DEESIDE SPV LPG STORAGE AND SUPPLY

FUNCTIONAL DESIGN SPECIFICATION

ISSUE DATE: 16/02/2025

REVISION: A

DOCUMENT QUALITY CONTROL

STATUS	REVISION	DESCRIPTION OF CHANGE	AUTHOR	AUTHORISER	DATE
Issue	A	Initial issue	S McDowall	P Coulson	16/02/2025

DOCUMENT OWNER: SCOTT MCDOWALL - PROJECT ENGINEER

DOCUMENT AUTHORISER: HEAD OF ENGINEERING

ANY AMENDMENTS TO THIS DOCUMENT MUST BE SUBMITTED TO THE DOCUMENT CONTROLLER FOR APPROVAL.

CONTENTS

1 CUSTOMER INFORMATION

Deeside SPV

2 EXECUTIVE SUMMARY

2.1 This Functional Design Specification is presented in response to Deeside SPV request for information on an LPG storage and supply solution for the purpose of an Anaerobic Digestion process.
An overview of the technical solution is provided herein, and AvantiGas have the pleasure of presenting the commercial offer on this basis.

2.2 The solution comprises briefly:

- Storage option/configuration such that Deeside SPV can evaluate and determine the most suitable from a technical, supply and site scenario.
- Installation of electrical Propane dispensing units and associated electrical works within vessel area for the purpose of meeting peak flow rate requirements.
- Installation and commissioning of equipment stated within this specification.
- Service and maintenance of vessels and equipment within the vessel area
- A tailored and bespoke LPG solution which is supported through all stages of design, planning and execution.
- The ability to call on AvantiGas' long and experienced history of LPG operations.

The above work will be carried out at timescales to be agreed between both parties. At all times, AvantiGas will work with yourselves to ensure the project causes minimal disruption and that it follows safe and professional working practices.

Please do not hesitate to contact us if you have any queries or require clarification to any of the responses included within. All information is comprehensive but is intended for comparative purposes.

If deemed to be of interest, our proposal will undergo a further stage of refinement, in order to customise the solution to your requirements, noting that at the current time this proposal is provided for evaluation purposes only. Should Deeside SPV wish to pursue further, through to contract, AvantiGas will engage directly to finalise the appropriate submissions.

3 DISTRIBUTION SYSTEM REQUIREMENTS; PEAK DEMAND & PROPANE USAGE DETAIL

3.1 Peak Energy Demand

Maximum liquid phase Propane Flow Rates: TBC

3.2 Propane Estimated Usage Detail

SITE	DEESIDE SPV
BIO-METHANE PRODUCED M3/H	**2,000**
% PROPANE	**0.04**
EST HOURLY CONSUMPTION (LITRES)	**308**
EST WEEKLY CONSUMPTION (LITRES)	**51,744**
WEEKLY CONSUMPTION (TONNES)	**26**
ANNUAL CONSUMPTION (TONNES)	**1,369**

FUELS COMPARISON CHART

Property	Natural Gas		Propane		Butane		Industrial Kerosene		Gas/Diesel Oil		Fuel Oil	
	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross	Net	Gross
Litre/ Tonne		-		1,966.00		1,739.00		1,250.00		1,172.00		1,014.00
Kg/ litre		-		0.51		0.58		0.80		0.85		0.99
kWh/ Kg	-	-	12.77	13.71	12.77	13.71	12.19	12.83	11.82	12.58	11.32	12.04
kWh/ litre	-	-	6.50	6.97	7.34	7.88	9.75	10.26	10.09	10.73	11.16	11.88
MJ/ Kg	-	-	45.96	49.35	45.96	49.35	43.89	46.20	42.57	45.29	40.75	43.35
MJ/m3	35.34	39.26	85.80	92.12	97.00	104.15	-	-	-	-	-	-
Kg Carbon/kWh		0.18		0.21		0.21		0.25		0.25		0.27
Kg Carbon/Litre		-		1.50		1.50		2.57		2.73		3.21
Notes:	Some figures vary due to ambient conditions											

NOTE: *For reference and transparency, Calorific Values used in conversion calculation*

4 CORE OFFER

4.1 The core offer for Deeside SPV is intended to provide the simplest (from a design and supply perspective) approach to LPG storage and distribution of Commercial Propane for the purpose of an AD process consists of: -

- A storage vessel configuration for Deeside SPV to evaluate which is based on providing sufficient storage with the physical space available for supply resilience and minimising Hazardous Consent and fire precaution requirements
- Installation of above ground liquid phase pipework – supply to electric dispensing units.
- Installation of high-pressure vapour phase balancing pipework (ensuring equal vessel contents)
- Installation of an electric dispensing assemblies capable of meeting peak flow rates
- Installation of Electropneumatic actuated valves and other associated safety equipment
- Installation of underground Flexwell pipework
- Installation of vapour phase pipework for a supply to site's flare permanent pilot (if required)
- Electrical installation up to the Point of Entry (POE) to GEU
- Electrostatic bonding where applicable
- All tanker offload planning and connections
- Routine maintenance and servicing of LPG storage vessels, dispensing units, and associated equipment within vessel area
- Support with application for necessary permissions (Hazardous Substance Consent, COMAH) if applicable
- Commissioning of all systems up to and including underground supply pipework
- As built drawings, P&ID, test, and commissioning certification

NOTE: This core offer is for proposal purposes only, final design pending defined supply requirements

5 PROPOSED LPG STORAGE & ASSOCIATED EQUIPMENT

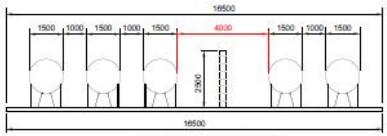
5.1 Storage Proposal

The Propane storage core offer for Deeside SPV are systems comprising of 5 x 4 Tonne above ground vessels with approximately 39,000 liquid litres of Propane storage.

For drawing examples of the storage proposals reference Section 5.2 - 5.3. The vessel configurations are for the purpose of proposal only which can be adapted to suit the energy requirements, planning restrictions, preference, consumption, and physical space of each specific site.

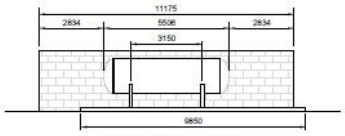
NOTE: The above initial storage proposals are based on the minimum capacity for supply resilience and the space available, minimising the requirements for Hazardous Consent (not accounting for aggregation rule) and addition fire precautions e.g. deluge systems.

5.2 STORAGE PROPOSAL – 5 x 4 Tonne Above Ground Vessels



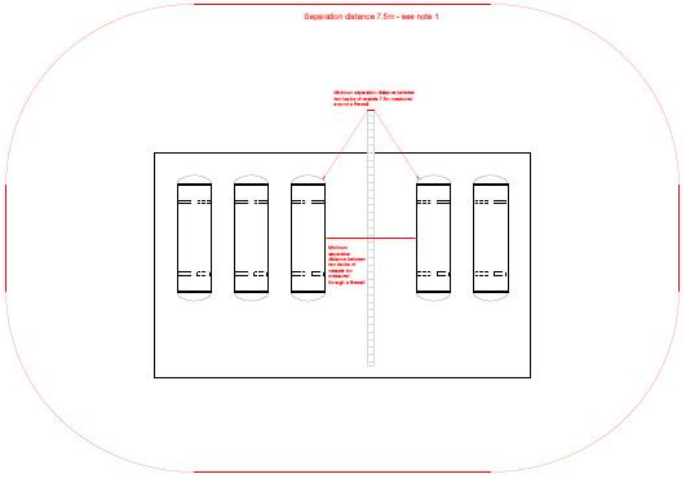
Base thickness to suit ground conditions
Load per vessel 11.5 tonnes

Side View



Base thickness to suit ground conditions
Load per vessel 11.5 tonnes

End View



Plan View

NOTE 1
2 banks of 3 x 4 tonne and 2 x 4 tonne LPG vessels. Minimum separation distance from buildings, boundaries, ignition sources, drains/pits/gullies (and between banks) 7.5m.

NOTE 2
The area which includes above ground vessels should be enclosed by an industrial-type fence, e.g. open mesh or palisade types, which:
a) ensures adequate ventilation
b) is at least 1.8m high
c) is at a distance of not less than 1.5m from the storage installation.

Around the immediate vessel area, fences should have at least two means of exit situated to minimise the distance to be travelled to escape from a dead end. Gates or access should open outwards and should be easily and immediately openable from the inside. They should not be self locking, and should provide unobstructed means of escape.

NOTE 3
Firefighting requirements:
Water supply for fire brigade use within 100m
1 x 19mm hose reel
2 x 9kg dry powder extinguishers.

NOTE 4
Vehicle protection required.
The design and construction of vehicle protection shall take into account the types, likely speeds and proximity of vehicles being operated in the area.

NOTE 5
Firewall Design:
Minimum 2m high or height of the vessel, whichever is greater.
Minimum separation distance between two banks of vessels 7.5m measured around a firewall.
Minimum separation distance between two banks of vessels 4m measured through a firewall.
Firewalls should be imperforate and substantially constructed from brick, concrete or solid masonry and be capable, if tested in accordance with either BS 476 part 20 and the relevant criteria of BS 476 parts 20 and 21 (formerly BS476 part 8), or BS EN 1363 in conjunction with the relevant parts of BS EN 1364 and BS EN 1365, of achieving 30 minute fire resistance.

Design Notes

1. All civil design and construction to be completed by others to satisfaction of AvantiGas Ltd.
2. All electrical design and construction to be completed by others to satisfaction of AvantiGas Ltd.
3. Vessel design and construction to be in accordance with PD5500 or CODAP equivalent.
4. Vessel / compound size, position and materials to be in accordance with LGUK CoP 1.
5. Pipework sizes, construction methods and materials to be in accordance with LGUK CoP 22.
6. Paintwork as per AvantiGas Ltd standard specifications.
7. All dimensions in mm U.O.S.

IF IN DOUBT CONTACT DRAUGHTSMAN

Legend

Rev	Description	Date	Drawn	Checked
E				
D				
C				
B				
A				
0	First draft	14.02	SM	

AVANTIGAS
AvantiGas Ltd
Gladstone Close
Chesterfield
S43 3JT
Tel: 0808 208 0000

Client: Deeside SPV

Project: Deeside SPV - Proposed LPG Storage

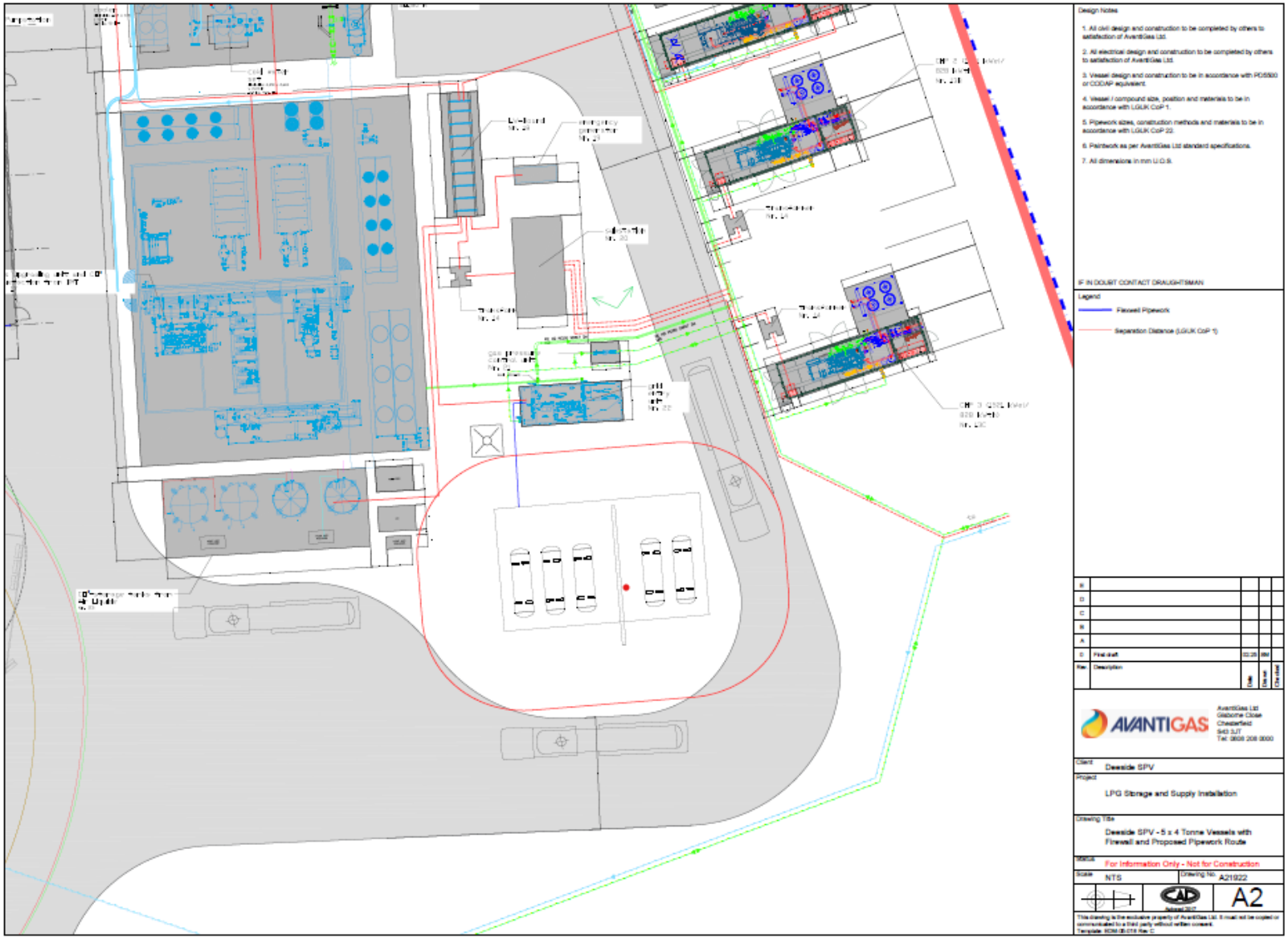
Drawing Title: General Arrangement - 5 x 4 Tonne LPG Vessels with Firewall

Status: For Information Only - Not for Construction

Scale: 1:125 | Drawing No: A21921 | A2

Advised 2017

5.3 STORAGE PROPOSAL – Site Plan with 5 x 4T Vessel and Firewall



5.4 STORAGE INFORMATION - Distances from Buildings, Boundaries, Sources of Ignition and Maximum Number of Vessels Permitted in a Group (Liquid Gas UK CoP 1 Part 1)

Maximum Propane Capacity			Minimum Separation Distances		
Of any single vessel in a group		Of all vessels in a group up to a max. of 6			
LPG Capacity (a)	Typical Water Capacity (b)	LPG Capacity (c)	From buildings, boundary, property line or fixed source of ignition - **without** a radiation wall (d)	From buildings, boundary, property line or fixed source of ignition - **with** a radiation wall (e)	Spacing between vessels (f)
Tonnes	Litres	Tonnes	metres	metres	metres
0,05 to 0,25	150 to 500	0,8	2,5	0,3	1
>0,25 to 1,1	>500 to 2 500	3,5	3	1,5	1
>1,1 to 4	>2 500 to 9 000	12,5	7,5	4	1
>4 to 60	>9 000 to 135 000	200	15	7,5	1,5
>60 to 150	>135 000 to 337 500	460	22,5	11	¼ of sum of the diameter of 2 adjacent vessels
>60 to 150	>135 000 to 337 500	460	22,5	11	¼ of sum of the diameter of 2 adjacent vessels

5.5 STORAGE INFORMATION CONT'D – Fire Precaution Requirements (Liquid Gas UK CoP 1 Part 1)

Installation Capacity Tonnes	Fire Precautions
< 4 Domestic Vapour Service	Water supply for fire brigade use.
< 1,1 Commercial and Industrial Vapour Service	Water supply for fire brigade use.
< 1,1 Commercial and Industrial Liquid Service	Water supply for fire brigade use. **And either:** 19 mm hose reel and either 2 x 9kg or 3 x 6 kg dry powder extinguishers. **Or:** 4 x 9 kg or 6 x 6 kg dry powder extinguishers. **Or:** 2 x 9 kg or 3 x 6 kg dry powder extinguishers and 2 x 9
> 1,1 < 25	Water supply for fire brigade use. **And:** 19 mm hose reel. **And:** 2 x 9 kg or 3 x 6 kg dry powder extinguishers.
> 25 < 50	Water supply. **And:** Fixed deluges and / or portable monitors for vessel or passive fire protection. **And:** Fixed deluges and / or portable monitors for road vehicle bays, where vessels are not passively coated. **And:** 19 mm hose reel. **And:** 2 x 9 kg or 3 x 6 kg dry powder extinguishers

Extract from Liquid Gas UK CoP 1 Part 1 (additional fire precautions due to increased filling frequencies).

4.2.2.7 At installations where an average of more than two road tanker deliveries a week take place, or where two or more road tankers a week are filled with LPG, based on the consumption over six months (including the Winter period), consideration should be given to the provision of additional fire protection at the tanker bay.

6 DOCUMENTATION

6.1 The following documentation shall be provided to the customer upon project completion:

- Test and commissioning certificates
- As built 2D drawings
- Customer Operation and Maintenance Manual
- Electrical/Earth-bonding certificates (where relevant)
- Supply of Method Statement and Risk Assessments for all installation works
- Snagging List (to be agreed with the customer)

7 VARIATIONS, EXCLUSIONS AND ASSUMPTIONS

7.1 The following items are excluded from the costings. The customer may request additional works during the project; these will follow AvantiGas' Variation process where authority for the variation (and costs associated) are agreed by the Project Engineer and Suitable Customer Contact. The customer is responsible for approval of all variations prior to the commencement of works associated.

7.2 The customer shall identify those within their organisation who have the authority to approve variations upon contract award.

7.3 Any work out of the scope of this proposal shall be charged as a schedule of rates, and based upon variation reports supplied and agreed with the customer during works:

- Any associated civil works including – trenching, load bearing piers, firewall, concrete plinth/s, vessel compound and vehicle protection
- Final Propane pipework, data / electrical and pneumatic connection to GEU
- Upgrade or replacement of any customer owned equipment
- Gas flow or pressure monitoring equipment
- Fire precautions, deluge system, gas detection or monitoring and passive fire protection
- Electrical control panel for the purpose of automated controls
- Electrical supply out with vessel area
- Vessel contents telemetry communication with GEU
- Incoming water supply for deluge system (if required)
- ESD function connection to site system including pneumatic or solenoid valves
- Remote supply pressure or flow rate monitoring system

- LPG storage vessel delivery; Complex or Intermediate Lift operation
- Process and Functional Safety studies
- Working outside normal working hours
- Any works outside this scope of works
- Working at height
- Any asbestos work

NOTE: *The above exclusions can be potentially included to the Core Offer*

AvantiGas Ltd will not be responsible for any of the following items:

- Poor performances as a result of misinformation provided to AvantiGas

7.4 It is not envisaged that any complications with the installation will arise. However, if it is deemed upon site visit that use of existing utilities and facilities is not suitable for works or that existing systems/downstream components are not fit for purpose, AvantiGas reserve the right to halt works until an agreement with the customer is formed with regards to any additional works and costs as applicable.

7.5 AvantiGas reserve the right to halt works until an agreement with the customer is formed with regards to any additional works and costs as applicable.

7.6 The following assumptions apply:

- Propane consumption figures detailed in section 3.1 are in-line with Deeside SPV's current and estimated future usage detail
- All civil works provided by Deeside SPV
- Suitable load bearing access road with turning and off-loading area for Third Party crane, low-loader and articulated re-fuelling road tanker
- Vessel/s siting in accordance with industry standards – separation distance from buildings, boundaries, drainage systems, and fixed sources of ignition (e.g. parked vehicles)
- Three phase power supply available
- Instrument air available
- Fire precautions provided by Deeside SPV: water supply for Fire Service use, 19mm hose reel and 2 x 9kg or 3 x 6kg dry powder extinguishers and deluge system if deemed a requirement

- Site PLC responsible for systematic / functional controls
- Final data, pneumatic or electrical connections from AvantiGas system to GEU to be completed by others
- LPG storage vessel delivery; Basic Lift operation
- Unobstructed use of safe, clean sanitary conveniences in accordance with the requirements of HASAWA as revised.
- Use of AvantiGas H&S protocols and work permit systems
- Customer to fulfil the requirements of CDM Coordinator (or equivalent) under the CDM 2015 regulations.
- Function and operation of the installed is as described. AvantiGas retain no liability for the condition and operation of other plant and only remain responsible for the design and operation of the works provided within this scope.

8 PROJECT TIMESCALES

AvantiGas would be happy to liaise with the Client in regard to a project commencement date/s. The lead time for packaged solutions after contractual agreement and final design stage will be determined by manufacturing lead times is currently between 20 – 30 weeks. On confirmation of contractual agreement this will be defined and potentially reduced.

All work proposed will be in strict accordance with AvantiGas Design and Engineering Procedures and to Liquid Gas UK and Health and Safety Executive Codes of Practice.

We are full members of the Liquid Gas UK and employ engineers fully conversant with their requirements and with many years' experience in LPG engineering.

9 CONTACT DETAILS

Scott McDowall

Project Engineer

E-mail: scott.mcdowall@avantigas.com

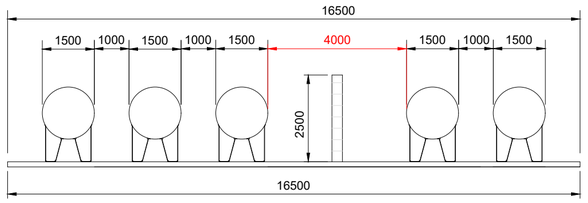
Tel: 07718 602853

Mari Jones

Area Sales Manager

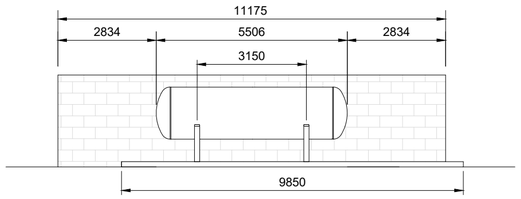
E-mail: mari.jones@avantigas.com

Tel: 07870 835704



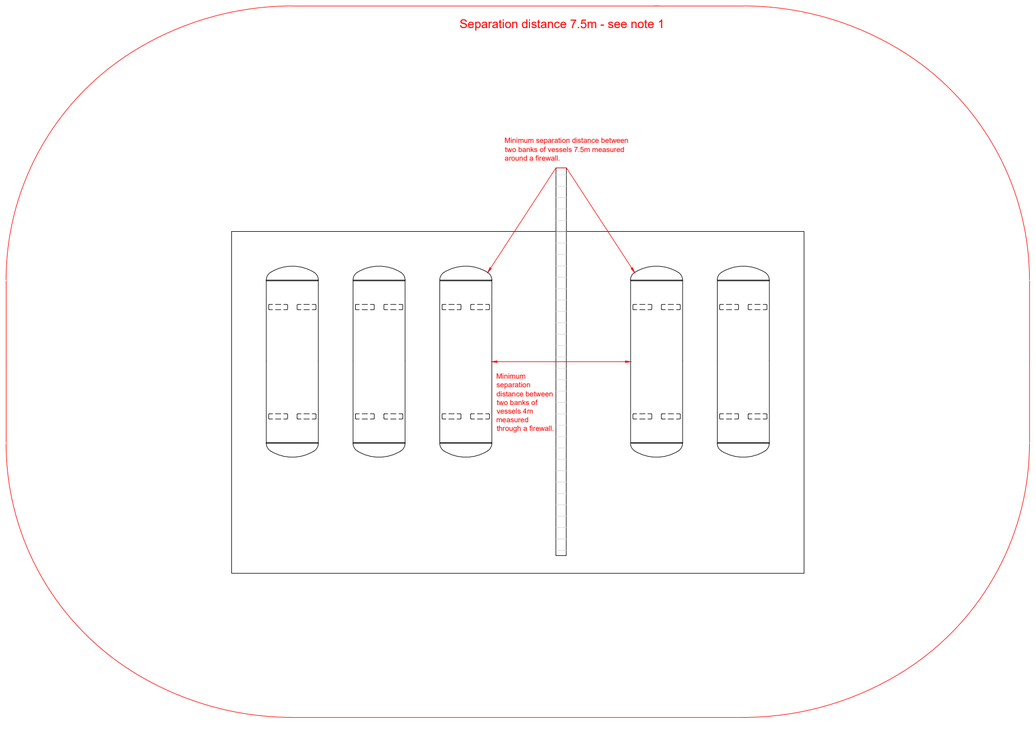
Base thickness to suit ground conditions
Load per vessel 11.5 tonnes

Side View



Base thickness to suit ground conditions
Load per vessel 11.5 tonnes

End View



Plan View

NOTE 1
2 banks of 3 x 4 tonne and 2 x 4 tonne LPG vessels. Minimum separation distance from buildings, boundaries, ignition sources, drains/pits/gullies (and between banks) 7.5m.

NOTE 2
The area which includes above ground vessels should be enclosed by an industrial-type fence, e.g. open mesh or palisade types, which:
a) ensures adequate ventilation
b) Is at least 1.8m high
c) Is at a distance of not less than 1.5m from the storage installation.

Around the immediate vessel area, fences should have at least two means of exit situated to minimise the distance to be travelled to escape from a dead end. Gates or access should open outwards and should be easily and immediately openable from the inside.
They should not be self locking, and should provide unobstructed means of escape.

NOTE 3
Firefighting requirements:
Water supply for fire brigade use within 100m
1 x 19mm hose reel
2 x 9kg dry powder extinguishers.

NOTE 4
Vehicle protection required.
The design and construction of vehicle protection shall take into account the types, likely speeds and proximity of vehicles being operated in the area.

NOTE 5
Firewall Design:
Minimum 2m high or height of the vessel, whichever is greater.
Minimum separation distance between two banks of vessels 7.5m measured around a firewall.
Minimum separation distance between two banks of vessels 4m measured through a firewall.
Firewalls should be imperforate and substantially constructed from brick, concrete or solid masonry and be capable, if tested in accordance with either BS 476 part 20 and the relevant criteria of BS 476 parts 20 and 21 (formerly BS476 part 8); or BS EN 1363 in conjunction with the relevant parts of BS EN 1364 and BS EN 1365, of achieving 30 minute fire resistance.

Design Notes

1. All civil design and construction to be completed by others to satisfaction of AvantiGas Ltd.

2. All electrical design and construction to be completed by others to satisfaction of AvantiGas Ltd.

3. Vessel design and construction to be in accordance with PD5500 or CODAP equivalent.

4. Vessel / compound size, position and materials to be in accordance with LGUK CoP 1.

5. Pipework sizes, construction methods and materials to be in accordance with LGUK CoP 22.

6. Paintwork as per AvantiGas Ltd standard specifications.

7. All dimensions in mm U.O.S.

IF IN DOUBT CONTACT DRAUGHTSMAN

Legend

Rev.	Description	Date	Drawn	Checked
E				
D				
C				
B				
A				
0	First draft	14.02	SM	

AvantiGas Ltd
Gisborne Close
Chesterfield
S43 3JT
Tel: 0808 208 0000

Client: Deeside SPV

Project: Deeside SPV - Proposed LPG Storage

Drawing Title: General Arrangement - 5 x 4 Tonne LPG Vessels with Firewall

Status: For Information Only - Not for Construction

Scale: 1:125

Drawing No.: A21921

Autocad 2017

A2

Template: EDM-05-018 Rev C

Design Notes

1. All civil design and construction to be completed by others to satisfaction of AvantiGas Ltd.

2. All electrical design and construction to be completed by others to satisfaction of AvantiGas Ltd.

3. Vessel design and construction to be in accordance with PD5500 or CODAP equivalent.

4. Vessel / compound size, position and materials to be in accordance with LGUK CoP 1.

5. Pipework sizes, construction methods and materials to be in accordance with LGUK CoP 22.

6. Paintwork as per AvantiGas Ltd standard specifications.

7. All dimensions in mm U.O.S.

IF IN DOUBT CONTACT DRAUGHTSMAN

Legend

Flexwell Pipework

Separation Distance (LGUK CoP 1)

Rev.	Description	Date	Drawn	Checked
E				
D				
C				
B				
A				
0	First draft	02.25	SM	

AvantiGas Ltd
Gisborne Close
Chesterfield
S43 3JT
Tel: 0808 208 0000

Client: Deeside SPV

Project: LPG Storage and Supply Installation

Drawing Title: Deeside SPV - 5 x 4 Tonne Vessels with Firewall and Proposed Pipework Route

Status: For Information Only - Not for Construction

Scale: NTS

Drawing No.: A21922

Autocad 2017

A2

Template: EDM-05-018 Rev C