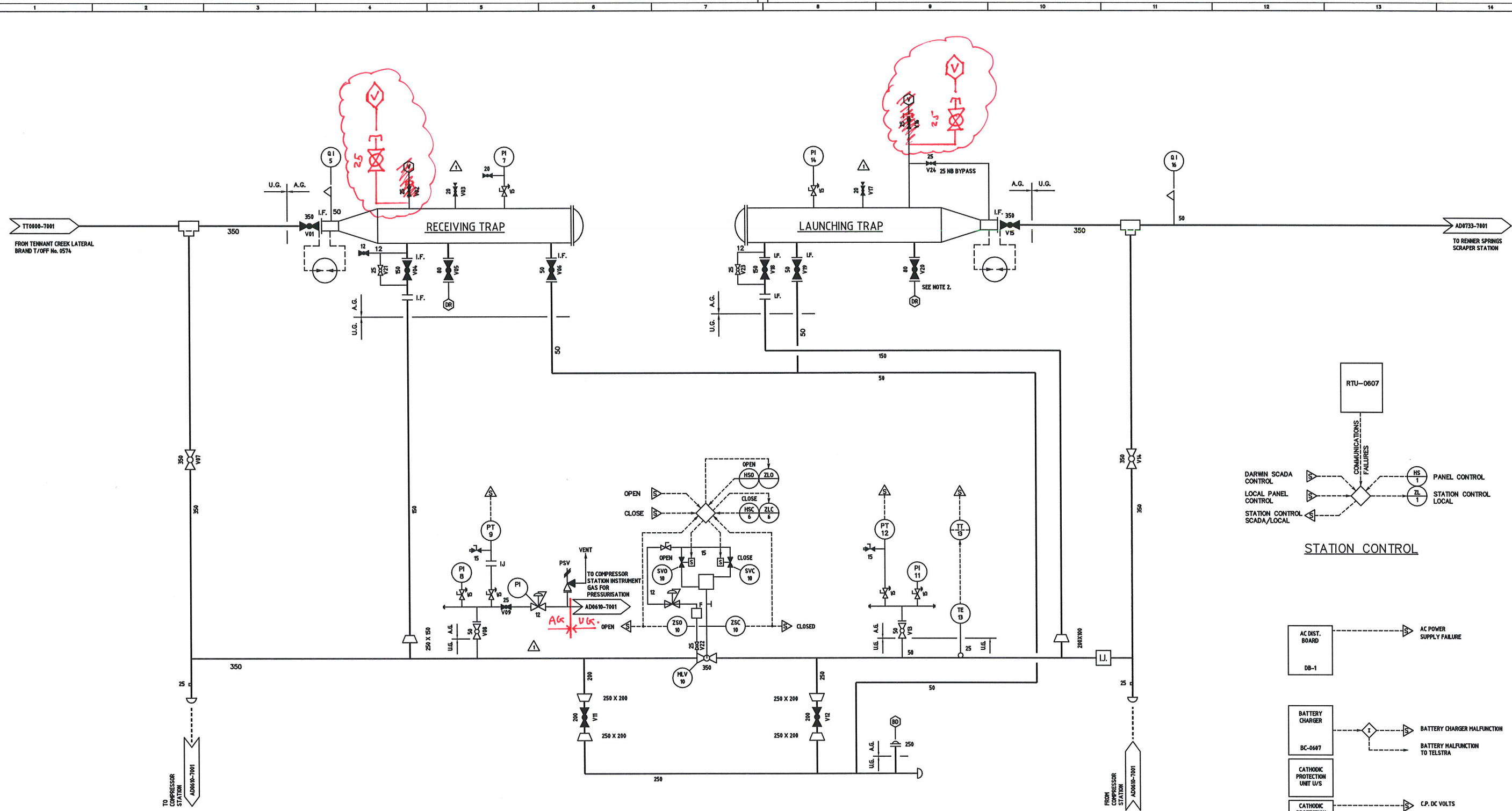
SECTION C  
SCALE: 1:100



- NOTES:
1. LOCATION OF UNDERGROUND SERVICES NOT CONFIRMED AND NOT SHOWN ON THIS DRAWING, REFER TO DRAWING AD0610-6004 ALL FOR PIPING DETAILS.
  2. ALL DIMENSIONS ARE BASED ON 3D SCAN DATA. ALL 3D DATA RETAINED BY FYFE

REV	REVISION DESCRIPTION	DATE	DRAWN	CHECKED	APP.	REFERENCE DRAWINGS	ORIGINATOR
1	ORIGINAL ISSUE AS PER P&ID SCHEMATA	13/07/11	TYFE	TCH			
2							

<b>FYFE Earth Partners</b> ACN 008 134 100 LEVEL 3, 80 FLINDERS STREET, ADLAIDE, SA 5000 TEL: 080 020 0400 FAX: 080 870 0400 Email: info@fyfe.com.au		<b>APA Group</b>		SHEET NO. 14 SCALE AS SHOWN PROJECT: AMADEUS BASIN TO DARWIN PIPELINE LEVEL: SCRAPER STATION 350 NS FIELD BOOK: PLOT PLAN - WARREGO DRAWN: TYFE CHECKED: TCH PROJECT NO. WARREGO DRAWING NO. AD0610-6005 REV: 0
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MARK UP BY  
TCB  
28/10/11

DWG No.	REFERENCE DRAWINGS
WB 0607-7002	S.L. DIAG./ CONTROL SCHEMATIC
WB 0607-7003	INSTRUMENT LOOP DIAGRAM
WB 0607-7004	INTERCONNECTION / CABLE SCHEDULE
WB 0607-7005	SITE LAYOUT
WB 0607-7006	EQUIPMENT PANEL LAYOUT
AD 0000-7006	INSTRUMENT INSTALLATION DETAILS
AD 0000-7016	MAINS POWER EQUIP. SHELTER LAYOUT & DETAILS
AD 0000-7018	EQUIPMENT LAYOUTS & CABLE ROUTES

NOTES  
 1. ALL EQUIPMENT/INSTRUMENT TAG NUMBERS SHALL BE SUFFIXED WITH THE STATION NUMBER eg. PT-9-12A1  
 2. CONNECT PIPING FOR E.R. YARD WHEN REQUIRED.

No.	DATE	REVISION	BY	CHKD	ENG	ENG MGR	PROJ MGR	APP'D	No.	DATE	REVISION	BY	CHKD	ENG	ENG MGR	PROJ MGR	APP'D
1	SEP'09	PSV REMOVED AND CHECK VALVE REMOVED	HL	BP				HD									
0	OCT'07	NEW DRAWING NUMBER, REFERENCE PREVIOUS DRG NO WD0607-7001 REV11	DCH	PDW				HD									

CMPS&F PTY LIMITED  
 ENGINEERS AND PROJECT MANAGERS  
 A.C.N. 000 912 630  
 67 ALBERT AVENUE, CHATSWOOD, NSW, AUSTRALIA. 2067  
 TEL. (+ 61 2) 9412 9999 FAX. (+ 61 2) 9412 9855

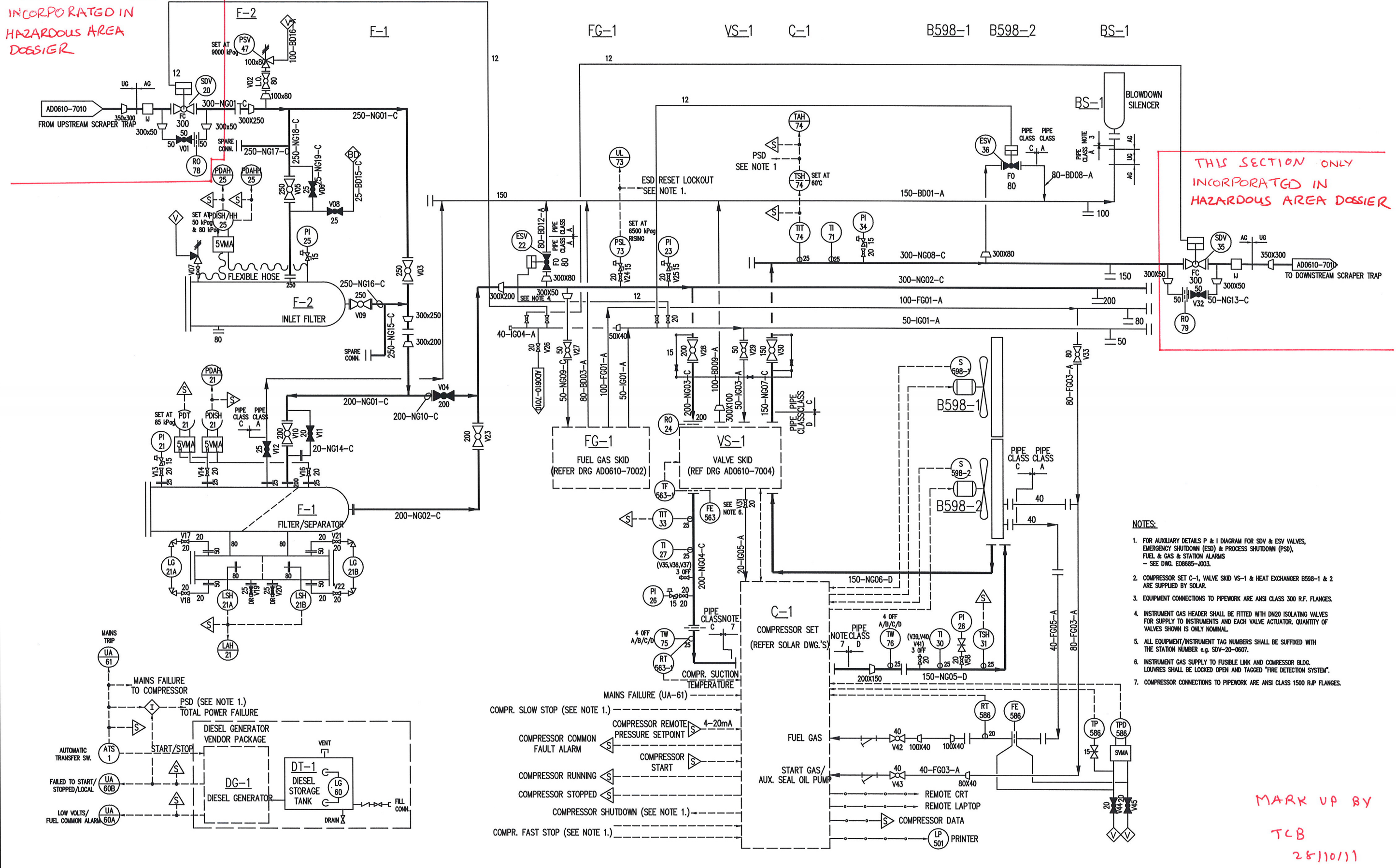
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CLIENT		N.T. GAS	
TITLE		AMADEUS BASIN TO DARWIN PIPELINE WARREGO SCRAPER STATION P & I DIAGRAM	
DRG. SIZE	SCALE	JOB No.	DRAWING No.
B1	NTS	6850-000	AD 0610-7010
REV.			1



THIS SECTION ONLY  
INCORPORATED IN  
HAZARDOUS AREA  
DOSSIER

THIS SECTION ONLY  
INCORPORATED IN  
HAZARDOUS AREA  
DOSSIER



- NOTES:
- FOR AUXILIARY DETAILS P & I DIAGRAM FOR SDV & ESV VALVES, EMERGENCY SHUTDOWN (ESD) & PROCESS SHUTDOWN (PSD), FUEL & GAS & STATION ALARMS - SEE DWG. E08685-1003.
  - COMPRESSOR SET C-1, VALVE SKID VS-1 & HEAT EXCHANGER B598-1 & 2 ARE SUPPLIED BY SOLAR.
  - EQUIPMENT CONNECTIONS TO PIPEWORK ARE ANSI CLASS 300 R.F. FLANGES.
  - INSTRUMENT GAS HEADER SHALL BE FITTED WITH DN20 ISOLATING VALVES FOR SUPPLY TO INSTRUMENTS AND EACH VALVE ACTUATOR. QUANTITY OF VALVES SHOWN IS ONLY NOMINAL.
  - ALL EQUIPMENT/INSTRUMENT TAG NUMBERS SHALL BE SUFFIXED WITH THE STATION NUMBER e.g. SDV-20-0607.
  - INSTRUMENT GAS SUPPLY TO FUSIBLE LINK AND COMPRESSOR BLDG. LOUVRES SHALL BE LOCKED OPEN AND TAGGED "FIRE DETECTION SYSTEM".
  - COMPRESSOR CONNECTIONS TO PIPEWORK ARE ANSI CLASS 1500 R/P FLANGES.

MARK UP BY  
TCB  
28/10/11

REV.	REVISION DESCRIPTION	DRAWN	CHECK	APP'D	DATE	REFERENCE DRAWINGS	INITS.	SIGNATURE	DATE	CLIENT	TITLE	DRG. SIZE	SCALE	DRAWING No.	REV.
1	UPDATED CONTINUANCE DRAWING NUMBERS	BP	ML	HD	26/5/10	AD0607-7004					N.T. GAS PTY. LTD.	A1	NTS	AD0610-7001	1
0	NEW DRAWING NUMBER. REF PREVIOUS DRG NO AD0607-7001 REV 5	DCH	BP	HD	10.06.08	AD0607-7002									
						49731-1500-F001		SOLAR - P & I PIPE VALVE SKID							
						49731-149356		SOLAR - AIR/GAS START SYSTEM SCHEMATIC							
						49731-A149201		SOLAR - LUBE OIL SYSTEM SCHEMATIC							
						49731-B149410		SOLAR - GAS OIL SYSTEM SCHEMATIC							
						49731-149356		SOLAR - GAS FUEL SYSTEM SCHEMATIC							
						WB0807-7001		WARREGO SCRAPER STATION P & I DIAGRAM							
						AD0607-7004		P & I DIAGRAM LEGEND							
						AD0607-7003		COMPRESSOR STATION AUXILIARY DETAILS							
						AD0607-7002		COMPRESSOR STATION FUEL/START/INSTRUMENT GAS STATION							



## **2 Hazardous Area Classification Report**

This section contains the hazardous area classification report written for the Amadeus Basin to Darwin pipeline facilities.

# AMADEUS BASIN TO DARWIN PIPELINE HAZARDOUS AREA CLASSIFICATION



FYFE REFERENCE: 18756-4-HAD-001

APA REFERENCE: HAD DATA REPOSITORY/ADP\_18756\_HADC

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## TABLE OF CONTENTS

<b>2.1 INTRODUCTION</b> .....	<b>3</b>
2.1.1 Objective.....	3
2.1.2 Scope of Stations .....	4
2.1.3 Exclusions .....	5
2.1.4 Revision History.....	5
2.1.4.1 <i>Revision A</i> .....	5
2.1.4.2 <i>Revision B</i> .....	5
2.1.4.3 <i>Revision C</i> .....	5
2.1.4.4 <i>Revision D</i> .....	6
2.1.4.5 <i>Revision E</i> .....	6
2.1.4.6 <i>Revision 0</i> .....	6
<b>2.2 Methodology</b> .....	<b>7</b>
<b>2.3 References</b> .....	<b>8</b>
2.3.1 Australian Standards .....	8
2.3.2 International Standards .....	8
<b>2.4 Process Description and Operations</b> .....	<b>9</b>
2.4.1 Process Description.....	9
2.4.1.1 <i>Overview</i> .....	9
2.4.1.2 <i>Mereenie</i> .....	9
2.4.1.3 <i>Palm Valley</i> .....	10
2.4.1.4 <i>Palm Valley Alice Springs</i> .....	10
2.4.1.5 <i>Tylers Pass</i> .....	11
2.4.1.6 <i>Tennant Creek Metering Station</i> .....	12
2.4.1.7 <i>Elliott Meter Station</i> .....	13
2.4.1.8 <i>Daly Waters Scraper and Meter Station</i> .....	13
2.4.1.9 <i>Katherine Offtake</i> .....	14
2.4.1.10 <i>Katherine Meter / Regulating Station</i> .....	14
2.4.1.11 <i>Pine Creek</i> .....	15
2.4.1.12 <i>Darwin City Gate</i> .....	16
2.4.1.13 <i>Channel Island</i> .....	17
2.4.1.14 <i>Scraper Stations</i> .....	18
2.4.1.15 <i>Ban Ban Springs Scraper Station</i> .....	18
2.4.1.16 <i>Warrego Scraper Station</i> .....	19
2.4.1.17 <i>Mainline Valves</i> .....	19
2.4.1.18 <i>Bachelor Mainline Valve</i> .....	20
2.4.2 Operating Conditions.....	20
2.4.3 Ventilation.....	20
<b>2.5 Properties of Hazardous Materials</b> .....	<b>21</b>
2.5.1 Gases Handled.....	21
2.5.2 Liquids Handled.....	23
2.5.2.1 <i>Filter Separator Drains</i> .....	23
2.5.2.2 <i>Odorant</i> .....	23
<b>2.6 EQUIPMENT SELECTION</b> .....	<b>24</b>
<b>2.7 CLASSIFICATION</b> .....	<b>25</b>
2.7.1 Piping .....	25
2.7.1.1 <i>Process Piping</i> .....	25
2.7.1.2 <i>Instrument Gas Piping</i> .....	25
2.7.1.3 <i>Fuel Gas Piping</i> .....	26
2.7.1.4 <i>Control Valves</i> .....	26
2.7.1.5 <i>Pressure Relief and Safety Relief Valves</i> .....	26
2.7.1.6 <i>Mainline Valves</i> .....	27

2.7.1.7	Local Vent Point.....	28
2.7.1.8	Pine Creek Vent Stack.....	28
2.7.1.9	Pipeline Blowdown.....	28
2.7.1.10	Low Velocity Vents.....	29
2.7.2	Scraper Vessels.....	29
2.7.3	Multicyclone and Filter Separators.....	30
2.7.4	Slop Tanks.....	30
2.7.5	Water Bath Heaters.....	31
2.7.6	Catalytic Heater.....	31
2.7.7	Knockout Pots.....	32
2.7.8	Gas Chromatograph System.....	32
2.7.9	Water Dew Point Analyser / Gas Sampler.....	33
2.7.10	Odorant Injection System.....	34
2.7.10.1	Odorant Pipework.....	34
2.7.10.2	Odorant Storage Tank.....	35
2.7.10.3	Odorant Injection Pumps.....	35
2.7.11	Ground Effect.....	36
2.7.12	Vapour Barriers.....	37
<b>APPENDIX A HAZARDOUS AREA CLASSIFICATION DATA SHEET.....</b>		<b>38</b>
<b>APPENDIX B HAZARDOUS AREA MAPPING DRAWINGS.....</b>		<b>44</b>

**Revision History:**

Rev.	Status	Date	Prepared	Reviewed	QA
A	Preliminary Issue	30/08/2010	YZW	TCB	
B	Revised to Incorporate Information from 2011 Part 1 Site Inspection	24/08/2011	TCB	RDK	
C	Revised to Incorporate Comments from Client	19/09/2011	TCB	RDK	
D	Revised to following 2011 Part 3 and Part 4 site inspections	26/09/2011	TCB	RDK	
E	Revised following 2011 Part 2 site inspections	10/10/2011	TCB	RDK	
0	Original Issue	24/11/2011	TCB	RDK	EZG

## 2.1 INTRODUCTION

### 2.1.1 OBJECTIVE

The hazardous area classification covers the above ground gas regulating and metering stations, scraper stations and mainline valves in the Northern Territory Gas Network.

The pipeline and facilities were originally constructed in 1985 with the additional facilities added to supply new users and supply points. No hazardous area documentation was completed at the time of the construction as there were no Australian Standards for hazardous area classification in 1985. The selection, installation and maintenance of electrical equipment were covered by AS 1076 series (1977).

This report documents the results of a Hazardous Area Classification undertaken for the facilities mentioned in Section 2.4.

The interpretation and application of this classification should take into account that Hazardous Area Classifications are inherently “imprecise” and involve assumption based estimates, code interpretation and engineering judgement.



## 2.1.2 SCOPE OF STATIONS

The scope of stations covered by this hazardous area classification is shown below:

Station	Description	KP
Palm Valley	Meter Station	0000
Palm Valley Alice Springs	Meter Station	0000
Mereenie	Meter Station	0000*
Tylers Pass	Transfer Station	0045
Tanami Road	Scraper Station	0161
Aileron	Mainline valve	0241
Ti Tree	Scraper Station	0316
Barrow Creek	Mainline Valve	0401
Wauchope	Scraper Station	0458
Kelly Well	Mainline Valve	0546
Tennant Creek	Meter Station	0025†
Warrego	Scraper Station ONLY	0610
Morphett Creek	Mainline Valve	0660
Renner Springs	Scraper Station	0733
Fergusson	Mainline Valve	0791
Elliott Meter Station	Meter Station	0003‡
Daly Waters	Meter Station	0982
Newcastle Waters	Scraper Station	0844
Katherine Offtake	Scraper Station	0000**
Katherine	Meter Station	0005**
Larrimah	Mainline Valve	1053
Mataranka	Scraper Station ONLY	1108
Tindal	Mainline Valve	1209
Helling	Scraper Station	1243
Pine Creek	Meter Station	1317
Ban Ban Springs	Scraper Station	1378
Batchelor	Mainline Valve	1441
Acacia	Mainline Valve	1465
Berry Springs	Mainline Valve	1486
Darwin City Gate	Meter Station	1498
Channel Island	Meter Station	1510

\* On Mereenie to Tylers Pass Pipeline

\*\* On ADP to Katherine Pipeline

† On ADP to Tennant Creek Pipeline

‡ On ADP to Elliott Pipeline

### 2.1.3 EXCLUSIONS

The following stations are excluded from this hazardous area classification

- Alice Springs facilities (owned and operated by Envestra),
- McArthur River Mine pipeline lateral facilities,
- Warrego compression facilities (scraper facilities are included),
- Tenant Creek offtake,
- Helling scraper station training pipework,
- Cosmo Howley facilities,
- Mt Todd facilities,
- Weddell facilities,
- Mataranka meter station.

The hazardous area classification does not consider the hazardous area associated with equipment not included in the pipeline licence, e.g. gas plants at Mereenie and Palm Valley, and the gas reticulation facilities at Darwin.

### 2.1.4 REVISION HISTORY

#### 2.1.4.1 *Revision A*

The hazardous area classification was raised and issued following the inspection of four sites on the Amadeus Basin to Darwin Pipeline in 2010, as listed below:

- Darwin City Gate Station
- Channel Island Station
- Helling Scraper Station
- Pine Creek Station

#### 2.1.4.2 *Revision B*

Further inspection of sites was undertaken in August 2011 and the hazardous area classification updated to incorporate sources of hazardous release from the equipment at these sites. The additional sites inspected were:

- Mereenie Station
- Palm Valley Meter Station
- Palm Valley Interconnect / Alice Springs Meter Station
- Tylers Pass Station
- Tanami Road Scraper Station
- Aileron Valve Site
- Ti Tree Scraper Station

#### 2.1.4.3 *Revision C*

The hazardous area classification updated to incorporate comments and recommendations from APA.

#### 2.1.4.4 *Revision D*

Further inspection of sites was undertaken in September 2011 and the hazardous area classification updated to incorporate sources of hazardous release from the equipment at these sites. The additional sites inspected were:

- Katherine Meter Station
- Mataranka Scraper Station
- Ban Ban Springs Scraper Station
- Batchelor Valve Site
- Berry Springs Valve Site

In addition there were some revisions to site descriptions for the stations included at revision to ensure consistency.

#### 2.1.4.5 *Revision E*

Further inspection of sites was undertaken in October 2011 and the hazardous area classification updated to incorporate sources of hazardous release from the equipment at these sites. The additional sites inspected were:

- Wauchope Scraper Station
- Tennant Creek Meter Station
- Warrego Springs Scraper Station
- Renner Springs Scraper Station
- Elliott Meter Stations
- Newcastle Waters Scraper Station
- Daly Waters Meter Station

#### 2.1.4.6 *Revision 0*

- Original Issue for use.

## 2.2 METHODOLOGY

This Hazardous Area Classification has been carried out in accordance with the “source-by-source” guidance taken from AS/NZS 60079.10.1 (Standards Association of Australia and New Zealand), in association with IP Code Part 15 (Institute of Petroleum – UK) and API RP 505 (American Petroleum Institute – USA).

The potential leaks that can be anticipated in both normal and abnormal operations have been considered, such as the failure of a valve gland and the partial failure of a gasket flange. The application of explosion proof (Ex) equipment will make sure that ignition does not take place. The classification does not allow for catastrophic failure of pipework or equipment where the associated mechanical effects are almost certain to cause ignition.

The extent of Zone 0, 1 and 2 areas has been identified by investigating each relevant source or type of source.

Due to the imprecision inherent in hazardous area classification, the designation of small non-hazardous area within larger hazard areas has been avoided.

Natural boundaries have been used to define zone limits where reasonably practical. In some cases, where believed adequate, this has reduced the assigned area to some extent. In other cases, where there is no economic disadvantage, the zone areas have been extended to simplify their arrangement.

The equipment and pipework in the stations are installed in open outdoor (all sides of the compounds are open and the stations are not installed in natural depressions), therefore they are considered adequately ventilated. This classification assumes that all stations on the ADP covered by this report are well maintained at all times.

## 2.3 REFERENCES

### 2.3.1 AUSTRALIAN STANDARDS

AS/NZS 60079.10.1:2009	Explosive atmospheres Part 10.1: Classification of areas – Explosive gas atmospheres (IEC 60079-10-1, Ed.1.0(2008) MOD)
AS/NZS 60079.20:2000	Electrical apparatus for explosive gas atmospheres Part 20: Data for flammable gases and vapours, relating to the use of electrical apparatus

### 2.3.2 INTERNATIONAL STANDARDS

IP 15 Third Edition, 2005	Model code of safe practice Part 15: Area classification code for installations handling flammable fluids
API RP 505 First Edition, 1997	Classification of locations for electrical installations at petroleum facilities classified as Class I, Zone 0, Zone 1, and Zone 2



## 2.4 PROCESS DESCRIPTION AND OPERATIONS

### 2.4.1 PROCESS DESCRIPTION

#### 2.4.1.1 Overview

The Amadeus Darwin Pipeline (ADP) was constructed to deliver gas from the Palm Valley and Mereenie gas plants in the south of the Northern Territory to Darwin in the north of the territory. Several offtakes have been added to supply users along the length of the pipeline. The pipeline is approximately 1,513 km long.

Currently, the majority of the gas is supplied to the ADP from Wadeye via the Bonaparte pipeline. The Bonaparte pipeline connects in to the ADP at Ban Ban Springs.

Typically drains and vents in the facilities are fitted with plugs or caps and therefore are not a source of release during normal operation. Drains are operated only when then the pipeline is depressured and do not require further consideration, vent points marked with BD on the P&IDs are assumed to be operated during routine operation and maintenance of the station and require consideration as a source of release.

#### 2.4.1.2 Mereenie

Gas to the Mereenie station comes from the Santos operated Mereenie gas plant. Currently there is no contract for the supply of gas from Mereenie, however the station remains pressurised and can be returned to operation if required.

The station consists of DN 200 above ground connection to the Mereenie gas plant. Close to the connection point are temperature and pressure transmitters and high temperature and pressure trips and a station limit valve (SLV). The SLV is pneumatically actuated from instrument gas conditioned locally. The instrument gas system is provided with a local PSV that vents to atmosphere.

The gas then passes to two parallel filter separators. The filter separators are horizontal and fitted with quick opening closures to allow removal of the filter elements. The filter separators have been swapped with the filters originally installed at Palm Valley and this required some pipework modifications. The liquids removed from the gas are collected in a drain boot underneath the filter separator. The liquids are drained back to the Mereenie production facility. The filter separators are fitted with the following instrumentation; pressure indicator, differential pressure transmitter, level glasses, high level switches and a PSV.

From each filter separator the gas flows to a meter run. The flow meters are orifice meters that are fitted with flow conditioners, pressure transmitter, a low range and a high range differential pressure transmitter and a temperature transmitter. A blowdown point is provided on each meter run that can blow down the meter run and filter separator.

The pipework downstream of each meter run joins to a common line. There is a DN 20 blowdown point and an insertion sample probe installed to provide gas samples for the gas chromatograph and dew point analyser.

The gas then passes underground through a manual station limit valve to the Mereenie to Tylers Pass pipeline. There is a scraper launcher installed with quick opening closure, pressure indicator, blow down vent and associated valving for the launching of pigs.

### 2.4.1.3 *Palm Valley*

The Palm Valley metering station receives gas from the Magellan Petroleum operated Palm Valley gas plant.

The station consists of DN 300 above ground connection to the Palm Valley gas plant. Close to the connection point are temperature and pressure transmitters and high value trips and a station limit valve (SLV). The SLV is pneumatically actuated from instrument gas conditioned locally. The instrument gas system is provided with a local PSV that vents to atmosphere.

The gas then passes to two parallel filter separators. The filter separators are horizontal and fitted with quick opening closures to allow removal of the filter elements. The filter separators have been swapped with the filters originally installed at Mereenie; the filters are installed in the same location and have required minimal pipework modifications. The liquids removed from the gas are collected in a drain boot underneath the filter separator. Liquids are removed to temporary containers. The filter separators are fitted with the following instrumentation; pressure indicator, differential pressure transmitter, level glasses, high level switches and a PSV.

From each filter separator the gas passes to a meter run. The flow meters are orifice meters that are fitted with flow conditioners, pressure transmitter, a low range and a high range differential pressure transmitter and a temperature transmitter. A blowdown point is provided on each meter run that can blow down the meter run and filter separator.

The pipework downstream of each meter run joins to a common line. There is a DN 20 blowdown point and an insertion sample probe installed to provide gas samples for the gas chromatograph and dew point analyser.

The gas then passes underground through a manual station limit valve to the Palm Valley to Tylers Pass pipeline. The underground section of pipe is fitted with a blowdown point. A connection point and additional valve has been installed on the blowdown stack to provide gas to the Palm Valley to Alice Springs station. The connection point for the gas analyser has been relocated to this section of pipework to allow measurement of the gas that passes from the Amadeus Darwin Pipeline to the Alice Springs Pipeline. The pipework to the Palm Valley to Alice Springs Pipeline passes underground to a point adjacent to the Palm Valley to Alice Springs compound. There is a flanged connection to the compound fence line.

There is a scraper launcher installed with quick opening closure, pressure indicator, blow down vent and associated valving for the launching of pigs to the ADP.

### 2.4.1.4 *Palm Valley Alice Springs*

The Palm Valley Alice Springs site, also referred to as the Palm Valley Interconnect receives gas from either the Magellan operated Palm Valley gas plant or from the ADP via the Palm Valley metering station.

The gas supply from the ADP is fed to a skid. The skid has recently been modified by APA, although no information is available. From the existing P&IDs and inspection; the pipe from the Palm Valley station is DN 100. The pipe decreases to DN 80 on the skid. At the inlet to the skid there is a pressure transmitter and indicator. The gas passes to a flow meter with pressure and temperature correction. Isolation valves and a manual bypass are provided. The skid is supplied with two pressure control valves, the main one is electro-pneumatic and the stand-by one is pneumatic controlled and actuated. Downstream of the control valves is an actuated valve fitted with pressure pilots and solenoids. The instrument gas for the control valves is conditioned from the transmission gas. The instrument gas is fitted with dual pressure regulators, knock out pot, filter, a PSV and high and low pressure pilots that close the actuated valve. The vents from all two valve instrument manifolds are tubed to a location at the edge of the skid roof.

The line from the Palm Valley gas plant is DN 100 which increases to DN 200. The gas then passes to a restriction orifice (RO). Upstream of the RO is the DN 50 kicker line connection to the scraper launcher. Downstream of the RO is the connection from the ADP. Next there is a station limit valve (SLV) that isolates Palm Valley to Alice Springs pipeline from both gas feeds. The SLV is pneumatically actuated from instrument gas conditioned locally and closes when a low pressure is sensed in the pipeline.

The scraper launcher is fitted with a quick opening closure, a pressure indicator, pressure relief valve and valves to allow operation.

Parallel to the scraper launcher is a wall. The wall is 1.8 m away from the centre line of the scraper launcher. The impact of the wall on the hazardous zones will be to extend the size of the hazardous area zone (refer section 2.7.12).

#### 2.4.1.5 *Tylers Pass*

At Tylers Pass the gas from Mereenie and Palm Valley are commingled and odorant is added. The DN 250 pipeline from Mereenie passes to an above ground scraper receiver, fitted with pig sig, vent, pressure indicator, quick opening closure and valving to allow operation. During normal operation the gas bypasses the scraper vessel via underground pipework. A pipeline riser is fitted with pressure transmitter, pressure indicator and high pressure trip. Downstream, there is a buried valve with above ground pneumatic actuator. The actuator is powered by instrument gas conditioned locally from the transmission gas.

The gas from Palm Valley is similar to the Mereenie connection but does not have a scraper receiver. The pipeline is DN 350 and includes a riser with pressure transmitter and pressure indicator upstream of a buried valve with above ground pneumatic actuator. The actuator is powered by instrument gas conditioned locally from the transmission gas.

There is a DN 200 vertical blowdown stack fitted with quick opening closure. The stack has buried connections and valves to the pipeline sections to Mereenie, Palm Valley and Tanami Road, as well as the scraper receiver.

Downstream of the two actuated valves the two pipeline sections join and are fitted with a temperature transmitter, pressure transmitter, pressure indicator, instrument gas offtake and odorant injection point.

The odorant injection package consists of an odorant storage pressure vessel, instrument gas conditioning and control and odorant dosing pumps. The storage vessel is fitted with a pressure relief valve, pressure indicator, two level glasses, a level transmitter and a continuous vent fitted with adsorption vapour filter. The vent from the tank is fitted with a cap so that the discharge point is vertically downwards. The instrument gas conditioning equipment comprises two regulators to reduce the pressure to 400 kPag. The tank blanket instrument gas is regulated to 15 kPag by a pressure regulator / over pressure shut off (OPSO) valve. The injection pump instrument gas is regulated to 400 kPag by a regulator. Control of the odorant injection pumps is by solenoid valves. The odorant dosing pumps suction is connected to the bottom of the odorant storage vessel. The discharge of each odorant dosing pump is fitted with a flow switch and pressure relief valve. The odorant injection point is fitted with an averaging chamber and a site flow indicator.

Note that there is no gas supply from Mereenie or Palm Valley and the gas flow through Tylers Pass is in the reverse direction. At the time of inspection the odorant plant was not operating.

#### 2.4.1.6 Tennant Creek Metering Station

The Tennant Creek pressure reduction and metering station receives gas from ADP to Tennant Creek Pipeline, approximately 25 km long, and supplies the Tennant Creek power generation site. The Tennant Creek Station comprises of two filter separators, two water bath heaters, an atmospheric slop tank, control valves, pressure regulators, pressure relief valves, and the related pipework, instrumentation and valving.

The inlet to the station is DN 100 and consists of a scraper receiver vessel. The scraper vessel is fitted with local vent, PSV, pressure indicator and associated pipework and valving. The closure on the vessel is a blind flange.

The piping in parallel to the scraper receiver is fitted with a pressure transmitter, pressure gauge and a buried mainline valve. The valve has an aboveground gas over oil hydraulic actuator.

The gas then passes through two parallel filter separators. Upstream of both filter separators are temperature control valves that reduce the pressure to 5,200 kPag / 17°C [based on operating conditions at the time of the site visit]. The temperature control valves are provided with cascade control for pressure and temperature. The filter separators are fitted with a differential pressure transmitter, pressure indicator, high liquid level switches and high-high liquid level switches. The liquids are drained manually to an elevated slops tank. The slop tank is fitted with a liquid level glass and hose to allow emptying.

Gas from the filter separators is then heated by indirect fired water bath heaters to approximately 60 °C. The water bath heaters are operated as duty - standby, with the standby heater remaining 'hot' to allow quick change over, controlled by the actuated valves on the inlet to each heater.

The heated gases from heaters pass through two parallel regulator / meter runs. The regulator / meter runs are operated in duty - standby and each contains active - monitor pressure regulators. The meter skids are provided with two actuated valves that close on high pressure downstream of the regulators. Additional high pressure switches at the station outlet initiate a station ESD. Further over pressure protection is provided by a PSV at the station outlet. A meter is provided in each run. The meters are orifice meters with upstream flow conditioners, temperature transmitters, pressure transmitters and high and low range differential pressure transmitters. Each run is provided with a local blowdown point, pressure indicators and valving.

The station outlet is provided with a temperature indicator, temperature transmitter and low temperature switches. There is also provision for the installation of a future gas sampler. The connection to the Tennant Creek power generation site is DN 100.

Pipework downstream of the heater is fitted with insulation up to the station outlet.

Instrument gas is conditioned locally for each actuated valve and temperature control valve. Gas is conditioned at each water bath heater to provide fuel gas for the pilot and main burners. The fuel gas conditioning trains comprise of a pre-heat coil, strainer, primary pressure regulating valve, actuated ESD valves, secondary pressure regulating valve, meter and a temperature control valve.

A control system provides control and telemetry for the various process measurement parameters. The control system provides flow control and high pressure automatic shutdown functionality and allows remote operator shutdown. The control system is powered by single phase 230 VAC power supply, with back up batteries.

#### 2.4.1.7 *Elliott Meter Station*

The Elliott Meter Station receives gas from a DN 50 lateral from the ADP. The lateral is approximately 4 km long and provides gas for the Elliott power generation site. The station consists of a scraper receiving vessel, dry gas filter, filter separator, knock out pot, two stages of pressure regulation, a catalytic heater, metering run, slop tank, atmospheric vent stack and the associated pipework, valves and instrumentation.

At the inlet to the station is a scraper receiving vessel. The scraper vessel is fitted with local vent, PSV, pressure indicator and associated pipework and valving. The closure on the vessel is a blind flange.

The main gas flow to the skid passes to an actuated valve. The gas is then filtered in a dry gas filter. The filter is horizontal and fitted with a quick opening closure, differential pressure gauge, PSV and vent.

The gas then passes to a temperature gauge and then two parallel pressure regulators that operate in duty and standby that reduce the gas pressure to 3,000 kPag.

The gas passes to a filter separator fitted with a differential pressure gauge with inductive high differential pressure switch, level gauge, pneumatic liquid level controller and control valve and high liquid level switch, pressure relief valve.

The gas from the filter separator passes to a knock out pot and then to a catalytic heater. The catalytic heater is decommissioned and has not operated for some time.

From the heater the gas passes to the second stage pressure regulators. The gas is reduced in pressure to 500 kPag in the parallel pressure regulators, operating in a duty-standby arrangement.

The gas is then metered in a rotary positive displacement meter that is corrected for temperature and pressure. Upstream of the meter is a second pressure relief valve.

Instrument gas for the site instrumentation and fuel gas for the catalytic heater are conditioned in an offtake from the outlet of the skid and distributed as required.

A control system provides control and telemetry for the various process measurement parameters. The control system provides flow control and high pressure automatic shutdown functionality and allows remote operator shutdown. The control system is powered by single phase 230 VAC power supply, with back up batteries.

#### 2.4.1.8 *Daly Waters Scraper and Meter Station*

The Daly Waters Scraper and Meter Station is located at KP 0982 on the ADP and consists of a scraper receiver, scraper launcher and a filter, meter and pressure regulator station. The scraper part of the station is on the ADP and is the same as the scraper stations described in section 2.4.14. The meter part of station provides filtration and metering for the McArthur Mine River Pipeline. The meter station consists of gas over oil hydraulically actuated mainline, filter separators, metering, pressure regulation, a scraper launcher and associated pipework, valving and instrumentation.

The connection to the meter station is from the underground future compressor connection on the southern side (nominally upstream) of the scraper station. An above ground DN 350 blank flange has been provided for future connections. The connection to the meter station is DN 150 and consists of a ball valve with pressurising bypass and a downstream blank flange. The connection to the meter skid is by approximately 50 m of DN 150 welded pipe across the station.

The metering station is installed on two skid frames. The first comprises of an actuated valve, two dry gas filters, two meters, pressure control valves, instrument gas conditioning system and a scraper launcher.



The actuated valve is gas over oil actuated. Downstream of the actuated valve are two dry gas filters. Each dry gas filter is fitted with a differential pressure transmitter, manual vent and a drain. The gas from each filter passes to a meter run that comprises of a flow conditioner, orifice plate and thermowells. One of the meter runs is not fitted with instruments. The other is fitted with pressure transmitter, differential pressure transmitter and temperature transmitter.

#### 2.4.1.9 *Katherine Offtake*

The Katherine Offtake is installed on the ADP at approximately KP 1,221. The site consists of a take-off from the mainline. The offtake is fitted with a DN 100 buried valve. The valve is manual operated and has above ground gear box, maintenance ports and a cavity bleed. The valve has DN 50 risers either side of the valve, fitted with manual valves. A scraper launcher is installed at the site. The scraper vessel is fitted with pressure indicator, PSV and local vent. An above ground DN 100 valve with DN 50 bypass is also provided at the station. The valve may be a plug valve, a ball valve or a globe valve in accordance with the P&ID, details drawing or site photographs respectively.

#### 2.4.1.10 *Katherine Meter / Regulating Station*

The Katherine Meter/Regulating Station includes two filter separator, two water bath heaters, a slop tank, main line valve, control valves, pressure relief valves and the related pipework, instrumentation and valving.

The inlet to the station is DN 100 and consists of a buried station limit valve (MLV 11) with above ground actuator, maintenance ports and cavity bleed. A scraper receiver vessel is installed in parallel to MLV 11. The scraper vessel is fitted with a local vent, PSV, pressure indicator and associated pipework and valving. The closure on the vessel is a blind flange.

The following instrumentation is installed at the inlet; pressure indicator, a pressure transmitter and a temperature indicator.

The gas then passes through two parallel filter separators. Upstream of both filter separators are temperature control valves that reduce the pressure to 4,400 kPag / 16°C [based on operating conditions at the site visit]. The temperature control valves are provided with cascade control for pressure and temperature. One valve is fitted with a pneumatic controller to continue supply during outage of the electronic control system. The filter separators are fitted with differential pressure transmitter, pressure indicator, high liquid level switches and high-high liquid level switches. The liquids are drained manually to an elevated slops tank. The slop tank is fitted with a liquid level glass and a hose to allow emptying. Gas from filter separators is then heated by indirect fired water bath heaters up to approximately 60 °C. The water bath heaters are operated as duty - standby, with the standby heater remaining 'hot' to allow quick change over of the that is controlled by actuated valves on the inlet to each heater.

The heated gases from the heaters pass through two parallel regulator / meter runs. The regulator / meter runs are operated in duty - standby and each contains active - monitor pressure regulators. The meter skids are provided with two actuated valves that close on high pressure downstream of the regulators. Additional high pressure switches at the station outlet provide a station ESD. Further over pressure protection is provided by a PSV at the station outlet. A meter is provided in each run. The meters are orifice meters with upstream flow conditioners, temperature transmitters, pressure transmitters and high and low range differential pressure transmitters. Each run is provided with a local blowdown point, pressure indicators and valving.

The station outlet is provided with a temperature indicator, temperature transmitter and low temperature switches. There is also provision for the installation of a future gas sampler. The connection to the Katherine power generation site is DN 100.

Instrument gas is conditioned locally for each actuated valve and temperature control valve. Gas is conditioned at each water bath heater to provide fuel gas for the pilot and main burners. The fuel gas conditioning trains comprise of pre-heat coil, strainer, primary pressure regulating valve, actuated ESD valves, secondary pressure regulating valve, meter and temperature control valve.

The gas released in emergency directs to the vent stack that discharges to atmosphere and the liquid removed from the gas flows to the slop tank. The maximum PSV set point is 3,200 kPag and the temperature limit is set at 60 °C in the station.

A control system provides control and telemetry for the various process measurement parameters. The control system provides flow control and high pressure automatic shutdown functionality and allows remote operator shutdown. The control system is powered by single phase 230 VAC power supply, with back up batteries.

#### 2.4.1.11 Pine Creek

The Pine Creek pressure reduction and metering station receives gas from ADP to supply the Pine Creek power generation site. The Pine Creek Station comprises of a dry gas filter vessel, a filter separator, a knockout pot, two water bath heaters, an atmospheric slop tank, control valves, pressure relief valves, and the related pipework, instrumentation and valving.

The Pine Creek station is located close to the ADP and a mainline valve is located within the station. The inlet connection to the station has two DN 80 manual valves. One valve is fitted with an insulation flange and a surge arrestor, the second is fitted with a pressurising bypass. Downstream of the manual valves is an actuated valve that is also fitted with a pressurising bypass. The gas then passes to a dry filter vessel that is fitted with a pressure indicator, PSV, a vent valve, pressurising line and a bypass line to allow maintenance of the filter. From the filter, the gas passes to a duty standby temperature control valve that drops the gas pressure from 7,800 to 4,200 kPag and a temperature of 16°C [based on observations during the site visit]. The gas then passes to a filter separator that is fitted with level gauge, level controller, level control valve, high level switch, pressure indicator, PSV, vent valve and differential pressure transmitter. In parallel to the filter separator is a knock out pot to allow maintenance on the filter separator. The knock out pot is fitted with level gauge, pressure indicator, PSV, vent valve and drain valve.

Gas from filter separator / knock out pot is then heated by indirect fired water bath heaters up to approximately 60 °C. The water bath heaters are operated as duty - standby, with the standby heater remaining "hot" to allow quick change over of the that is controlled by actuated valves on the inlet to each heater.

The heated gas then passes to parallel pressure control valves. The valves are operated as duty and standby. The valves are pneumatically controlled. Over pressure protection is provided by a PSV downstream of the pressure control valves. Gas metering is by a single orifice meter fitted with a pressure transmitter; high and low range differential pressure transmitters and a temperature transmitter. A bypass is provided around the meter for maintenance.

Metered gas then passes to a second knock out pot fitted with a drain valve, PSV and level gauge. The piping from the knock out pot contains a temperature transmitter, temperature indicator, high pressure switches and a pressure transmitter. A double block and bleed valving arrangement is provided. The connection to the Pine Creek power generation site is via an underground pipework and the above ground flange is provided with an insulation



gasket. A spare flange is provided at the connection point for a future connection to the Pine Creek power generation site, the flange is fitted with a blind flange, insulation gasket and a surge arrestor.

Liquids collected from the dry filter, filter separator and knock out pots is sent to an elevated slops tank. The slops tank is fitted with a safety relief valve (SRV), pressure vacuum vent valve, flame arrestor, pressure indicator, high liquid level switch and hose for emptying.

Vents and PSV discharges from the dry filter, filter separator and knock out pots and vents from instrument manifolds and pneumatic controllers are sent to a local vent stack. The vent stack is fitted with a flame arrestor.

Instrument gas is conditioned centrally for the site from a connection from the outlet knock out pot.

Gas is conditioned at each water bath heater to provide fuel gas for the pilot and main burners. The fuel gas conditioning trains comprise of pre-heat coil, strainer, primary pressure regulating valve, actuated ESD valves, secondary pressure regulating valve, meter and temperature control valve. A control system provides control and telemetry for the various process measurement parameters. The control system provides flow control and high pressure automatic shutdown functionality and allows remote operator shutdown. The control system is powered by single phase 230 VAC power supply, with back up batteries.

#### 2.4.1.12 Darwin City Gate

Darwin City Gate receives gas from the ADP. Gas flows to three locations, Wickham Point, Channel Island and Trunk Package Offtake Station (TPOTS). The Wickham Point (Corroco Philips, Darwin LNG plant) pipeline can be reversed to ensure gas supply to Darwin/Channel Island. The gas supply to Wickham point is fitted with an actuated valve. The gas supply to Channel Island and TPOTS is filtered, reduced in pressure to 5,800 kPag and the gas composition and moisture dew point is analysed. The gas to TPOTS is regulated to a 850 kPag and metered.

The Darwin City Gate Station comprises of scraper vessels, a multicyclone, two filter separators, an atmospheric slop tank, gas chromatograph system, moisture analyser, control valves, pressure regulator, pressure relief valves, blowdown stack and the related pipework. Liquids (condensate, water and compressor lube oil) removed from the gas is stored in the slop tank for batch treatment.

The station consists of DN 300 above ground connection. A scraper receiver is installed with buried hydraulically actuated valve. The actuated valve includes electric solenoids to allow remote operation. During normal operation gas bypasses the scrapers and flows through the actuated valve, the scraper vessels are closed and isolated from the pipeline. At the station inlet, the pipeline divides in two, with one supplying gas to Weddell interconnect and one supplying to the City Gate station. The main line is installed with DN20 blowdown, temperature transmitter and pressure transmitter. The line then divides in two, the normal flow is through the multi-cyclone to remove solids. The multicyclone is fitted with a PSV with a set point of 9,650 kPag. Both parallel streams include a temperature control valve and a filter separator. The filter separators are horizontal and fitted with quick opening closures to allow removal of the filter elements. The liquids removed from the gas are collected in a drain boot underneath the filter separator and flow under level control to a slop tank. The filter separators are fitted with the following instrumentation and connections; pressure indicator, differential pressure transmitter, level glasses, high level switches, high high level switches, local drains and level controllers. The

temperature and level control valves are pneumatically controlled and actuated. Local instrument gas conditioning skid is provided with PSV to provide over pressure protection.

Common line of the outlet from the filter separators is installed with temperature indicators, temperature transmitter, pressure indicators, and pressure transmitters. The connection point for the gas chromatograph and dew point analyser has been installed to this section of pipework to allow analysis of the gas. The gas chromatograph and dew point analyser are installed in a shelter adjacent to the filter skid. The chromatograph receives a sample of the transmission gas at a pressure of approximately 140 kPag from an insertion regulator installed in the pipe. The carrier and calibration gases are stored in gas bottles and regulated for use at 140 kPag. The chromatograph vents gas to exhaust vents above the analyser shelter roof. The mainline then passes through a mainline valve. Downstream of the mainline valve is installed with pressure indicator and transmitter before the pipeline directed to Channel Island meter station.

A separate offtake to TPOTS passes gas to a DN 50 pressure regulation and metering skid. The skid has duty and standby arrangement with each containing active and monitor pressure regulators and turbine meters. A high pressure trip is provided that closes an actuated valve at the inlet. The meter runs, with one serving as duty run and other as standby run. The gas is then directed to Berrimah Road.

A control system provides measurement and telemetry for the various process instruments. The control system allows remote operator shutdown. The control system is powered by single phase 230 VAC power supply, with back up batteries.

#### 2.4.1.13 Channel Island

Channel Island regulating and metering station receives gas from Darwin City Gate meter station. The Channel Island Regulating Meter Station consists of two water bath heaters, solids filter, four filter separators, slam shut valves, active and monitor regulators, meters, pressure relief valves, local vent points and the associated valving and pipework.

The gas passes to a solids filter. The filter is fitted with a pressure indicator, differential pressure transmitter, local vent point and local drain. The filter has a quick opening closure and a bypass, with manual valving. The filtered gas is then heated to approximately 60°C in two parallel water bath heaters. One water bath heater is operating and the other is in hot-standby. Actuated valves at the heater inlets control the gas flow.

The combined outlet line from the water heaters as a high temperature switch, temperature indicator and temperature transmitter. The line then passes to one of two filter, regulation and metering runs to supply gas to either Unit 1 or Unit 7 at the Channel Island Power Generation Site.

The Unit 1 filter, regulation and metering run comprises of two parallel runs each containing actuated valve, active-monitor pressure regulators, filter separators and meters. The actuated valves are both normally open and are closed on either signal from the control system or high pressure downstream of the regulators. The pressure regulators are self acting and externally sensed. The gas of each regulator pair flows to the corresponding filter separator. The filter separators are horizontal and fitted with quick opening closures to allow removal of the filter elements. The liquids removed from the gas are collected in a drain boot underneath the filter separator. No slops tank is installed at site at liquids are drained from the filter separators manually. The filter separators are fitted with the following instrumentation and connections; pressure indicator, differential pressure transmitter, level glasses, high-high level switches, local drains and level controllers. The filtered gas is metered in orifice meters, each meter is fitted with flow conditioner, pressure transmitter, high and low range differential pressure transmitters and temperature transmitters. Additional overpressure protection is provided by a PSV. The combined outlet from the Unit

1 regulation, filter and metering runs is fitted with low pressure switch and high pressure switches that all initiate an ESD, and a pressure transmitter, pressure indicator, temperature transmitter, temperature indicator, low temperature switch connection for future gas analysis and an isolation valve.

The Unit 7 filter, regulation and metering run comprises of two parallel runs each consisting of filter separator, pressure regulators, metering and associated instrumentation and valving. There is an actuated valve at the inlet before a split to two filters. The filters are fitted with pressure indicator and differential pressure transmitter. Downstream of each filter is an actuated valve. The valves are normally open and are closed on signal from the control system or high pressure downstream of the pressure regulators. Metering is provided by a Coriolis meter and a AVT turbine meter. The primary duty meter is the Coriolis meter, but the turbine meter can be operated in series or parallel. Both meters are provided with temperature and pressure correction. Downstream of the meters the combined outlet has a PSV, local manual vent, temperature transmitter and pressure transmitter.

Instrument gas is conditioned locally for each actuated valve.

A control system provides measurement and telemetry for the various process instruments. The control system allows remote operator shutdown. The control system is powered by single phase 230 VAC power supply, with back up batteries.

#### 2.4.1.14 *Scraper Stations*

The scraper stations are provided along the length of the pipeline to allow cleaning and inspection of the pipeline. The scrapers stations are installed at Tanami Road, Ti Tree, Wauchope, Renner Springs, Newcastle Waters, Helling and Ban Ban Springs. Additionally scraper vessels are included at some of the stations along the pipeline. A scraper receiver and launcher are installed at each site along with a buried hydraulically actuated valve. The actuated valve includes electric solenoids to allow remote operation. During normal operation gas bypasses the scrapers and flows through the actuated valve, the scraper vessels are closed, isolated from the pipeline and depressured.

The pipeline is provided with buried isolation valves. A pressure transmitter and indicator are installed on a pipe riser either side of the actuated valve. A temperature transmitter is installed downstream of the actuated valve.

The scraper vessels are fitted with quick opening closures, a DN 25 local vent, a pressure gauge and connections with valves to allow operation. The vessels also include connections for pressure relief valves that have been removed on some / all scraper vessels. Pig passage indicators are installed on the pipeline and scraper vessels.

There is also a pipeline vent installed at the site within a separate compound. During normal operation the vent is closed with a quick opening closure.

#### 2.4.1.15 *Ban Ban Springs Scraper Station*

The scraper station at Ban Ban Springs also includes an off take connection to Cosmo-Howley and a supply connection from the Wadeye pipeline. The off take to Cosmo Howley is a blind flange on a pipeline riser. The pipeline is decommissioned and the meter station has been removed. The connection from the Wadeye pipeline is underground pipework from the Ban Ban Springs meter station. The pipeline connections is to the upstream connection for a future compressor. There is an above ground valve with bypass installed adjacent to the connection.

At the Helling scraper station there are pipework and vents that are used for training. The training pipework is not connected to the station pipework during normal operation of the pipeline and the training pipework is unpressurised. No records have been provided for the training pipework and it is not included in the hazardous area classification.

#### 2.4.1.16 Warrego Scraper Station

The scraper station at Warrego is also the site of a compressor. The compressor is connected to underground connections either side of the mainline valve. An actuated valve with manual bypass / pressuring line is installed at each connection. The actuated valves are provided with an instrument gas connection from the Warrego compressor site.

The remainder of the Warrego compressor site is not considered within this hazardous area classification.

#### 2.4.1.17 Mainline Valves

There are several mainline valve sites located at Aileron, Barrow Creek, Kelly Well, Morphett Creek, Fergusson, Larrimah, Tindal, Acacia and Berry Springs. The data used for classifying the mainline valves' hazardous area is obtained solely from the Aileron site. Each of the sites is assumed to be identical and comprises of a buried valve with an above ground bypass and vent points with no instrumentation installed on the mainline valve. The buried valve has a manual actuator and gear box, injection ports and cavity bleed extended above ground. This is shown in the photograph below.





#### 2.4.1.18 Bachelor Mainline Valve

The Bachelor mainline valve site is located at KP 1441 between Ban Ban Springs and Darwin City Gate. The Bachelor Mainline valve site is similar to other mainline valve sites but the mainline valve has an actuator, similar to the scraper stations. The mainline valve consists of a DN300 underground valve with an above ground actuator, maintenance ports and cavity bleed. The valve has an above ground DN100 bypass. Pressure transmitters are fitted either side of the valve. The site also has a control room.

### 2.4.2 OPERATING CONDITIONS

The maximum operating pressures and temperatures at the stations are summarised in Table 1.

**Table 1 Operating pressures and temperatures**

Temperature	Pressure (Process)	Pressure (Fuel gas)	Pressure (Instrument gas)
Max. (°C)	Max. (kPag)	Max. (kPag)	Max. (kPag)
60	9,650	≤ 650	770

### 2.4.3 VENTILATION

Each of the sites is in the open air and is considered to have good ventilation. Some equipment is installed in open-sided shelters. These are not considered to have any impact on ventilation.

## 2.5 PROPERTIES OF HAZARDOUS MATERIALS

### 2.5.1 GASES HANDLED

The gas processed through the regulating and metering stations contains mainly methane (typically 87 mol%) and nitrogen (about 8 mol%), along with small quantities of hydrocarbons (C<sub>2</sub>+) and carbon dioxide (totally < 5 mol%). The specific gravity of the gas is 0.62, which is lighter than air (SG=1.0). It is classified as a Category G(i) fluid in accordance with IP15 Section 1 (Table 1.2 – fluid categories) and as a Group IIA in accordance to AS/NZS 60079.20 section 4.6. The composition of the gas is shown in Table 2.

Note that the gas composition in the pipeline can vary from the typical figures shown in Table 2. However, methane will remain the predominant component and the properties of the gas will remain the same and will be the same as methane. Australian standard AS 4564 (AG 865) Specification for general purpose natural gas, provides information of the allowable properties of natural gas. Similarly, APA will have a Sales / Shipping Agreement for the injection of gas into the pipeline that should be observed. The limitations are summarised in Table 3.

Note that on release from high pressure, the gas will be cooled due to Joule-Thomson cooling. At lower temperatures the gas is less dense and the dispersion in air will be slightly impacted, but the flammable range is reduced. Similarly, for higher temperatures the flammable range is increased, but the dispersion is increased. At the dilute concentrations at the lower explosive limit, the gas-air mixture temperature will be close to ambient temperature therefore, there will be no additional consideration for temperature effects.

**Table 2 Typical Gas Composition**

Component	Symbol	mol%
Methane	CH <sub>4</sub>	87.0
Ethane	C <sub>2</sub> H <sub>6</sub>	2.6
Propane	C <sub>3</sub> H <sub>8</sub>	0.8
i-Butane	C <sub>4</sub> H <sub>10</sub>	0.1
n-Butane	C <sub>4</sub> H <sub>10</sub>	0.2
i-Pentane	C <sub>5</sub> H <sub>12</sub>	0.07
n-Pentane	C <sub>5</sub> H <sub>12</sub>	0.05
n-Hexane	C <sub>6</sub> H <sub>14</sub>	0.07
n-Heptane	C <sub>7</sub> H <sub>16</sub>	0.02
n-Octane	C <sub>8</sub> H <sub>18</sub>	0.004
n-Nonane	C <sub>9</sub> H <sub>20</sub>	0.004
Carbon Dioxide	CO <sub>2</sub>	0.95
Nitrogen	N <sub>2</sub>	8.2
<b>Total</b>		<b>100</b>
<b>Specific Gravity (mixture)</b>		<b>0.62</b>

**Table 3 Gas specification limits**

<b>Characteristic</b>	<b>APA Schedule 4 Limits</b>	<b>AS 5654 Limits</b>
HHV	Minimum 33.0 MJ/Sm <sup>3</sup> Maximum 42.0 MJ/Sm <sup>3</sup>	-
Wobbe Index	Minimum 44.0 MJ/Sm <sup>3</sup> Maximum 51.0 MJ/Sm <sup>3</sup>	Minimum 46.0 MJ/m <sup>3</sup> Maximum 52.0 MJ/m <sup>3</sup>
Oxygen	Maximum 0.2 mol%	Maximum 0.2 mol%
Hydrogen Sulphide	Maximum 10.0 ppmw	Maximum 5.7 mg/m <sup>3</sup>
Total Sulphur	Maximum 50 mg/Sm <sup>3</sup>	Maximum 50 mg/m <sup>3</sup>
Water Content	Maximum 80 mg/Sm <sup>3</sup>	Maximum – Dewpoint 0°C at the highest MAOP in the relevant transmission system (in any case, no more than 112.0 mg/m <sup>3</sup> )
Cricodentherm	Maximum 10.0°C	
Hydrocarbon Dewpoint		Maximum 2.0°C at 3,500 kPa
Total inert gases	Maximum 12.0 mol%	Maximum 7.0 mol%
Nitrogen	Maximum 11.0 mol%	-
CO <sub>2</sub>	Maximum 7.5 mol%	-
Mercury	Maximum 0.2 mg/Sm <sup>3</sup>	
Methanol	Maximum 1.0 mg/Sm <sup>3</sup>	
Glycols	Maximum 1.0 mg/Sm <sup>3</sup>	
Radioactivity	Maximum 8,000 Bq/Sm <sup>3</sup>	
Notes		m <sup>3</sup> refers to dry gas at standard conditions (15°C and 101.325 kPa)

The chromatograph used for gas composition analysis requires carrier and calibration gases. The carrier gas (helium) is not flammable, while the calibration gas (mainly methane) is classified as a Category G(i) fluid with similar compositions as process gas.



## 2.5.2 LIQUIDS HANDLED

### 2.5.2.1 *Filter Separator Drains*

The liquids handled at the facilities may consists of condensate, compressor lubrication oil or water, which is removed from the gas by the filter separators. The condensate is considered to be flammable liquid and based on hexane is considered to be a group IIA liquid in accordance to AS/NZS 60079.20. The compressor lube oil used in the stations is combustible, but not flammable, with a typical flash point (closed cup) over 60 °C. Therefore, it is treated as a non-hazardous material for the purpose of the hazardous area classification. Water is considered to be non-hazardous liquid.

### 2.5.2.2 *Odorant*

Odorant is injected into the pipeline at Tylers Pass. The odorant is SpotLeak 1005 and is a flammable liquid. It consists of Thiophene, Propanethiol and methyl as per the product specification. The odorant is classified as group IIA in accordance to AS/NZS 60079.20 and category C fluid in accordance with IP15 Section 1 (Table 1.2 – fluid categories).

## 2.6 EQUIPMENT SELECTION

The general requirements for selection, installation and maintenance of explosion proof (Ex) electrical equipment are described in AS/NZS 2381.1:2005.

To ensure the Ex electrical equipment performs satisfactorily, without the risk of ignition, the data shown in Table 3 must be used as area specification requirements.

**Table 4 Gas Group and Temperature Class**

Performance Criterion	Requirement	Reference
Ambient temperature	0 - 50 °C	Bureau of Meteorology
Auto-ignition temperature (Methane)	537 °C	AS/NZS 60079.20
Apparatus Group	IIA	AS/NZS 60079.20
Temperature Class	T1 / T3	AS/NZS 60079.20

The recommendations on equipment group and temperature class should be regarded as **minimum** requirements. Equipment selection must take into account local conditions, such as the presence of hot surfaces close by and electrical equipment design.

## 2.7 CLASSIFICATION

### 2.7.1 PIPING

#### 2.7.1.1 Process Piping

Welded piping at the stations is designed and constructed to ANSI/ASME B 31.3 and is not considered as a source of release. However, the possible release of flammable material occurs at flanges, valves and fittings due to the possible leakage from a gasket or seal. A majority of process gas service pipework installed in the stations is flanged. The screwed connections are limited to the small bore piping with a nominal size less than DN25. The screwed piping has tapered threads with similar leakage integrity to the flanged connections. The piping in the facilities is a permanent fixture and not subject to vibration.

All flanges and infrequently used valves are considered to be well maintained and located in an adequately ventilated area in the gas regulating and metering stations. Leakage of the flammable material at connection points is considered abnormal and the quantity of the hazardous material released is considered minor. Consequently, they are regarded as sources of *Secondary* grade release and a hazardous Zone 2 within a sphere area with 2 m radius from the potential leakage points is claimed around the piping with flanges or threaded joints, meters or regulators and valves other than relief valve in accordance with AS/NZS 60079.10.1 Clause ZA.6.6.2.4 for high pressure gas transmission system.

As a worst case the liquid piping is assumed to carry condensate which is a flammable liquid in accordance with AS/AZS 60079.10.1 clause ZA 5.2.8 that claims a hazardous area of Zone 2 of 1.5m in all directions of potential release points. However the liquid drain lines may contain sufficient quantities of dissolved and entrained. Since this hazardous area classification must account for a number of installations with a range of process conditions, liquid piping is classified as gas piping.

All process drains and vents used infrequently for maintenance or start-ups are normally plugged. Similarly, the sample points are taken on an infrequent or as required basis (maximum once every six months). To simplify hazardous area management, the classification for process gas piping will be assigned to the uncommonly operated process drains, vents and sample points, meaning a Zone 2 area of radius 2 m is declared around those potential leakage points.

The hazard zones adopted for the process piping, flanges, joints, valves and fittings are summarised below:

**Zone 2** 2 m radius from the edge of the process piping routes, including infrequently used process drains, vents and sample points

#### 2.7.1.2 Instrument Gas Piping

The instrument gas pipework is fabricated from screwed pipe and tube with compression fittings. Similar to process gas piping, the instrument gas piping has potential leakage points at connection points. The leakage is considered abnormal with minor quantities of flammable material. Hence, they are regarded as sources of *Secondary* grade release and the associated hazardous area zone will be classified as Zone 2.

According to AS/NZS 60079.10.1 Clause ZA.6.4.2.3c, for the lighter-than-air flammable gas operating with a pressure between 700 and 2,000 kPag, a hazardous Zone 2 within a sphere area with 1 m radius from the potential leakage points is assigned to the piping with flanged and screwed joints.

The hazard zone adopted for instrument gas piping is summarised below:

**Zone 2** 1 m radius from the edge of the instrument gas piping routes

### 2.7.1.3 Fuel Gas Piping

Fuel gas piping is fabricated with screwed connections, except those pipes with a nominal diameter less than DN25 and with flanges for larger diameters. The screwed piping has tapered threads with similar leakage integrity to flanged connections. The leakage is considered abnormal with the presence of minor quantities of flammable material. Hence, they are regarded as sources of *Secondary* grade release and the associated hazardous area zone will be classified as Zone 2.

According to AS/NZS 60079.10.1 Clause ZA.6.4.2.3c, for the lighter-than-air flammable gas operating with a pressure between 100 and 700 kPag, a hazardous Zone 2 within a sphere area with 0.5 m radius from the potential leakage points is declared around the piping with flanged and screwed connections.

The hazard zone adopted for fuel gas piping is summarised below:

**Zone 2**            0.5 m radius from the edge of the fuel gas piping routes

### 2.7.1.4 Control Valves

There are several shut down valves, pressure / temperature control valves and level control valves installed in the stations. Similar to process piping, the process connections of control and actuated valves are considered well maintained and leakage is considered abnormal. Therefore connection points are considered the same as process piping as described in Sections 2.7.1.1, 2.7.1.2 and 2.7.1.3.

In addition, the control valves are in regular use and leakage is more likely due to wear on the packing. An additional *Primary* grade of release (Zone 1) with a nominal hazard radius of 0.3 m around the glands is claimed in accordance with IP15 Section 5.4.5.1.

Control valves will release minor amounts of flammable gas with a small continuous bleed from the positioners or exhausts at a low discharge velocity in normal operation. It contributes a *Continuous* grade of release and in accordance with AS/NZS 60079.10.1 clause ZA 6.6.2.5, a Zone 1 area with a 0.5m radius will be claimed. A larger region that represents infrequent higher gas velocities that may exist surrounding the Zone 1 area due to abnormal operation or failure of the valves. A Zone 2 area within 1 m radius in all directions is assigned to the low velocity vents.

The additional hazard zones adopted for the control valves are summarised below:

**Zone 1**            0.5 m radius around the control valve positioners and exhausts

0.3 m radius around the control and actuated valve glands

**Zone 2**            1 m radius around the control valve positioners and exhausts

### 2.7.1.5 Pressure Relief and Safety Relief Valves

Pressure relief valves (PSVs) and safety relief valves (SRVs) are mounted on the multi-cyclone, filters, process gas piping, fuel gas and instrument pipework to provide the protection against operational overpressure for the piping and equipment.

Note that SRVs in Pine Creek Station piped to the vent stack do not contribute to the extent of the hazardous classification except as discussed under Section 2.7.1.1 for process piping.

PSVs and SRVs venting directly to atmosphere are normally treated as a *Secondary* grade of release due to no action on normal operating conditions, and as a result the associated hazard zone will be classified as Zone 2. In accordance with AS/NZS 60079.10.1 Clause ZA.6.6.2.9, a Zone 2 area is assigned within 6 m diameter cylinder with its axis on the line

of discharge from 1 m behind the points of discharge to a distance 8 m in front of the points of discharge.

The seats on the PSVs and SRVs will be metal to metal and tight shut-off, which will contribute to a small leakage at the vent tips during the normal operation. In line with the specification described in IP15 Section 5.4.4.5, a Zone 2 area of nominal 1 m radius should be placed around the end of the discharge point to account for any small leakages. It is recommended to upgrade the *Secondary* grade of release to a *Primary* grade of release accounting for the presence of the flammable material in the normal operating. Hence, an additional Zone 1 area with a nominal hazard radius of 1 m is claimed around the PSV and SRV discharge points to account for the minor leak through the valve seats.

The hazard zones of the PSVs and RSVs are considered to be the same due to lack of the discharge rates, which actually affect the extending zone of hazardous area.

The hazard zones adopted for the PSVs and RSVs are summarised below:

- Zone 1**            1 m radius from the vent tips
- Zone 2**            6 m laterally, 8 m above and 1 m below the discharge points

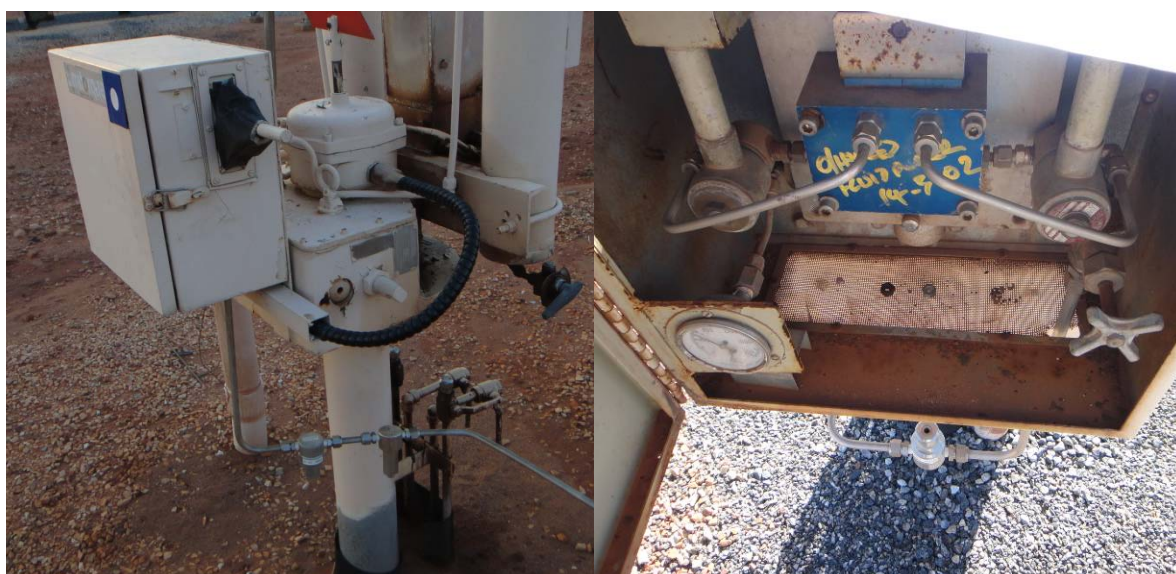
#### 2.7.1.6 Mainline Valves

Some of the actuated mainline valves (MLV) installed at the scraper stations as shown in the following photographs include an enclosure containing the solenoids and a hand pump for the valve. The solenoids vent to a location outside of the enclosure, however the tubing connections to the solenoid are a *Secondary* source of release. The enclosure has minimal ventilation and released gas can accumulate within the enclosure. Therefore a Zone 1 hazardous area is claimed within the enclosure.

Body bleeds valves maintenance ports and instrument gas connections from the buried valve are brought above grade. These provide potential leak sources and are treated the same as process piping connections as per section 2.7.1.1.

The hazard zone adopted for the actuated valve enclosures is summarised below:

- Zone 1**            Within the solenoid valve enclosure
- Zone 2**            2m radius from point of discharge





### 2.7.1.7 Local Vent Point

There are several local vent points installed in the facilities to allow the purging of gas from the stations following isolation. Each manual vent generally consists of a ball valve to control blow down rate. The ball valve provides high integrity isolation and wear is not considered on the valves. Hence, no leak is taken into account during the normal operation.

The hazardous area classification for those points is considered to be the same as PSVs and RSVs due to the similar operation which happens only during the period of system depressurisation. Therefore, they are treated as a *Secondary* grade of release and a Zone 2 area within 6 m diameter cylinder with its axis on the line of discharge from 1 m behind the points of discharge to a distance 8 m in front of the points of discharge are declared in accordance with AS/NZS 60079.10.1 Clause ZA.6.6.2.9.

Note: Majority of the vents are fitted with a cap and have a hole drilled in the vent pipe.

The hazard zone adopted for the local vent points is summarised below:

**Zone 2**            6 m laterally, 8 m above and 1 m below the discharge points

### 2.7.1.8 Pine Creek Vent Stack

There is a vent stack installed in the Pine Creek Station. Gas released from the PSVs, instrument manifold vents and vented instrument gas from the pneumatic controllers is sent to the vent stack. During normal operation, there is minimal flow from the vent stack from the pneumatic controllers. The vent stack is fitted with a flame arrester that offers protection against fire and explosion from outside sources of ignition. The flame arrester is fitted with a cover to prevent rain ingress but also acts to direct gas downwards. and will increase the diameter of the hazardous area.

The hazardous area is increased to a Zone 2 area within 12 m diameter cylinder and 6 m below the discharge point is claimed, compared with 8 m distance stated for vertical up discharge.

Furthermore, minor leakage of flammable mixture may occur through the PSV seats under normal operation as analysed in Section 2.7.1.5. As a result, it contributes to a *Primary* grade of release and an additional Zone 1 hazardous area with a nominal radius of 1 m is claimed around the vent stack discharge point to account for any small leakages from safety relief valve seats.

The continuous bleed from the pneumatic controllers also vents through the vent stack. As per Section 2.7.1.4, a 0.5 m Zone 1 hazardous area is claimed. This is within the hazardous area claimed for leakage through PSV seats.

The pipework to the vent stack is flanged and will generally be at close to atmospheric pressure. However for continuity the claimed hazardous area will be claimed to be as for process pipework, refer section 2.7.1.2.

The hazard zones adopted for the vent stack are summarised below:

**Zone 1**            1 m radius from the vent tip

**Zone 2**            12 m laterally, 6 m below and 8 m above the vent tip

### 2.7.1.9 Pipeline Blowdown

There are pipeline blowdown points at the scraper stations and meter stations. The vents are approximately 2.4 m tall, discharge vertically upwards and are fitted with quick opening closures. Pipeline blowdowns have the potential to release large volumes of gas to atmosphere and to obtain a representative hazardous area zone it would be required to



undertake plume analysis based on the blowdown conditions. An estimate of the extent of the plume from previous experience for pipeline blowdown vents is a cylinder with a radius of 15 m and a length of 30 m extending in the direction of the discharge and 1 m below the discharge point to account for the localised turbulence at the vent tip. Pipeline blowdowns are a done infrequently and therefore a *Secondary* release that results in a Zone 2 hazardous area. The discharge is vertically upwards and therefore no ground effect would occur.

During normal operation a quick opening closure in the closed position is considered to provide similar containment as a pipe flange or fitting. Therefore the associated release would be *Secondary* providing a Zone 2 hazardous area of 2 m as per AS/NZS 60079.10.1 Clause ZA.6.4.2.4.

**Zone 2** A cylinder of radius 15 m extending 30 m vertically upwards and 1 m downwards from the point of discharge

**HOLD** The exact shape of the hazardous area zone should be determined using plume dispersion modelling based on the blowdown operation and conditions.

#### 2.7.1.10 Low Velocity Vents

There are numerous pressure relief valves installed on instrument gas systems, for example on the station limit valves. The relief from these pressure relief valves are similar to low velocity vents in accordance with AS/NZS 60079.10.1 ZA.6.6.2.8 that has an associated Zone 1 hazardous area of 0.5 m in all directions surrounded by a Zone 2 hazardous area of 1.0 m from the point of discharge. The pressure relief valves will not typically be relieving gas and the release will be *Secondary*, therefore the Zone 1 area is not appropriate. Therefore a Zone 2 hazardous area of 1 m radius from the point of discharge is claimed.

The hazard zone adopted for the instrument gas relief and vent points is summarised below:

**Zone 2** Radius of 1 m extending in all directions from the point of discharge

#### 2.7.2 SCRAPER VESSELS

The scraper vessels shall be operated such that it is normally isolated from the pipeline. There are no regular pigging operations. It is expected that the scraper vessels are opened at approximately yearly intervals and the small quantities of flammable gas may occur at the closures. Accordingly, they are treated as sources of *Secondary* grade release and a hazardous Zone 2 within a radius of 3 m centred at the closure is claimed as identified in AS/NZS 60079.10.1 ZA.6.6.2.2b for the equipment located at an adequately ventilated area.

The scraper vessels are enclosed vessels containing nozzle connections with piping, valves and fittings, which are also potential release sources. These are classified as piping as per section 2.7.1.1.

The hazard zone adopted for the pig receivers and launchers is summarised below:

**Zone 2** 3 m radius in all directions from quick opening closure  
As per section 2.7.1.1 for piping for remainder of the vessel

### 2.7.3 MULTICYCLONE AND FILTER SEPARATORS

Similar to receiving traps, the multicyclone and filter separators have quick opening closures that are operated at approximately yearly intervals under normal operation. The hazard zone assigned to the receiving traps in accordance with AS/NZS 60079.10.1 ZA.6.6.2.2b is also applicable to the filter coalescers, resulting in a hazardous Zone 2 area within 3 m radius around the discharge points is claimed.

Since the multicyclone and filter coalescers are enclosed vessels which handle process gas and liquids removed from the gas, the nozzle connections with piping, valves and fittings are also potential release points. To simplify hazardous area management, the classification for process gas piping will be applied to the vessels meaning a Zone 2 area of radius 2 m will be declared from the shell of the vessels.

The hazard zone adopted for the multicyclone and filter coalescers is summarised below:

**Zone 2**            3 m radius around the quick opening closures and 2 m radius from the edge of the vessels

### 2.7.4 SLOP TANKS

The slop tank installed at some stations are above ground storage tank used to collect condensate, compressor lube oil and water from the filter separators. The liquids in the tank are treated as a flammable fluid. The capacity of the tanks are approximately 1 kL. The tanks are provided with a vent that discharges to atmosphere. During the short period of the drainage from the filter coalescers to slop tank, the liquids may form a flammable mist and additionally the gas may break through into the drain tank. The freely vented tank allows vapour/air mixtures to be released during the normal operation.

Therefore, the slop tank will contain flammable vapours and a range of hazard zones is required. As such, it is likely that a small amount of flammable gas mixture would continuously exist in the tank and within close proximity of the tank vent, surrounded by a larger region that may sometimes exist due to occasional higher gas quantities and an even larger region that represents very infrequent high gas quantities.

The slop tank installed at the Pine Creek Station has a pressure vacuum vent set at 2 kPa pressure / vacuum. The vapour or released gas is directed to atmosphere through the vent that installed in conjunction with an inline flame arrester and a cap. The flame arrester is required to provide protection against internal fire and explosion from outside sources of ignition. The vented gas will be discharged vertical downwards to the surrounding equipment or pipework due to the installation of the cap. However, the additional extent zones are not claimed considering the relatively low operating pressure in the tank.

In accordance with API RP 505 Section 8.2.1, a Zone 0 area within 0.5 m radius, a Zone 1 area within 1.5 m radius and a Zone 2 area within 3 m radius of the vent point are declared. It is also stated in API RP 505 Section 8.2.1, a Zone 0 area should be claimed inside the tank above the liquid level due to the possibility of the continuous presence of the flammable mixture and a Zone 2 area with radius of 3 m should be placed around the shell of the equipment.

The hazard zones adopted for the slop tanks in the stations are summarised below:

**Zone 0**            Inside the tanks above the liquid level and 0.5 m radius from the tank discharge points

**Zone 1**            1.5 m radius from the tank discharge points

**Zone 2**            3 m radius around the shell of the tanks and from the tank discharge points

### 2.7.5 WATER BATH HEATERS

The indirect fired water bath heaters are fitted in some stations to heat the high pressure gas up to a temperature of 60 °C prior to pressure reduction, which prevents hydrate formation that may occur due to the Joule-Thomson effect when the temperature drops. The water bath heater consists of an insulated shell, removable process coils, removable fire tubes, stack burners, fuel gas conditioning train and control system.

During normal operation, a flame is projected into a submerged "fire-tube" located at the bottom of a horizontal cylindrical shell. Energy is transferred through the tube wall to the surrounding bath fluid water. By means of natural convection, the water then transfers the required amount of energy into a series of process coils located at the top of the heater shell.

The water bath burners are continuously flaming and provided with burner elements to ensure that the flame is maintained. On loss of flame the fuel gas supply is shut down. Therefore no hazardous area zones are claimed from the stacks.

The process tube within the water bath is fully welded with no potential points for release and would not normally provide a hazardous area. If there was a history of failure of the process coils leading to corrosion or erosion of the tubes, then a hazardous area should be claimed on the vent of the water bath heater. APA has not indicated that there have been failures of the process coils. Further, the maximum operating temperature of the water bath heaters is 95°C, the pH and the nitrate content of the water in the baths is checked frequently and APA has confirmed that the water bath heaters are treated with oxygen scavenger. Therefore no hazardous area is claimed from the water bath vent.

The potential release points on the vessels are process connections to the heaters. The classification for process piping will be applied to the process connections resulting in a *Secondary* grade of release and a related Zone 2 area with 2 m radius from the connection points in accordance with AS/NZS 60079.10.1 Clause ZA.6.4.2.4.

The hazard zone adopted for the water bath heaters is summarised below:

**Zone 2**            2 m radius from the high pressure gas connections of the vessel.

### 2.7.6 CATALYTIC HEATER

A catalytic heater is installed at the Elliott meter station. The heater consists of a section of pipe contained in a compartment. The inside of the compartment is surrounded by heating elements that heat the gas by radiant heat. The heat is generated by the combustion of gas in catalytic elements. The manufacturer's information indicates that the catalytic elements ensure that the gas is combusted at a lower temperature. The heating unit is approved for installation in hazardous areas and has Factory Mutual certification.

The pipework has no additional source of release and will be classified the same as the process pipework as described in section 2.7.1.1 and a 2 m Zone 2 hazardous area is claimed from the outside of the heater.

Additionally, there is a possibility of fuel gas not being combusted inside the heater. The manufacturer's literature indicates that there is a protection to prevent uncombusted gas being released. However the configuration of the heater is not well defined and to be conservative a primary grade of release is claimed. There is minimal ventilation in the compartment and the claimed zone is increased from Zone 1 to Zone 0 within the compartment.

The heater compartment is not considered to be gas tight and an additional hazardous area zone is claimed that will surround the heater compartment. The release will be a primary grade of release. The heater has good ventilation and a Zone 1 hazardous area is claimed. The released gas will be fuel gas and will be close to atmospheric pressure. In accordance with section 2.7.1.3 the extent of the hazardous area will be 0.5 m from the outside of the box.

The hazard zone adopted for the catalytic heater is summarised below:

- Zone 0**            Inside the heater compartment
- Zone 1**            0.5 m from the edges of the heater box
- Zone 2**            2 m radius from the high pressure gas connections of the vessel

### 2.7.7 KNOCKOUT POTS

The knockout pots are enclosed vessels which do not contribute to the hazardous area classification. However, the nozzle connections with piping, valves and fittings on the vessels are potential release points where small amounts of flammable mixture may present. To simplify hazardous area management, the classification for process gas piping will be applied to the vessels meaning a Zone 2 area of radius 2 m will be declared from the shell of the vessels.

The hazard zone adopted for the knockout pots is summarised below:

- Zone 2**            2 m radius from the edge of the vessels

### 2.7.8 GAS CHROMATOGRAPH SYSTEM

Gas chromatograph (GC) system is a specific analyser to determine natural gas stream composition and anticipated concentration of the selected components.

The chromatograph system comprises of several components: the analyser, sample tubing, process vents, pressure control valve, pressure safety valve, carrier gas cylinders and tubing, calibration gas cylinder and tubing. The chromatograph system is located under a shelter with open sides, therefore it is considered as being adequately ventilated.

The process tubing and analyser contain gas at approximately 140 kPag. The tubing will be well maintained and minor release of the flammable gas may occur at the connections due to leakage, and as a result the grade of release is considered to be *Secondary*. Therefore, a Zone 2 hazardous area with 0.5 m radius is assigned around the whole chromatography system to cover the process tubing potential leakage points according to AS/NZS 60079.10.1 Clause ZA.6.4.2.3c, for the lighter-than-air flammable gas operating at a pressure between 100 and 700 kPag.

The carrier gas is helium that is a non-hazardous material and therefore the carrier gas cylinders and tubing do not contribute to the hazardous zone.

The calibration gas comprises mainly methane and stores in a gas cylinder with an approximate volume of less than 10 L. AS/NZS 60079.10.1 Clause ZA.6.4.2.6d states that cylinder located in ventilated area, whether in storage or installed for use, is not associated with a hazardous zone when the gas capacity is less than 30 m<sup>3</sup>. Therefore, no hazardous zone is claimed around the calibration gas cylinder. The calibration gas tubing is at the same operating pressure as the process tubing and will have the same Zone 2 hazardous with 0.5 m radius around the calibration gas tubing connections.

The chromatograph system has several vent points that release the sample line contents at low velocity during the normal operation. The amount of the released gas will be small and the discharge rate will be slow and readily dispersed. Consequently, they are regarded as sources of *Primary* grade release and a hazard Zone 1 within a sphere area with 0.5 m

radius is declared from the vent tips in accordance with AS/NZS 60079.10.1 Clause ZA.6.6.2.8 for the low velocity vents in adequately ventilated area.

In addition, a larger region that represents infrequent higher gas quantities may exist surrounded the Zone 1 area due to the failure of pressure regulator or PSV. It results a *Secondary* grade of release and an additional Zone 2 area with 1 m radius is considered around the vents in accordance with AS/NZS 60079.10.1 Clause ZA.6.6.2.8.

The pressure relief valve will be activated in emergency. To simplify the hazardous area arrangement, it is treated the same as a vent as described above.

The hazard zones adopted for the chromatograph system are summarised below:

- Zone 1**            0.5 m radius from the vent tips
- Zone 2**            0.5 m radius around the gas chromatograph system, excluding the cylinders  
                         1.0 m radius around the vent tips

### 2.7.9 WATER DEW POINT ANALYSER / GAS SAMPLER

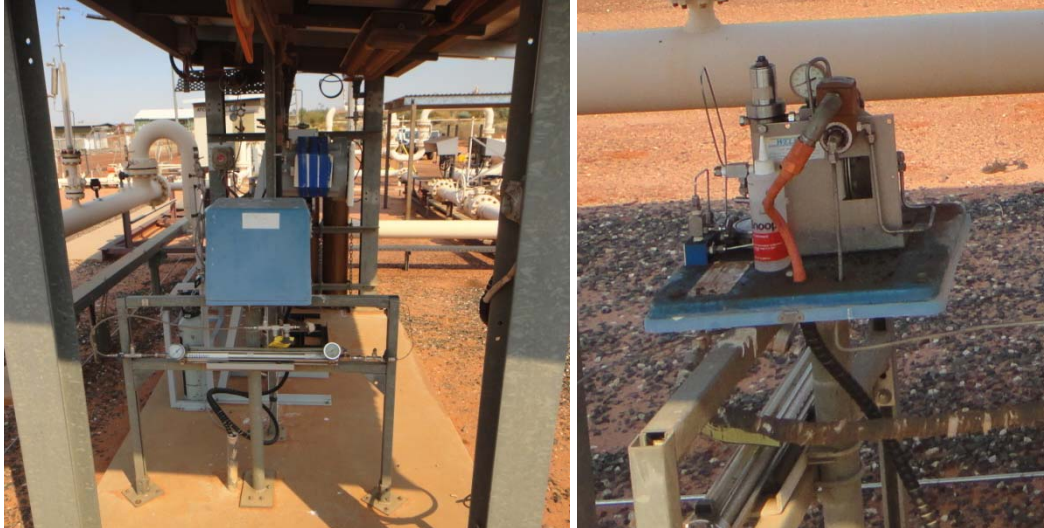
The water dew point analyser uses a chilled mirror to determine the dew point of the gas. The analysers receive gas from the sampler as shown in the photographs below. The gas sampler consists of an insertion regulator installed in the pipework, a heated capillary tube a sample cylinder, solenoid valve, further regulators and pressure relief valves. A solenoid valve is installed inside a box with a removable cover. The box prevents ventilation and therefore the declared hazardous area zone is increased to Zone 1 for the interior of the box.

The water dew point analyser comprises of several components: the analyser, sample tubing, process vents, pressure control valve, pressure safety valve, gas cylinders and tubing, calibration gas cylinder and tubing. The analyser system is located under a shelter with open sides, therefore it is considered as being adequately ventilated.

The process tubing and analyser contain gas at approximately 140 kPag. The tubing will be well maintained and minor release of the flammable gas may occur at the connections due to leakage, and as a result the grade of release is considered to be *Secondary*. Therefore, a Zone 2 hazardous area with 0.5 m radius is assigned around the whole analyser system to cover the process tubing potential leakage points according to AS/NZS 60079.10.1 Clause ZA.6.4.2.3c, for the lighter-than-air flammable gas operating at a pressure between 100 and 700 kPag.

The water dew point analyser and gas sampler have local vents that will frequently vent gas at low velocity to atmosphere during the normal operation. The amount of the released gas will be small and the discharge rate will be slow due to the characterisation of the systems. Consequently, they are regarded as sources of *Primary* grade release and a hazard Zone 1 within a sphere area with 0.5 m radius is declared from the vent tips in accordance with AS/NZS 60079.10.1 Clause ZA.6.6.2.8 for the low velocity vents in adequately ventilated area.





The hazard zone adopted for the water dew point analyser / gas sampler is summarised below:

- Zone 1**            0.5 m radius from the vent tips  
                          Inside the sampler box
- Zone 2**            0.5 m radius around the water dew point analyser system  
                          1.0 m radius around the vent tips

## 2.7.10 ODORANT INJECTION SYSTEM

### 2.7.10.1 Odorant Pipework

A majority of the odorant pipework is tubing fitted with compression fittings, these are considered to be well maintained and infrequently operated. This provides a *Secondary* source of release and a Zone 2 hazardous area. In accordance with AS/NZS 60079.10.1 Clause ZA.5.2.8 the associated hazardous area is 1.5 m in all directions down to ground level.

- Zone 2**            1.5 m in all directions extending down to ground level



### 2.7.10.2 Odorant Storage Tank

The odorant storage tank is a pressure vessel supplied with a natural gas blanket and a pressure relief valve.

AS/NZS 60079.10.1 Clause ZA.5.2.1.2c describes the hazardous area associated with the above ground vent on a storage tank as Zone 1 within 1.5 m radius in all directions from point of discharge and Zone 2 within the cylindrical volume below the Zone 1 area. This is applicable for a vent on a storage vessel. There will be a constant release from the vent however the volume of release is small and is considered to be a *Primary* and a Zone 1 area is claimed.

The connections on the pressure vessel will have the same Zone 2 hazardous area as the odorant pipework.

The tank pressure relief valve will provide a *Secondary* release. This will result in a Zone 2 hazardous area. The extent of the hazardous area will be as the Zone 1 area for the vent, but without the additional Zone 2 area.

- Zone 1** 1.5 m in all directions from vent tip
- Zone 2** Cylindrical volume below the Zone 1 area  
1.5 m in all directions extending down to ground level for tank connections

### 2.7.10.3 Odorant Injection Pumps

The odorant injection pumps are pneumatically powered from instrument gas that is derived from the transmission gas. During operation of pumps there will be a continuous vent of gas. There will be a *Continuous* release from the pump discharge through a bug screen located on the pump, refer photograph below. The minimum diameter of the instrument gas is small. It is reasonable to assume that the solenoid valve has a reduced bore, and a typical size is 1/8" (3.2 mm). Based on Table C9(a) from IP15 for a G(i) gas, a pressure of 5 bar(a) (400 kPag) and a 5 mm hole the hazard radius is <1 m. Therefore a hazardous radius of 0.5 m is claimed around the pump.

The pump is a high integrity positive displacement pump capable of developing high discharge pressures to the odorant, therefore it is assumed that any hazardous area associated with leakage from the pump seals would be small and within the hazardous zone associated with the gas vent.



- Zone 1** 0.5 m radius from the pump

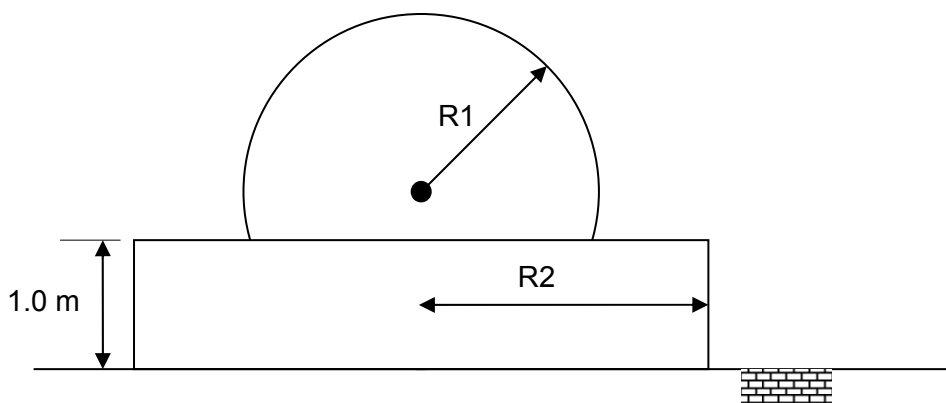
### 2.7.11 GROUND EFFECT

IP 15 Section 5.5 states that the determination of the full three dimensional envelope of the hazardous area zone shall consider the location of the release. The shape factor depends on height and orientation of the release. The key factors are:

1. For sources of release that are higher from grade than the hazardous radius, there is no impact due to ground effect.
2. For sources of release that are higher than 1 m from grade but less than the hazardous radius, there is a ground effect, up to 1 m above grade.
3. For sources of release that are 1 m or less from grade, there is a ground effect up to 1 m above grade.

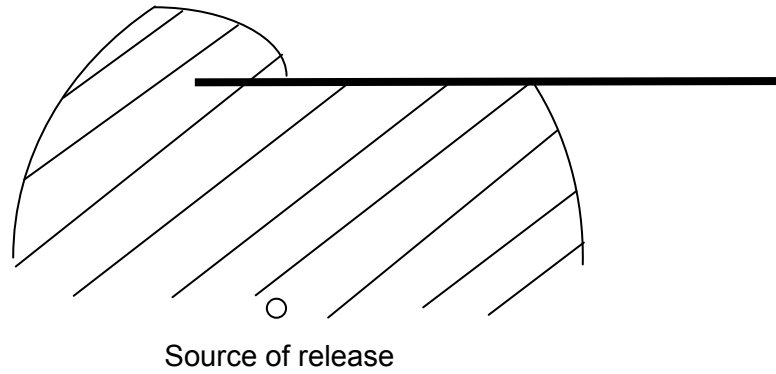
The main process pipework has a hazardous area of radius 2 m, and is located less than 2 m above grade. The direction of release from flanged joints and screwed fittings could be in any direction, therefore ground effects are to be considered. Other hazardous area zones will be sufficiently above grade so that there is no ground effect, or the direction of release will be upwards and therefore ground effect is negligible.

The ground effect increases the hazardous radius in accordance with IP 15 Table C9(b). A majority of the pipework in the facilities is to be located less than 1 m above grade. Interpolation of IP 15 Table C9(b) shows that the hazardous area for ground effect is 0.5 m larger than the hazardous area radius defined above, from the figure below,  $R_2 = R_1 + 0.5$ . Therefore the hazardous area at grade for gas pipework at transmission pressure will be 2.5 m to a height of 1 m.



### 2.7.12 VAPOUR BARRIERS

At Palm Valley Alice Springs and Mereenie the hazardous area zone impacts on a wall and the control hut, respectively. At these locations the hazardous area zone will extend around the barrier as shown in the diagram below. This is in accordance with AS/NZS 60079.10.1 Clause ZA.2 for measurements of distances.



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## **APPENDIX A HAZARDOUS AREA CLASSIFICATION DATA SHEET**

- Part I : Flammable material list and characteristics
- Part II : List of sources of release

## Part I – Sheet 1 of 1

## Flammable material list and characteristics

Amadeus Basin to Darwin Pipeline

Surface facilities



Revision:	0				
Author:	TCB				
Checked:	RDK				
QA:	EZG				
Date:	24/11/2011				

Material	Phase	ADG Class	IP 15 Fluid Category	Boiling Point °C	ASTM D86 5%(vol) Point of Stabilised Liquid at Atmospheric Pressure	Relative Density Of Fluid Vapour (Air SG=1) Liquid (Water SG=1)	Flash Point of Stabilised Liquid at Atmospheric Pressure °C	Vapour LEL (Vol %) In Air	Vapour UEL (Vol %) In Air	Ignition Temperature °C	Temperature Class	Equipment Group	Source Of Data
1	2	3	4	5	6	7	8	9	10	11	12	13	14
Process gas and calibration gas (mixture)	Vapour	2.1	G(i)	-162	-	0.62	Gas	4.4 (Methane)	17 (Methane)	537 (Methane)	T1	IIA	AS/NZS 60079.20
Odorant (tetrahydrothiophene and tertiary butyl mercaptan)	Liquid	3	C	82	-	0.939 (liquid) 3.06 (vapour)	-8	1.1*	12.1*	224	T3*	IIA	AS/NZS 60079.20 MSDS
Condensate	Liquid	3	C	69 <sup>†</sup>	-	2.97 <sup>†</sup>	-21 <sup>†</sup>	1.0 <sup>†</sup>	8.4 <sup>†</sup>	233 <sup>†</sup>	T3 <sup>†</sup>	IIA	AS/NZS 60079.20

\* Values obtained for Tetrahydrothiophene

<sup>†</sup> Based on Hexane

Part II – Sheet 1 of 4

List of sources of release

Amadeus Basin to Darwin Pipeline

Surface facilities



Revision:	0				
Author:	TCB				
Checked:	RDK				
QA:	EZG				
Date:	24/11/2011				

Process Equipment Item			Flammable Material	Operating Conditions Pressure and Temperature	Description of Flammable Material Containment	Ventilation	Source Of Release		Distance From Source To			Equipment Group and Temperature Class	Section
No.	Description	Location					Description	Grade*	Boundary of Zone 0	Boundary of Zone 1	Boundary of Zone 2		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Process piping	Amadeus Basin to Darwin Pipeline surface facilities	Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Closed system with flanges, piping joints and valves	Natural (open air)	Flanges, joints, valve seals, drains and vents	S	N/A	N/A	2 m radius from the edge of piping routes	IIA, T1	2.7.1.1
2	Instrument gas piping		Vap. Cat "G(i)"	≤ 770 kPag ≤ 60 °C	Closed system with flanges, piping joints and valves	Natural (open air)	Flanges, joints, valve seals, drains and vents	S	N/A	N/A	1 m radius from the edge of piping routes	IIA, T1	2.7.1.2
3	Fuel gas piping		Vap. Cat "G(i)"	≤ 700 kPag ≤ 60 °C	Closed system with flanges, piping joints and valves	Natural (open air)	Flanges, joints, valve seals, drains and vents	S	N/A	N/A	0.5 m radius from the edge of piping routes	IIA, T1	2.7.1.3
4	Control valves		Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Valves with packed gland / positioner / exhaust	Natural (open air)	Valve glands, positioners and connections	C & P & S	N/A	0.5 m radius around control valve positioners and exhaust	1 m radius around control valve positioners and exhausts;	IIA, T1	2.7.1.4
5	Pressure relief and safety relief valves		Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Valves and piping discharging vertically upwards	Natural (open air)	Pipe vent to atmosphere	C & P	N/A	1 m radius from vent tips	6 m laterally, 8 m above and 1 m below discharge points	IIA, T1	2.7.1.5
6	Mainline valves		Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Closed system with flanges, piping joints and valves	Natural (open air)	Connections and valve seals	S	N/A	Within solenoid valve enclosure	As Piping	IIA, T1	2.7.1.6
7	Local Vent Points		Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Valves and piping discharging vertically upwards	Natural (open air)	Pipe vent to atmosphere	S	N/A	N/A	6 m laterally, 8 m above and 1 m below discharge points	IIA, T1	2.7.1.7

\* C – Continuous; S – Secondary; P – Primary



Part II – Sheet 2 of 4

List of sources of release

Amadeus Basin to Darwin Pipeline

Surface facilities



Revision:	0				
Author:	TCB				
Checked:	RDK				
QA:	EZG				
Date:	24/11/2011				

Process Equipment Item			Flammable Material	Operating Conditions Pressure and Temperature	Description of Flammable Material Containment	Ventilation	Source Of Release		Distance From Source To			Equipment Group and Temperature Class	Section
No.	Description	Location					Description	Grade*	Boundary of Zone 0	Boundary of Zone 1	Boundary of Zone 2		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
8	Pine Creek vent stack	Pine Creek	Vap. Cat "G(i)"	Atmospheric pressure Ambient temperature	Valves and piping discharging vertically upwards	Natural (open air)	Pipe vent to atmosphere	P & S	N/A	1 m radius from the vent tip	12 m laterally, 6 m below and 8 m above vent tip	IIA, T1	2.7.1.8
9	Pipeline blowdown	Amadeus Basin to Darwin Pipeline surface facilities	Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Valves and piping discharging vertically upwards	Natural (open air)	Pipe vent to atmosphere	S	N/A	N/A	A cylinder of radius 15 m extending 30 m vertically upwards and 1 m downwards from discharge point <b>HOLD – To be confirmed</b>	IIA, T1	2.7.1.9
10	Low velocity vents		Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Valves and piping discharging vertically upwards	Natural (open air)	Pipe vent to atmosphere	S	N/A	N/A	Radius of 1 m extending in all directions from the point of discharge	IIA, T1	2.7.1.10
11	Scraper vessels		Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Enclosed system with closures	Natural (open air)	Flanges, joints, valve seals, drains and vents	S	N/A	N/A	3 radius in all directions from quick opening closure As per section 2.7.1.1 for piping for remainder of the vessel	IIA, T1	2.7.2
12	Multicyclone and filter separators		Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Enclosed vessels with quick opening closures	Natural (open air)	Flanges, joints, valve seals, drains and vents	S	N/A	N/A	3 m radius around the closures and 2 m radius from the edge of the vessels	IIA, T1	2.7.3
			Liq. Cat "C"	≤ 9,650 kPag ≤ 60 °C	Liquid drain pipework	Natural (open air)	Piping connections	S	N/A	N/A	2 m in all directions down to ground level	IIA, T3	2.7.1.1

\* C – Continuous; S – Secondary; P – Primary

Part II – Sheet 3 of 4

List of sources of release

Amadeus Basin to Darwin Pipeline

Surface facilities



Revision:	0				
Author:	TCB				
Checked:	RDK				
QA:	EZG				
Date:	24/11/2011				

Process Equipment Item			Flammable Material	Operating Conditions Pressure and Temperature	Description of Flammable Material Containment	Ventilation	Source Of Release		Distance From Source To			Equipment Group and Temperature Class	Section
No.	Description	Location					Description	Grade*	Boundary of Zone 0	Boundary of Zone 1	Boundary of Zone 2		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
13	Slop tanks	Amadeus Basin to Darwin Pipeline surface facilities	Vap. Cat "G(i)"	Atmospheric pressure Ambient temperature	Open vessels	Natural (open air)	Piping connections and vents	C & P & S	Inside the tank above liquid level and 0.5 m radius from tank discharge points	1.5 m radius from tank discharge points	3 m radius from around shell of tanks and from tank discharge points	IIA, T1	2.7.4
14	Water bath heaters		Vap. Cat "G(i)"	≤ 9,900 kPag ≤ 60 °C	Enclosed vessels	Natural (open air)	Piping connections	S	N/A	N/A	2 m radius from high pressure gas connections of vessel	IIA, T1	2.7.5
15	Catalytic heater		Vap. Cat "G(i)"	≤ 9,900 kPag ≤ 60 °C	Enclosed vessels	Natural (open air)	Piping connections	S	Inside the heater compartment	0.5 m from the edge of the heater compartment	2 m radius from high pressure gas connections of vessel	IIA, T1	2.7.6
16	Knockout pots		Vap. Cat "G(i)"	≤ 9,900 kPag ≤ 38 °C	Enclosed vessels	Natural (open air)	Piping connections	S	N/A	N/A	2 m radius from edge of vessels	IIA, T1	2.7.7
17	Gas chromatograph systems		Vap. Cat "G(i)"	≤ 140 kPag ≤ 60 °C	Closed tubing systems with joints and vents	Shelter with open sides (open air)	Tubing joints, drains and vents	P & S	N/A	0.5 m radius from vent tips	0.5 m radius around system, excluding cylinders 1.0 m radius around vent tips	IIA, T1	2.7.8
18	Water dew point analysers / gas samplers		Vap. Cat "G(i)"	≤ 140 kPag ≤ 60 °C	Closed tubing systems with joints and vents	Shelter with open sides (open air)	Tubing joints, drains and vents	P & S	N/A	0.5 m radius from vent tips Inside sampler box	0.5 m radius around the system, 1.0 m radius around vent tips	IIA, T1	2.7.9

\* C – Continuous; S – Secondary; P – Primary

Part II – Sheet 4 of 4

List of sources of release

Amadeus Basin to Darwin Pipeline

Surface facilities



Revision:	0					
Author:	TCB					
Checked:	RDK					
QA:	EZG					
Date:	24/11/2011					

Process Equipment Item			Flammable Material	Operating Conditions Pressure and Temperature	Description of Flammable Material Containment	Ventilation	Source Of Release		Distance From Source To			Equipment Group and Temperature Class	Section
No	Description	Location					Description	Grade*	Boundary of Zone 0	Boundary of Zone 1	Boundary of Zone 2		
1	2	3	4	5	6	7	8	9	10	11	12	13	14
19	Odorant injection system pipework	Tylers Pass odorant injection station	Vap. Cat "C"	≤ 9,650 kPag ≤ 60 °C	Closed system with flanges, piping joints and valves	Natural (open air)	Flanges, joints, valve seals, drains and vents	S	N/A	N/A	1.5 m in all directions down to ground level	IIA, T3	2.7.10.1
20	Odorant injection system storage tanks		Vap. Cat "C"	15 kPag ≤ 60 °C	Enclosed vessel	Shelter with open sides (open air)	Connections	S	N/A	N/A	1.5 m in all directions down to ground level	IIA, T3	2.7.10.2
					Blanket gas vent		Pipe vent to atmosphere	P		Radius of 1.5 m in all directions from vent tip	Within cylindrical volume below Zone 1		
					Pressure relief valve and piping discharging vertically upwards		Pipe vent to atmosphere	S		N/A	Radius of 1.5 m in all directions from vent tip		
21	Odorant injection system pumps		Vap. Cat "G(i)"	≤ 400 kPag ≤ 60 °C	Pneumatic pump instrument gas exhaust	Shelter with open sides (open air)	Piping connections and vents	C	N/A	N/A	Radius of 0.5 m	IIA, T1	2.7.10.3
22	Ground effect	Amadeus Basin to Darwin Pipeline surface facilities	Vap. Cat "G(i)"	≤ 9,650 kPag ≤ 60 °C	Closed system with flanges, piping joints and valves	Natural (open air)	Flanges, joints, valve seals, drains and vents	S	N/A	N/A	2.5 m laterally and extending to 1 m above grade for all process piping less than 2 m above grade	N/A	2.7.12

\* C – Continuous; S – Secondary; P – Primary

## **APPENDIX B HAZARDOUS AREA MAPPING DRAWINGS**

For hazardous area mapping drawings, refer to Section 4 of the Hazardous Area Dossiers for each site.

### 3 Observation for Improvement (OFI)

OFI No.	Description	Proposed Remedy
<b>AD 0610-OFI-1</b> Pressure Transmitter AD 0610-PT-9	Cable glands are loose.	Tighten loose cable glands.
	Cabling at equipment requires re-termination.	Review as described.
<b>AD 0610-OFI-2</b> Valve Limit Switch AD 0610-ZSC-10 AD 0610-ZSO-10	Cable glands are loose.	Tighten loose cable glands.
	Equipment ID required.	Provide equipment ID.
	Nil support to cable/mechanical protection.	Provide cable support/mechanical protection.
	Nil evidence of equipment explosion protection.	Replace the equipment or get appropriate certificate of compliance.
<b>AD 0610-OFI-3</b> Solenoid Valve AD 0610-SVC-10 AD 0610-SVO-10	Equipment and circuit ID required.	Provide equipment and circuit ID.
	Damaged solenoid enclosure.	Repair as necessary.
	Nil evidence of equipment explosion protection.	Replace the equipment.
	Replacement of the equipment is required due to poor condition and age.	
<b>AD 0610-OFI-4</b> Pressure Transmitter AD 0610-PT-12	Circuit ID required.	Provide circuit ID.
	Blue sheath to cabling required.	Provide the cable with a blue sheath.
	Cable glands are loose.	Tighten loose cable glands.
	Sealing of conduit/ducts required.	Review as described.
<b>AD 0610-OFI-5</b> Temperature Transmitter AD 0610-TT-13	Equipment and circuit ID required.	Provide equipment and circuit ID.
	Nil support to cable/mechanical protection.	Provide cable support/mechanical protection.
	Sealing of conduit/ducts required.	Review as described.
	Provide/test equipotential bonding.	Review as described.

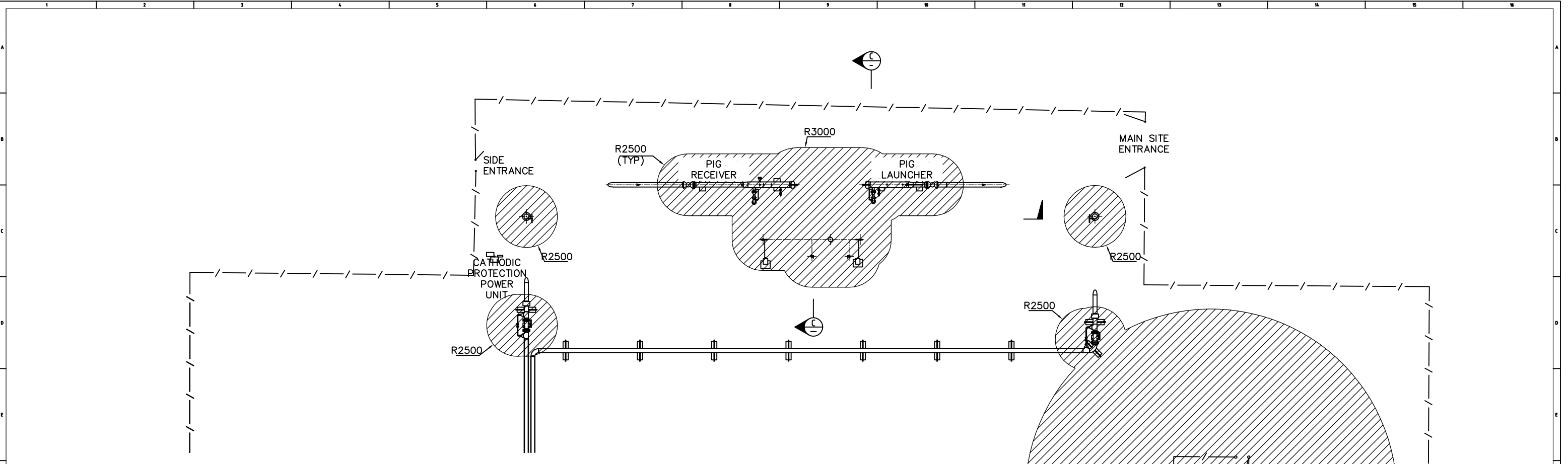
<b>OFI No.</b>	<b>Description</b>	<b>Proposed Remedy</b>
<b>AD 0610-OFI-6</b> Temperature Element AD 0610-TE-13	Circuit ID in poor condition	Provide circuit ID.



## 4 Hazardous Area Mapping Drawings

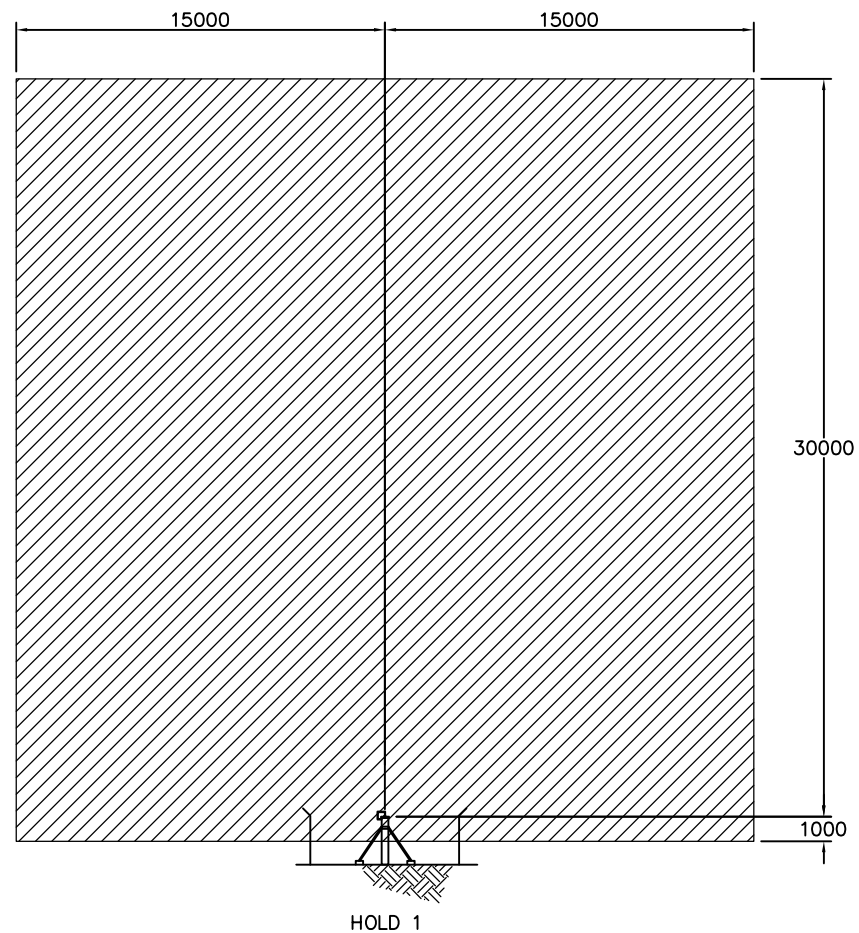
This section contains the hazardous area mapping drawings.

<b>Drawing Number</b>	<b>Description</b>	<b>Revision</b>
AD 0610-5001	Scraper Station 350 NS – Warrego Hazardous Area	0

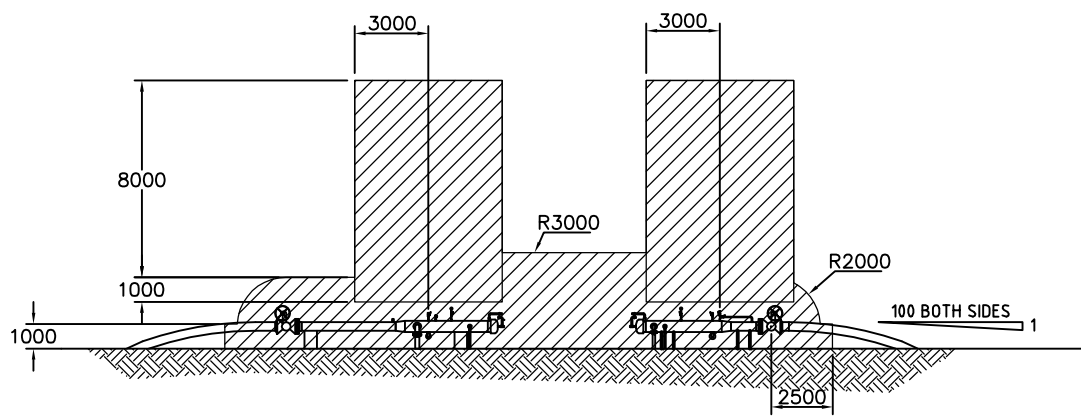


CONTINUATION ON DRAWING AD0610-XXXX

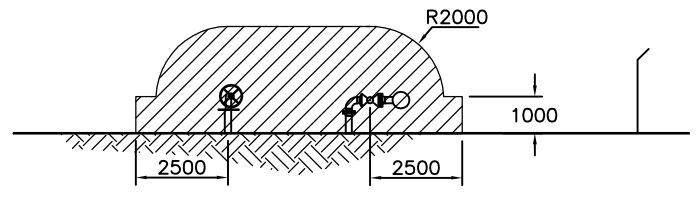
PLAN VIEW 01  
SCALE 1:150



SECTION A  
SCALE 1:150



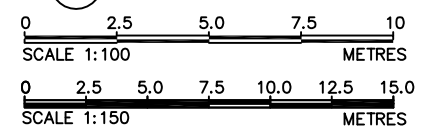
SECTION B  
SCALE 1:150



SECTION C  
SCALE 1:100

CLASSIFICATION LEGEND

- ZONE 0
  - ZONE 1
  - ZONE 2
- GAS T1 IIA



REV	DESCRIPTION	DATE	BY	CHKD	APP	REFERENCE DRAWINGS	ORIG

NOTES:  
 1. LOCATION OF UNDERGROUND SERVICES NOT CONFIRMED AND NOT SHOWN ON THIS DRAWING, REFER TO DRAWING AD0610-6004 ALL FOR PIPING DETAILS.  
 1. ACTUAL SHAPE AND EXTENT OF HAZARDOUS AREA TO BE DETERMINED BY PLUME ANALYSIS

<b>FYE Earth Partners</b> <small>ADVISED BY 13/1/10</small>		<b>APA Group</b>		<small>PROJECT: AMADEUS BASIN TO DARWIN PIPELINE</small> <small>FILE: SCRAPER STATION 350 NS</small> <small>HAZARDOUS AREAS - WARREGO</small> <small>WARREGO HAZARDOUS</small>	
<small>1/11/11</small> <small>13/01/11</small> <small>13/01/11</small>		<small>SCALE: AS SHOWN</small> <small>LEVEL DATUM: ADDITIONAL</small> <small>SCALE: 1:150/100</small> <small>DRAWN: PVT</small> <small>CHECKED: TTS</small>		<small>DESIGNER: [Signature]</small> <small>APPROVED: [Signature]</small> <small>PROJECT NO. AD0610-5001</small> <small>DRAWING NO. AD0610-5001</small> <small>REV 0</small>	

## **5 Hazardous Area Equipment Register and Certificates of Conformity**

This section contains the hazardous area equipment register and associated certificates of conformity.



## Warrego Scrapper Station Hazardous Area Equipment Register



Doc No.: 18756-6-70-003

Rev: 0

Date: 1/11/2011

Tag	P&ID No.	Location	Instrument Type	Manufacturer	Model	Serial No.	Hazard Area Drawing No.	Haz Area Classification			Ex Protection	Certification
								Zone	Gas Group	Temp.		
<b>WARREGO SCRAPPER STATION P&amp;ID (AD0610-7010-1)</b>												
AD 0610-PT-9	AD 0610-7010-1	Upstream of mainline valve AD0610-MLV-10	Pressure Transmitter	Rosemount	3051TG4A2B21AB4I7M5	RS0608414					Ex ia IIC T5	AUS Ex 1249x
AD 0610-ZSO-10	AD 0610-7010-1	Mainline valve AD0610-MLV-10	Valve Limit Switch (Open)	Limatorque								
AD 0610-ZSC-10	AD 0610-7010-1	Mainline valve AD0610-MLV-10	Valve Limit Switch (Closed)	Limatorque								
AD 0610-SVO-10	AD 0610-7010-1	Mainline valve AD0610-MLV-10	Solenoid Valve (Open)									
AD 0610-SVC-10	AD 0610-7010-1	Mainline valve AD0610-MLV-10	Solenoid Valve (Closed)									
AD 0610-PT-12	AD 0610-7010-1	Downstream of mainline valve AD0610-MLV-10	Pressure Transmitter	Rosemount	3051PG5A22AIAM5B4I7	0523891					Ex ia IIC T4	AUS Ex 1249x
AD 0610-TT-13	AD 0610-7010-1	Downstream of mainline valve AD0610-MLV-10	Temperature Transmitter	Rosemount	3144PD2A1I7M5F5	1030440					Ex ia IIC T6 IP 66	AUS Ex 02.3794x
AD 0610-TE-13	AD 0610-7010-1	Downstream of mainline valve AD0610-MLV-10	Temperature Element									







Certification of

**EXPLOSION PROTECTED ELECTRICAL EQUIPMENT**

Administered by: Standards Australia Quality Assurance Services

Certificate of Conformity

Certificate No: AUS Ex 1249X Issue 0: Original Issue 17/7/1991  
Issue 5: 30/05/2003 (Revalidation)

Date of Expiry: 30/05/2013

Certificate Holder: Fisher-Rosemount Pty Ltd  
471 Mountain Highway  
BAYSWATER Victoria 3153

Electrical Equipment: Model 3051-series Pressure Transmitter and Model 3001-series Hydrostatic Pressure Transmitter, including optional Fieldbus/Profibus outputs, LCD indicator and T1 Transient-protection Terminal Board.

Type of Protection: Ex ia  
Ex n

Marking Code: Ex ia IIC T4 (T<sub>amb</sub> = 70 °C) / T5 IP66 (for non-Fieldbus)  
Ex ia IIC T4 (T<sub>amb</sub> = 60 °C) / T5 IP66 (for Foundation Fieldbus/Profibus)  
Ex n IIC T4 (T<sub>amb</sub> = 70 °C) / T5 IP66  
AUS Ex 1249X

Manufactured By: Rosemount Inc  
8200 Market Boulevard  
Chanhassen MN 55317 USA

Emerson Process Management		
Document Control		
PDC No: 4-70538561-001	Rev: 0	Date: 31/7/03
ORDER NUMBERS		
Customer: 626973		
Emerson: 70538561		

Issued by:



919 Londonderry Road Londonderry NSW 2753  
Phone: (02) 4724 4900 Fax: (02) 4724 4999

JAS-ANZ



Accreditation by the Joint Accreditation System of Australia and New Zealand, Acc No. Z2221100AS

STANDARDS AUSTRALIA



# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

*This certificate is granted subject to the conditions as set out in Standards Australia Miscellaneous Publication MP 69 and the Procedures (Doc Q7134) of the scheme.*

*The electrical equipment and any acceptable variation to it specified in the schedule to this certificate and the identified documents, was found to comply with the following standards:*

- AS 2380.1-1989 Electrical equipment for explosive atmospheres - Explosion-protection techniques - General requirements (incorporating Amendment 1)
- AS 2380.7-1987 Electrical Equipment for explosive atmospheres - Explosion-protection techniques - Intrinsic safety 'i'
- AS 2380.9-1991 Electrical Equipment for Explosive atmospheres - Explosion-protection Techniques - Non-sparking Apparatus - Type of protection 'n'
- AS 1939-1990 Degrees of protection provided by enclosures of electrical equipment (IP Code)

*This certificate does not ensure compliance with electrical safety requirements and performance other than those included in the Standards listed above.*

*The equipment listed has successfully met the examination and test requirements as recorded in*

*Test Report No:* LOSC 11812; 16864; 16910 and TestSafe 20320, 21599 and 22468

*File Reference:* TestSafe 94/5985-TSA 0007



Signed for and on behalf of issuing authority  
Laboratory Systems Manager  
TestSafe Australia

Position  
30/05/2003

Date of issue

Ex 1249X-5

*This certificate and schedule may not be reproduced except in full.*

*This certificate is not transferable and remains the property of Standards Australia Quality Assurance Services and must be returned in the event of its being revoked or not renewed.*

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Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 642

# Certification of

# EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

## Schedule

**Certificate No:** AUS Ex 1249X

**Issue:** 5

**Date of Issue:** 30/05/2003

**Certified Equipment:**

The range of transmitters is designed to convert signals from a pressure transducer into an electrical signal. The electronics provide an analogue 4-20 mA output with HART, or optionally a d.c. output for low power applications or Foundation Fieldbus, or Profibus output for Fieldbus applications. The transmitter is intended for connection to separately certified apparatus having a source of potential not exceeding 30 Volts d.c. and a short circuit current not exceeding 200 mA for the low power and analog/HART output or 300 mA for the Fieldbus output.

The equipment may be manufactured in a number of combinations from the ranges of optional boards according to the configurations, and they are tabulated in the following tables.

(a) Foundation Fieldbus/Profibus Transmitter Configuration		
Ref.	Description	Drawing No.
Any one of the following terminal boards:		
Ter.e	Standard 3051 Fieldbus	03031-0467
Ter.f	Transient Protection 3051 Fieldbus (T1 Option)	03031-0486
Micro-board assembly:		
Micro.a1	3051 Fieldbus Analog	03031-0477
Micro.a2	3051 Fieldbus Digital	03031-0481
Optional LCD Indicator assembly:		
Dis.c	CCA, Vortex Shrouded, LCD Board, 2 Line	08800-7611
Any one of the sensor boards can be used: (Refer to Sensor Board List below)		

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# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

Ex 1249X-5

Addendum to Certificate No.....

Certified Equipment: (Continued)

(b) Low Power Transmitter Configuration		
Ref.	Description	Drawing No.
Any one of the following terminal boards can be used:		
Ter.a	Potted Low Power Terminal Block Assembly	03031-0607
Ter.b	Transient Protection Terminal Brd, 3-Wire (T1 Option)	03031-0506
Microboard assembly:		
Micro.b	Low Power Microboard Conformal Coated	03031-0275
Optional LCD Indicator assembly:		
Dis.a	Coated CCA Meter/LCD Board	03031-0162
Any one of the sensor boards can be used: (Refer to Sensor Board List below)		

(c) Analog/HART Transmitter Configuration		
Ref.	Description	Drawing No.
Any one of the following terminal boards can be used:		
Ter.c	4-20mA Standard Terminal Block Assembly	03031-0657
Ter.d	Standard Transient Protection Terminal Block Assembly (T1 Option)	03031-0665
Microboard Assembly:		
Micro.c	Micro Brd 5, Coated & Spot Potted, 3051/3001 & Probar	03031-0584
Optional LCD Indicator assembly:		
Dis.b	Shrouded/Spot-Potted/Labelled LCD Board, 2 Line	03031-0591
Any one of the sensor boards can be used: (Refer to Sensor Board List below)		

Sensor Boards List		
Ref.	Description	Drawing No.
Sen.a	Low Cost Sensor Card Conformal Coated	03031-0283
Sen.b	Sensor Board 3, Uncoated, 3051C	03031-0587
Sen.c	Sensor Board IV Coated, 3051C	03031-0817
Sen.d	AP Sensor Card Conformal Coated	03031-2011
Sen.e	Sensor Board, Coated, 3051T	03031-0923
Sen.f	Sensor Taconite, Coated, 3051/2088	03031-0929

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# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

Addendum to Certificate No. Ex 1249X-5

### Variations Permitted By Issue 5:

- The complete range of the equipment has been classified as documented in the Certified Equipment.

### Conditions of Certification relating to Variations Permitted by Issue 5:

- It is a condition of manufacture that the 3051 or 3001 pressure transmitters that do not include the transient protection on the terminal board assembly must be capable of withstanding a test voltage of not less than 500 Volts, 48 Hz to 62 Hz applied between input terminals and case for a period not less than 1 minute.
- It is a condition of safe use that the following parameters are to be taken into account for Intrinsic Safety applications:

(a) Foundation Fieldbus/Profibus Transmitter Configuration	
Entity Parameters	With or without transient protected T1 option
Ui	30 V
Ii	300 mA
Pi	1.3 W
Ci	0 µF
Li	0 µH

(b) Low Power Transmitter Configuration		
Entity Parameters	Without transient protected T1 option	With transient protected T1 option
Ui	30 V	30 V
Ii	200 mA	200 mA
Pi	0.9 W	0.9 W
Ci	0.042 µF	0.042 µF
Li	10 µH	0.75 mH

(c) Analog/HART Transmitter Configuration		
Entity Parameters	Without transient protected T1 option	With transient protected T1 option
Ui	30 V	30 V
Ii	200 mA	160 mA
Pi	0.9 W	0.9 W
Ci	0.01 µF	0.01 µF
Li	10 µH	1.05 mH

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# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

Addendum to Certificate No. Ex 1249X-5

### Conditions of Certification relating to Variations Permitted by Issue 5: (continued)

3. It is a condition of safe use that the apparatus may only be used with a passive current limited power source for Intrinsic Safety applications. The power source parameters must be such that  $P_o \leq (U_o \times I_o) / 4$ .
4. It is a condition of safe use that for models using transient protection in the terminal assembly (T1 transient protection models) the apparatus enclosure is to be electrically bonded to the protective earth. The conductor used for the connection shall be equivalent to a copper conductor of 4 mm<sup>2</sup> minimum cross-sectional area.
5. It is a condition of safe use that the Fieldbus option is to be supplied from a voltage source not exceeding 35.0 V dc for Non-Sparking applications. The Low Power and Analog/HART options are to be supplied from a voltage source not exceeding 55 V dc for Non-sparking applications.
6. It is a condition of safe use that where the equipment is installed such that there is an unused conduit entry, the entry must be sealed with a suitable blanking plug to maintain the minimum degree of protection of IP66 for Non-Sparking applications.
7. It is a condition of safe use that upon completion of commissioning the apparatus with a label plate with more than one marking on it, the irrelevant marking code(s) shall be permanently scribed off.

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Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 642

# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

Addendum to Certificate No. .... Ex 1249X-5

### Drawings Relating to Variations Permitted by Issue 5

Document No.	Document Title	Sheets	Issue	Date
00268-0031	Index of I.S. Barrier System for MOD.268 Smart Family Interface	1 to 7	M	08/04/1993
03031-0059	Label, Nameplate / Customer Tag	1 to 16	AY	17/12/2001
03031-0060	Label, Approvals, 3051C	1 to 8	BG	04/04/2002
03031-0087	Schematic Diagram, 3051/3001 CENELEC I.S. Approval	1 of 1	AC	10/10/1997
03031-0160	Schematic Diagram, Meter/LCD Board	1 of 1	H	07/05/1990
03031-0161	Printed Wiring Board LCD/Meter Board	1 to 4	U	05/08/1996
03031-0162	Coated CCA Meter/LCD Board	1 of 1	AC	22/11/1999
03031-0272	Schematic Diagram 3051C Low Power	1 of 2	AA	17/02/1999
03031-0273	Printed Wiring Board Low Power Microboard	1 to 4	J	06/08/1996
03031-0275	Circuit Card Assy Low Power Microboard Conformal Coated	1 to 3	AB	10/11/1999
03031-0280	Schematic Diagram Low Cost Sensor BRD	1 of 1	F	12/01/1995
03031-0281	Printed Wiring Board Low Cost Sensor Card	1 to 4	G	06/08/1996
03031-0283	Circuit Card Assy Low Cost Sensor Card Conformal Coated	1 of 1	F	21/03/1991
03031-0464	Schematic Drawing Standard Terminal Block, 3051 Fieldbus	1 of 1	AA	20/03/1998
03031-0467	Terminal Block Assy, Standard 3051 Fieldbus	1 to 2	AC	12/1998
03031-0475	3051 Fieldbus Analog Electronics	1 to 2	AC	12/1998
03031-0476	Printed Wiring Board - Fieldbus Analog	1 to 3	AC	10/06/1998
03031-0477	Circuit Card Assy 3051 Fieldbus Analog	1 to 2	AH	29/05/2001
03031-0479	3051 Fieldbus Digital Electronics	1 of 1	AB	12/1998
03031-0480	Printed Wiring Board - 3051 Fieldbus Digital	1 to 3	AC	12/1998
03031-0481	Circuit Card Assy - 3051 Fieldbus Digital	1 to 3	AD	01/2000
03031-0483	Schematic Drawing Transient Terminal Block, 3051 Fieldbus	1 of 1	AB	22/02/2001
03031-0484	Printed Wiring Board Transient Protection 3051 Fieldbus	1 to 3	AC	22/02/2001
03031-0486	Terminal Block Assy, Transient Protection, 3051 Fieldbus	1 to 2	AC	12/1998
03031-0488	Ass'y Output Electronics, Fieldbus	1 of 1	AG	29/05/2001
03031-0504	Schematic Diagram Terminal Block 3-wire Configuration	1 of 1	C	21/05/1991
03031-0505	Printed Wiring Board Terminal Board, 3-Wire Configuration	1 to 2	E	23/06/1995
03031-0506	Circuit Card Assy, Transient Protection Terminal BRD, 3-Wire	1 to 3	AA	24/08/1998

Issued by:



**919 Londonderry Road Londonderry NSW 2753**  
Phone: (02) 4724 4900 Fax: (02) 4724 4999

JAS-ANZ



Accreditation by the Joint Accreditation  
System of Australia and New Zealand,  
Acc No. Z2221100AS

## STANDARDS AUSTRALIA



Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 642

# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

Addendum to Certificate No. .... Ex 1249X-5

### Drawings Relating to Variations Permitted by Issue 5 (Continued)

Document No.	Document Title	Sheets	Issue	Date
03031-0519	3051P Label, Nameplate / Customer Tag	1 to 8	AG	10/08/2001
03031-0520	Label, Approvals, 3051P	1 to 8	AJ	06/01/2000
03031-0521	Label, Nameplate / Customer Tag 3051C-Low Power	1 to 7	AH	15/02/2001
03031-0535	Label, Nameplate / Customer Tag 3051P-Low Power	1 to 3	F	19/05/1995
03031-0581	Schematic Drawing Micro Board #5 3051C	1 to 3	AD	01/03/2002
03031-0582	Printed Wiring Board, Micro BRD 5, 3051C	1 to 3	AD	17/07/2000
03031-0584	Shrouded Assembly Micro BRD 5, Coated & Spot Potted, 3051/3001 & Probar	1 to 4	AK	04/03/2002
03031-0585	Schematic Sensor Board 3	1 to 2	B	13/11/1995
03031-0586	Printed Wiring Board Sensor Board 3 3051C	1 to 4	AA	08/10/1997
03031-0587	Circuit Card Assy Sensor Board 3, Uncoated, 3051C	1 to 2	AC	25/06/1998
03031-0589	Schematic Diagram 160 Segment LCD Board	1 to 1	A	31/01/1995
03031-0590	Printed Wiring Board LCD Board, 2 Line	1 to 4	AA	30/11/1998
03031-0591	Circuit Card Assembly Shrouded/Spot-Potted/labeled LCD Board, 2 Line	1 to 3	AF	19/06/2000
03031-0604	Schematic Diagram 3051C Low Power Terminal Block	1 of 1	A	12/02/1996
03031-0605	Printed Wiring Board, Low Power, Terminal, Block, 3051C	1 to 3	A	12/02/1996
03031-0607	Potted Low Power Terminal Block Assembly	1 of 1	AC	15/11/2001
03031-0655	Schematic Diagram 4-20mA Standard Terminal Block	1 of 1	AB	15/10/2001
03031-0656	Printed Wiring Board, Standard 4-20mA, Terminal Block, 3051C	1 to 3	AD	20/06/2000
03031-0657	4-20mA Standard Terminal Block Assembly	1 to 2	AF	15/11/2001
03031-0663	Schematic Diagram Standard Trans. Protection Terminal Block	1 of 1	AB	10/2001
03031-0664	Printed Wiring Board, Transient Protection Standard, Term. Block, 3051C	1 to 3	AC	07/08/1997
03031-0665	Standard Transient Protection Terminal Block Assembly	1 to 2	AD	15/11/2001
03031-0687	Schematic Diagram, 3051 Fieldbus CENELEC I.S. Approval	1 of 1	AB	16/08/2001
03031-0815	Schematic Sensor Board IV	1 to 2	AE	13/01/1999
03031-0816	Printed Wiring Board Sensor Board IV, 3051C	1 to 3	AE	11/06/1998

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## STANDARDS AUSTRALIA

Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 642

# Certification of

# EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

Addendum to Certificate No... Ex 1249X-5

## Drawings Relating to Variations Permitted by Issue 5 (Continued)

Document No.	Document Title	Sheets	Issue	Date
03031-0817	Circuit Card Assy Sensor Board IV Coated, 3051C	1 to 2	AH	13/01/1999
03031-0920	Schematic Sensor, 3051T	1 to 2	G	13/12/1995
03031-0921	Printed Wiring Board, Sensor Board 3051T	1 to 3	C	25/02/1997
03031-0923	Circuit Card Assy Sensor Board Coated, 3051T	1 of 1	AA	07/10/1997
03031-0926	Schematic Sensor, 3051TAC	1 to 3	AE	01/04/2001
03031-0927	Printed Wiring Board Sensor Taconite, 3051/2088	1 to 3	AF	25/05/2001
03031-0929	Circuit Card Assembly Sensor Taconite, Coated, 3051/2088	1 of 1	AJ	01/04/2001
03031-1017	Approval Drawing For Module Housing Ass'y, Intrinsically Safe	1 to 6	AH	30/11/2000
03031-1022	Model 3051C/L/P/H, 3001C/S Intrinsically Safe and Type N Configuration, SAA	1 to 10	AG	28/05/2003
03031-1026	SAA I.S. Index For 3051 and 3001	1 to 4	AB	26/04/1999
03031-2008	Schematic Diagram AP Sensor Brd	1 of 1	L	23/09/1996
03031-2009	Printed Wiring Board AP Sensor Card	1 to 4	K	23/09/1996
03031-2011	Circuit Card Assy AP Sensor Card Conformal Coated	1 of 1	AA	07/10/1997
03031-2041	3051T Sensor Board Standoff	1 of 1	AC	05/09/2000
08800-7609	Schematic Diagram, Vortex LCD Board	1 of 1	AA	15/10/1997
08800-7610	Printed Wiring Board, LCD 2 Line	1 to 3	AA	15/10/1997
08800-7611	CCA, Vortex, Shrouded, LCD Board, 2 Line	1 to 2	AE	06/07/2000

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## STANDARDS AUSTRALIA



Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 642

CONFIDENTIAL AND PROPRIETARY  
INFORMATION IS CONTAINED  
HEREIN AND MUST BE  
HANDLED ACCORDINGLY

REVISIONS

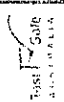
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AA	UPDATE ENTITY PARAMETERS	RTC1002910	J.D.J.	12/2/97
AB	ADD FIELDBUS AND PROFIBUS	RTC1006448	J.D.J.	4/26/99

SAA ENTITY CONCEPT APPROVALS

3051C	3001C
3051L	3001CL
3051P	3001CH
3051H	3001S
3051CA	
3051T	

OUTPUT CODE A (4-20 mA HART) SEE SHEETS 2  
OUTPUT CODE M (LOW POWER) SEE SHEETS 3  
OUTPUT CODE F / W (FIELDBUS, PROFIBUS) SEE SHEETS 4

TestSafe Australia  
 This drawing forms part of certification  
 documents under Certificate Number  
 AUS Ex 12491-5  
 Amendments require Supplementary  
 Certification



THE ROSEMOUNT PRESSURE TRANSMITTERS LISTED ABOVE ARE INTRINSICALLY SAFE WHEN USED IN THE CIRCUIT WITH SAA APPROVED BARRIERS WHICH MEET THE LIST ENTITY PARAMETERS.

TO ASSURE AN INTRINSICALLY SAFE SYSTEM, THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURER'S FIELD WIRING INSTRUCTIONS AND THE APPLICABLE CIRCUIT DIAGRAM.

CAD Maintained, (MICROSTATION)

UNLESS OTHERWISE SPECIFIED DIMENSIONS IN INCHES [mm]. REMOVE ALL BURRS AND SHARP EDGES, MACHINE SURFACE FINISH 125  -TOLERANCE- .X ± .1 [2,5] .XX ± .02 [0,5] .XXX ± .010 [0,25] FRACTIONS ANGLES ± 1/32 ± 2° DO NOT SCALE PRINT	CONTRACT NO.	<b>ROSEMOUNT MEASUREMENT</b>		Rosemount Inc. 12001 Technology Drive Eden Prairie, MN 55344 USA
	DR. Mike Dobe 12/30/91	FISHER-ROSEMOUNT		
	CHK'D	TITLE		
	APP'D. GLEN MONZO 5/8/92	SAA I.S. INDEX FOR 3051 & 3001		
APP'D. GOVT.	SIZE A	FSCM NO.	DWG NO. 03031-1026	
	SCALE N/A	WT.	SHEET 1 OF 4	

Electronic Master - PRINTED COPIES ARE UNCONTROLLED - Rosemount Proprietary

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB		RTC1006448		

### OUTPUT CODE "A" (4-20MA / HART) SAA ENTITY CONCEPT APPROVALS

THE ROSEMOUNT PRESSURE TRANSMITTERS LISTED BELOW ARE INTRINSICALLY SAFE WHEN USED IN THE CIRCUIT WITH SAA APPROVED BARRIERS WHICH MEET THE LISTED ENTITY PARAMETERS.

#### APPROVED TRANSMITTERS

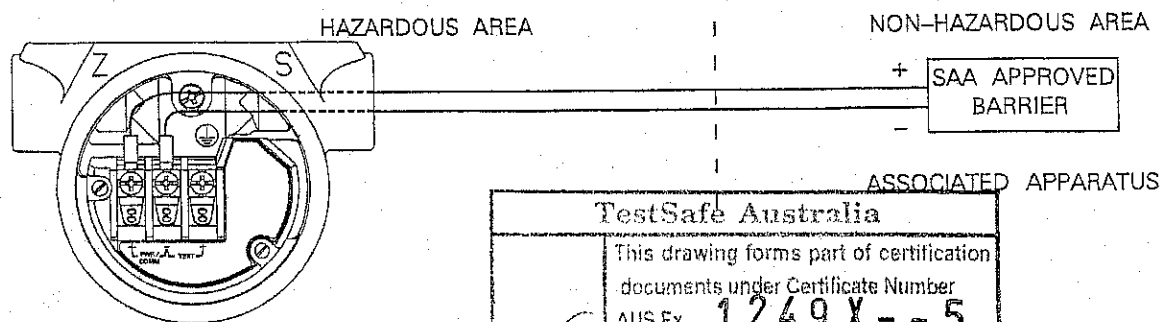
3051C 3051H 3001C 3001S  
 3051L 3051T 3001CL  
 3051P 3051CA 3001CH

ENTITY PARAMETER FOR Ex Ia IIC T5 CLASS I, ZONE 0 PROTECTION:

APPARATUS PARAMETER	BARRIER PARAMETER
$V_{max} = 30V$ $I_{max} = 200mA$ $P_{max} = 0.9W$  $C_i = 0.01\mu F$ $L_i = 10\mu H$  FOR T1 OPTION ONLY $I_{max} = 160mA$ $L_i = 1.05mH$	$V_{oc}$ IS LESS THAN OR EQUAL TO 30V $I_{sc}$ IS LESS THAN OR EQUAL TO 200mA $\frac{V_{oc} * I_{sc}}{4}$ IS LESS THAN OR EQUAL TO 0.9W $C_a$ IS GREATER THAN 0.01 MICROFARADS $L_a$ IS GREATER THAN 10 MICROHENRIES  $I_{sc}$ IS LESS THAN OR EQUAL TO 160mA $L_a$ IS GREATER THAN 1.05 MILLIHENRIES

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM.

TO ASSURE AN INTRINSICALLY SAFE SYSTEM THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURERS FIELD WIRING INSTRUCTIONS AND THE CIRCUIT DIAGRAM SHOWN BELOW.



Rosemount Inc.  
 12001 Technology Drive  
 Eden Prairie, MN 55344 USA

DR. Mike Dobe  
 ISSUED

**TestSafe Australia**  
 This drawing forms part of certification documents under Certificate Number  
 AUS Ex **1249X-5**  
 Amendments require Supplementary Certification

CAD Maintained, (MICROSTATION)

SIZE A	FSCM NO	DWG NO. 03031-1026
SCALE N/A	WT.	SHEET 2 OF 4



REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB		RTC1006448		

**OUTPUT CODE "M" (LOW POWER)  
SAA ENTITY CONCEPT APPROVALS**

THE ROSEMOUNT LOW POWER CONFIGURED PRESSURE TRANSMITTERS LISTED BELOW ARE SAA APPROVED AS INTRINSICALLY SAFE WHEN USED IN THE CIRCUIT WITH SAA APPROVED BARRIERS WHICH MEET THE LISTED ENTITY PARAMETERS.

APPROVED TRANSMITTERS WITH LOW POWER CONFIGURATION

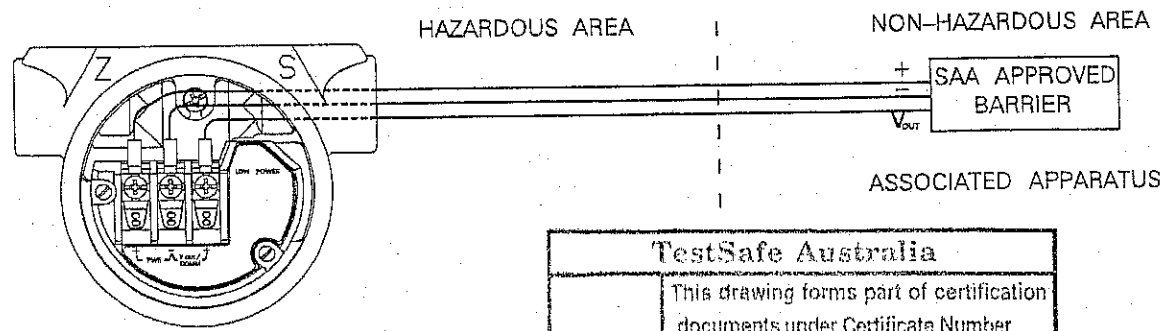
- |       |        |
|-------|--------|
| 3051C | 3051T  |
| 3051L | 3051CA |
| 3051P |        |
| 3051H |        |

ENTITY PARAMETER FOR Ex ia IIC T5 CLASS I, ZONE 0 PROTECTION:

APPARATUS PARAMETER	BARRIER PARAMETER
$V_{max} = 30V$ $I_{max} = 200mA$ $P_{max} = 0.9W$  $C_i = 0.042\mu F$ $L_i = 10\mu H$  FOR T1 OPTION ONLY $L_i = 0.75mH$	$V_{oc}$ IS LESS THAN OR EQUAL TO 30V $I_{sc}$ IS LESS THAN OR EQUAL TO 200mA $\frac{V_{oc} * I_{sc}}{4}$ IS LESS THAN OR EQUAL TO 0.9W $C_a$ IS GREATER THAN 0.042 MICROFARADS $L_a$ IS GREATER THAN 10 MICROHENRIES  $L_a$ IS GREATER THAN 0.75 MILLIHENRIES

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM.

TO ASSURE AN INTRINSICALLY SAFE SYSTEM THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURERS FIELD WIRING INSTRUCTIONS AND THE CIRCUIT DIAGRAM SHOWN BELOW.



Rosemount Inc.  
12001 Technology Drive  
Eden Prairie, MN 55344 USA

**TestSafe Australia**  
This drawing forms part of certification documents under Certificate Number  
AUS Ex **1249X--5**  
Amendments require Supplementary Certification  
CAD Maintained (MICROSTATION)

DR.	Mike Dobe	SIZE	A	FSCM NO		DWG NO.	03031-1026
ISSUED		SCALE	N/A	WT.		SHEET	3 OF 4

REVISIONS				
REV	DESCRIPTION	CHG. NO.	APP'D	DATE
AB		RTC1006448		

## OUTPUT CODE F /W (FIELD BUS, PROFIBUS) SAA ENTITY CONCEPT APPROVALS

THE ROSEMOUNT PRESSURE TRANSMITTERS LISTED BELOW ARE INTRINSICALLY SAFE WHEN USED IN THE CIRCUIT WITH SAA APPROVED BARRIERS WHICH MEET THE LISTED ENTITY PARAMETERS.

### APPROVED TRANSMITTERS

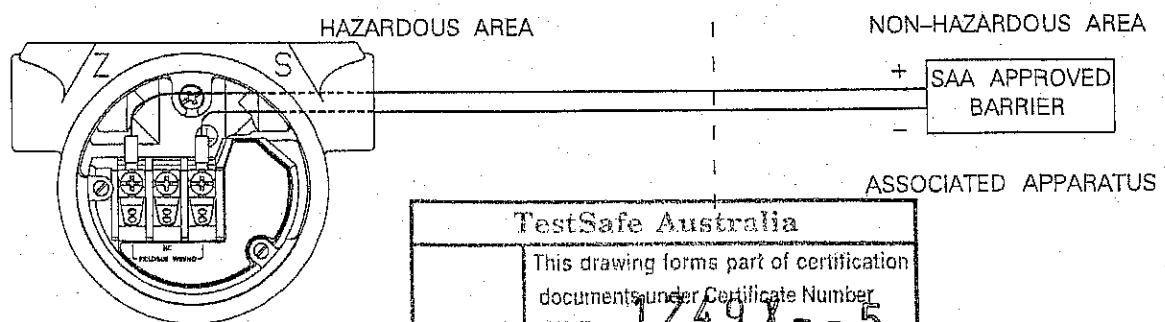
3051C	3051H	3001C	3001S
3051L	3051T	3001CL	
3051P	3051CA	3001CH	

ENTITY PARAMETER FOR Ex ia IIC T5 CLASS I, ZONE 0 PROTECTION:

APPARATUS PARAMETER	BARRIER PARAMETER
$V_{max} = 30V$ $I_{max} = 300mA$ $P_{max} = 1.3W$  $C_i = 0 \mu F$ $L_i = 0 \mu H$	$V_{oc}$ IS LESS THAN OR EQUAL TO 30V $I_{sc}$ IS LESS THAN OR EQUAL TO 300mA $\frac{V_{oc} * I_{sc}}{4}$ IS LESS THAN OR EQUAL TO 1.3W  $C_a$ IS GREATER THAN 0 MICROFARADS $L_a$ IS GREATER THAN 0 MICROHENRIES

THE ENTITY CONCEPT ALLOWS INTERCONNECTION OF INTRINSICALLY SAFE APPARATUS NOT SPECIFICALLY EXAMINED IN COMBINATION AS A SYSTEM.

TO ASSURE AN INTRINSICALLY SAFE SYSTEM THE TRANSMITTER AND BARRIER MUST BE WIRED IN ACCORDANCE WITH THE BARRIER MANUFACTURERS FIELD WIRING INSTRUCTIONS AND THE CIRCUIT DIAGRAM SHOWN BELOW.



Rosemount Inc.  
12001 Technology Drive  
Eden Prairie, MN 55344 USA

**TestSafe Australia**

This drawing forms part of certification documents under Certificate Number  
AUS Ex **1249X--5**  
Amendments require Supplementary Certification

DR. **Mike Dobe**  
ISSUED

CAD Maintained, (MICROSTATION)

SIZE A	FSCM NO	DWG NO. <b>03031-1026</b>
SCALE N/A	WT.	SHEET 4 OF 4



# SAI Global

## Assurance Services

11-06-2003

Emerson Process Management  
471 Mountain Highway  
BAYSWATER VICTORIA 3153

Attention: Mr. Joe Ruggles

Dear Sir,

**RE: Further Extension of Expiry Date for Certificate AUS Ex 1347X**

I am pleased to inform you that your request for a further extension of the expiry date for the above Certificate of Conformity is granted on the basis of the ongoing revalidation process at TestSafe Australia.

I confirm that the expiry date for Certificate of Conformity No. AUS Ex 1347X is now 1 August 2003.

Yours sincerely,

Noel Baker  
Project Coordinator  
**ELECTROTECHNOLOGY GROUP**

*Head Office*

286 Sussex Street  
Sydney NSW 2000 Australia

*Postal Address*

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Sydney NSW 2001 Australia

Phone (61-2) 8206 6060

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Email [assurance@sai-global.com](mailto:assurance@sai-global.com)

[training@sai-global.com](mailto:training@sai-global.com)

Web [www.sai-global.com](http://www.sai-global.com)

Our Ref: AUS Ex 1347X

Contact: N.Baker

Phone: 61-2 8206 6614

Fax: 61-2 8206 6032

Email: [noel.baker@qas.com.au](mailto:noel.baker@qas.com.au)



# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

### Certificate of Conformity

**Certificate No:** AUS Ex 02.3794X      **Issue 0:** Original Issue: 29/05/2002

**Date of Expiry:** 29/05/2012

**Certificate Holder:** Fisher Rosemount Pty Ltd  
471 Mountain Highway  
Bayswater Victoria 3153

**Electrical Equipment:** Model 3144P Smart Temperature Transmitter, with optional integral temperature assembly and/or indicator

**Type of Protection:** Ex ia  
Ex n

**Marking Code:** Ex n IIC IP66 T5 (Tamb= -60 °C to 75 °C), T6 (Tamb= -60 °C to 50 °C)  
Ex ia IIC IP66 T5 (Tamb= -60 °C to 75 °C), T6 (Tamb= -60 °C to 50 °C)  
AUS Ex 02.3794X

**Manufactured By:** Rosemount, Inc.  
Minneapolis, Mn  
U.S.A

Issued by:



919 Londonderry Road Londonderry NSW 2753  
Phone: (02) 4724 4900      Fax: (02) 4724 4999

STANDARDS AUSTRALIA



Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 612

# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

*This certificate is granted subject to the conditions as set out in Standards Australia Miscellaneous Publication MP 69 and the Procedures (Doc Q1137) of the scheme.*

*The electrical equipment and any acceptable variation to it specified in the schedule to this certificate and the identified documents, was found to comply with the following standards:*

AS 2380.1:1989	Electrical equipment for explosive atmospheres – Part 1 – General requirements
AS 2380.9:1991	Electrical equipment for explosive atmospheres – Part 9 – Type of protection n – Non-sparking.
AS 1939:1990	Degrees of protection provided by enclosures for electrical equipment (IP Code)
AS/NZS 60079.0:2000	Electrical apparatus for explosive gas atmospheres – Part 0: General requirements (including Amendment 1)
AS/NZS 60079.11:2000	Electrical apparatus for explosive gas atmospheres – Part 11: Intrinsic safety 'i' (including Amendment 1)

*This certificate does not ensure compliance with electrical safety requirements and performance other than those included in the Standards listed above.*

*The equipment listed has successfully met the examination and test requirements as recorded in*

*Test Report No: TestSafe 22328*

*File Reference: TestSafe 2002/001006*

*Signed for and on behalf of issuing authority*

Director  
TestSafe Australia

*Position*

29/05/2002

*Date of issue*

Ex 02.3794X

*This certificate and schedule may not be reproduced except in full.*

*This certificate is not transferable and remains the property of Standards Australia Quality Assurance Services and must be returned in the event of its being revoked or not renewed.*

*Issued by:*



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STANDARDS AUSTRALIA

# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

### Schedule

Certificate No: AUS Ex 02.3794X

Issue: 0

Date of Issue: 29/05/2002

**Certified Equipment:** The Model 3144P Smart Temperature Transmitter is designed to convert the input from a temperature sensor into a 4-20 mA signal for measurement purposes. It contains printed circuit boards housed in a cylindrical metallic enclosure with a central partition that forms two compartments, each fitted with screw-on covers. The electronics compartment contains a transition printed circuit board, a main printed circuit board which is completely encapsulated, and an optional meter/LCD board. External connections are made via a terminal assembly in the terminal compartment. The terminal assembly consists of terminals mounted on a printed circuit board. The board itself is potted in a plastic enclosure. An encapsulated transient protection block may be fitted as an option in the terminal compartment. The metallic enclosure is polyurethane coated aluminum alloy, or optionally stainless steel.

#### Conditions of Certification:

##### 1 Conditions of Safe Use

The following conditions shall be adhered to during installation:

- 1.1 For the option using the lightning protection board, the apparatus should be bonded to earth with a copper conductor of 4 mm<sup>2</sup> or greater.
- 1.2 For the label plate with more than one type of marking on it, on completion of commissioning the apparatus, the irrelevant marking code(s) shall be permanently scribed off.
- 1.3 Input/Output parameters for non-sparking protection model: Ex n

Input Parameters	Power / Loop Terminals J2B (Pins "+", "-" & "T")
Maximum Input Voltage $U_n$	55 V
Maximum Input Power $P_n$	1.3 W

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STANDARDS AUSTRALIA



Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 000



# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

Ex 02.3794X

Conditions of Certification continued:

Addendum to Certificate No. ....

1.4 Input/Output parameters for intrinsically safe model: Ex ia

I.S. Inputs/Outputs Parameters	Power / Loop Terminals J2B Pins "+", "-" and "T"	Sensor Terminals J1B Pins "1" to "5"
Maximum Input Voltage $U_i$	30 V	
Maximum Input Current $I_i$	300 mA	
Maximum Input Power $P_i$	1.0 W	
Maximum Internal Capacitance $C_i$	0.005 $\mu$ F	
Maximum Internal Inductance $L_i$	20 $\mu$ H	
Maximum Output Voltage $U_o$		13.6 V
Maximum Output Current $I_o$		100 mA
Maximum Output Power $P_o$		80 mW
Maximum External Capacitance $C_o$		0.66 $\mu$ F
Maximum External Inductance $L_o$		1.9 mH

### Drawing Schedule

Drawing No	Drawing Title	Sheets	Issue	Date
00644-4250	Transformer	1 of 1	AB	11/02/2000
00644-4253	Opto Coupler	1 to 5	AA	04/10/1999
03144-0140	Label, Nameplate	1 to 2	AD	21/01/2002
03144-0164	Label, Approvals for 3144P	1 to 2	AC	22/05/2002
03144-0308	Approval DWG. 3144P Hart/Analog SAA I.S. & Type n	1 to 3	AA	17/08/2001
3144-2004	Schematic Diagram Transition Board	1 of 1	B	10/04/1995
03144-1015	Filter Plate Assembly	1 to 3	AC	14/01/2002
03144-2005	PWB Drill Drawing Transition Board	1 to 2	D	03/05/1996
3144-2006	Circuit Card Assembly 3144 Transition Board Uncoated	1 of 1	B	05/1996
03144-2007	Schematic Diagram 3144 Terminal Block	1 of 1	B	10/04/1995
03144-2008	PWB Drill Drawing Terminal Block	1 to 2	E	04/11/1996
03144-2009	Circuit Card Assembly 3144 Terminal Block	1 of 1	AA	10/04/1997
03144-2017	Schematic, 3144/3244 Transient Protection Block, Hart	1 of 1	B	19/11/1996

Issued by:



**919 Londonderry Road Londonderry NSW 2753**

Phone: (02) 4724 4900

Fax: (02) 4724 4999

## STANDARDS AUSTRALIA



Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 614

# Certification of

## EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

Administered by: Standards Australia Quality Assurance Services

Ex 02.3794X  
Addendum to Certificate No. ....

### Drawing Schedule continued:

Drawing No	Drawing Title	Sheets	Issue	Date
03144-2018	PWB, 3144/3244 Transient Protection Block, Hart	1 to 3	A	19/11/1996
03144-2019	CCA, Transient	1 to 2	AA	16/01/1998
03144-2108	Schematic, 3144P Electronics Board Fieldmount	1 to 3	AE	23/04/2002
03144-2109	Printed Wiring Board, Electronics Field Mount	1 to 3	AC	24/04/2002
03144-2110	CCA, Electronics Board Coated	1 to 2	AF	24/04/2002
3144-2111	Schematic, 3144 LCD Adapter Board	1 of 1	AA	21/06/01
3144-2112	PWB, Fabrication Drawing Interconnect Board	1 to 2	01	12/2000
3144-2113	CCA Interconnect Board	1 of 1	01	07/2001
03144-2354	Coated LCD/Meter Assembly 3144/3244	1 to 3	AE	19/07/2001
03144-2357	Schematic Diagram FB/ADV Meter/LCD Board	1 of 1	AA	29/04/1999
03144-2358	PWB FB/ADV Meter/LCD Board	1 to 3	AA	29/04/1999
03144-3040	Final Assy, Transient Protector	1 of 1	AB	16/06/1998

Issued by:



919 Londonderry Road Londonderry NSW 2753

Phone: (02) 4724 4900

Fax: (02) 4724 4999

STANDARDS AUSTRALIA



Standards Australia Quality Assurance Services Pty Limited A.B.N. 67 050 611 012

## **6 Equipment Datasheets and Electrical Drawings**

Documentation in relation to this section is to be included and maintained by APA Group.

## 7 Calculations

Documentation in relation to this section is to be included and maintained by APA Group.

Calculations need to be confirmed for equipment installed in hazardous areas. These include heat dissipation calculation for Ex e and intrinsically safe barrier assessment for Ex i, which are relevant for the ADP sites.

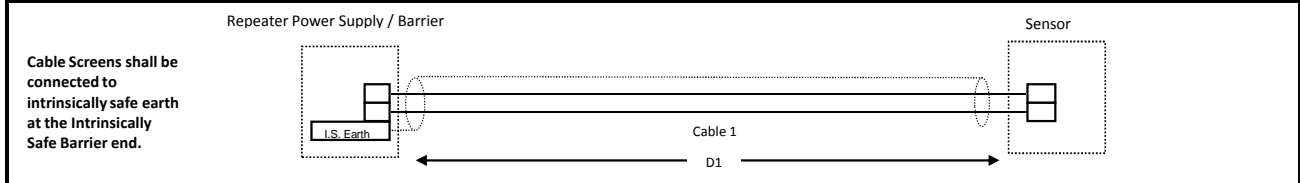
This section contains sample calculation sheet for intrinsically safe barrier assessment and extracts from AS 2381.6-1993 and AS 2381.7-1989.

# Intrinsically Safe Barrier Assessment Sheet



Document No:		Prepared By:	
Site:		Checked:	
Loop Description:		QA:	
Loop Drawing Number:		Approved:	
		Date:	

<b>Hazardous Area:</b> H. A. Report: <input style="width: 100%;" type="text"/> H. A. Drawing No.: <input style="width: 100%;" type="text"/>	Area Class: <input style="width: 100%;" type="text"/> Gas Group: <input style="width: 100%;" type="text"/> Temperature Class: <input style="width: 100%;" type="text"/>
---	---



<b>I.S. Device details (Hazardous Area) [Note 2]</b>	
Tag: <input style="width: 100%;" type="text"/> Type of instrument: <input style="width: 100%;" type="text"/> Manufacturer: <input style="width: 100%;" type="text"/> Model Number: <input style="width: 100%;" type="text"/> Serial No: <input style="width: 100%;" type="text"/> Certificate Number: <input style="width: 100%;" type="text"/> Certifying Authority: <input style="width: 100%;" type="text"/> Protection Type: <input style="width: 100%;" type="text"/>	Max Voltage Um: <input style="width: 100%;" type="text"/> V O/C Voltage Uo: <input style="width: 100%;" type="text"/> V S/C Current Io: <input style="width: 100%;" type="text"/> mA Power Po: <input style="width: 100%;" type="text"/> mW Allowable Cap. Co: <input style="width: 100%;" type="text"/> uF Allowable Ind. Lo: <input style="width: 100%;" type="text"/> mH L/Ro: <input style="width: 100%;" type="text"/> uH/Ohm

<b>Cables:</b>		
<b>Cable 1:</b> Tag: <input style="width: 100%;" type="text"/> Capacitance: <input style="width: 100%;" type="text"/> uF/m Inductance: <input style="width: 100%;" type="text"/> mH/m L/Rc: <input style="width: 100%;" type="text"/> mH/Ohm Length(D1): <input style="width: 100%;" type="text"/> m	<b>Cable 2:</b> Tag: <input style="width: 100%;" type="text"/> Capacitance: <input style="width: 100%;" type="text"/> uF/m Inductance: <input style="width: 100%;" type="text"/> mH/m L/Rc: <input style="width: 100%;" type="text"/> mH/Ohm Length(D2): <input style="width: 100%;" type="text"/> m	<b>Total Cable:</b> Capacitance: <input style="width: 100%;" type="text"/> uF Inductance: <input style="width: 100%;" type="text"/> mH Max L/Rc: <input style="width: 100%;" type="text"/> mH/Ohm

<b>I.S. Apparatus Parameters (Hazardous Area):</b>	
Tag: <input style="width: 100%;" type="text"/> Type of instrument: <input style="width: 100%;" type="text"/> Manufacturer: <input style="width: 100%;" type="text"/> Model Number: <input style="width: 100%;" type="text"/> Serial No: <input style="width: 100%;" type="text"/> Certificate Number: <input style="width: 100%;" type="text"/> Certifying Authority: <input style="width: 100%;" type="text"/> Protection Type: <input style="width: 100%;" type="text"/>	O/C Voltage Ui: <input style="width: 100%;" type="text"/> V S/C Current li: <input style="width: 100%;" type="text"/> mA Power Pi: <input style="width: 100%;" type="text"/> mW Capacitance Ci: <input style="width: 100%;" type="text"/> uF Inductance Li: <input style="width: 100%;" type="text"/> mH

<b>Checks:</b>		<b>PASS/FAIL/NA</b>
1	Uo <= Ui	<=
2	Io <= li	<=
3	Po <= Pi	<=
4	Ci+C <sub>Cable</sub> <= Co	<=
6	Li+L <sub>Cable</sub> <= Lo	<=
OR		
7	L/R <sub>Cable</sub> < L/Ro	<
<b>Conclusion:</b>	The circuit IS Loop Calculation	<input style="width: 100%;" type="text"/>

**Notes:**

- 1- Calculation is based on AS.NZS 2381.1:2005, AS2381.7-1989 & AS/NZS 60079.25:2004 for a single power supply loop in an intrinsically safe system.
- 2- The I.S. Barrier is an integral part of the discrete input wireless transmitter.
- 3- The above calculation, check and conclusion are also applicable to wireless transmitter LSL and LSL level switch I.S. circuits used for pump 1161C/D, 1162C/D, 1163C/D and 1164C/D sealoil pots.
- 4- The level switch in this I.S. Circuit is classified as simple device.

APPENDIX A  
DETERMINATION OF EXTERNAL CIRCUIT PARAMETERS  
FOR INTRINSICALLY SAFE SYSTEMS

(This Appendix forms an integral part of this Standard.)

**A1 CERTIFICATION METHODS.** As specified in Clause 1.4, intrinsically safe electrical equipment may be certified under one of three categories as follows:

- (a) *Self-contained equipment.* Since this equipment has no external cabling, there are no external parameters to be specified, and hence, such equipment will not be considered further in this Appendix.
- (b) *Entity concept equipment.*
- (c) *Integrated systems.*

**A2 PARAMETERS TO BE DEFINED.**

**A2.1 Entity concept equipment.** For certified entity concept equipment the following parameters should be defined:

- (a) *Associated electrical equipment.*
  - (i) Maximum open circuit voltage ( $U_o$ ).
  - (ii) Maximum output current ( $I_o$ ).
  - (iii) Maximum external capacitance ( $C_o$ ).
  - (iv) Maximum external inductance ( $L_o$ ).
  - (v) Maximum external connected inductance to resistance ratio ( $L/R$ ).
- (b) *Intrinsically safe equipment.*
  - (i) Maximum input voltage ( $U_i$ ).
  - (ii) Maximum input current ( $I_i$ ).
  - (iii) Maximum internal capacitance ( $C_i$ ).
  - (iv) Maximum internal inductance ( $L_i$ ).

The parameters are marked on the equipment or specified in the accompanying documentation.

**A2.2 Integrated systems.** For integrated systems, either one of the following cable parameters should be defined:

- (a) Maximum capacitance, inductance, and inductance to resistance ratio.
- (b) Maximum cable lengths for defined cable types.

These parameters are specified in the system documentation or the certificate.

**A3 INSTALLATION OF ENTITY CONCEPT EQUIPMENT.** For entity concept equipment to be installed, the total of the cable parameters and those for the intrinsically safe equipment shall be less than those permitted to be connected to the associated electrical equipment, i.e.

- (a)  $C_i + C_{\text{cable}} < C_o$ ; and
- (b) either  $L_i + L_{\text{cable}} < L_o$ , or  $L/R_{\text{cable}} < L/R$ .

Also, the voltage and current allowed for the intrinsically safe equipment shall be greater than those available from the associated electrical equipment, i.e.  $U_i > U_o$ ;  $I_i > I_o$ .

Where shunt diode safety barriers are being used and their capacitance, inductance and  $L/R$  ratio parameters have not been specified in the documentation, the values specified in Table A1 may be used.

**A4 INSTALLATION OF INTEGRATED SYSTEMS.** For an integrated system to be installed correctly, the cable characteristics shall be below those specified in the system certification, i.e. the total cable capacitance and either the total lumped cable inductance or the  $L/R$  ratio must be less than those shown in the certificate or installation diagram. Cable characteristics may be obtained from the manufacturer or the values specified in Tables A2 and A3 may be used.

Alternatively, the following cable characteristics represent probable maximums:

- (a)  $C = 0.11 \mu\text{F}/\text{km}$ .
- (b)  $L = 0.8 \text{ mH}/\text{km}$ .
- (c)  $L/R = 56 \mu\text{H}/\Omega$ .

If the parameters are only specified in the system certification for Group IIC they may be multiplied by 3 for Group IIB, by 8 for Group IIA, or by 10 for Group I installations.

Where the system documentation specifies cable types and corresponding lengths it is simply a matter of adhering to those specific requirements.

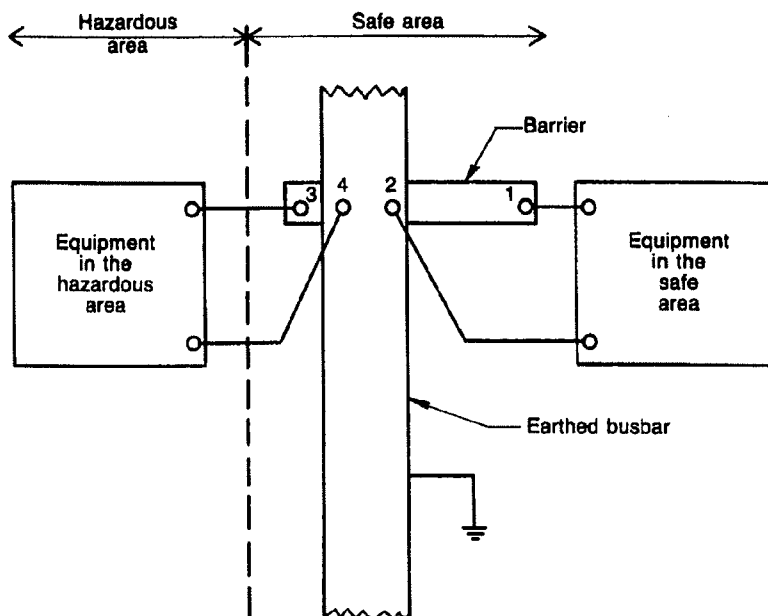
**TABLE A1**  
**EXTERNAL PARAMETERS**  
**MAXIMUM VALUES FOR GROUP IIC (HYDROGEN)\***

Barrier type	Permissible configuration	Max. permissible capacitance $\mu\text{F}$	Max. permissible inductance $\text{mH}$	Max. permissible $L/R$ ratio $\mu\text{H}/\Omega$
27 V 270 $\Omega$	Figure A1	0.15	3.7	55
22 V 150 $\Omega$	Figure A1	0.2	1.5	40
15 V 100 $\Omega$	Figure A1	0.8	1.5	60
	Figure A2	0.8	1.5	60
10 V 47 $\Omega$	Figure A1	3.0	1.0	80
	Figure A2	3.0	1.0	80
	Figure A3	0.2	1.0	40
47 V 10 $\Omega$	Figure A1	>1 000	0.16	100
	Figure A2	>1 000	0.16	100
	Figure A3	3.0	0.16	50
1 V 2 $\Omega$	Figure A1	>1 000	0.16	320
	Figure A2	>1 000	0.16	320
	Figure A3	>1 000	0.16	160

\* For most practical purposes, the value for gases of Group IIB are 3 times these values, and for gases of Group IIA are 8 times these values.

† The  $L/R$  ratio of the cable is defined as follows:

$$L/R \text{ ratio} = \frac{\text{Inductance per unit length } (\mu\text{H})}{\text{Resistance per unit length } (\Omega)}$$



NOTE: Barrier can be either positive or negative.

**FIGURE A1** INSTALLATION CONFIGURATION 2-WIRE SYSTEM  
WITH SINGLE BARRIER

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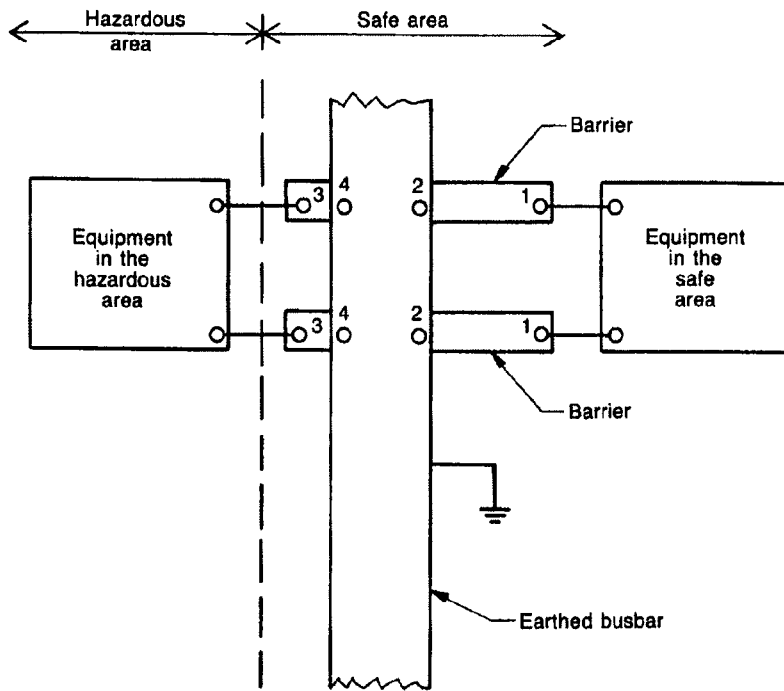


FIGURE A2 INSTALLATION CONFIGURATION 2-WIRE SYSTEM WITH TWO BARRIERS OF LIKE POLARITY

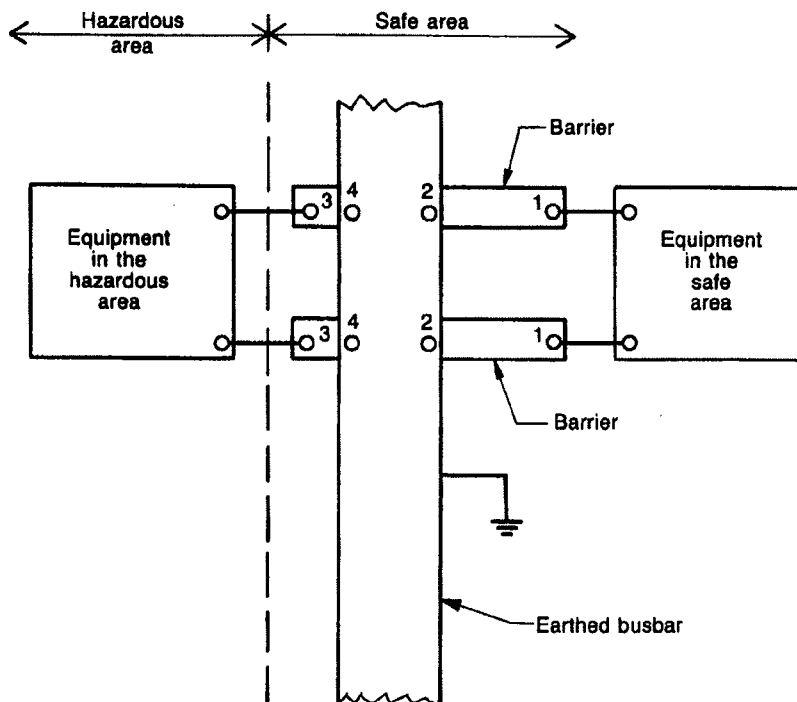


FIGURE A3 INSTALLATION CONFIGURATION 2-WIRE SYSTEM WITH TWO BARRIERS OF OPPOSITE POLARITY

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**TABLE A2**  
**TYPICAL CABLE CHARACTERISTICS FOR PVC CABLES WITH 0.3 mm**  
**RADIAL THICKNESS**

Nominal conductor size, number and dia. of wires	7/0.3 mm (0.5 mm <sup>2</sup> )		7/0.5 mm (1.5 mm <sup>2</sup> )	
	Screened	Unscreened	Screened	Unscreened
Conductor resistance at 20°C (Ω/100 m)	3.8	3.8	1.4	1.4
Capacitance of pairs (μF/km)	0.145	0.090	0.2	0.12
Inductance at 1 kHz (mH/km)	0.9	0.9	0.8	0.8
L/R ratio (μH/ohm)	12	12	31	31

**TABLE A3**  
**TYPICAL CABLE CHARACTERISTICS FOR**  
**2-CORE MICC CABLE**

Nominal conductor size (mm <sup>2</sup> )	1
Conductor resistance single core (Ω/100 m)	3.45
Capacitance of pairs (μF/km)	0.1194
Capacitance, conductor to earth (μF/km)	1.1612
Inductance at 1 kHz (mH/km)	0.684
L/R ratio (μH/ohm)	20

APPENDIX C  
SELECTION OF Ex e COMPONENTS  
(Normative)

**C1 GENERAL** Each enclosure is allocated a permissible maximum dissipating power, expressed in watts, taking into account—

- (a) the dissipation per component for a given cable conductor size;
- (b) the size of each cable used and the resistance of its length, equal to the diagonal of the enclosure;
- (c) the maximum allowable current for the Ex e component or the maximum current allowable for each cable, if below the maximum allowable for the terminal block; and
- (d) the bunching of cables within each enclosure and the effect this has in producing 'hot spots'.

The selection of an acceptable combination in any assembly is based upon the requirement that enclosures shall not exceed a specified total dissipation of power (in watts) from the cables and the components which are to be housed within each enclosure.

The permissible maximum dissipating power (*MDP*) for the temperature classification of the enclosure, determined by test, will appear on the manufacturer's rating plate, e.g. 15.5 W.

Having established maximum dissipation of power from the enclosures, the wired assembly may be expressed in power loss in the following way:

$$\text{Dissipation per terminal: } P = I^2[R_t + L \times R_c] \quad \dots \text{ E(1)}$$

$$P = I^2[R_t + R_d] \quad \dots \text{ E(2)}$$

where

$P$  = power dissipation, in watts

$I$  = current through terminal (max. allowable or limited by cable size)

$R_t$  = internal resistance of terminal, in ohms

$R_c$  = cable resistance per metre, in ohms

$L$  = length of cable equal to the diagonal of the enclosure, in metres

$MDP$  = maximum dissipating power, in watts—the sum total of all terminals and wiring within the enclosure

$R_d$  = resistance of a length of cable equal to the diagonal of the enclosure

Therefore, for a combination of terminals and cables the watts loss can be calculated from the basic test information and cable data as follows:

$$MDP = aP_1 + bP_2 + cP_3 \dots + zP_n \quad \dots \text{ E(3)}$$

where

$aP_1; bP_2; cP_3, \dots zP_n$  represent the heat dissipation of different combinations and numbers ( $a; b; c \dots z$ ) of terminals and cables.

**C2 EXAMPLE: SELECTION OF TERMINAL BLOCKS FOR COMPLIANCE WITH T6 CLASSIFICATION**

Assume that the following is derived from tests:

Enclosure  $MDP = 15 \text{ watt}$

Terminal block TBK2.5 = 15 A max.

Terminal block TBK16 = 47 A max.

$L$  = 270 mm

A.  **$P$  (TBK2.5) for**

$P_1$  3 amps 0.5 mm<sup>2</sup> cable = 0.092 W

$P_2$  12 amps 1.0 mm<sup>2</sup> cable = 0.763 W

$P_3$  15 amps 2.5 mm<sup>2</sup> cable = 0.530 W

B.  **$P$  (TBK16) for**

$P_4$  47 amps 16 mm<sup>2</sup> cable = 0.790 W

Maximum number of allowable terminals:

$$P_1 \text{ only} = \frac{15.0}{0.092} = 163; \text{ or}$$

$$P_2 \text{ only} = \frac{15.0}{0.763} = 19; \text{ or}$$

$$P_3 \text{ only} = \frac{15.0}{0.530} = 28; \text{ or}$$

$$P_4 \text{ only} = \frac{47.0}{0.790} = 59;$$

Now assume the following combination of terminals—

$$(60 \times P_1) + (6 \times P_2) + (3 \times P_3) + (3 \times P_4)$$

$$(60 \times 0.092) + (6 \times 0.763) + (3 \times 0.530) + (3 \times 0.790)$$

Total Heat Dissipation is—

$$5.52 + 4.578 + 1.590 + 2.37 = \mathbf{14.058 \text{ Watt}}$$

It is concluded that the combination of terminals and cables does not exceed MDP of 15 W and is therefore satisfactory for T6.

NOTE: The cables should not be bunched in quantities greater than the number of cores from each cable or conduit entering the enclosure and in any case should not exceed six per bunch.

**C3 CABLE SELECTION v TERMINAL SELECTION** The maximum current density permitted in any conductor inside or outside the enclosure is to be established as though the conductors are insulated with V75 material and enclosed in conduit in air and derated according to the ambient temperature and in any case not less than 50°C as established according to AS 3008.1. Additional derating factors may be necessary where bunching of cables occurs.

However, where the cables are run in situations that allow an increase of current-carrying capacity, the Ex e installation is placed at risk, particularly when the cable enters the terminal enclosure.

It is important to keep in mind that—

- (a) the Ex e terminal block rated current must not be exceeded; and
- (b) the cable connected to each terminal block is of a size acceptable to that block and the current carried by that cable complies with the requirements of Clause 2.7.2.

**C4 FACTORS TO BE CONSIDERED IN SELECTING EQUIPMENT CERTIFIED**

**TO Ex e** The establishment of criteria which can lead to practical installation of terminal boxes for use in Class I, Zones 1 and 2 hazardous areas can only be made by testing and from the tests a manufacturer can tabulate and mark—

- (a) maximum power for each enclosure to meet the temperature class—generally T6 or as certified;
- (b) maximum current per Ex e terminal—marked thereon, in amps;
- (c) resistance per terminal, in ohms;
- (d) average length per conductor—box diagonal in metres;
- (e) resistance per conductor length, in ohms;
- (f) actual load current per terminal for the installation in amps; and
- (g) maximum current per conductor, in amps in accordance with AS 3008.1.

For a particular manufacturer's terminal box, these criteria lead to the following tabulations:

**TABLE C1**  
**CONDUCTOR RESISTANCE PER BOX FOR EACH CONDUCTOR SIZE**

Size mm <sup>2</sup>	Enclosure types				
	No. 1	No. 2	No. 3	No. 4	No. 5
0.5	$\frac{\text{ohms}/1000\ m \times L}{1000}$ where <i>L</i> is in metres				
1.0					
2.5					
4.0					
6.0					
10.0					
16.0					
25.0					
35.0					
50.0					
70.0					
95.0					

**TABLE C2**  
**TERMINAL/COMPONENT RESISTANCE (*R<sub>t</sub>*)**

Component type	Average resistance (ohms)
TBK 2.5	Determined by test
TBK 4	
TBK 6	
TBK 10	
TBK ... <i>n</i>	

From Tables C1 and C2, details for each enclosure can be derived:

Assume ..... Enclosure type box No. 1. **MDP = 15 watt**

Ex e component			Cable	Total
Type	Qty	Load or rating A	mm <sup>2</sup>	W
TBK 2.5	60	3.0	0.5	5.52
TBK 2.5	6	12.0	1.0	4.578
TBK 2.5	3	15.0	2.5	1.590
TBK 16	3	47.0	16.0	2.37
<b>Enclosure Total =</b>				<b>14.058</b>

It is possible to determine a large variety of enclosure combinations for different components, given—

- (a) conductor resistance;
- (b) component resistance;
- (c) current drawn through each cable and component; and
- (d) enclosure MDP.

The manufacturer should be able to supply details of certified components and enclosures. Cable resistances are readily available from tables or the enclosure manufacturer may provide the values for each enclosure size and each cable length, equal to the enclosure diagonals.

**C5 ENCLOSURE CONTENTS AND LABEL** Having established the contents for each enclosure for a known application, it is important that any spare space within is **not** filled at some later stage with equipment which—

- (a) exceeds the certified MDP;
- (b) is not certified Ex e; or
- (c) arcs or sparks.

The user or the supplier should attach to the inside of the enclosure a label showing—

- (i) certified MDP;
- (ii) original component contents; and
- (iii) calculated total power dissipation of original installed components.

If the user changes the contents, it would be his responsibility to secure a revised list, having first established that the enclosure temperature class and certified MDP will not be exceeded by the proposed changes.

## **8 Manufacturer's Data Reports (MDR) and Installation, Operation and Maintenance (IOM) Manual**

Documentation in relation to this section is to be included and maintained by APA Group.



## 9 Maintenance Register

Documentation in relation to this section is to be included and maintained by APA Group.  
This section includes sample maintenance sheet.



FYFE  
Earth Partners  
ENVIRONMENT  
DEVELOPMENT  
RESOURCES

### MAINTENANCE REGISTER

APA Group

Site:

DATE	DESCRIPTION	ASSOCIATED TAGS	DOSSIER UPDATE AS REQUIRED (YES / NO / NA)								REMARKS
			P&ID	DATASHEET	HA EQUIPMENT REGISTER	CERTIFICATE OF CONFORMITY	INSTALLATION CHECK LIST	REPAIR & EXAMINATION REPORT	HA CLASSIFICATION	HA DRAWING	





# MAINTENANCE REGISTER

APA Group

Site:

DATE	DESCRIPTION	ASSOCIATED TAGS	DOSSIER UPDATE AS REQUIRED (YES / NO / NA)								REMARKS	
			P&ID	DATASHEET	HA EQUIPMENT REGISTER	CERTIFICATE OF CONFORMITY	INSTALLATION CHECK LIST	REPAIR & EXAMINATION REPORT	HA CLASSIFICATION	HA DRAWING		

## 10 Inspection Register

Close visual inspection to confirm equipment installations was performed by Neville Green, an electrical engineer from Sitzler during a site visit on the 5th October 2011.

This Section contains the inspection sheets. The Section also contains sample inspection sheet(s) for future inspection.

Documentation in relation to this section is to be maintained by APA Group.

Ref: I:\data\sitzler\contracts\darwin\sbsj12\fyf1 fyfe Pty Ltd hazardous areas reporting award 28.07.11\fyf2 fyfe mid pipeline\reports\warrego\electrical equipment for hazardous area summary report - warrego 13.10.11.docx

**13 October 2011**

FYFE PTY LTD  
Level 3, 80 Flinders St  
Adelaide SA 5000

**Attention: Tony Bird**

Dear Tony,

**RE: AMADEUS PIPELINE – WARREGO SCRAPER STATION**

**HAZARDOUS AREA ELECTRICAL INSPECTION REPORTING**

Please find attached hazardous area device inspection sheets for the above site as part of the visual grade of inspection reporting completed on October 6<sup>th</sup> 2011. A broad range of findings have been identified and documented within the 'action required' section of each check sheet in order to identify the non compliance of the equipment/installation with respect to current standards.

We list the items of deliverables requested by FYFE below and trust the scope of work delivered is in accordance with the specified requirements.

1. Preparation of hazardous area device inspection check-sheets
2. Attend sites and inspect all electrical equipment at each site
3. Complete inspection check-sheets for each instrument
4. Production of a memo stating what work was done and a summary of rectification work
5. To provide ongoing support to the client, it is recommended that a cost estimate is provided for any rectification work.

The level of electrical inspections were carried out in accordance with the Australian/New Zealand Standard AS/NZS 60079 series for explosive atmospheres and in particular parts 14 and 17 relating to electrical installations, design, selection, inspections and maintenance.

The grade of inspection completed was a combination of visual and close techniques only as defined within the above standards. Detailed equipment/installation inspections in accordance with the above standards were not performed however it is a requirement that detailed inspections be performed prior to initial energising of equipment installed within hazardous classified areas and in the absence of any information it is assumed this has been completed by others.

The visual inspections were conducted on energised equipment with emphasis on the condition reporting of the equipment and installation techniques applicable to the hazardous area classification and associated environment. It is also acknowledged that at the commissioning date of the original installation the Australian standards have since been revised which has been taken into consideration in the compliance evaluation of each device.

In some cases the nameplate detail of the installed equipment was illegible and hence the equipment method of protection and associated certification could not be identified.

A compilation of the inspection findings/actions across the installation is provided as follows:

1. Re-termination of cabling at equipment with exposed cable armour.
2. Tighten loose cable glands and accessories.
3. Equipment and cable identification labelling required (where not provided) and alteration of existing where incorrectly labelled in accordance with the piping and instrumentation diagrams and electrical loop drawings.
4. Application of blue cable sheathing and/or labelling to clearly identify intrinsically safe installations.
5. Replace/remediate cabling where long term ultraviolet damage has occurred.
6. Replacement of uncertified hazardous area installed equipment.
7. Sealing of conduit surrounding instrument cabling to prevent transmission of flammable gases.
8. Provide cable support system to unsupported cabling.
9. Provide equipotential bonding (or at least testing for compliance) of conductive equipment/stands for the control of undesirable static electricity.
10. Corrosion visible compromising IP rating and method of protection.
11. Replacement of equipment impending failure due to the age and poor condition.

It is evident that the lifetime expectancy of some equipment installed would be considered approaching a nominal design life of 30 years. Where nil evidence of Australian hazardous area certification exists, and nameplate details are illegible, we recommend replacement with Australian certified equipment. Where evidence of Australian certification was valid at the time of installation, and the general condition is acceptable for use within the hazardous area, minor remediation works can be completed with minimal operational impacts. The establishment of a regular periodic maintenance regime with respect to hazardous area compliance is also recommended as a minimum in accordance with AS/NZS 60079 Part 14/17.

We look forward to providing further advice and discussions with FYFE in order to assist the client with a remediation plan and associated cost estimating of the works. Trusting the above is satisfactory, please do not hesitate to contact the undersigned should you require any further information on the above or attached.

Yours faithfully,



**Neville Green**  
**Engineering Services Manager**  
Encl. Device Inspection Sheets.



# Hazardous area device inspection sheet for Ex-d, Ex-e, Ex-i, Ex-n, Ex-p And other Ex devices



Based on AS/NZS 60079 part 17 (Visual/Close External Only)

Ref: I:\data\sitzler\contracts\darwin\bsbj12\fyf1 fyfe pty ltd hazardous areas reporting award 28.07.11\fyf1 fyfe southern end pipeline\inspection forms\hazardous area device inspection sheet for ex-d,ex-e,ex-i,ex-n,ex-p and other ex devices rev 1.doc

1472 - ~~1487~~ 1477

## Specifications

Equipment ID/Tag:	PT-9		Plant/Asset:	
Circuit ID:	PT-9 J004		Site Location:	WAAREGO
Apparatus type: (light, JB, Motor)	PRESSURE TX		Environment: (hot, dusty?)	
Manufacturer:	ROSEMOUNT		Type of protection: (d, e, i, n, p etc)	ia
Full model number:	3051 T4A2B2IAB4T7MS		Gas group: (IIA/B/C)	IIIC
Serial number:	RS0608414		Temp class: (T1-T6)	T5
IP Class			Certificate number:	AMS Ex 1249X
Number of cables:	1		Test authority: (BAS, PTB, SAA etc)	
Area classification : Zone:	Gas Group:	Temp. Class		
<b>Cable entries</b>	gland 1	n gland 2	SURGE	others
Gland manufacturer:	ALCO	MFL	ARRESTOR	
Model:	FLPN 205			
Gland type of protection: (d, e)				

## Inspection

Circle as checked

	A Equipment	Applicable to protection type:	Circle as checked		Notes
			External		
1	Equipment (incl group and temp class) is appropriate for area classification	all	X		
2	Equipment ID is available	all	⊗		
3	Equipment ID is correct	all	⊗		
4	Equipment circuit ID is available	all	⊗		
5	Equipment circuit ID is correct	all	⊗		
6	Enclosure, sealing gaskets or compounds are satisfactory	all	⊗		
7	There is no evidence of unauthorised modifications	all	⊗		
8	Bolts, cable entry devices and blanking elements are of the correct type and are complete and tight	all	⊗		RE-TERM
9	Installation clearly labelled	i	⊗		
10	Safety barriers/isolators installed as per certification and securely earthed where required	i	⊗		
11	Entropy calculation/ equipment documentation is available	i	X		
<b>B Installation</b>					
1	The cables are adequately supported and there is no obvious damage to cables	all	⊗		
2	Sealing of trunking, ducts, pipes and/or conduits is satisfactory	all	⊗		
3	Earthing and bonding connections are tight, in good condition and of sufficient cross section	all	⊗		
4	No obstructions adjacent to flameproof flanged joint	d	X		
<b>C Environment</b>					
1	Apparatus adequately protected from corrosion, weather, vibration, and other adverse factors	all	⊗		
2	No undue accumulation of dust or dirt	all	⊗		

Faults found? (circle as appropriate): No / Yes:

Action required to make device compliant (based on visual/close inspection techniques only):

	Yes/No		Yes/No
Provide equipment identification?	<input type="checkbox"/> / <input type="checkbox"/>	Provide equipment cover/UV protection?	<input type="checkbox"/> / <input type="checkbox"/>
Provide circuit identification?	<input type="checkbox"/> / <input type="checkbox"/>	Sealing of conduit/ducts required?	<input type="checkbox"/> / <input type="checkbox"/>
Provide blue cable sheath?	<input type="checkbox"/> / <input type="checkbox"/>	Provide/test equipotential bonding?	<input type="checkbox"/> / <input type="checkbox"/>
Remediate damaged cable sheath?	<input type="checkbox"/> / <input type="checkbox"/>	Evidence of equipment explosion protection?	<input type="checkbox"/> / <input type="checkbox"/>
Tighten loose cable gland(s)?	<input checked="" type="checkbox"/> / <input type="checkbox"/>	Replace equipment explosion protection labels?	<input type="checkbox"/> / <input type="checkbox"/>
Re-terminate cabling at equipment?	<input checked="" type="checkbox"/> / <input type="checkbox"/>	Conformity/Fitness for Purpose assessment required?	<input type="checkbox"/> / <input type="checkbox"/>
Terminate and earth exposed cabling?	<input type="checkbox"/> / <input type="checkbox"/>	Replace equipment due to age or poor condition?	<input type="checkbox"/> / <input type="checkbox"/>
Provide cable support/mech. protection?	<input type="checkbox"/> / <input type="checkbox"/>		<input type="checkbox"/> / <input type="checkbox"/>

Additional comments:

*[Faint, illegible handwritten notes in the additional comments section]*

Contractor (write): Inspector <i>D. Williams</i>	Supervisor	Client (write): Inspector
Date: <i>6/16/11</i>		Date:

Reviewed by: <i>N. GREEN</i>
Date: <i>12/10/11</i>
Priority:

Comments:

*[Empty comments section]*

All action items now completed:

Job closed:

Device now fully compliant, spreadsheet register has been updated
Supervisor (write):
Date:



# Hazardous area device inspection sheet for Ex-d, Ex-e, Ex-i, Ex-n, Ex-p And other Ex devices



Based on AS/NZS 60079 part 17 (Visual/Close External Only)

Ref: I:\data\sitzler\contracts\darwin\bsj12\fyf1 fyfe Pty Ltd hazardous areas reporting award 28.07.11\fyf1 fyfe southern end pipeline\inspection forms\hazardous area device inspection sheet for ex-d,ex-e,ex-i,ex-n,ex-p and other ex devices rev 1.doc

1477 -1487

## Specifications

Equipment ID/Tag: <b>ZSC/250-10</b>	Plant/Asset:		
Circuit ID: <b>MLV-10 JD07</b>	Site Location: <b>WARREKO</b>		
Apparatus type: (light, JB, Motor) <b>LIMIT SWITCHES</b>	Environment: (hot, dusty?)		
Manufacturer: <b>LIMITORQUE</b>	Type of protection: (d, e, i, n, p etc) <input checked="" type="checkbox"/>		
Full model number: <b>-</b>	Gas group: (IIA/B/C) <b>-</b>		
Serial number: <b>-</b>	Temp class: (T1-T6) <b>-</b>		
IP Class <b>-</b>	Certificate number: <b>-</b>		
Number of cables: <b>1</b>	Test authority: (BAS, PTB, SAA etc) <b>-</b>		
Area classification : Zone:	Gas Group:	Temp.Class	
<b>Cable entries</b>	gland 1	gland 2	others <b>ADAPTOR</b>
Gland manufacturer:	<b>NOT AVAILABLE</b>		
Model:			
Gland type of protection: (d, e)			<b>NO USE</b>

## Inspection

Circle as checked

	A Equipment	Applicable to protection type:	Circle as checked		Notes
			External		
1	Equipment (incl group and temp class) is appropriate for area classification	all	X		
2	Equipment ID is available	all	<input checked="" type="checkbox"/>		<b>NIL</b>
3	Equipment ID is correct	all	<input checked="" type="checkbox"/>		
4	Equipment circuit ID is available	all	<input checked="" type="checkbox"/>		
5	Equipment circuit ID is correct	all	<input checked="" type="checkbox"/>		
6	Enclosure, sealing gaskets or compounds are satisfactory	all	<input checked="" type="checkbox"/>		
7	There is no evidence of unauthorised modifications	all	<input checked="" type="checkbox"/>		
8	Bolts, cable entry devices and blanking elements are of the correct type and are complete and tight	all	<input checked="" type="checkbox"/>		<b>LOOSE</b>
9	Installation clearly labelled	i	X		
10	Safety barriers/isolators installed as per certification and securely earthed where required	i	X		
11	Entropy calculation/ equipment documentation is available	i	X		
<b>B Installation</b>					
1	The cables are adequately supported and there is no obvious damage to cables	all	<input checked="" type="checkbox"/>		<b>SUPPORT.</b>
2	Sealing of trunking, ducts, pipes and/or conduits is satisfactory	all	<input checked="" type="checkbox"/>		
3	Earthing and bonding connections are tight, in good condition and of sufficient cross section	all	<input checked="" type="checkbox"/>		
4	No obstructions adjacent to flameproof flanged joint	d	X		
<b>C Environment</b>					
1	Apparatus adequately protected from corrosion, weather, vibration, and other adverse factors	all	<input checked="" type="checkbox"/>		
2	No undue accumulation of dust or dirt	all	<input checked="" type="checkbox"/>		

Faults found? (circle as appropriate): No / Yes

Action required to make device compliant (based on visual/close inspection techniques only):

	Yes/No		Yes/No
Provide equipment identification?	<input checked="" type="checkbox"/> /□	Provide equipment cover/UV protection?	□/□
Provide circuit identification?	□/□	Sealing of conduit/ducts required?	□/□
Provide blue cable sheath?	□/□	Provide/test equipotential bonding?	□/□
Remediate damaged cable sheath?	□/□	Evidence of equipment explosion protection?	□/□ <input checked="" type="checkbox"/>
Tighten loose cable gland(s)?	<input checked="" type="checkbox"/> /□	Replace equipment explosion protection labels?	□/□
Re-terminate cabling at equipment?	□/□	Conformity/Fitness for Purpose assessment required?	□/□
Terminate and earth exposed cabling?	□/□	Replace equipment due to age or poor condition?	<input checked="" type="checkbox"/> /□
Provide cable support/mech. protection?	<input checked="" type="checkbox"/> /□		□/□

Additional comments:

Contractor (write): Inspector <i>D. WILLIAMS</i>	Supervisor	Client (write): Inspector
Date: <i>6/10/11</i>		Date:

Reviewed by: *N. GREEN*  
Date: *12/10/11*  
Priority:

Comments:

All action items now completed:   
Job closed:

Device now fully compliant, spreadsheet register has been updated  
Supervisor (write):  
Date:



# Hazardous area device inspection sheet for Ex-d, Ex-e, Ex-i, Ex-n, Ex-p And other Ex devices



Based on AS/NZS 60079 part 17 (Visual/Close External Only)

Ref: I:\data\sitzler\contracts\darwin\sbsj12\fyf1 fyfe Pty Ltd hazardous areas reporting award 28.07.11\fyf1 fyfe southern end pipeline\inspection forms\hazardous area device inspection sheet for ex-d,ex-e,ex-i,ex-n,ex-p and other ex devices rev 1.doc

1477 - 1487

## Specifications

Equipment ID/Tag: <b>SVC/SVD-10</b>	Plant/Asset:		
Circuit ID: <b>MLU-10 J007</b>	Site Location: <b>WARRBURD</b>		
Apparatus type: (light, JB, Motor) <b>SOLENOID VALVES</b>	Environment: (hot, dusty?)		
Manufacturer:	Type of protection: (d,e, i, n, p etc)		
Full model number:	Gas group: (IIA/B/C)		
Serial number:	Temp class: (T1-T6)		
IP Class	Certificate number:		
Number of cables:	Test authority: (BAS, PTB, SAA etc)		
Area classification : Zone:	Gas Group:	Temp.Class	
<b>Cable entries</b>	<b>gland 1</b>	<b>gland 2</b>	<b>others</b>
Gland manufacturer:			
Model:			
Gland type of protection: (d,e)			

## Inspection

Circle as checked

Applicable to protection type:

External Notes

A Equipment		Applicable to protection type:	External	Notes
1	Equipment (incl group and temp class) is appropriate for area classification	all	X	
2	Equipment ID is available	all	<input checked="" type="checkbox"/>	NIC
3	Equipment ID is correct	all	<input checked="" type="checkbox"/>	
4	Equipment circuit ID is available	all	<input checked="" type="checkbox"/>	NIC
5	Equipment circuit ID is correct	all	<input checked="" type="checkbox"/>	
6	Enclosure, sealing gaskets or compounds are satisfactory	all	<input checked="" type="checkbox"/>	
7	There is no evidence of unauthorised modifications	all	<input checked="" type="checkbox"/>	
8	Bolts, cable entry devices and blanking elements are of the correct type and are complete and tight	all	<input checked="" type="checkbox"/>	
9	Installation clearly labelled	i	X	
10	Safety barriers/isolators installed as per certification and securely earthed where required	i	X	
11	Entity calculation/ equipment documentation is available	i	X	
B Installation		Applicable to protection type:	External	Notes
1	The cables are adequately supported and there is no obvious damage to cables	all	<input checked="" type="checkbox"/>	
2	Sealing of trunking, ducts, pipes and/or conduits is satisfactory	all	<input checked="" type="checkbox"/>	
3	Earthing and bonding connections are tight, in good condition and of sufficient cross section	all	<input checked="" type="checkbox"/>	
4	No obstructions adjacent to flameproof flanged joint	d	X	
C Environment		Applicable to protection type:	External	Notes
1	Apparatus adequately protected from corrosion, weather, vibration, and other adverse factors	all	<input checked="" type="checkbox"/>	CORROSION
2	No undue accumulation of dust or dirt	all	<input checked="" type="checkbox"/>	

Faults found? (circle as appropriate): No  Yes

Action required to make device compliant (based on visual/close inspection techniques only):

	Yes/No		Yes/No
Provide equipment identification?	<input checked="" type="checkbox"/>	Provide equipment cover/UV protection?	<input type="checkbox"/>
Provide circuit identification?	<input checked="" type="checkbox"/>	Sealing of conduit/ducts required?	<input type="checkbox"/>
Provide blue cable sheath?	<input type="checkbox"/>	Provide/test equipotential bonding?	<input type="checkbox"/>
Remediate damaged cable sheath?	<input type="checkbox"/>	Evidence of equipment explosion protection?	<input checked="" type="checkbox"/>
Tighten loose cable gland(s)?	<input type="checkbox"/>	Replace equipment explosion protection labels?	<input type="checkbox"/>
Re-terminate cabling at equipment?	<input type="checkbox"/>	Conformity/Fitness for Purpose assessment required?	<input type="checkbox"/>
Terminate and earth exposed cabling?	<input type="checkbox"/>	Replace equipment due to age or poor condition?	<input checked="" type="checkbox"/>
Provide cable support/mech. protection?	<input type="checkbox"/>		<input type="checkbox"/>

Additional comments:  
- DAMAGE TO, REPAIR REQUIRED TO CONDUITS IN SOLENOID ENCLOSURE

Contractor (write): Inspector <i>O. Williams</i>	Supervisor	Client (write): Inspector
Date: <i>6/10/11</i>		Date:

Reviewed by: *N. GREEN*  
Date: *12/10/11*  
Priority:

Comments:

All action items now completed:   
Job closed:

Device now fully compliant, spreadsheet register has been updated  
Supervisor (write):  
Date:



# Hazardous area device inspection sheet for Ex-d, Ex-e, Ex-i, Ex-n, Ex-p And other Ex devices



Based on AS/NZS 60079 part 17 (Visual/Close External Only)

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1488 - 1495.

## Specifications

Equipment ID/Tag:	PT-12		Plant/Asset:	
Circuit ID:	-		Site Location:	WARREGO
Apparatus type: (light, JB, Motor)	PRESSURE TX		Environment: (hot, dusty?)	
Manufacturer:	ROSEMOUNT		Type of protection: (d, e, i, n, p etc)	ia#
Full model number:	3061 PUSA 22A I AMSB 4I 7		Gas group: (IIA/B/C)	11C
Serial number:	0523891		Temp class: (T1-T6)	T4
IP Class			Certificate number:	AUSEX 1249X
Number of cables:	1		Test authority: (BAS, PTB, SAA etc)	
Area classification : Zone:	Gas Group:	Temp.Class		
<b>Cable entries</b>	gland 1	gland 2	others ADAPTORBS X2	
Gland manufacturer:	ALCO			
Model:	PLPW 203			
Gland type of protection: (d,e)				

## Inspection

Circle as checked

	A Equipment	Applicable to protection type:	Circle as checked		Notes
			External		
1	Equipment (incl group and temp class) is appropriate for area classification	all	X		
2	Equipment ID is available	all	⊗		
3	Equipment ID is correct	all	⊗		
4	Equipment circuit ID is available	all	⊗		
5	Equipment circuit ID is correct	all	⊗		NIL
6	Enclosure, sealing gaskets or compounds are satisfactory	all	⊗		
7	There is no evidence of unauthorised modifications	all	⊗		
8	Bolts, cable entry devices and blanking elements are of the correct type and are complete and tight	all	⊗		LOOSE
9	Installation clearly labelled	i	⊗		
10	Safety barriers/isolators installed as per certification and securely earthed where required	i	⊗		
11	Entity calculation/ equipment documentation is available	i	X		
<b>B Installation</b>					
1	The cables are adequately supported and there is no obvious damage to cables	all	⊗		
2	Sealing of trunking, ducts, pipes and/or conduits is satisfactory	all	⊗		SEAL CONDUIT ✓
3	Earthing and bonding connections are tight, in good condition and of sufficient cross section	all	⊗		
4	No obstructions adjacent to flameproof flanged joint	d	X		
<b>C Environment</b>					
1	Apparatus adequately protected from corrosion, weather, vibration, and other adverse factors	all	⊗		
2	No undue accumulation of dust or dirt	all	⊗		

Faults found? (circle as appropriate): No / Yes

Action required to make device compliant (based on visual/close inspection techniques only):

	Yes/No		Yes/No
Provide equipment identification?	<input type="checkbox"/>	Provide equipment cover/UV protection?	<input type="checkbox"/>
Provide circuit identification?	<input checked="" type="checkbox"/>	Sealing of conduit/ducts required?	<input checked="" type="checkbox"/>
Provide blue cable sheath?	<input checked="" type="checkbox"/>	Provide/test equipotential bonding?	<input type="checkbox"/>
Remediate damaged cable sheath?	<input type="checkbox"/>	Evidence of equipment explosion protection?	<input type="checkbox"/>
Tighten loose cable gland(s)?	<input checked="" type="checkbox"/>	Replace equipment explosion protection labels?	<input type="checkbox"/>
Re-terminate cabling at equipment?	<input type="checkbox"/>	Conformity/Fitness for Purpose assessment required?	<input type="checkbox"/>
Terminate and earth exposed cabling?	<input type="checkbox"/>	Replace equipment due to age or poor condition?	<input type="checkbox"/>
Provide cable support/mech. protection?	<input type="checkbox"/>		<input type="checkbox"/>

Additional comments:

Contractor (write): Inspector <i>D. WILLIAMS</i>	Supervisor	Client (write): Inspector
Date: <i>6/16/11</i>		Date:

Reviewed by: *N. GREEN*  
Date: *12/10/11*  
Priority:

Comments:

All action items now completed:   
Job closed:

Device now fully compliant, spreadsheet register has been updated  
Supervisor (write):  
Date:



# Hazardous area device inspection sheet for Ex-d, Ex-e, Ex-i, Ex-n, Ex-p And other Ex devices



Based on AS/NZS 60079 part 17 (Visual/Close External Only)

Ref: I:\data\sitzler\contracts\darwin\bsj12\fyf1 fyfe Pty Ltd hazardous areas reporting award 28.07.11\fyf1 fyfe southern end pipeline\inspection forms\hazardous area device inspection sheet for ex-d,ex-e,ex-i,ex-n,ex-p and other ex devices rev 1.doc

1496 - 1505

## Specifications

Equipment ID/Tag:	TT-13		Plant/Asset:	
Circuit ID:	NONE		Site Location:	WARRENDA.
Apparatus type: (light, JB, Motor)	TEMP TX		Environment: (hot, dusty?)	
Manufacturer:	ROSEMOUNT		Type of protection: (d, e, i, n, p etc)	ia
Full model number:	3144P 02A17MSFS		Gas group: (IIA/B/C)	IC
Serial number:	1030440		Temp class: (T1-T6)	TL
IP Class	66		Certificate number:	AUS Ex 02.3794X
Number of cables:	2		Test authority: (BAS, PTB, SAA etc)	
Area classification : Zone:	Gas Group:	Temp.Class		
<b>Cable entries</b>	gland 1	gland 2	others ADAPTORS X2	
Gland manufacturer:	ALCO	ALCO	ROSEMOUNT	
Model:	UFP2B	WG 203	M20	
Gland type of protection: (d, e)	11C	NO CERT	?	

## Inspection

Circle as checked

A Equipment		Applicable to protection type:	Circle as checked		Notes
			External		
1	Equipment (incl group and temp class) is appropriate for area classification	all	X		
2	Equipment ID is available	all	⊙		
3	Equipment ID is correct	all	⊙		
4	Equipment circuit ID is available	all	⊙		TT-13 OK.
5	Equipment circuit ID is correct	all	⊙		NIL
6	Enclosure, sealing gaskets or compounds are satisfactory	all	⊙		
7	There is no evidence of unauthorised modifications	all	⊙		
8	Bolts, cable entry devices and blanking elements are of the correct type and are complete and tight	all	⊙		
9	Installation clearly labelled	i	⊙		
10	Safety barriers/isolators installed as per certification and securely earthed where required	i	⊙		
11	Entity calculation/ equipment documentation is available	i	X		
<b>B Installation</b>					
1	The cables are adequately supported and there is no obvious damage to cables	all	⊙		SUPPORT
2	Sealing of trunking, ducts, pipes and/or conduits is satisfactory	all	⊙		SEAL CONDUIT
3	Earthing and bonding connections are tight, in good condition and of sufficient cross section	all	⊙		INSTK STAND EARTH
4	No obstructions adjacent to flameproof flanged joint	d	X		
<b>C Environment</b>					
1	Apparatus adequately protected from corrosion, weather, vibration, and other adverse factors	all	⊙		
2	No undue accumulation of dust or dirt	all	⊙		

Faults found? (circle as appropriate): No / Yes

Action required to make device compliant (based on visual/close inspection techniques only):

	Yes/No		Yes/No
Provide equipment identification?	✓/□	Provide equipment cover/UV protection?	□/□
Provide circuit identification?	✓/□	Sealing of conduit/ducts required?	✓/□
Provide blue cable sheath?	□/□	Provide/test equipotential bonding?	✓/□
Remediate damaged cable sheath?	□/□	Evidence of equipment explosion protection?	□/□
Tighten loose cable gland(s)?	□/□	Replace equipment explosion protection labels?	□/□
Re-terminate cabling at equipment?	□/□	Conformity/Fitness for Purpose assessment required?	□/□
Terminate and earth exposed cabling?	□/□	Replace equipment due to age or poor condition?	□/□
Provide cable support/mech. protection?	✓/□		□/□

Additional comments:

Contractor (write): Inspector <i>D. WILLIAMS</i>	Supervisor	Client (write): Inspector
Date: <i>8/10/11</i>		Date:

Reviewed by: *N. GREEN*  
Date: *12/10/11*  
Priority:

Comments:

All action items now completed:   
Job closed:

Device now fully compliant, spreadsheet register has been updated  
Supervisor (write):  
Date:



# Hazardous area device inspection sheet for Ex-d, Ex-e, Ex-i, Ex-n, Ex-p And other Ex devices



Based on AS/NZS 60079 part 17 (Visual/Close External Only)

Ref: I:\data\sitzler\contracts\darwin\sbsj12\fyf1 fyfe Pty Ltd hazardous areas reporting award 28.07.11\fyf1 fyfe southern end pipeline\inspection forms\hazardous area device inspection sheet for ex-d,ex-e,ex-i,ex-n,ex-p and other ex devices rev 1.doc

1506.- 1509.

## Specifications

Equipment ID/Tag: <b>TE-13</b>	Plant/Asset:		
Circuit ID: <b>NONE (POOR CONDITION)</b>	Site Location: <b>WARLEED</b>		
Apparatus type: (light, JB, Motor) <b>TEMP ELEMENT</b>	Environment: (hot, dusty?)		
Manufacturer: <b>-</b>	Type of protection: (d, e, i, n, p etc) <b>-</b>		
Full model number: <b>-</b>	Gas group: (IIA/B/C) <b>-</b>		
Serial number: <b>-</b>	Temp class: (T1-T6) <b>-</b>		
IP Class: <b>-</b>	Certificate number: <b>-</b>		
Number of cables: <b>1</b>	Test authority: (BAS, PTB, SAA etc) <b>-</b>		
Area classification : Zone:	Gas Group:	Temp.Class	
<b>Cable entries</b>	gland 1	gland 2	others
Gland manufacturer:	<b>ALCO</b>		
Model:	<b>W6203</b>		
Gland type of protection: (d,e)			

## Inspection

Circle as checked

	A Equipment	Applicable to protection type:	Circle as checked		Notes
			External		
1	Equipment (incl group and temp class) is appropriate for area classification	all	X		
2	Equipment ID is available	all	<input checked="" type="checkbox"/>		
3	Equipment ID is correct	all	<input checked="" type="checkbox"/>		
4	Equipment circuit ID is available	all	<input checked="" type="checkbox"/>		
5	Equipment circuit ID is correct	all	<input checked="" type="checkbox"/>		<b>NIC</b>
6	Enclosure, sealing gaskets or compounds are satisfactory	all	<input checked="" type="checkbox"/>		
7	There is no evidence of unauthorised modifications	all	<input checked="" type="checkbox"/>		
8	Bolts, cable entry devices and blanking elements are of the correct type and are complete and tight	all	<input checked="" type="checkbox"/>		
9	Installation clearly labelled	i	X		
10	Safety barriers/isolators installed as per certification and securely earthed where required	i	X		
11	Entropy calculation/ equipment documentation is available	i	X		
<b>B Installation</b>					
1	The cables are adequately supported and there is no obvious damage to cables	all	<input checked="" type="checkbox"/>		
2	Sealing of trunking, ducts, pipes and/or conduits is satisfactory	all	<input checked="" type="checkbox"/>		
3	Earthing and bonding connections are tight, in good condition and of sufficient cross section	all	<input checked="" type="checkbox"/>		
4	No obstructions adjacent to flameproof flanged joint	d	X		
<b>C Environment</b>					
1	Apparatus adequately protected from corrosion, weather, vibration, and other adverse factors	all	<input checked="" type="checkbox"/>		
2	No undue accumulation of dust or dirt	all	<input checked="" type="checkbox"/>		

Faults found? (circle as appropriate): **No / Yes**

Action required to make device compliant (based on visual/close inspection techniques only):

	Yes/No		Yes/No
Provide equipment identification?	<input type="checkbox"/> / <input checked="" type="checkbox"/>	Provide equipment cover/UV protection?	<input type="checkbox"/> / <input type="checkbox"/>
Provide circuit identification?	<input checked="" type="checkbox"/> / <input type="checkbox"/>	Sealing of conduit/ducts required?	<input type="checkbox"/> / <input type="checkbox"/>
Provide blue cable sheath?	<input type="checkbox"/> / <input type="checkbox"/>	Provide/test equipotential bonding?	<input type="checkbox"/> / <input type="checkbox"/>
Remediate damaged cable sheath?	<input type="checkbox"/> / <input type="checkbox"/>	Evidence of equipment explosion protection?	<input type="checkbox"/> / <input type="checkbox"/>
Tighten loose cable gland(s)?	<input type="checkbox"/> / <input type="checkbox"/>	Replace equipment explosion protection labels?	<input type="checkbox"/> / <input type="checkbox"/>
Re-terminate cabling at equipment?	<input type="checkbox"/> / <input type="checkbox"/>	Conformity/Fitness for Purpose assessment required?	<input type="checkbox"/> / <input type="checkbox"/>
Terminate and earth exposed cabling?	<input type="checkbox"/> / <input type="checkbox"/>	Replace equipment due to age or poor condition?	<input type="checkbox"/> / <input type="checkbox"/>
Provide cable support/mech. protection?	<input type="checkbox"/> / <input type="checkbox"/>		<input type="checkbox"/> / <input type="checkbox"/>

**Additional comments:**

<b>Contractor (write):</b> Inspector <b>Supervisor</b> <i>D. WILLIAMS</i>	<b>Client (write):</b> Inspector
<b>Date:</b> <i>6/10/11</i>	<b>Date:</b>

**Reviewed by:** *N. GREEN*

**Date:** *12/10/11*

**Priority:**

**Comments:**

All action items now completed:

Job closed:

**Device now fully compliant, spreadsheet register has been updated**

**Supervisor (write):**

**Date:**

**INSPECTION CHECK SHEET**  
**Intrinsically Safe Ex i**



TAG/IDENTIFICATION		DESCRIPTION										
<b>Area Classification - Zone 0 1 2 20 21 22 Non Hazardous - Group I IIA IIB IIC - Temp T1 T2 T3 T4 T5 T6</b>												
<b>Record Name Plate Details</b>								Record other nameplate information that may be relevant				
Manufacturer		Vin		Chin								
Serial No.		Lin		Lin								
Model												
Certificate no.		T		IP								
Certifying authority												
<b>Inspection Type Performed (I=Initial, P=Periodic, S=Sample)</b>								<b>I</b>	<b>P</b>	<b>S</b>		
<b>Inspection Grade Performed (D=Detailed, C=Close, V=Visual)</b>								<b>D</b>	<b>C</b>	<b>V</b>	Detailed requires de-energization	
<b>Equipment Y=OK, N=Not Acceptable, N/A=Not Applicable, N/C=Not Checked</b>								<b>Inspect Grade</b>	<b>Remarks</b>			
Equipment is Australian or IEC Certified	Y	N	N/A	N/C	DCV							
EX markings are suitable for the area	Y	N	N/A	N/C	DCV							
Equipment is clearly marked and has appropriate tag/identification details	Y	N	N/A	N/C	DCV							
Enclosure is not damaged and maintains its weatherproofing	Y	N	N/A	N/C	DCV							
Terminations are tight	Y	N	N/A	N/C	DC							
All unused conductors terminated	Y	N	N/A	N/C	DC							
Bolts, bungs, plugs/blank plates installed and tight	Y	N	N/A	N/C	DCV							
Fuses and lamps are correct rating	Y	N	N/A	N/C	DCV							
No unauthorised modifications (Y=OK)	Y	N	N/A	N/C	DCV							
<b>Installation</b>								<b>Grade</b>	<b>Remarks</b>			
Cable type is as per the documentation	Y	N	N/A	N/C	D							
IS Entity and cable parameters are suitable for installation	Y	N	N/A	N/C	D							
The device is securely mounted	Y	N	N/A	N/C	DC							
Cables/conduits in acceptable condition	Y	N	N/A	N/C	D							
Cables/conduit entry correct, complete, and tight	Y	N	N/A	N/C	DCV							
No excessive vibration present that may cause conductors to work loose (Y=OK)	Y	N	N/A	N/C	DCV							
Segregation between IS and non IS circuits at junction boxes	Y	N	N/A	N/C	DCV							
Segregation between IS and non IS circuits in cable ladder and conduit	Y	N	N/A	N/C	DCV							
Earthing and equipotential bonding satisfactory	Y	N	N/A	N/C	D							
Insulation resistance is satisfactory (NB Danger of MEGGER testing HA)	Y	N	N/A	N/C	D							
Cable screens earthed as per documentation (normally one point only)	Y	N	N/A	N/C	D							
<b>Barriers</b>								<b>Grade</b>	<b>Remarks</b>			
Record Safety Barriers manufacturer and model no. (available on device = Y)	Y	N	N/A	N/C	DC							
Equipment is Australian or IEC Certified (Enter certification details in 'Remarks')	Y	N	N/A	N/C	DCV							
Record Safety Barriers certification details (available on device = Y)	Y	N	N/A	N/C	DC							
Safety Barriers are the correct type as per the drawings	Y	N	N/A	N/C	DC							
Safety Barriers are securely connected to the earth bar	Y	N	N/A	N/C	DCV							
Barrier/Isolator terminations are tight	Y	N	N/A	N/C	DCV							
Maximum voltage on the safe side of the barrier/isolator is 240V	Y	N	N/A	N/C	DCV							
IS circuits are all free from external power circuit infiltration	Y	N	N/A	N/C	DCV							
No energy storing devices in excess of the max energy permitted	Y	N	N/A	N/C	DC							
Relays acting as safety barriers are in good condition	Y	N	N/A	N/C	DCV							
Earth continuity from barrier bar to the transformer neutral point is <1ohm	Y	N	N/A	N/C	D	Check one connection at a time						
<b>Environment</b>								<b>Grade</b>	<b>Remarks</b>			
Equipment adequately protected against corrosion, weather, vibration, etc	Y	N	N/A	N/C	DCV							
Dust and dirt on the equipment and cable are within acceptable limit	Y	N	N/A	N/C	DCV							
<b>Special conditions</b>								<b>Grade</b>	<b>Remarks</b>			
Special conditions on certificate are satisfied	Y	N	N/A	N/C	D							
<b>Notes:</b>												
Inspected: _____ Date: _____ Checked: _____ Date: _____												

## INSPECTION CHECK SHEET - Increased Safety Ex e

TAG/IDENTIFICATION	DESCRIPTION							
Area Classification - Zone 0 1 2 Non Hazardous - Group I IIA IIB IIC - Temp T1 T2 T3 T4 T5 T6								
<b>Record Name Plate Details</b>					Record other nameplate information that may be relevant			
Manufacturer		KW		FLC				
Serial No.		Volts		RPM				
Model								
Certificate No.		T		IP				
Certifying authority								
<b>Inspection type performed (I=Initial, P=Periodic, S=Sample)</b>					<b>I</b>	<b>P</b>	<b>S</b>	
<b>Inspection Grade Performed (D=Detailed, C=Close, V=Visual)</b>					<b>D</b>	<b>C</b>	<b>V</b>	
<b>Equipment Y=OK, N=Not Acceptable, N/A=Not Applicable, N/C=Not Checked</b>					<b>Inspect Grade</b>		<b>Remarks</b>	
Equipment is Australian or IEC Certified	Y	N	N/A	N/C	DCV			
EX markings are suitable for the area	Y	N	N/A	N/C	DCV			
Equipment is clearly marked and has appropriate tag/identification details	Y	N	N/A	N/C	DCV			
Enclosure is not damaged and maintains its weatherproofing (min IP54)	Y	N	N/A	N/C	DCV			
Enclosure gaskets are in a satisfactory condition	Y	N	N/A	N/C	D			
Bolts, bungs, plugs/blank plates installed and tight	Y	N	N/A	N/C	DCV			
Terminals are sized correctly for the rating	Y	N	N/A	N/C	D			
Conductors > 0.5mm <sup>2</sup> for multistranded and 1mm <sup>2</sup> for single strand	Y	N	N/A	N/C	D			
No chafing parts that may cause local hot spots (motor fans) (Y=OK)	Y	N	N/A	N/C	D			
Guards are correctly fitted	Y	N	N/A	N/C	D			
No unauthorised modifications (Y=OK)	Y	N	N/A	N/C	DCV			
Lamp rating, type and position are correct	Y	N	N/A	N/C	D			
<b>Installation</b>					<b>Grade</b>		<b>Remarks</b>	
Equipment carries correct circuit identification at switchboard and local isolator	Y	N	N/A	N/C	D			
Effective means of isolation of all live conductors (including neutral)	Y	N	N/A	N/C	D			
Installation is in compliance with documentation	Y	N	N/A	N/C	DC			
Cable type is as per the documentation	Y	N	N/A	N/C	D			
The device is securely mounted	Y	N	N/A	N/C	DCV			
Cables/conduits in acceptable condition	Y	N	N/A	N/C	DCV			
Cables/conduit entry correct, complete, and tight (Exd or Exe glands used)	Y	N	N/A	N/C	DCV			
Exd glands have additional weatherproofing	Y	N	N/A	N/C	DCV			
Electrical connections are tight	Y	N	N/A	N/C	D			
Creepage and clearance distance are maintained	Y	N	N/A	N/C	D			
All unused conductors terminated in Exe terminals	Y	N	N/A	N/C	D			
Earthing and equipotential bonding satisfactory	Y	N	N/A	N/C	DCV			
Insulation resistance is satisfactory (NB Danger of MEGGER testing HA)	Y	N	N/A	N/C	D			
Motor parameters (Ia/In and te) and TOLs coordinate (record TOL mfr/model)	Y	N	N/A	N/C	D			
<b>Cable Glands and adaptors</b>					<b>Grade</b>		<b>Remarks</b>	
Cable glands details available, record (available=Y, not recorded=N/C)	Y	N	N/A	N/C	DCV			
Cable glands certificate details available, record (available=Y, not recorded=N/C)	Y	N	N/A	N/C	DCV			
Adaptors and plugs details available, record (available=Y, not recorded=N/C)	Y	N	N/A	N/C	DC			
Glands and adaptors Ex markings are suitable for area	Y	N	N/A	N/C	DCV			
<b>Environment</b>					<b>Grade</b>		<b>Remarks</b>	
Equipment adequately protected against corrosion, weather, vibration, etc	Y	N	N/A	N/C	DCV			
Dust and dirt on the equipment and cable are within acceptable limit	Y	N	N/A	N/C	DCV			
<b>Special conditions</b>					<b>Grade</b>		<b>Remarks</b>	
Special conditions on certificate are satisfied	Y	N	N/A	N/C	D			
<b>Notes:</b>								
Inspected: _____ Date: _____ Checked: _____ Date: _____								



## Hazardous Area Check Sheet Flameproof Ex d



TAG/IDENTIFICATION	DESCRIPTION										
<b>Area Classification - Zone 0 1 2 Non Hazardous - Group I IIA IIB IIC - Temp T1 T2 T3 T4 T5 T6</b>											
<b>Record Name Plate Details</b>								Record other nameplate information that may be relevant			
Manufacturer		KW		FLC							
Serial No.		Volts		RPM							
Model											
Certificate No.		T		IP							
Certifying authority											
<b>Inspection Type Performed (I=Initial, P=Periodic, S=Sample)</b>								I	P	S	
<b>Inspection Grade Performed (D=Detailed, C=Close, V=Visual)</b>								D	C	V	Detailed requires de-energization
<b>Equipment Y=OK, N=Not Acceptable, N/A=Not Applicable, N/C=Not Checked</b>								<b>Inspect Grade</b>	<b>Remarks</b>		
Equipment is Australian or IEC Certified	Y	N	N/A	N/C	DCV						
EX markings are suitable for the area	Y	N	N/A	N/C	DCV						
Equipment is clearly marked and has appropriate tag/identification details	Y	N	N/A	N/C	DCV						
Enclosure is not damaged and maintains its flameproof characteristics	Y	N	N/A	N/C	DCV						
Locking sealing, fastening devices are of type certified by manufacturer	Y	N	N/A	N/C	DCV						
Locking sealing, fastening devices operate correctly and are tight	Y	N	N/A	N/C	DC						
Bolts, bungs, plugs/blank plates installed and tight	Y	N	N/A	N/C	DCV						
Sealing gaskets and components in acceptable condition	Y	N	N/A	N/C	DCV						
Flange faces are clean and undamaged	Y	N	N/A	N/C	D						
Flange gap dimensions are less than _____ mm	Y	N	N/A	N/C	DC						
No unauthorised modifications (Y= OK)	Y	N	N/A	N/C	DCV						
Equipment is clear of obstructions (minimum dimensions 40mm)	Y	N	N/A	N/C	DCV						
No chafing parts that may cause local hot spots (motor fans) (Y=OK)	Y	N	N/A	N/C	D						
Guards are correctly fitted	Y	N	N/A	N/C	D						
Lamp rating, type and position are correct	Y	N	N/A	N/C	D						
<b>Installation</b>								<b>Grade</b>	<b>Remarks</b>		
Equipment carries correct circuit identification at switchboard and local isolator	Y	N	N/A	N/C	D						
Effective means of isolation of all live conductors (including neutral)	Y	N	N/A	N/C	D						
Cable type is as per the documentation	Y	N	N/A	N/C	D						
The device is securely mounted	Y	N	N/A	N/C	DCV						
Cables/conduits in acceptable condition	Y	N	N/A	N/C	DCV						
Cables/conduit entry correct, complete, and tight with sufficient threads	Y	N	N/A	N/C	DCV						
Sealing of conduits, ducts or other connections is satisfactory	Y	N	N/A	N/C	D						
Integrity of conduit system and mixed system interface satisfactory	Y	N	N/A	N/C	D						
Earthing and equipotential bonding satisfactory	Y	N	N/A	N/C	DCV						
Insulation resistance is satisfactory (NB Danger of MEGGER testing HA)	Y	N	N/A	N/C	D						
Protection devices (Limit sws, phase rot, TOLs) operate correctly	Y	N	N/A	N/C	D						
<b>Cable Glands and adaptors</b>								<b>Grade</b>	<b>Remarks</b>		
Cable glands details available, record (available=Y, not recorded=N/C)	Y	N	N/A	N/C	DCV						
Cable glands certificate details available, record (available=Y, not recorded=N/C)	Y	N	N/A	N/C	DCV						
Adaptors and plugs details available, record (available=Y, not recorded=N/C)	Y	N	N/A	N/C	D						
Adaptors and plugs have sufficient engaged threads	Y	N	N/A	N/C	DCV						
Glands and adaptors Ex markings are suitable for area	Y	N	N/A	N/C	DCV						
<b>Environment</b>								<b>Grade</b>	<b>Remarks</b>		
Equipment adequately protected against corrosion, weather, vibration, etc	Y	N	N/A	N/C	DCV						
Dust and dirt on the equipment and cable are within acceptable limit	Y	N	N/A	N/C	DCV						
<b>Special conditions</b>								<b>Grade</b>	<b>Remarks</b>		
Special conditions on certificate are satisfied	Y	N	N/A	N/C	D						
<b>Notes:</b>											
Inspected: _____ Date: _____ Checked: _____ Date: _____											



## **11 Overhaul, Repair, Modification and Replacement Register**

Documentation in relation to this section is to be maintained by APA Group.  
This Section contains the sample repair and examination report(s).

# REPAIR AND EXAMINATION REPORT FOR ENCAPSULATED EQUIPMENT (EX 'm')



### General

Tag no.:	Site:
P&ID:	Area Classification:

### Equipment Details

Equipment type:	Gas group (IIA/B/C):
Manufacturer:	Temp class (T1-T6):
Model no.:	Certificate no.:
Serial no.:	Test authority:

### Operator

Name:	Identification no.:
Company:	Company registration:

Condition upon receipt:.....

Old repair label details:.....

Reported fault (if any):.....

Repair action:.....

Parts replaced:.....

Test performed:.....

### Results:

Item	Description of check	Remarks
(a)	Cracks in compound	
(b)	Crazing	
(c)	Exposure of encapsulated parts	
(d)	Flaking	
(e)	Shrinking	
(f)	Swelling	
(g)	Decomposition	
(h)	Discoloration	
(i)	Failure of adhesion	
(j)	Change in hardness	

Certification drawing no(s):.....

Remarks:.....

.....

.....

I,.....confirm that the above equipment, repaired/overhaul/modified (strike out whichever is not applicable) as above, complies/does not comply with the relevant requirements of AS/NZS 3800 (including markings as required by Appendix D) and AS.....and that this Report has been recorded in the logbook of the service facility.

Sign:.....

Date:...../...../.....

# REPAIR AND EXAMINATION REPORT FOR INTRINSICALLY SAFE EQUIPMENT (EX 'i')



## General

Tag no.:	Site:
P&ID:	Area Classification:

## Equipment Details

Equipment type:	Gas group (IIA/B/C):
Manufacturer:	Temp class (T1-T6):
Model no.:	Certificate no.:
Serial no.:	Test authority:

## Competent Operator

Name:	Identification no.:
Company:	Company registration:

## Condition

Condition upon receipt:
Old repair label details:
Reported Fault (if any):

## Action

Repair action:..... ..... ..... ..... ..... ..... .....
Remarks:..... ..... ..... ..... ..... ..... .....

I,.....confirm that the above equipment, repaired/overhaul/modified (strike out whichever is not applicable) as above, complies/does not comply with the relevant requirements of AS/NZS 3800 (including markings as required by Appendix D) and AS.....and that this Report has been recorded in the logbook of the service facility.

Sign:.....

Date:...../...../.....

# REPAIR AND EXAMINATION REPORT FOR INCREASED SAFETY ENCLOSURES (EX 'e')



## General

Tag no.:	Site:
P&ID:	Area Classification:

## Equipment Details

Equipment type:	Gas group (IIA/B/C):
Manufacturer:	Temp class (T1-T6):
Model no.:	Certificate no.:
Serial no.:	Test authority:

## Competent Operator

Name:	Identification no:
Company:	Company Registration:

## Enclosure Condition

Old repair label no.:		
External surface cleaned for inspection - Yes / No		
Covers and fasteners:	Base of enclosure:	
Threaded holes:	External corrosion:	
Surface coating:	Gland entries and glands:	
General external condition:		
Enclosure dismantled:	Degree of protection: IP	
Internal Condition - Dust/Liquids:	Corrosion:	Heat:
Missing parts:		
Cables and terminations:	Terminal blocks:	
Earth terminals:	Insulation:	
Windows and seals:	Actuators and seals:	
Ex 'de' parts:	Meters:	
Lamps:	Transformers:	
Switches:	Others:	
Relays:	Interlocks:	
Luminaire:	Lamp power (W):	
Transparent part:	Lampholders:	
Ballasts:	Capacitors:	Batteries:

## Action

Repair
.....
Remarks:.....
.....

I,.....confirm that the above equipment, repaired/overhaul/modified (strike out whichever is not applicable) as above, complies/does not comply with the relevant requirements of AS/NZS 3800 (including markings as required by Appendix D) and AS.....and that this Report has been recorded in the logbook of the service facility.

Sign:.....

Date:...../...../.....

# REPAIR AND EXAMINATION REPORT FOR ELECTRICAL EQUIPMENT INSTALLED WITHIN FLAMEPROOF ENCLOSURE (EX'd')



## General

Tag no.:	Site:
P&ID:	Area Classification:

## Equipment Details

Equipment type:	Gas group (IIA/B/C):
Manufacturer:	Temp class (T1-T6):
Model no.:	Certificate no.:
Serial no.:	Test authority:

## Operator

Name:	Identification no.:
Company:	Company registration:

## Equipment Condition Checklist

Item	Description of check	No work	Repaired	Replaced
(a)	Isolator mechanism and switch operation			
(b)	Earthing device and operation			
(c)	All auxiliary mechanisms, trip bars, latching arrangements, etc.			
(d)	All locking devices, function and operation			
(e)	All parts for mechanical condition			
(f)	All insulation checked – no heat, cracks, etc.			
(g)	Phase barriers fitted correctly and functional			
(h)	Oil levels and/or gas pressure			
(i)	Gas pressure-sensing devices			
(j)	All wiring and terminations			
(k)	Earth continuity; phase/earth fault lock units			
(l)	Overcurrent, overload and earth-fault devices			
(m)	Earth-fault trip devices			
(n)	Timing devices			
(o)	Temperature-sensing devices			
(p)	Transformer connections, bolts, tapes, bracing, insulators and fittings, etc.			
(q)	Installation			
(r)	Machine cables and glands			

Details of repair or modification (attach extra pages if required):

Results of insulation resistance tests on transformers:

Transformers ratio:..... Capacity:..... Serial no.:.....

Manufacturer:..... Type of cooling:.....

Tested with:..... V (megohmmeter)

Primary winding to secondary winding:..... MΩ

Primary winding to earth:..... MΩ

Secondary winding to earth:..... MΩ

Earth continuity of earth screen to core:.....

Continued....

# REPAIR AND EXAMINATION REPORT FOR ELECTRICAL EQUIPMENT INSTALLED WITHIN FLAMEPROOF ENCLOSURE (EX'd')



Assembled unit tested for insulation resistance with: V megohmmeter, and power frequency tested on the following circuits:

Circuit description	Insulation resistance MΩ	Test voltage kV	Test frequency Hz	Result

Certification no(s).....

Remarks:.....  
 .....  
 .....  
 .....  
 .....

I,.....confirm that the above equipment, repaired/overhaul/modified (strike out whichever is not applicable) as above, complies/does not comply with the relevant requirements of AS/NZS 3800 (including markings as required by Appendix D) and AS.....and that this Report has been recorded in the logbook of the service facility.

Sign:.....

Date:...../...../.....



# REPAIR AND EXAMINATION REPORT FOR FLAMEPROOF ENCLOSURE (EX'd')



## General

Tag no.:	Site:
P&ID:	Area Classification:

## Equipment Details

Equipment type:	Gas group (IIA/B/C):
Manufacturer:	Temp class (T1-T6):
Model no.:	Certificate no.:
Serial no.:	Test authority:

## Operator

Name:	Identification no.:
Company:	Company registration:

## Equipment Condition Checklist

Item	Description of check	Remarks
(a)	Check of external and internal damage	
(b)	Dimensional check	
(c)	Corrosion on flamepaths	
(d)	Result of static pressure test	
(e)	Check of flanged joint surfaces	
(f)	Check of all threaded holes	
(g)	Check of all windows and lenses	
(h)	Check of breathers	
(i)	Check of all bolt holes, studs, screws,	
(j)	Check of all gland entries and fixing	
(k)	Check of all cables glands	
(l)	Check of all handhole and inspection	
(m)	Check of all mechanical interlocks	
(n)	Check of all flamepath gaps	

### Main control panel

1. Max. out of plane of box flanges:.....
2. Max. out of plane of cover:.....
3. Max. flameproof gap when bolted up:.....
4. Max. diametral clearance of spindles:.....
5. Max. diametral clearance of gland to gland apertures:.....
6. Static pressure test – pressure:.....
7. Water jacket – pressure test:.....Capacity:.....

Certification drawing no(s):.....

Remarks:.....  
.....  
.....

I,.....confirm that the above equipment, repaired/overhaul/modified (strike out whichever is not applicable) as above, complies/does not comply with the relevant requirements of AS/NZS 3800 (including markings as required by Appendix D) and AS.....and that this Report has been recorded in the logbook of the service facility.

Sign:.....

Date:...../...../.....

## 12 Schedule of Equipment and Conditions Requiring Compliance Status Attention

Tag	P&ID No.	Location	Reason for non-compliance
AD 0610-ZSC-10 AD 0610-ZSO-10	AD 0610-7010-1	Mainline valve AD0610-MLV-10	Nil evidence of equipment explosion protection.
AD 0610-SVC-10 AD 0610-SVO-10	AD 0610-7010-1	Mainline valve AD0610-MLV-10	Nil evidence of equipment explosion protection. Replacement of the equipment is required due to poor condition and age.