

**CES Technical Proposal
for**

Barnsley Hospital
Site Address
Gawber Rd,
Barnsley

Project Details

Project No: **UK-2025-20992**
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Revision: 0

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Technical Proposal for the Installation of a Medical Oxygen System

1. Introduction

This proposal outlines the scope, technical details, and installation methodology for a Medical Oxygen System comprising a primary supply (V100 vessel with 400 m³/hr vaporizer skid and Hi-Flow Medical Panel) and a secondary (backup) supply (VIE 42 with pressure-raising vaporizer, process vaporizer, and secondary Hi-Flow Medical Panel), all mounted on the same plinth to ensure redundancy, continuity of supply, and compliance with medical gas safety standards.

2. System Overview

2.1 Objective

To provide a reliable, high-capacity, uninterrupted medical oxygen supply system with both primary and secondary backup capabilities, suitable for a healthcare facility or hospital environment.

2.2 Key Features

- Fully redundant system (N+1)
- Simultaneous mounting of primary and secondary supplies
- Automatic switchover between supplies
- Designed for high flow medical oxygen demand
- Compliance with relevant standards (HTM 02-01, NFPA 99, ISO 7396-1)

3. System Components

3.1 Primary Supply (Main Supply)

Component	Specification
Cryogenic Storage Tank	V100 Vertical Vacuum Insulated Vessel
Storage Capacity	~21,000 liters
Vaporizer Skid	400 Nm ³ /hr Ambient Air Vaporizer
Medical Oxygen Panel	Hi-Flow Medical Oxygen Panel with automatic pressure regulation, filtration, and monitoring

Functional Description:

The V100 vessel will store liquid oxygen at cryogenic temperatures. The ambient air vaporizer will convert liquid oxygen to gaseous form at high flow rates, which is then regulated through the Hi-Flow Medical Panel to meet hospital demands.

3.2 Secondary Supply (Backup System)

Component	Specification
Cryogenic Storage Tank	VIE 42 (approx. 3000 liters)
Pressure Raising Vaporizer	Sized for rapid pressure recovery (as per tank manufacturer recommendations)
Process Vaporizer	Ambient Air Vaporizer (~400 Nm ³ /hr)

Component	Specification
Medical Oxygen Panel	Secondary Hi-Flow Medical Panel with automatic isolation and switchover capability

Functional Description:

The backup system will remain on standby, maintaining operational pressure via the pressure raising vaporizer. Upon failure or depletion of the primary supply, the system will automatically switch to the secondary supply. The process vaporizer ensures continuous flow during peak demand.

4. Installation Plan

4.1 Site Preparation (By Others)

- Civil foundation work for a combined plinth to accommodate both vessels and equipment
- Load-bearing calculation and reinforced concrete platform
- Electrical grounding and lightning protection
- Pipeline routing to the manifold room / medical gas terminal units
-

4.2 Mechanical Installation (By BOC)

- Mounting of V100 and VIE 42 vessels on the same plinth
- Installation of vaporizers adjacent to vessels with required clearances
- Piping connections between storage tanks, vaporizers, and medical panels using stainless steel (SS 316L) pipeline
- Pressure and flow test of the entire system
-

4.3 Electrical & Instrumentation (By Others)

- Level and pressure transmitters for both vessels
 - Oxygen purity analyzers and pressure sensors at medical panels
 - Alarm and BMS integration for remote monitoring
 - Emergency shutdown system
-

5. Operation and Control

5.1 Switchover Mechanism

- The system will have an auto-changeover unit to detect pressure drop in the primary line and activate the secondary system.
- Manual override available for maintenance and testing purposes.
-

5.2 Monitoring

- Local indicators for pressure, temperature, and level
 - Remote telemetry to hospital BMS
 - Audio-visual alarms for low pressure, low level, and high flow
-

6. Safety and Compliance

- All components to be certified for medical gas use
- Installation to follow:
 - HTM 02-01 (UK)
 - NFPA 99 (US)

- ISO 7396-1 (International)
- Fire-safe valves, emergency shut-off, and access control

7. Training and Handover

- On-site training for biomedical and maintenance staff
- Submission of as-built drawings, P&ID, data sheets, O&M manuals
- Final performance verification and oxygen purity test

8. Project Timeline

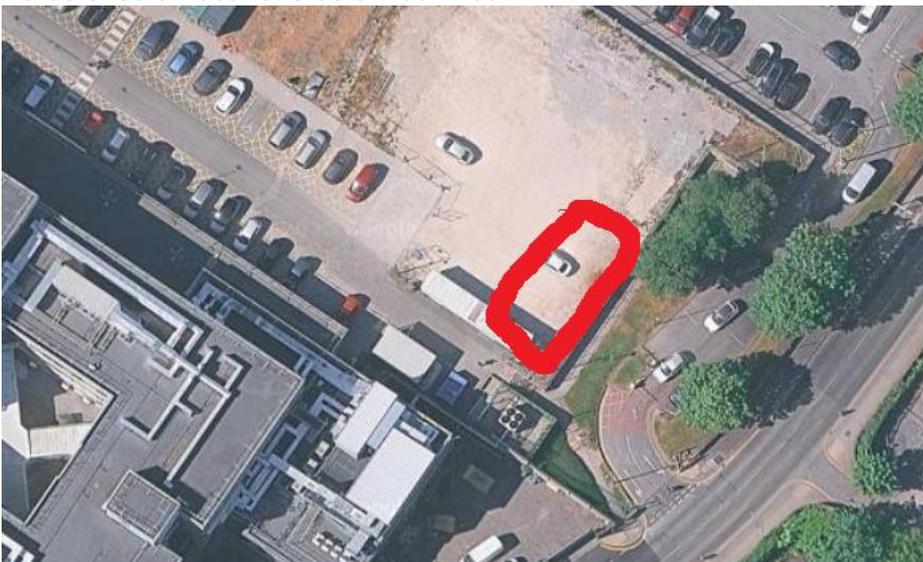
Phase	Duration
Design and Approval	2 weeks
Site Preparation	1 week
Delivery of Equipment	2 weeks
Installation & Commissioning	2 weeks
Testing and Handover	1 week
Total Estimated Duration	8 weeks

9. Conclusion

This system provides a robust, redundant, and high-capacity oxygen supply suitable for medical environments where continuous oxygen delivery is critical. With both primary and backup supplies integrated on a single plinth, the system ensures compact footprint, ease of maintenance, and operational efficiency.

2. Siting

To be sited at locations below outlined in RED.



3. General Information Required by BOC

- Notify BOC of any site induction procedures. Note: *Time spent at site inductions may be charged at T&M rates.*
- Notify BOC of any site entry documentation (including craneage documentation)
- Notify BOC of any adverse weather conditions that may effect the craneage operation a minimum of 2 days prior to the operation. If craneage has to be cancelled on the day due to weather conditions, the revisit will be charged as a variation.
- Notify BOC of any risks in the vicinity of the works.
- Notify BOC of any site permit procedures.
- Notify BOC of any additional documentation required. Note: *BOC will supply their own risk assessments and method statements for the project as well as specialist contractor risk assessments for the craneage operation. If customer specific or additional risk assessments and method statements are required over and above the BOC standard offering. These may be charged as a variation.*
- Notify BOC of any additional commissioning requirements. Note: *BOC have allocated 1 man for a single day for commissioning, any additional requests may be charged as a variation.*
- Notify BOC of any additional training and user manual requirements. Note: *BOC will supply one copy of the user manual and carry out a toolbox talk type training session at the time of commissioning and additional requests for training or user manuals may be charged as a variation.*
- Notify BOC of any specific project phasing. Note: *BOC have based costs on an uninterrupted site installation. If this changes, additional visits may be charged as a variation.*
- Planning Permission.

4. Customer Responsibilities: Civil and Building Works

- Notify BOC of any site induction procedures. Note: *Time spent at site inductions may be charged at T&M rates.*
- Notify BOC of any site entry documentation (including craneage documentation)
- Notify BOC of any adverse weather conditions that may effect the craneage operation a minimum of 2 days prior to the operation. If craneage has to be cancelled on the day due to weather conditions, the revisit will be charged as a variation.
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- Planning Permission.
- Fencing and Gates as per BOC drawing and Civil Data Sheet. Gates must open 180 Degrees.
- Plinth & hard-standing as per BOC drawings, including alteration of drains, roads, paths etc.

5. Customer Responsibilities: Electrical

- Provision of lighting for night time filling and maintenance as detailed on the civils data sheet.
- Provision of a temporary 230V supply for drilling holding down bolts..
- Provision of electrician for completion of terminations during commissioning and appropriate electrical supply.
- Provision of electrician for isolation and removal of electrical supply to BOC owned equipment.

- A 230/110V, 2A, 1 ph, electrical supply for the medical panel run in cable tray or conduit and terminated in the BOC panel. Reference drawing 1850206.
- A 230/110V, 2A, 1 ph, electrical supply for the timed changeover run in cable tray or conduit and terminated in the BOC panel
- Installation of lightning protection as per specification 1872011.
- Earthing and bonding of plinth pipe work to BS7671.
- To supply and install alarm system to interface to medical oxygen system

6. Customer Responsibilities: General

- Provision of a 'fire watcher' and or 'buddy worker' if either is required by site safety regulations.
- Provision of grease free secure site storage for BOC tools and/or equipment.
- The provision and management of a 25m exclusion zone around the installation for the duration of pressure testing reference specification 1850859.
- Provision of hot water or steam supply on or adjacent to the plinth for vaporiser and pipework de-icing. If de-icing is required at a later date and this facility is not available BOC may charge for a mobile de-icing service.
- Safe, secure, unimpeded access and egress for transport and craneage during the loading, offloading and positioning of BOC equipment.
- Safe, secure, unimpeded access and egress of BOC tanker to be agreed with BOC transport.
- Safe, secure, unimpeded access and egress to and from the factory for the process equipment.
- It is the customers responsibility to run the vessel contents to zero. BOC may be able to vent product to atmosphere or decant product back into a delivery vehicle. An additional cost may be incurred if a delivery vehicle is used.
- The installation, testing and commissioning of the link between the new vessel location and the process.
- To supply a qualified pharmacist to test purity of oxygen from the supply scheme up to the BOC termination point.
- It is the customer's responsibility to provide welfare facilities for BOC and its contractors while working on site.

7. Safety and Equipment Data Sheets

- TD004 Design and Build of your BOC Gas System
- TD005 Cryoscan CS51 Telemetry
- TD066 The Pressure Systems Safety Regulations 2000 SI 128
- TD 086 Medical VIE system typical layout

8. Termination Points

BOC responsibility will terminate at Termination tag

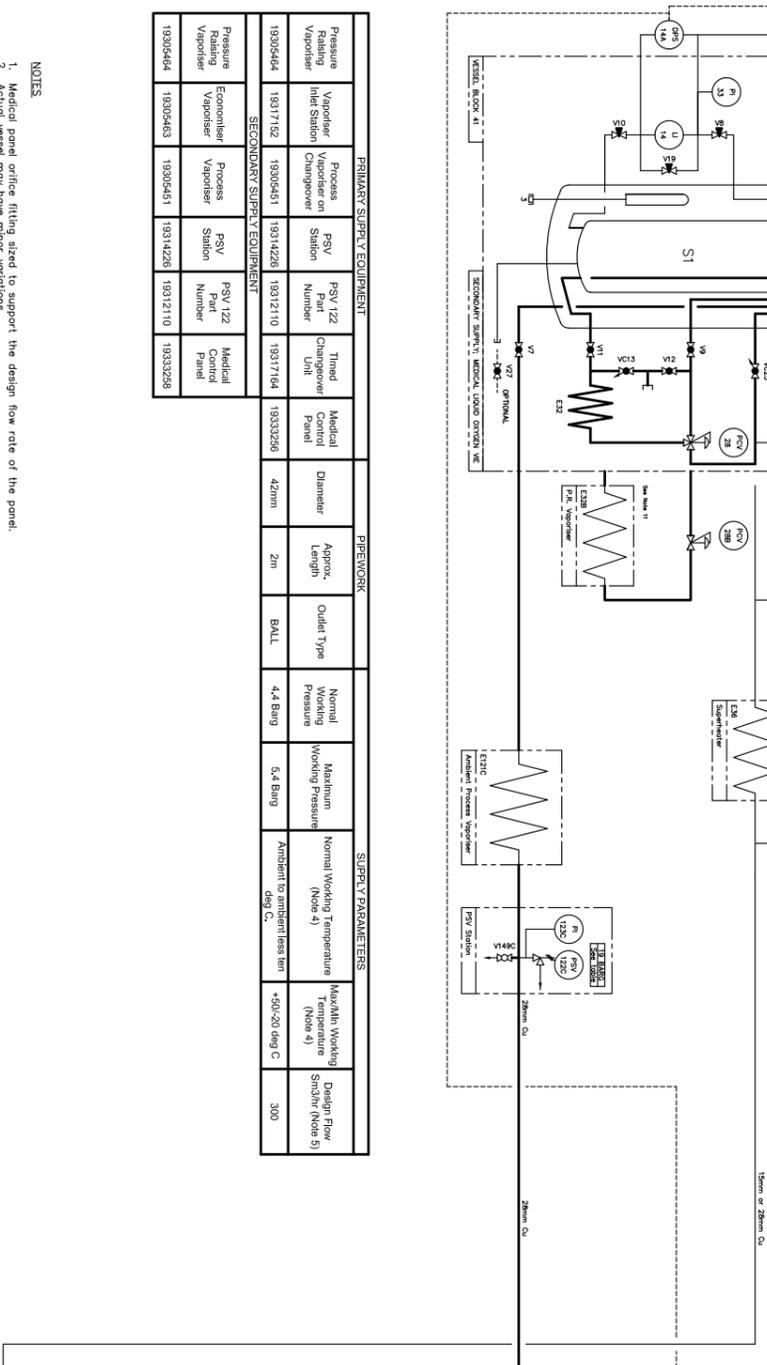
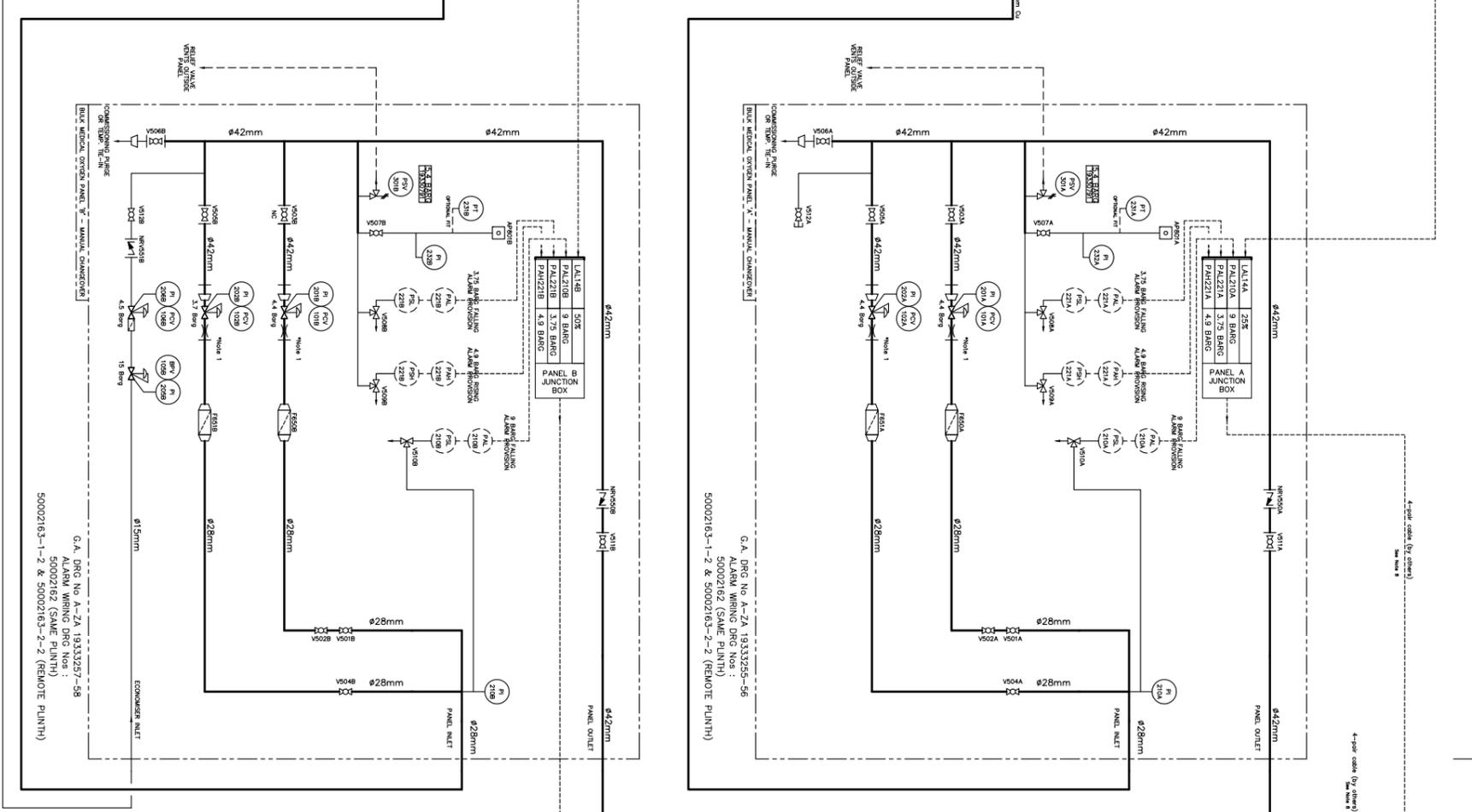
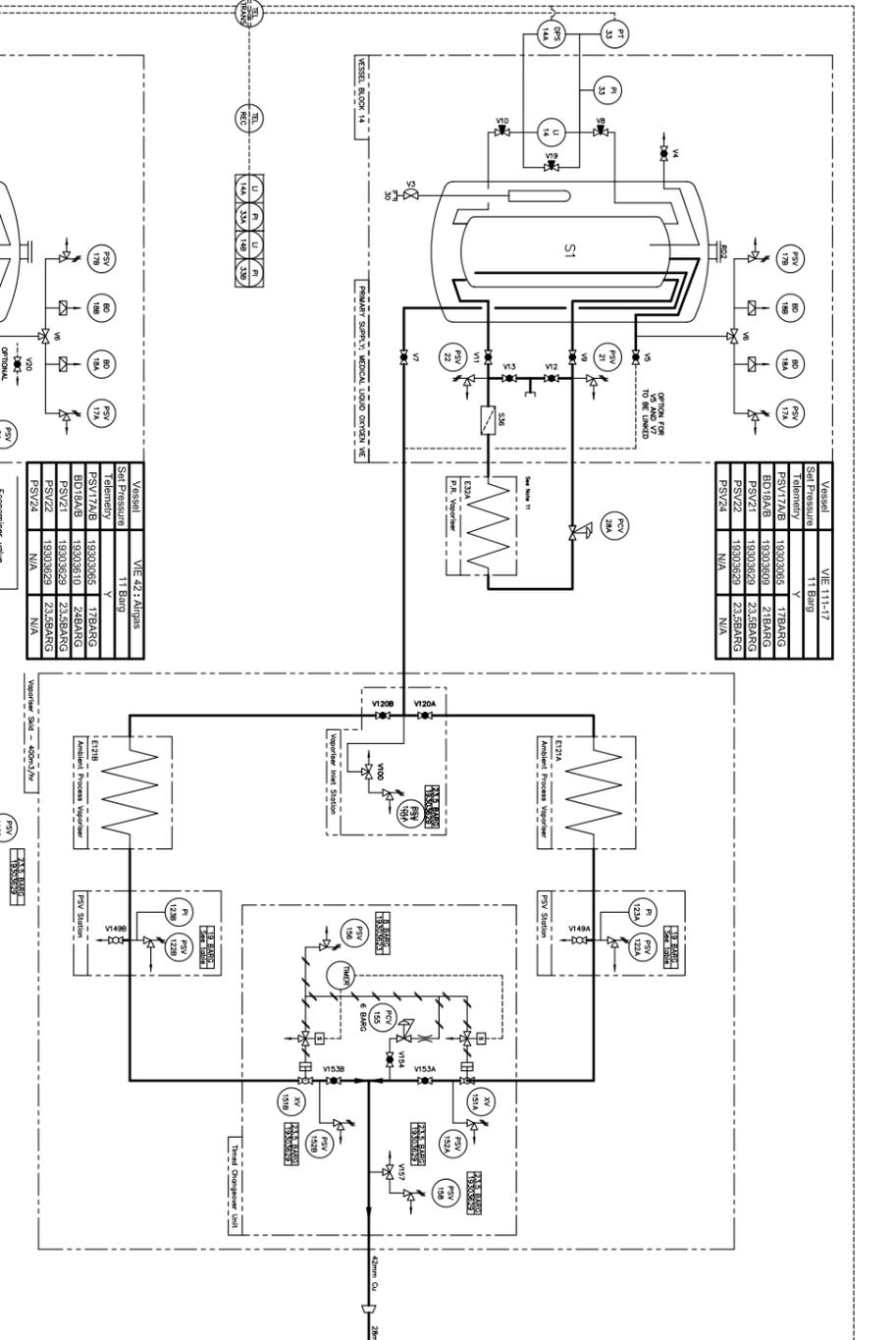
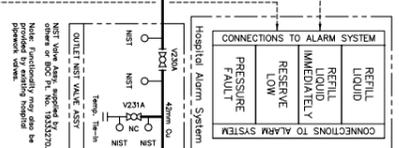
9. Delivery

12-16 Weeks from receipt of written order.

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WARNING - OXYGEN
 USE NO OIL OR GREASE
 DURING OR AFTER ASSEMBLY

ALARM	ALARM CONDITION	HOSPITAL LEGEND	INITIATED BY	SETTING
1	PRIMARY OXYGENS	REFILL LIQUID	LAL 14A	20% See note 9
2	RESERVE OXYGENS	REFILL LIQUID	PAL 210A	9 BAR
3	SECONDARY OXYGENS	RESERVE LIQUID	LAL 14B	< 0.2 BAR
4	PRESSURE HIGH OR LOW	PRESSURE FACT	PAL 221A/B	> 4.50 BAR < 3.15 BAR



- NOTES**
- Medical panel refers fitting sized to support the design flow rate of the panel.
 - Actual vessel may have more applications.
 - Both vessels shall have independent D.P. topplings. D.P. conversions shall not be used.
 - A valve VS shall be added to 2 pipe vessels.
 - SEF safety accessories are CE marked by equipment manufacturer including when the piping assembly is classed as fabricated to 6. The expected temperature of the product downstream of the vapouriser is based on the flow rate and pattern copied with the customer and normal ambient conditions. If the design flow is exceeded, or ambient temperatures low for long periods, downstream temperatures may fall below those stated. This should form part of the customer's risk assessment.
 - The system is designed for continuous use.
 - Should from sunlight. The actual flow figure anticipated for this installation will be recorded in the user manual.
 - This system is designed for continuous use.
 - It is the customer's responsibility to wire the alarms from the control panel to the hospital alarm system(s).
 - As per best practice, and HIM2-01, customer to ensure a suitable non-return valve assembly is installed immediately within customer premises to minimise any loss from the vulnerable pipeline, example shown for illustration.
 - Delete external PR Cct. If vessels integral PR Cct. is to be used.

Standard P&ID Number
 500035289

Standard P&ID Issue Date
 01-08-21

IF IN DOUBT
 Med 1A - M Burke

AS per Standard P&ID
 Revision Details

Rev	Date	Desc
1		

Customer
 Medical Oxygen VIE + VIE Bock Up
 Medical Panel Flow - 5000L/min

Scale
 NTS

Drawn By
 XXX

Project No
 SCXXXX

Sheet No
 1/1

Issue
 1

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Scale
 NTS

Drawn By
 XXX

Project No
 SCXXXX

Sheet No
 1/1

Issue
 1

BOC
 A Member of the Linde Group

BOC
 Boreham
 500 SNT
 United Kingdom

Design and Build of Your BOC Gas System

The widest selection of tanks available in the UK today, along with the largest fleet of delivery vehicles to ensure security of supply



Introduction

BOC supply more than just gas. We work with our customers to deliver total process solutions. Our application specialists work with you to gain an in-depth understanding of your processes and strive to improve your productivity, yield, product quality and meet exacting environmental performance.

Vessel Information

BOC supply more than just gas. We work with our customers to deliver total process solutions.

Our application specialists work with you to gain an in-depth understanding of your processes and strive to improve your productivity, yield, product quality and meet exacting environmental performance.

For processes that require high volumes of gaseous or liquid product, we supply a selection of products as liquid.

The liquid is delivered by a cryogenic tanker into a vacuum insulated bulk storage vessel on your site. The vessel will provide either a liquid or gaseous supply. The installation also includes a pressure-raising system to maintain the pressure within the vessel at a pre-determined value. This BOC service is designed to give you an unfailing supply of high-quality product. This in turn gives you security and reliability in your own production line. When you buy BOC, you buy the biggest name and best resources in the business.

What Size Vessel Do I Need?

The basic criteria are twofold – the amount of gas you need for your process and the size and frequency of deliveries which we can economically make. Bear in mind that the more efficient and cost-effective our operation can be, the better deal we can offer to you. Key factors to consider are your required flow rate and your gas demand (whether it is steady or fluctuating), together with the peaks and troughs in your business. BOC will work with you to decide which type and size of vessel will best fit your requirements.



Build and Safety Requirements

Before we can install the vessel on your site, a suitable location needs to be agreed. The following should all be considered when selecting the location of the vessel:

- There is sufficient space for our filling tankers to safely access and egress the location, this should also include the turning space for the vehicle,
- A suitable concrete plinth or plinths have been made available for the equipment to be installed on, see below and relevant data sheets for further details,
- A hard-standing area can be provided for the tanker to park on during vessel filling,
- Sufficient lighting is provided in the area, for filling and maintenance,
- Safety distances are achievable – see page 5 for further details,
- A hot water or steam point can be provided for de-icing,
- Finally, some legal work will be required to make sure there are no covenants which need to be observed.

Fencing Details

Where fencing is required it can be in either panel form or for 'roll round' installation. The following standard is recommended:

The fence must not create an enclosed area as this can create a significant asphyxiation risk.

Fence type	50 x 50 RSA 3 mm weld mesh panel and panels to be hot-dipped galvanised or roll round chain link with a medium grade industrial plastic coating. Gaps between the columns and posts are to be small enough as to not be able to reach through and to avoid contact with the cold pipe work. All fencing must be fabricated to the latest standards.
Fence height	1.8 m (min)
Posts	50 x 50 RHS hot-dipped galvanised (as a minimum). To be fixed accordingly with suitable fixings to resist any wind load.
Gates	50 x 50 RSA 3mm weld mesh. Gates to be hot-dipped galvanised. Gate posts should be set in pockets. Single gate width 800 mm (min) Double gate width 2010 mm. They are also to include doors which open to 180 degrees.

Concrete Plinths

The customer is responsible for the design and construction of the concrete plinth. BOC will provide details of the wind loads and fixings required to secure the vessel, using the standards generic data listed below. If the customers install requires for more specific loadings, this can be done at a cost.

The wind load calculations that are produced to determine the fixing category, are done in accordance with BS EN 1991-1-4:2005 Eurocode1: Actions on Structures

The calculations assume the following:

- maximum basic wind speed of 27 m/s
- site effective height of 100 m above sea level
- distance to the sea of 25 km
- terrain category II (Low vegetation such as grass and isolated obstacles (trees, buildings) with separations of at least 20 obstacle heights)

Bolting categories for the vessels are detailed on separate data sheets.

The concrete plinth should have a brush finish and have a maximum fall of 1:150 to allow surface water to run off and should be constructed on 200mm of consolidated hardcore. The minimum concrete grade should be C35/45 with an air entrainment admixture.

Hydrocarbon based surfacing shall not be used for hard standings on oxygen installations.

IMPORTANT NOTE: The plinth dimension information (including length, width, thickness and reinforcement details) given in the BOC documentation is notional only as a preliminary indicative means for the Customer to seek quotes from structural or civil engineers to provide specific advice to the Customer in relation thereto. Properly advise the Customer. Notwithstanding that BOC has provided notional plinth dimension information, the Customer is and shall at all times remain responsible for the design and construction of the concrete plinth and for the carrying out of all civil works in relation thereto and nothing stated herein shall imply any responsibility for the design and construction of the concrete plinth on the part of BOC.

Safety Distances

Hazards	Oxygen (metres)			Argon/nitrogen (metres)	
	0-2000 litres	2000-20,000 litres	20,000-125,000 litres	0-2000 litres	2000-20,000 litres
1. Property boundaries	3	5	8	1	3
2. Public roads	3	5	8	1	5
3. Railways	3	10	15	3	5
4. Places of public assembly	5	10	15	3	3
5. Offices, canteens, areas of congregation	5	7	8	3	3
6. Vehicle parking areas	3	5	8	1	3
7. Pits, ducts, drains to underground systems	4	5	8	1	3
8. Naked flames/smoking areas	3	5	8	1	3
9. LPG vessels and bulk flammable liquid storage	7.5*	7.5*	7.5*	3*	3*
10. Compressed flammable gases	5**	8**	8**	1**	3**
11. Non flammable gas cylinder storage	1	1	1	1	1
12. Fuel gas vents	5	5	8	1	3
13. Continuous sections of flammable pipelines	1	5	6	1	1
14. Mechanically jointed pipelines, flammable gas or liquid	6	6	6	1	3
15. Process equipment and machinery	4	5	8	1	3
16. Compressors, ventilator air intakes	5	7	8	1	3
17. Large wooden structures	5	15	15	1	3
18. Site huts and small stocks of combustibles	3	5	8	1	3
18. MV and HV substations	4	5	8	1	3

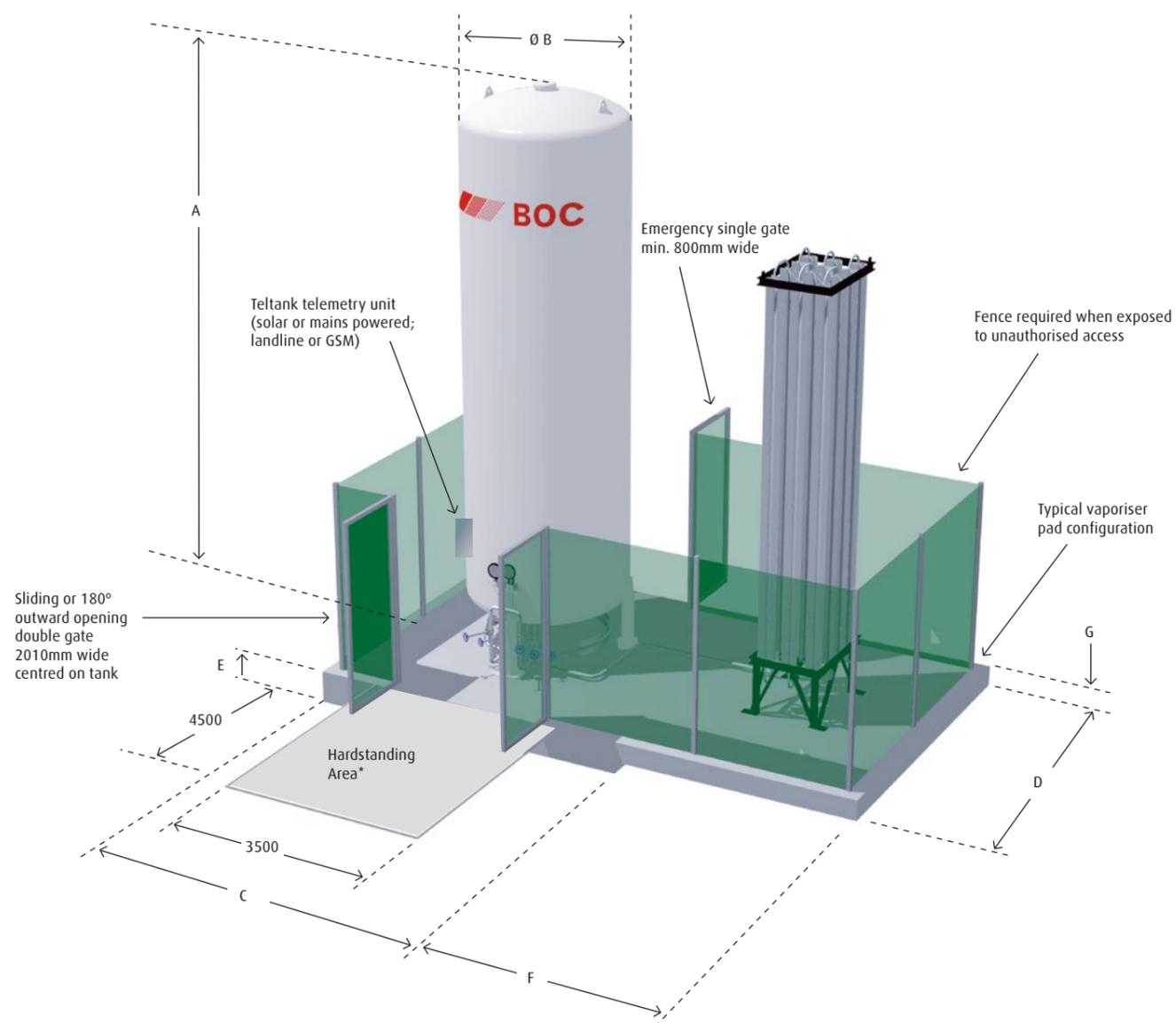
For more information refer to TD052 and TD053 for Oxygen and TD008 and TD056 for Argon and Nitrogen

* For LPG or flammable liquid storage above 4 tonnes a risk assessment shall be carried out to establish the safe separation distance

** Refer to TD068 and BCGA CP6 for safety distances for dissolved acetylene



Typical Installations



* Hardstanding area shall be provided for 44 tonne G.V.W.; axle loading 10.5 tonnes. The hardstanding shall be concrete for all gases, 250 mm thick with A252 mesh reinforcement top and bottom slabs. The area shall be centred on the vessel control panel.



VIE & VAP skid 100m³/hr



VIE & VAP skid 200m³/hr



VIE & VAP skid 400m³/hr

Accompanying Information

Separate data sheets for the vessels and vaporisers are available upon request. Fixings data sheets are also available.

BOC – Turning Ideas into Solutions

BOC is a member of The Linde Group, the leading global gases and engineering company. BOC is the UK's largest provider of industrial, specialist and medical gases, as well as related products and services. As a leader in the application of technology, we are constantly looking for new ways to provide our customers with high quality products and innovative solutions.

At BOC we help our customers to create added value, clearly discernible competitive advantage and hence greater profitability. To achieve this we have a comprehensive range of products, services and technical support, which can be customised to meet the individual requirements of our clients.

To keep ahead of the competition in today's market, you need a partner for whom quality, service, process and productivity optimisation are an integral part of customer support. We are there for you and with you, helping to build your success.

BOC's reputation has been forged through partnerships – with customers, with relevant regulatory authorities and with key suppliers. In this way, we deliver comprehensive and consistent benefits to you.

BOC – world-leading knowledge and resources adapted to local requirements.

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VIE and VIT Vessels

Introduction BOC can provide a range of over 60 sizes of storage vessels. The following tables show you the most common ranges. We will equip you with the nearest size vessel available for your requirements, usually within ±10% of the capacity shown. The size and frequency of the liquid delivery will then be adjusted to cover any slight variation in capacity from the ideal.

Normally low pressure vessels (up to 4 bar) are used for liquid nitrogen supplies for cooling purposes. Medium pressure (up to 18 bar) and high pressure (up to 35 bar) are used for gas supplies.

Please note vessel weights and working pressures vary across the range and sometimes across the same model number. Check before order to ensure the vessel meets your requirements.

Capacities, weights and dimensions

VIT Vessels

Model	Water capacity (litres)		Nominal product capacities HCM at 1013 mb and 15°C 1 HCM=100 m ³			Vessel dimensions		Weight (tonnes)			
	Gross	Net	O ₂	N ₂	Ar	Height (A)	Dia (B)	Full			
								Empty	O ₂	N ₂	Ar
21	2300	2070	17.4	14.2	17.1	3.19	1.62	1.5	4.5	3.8	4.9
33-8	3323	3165	26.6	21.5	26.1	4.21	1.52	2.3	5.9	4.9	6.7
41	4500	4160	35.1	28.4	34.4	4.11	1.85	2.8	7.5	6.2	8.6
61-8	6082	5792	48.7	39.3	47.7	6.66	1.52	3.8	10.4	8.5	11.9
106	11120	10590	89.3	72.3	87.3	4.92	2.57	6.4	12.1	8.6	14.8
109-5	10897	10378	87.2	70.4	85.5	4.68	2.50	5.4	17.2	13.8	19.9
179	19400	17950	151.2	122.6	148.3	7.93	2.46	9.7	30.1	24.1	34.7
188	19780	18840	158.8	128.7	155.2	7.43	2.55	9.5	31.0	24.8	35.8
191	20030	19075	160.8	130.3	157.2	7.43	2.55	9.5	31.3	25.0	36.1
194-5	19392	18468	155.1	125.3	152.1	7.18	2.50	8.0	29.0	22.9	33.7
279-4	27887	26560	223.1	180.1	218.8	10.1	2.50	11.0	41.2	32.4	48.0
410	43000	40950	344.6	278.2	337.8	9.45	3.38	19.0	66.0	52.4	77.4
413	43700	41285	348.0	282.0	340.2	8.9	3.4	19.0	66.1	52.4	76.6
432-6	43165	41110	345.3	278.8	338.5	8.15	3.57	17.4	64.4	50.6	75.0
608-5	61200	58285	489.6	395.3	480.0	10.64	3.57	21.7	88.0	68.6	102.9
785-5	78990	75230	634.2	513.8	619.9	13.3	3.55	26.8	112.7	87.7	131.7
962-4	96130	91550	771.8	625.3	754.4	15.8	3.55	28.7	133.3	102.9	156.4
1139-4	114570	109115	916.5	739.8	898.6	18.14	3.57	35.3	159.5	123.0	187.3

The data given represents actual design data and may vary slightly from other published data. Reinforcement category, bolting category and vessel plinth dimensions overleaf.

Capacities, weights and dimensions

VIT Vessels (continued)

Model	Reinforcement category	Bolting category	Vessel plinth dimensions (m)		
			W (C)	D (D)	T (E)
21	A	4 or 6	4.0	3.5	0.25
33-8	A	4 or 6	4.0	3.5	0.25
41	A	4 or 6	4.0	3.5	0.25
61-8	A	4 or 6	4.0	3.5	0.30
106	B	None	5.1	4.6	0.30
109-5	B	None	5.1	4.6	0.40
179	B	4 or 6	5.1	4.6	0.35
188	B	4 or 6	5.1	4.6	0.35
191	B	4 or 6	5.1	4.6	0.35
194-5	B	4 or 6	5.1	4.6	0.40
279-4	C	4 or 6	5.1	4.6	0.40
410	C	5	5.9	5.4	0.35
413	C	4 or 6	5.9	5.4	0.35
432-6	C	4 or 6	5.9	5.4	0.35
608-5	C	4 or 6	5.9	5.4	0.35
785-5	D	20	5.9	5.4	0.40
962-4	D	20	5.9	5.4	0.45
1139-4	E	20	5.9	5.4	0.60

VIE Vessels

Model	Water capacity (litres)		Nominal product capacities HCM at 1013 mb and 15°C			Vessel dimensions		Weight (tonnes)			
	Gross	Net	1 HCM=100 m ³			Height (A)	Dia (B)	Empty	Full		
			O ₂	N ₂	Ar				O ₂	N ₂	Ar
17	1885	1600	13.5	11.0	13.2	3.73	1.39	2.8	4.6	4.1	5.0
18	2004	1822	15.4	12.4	15.0	3.90	1.37	2.4	4.5	3.9	4.9
25	2773	2520	21.2	17.2	20.8	3.89	1.62	2.9	5.8	4.9	6.4
31S	3327	3080	25.9	20.9	25.4	4.27	1.62	3.6	7.1	6.1	7.9
33-17	3323	3165	26.6	21.5	26.1	4.21	1.52	2.7	6.3	5.3	7.1
42	4500	4160	35.1	28.4	34.4	4.70	1.70	4.6	9.2	7.8	10.3
56S	6087	5637	47.4	38.2	46.4	6.77	1.62	5.5	12.0	10.0	13.4
61-17	6082	5792	48.7	39.3	47.7	6.66	1.52	4.2	10.7	8.8	12.2
83	9000	8320	70.2	56.9	68.8	6.55	1.98	7.1	16.7	13.9	18.7
102	14514	10160	85.3	68.9	83.7	7.54	2.44	12.2	23.6	20.4	26.3
105S	11350	10500	88.5	71.7	86.5	4.9	2.57	9.0	21.0	17.5	23.6
111-17	11115	10585	88.9	71.8	87.2	4.68	2.50	6.9	18.9	15.4	21.6
130	14400	13000	109.5	88.9	107.3	7.32	2.44	13.4	28.4	23.8	31.8
134	14498	13423	113.2	91.7	110.6	7.0	2.28	10.0	25.3	20.9	28.7
185S	20000	18500	156.0	126.4	152.4	7.4	2.57	13.5	34.6	28.5	39.3
196-17	19610	18675	156.9	126.6	153.8	7.18	2.50	10.3	31.6	25.3	36.5
201	22313	20105	169.5	137.3	165.7	8.4	2.74	19.8	42.8	36.1	47.8
207	22300	20661	174.0	140.9	170.2	8.30	2.70	14.3	37.9	31.0	43.1
281-17	28105	26767	224.9	181.5	220.4	10.10	2.50	14.5	45.0	36.0	51.8
337N	36350	33650	282.7	228.2	277.0	6.73	3.88	16.6	55.0	43.6	63.5
405	43698	40469	341.2	276.4	333.5	9.1	3.38	27.6	73.8	60.4	84
420UC	41600	39520	332.8	269.6	325.6	12.90	2.60	27.0	72.0	58.8	82.1
432-18	42835	40800	343.0	277.0	336.0	8.15	3.57	23.2	69.6	56.0	80.0
450 I&RD	46076	43772	369.0	299.0	360.0	11.8	2.90	16.2	66.2	51.7	77.3
505N	54530	50480	424.0	342.2	415.7	9.10	3.88	21.6	79.0	62.2	92.0
608-18	60390	57515	483.1	390.0	473.6	10.64	3.57	29.4	94.8	75.6	109.5
785-17	77940	74230	763.9	616.7	749.0	13.32	3.57	36.5	121.0	96.2	139.9
962-17	95500	90950	763.9	616.7	749.0	15.81	3.57	42.8	146.6	116.4	169.6
1010N	109050	100950	851.0	689.5	831.8	16.2	3.86	36.3	151.6	118.1	177.1
1139-17	113050	107670	904.3	730.1	886.7	18.14	3.57	49.0	171.5	135.6	199.0

The data given represents actual design data and may vary slightly from other published data. Reinforcement category, bolting category and vessel plinth dimensions overleaf.

Capacities, weights
and dimensions

VIE Vessels (continued)

Model	Reinforcement category	Bolting category	Vessel plinth dimensions (m)		
			W (C)	D (D)	T (E)
17	A	None	4.0	3.5	0.25
18	A	4 or 6	4.0	3.5	0.25
25	A	4 or 6	4.0	3.5	0.25
31S	A	4 or 6	4.0	3.5	0.25
33-17	A	4 or 6	4.0	3.5	0.25
42	A	4 or 6	4.0	3.5	0.25
56S	B	4 or 6	4.0	3.5	0.30
61-17	B	4 or 6	4.0	3.5	0.30
83	B	4 or 6	4.7	4.2	0.30
102	B	4 or 6	5.1	4.6	0.40
105S	B	None	5.1	4.6	0.30
111-17	B	None	5.1	4.6	0.30
130	C	4 or 6	5.1	4.6	0.30
134	B	4 or 6	4.7	4.2	0.30
185S	B	None	5.1	4.6	0.35
196-17	B	4 or 6	5.1	4.6	0.35
201	C	4 or 6	5.1	4.6	0.40
207	B	4 or 6	5.1	4.6	0.35
281-17	C	4 or 6	5.1	4.6	0.40
337N	C	None	6.1	5.6	0.35
405	C	21	5.9	5.4	0.40
420UC	C	20	5.1	4.6	0.60
432-18	C	None	5.9	5.4	0.35
450 I&RD	C	20	5.9	5.4	0.40
505N	C	5	6.1	5.6	0.35
608-18	C	5	5.9	5.4	0.35
785-17	D	20	5.9	5.4	0.40
962-17	D	20	5.9	5.4	0.45
1010N	E	21	6.1	5.6	0.45
1139-17	E	22	5.9	5.4	0.60

The data given represents actual design data and may vary slightly from other published data.

Bolting category

Bolting category	Size of bolt	Anchor description	Capsule description
4	M20	HAS-U Anchor Rod M20 x 240mm	Resin Capsule HVU- M20 x 170mm
5	M20	HAS-U Anchor Rod M20 x 400mm	Resin Capsule HVU- M20 x 170mm
6	M20	HAS-R Expansion Anchor M20	Not Required
7	M16	HAS-U Anchor Rod M16 x 190mm	Resin Capsule HVU- M16 x 125mm
8	M16	HAS-R Expansion Anchor M16	Not required
9	M12	HAS-R Expansion Anchor M12	Not required
10	M10	HAS-R Expansion Anchor M10	Not required
20	M24	HAS-U Anchor Rod M24 x 300mm	Resin Capsule HVU- M24 x 210mm
21	M27	HAS-U Anchor Rod M27 x 340mm	Resin Capsule HVU- M27 x 240mm
22	M30	HAS-U Anchor Rod M30 x 380mm	Resin Capsule HVU- M30 x 270mm
20a	M24	2No. HAS-U Anchor Rod M24 x 300mm/leg	Resin Capsule HVU- M24 x 210mm
21a	M27	2No. HAS-U Anchor Rod M27 x 340mm/leg	Resin Capsule HVU- M27 x 240mm
22a	M30	2No. HAS-U Anchor Rod M30 x 380mm/leg	Resin Capsule HVU- M30 x 270mm

Note for vessels: It is recommended to bolt through feet holes where provided.

If a clamp is required, then the bolt should be positioned as close to the vessel leg as possible to reduce the lever arm effect on the clamp and bolt. In any case the dimensions stated on the drawings shall not be exceeded.

Plinth reinforcement category

Category	Reinforcement details
A	A252 mesh top and bottom
B	A393 mesh top and bottom
C	12 dia bars (high yield) at 150 centres each way top and bottom
D	16 dia bars (high yield) at 200 centres each way top and bottom
E	16 dia bars (high yield) at 150 centres each way top and bottom

Mesh references are in accordance with BS4483.

Hot rolled bars shall be in accordance with BS4449.

Important note: The plinth dimension information (including length, width, thickness and reinforcement details) given above is notional only as a preliminary indicative means for the Customer to seek quotes from structural or civil engineers to provide specific advice to the Customer in relation thereto. properly advise the Customer. Notwithstanding that BOC has provided notional plinth dimension information, the Customer is and shall at all times remain responsible for the design and construction of the concrete plinth and for the carrying out of all civil works in relation thereto and nothing stated herein shall imply any responsibility for the design and construction of the concrete plinth on the part of BOC.

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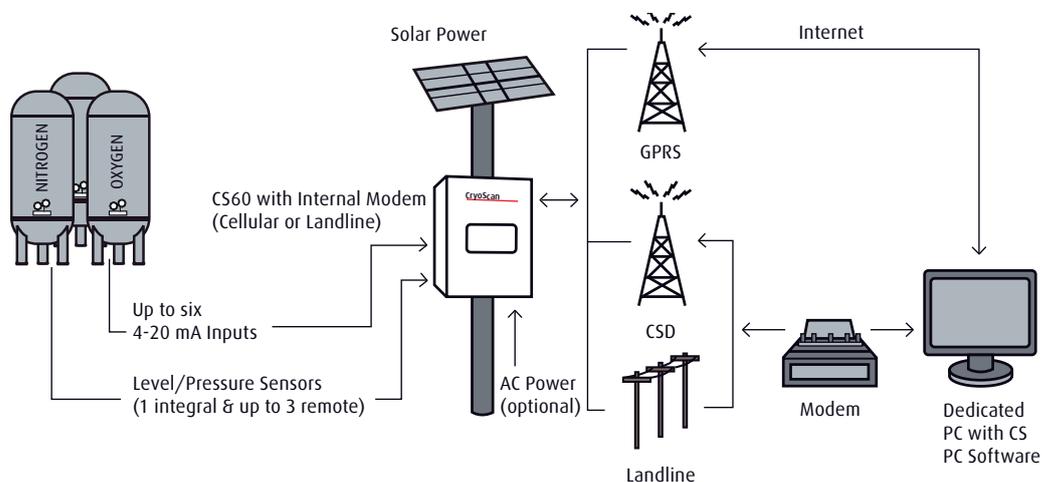
CryoScan® 60. Telemetry system.



CryoScan® 60.

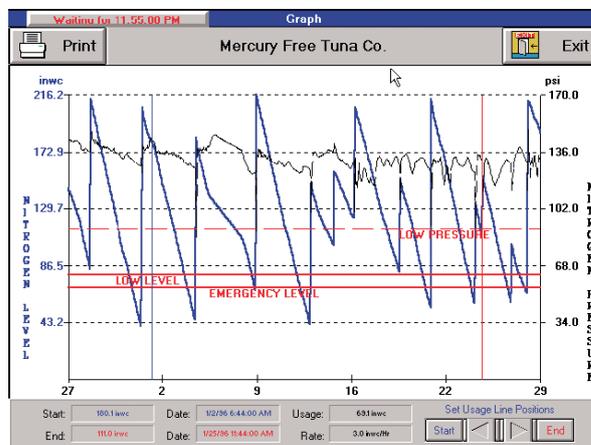
Introduction The CryoScan® 60 (CS60) Telemetry System combines up-to-the-minute accuracy in cryogenic product level and pressure measurement with a communications system that optimizes inventory management and product delivery cycles. The remote telemetry unit (RTU) calculates the level of product inside a tank using pressure measurements from its integral sensor and/or 4 – 20 mA inputs, and stores the information in data logs. The logged data is transmitted regularly to a computer for on-screen viewing or printing for quick and easy analysis. Built-in alarms alert the operator when a parameter drops to a user-specified setpoint. An operator can also run a status report “on demand” for instantaneous data monitoring.

- Features**
- Advanced microcontroller with flash memory
 - Integral sensor for highly accurate tank level and pressure measurements
 - Six additional inputs (4 – 20 mA) and two 4 – 20 mA outputs available with external AC power supply
 - Solar power with internal rechargeable battery or AC power with backup battery (24V loop power available with AC-powered units)
 - Landline or cellular data modem (comes with internal antenna)
 - Easy-to-read LCD displays with large, 0.7” character



Advantages

The CS60's continuous monitoring and alarm system helps eliminate the risk of running out of product. It also minimizes the need for "extra" product deliveries to ensure that tank levels do not become critically low. For companies that manage multiple chemicals and/or multiple storage sites, and applications such as healthcare services where a constant supply of cryogenic gas is critical, the CS60 is highly practical and cost-efficient. The CS60 telemetry system is actuated by a multi-variable sensor for highly accurate tank level and pressure measurement and features landline or cellular communications.



Customer use history datalog.

Specifications

Measurement Accuracy	±0.25% of full scale Temperature Effect: ±0.25% of full scale over operating temperature range
Sensor	316 stainless steel wetted parts Fluorinert fill fluid 1/4" NPT process connections on 2 1/8" centers
Calibrated Sensor Ranges	Level: 1000 In H ₂ O (2.5 bar) Pressure: 575 psig (40 bar)
Sensor Pressure Ranges	Maximum working pressure: 575 psig (40 bar)
Operating Temperature	-40°F to +158°F (-40°C to +70°C)
Inputs	Integral sensor Six 4 – 20 mA inputs (AC-powered units only)
Outputs	Two 4 – 20 mA (AC-powered units only)
Datalog Measurement Interval	User-selectable (1-minute minimum)
Datalog Capacity	800 datalogs total for all inputs
Alarms	Two user-selectable alarm set points for tank level and pressure inputs (DP, SP and 4 – 20 mA)
Reporting Interval	User-selectable daily call out/call in times for receiving RTU status reports "Poll on demand" reports for instantaneous RTU status checks
Communications	Landline (V.90) or cellular modem (CSD GPRS with internal antenna)
Display	Two LCDs, 0.7" characters
Power	12V, 10 watt, solar panel with rechargeable battery AC power (100 – 240 VAC 50/60 Hz) with backup battery
Enclosure	Dimensions (W x H): 7.7" x 9.8" X 5.77" D NEMA 4X/IP66
Mounting Hardware	Hardware for 2" pipe mount and wall mount included with each instrument
Approvals	CE approved AC Power Supply – UL, TUV, and CB Landline Modem – FCC Parts 15 & 68, IC-CS03, CTR21, and UL GSM Modem – R&TTE, FCC, UL, IC, GCF, PTCRB

Specifications

Part no	Description	Code	Range (cmwg)
19308558*	CS60 GSM solar powered	9A-CS60-A-1-D-2-B-0-A	0 to 2540
19310431*	CS60 GSM AC powered	9A-CS60-A-1-A-2-B-0-B	0 to 2540
19310435	CS60 LLM AC powered, landline modem	9A-CS60-A-1-A-1-B-0-B	0 to 2540
19312100*	CS60 GSM AC powered, no transducer, up to 6 analogue inputs/2 analogue outputs	9A-CS60-B-0-A-2-B-0-B	N/A
19314218*	CS60 GSM solar powered, supplied without a solar panel	9A-CS60-A-1-E-2-B-0-A	0 to 2540
19314236	CS60 LLM AC powered, no transducer, landline modem, up to 6 analogue inputs/2 analogue outputs	9A-CS60-B-0-A-1-B-0-B	N/A

* These units are standard BOC stock items.

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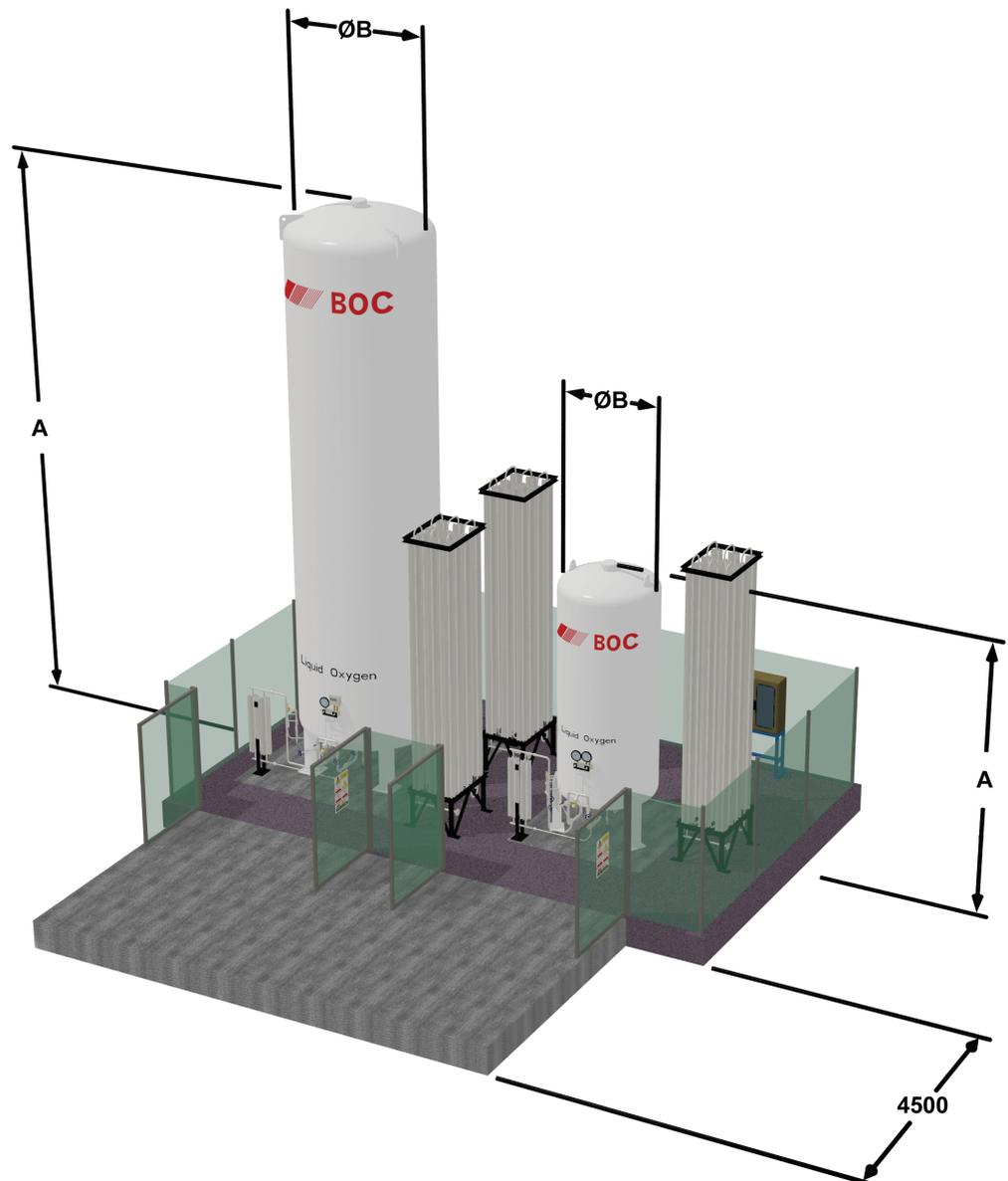
Medical VIE. Typical layout.

This data sheet should be read in conjunction with TD004 Design and build of your BOC gas system.

Introduction Typical layout of a bulk medical oxygen supply scheme, comprising liquid oxygen primary supply vessel and liquid oxygen secondary supply vessel.

The system is designed to supply 3000 litres per minute of medical oxygen at 4.1 barg to the hospital pipework distribution system.

Typical layout

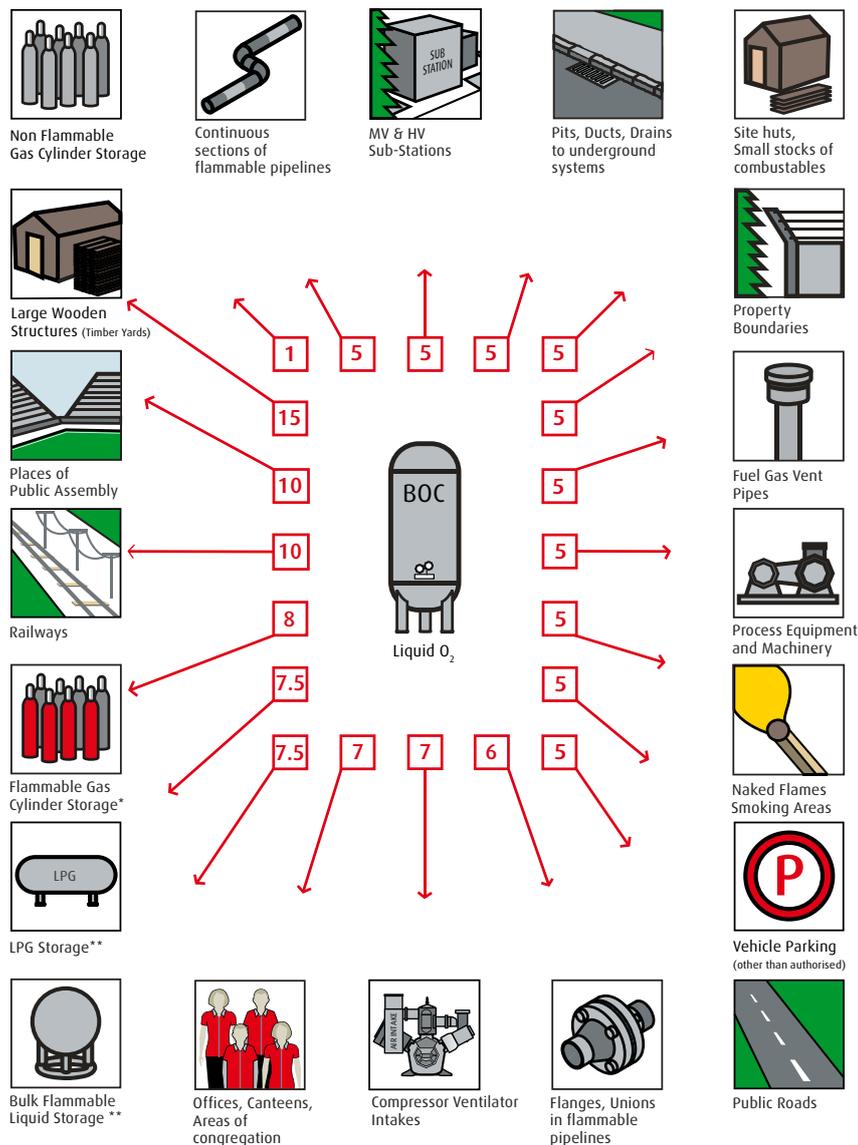


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Safety distances for liquid oxygen storage, 2,000 to 20,000 litres net liquid capacity.



Safety distances for liquid oxygen storage, 2000 to 20,000 litres net liquid capacity (distances in metres).

Notes

1. Safety distances are defined as the distance from the exposure to:
 - A: Any point on the storage system where in normal operation leakage or discharge can occur, (e.g. fill coupling, pressure relief devices),
 - or B: The vessel outer jacket,
 - or C: The vessel nozzles.
2. Assumed maximum oxygen liquid phase pipework diameter DN15 (½" nominal bore) and flammable gas/liquid up to DN25 (1" nominal bore).
3. For buildings, the distances are measured to the nearest opening in the building – doors, windows.
4. Ventilator air intakes should be at least 1 metre above ground level if within 10 metres of the installation.
5. Safety distances are from BCGA CP36.

*Safety distances for acetylene. Refer to BCGA CP6 and TD068 Safety distances for dissolved acetylene.

**For LPG or flammable liquids storage above 4 tones, a risk assessment should be carried out to establish the safe separation distance.

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The Pressure Systems Safety Regulations 2000 SI 128.

The Pressure System Safety Regulations, SI 128 came into force on the 14th February 2000. They replaced the existing regulations that were already in place, concerning the in service use of pressure systems.

The intention remains the same, they are concerned with the reasonably foreseeable danger to people from the unintentional release of stored energy, and with the scalding effects of steam. In general any pressure system which contains a relevant fluid with a pressure greater than 0.5 bar gauge is included in the regulations. The enclosed decision tree details the application of the regulations and the relevant duties.

The new regulations follow closely the old regulations, and the main difference is that all reference to transportable containers has been removed, and maintenance has been given its own section.

Regulation 4 Design and construction

This regulation requires any pressure system to be properly designed and constructed. All equipment sold or rented by BOC is designed to generally recognised standards and codes.

Regulation 5 Provision of information and marking

Designers, manufacturers and suppliers are required to pass on to users sufficient information to allow safe operation, maintenance and examination of plant and equipment supplied. It is BOC policy to provide customers with an operating manual, instructions and/or gas safety and data sheets.

Regulation 6 Installation

The purpose of this regulation is to ensure pressure systems are safely and properly installed. BOC procedures ensure compliance.

Regulation 7 Safe operating limits

This regulation requires the user to know the safe operating limits of the pressure system and to ensure that it is operated within these limits. BOC state these limits in the operating manual, instruction or data sheet for the benefit of users.

In addition for liquid customers:

- design pressures and temperatures are shown on the VIE data plate.
- normal operating conditions are given on the VIE P&ID/Instruction data plate.
- maximum operating pressures are governed by the relief valve setting

Regulations 8 and 9 Written scheme of examination and examination in accordance with the written scheme

These regulations require any pressure system to have a written scheme of examination and to be periodically examined in accordance with the written scheme. BOC have accepted responsibility for the production of and the examination in accordance with the written scheme of all equipment rented to Customers. Examination schedules used by Customer Engineering Services ensure that the requirements of the regulations are met.

Customers retain responsibility for equipment they own. Third party work carried out by Customer Engineering Services will be to BOC standards and meet the requirements.

- Regulation 10 Action in case of imminent danger**
This is covered by the examination that is carried out by Customer Engineering Services, and the action required.
-
- Regulation 11 Operation**
This regulation states that the user of equipment must operate the equipment in accordance with the operating instructions provided by the supplier and within safe operating limits. BOC supply sufficient information to allow compliance.
-
- Regulation 12 Maintenance**
Maintenance schedules used by Customer Engineering Services ensure that the requirements of this regulation are met.
-
- Regulations 13 Modification and repair**
Modification and repair procedures used by Customer Engineering Services ensure that the requirements of the regulations are met.
- Customers retain responsibility for equipment they own. Third party work carried out by Customer Engineering Services will be to BOC standards and meet the requirements.
-
- Regulation 14 Keeping of records, etc**
The aim of this regulation is to ensure that all necessary records are kept, particularly with regard to maintenance and examination BOC keeps such records on the SAP Plant Maintenance database.
- Below is an extract from Schedule 2 of the regulations dealing with pressure systems that are supplied by way of lease hire or other arrangements.
-
- Schedule 2** This schedule allows the suppliers in the case of a rented installation system to assume certain responsibilities in writing for compliance with parts of the regulations, typically 8(1) (2), 9(1), 11(1), 12 and 14. BOC have accepted these responsibilities for equipment subject to a rental agreement with customers under section 6.1 of schedule B of the liquid contract "Supply of BOC Storage Vessels and Other Equipment".
- BOC will assume the appropriate duties under these regulations for BOC equipment, up to the boundary between the BOC assembly and the customers. It is the customer's legal responsibility to ensure that they comply fully with the regulations, further guidance is given in the Approved Code of Practice L122.

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