



TECHNICAL NOTE TN01

Project Ref: 23171

Project: Pallet recycling

Date: June 2026

Prepared by: Daniel Rees
Civil Engineer

Subject: Foul Water Drainage Strategy

1 INTRODUCTION

1.1 Purpose of the Report

The purpose of the technical note is to provide an overview of the foul drainage strategy and response to the NRW consultee response for the Pallet recycling development at Newport Docks. The technical note will describe the proposed strategy for the discharge of foul water for the development and will demonstrate that the proposals meet the required standards.

1.2 Site Location

The property is located at land parcel B16 at Newport/Alexandra Docks. The property is accessed directly off the private road via a vehicular crossover.

1.3 Proposed Development

The site is currently consists of a concrete yard slab over the entire site area with existing surface water drainage infrastructure. The property owner is seeking planning permission for construction of two portal frame warehouse units.



2 FOUL WATER DRAINAGE PROPOSALS

2.1 Existing Drainage Systems

The site is brownfield and currently has a suitable surface water drainage system but due to its current use does not have an existing foul water drainage solution. The wider site does not currently have a foul water drainage system for practical reasons as such all units are required to have individual foul water drainage systems.

2.2 Proposed Drainage Systems

Foul water discharge location preferences

The following receptors have been considered for foul water generated on site, in order of preference, with the aim of selecting the most appropriate discharge location. The order of preference should be observed below.

- 1. Connection to a Public Foul Sewer**
- 2. Discharge to a package treatment plant**
- 3. Discharge to Septic Tank with a drainage field**
- 4. Discharge into a cesspool**

Preference Level 1 – Connection to a public foul water sewer:

The connection of foul water to an existing public sewerage network is not viable for the site due to no existing infrastructure being present in the vicinity of the site.

Preference Level 2 – Discharge to a package treatment plant:

A package treatment plant has been considered for the site but due to lack of possible discharge points once the effluent has been treated the option has been discounted. Furthermore, the location of the treatment plant would be very difficult on this industrial site as the whole site will be subject to high wheel loads from HGVs and other industrial equipment.

Preference Level 3 – Discharge to a Septic Tank with a drainage field:

A septic tank with discharge to a drainage field is not viable for this site due to very high ground water and impermeable ground conditions with superficial deposits consisting of silt and clay.

Preference Level 4 – Discharge into a cesspool:

Due to all other options not being viable for the proposed development the only remaining discharge method is to utilise a proposed cesspool. The proposed Cesspool should be designed in accordance with Building Regulation Part H to ensure a reliable design. Furthermore it should also be noted that all other units on the docks utilise a cesspool solution due to the existing ground conditions.

Proposed foul drainage system

As discussed above the site is to utilise a proposed cesspool designed to Building Regulation Part H or to specific manufacture/supplier guidance.

The proposed cesspool should have a minimum capacity of 140m³ to ensure it has appropriate capacity to serve the 30 occupants of the site and need to be emptied at 45 day intervals at minimum. A capacity calculation can be seen below.

The proposed cesspool should be a TS600/140000/HVY by SPEL or similar approved and should be designed and constructed inline with specific manufacture guidance.



Cesspool capacity Calculation

The capacity of the cesspool has been designed in accordance with the proposed site occupancy rates and the volumes in the tables of loadings for sewage treatment systems.

The site occupancy was confirmed to be no more than 30 employees per day and as such a rate of 100/person/day has been selected as the site has a canteen proposed.

Occupancy Rate	Foul Water Flow Volumes	Emptying schedule	Total required volume
30 employees	100L/p/d	45 days	135000L = 135m ³



APPENDIX A:

Proposed site plan



APPENDIX B:

Ground investigation Results

Borehole Log

BHM4CAN117

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

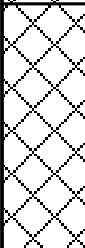
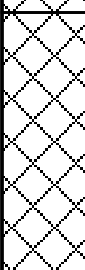
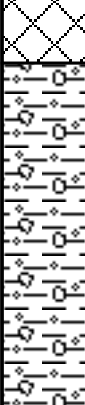
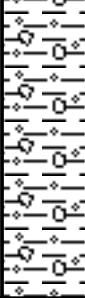
Borehole ID: BHM4CAN117

Location: Newport Co-ords (British National Grid): 331572.63 - 185184.62 Level: 10.35

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		0.2 - 0.5 0.2 - 0.55	ES B		0.20	10.15		Grey CONCRETE	
		0.6 - 1.05	B					Dark grey mottled red very sandy subangular to subrounded fine to coarse brick and clinker GRAVEL with occasional tarmacadam Sand is fine to coarse	0.5
		1.2 - 1.55 1.2 - 1.65	ES B	N=25 (5,5/6,6,8,5)	1.20	9.15			1.0
		2.0 - 2.45	ES B	N=16 (3,3/3,4,4,5)	2.00	8.35		Medium dense grey sandy clayey subangular to subrounded fine to coarse GRAVEL of sandstone clinker and brick Sand is fine to coarse	1.5
		3.0 - 3.45	ES B	N=14 (4,2/3,3,5,3)	3.00	7.35		Medium dense dark grey very sandy subangular to angular fine to coarse tarmacadam and clinker GRAVEL with a low subangular tarmacadam cobble content Sand is fine to coarse	2.0
		4.0 - 4.45	ES B	N=11 (2,2/3,2,3,3)				Firm grey gravelly very sandy CLAY Gravel is subangular to subrounded fine to medium sandstone Sand is fine to coarse	2.5

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Borehole Log

BHM4CAN117

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

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Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m							
		Depth (m)	Type													
		5.0 - 5.45	B	N=31 (5,7/7,8,7,9)	5.80	4.55		Firm grey gravelly very sandy CLAY Gravel is subangular to subrounded fine to medium sandstone Sand is fine to coarse	5.5							
		5.8	D						6.0 - 6.45	UT	N=0 (0,0/0,0,0,0)	6.80	3.55		Very soft to firm reddish brown slightly sandy CLAY Sand is fine to coarse	6.0
		6.5	D													7.0 - 8.0
		6.5 - 6.95	ES B D	7.1 - 8.0	B	N=0 (0,0/0,0,0,0)	9.0 - 10.0	P		Very soft to soft grey mottled brown CLAY Faint organic odour	7.0					
		7.5														
		8.0									8.0					
		8.5									8.5					
		9.0									9.0					
		9.5									9.5					

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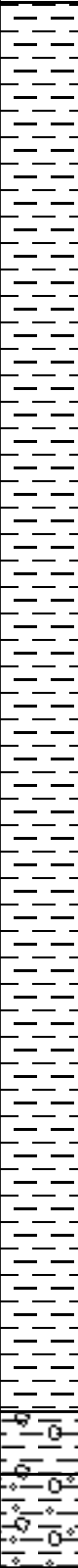
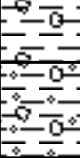
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Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
	 	10.0 - 10.45	B ES D	N=2 (1,0/1,0,1,0)				Very soft to soft grey mottled brown CLAY Faint organic odour	10.5
		11.0 - 11.45	P						11.0
		12.0 - 12.45	B ES D	N=2 (1,0/1,0,1,0)				Firm grey slightly gravelly sandy CLAY Gravel is subangular to rounded medium sandstone Sand is fine to coarse	11.5
		13.0 - 14.0	P						12.0
		14.0 - 14.45	ES D	N=14 (4,4/7,4,1,2)					12.5
					14.50	-4.15		Firm to stiff grey sandy gravelly CLAY Gravel is subangular to rounded fine to medium sandstone Sand is fine to coarse	13.0
					14.70	-4.35			13.5
				N=17 (4,4/7,4,4,2)					14.0
									14.5

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Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		15.0 - 15.45	B ES	N=17 (4,4/7,4,4,2)				Firm to stiff grey sandy gravelly CLAY Gravel is subangular to rounded fine to medium sandstone Sand is fine to coarse	15.5
		16.0 - 16.45	B	N=29 (5,7/8,8,7,6)	16.20	-5.85		Medium dense grey slightly sandy slightly clayey subangular to rounded fine to coarse sandstone GRAVEL with a low subangular sandstone cobble content Sand is fine to coarse	16.0
		17.0 - 17.45	B ES	N=42 (9,11/10,10,12,10)	17.00	-6.65			16.5
		18.0 - 18.45	B	50 (25 for 115mm/50 for 135mm)	18.00	-7.65		Dense grey very gravelly slightly clayey fine to coarse SAND with a low subrounded sandstone cobble content Gravel is subangular to rounded fine to medium sandstone	17.0
		19.0 - 19.45	B ES	50 (3,10/50 for 75mm)				Very dense greyish brown very sandy subangular to rounded fine to coarse sandstone and quartzite GRAVEL Sand is fine to coarse	17.5
									18.0
									18.5
									19.0
									19.5

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Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		20.5 - 20.95	B	N=14 (4,3/3,3,4,4)	21.20	-10.85		Very dense greyish brown very sandy subangular to rounded fine to coarse sandstone and quartzite GRAVEL Sand is fine to coarse	20.5
		21.2 - 21.65	ES B						21.0
		22.0 - 22.3	D B	50 (6,8/50 for 150mm)	22.70 22.90	-12.35 -12.55		Soft to firm reddish brown mottled grey sandy CLAY Sand is fine to coarse weathering grade IVb	21.5
		22.7 - 22.9	ES B						22.0
		23.2 - 23.45	CD	50 (25 for 80mm/50 for 50mm)	22.70 22.90	-12.35 -12.55		Stiff to very stiff reddish brown mottled grey slightly sandy gravelly CLAY Gravel is subangular fine to medium mudstone Sand is fine to coarse weathering grade III	22.5
		24.45 - 24.7	CD	100 (25 for 138mm/100 for 280mm)				Very stiff dark reddish brown gravelly CLAY with frequent bluish grey reduction spots up to 50mm Gravel is angular to subangular fine to medium very weak mudstone lithorelicts weathering grade III	23.0
									23.5
									24.0
									24.5

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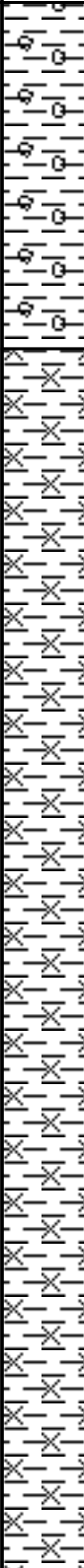
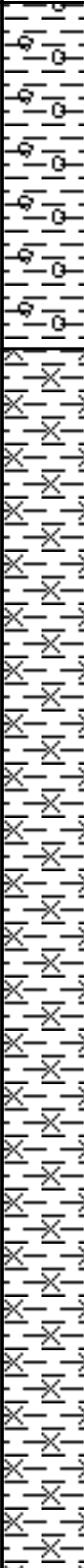
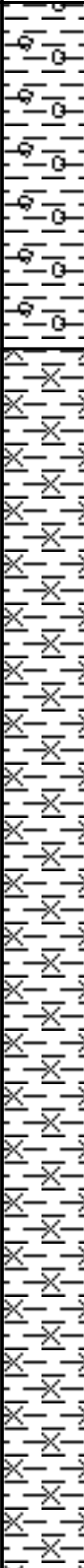
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Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		25.0 - 25.25	C	100 (25 for 78mm/100 for 133mm)	26.10	-15.75		Very stiff dark reddish brown gravelly CLAY with frequent bluish grey reduction spots up to 50mm Gravel is angular to subangular fine to medium very weak mudstone lithorelicts weathering grade III	25.5
		25.8 - 26.05	CD						26.0
		26.6 - 26.9	C						26.5
		26.6 - 26.9	C						27.0
		27.65 - 27.95	C						27.5
		27.65 - 27.95	C						28.0
		28.5 - 28.8	C	100 (25 for 42mm/100 for 105mm)				Very stiff fissured dark reddish brown silty CLAY with frequent light bluish grey reduction spots up to 10mm and rare coarse sand sized gypsum crystals weathering grade IVb	28.5
		28.5 - 28.8	C						29.0
		29.35 - 29.65	C						29.5
		29.35 - 29.65	C	100 (25 for 114mm/100 for 185mm)					

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Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
					30.25	-19.90		Very stiff fissured dark reddish brown silty CLAY with frequent light bluish grey reduction spots up to 10mm and rare coarse sand sized gypsum crystals weathering grade IVb	30.5
								Extremely weak dark reddish brown MUDSTONE with frequent light bluish grey reduction spots up to 5mm Fractures are subhorizontal to 50 extremely closely to widely spaced undulating smooth and locally infilled with a veneer of clay weathering grade II	31.0
		32.2 - 32.3	CD	100 (25 for 69mm/100 for 104mm)	31.90	-21.55			31.5
								Weak light bluish grey locally dark reddish brown mottled MUDSTONE Fractures are subhorizontal to 20 closely to widely spaced undulating smooth weathering grade II	32.0
		33.0 - 33.25	C		32.75	-22.40			32.5
								Very stiff dark reddish brown gravelly silty CLAY with frequent light bluish grey reduction spots up to 30mm Gravel is angular to subangular fine to coarse mudstone lithorelicts weathering grade III	33.0
		34.0 - 34.2	CD	100 (25 for 117mm/100 for 169mm)					33.5
									34.0
									34.5

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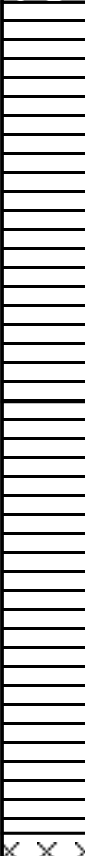
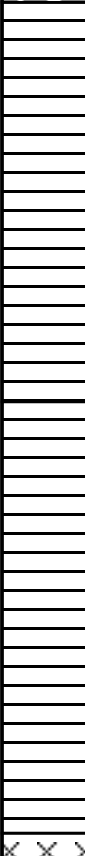
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Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		35.2 - 35.4	CD	100 (25 for 123mm/100 for 180mm)				Very stiff dark reddish brown gravelly silty CLAY with frequent light bluish grey reduction spots up to 30mm Gravel is angular to subangular fine to coarse mudstone lithorelicts weathering grade III	35.5
		36.15 - 36.35	CD						36.0
		36.9 - 37.2	C					Extremely weak to very weak reddish brown MUDSTONE Recovered as clayey angular to subangular fine to coarse mudstone gravel with frequent light bluish grey reduction spots up to 10mm weathering grade II	36.5
		37.46 - 37.6	CD						37.0
		38.25 - 38.35	D					Weak dark reddish brown MUDSTONE with frequent light bluish grey reduction spots up to 20mm Fractures are subhorizontal to 10 extremely closely to medium spaced undulating smooth weathering grade II	37.5
		39.0 - 39.25	C						38.0
					37.30	-26.95		Weak dark reddish brown SILTSTONE with frequent light bluish grey reduction spots up to 15mm Fractures are subhorizontal to 80 extremely closely to widely spaced undulating and planar smooth occasionally rough locally with black staining weathering grade II	38.5
					38.55	-28.20			39.0
					39.90	-29.55			39.5

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Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m				
		Depth (m)	Type										
		40.0 - 40.3	C	100 (25 for 30mm/100 for 86mm)	43.90	-33.55	× × × × × × × × × ×	Weak dark reddish brown SILTSTONE with frequent light bluish grey reduction spots up to 15mm Fractures are subhorizontal to 80 extremely closely to widely spaced undulating and planar smooth occasionally rough locally with black staining weathering grade II	40.5				
		40.9 - 41.2	C				× × × × × × × × × ×		41.0				
		42.6 - 42.85	C				100 (25 for 22mm/100 for 69mm)		× × × × × × × × × ×	41.5			
									× × × × × × × × × ×	42.0			
									× × × × × × × × × ×	42.5			
									× × × × × × × × × ×	43.0			
									× × × × × × × × × ×	43.5			
									43.75 - 43.9	CD	× × × × × × ×	44.0	
									44.35 - 44.45	CD	100 (25 for 32mm/100 for 83mm)	× × × × × × ×	44.5
												× × × × × × ×	
		× × × × × × ×											
		× × × × × × ×											

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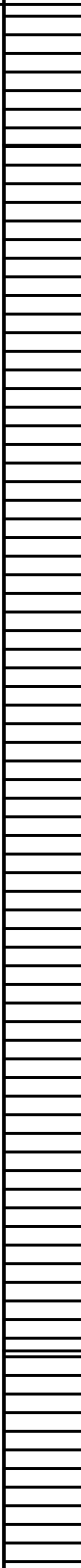
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Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		45.25 - 45.35	CD		45.45	-35.10		Weak dark reddish brown MUDSTONE with frequent light bluish grey reduction spots up to 10mm Fractures are subhorizontal to 70 extremely closely to medium spaced undulating rarely planar smooth One subvertical fracture undulating smooth weathering grade II	45.5
		45.75 - 45.9	CD						46.0
		46.26 - 46.45	CD						46.5
		47.0 - 47.1	CD						47.0
									47.5
		48.25 - 48.35	CD						48.0
									48.5
		49.05 - 49.25	CD						49.0
									49.5

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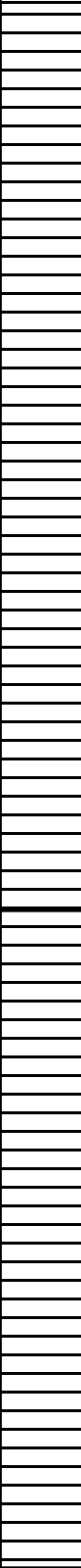
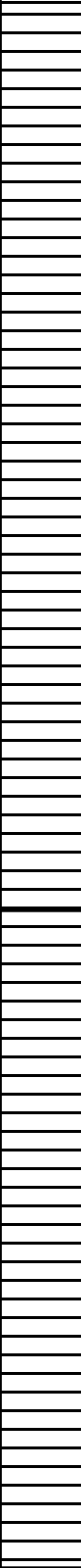
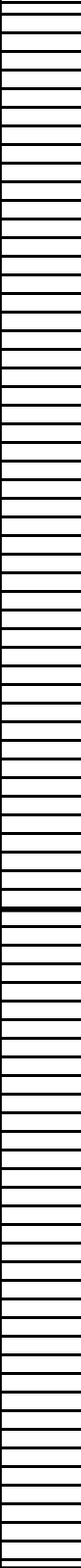
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		Depth (m)	Type						
		50.1 - 50.2	CD	100 (25 for 53mm/100 for 82mm)				Weak dark reddish brown MUDSTONE with frequent light bluish grey reduction spots up to 15mm Fractures are subhorizontal to 30 very closely to widely spaced undulating smooth weathering grade II	50.5
									51.0
		51.4 - 51.5	CD						51.5
									52.0
		52.25 - 52.35	CD						
									52.5
				100 (25 for 46mm/100 for 85mm)	52.90	-42.55		Extremely weak to weak dark reddish brown MUDSTONE with frequent light bluish grey reduction spots up to 20mm Fractures are subhorizontal to 50 extremely closely to medium spaced undulating smooth weathering grade II	53.0
		52.85 - 53.05	CD						
									53.5
									54.0
									54.5
		54.4 - 54.55	CD						
				100 (25 for 68mm/100 for 82mm)	55.00	-44.65			

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GENERAL REMARKS

Concrete coring to 0.20 mbgl. Inspection pit hand excavated from 0.20 mbgl to 1.20 mbgl. Cable percussive drilling between 1.20 mbgl and 22.90 mbgl. Bentonite seal between 5.50 mbgl and 6.50 mbgl. Rotary coring between 22.90 mbgl and 55.00 mbgl. Drilling suspended on encountering gas at 14.00 mbgl for 4 hours and between 02/07/18 and 03/07/18 on encountering gas at 4.70 mbgl. Borehole backfilled upon completion.

Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

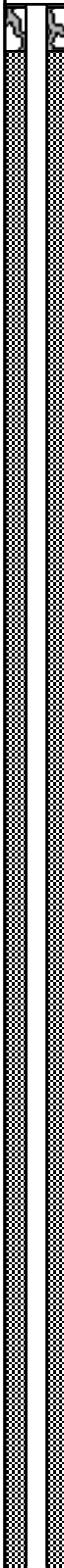
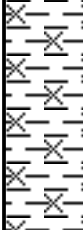
Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

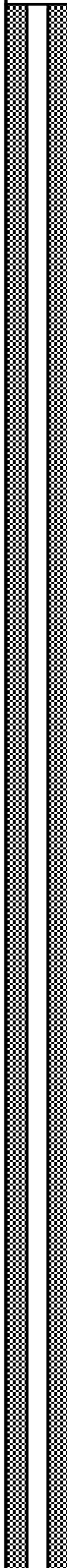
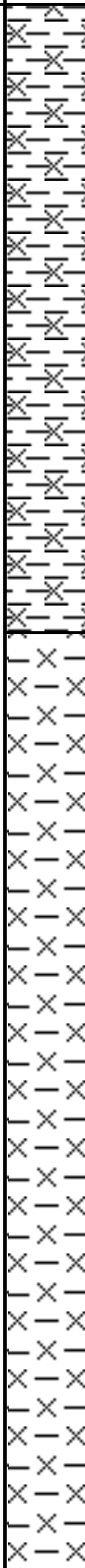
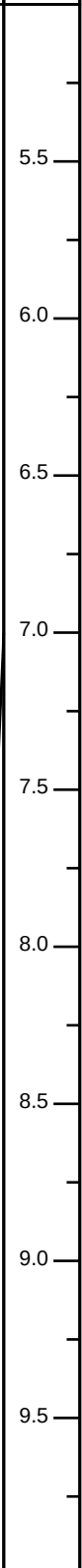
Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m	
		Depth (m)	Type							
	 	0.2 - 0.65	B	N=39 (7,10/13,8,9,9)	0.25 0.30	8.56 8.51		Black TARMACADAM	0.5	
		0.8 - 1.15 0.8 - 1.5	B ES			Dark bluish grey CONCRETE				
		1.2 - 1.65	B			Dense brown and grey sandy clayey angular to subangular fine to coarse GRAVEL of sandstone limestone red brick and concrete with a medium angular to subangular concrete cobble content and gravel sized ceramic and tile fragments Sand is fine to coarse	1.5			
		2.0 - 2.45	B ES	N=21 (5,4/6,5,5,5)		2.00		6.81		2.0
		3.0 - 3.45	B ES	N=18 (4,6/7,7,2,2)		3.45		5.36		
		4.0 - 4.45	UT	N=4 (1,0/1,1,1,1)				Very soft to soft dark greyish brown silty CLAY	4.0	
		4.45 - 4.95 4.5 4.5 - 4.95	ES D B D						4.5	

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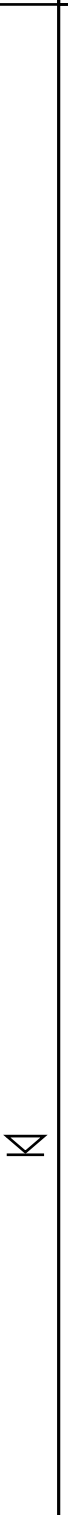
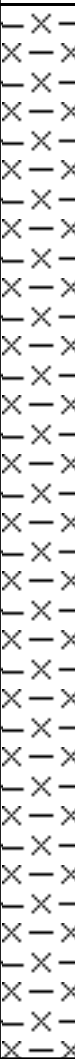
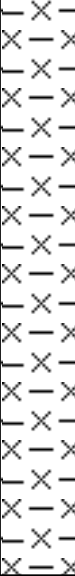
Borehole Log								BHM4CAN155		
Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6										
Borehole ID: BHM4CAN155										
Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81										
Hole Type: CP+RC Logged By: Dates: -										
Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres										
Plant Used: SPT Hammer Serial No: GH1										
Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m	
		Depth (m)	Type							
		5.0 - 5.45	UT	N=0 (0,0/0,0,0,0)	7.00	1.81		Very soft to soft dark greyish brown silty CLAY		
		5.5 - 5.95	D B D ES							
		6.0 - 7.05	P-NR ES							
		7.0 - 7.45	B ES D	N=0 (0,0/0,0,0,0)				Very soft dark grey clayey SILT		
		8.0 - 9.0	P	N=0 (0,0/0,0,0,0)						
9.0 - 9.45	B ES D									

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Borehole Log	BHM4CAN155
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Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		10.0 - 11.0	P	N=0 (0,0/0,0,0,0)	13.30	-4.49		Very soft dark grey clayey SILT	10.5
		11.0 - 11.45	B ES D						11.0
		12.0 - 13.0	P	N=23 (1,2/5,8,5,5)	13.30	-4.49		Medium dense dark brownish grey slightly sandy clayey angular to rounded fine to coarse GRAVEL of mudstone sandstone and siltstone Sand is fine to coarse	12.0
		13.0 - 13.45	B ES D						12.5
		14.0 - 14.45	B	N=24 (5,8/6,6,6,6)	13.0				
					15.00	-6.19			14.5

~~50 (12,13/50 for 225mm)~~

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

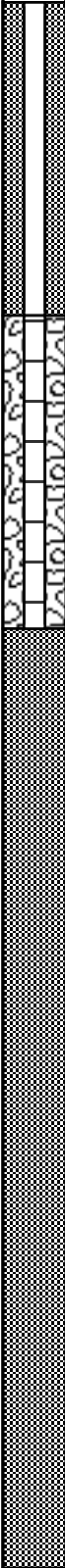
Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		15.0 - 15.45	B	50 (12,13/50 for 225mm)	17.00	-8.19		Dense to very dense dark brownish grey very sandy angular to rounded fine to coarse GRAVEL of mudstone sandstone and siltstone Sand is fine to coarse	15.5
		16.0 - 16.45	B	N=35 (6,7/10,8,8,9)					16.0
		17.0 - 17.45	B	N=42 (9,12/13,10,9,10)					16.5
		18.0 - 18.45	B	50 (5,11/50 for 200mm)				Dense to very dense light brown gravelly coarse SAND Gravel is angular to rounded fine to coarse mudstone sandstone and siltstone	17.0
				50 (25 for 125mm/50 for 180mm)					17.5
									18.0
									18.5
									19.0
									19.5

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		20.5 - 20.9 20.5 - 20.95	B D	50 (25 for 135mm/50 for 135mm)	20.50	-11.69		Dense to very dense light brown gravelly coarse SAND Gravel is angular to rounded fine to coarse mudstone sandstone and siltstone	20.5
								Stiff to very stiff dark reddish brown silty CLAY with frequent light bluish grey reduction spots up to 2mm and occasional subangular fine to coarse mudstone lithorelicts Weathering grade III	21.0
		21.7 - 21.85	CD		21.30	-12.49			21.5
		22.0 - 22.2	CD						22.0
								Extremely weak thinly to thickly laminated reddish brown MUDSTONE locally tending to clay bound subangular fine to coarse gravel sized mudstone lithorelicts with occasional greenish grey reduction veins up to 6mm greenish grey reduction spots up to 6mm and rare gypsum veins up to 1mm Fractures are randomly orientated extremely closely spaced undulating planar and stepped smooth and rough weathering grade II	22.5
									23.0
									23.5
				100 (9,14/100 for 286mm)					24.0
									24.5
		24.6 - 24.75	CD						

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m						
		Depth (m)	Type												
		25.5 - 25.7	C	100 (25 for 86mm/100 for 126mm)				Extremely weak thinly to thickly laminated reddish brown MUDSTONE locally tending to clay bound subangular fine to coarse gravel sized mudstone lithorelicts with occasional greenish grey reduction veins up to 6mm greenish grey reduction spots up to 6mm and rare gypsum veins up to 1mm Fractures are randomly orientated extremely closely spaced undulating planar and stepped smooth and rough weathering grade II	25.5						
									26.0						
									26.5						
									26.2 - 26.4	C					26.0
															26.5
		27.0													
		27.5													
		28.0													
		27.0 - 27.2	C	100 (25 for 40mm/100 for 97mm)						27.0					
										27.5					
										28.0					
										28.5					
										29.0					
		27.5 - 27.7	CD							27.5					
										28.0					
										28.5					
										29.0					
										29.5					
		28.5 - 28.7	C	100 (25 for 85mm/100 for 107mm)							28.0				
											28.5				
29.0															
29.5															
30.0															
29.1 - 29.3	C							29.0							
								29.5							
								30.0							
								30.5							
								31.0							
				100 (25 for 102mm/100 for 148mm)					29.5						
									30.0						
									30.5						
									31.0						
									31.5						

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		30.1 - 30.2	CD	100 (10,15/100 for 197mm)				Extremely weak thinly to thickly laminated reddish brown MUDSTONE locally tending to clay bound subangular fine to coarse gravel sized mudstone lithorelicts with occasional greenish grey reduction veins up to 6mm greenish grey reduction spots up to 6mm and rare gypsum veins up to 1mm Fractures are randomly orientated extremely closely spaced undulating planar and stepped smooth and rough weathering grade II	30.5
		30.8 - 30.9	CD						31.0
		31.4 - 31.6	CD						31.5
		32.1 - 32.3	C						32.0
									32.5
									33.0
		33.3 - 33.4	C						33.5
		33.6 - 33.8	C						34.0
									34.5
		34.35 - 34.55	CD	100 (25 for 62mm/100 for 95mm)	34.85	-26.04		Extremely weak thinly to thickly laminated reddish brown MUDSTONE with occasional greenish grey reduction spots up to 6mm Weathering Grade II	

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m												
		Depth (m)	Type																		
		35.2 - 35.4	C	100 (25 for 80mm/100 for 96mm)				Extremely weak thinly to thickly laminated reddish brown MUDSTONE with occasional greenish grey reduction spots up to 6mm Weathering Grade II	35.5												
		36.1 - 36.2	CD						Weak reddish brown MUDSTONE with frequent greenish grey reduction spots up to 25mm Fractures are subhorizontal to 10 closely spaced undulating and smooth Weathering grade II	36.0											
		36.8 - 36.9	CD							Extremely weak to very weak reddish brown MUDSTONE with frequent greenish grey reduction spots up to 40mm Fractures are subvertical and subhorizontal intersecting planar and undulating smooth weathering grade II	36.5										
		37.7 - 37.8	CD								Very weak to weak reddish brown thinly laminated to thinly bedded MUDSTONE with rare greenish grey reduction spots up to 10mm Fractures are subhorizontal rarely subvertical extremely closely to very closely spaced undulating rough and smooth locally stained black weathering grade II	37.0									
		38.35 - 38.5	CD									Very weak thinly laminated reddish brown MUDSTONE with frequent greenish grey reduction spots up to 10mm Fractures are subhorizontal to 10 very closely to closely spaced undulating rough and smooth weathering grade II	37.5								
		39.0 - 39.15	CD										38.75	-29.94	38.0						
		39.85 - 40.0	CD												39.40	-30.59	38.5				
																	39.85	-31.04	39.0		
																					39.5

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		40.5 - 40.65	CD	100 (25 for 36mm/100 for 86mm)	43.00	-34.19		Very weak thinly laminated reddish brown MUDSTONE with frequent greenish grey reduction spots up to 10mm Fractures are subhorizontal to 10 very closely to closely spaced undulating rough and smooth weathering grade II	40.5
		41.15 - 41.3	CD	100 (25 for 49mm/100 for 86mm)					41.0
									41.5
									42.0
									42.5
		43.0 - 43.2	CD	100 (25 for 63mm/100 for 91mm)					43.0
		43.5 - 43.6	CD					Extremely weak thinly to thickly laminated reddish brown MUDSTONE with rare greenish grey reduction spots up to 15mm Fractures are randomly orientated extremely closely spaced planar and undulating rough and smooth with occasional black staining weathering grade II	43.5
		43.8 - 43.97	CD						44.0
		44.3 - 44.5	CD						44.5
				100 (25 for 68mm/100 for 95mm)				Weak to medium strong light greenish grey and purplish brown thinly laminated to thinly bedded MUDSTONE with rare greenish grey reduction spots up to 5mm Fractures are subhorizontal to 45 extremely closely to medium spaced undulating and planar rough and smooth with black staining weathering grade I	
					44.76	-35.95			

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		45.1 - 45.3	CD	100 (25 for 68mm/100 for 96mm)				Weak to medium strong light greenish grey and purplish brown thinly laminated to thinly bedded MUDSTONE with rare greenish grey reduction spots up to 5mm Fractures are subhorizontal to 45 extremely closely to medium spaced undulating and planar rough and smooth with black staining weathering grade I	45.5
		45.78 - 45.84	CD						46.0
		46.3 - 46.5	CD						46.5
		47.1 - 47.3	CD						47.0
		47.5 - 47.6	CD						47.5
		47.84	CD						48.0
		48.23 - 48.41	CD						48.5
		48.72 - 48.79	C						49.0
		49.3 - 49.4	CD						49.5

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		50.02 - 50.2	CD	100 (25 for 51mm/100 for 85mm)				Extremely weak to weak thinly to thickly laminated reddish brown MUDSTONE with rare greenish grey reduction spots up to 10mm Fractures are subhorizontal intersecting subvertically extremely closely to closely spaced planar smooth with occasional black staining weathering grade II	50.5
		50.8 - 51.0	CD						51.0
									51.5
		51.97 - 52.17	CD						52.0
								Extremely weak reddish brown thinly laminated MUDSTONE locally tending to clay bound subangular fine to coarse gravel sized mudstone lithorelicts with occasional greenish grey reduction spots up to 4mm and rare gypsum crystals up to 5mm Fractures are randomly orientated extremely closely spaced undulating planar and stepped rough and smooth and locally infilled with gypsum crystals weathering grade II	52.5
		52.9 - 53.1	CD						53.0
		53.53 - 53.65	CD						53.5
									54.0
		54.2 - 54.3	CD		54.26	-45.45			54.5

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Borehole Log

BHM4CAN155

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN155

Location: Newport Co-ords (British National Grid): 331487.51 - 185169.62 Level: 8.81

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: GH1

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		55.0 - 55.2	C		55.50	-46.69		Extremely weak reddish brown thinly laminated MUDSTONE locally tending to clay bound subangular fine to coarse gravel sized mudstone lithorelicts with occasional greenish grey reduction spots up to 4mm and rare gypsum crystals up to 5mm Fractures are randomly orientated extremely closely spaced undulating planar and stepped rough and smooth and locally infilled with gypsum crystals weathering grade II	55.5
									56.0
									56.5
									57.0
									57.5
									58.0
									58.5
									59.0
									59.5

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GENERAL REMARKS

Concrete coring from 0.00 mbgl to 0.30 mbgl. Hand dug inspection pit from 0.30 mbgl to 1.20 mbgl. Cable percussive drilling from 1.20 mbgl to 21.30 mbgl. Rotary core from 21.30 mbgl to 55.50 mbgl. Dual installation. Shallow installation between 0.00 mbgl and 11.00 mbgl with response zone between 10.00 mbgl and 11.00 mbgl. Deep installation between 0.00 mbgl and 17.00 mbgl with response zone between 16.00 mbgl and 17.00 mbgl.

Borehole Log

BHM4CAN156

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

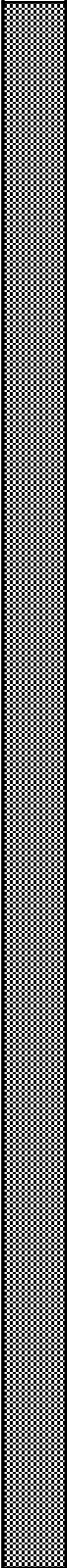
Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		0.2 - 0.45	ES B		0.20	10.31		Dark grey TARMACADAM above grey concrete	0.5
		0.5 - 0.95	ES B		0.50	10.01		Grey very sandy subangular to rounded fine to medium clinker GRAVEL Sand is fine to coarse	
		1.2 - 1.65	ES B	50 (8,10/50 for 190mm)	1.65	8.86		Dense to very dense black gravelly clayey ashy fine to coarse SAND with a low subangular clinker and sandstone cobble content Gravel is subangular to rounded fine to medium clinker sandstone and coal	1.5
		2.0 - 2.45	ES B	N=6 (2,3/2,1,2,1)	2.00	8.51		Soft to firm dark grey gravelly very sandy CLAY Gravel is subangular to rounded fine to medium sandstone brick and clinker Sand is fine to coarse	2.0
		3.0 - 3.45	ES B	N=8 (3,3/2,2,2,2)	3.00	7.51		Soft to firm dark greyish brown slightly gravelly sandy CLAY Gravel is subangular to rounded fine sandstone ash and clinker Sand is fine to coarse	3.0
		4.0 - 4.45	ES B	N=6 (3,2/1,2,1,2)	4.00	6.51		Loose dark grey gravelly clayey fine to coarse SAND Gravel is subangular to subrounded fine to medium slag clinker and ash	4.0
					5.00	5.51		Loose black very sandy ashy subangular to subrounded fine to medium slag and clinker GRAVEL Sand is fine to coarse	4.5

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

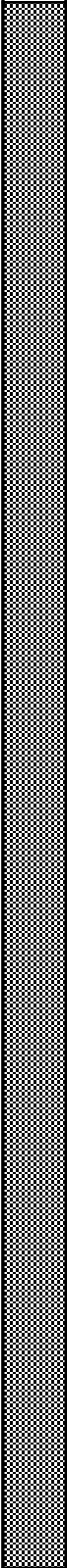
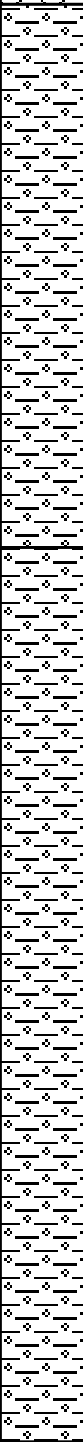
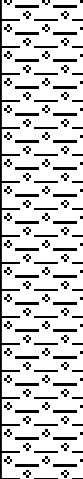
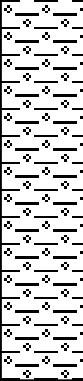
Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		5.0 - 5.45	ES B	N=20 (5,0/4,0,5,5)	5.50	5.01		Medium dense black and brown sandy subangular to subrounded fine to medium GRAVEL of sandstone chert and slag with rare wooden planks up to 200mm Sand is fine to coarse	5.5
		5.5	D						
		6.0 - 6.45	ES UT		7.20	3.31			6.0
		6.5	D	N=5 (1,2/1,2,1,1)					
		6.5 - 6.95	D B ES						
		7.0 - 8.0	P						
		8.0 - 8.45	D B	N=0 (0,0/0,0,0,0)				Very soft to soft brown mottled dark grey slightly sandy CLAY Sand is fine to medium	7.5
		9.0 - 10.0	P						
				N=0 (0,0/0,0,0,0)				Very soft dark bluish grey and grey slightly sandy CLAY Sand is coarse	9.0
									9.5

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

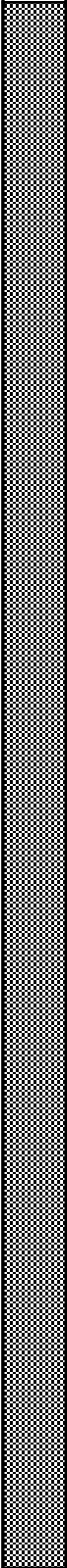
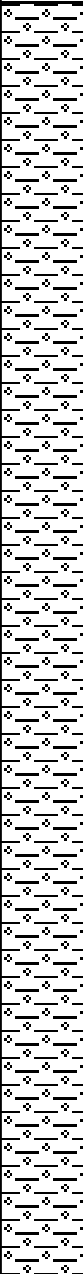
Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		10.0 - 10.45	D B	N=0 (0,0/0,0,0,0)				Very soft dark bluish grey and grey slightly sandy CLAY Sand is coarse	10.5
		11.0 - 12.0	P						11.0
		12.0 - 12.45	D B	N=0 (0,0/0,0,0,0)				Medium dense to very dense grey and reddish brown slightly sandy slightly clayey subrounded to rounded fine to medium GRAVEL of mudstone sandstone quartzite and conglomerate with a medium cobble content Sand is fine to coarse	12.0
		13.0 - 14.0	P						13.0
		14.0 - 14.45	D B	N=13 (1,1/2,3,4,4)	14.00	-3.49			14.0
				N=14 (3,3/3,3,4,4)					14.5

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		15.0 - 15.45	B	N=14 (5,3/3,3,4,4)				Medium dense to very dense grey and reddish brown slightly sandy slightly clayey subrounded to rounded fine to medium GRAVEL of mudstone sandstone quartzite and conglomerate with a medium cobble content Sand is fine to coarse	15.5
		16.0 - 16.45	B	50 (11,13/50 for 190mm)					16.0
		17.0 - 17.45	B	N=24 (4,5/6,5,6,7)					16.5
		18.0 - 18.45	B	50 (25 for 135mm/50 for 95mm)					17.0
		19.0 - 19.45	B	N=31 (7,11/8,9,6,8)					17.5
									18.0
									18.5
									19.0
									19.5

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

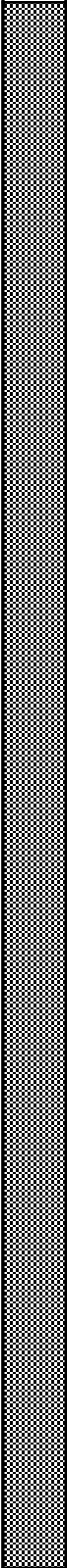
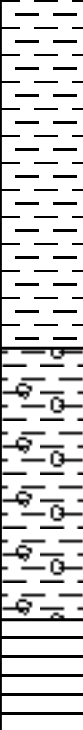
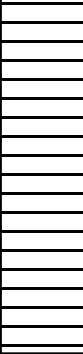
Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		20.5 - 20.95	B	N=21 (5,4/5,5,5,6)	21.60	-11.09		Medium dense to very dense grey and reddish brown slightly sandy slightly clayey subrounded to rounded fine to medium GRAVEL of mudstone sandstone quartzite and conglomerate with a medium cobble content Sand is fine to coarse	20.5
		21.6 - 21.95	B					Very stiff reddish brown CLAY with occasional light greenish grey reduction mottling weathering grade IVb	21.0
		22.0 - 22.45	D B	50 (7,10/50 for 235mm)	22.70	-12.19			21.5
		22.5 - 22.7	B	50 (25 for 85mm/50 for 60mm)				Very stiff dark reddish brown gravelly CLAY with frequent light greenish grey reduction spots up to 25mm Gravel is subangular to rounded fine lithorelicts of extremely weak mudstone weathering grade IVa	22.0
		23.1 - 23.25	C		23.55	-13.04			22.5
		23.6 - 23.8	C					Extremely weak to very weak dark reddish brown calcareous MUDSTONE with frequent light greenish grey reduction spots up to 15mm weathering grade II	23.0
		24.1 - 24.2	C	100 (25 for 106mm/100 for 164mm)					23.5

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

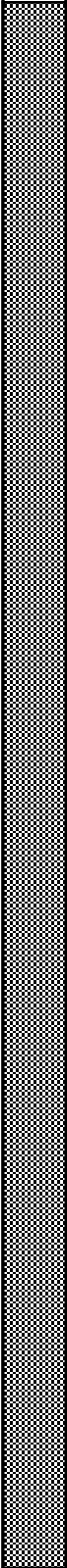
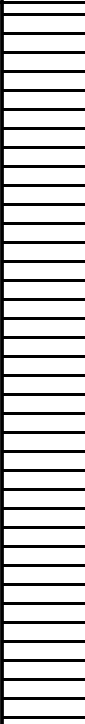
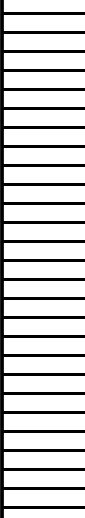
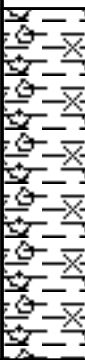
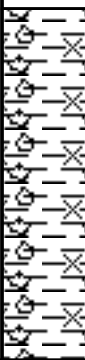
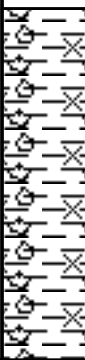
Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		25.6 - 25.8	C	100 (25 for 87mm/100 for 141mm)				Extremely weak to very weak dark reddish brown calcareous MUDSTONE with frequent light greenish grey reduction spots up to 15mm weathering grade II	25.5
									26.0
									26.5
									27.0
		27.3 - 27.4	C	100 (25 for 66mm/100 for 146mm)				Very stiff dark reddish brown gravelly silty CLAY with rare light greenish grey reduction spots up to 10mm Gravel is angular to subangular fine to coarse mudstone lithorelicts weathering grade III	27.5
									28.0
		28.2 - 28.35	C	100 (25 for 65mm/100 for 137mm)					28.5
									29.0
		28.95 - 29.15	C		28.90	-18.39			29.5
		29.75 - 29.9	C						

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Borehole Log

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
				100 (25 for 51mm/100 for 93mm)	30.15	-19.64		Very stiff dark reddish brown gravelly silty CLAY with rare light greenish grey reduction spots up to 10mm Gravel is angular to subangular fine to coarse mudstone lithorelicts weathering grade III	30.5
		31.05 - 31.15	C					Extremely weak to weak dark reddish brown MUDSTONE with rare light greenish grey reduction spots up to 5mm weathering grade II	31.0
		31.2 - 31.45	C	100 (25 for 49mm/100 for 82mm)	31.20	-20.69			31.5
								Extremely weak to very weak reddish brown calcareous MUDSTONE weathering grade II	32.0
		32.15 - 32.4	C					Stiff reddish brown slightly gravelly CLAY Gravel is subangular to subrounded fine to medium lithorelicts of extremely weak mudstone weathering grade III	32.5
		32.8 - 33.05	C	100 (25 for 95mm/100 for 172mm)	32.80	-22.29		Extremely weak reddish brown MUDSTONE Fractures are subhorizontal to 50 closely to medium spaced planar rarely undulating and rough rarely smooth with rare greenish grey staining and clay infill weathering grade II	33.0
					33.05	-22.54			33.5
		33.8 - 34.01	C					Very stiff reddish brown gravelly CLAY Gravel is subangular to subrounded fine to medium lithorelicts of extremely weak mudstone weathering grade III	34.0
				100 (25 for 90mm/100 for 154mm)	34.20	-23.69			
		34.48 - 34.74	C		34.45	-23.94		Extremely weak to weak reddish brown calcareous MUDSTONE with occasional greenish grey reduction spots up to 20mm weathering grade II	34.5

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		35.45 - 35.7	C	100 (25 for 62mm/100 for 95mm)				Extremely weak to weak reddish brown calcareous MUDSTONE with occasional greenish grey reduction spots up to 20mm weathering grade II	35.5
		35.8 - 36.05	C						36.0
									36.5
		36.72 - 36.98	C						37.0
									37.5
		37.65 - 37.9	C					Extremely weak to very weak reddish brown calcareous MUDSTONE with frequent greenish grey reduction spots up to 20mm weathering grade II	38.0
		38.42 - 38.68	C						38.5
									39.0
		39.19 - 39.45	C						39.5

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Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m	
		Depth (m)	Type							
		40.07 - 40.3	C	100 (25 for 49mm/100 for 77mm)	40.35	-29.84		Extremely weak to very weak reddish brown calcareous MUDSTONE with frequent greenish grey reduction spots up to 20mm weathering grade II	40.5	
		40.35 - 40.6	C							
		40.99 - 41.2	C	100 (25 for 52mm/100 for 49mm)					Very weak to weak reddish brown calcareous MUDSTONE with occasional greenish grey reduction spots up to 20mm Fractures are subhorizontal to 70 extremely closely to medium spaced planar or undulating smooth or rough with rare clay infill weathering grade II	41.0
		41.8 - 42.05	C	100 (25 for 34mm/100 for 63mm)						41.5
42.69 - 43.0	C						42.0			
43.02 - 44.04	C						42.5			
							43.0			
							43.5			
							44.0			
44.57 - 44.8	C						44.5			
44.8 - 45.05	C							100 (25 for 30mm/100 for 57mm)		

Borehole Log

BHM4CAN156

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
					45.20	-34.69		Very weak to weak reddish brown calcareous MUDSTONE with occasional greenish grey reduction spots up to 20mm Fractures are subhorizontal to 70 extremely closely to medium spaced planar or undulating smooth or rough with rare clay infill weathering grade II	45.5
					45.52	-35.01			
		46.0 - 46.25	C					Very stiff reddish brown gravelly CLAY Gravel is subangular to angular fine to medium mudstone lithorelicts weathering grade III	46.0
				100 (25 for 80mm/100 for 127mm)				Extremely weak to weak reddish brown calcareous MUDSTONE with rare greenish grey reduction spots up to 30mm Fractures are subhorizontal to 60 closely to widely spaced planar and smooth with greenish grey staining and rare clay infill weathering grade II	46.5
		46.65 - 46.92	C						
								Weak to medium strong pale reddish brown and greenish grey mottled SILTSTONE with occasional gypsum crystals Fractures are subhorizontal to 30 very closely to closely spaced planar or rarely undulating smooth or rarely rough with rare grey staining weathering grade I	47.0
					47.28	-36.77			
		47.44 - 47.7	C					Weak to medium strong greenish grey SILTSTONE weathering grade I	47.5
					47.70	-37.19			
		47.8 - 48.0	C					Medium strong greenish grey and orangish brown SILTSTONE with occasional sandstone bands up to 30mm One fracture set is subvertical undulating or planar smooth A second fracture set is subhorizontal closely spaced undulating or planar smooth or rough weathering grade I	48.0
					48.00	-37.49			
		48.35 - 48.62	C					Very weak greenish grey and reddish brown mottled calcareous SILTSTONE Fractures are subhorizontal very closely to medium spaced planar or rarely undulating smooth or rough with occasional orange staining weathering grade II	48.5
					48.30	-37.79			
								Weak to medium strong greenish grey SILTSTONE Fractures are subhorizontal to 75 very closely to medium spaced planar smooth with rare gypsum infill weathering grade I	49.0
		49.43 - 49.5	C						49.5
					49.36	-38.85			

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Project Name: M4CAN: Key Stage 6 Project No: JFR8707-KS6

Borehole ID: BHM4CAN156

Location: Newport Co-ords (British National Grid): 331547.13 - 185221.31 Level: 10.51

Hole Type: CP+RC Logged By: Dates: -

Client: Welsh Government Contractor: CJ Associates Project Engineer: Vicky Acres

Plant Used: SPT Hammer Serial No: CJA.5

Well	Water	Samples		Result	Depth (m)	Level (m)	Legend	Stratum Description	Depth m
		Depth (m)	Type						
		50.32 - 50.53	C	100 (25 for 30mm/100 for 44mm)	50.32	-39.81		Weak to medium strong greenish grey SILTSTONE Fractures are subhorizontal to 75 very closely to medium spaced planar smooth with rare gypsum infill weathering grade I	50.5
					50.53	-40.02			
		50.77 - 50.99	C					Very stiff reddish brown gravelly CLAY Gravel is subangular to subrounded fine to medium mudstone lithorelicts weathering grade III	51.0
		51.78 - 52.07	C		51.80	-41.29		Weak to medium strong reddish brown MUDSTONE recovered as subangular to angular cobbles with occasional greenish grey reduction spots up to 30mm Fractures are subhorizontal very closely to medium spaced undulating or planar smooth or rough with rare clay infill weathering grade I	52.0
		52.15 - 52.37	C						
								Very weak to weak reddish brown MUDSTONE Fractures are subhorizontal to 40 very closely to closely spaced planar or undulating smooth or rough with rare clay and gravel infill weathering grade II	53.0
		53.15 - 53.31	C		53.00	-42.49			
								Very weak to medium strong reddish brown calcareous MUDSTONE with frequent greenish grey reduction spots up to 40mm Fractures are subhorizontal to 55 extremely closely to medium spaced undulating or planar smooth or rough with occasional gypsum infill and rare polished surfaces weathering grade I	54.0
		53.72 - 53.95	C						
									54.5
		54.6 - 54.84	C						
					55.00	-44.49			

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GENERAL REMARKS

Concrete coring from ground level to 0.20 mbgl. Inspection pit hand excavated from 0.20 mbgl to 1.20 mbgl. Cable percussive drilling between 1.20 mbgl and 22.70 mbgl. Bentonite seal between 6.00 mbgl and 7.00 mbgl. Drilling temporarily suspended due to gas encountered at 14.00mbgl. Rotary coring between 22.70 mbgl and 55.00 mbgl. Borehole backfilled upon completion.



APPENDIX C:

Manufacture information

SPEL Cesspool Tanks

Overview

SPEL Cesspool tanks are available for sites where treatment plants and/or a septic tank with drainage fields/sub are unacceptable.

SPEL cesspools are manufactured as watertight underground tanks for storage of sewage and comply with BS EN 12566-1.

Product Sizing

200 Series

(1.2m inside diameter):
1,000 – 10,000L capacity

300 Series

(1.8m inside diameter):
4,000 – 40,000L capacity

400 Series

(2.6m inside diameter):
13,650 – 100,000L capacity

500 & 600 Series

Available on request

Applications

Applications include:

Residential developments
Process water holding tanks
Industrial sites
Contamination/Wash-down

Shell Design

Designed with reference to BS EN 13121. All tank shells carry the SPEL 25 Year Warranty and life expectancy in excess of 50 years.

Shell Specifications

Different tank shell specifications are available dependent upon tank invert levels, ground conditions and ground water levels.

Inlet/Outlet Connections

Pipe connections available to accommodate most standard sizes.



SPEL Cesspools

Introduction

Siting

SPEL cesspools should be sited at least 7m from any habitable building and preferably downslope. They should also be sited within 30m of an access road, allowing for safe tanker access. If the frontage is big enough, locating your tank here is more practical as it saves tanker hoses trailing into back gardens.

Design and construction

Filament wound in glass reinforced plastic, known as GRP, **SPEL tanks are strong yet light in weight for easy handling on site.** An inlet connection, normally a 160mm UPVC socket is fitted in a 600mm dia. access opening. Extension access shafts are available to suit tank invert depth.

SPEL offer a bauer connection system that makes tank emptying **safer and cleaner.** Further details on this can be seen displayed below.

Specification

SPEL cesspools are suitable for well drained or wet ground conditions. The correct specification depends on the tank invert depth and the water table in winter – see Section 7 for burial depth/water table level charts.

Sizing

SPEL cesspools should be sized according to the Building Regulations 2000 – H2 as follows:

2 persons – 18000 litre capacity. This size should be increased by 6800 litres (6.8m³) for each additional user.

It is also worth considering the size of tanker available and any potential access issues.

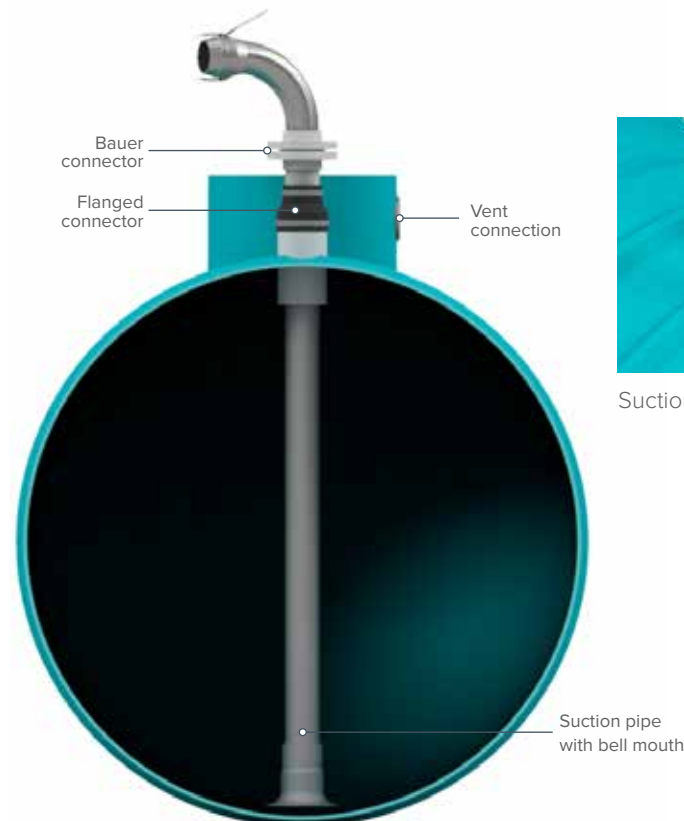
200 Series: 1,000 - 10,000L

300 Series: 4,000 - 40,000L

400 Series: 13,650 - 100,000L

See SPEL Data Manual Tankstor® Section 2 for full range, including our larger 500 and 600 Series tanks.

Bauer Connectors & Suction Pipes



Suction pipe connection

SPEL Cesspool Horizontal Tank Dimensions

Tank capacity	200 Series 1.2m inside dia.	300 Series 1.8m inside dia.	400 Series 2.6m inside dia.	500 Series 3.5m inside dia.	600 Series 4.0m inside dia.
litres	length mm	length mm	length mm	length mm	length mm
	TS200	TS300	TS400	TS500	TS600
1,000	1,160				
2,000	2,040				
3,000	2,930				
4,000	3,810	1,950			
5,000	4,700				
6,000	5,578	2,755			
7,000	6,470				
7,300		3,200			
8,000	7,346	3,535			
9,000	8,236				
9,270		4,015			
10,000	9,120	4,285			
12,000	10,888	5,070			
13,650	12,347	5,755			
16,000		6,700			
17,000		7,060			
18,200		7,615	4,000		
20,000		8,255	4,400		
25,000		10,215	5,250		
27,300			5,700		
30,000		12,175	6,170		
35,000		14,155			
36,400			7,400		
40,000		16,120			
40,600			8,200		
45,000				5,390	
45,500			9,050		
50,000			9,950		
60,000			11,830	6,960	
70,000			13,710		
75,000			14,700	8,530	
80,000			15,600	9,030	
90,000				10,040	
90,400			17,560		
100,000			19,350	11,180	8,710
120,000					10,310
125,000				13,830	
140,000					11,910
150,000				16,330	12,690
160,000				17,550	13,510
170,000					14,320
175,000				18,930	14,740
180,000				19,430	15,110
190,000				20,530	15,880
200,000				21,530	16,650
220,000					18,260
240,000					19,890
250,000					20,660
260,000					21,470
270,000					22,270
280,000					23,020
290,000					23,850
300,000					24,660

Your SPEL Model Number Key

Model Number: **TS** - Series Number - Volume - Cesspool
 For example: Series: 200, Volume: 8,000L = **TS200/8,000/Cesspool**

Append the shell specification code to the model number:
TS200/8,000/Cesspool/HVY = Heavy Tank Shell Specification

Full list of shell specifications on P.7.4-7.7

Note: Intermediate sizes are available.

SECTION 7

Installation Instructions

All SPEL Products & Systems

7.2	Introduction to Installation
7.4	Specifications to suit Invert Depths & Ground Water Conditions
7.8	Lifting, Handling and Storage
7.9	Stabilising Chocks
7.10	Installation of Tanks Surrounded in Concrete
7.12	Installation of Tank Surrounded with Pea Gravel
7.16	Mechanical Anchoring
7.18	Wellpoint Dewatering and Long Excavations
7.19	Ultra & Ultra Deep Invert Depths
7.21	Vertical Below Ground Tank Installation
7.25	Venting Underground SPEL Tanks
7.26	Venting & Ducting
7.29	Extension Shafts & Man Hole Covers
7.30	Coalescer & Clarifier Pack Installation
7.32	Guide Rail Extensions & Trimming Guide Rails
7.33	Automatic Closure Device Installation
7.35	SPEL Silt Trap Installation
7.36	Vertical Above Ground Installation
7.38	Horizontal Above Ground Installation



VIEW ONLINE



Introduction to Installation

Following strict installation instructions is essential for ensuring your stormwater treatment system's safety, structural integrity, water treatment capabilities, compliance, longevity, and the protection of SPEL warranties. These installation instructions are crucial for a successful installation and the reliable operation of the system over time.

SPEL Separators (Stormceptor® by-pass separators, Puraceptor® class 1 separators and full retention class 2 separators) and SPEL Tankstor® (underground tanks, septic/settlement tanks, cesspools and stormwater attenuation tanks, etc.) must be installed according to these instructions and the SPEL Tankstor® and Separator installation instructions (supplied with every tank).

The local authority and the local region of the Environment Agency should also be consulted as to whether any particular code applies to installation. Failure to follow these installation instructions will make our warranty void and may result in tank failure.

Site access and conditions

It is the responsibility of the contractor to ensure suitable access to good hard ground that is safe and suitable for off-loading.

Wide/long loads

Where the tank is of such size that police/private escort is required delivery times given are estimates only. In the event of delays outside our control e.g. police re-routing or escort delays, the extra charges that result will be forwarded to the contractor.

Off-loading/handling

The contractor is responsible for off-loading. Tank handling during off-loading must be carried out with care to prevent rolling off the vehicle. Care must also be exercised to prevent accidental damage from impact or contact with sharp objects.

Do not drag tanks along the ground for any distance and avoid jarring or bumps. Tanks should be lifted using slings, not chains or wire ropes. For large tanks a spreader bar may be required. Use guidelines when craning long tanks. Do not lift with water in the tank (see page 7.8).

Note: Where transport height restrictions prevent the tank being loaded in the vertical position on the transport vehicle, the tank will be loaded at 45 degrees or as required to keep within the restrictions. In such cases it will be necessary for the tank to be off loaded onto a level area or well supported planks positioned adjacent to the 'lift' points and supporting at least four ribs. The area must allow room to enable the tank to be rolled into the vertical position before lifting the tank into the excavation.

Storage

Set the tank on smooth ground free of bricks and sharp objects. Chock/tie down to prevent rolling and movement especially in high winds. (See P7.8).

If the tank is to be stored above ground for any period of time, with the chance of it filling up with rainwater, then it is strongly advised to cover across shafts to ensure water does not enter the tank and make it difficult to lift or potentially damage the tank due to the force of water exerted on the tank shell.

Tank dimensions

Dimensions given on drawings and literature shall be subject to manufacturing tolerances and should be physically checked prior to installation. This applies to overall length, connection positions, their size and invert dimensions. Also check the correct way the tank shall be installed and alignment with site drainage.

Installation procedures

The alternative methods of installation depend on the ground conditions, water table and the tank's location.

Installation should be carried out by a competent contractor in accordance with the above procedures, Health & Safety at Work legislation and good building practice.

It is recommended to cover the access shaft openings with polythene or plywood sheets to prevent concrete and debris entering the tank.

It is not possible to cover every condition in these instructions, therefore if in doubt contact us.

Tank specification

Check that you have received the correct specification tank. SPEL underground tanks are available in specifications to suit invert depths, concrete or pea gravel surround and ground water conditions. Different tank shell specifications are available dependent upon tank invert levels, ground conditions and ground water levels. For most applications the standard or heavy specifications are adequate. If the tank invert depth and/or water table depth is outside the range specified we shall be pleased to advise accordingly.

Introduction to Installation

Siting SPEL septic tanks

British Standard BS 6297: 1983 recommends that sewage treatment works should be as far from habitable buildings as is economically practicable. The direction of the prevailing wind should be considered in relation to any properties when siting the works.

In accordance with current building regulations, SPEL septic tanks should be sited at least 7m from any habitable parts of buildings.

The tank should not be installed near a road or driveway, where it could be subjected to high external loads, unless the installation is designed to withstand such loadings, so they are not transferred to the tank shell.

Where the tank is to be emptied using a tanker, it should be sited within 30m of a vehicle access, provided that the invert level of the septic tank is no more than 3m below the level of the vehicle access. This distance may need to be reduced where the depth to the invert of the tank is more than 3m. There should also be a clear route for the hose such that the tank can be emptied and cleaned without hazard to the building occupants and without the contents being taken through a dwelling or place of work.

Siting SPEL cesspools

SPEL cesspools should be sited at least 7m from any habitable building and preferably downslope. They should, however, be sited within 30m of a silt removal tanker access and at such levels and position to operate without hazard to the building occupants.

Access openings

It is recommended that the access openings are covered prior to back filling to keep the internal shell and fittings clean.

Extension access shafts

Check if extension shafts are required.

These are available in 500mm high increments with socket joints or if required, flanged joints with neoprene gaskets.

Prior to surrounding in concrete, if required, ensure access shafts are shuttered internally to support the sides and prevent distortion. This is especially important when guide rails are installed for pumps or coalescer units.

With high water table ensure all joints are double sealed to prevent ingress of water.

Note: Where coalescer units or pumps are incorporated that require guide rails, or ladders are fitted, the height of the extension access shaft/s should be measured accurately before ordering.

Health and safety

Installation should be carried out by a competent contractor in accordance with the above procedures, Health & Safety at Work legislation and good building practice.

A warning notice should be visible at the top of each access shaft – 'danger, harmful fumes' and 'respirators must be worn in this tank'. Before entering persons must be qualified in accordance with 'confined space' requirements.

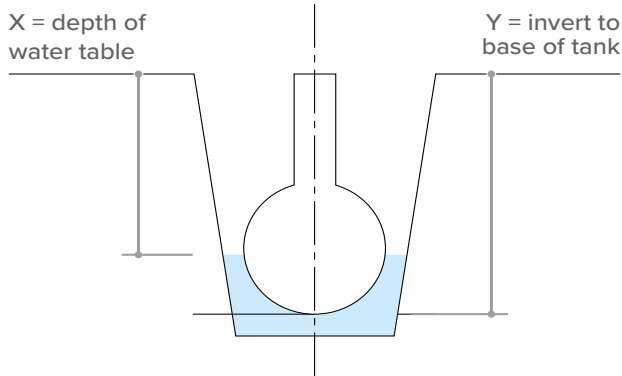


SPEL system installation. Yard extension, Soham, UK.

SPEL Horizontal Underground Tanks - 100 & 200 Series

Specifications to Suit Invert Depths and Ground Water Conditions - Concrete Surrounds

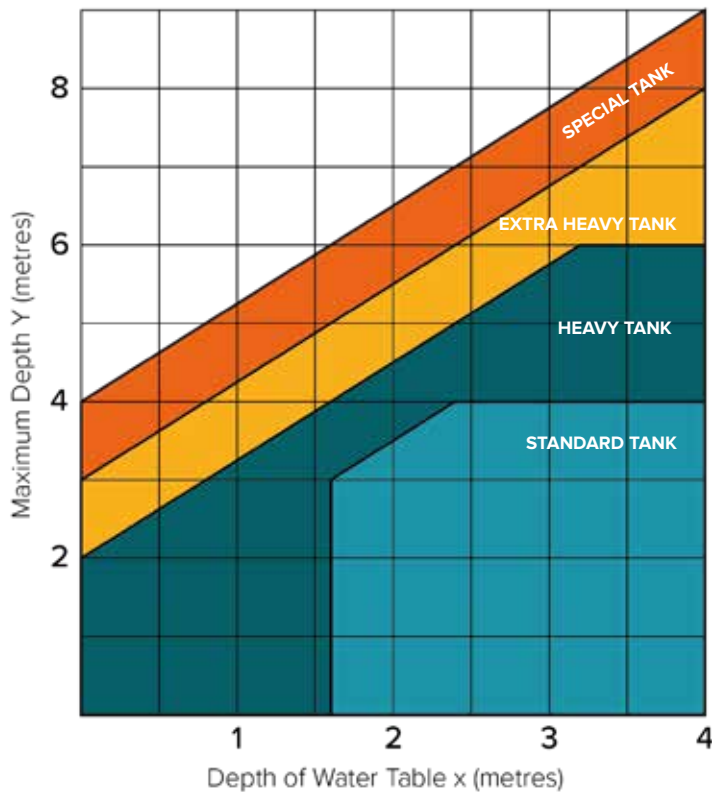
X & Y Axis Explained:



NOTE: The 'X' axis relates to ground water and is measured from cover level to the highest potential ground water level. The 'Y' axis relates to the base invert of the tank, measured from cover level.

100 & 200 Series

Concrete Surround

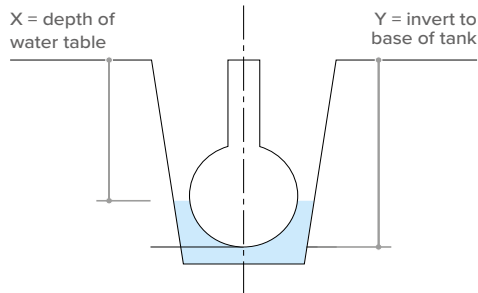


Note: 100 & 200 Series only available in concrete surround

SPEL Horizontal Underground Tanks - 300 & 400 Series

Specifications to Suit Invert Depths and Ground Water Conditions - Pea Gravel and Concrete Surrounds

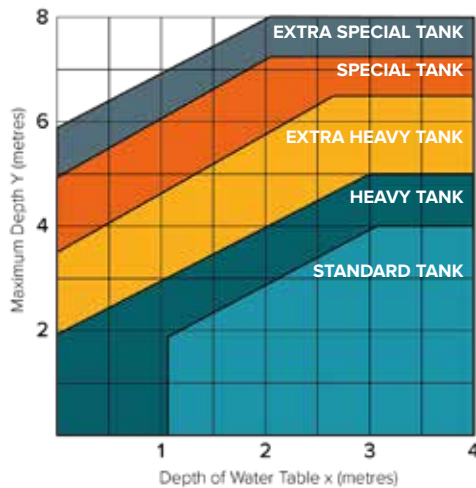
X & Y Axis Explained:



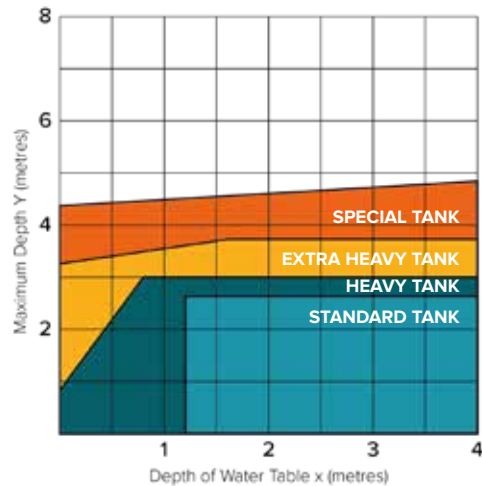
NOTE: The 'X' axis relates to ground water and is measured from cover level to the highest potential ground water level. The 'Y' axis relates to the base invert of the tank, measured from cover level.

300 Series

Concrete Surround

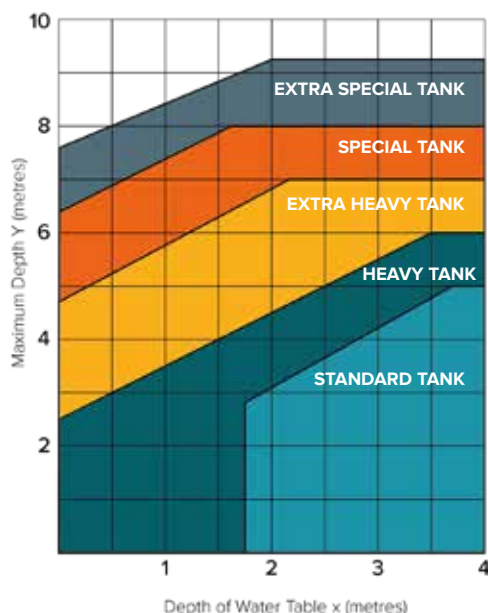


Pea Gravel Surround

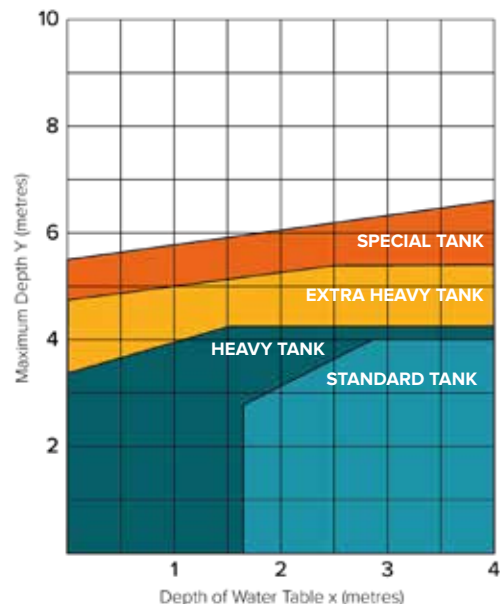


400 Series

Concrete Surround



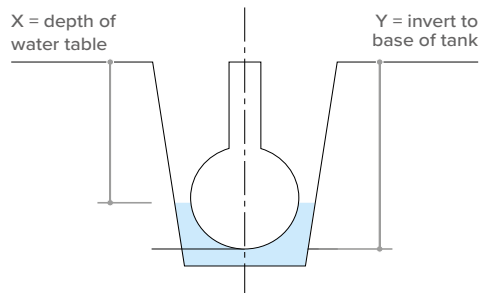
Pea Gravel Surround



SPEL Horizontal Underground Tanks - 500 Series

Specifications to Suit Invert Depths and Ground Water Conditions - Pea Gravel and Concrete Surrounds

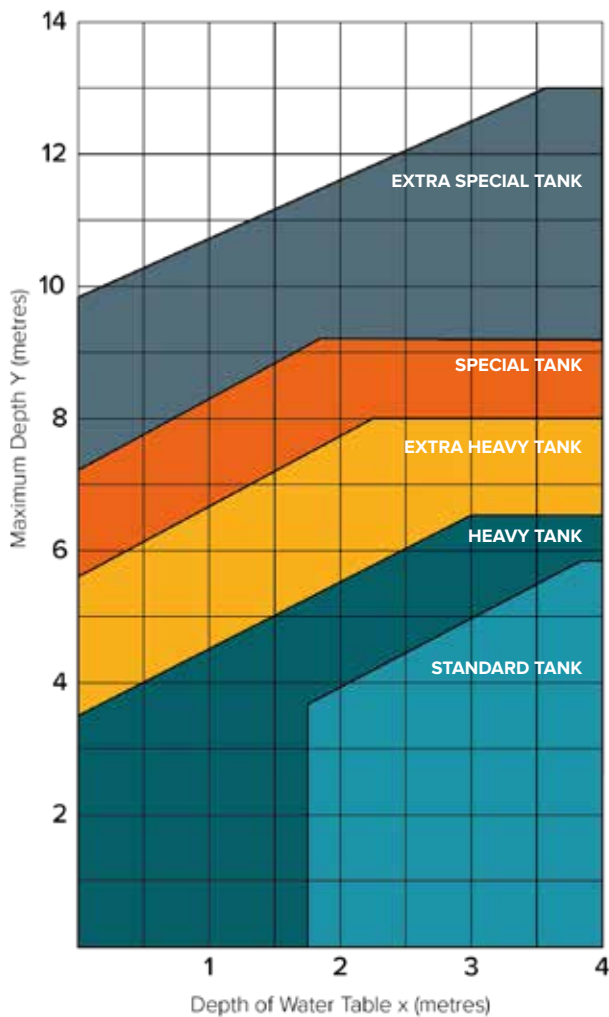
X & Y Axis Explained:



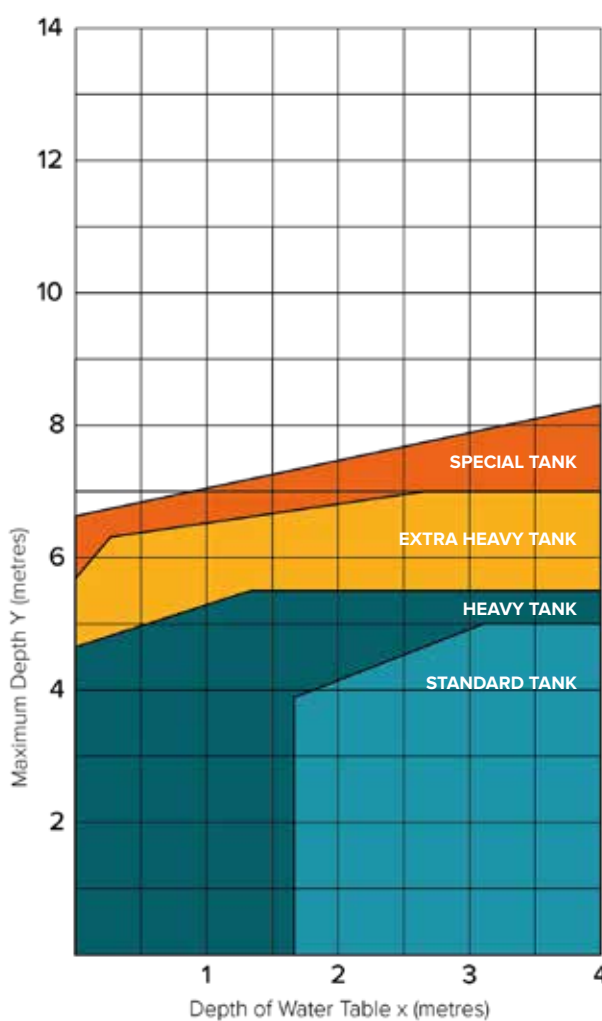
NOTE: The 'X' axis relates to ground water and is measured from cover level to the highest potential ground water level. The 'Y' axis relates to the base invert of the tank, measured from cover level.

500 Series

Concrete Surround



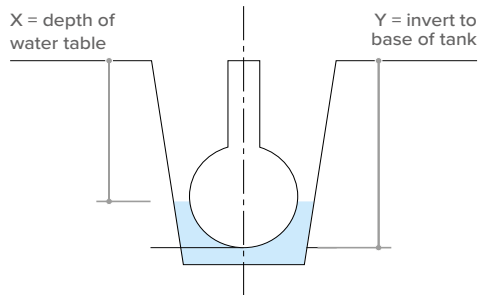
Pea Gravel Surround



SPEL Horizontal Underground Tanks - 600 Series

Specifications to Suit Invert Depths and Ground Water Conditions - Pea Gravel and Concrete Surrounds

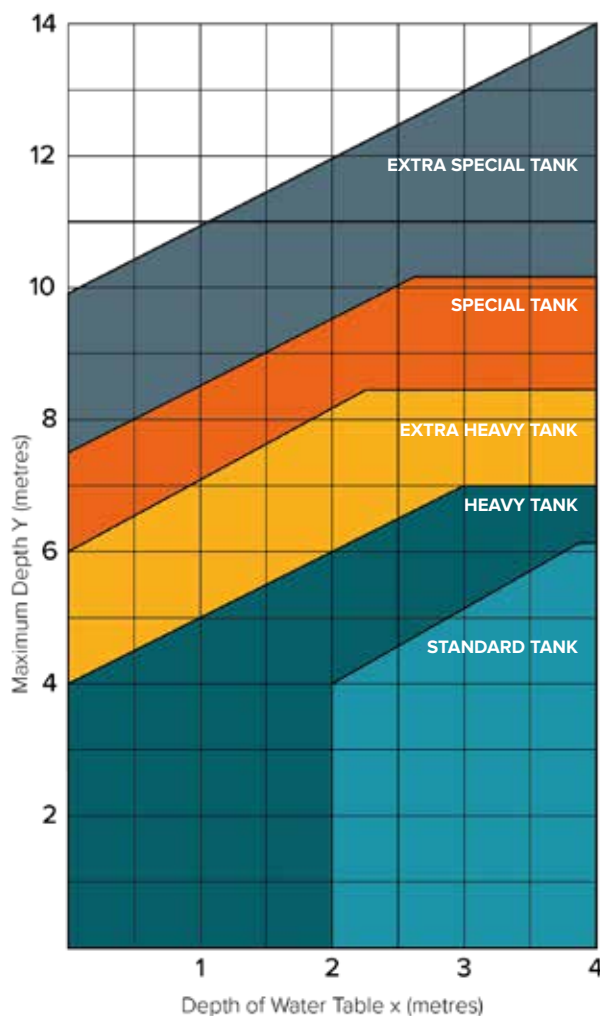
X & Y Axis Explained:



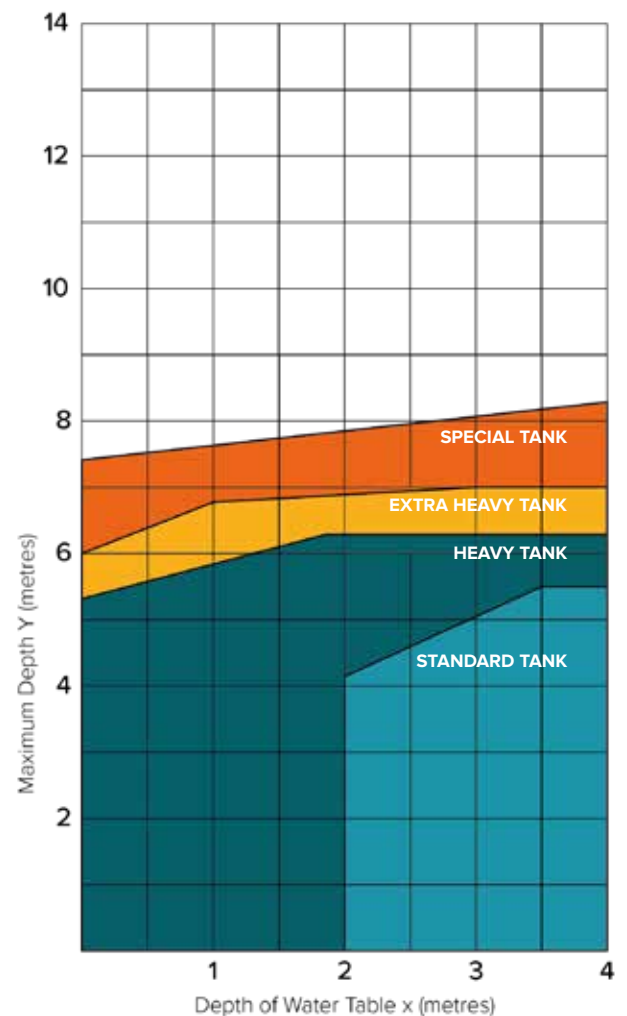
NOTE: The 'X' axis relates to ground water and is measured from cover level to the highest potential ground water level. The 'Y' axis relates to the base invert of the tank, measured from cover level.

600 Series

Concrete Surround



Pea Gravel Surround

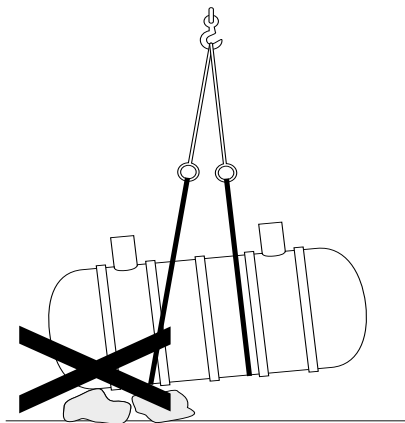
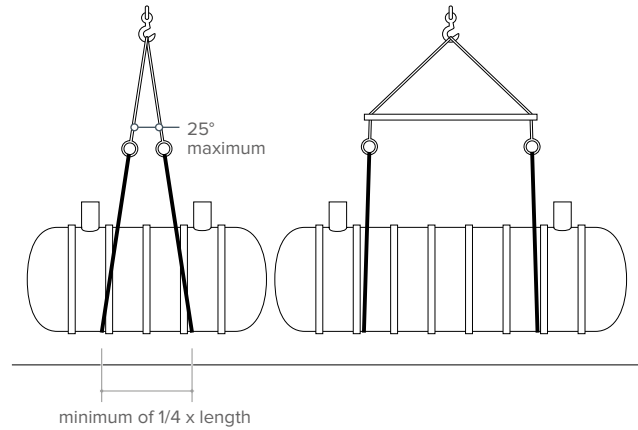


Lifting, Handling and Storage

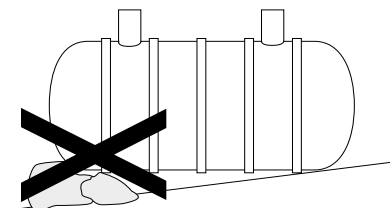
Lifting and Handling

Preferable Methods

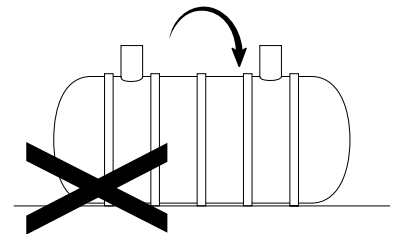
- Do not roll or drop tanks. Only move tanks by lifting. Rolling tanks could damage fittings.
- Tanks can be lifted using slings/webbing straps as illustrated.
- Where necessary, a spreader bar should be used.
- Guide the tank with guide lines. Never use chains or steel cables around tank shell.
- Do not drag tanks along ground for any distance.
- Avoid jarring or bumps.
- Do not lift with liquid in the tank.
- Set tanks on smooth ground, free of rocks or other sharp objects.



Never drag along the ground or lift unevenly.



Place tanks on smooth, level ground.



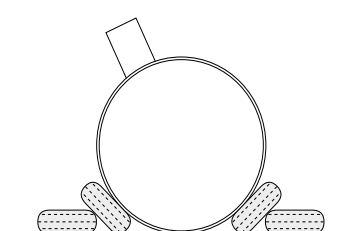
Do not roll or drop tank.

Storage

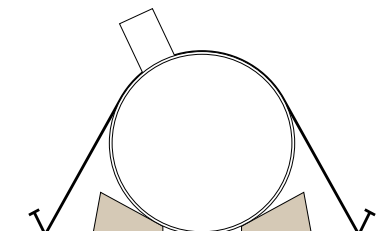
If tanks have to be stored temporarily prior to installation, they should be located:

- In an area where the chance of accidental damage or vandalism will be minimised.
- On a flat surface free from small or sharp objects.
- With efficient temporary anchorage to prevent high winds causing damage.
- If the tank has a sump, a hole must be dug in the ground for this sump to sit in without the sump touching the ground. The main body of the tank must sit on a flat surface to ensure there is no pressure on the sump.

If the tank is to be stored above ground for any period of time, with the chance of it filling up with rainwater, then it is strongly advised to cover access shafts to ensure water does not enter the tank and make it difficult to lift or potentially damage the tank due to the force of water exerted on the tank shell.

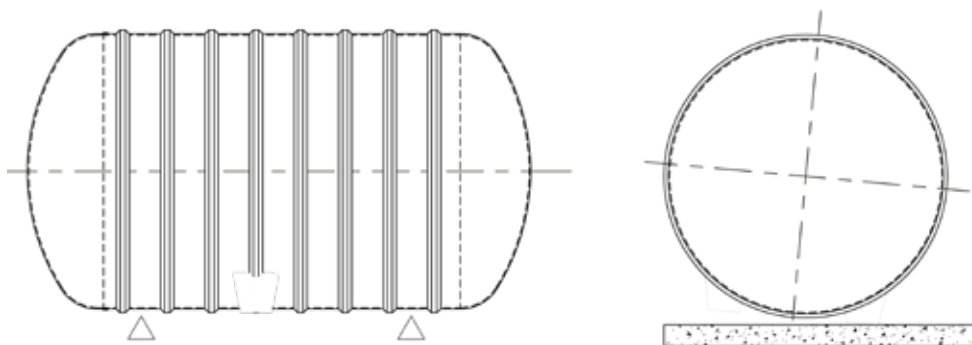


Prevent any movement.



Tie down against high winds.

Stabilising Chocks



Chocks can be fitted to maintain the tank in a truly vertical position on a flat base slab. These chocks are not load-bearing. If fitted, the tank should be handled with care to ensure the tank is lowered squarely onto the flat base slab. Avoid lowering the tank at an angle with a chock impacting on the base slab and taking the full weight of the tank as this impact could damage both the shell and the chock.



Feet:

Used for 200 Series SPEL tanks.



Chocks:

Used for 300, 400, 500 and 600 Series SPEL tanks.



Installation in Aberdeenshire, Scotland

Installation of Tanks Surrounded in Concrete

Installation Guidance

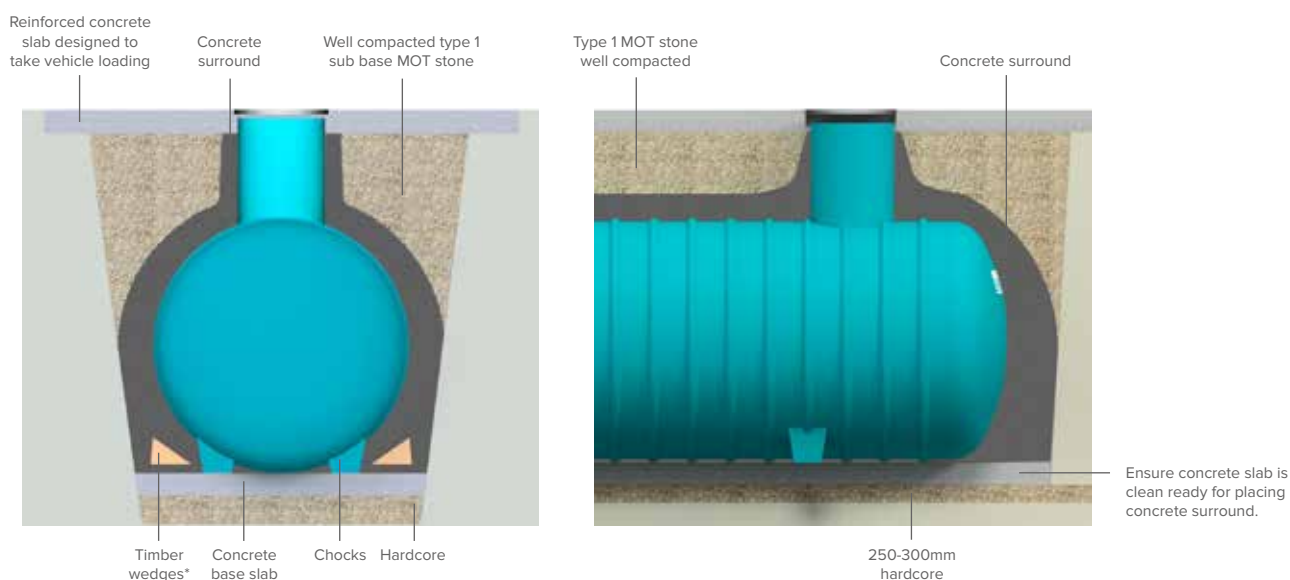
Preliminary

Dimensions given on the drawings and literature are subject to manufacturing tolerances and should be physically checked prior to installation. This applies to overall length, connection positions, their size and invert dimensions. Also check the correct way the tank should be installed and alignment with site drainage.

Determine the size of the excavation from the dimensions of the tank and the incoming drain invert depth allowing for a minimum of 200-250mm (250-300mm for 500/600 Series tanks) of concrete all round the tank. Where difficult ground conditions or the possibility of external loading exist, the concrete surround should be designed accordingly, ie. extra thickness and/or the use of reinforcing.

A semi-dry concrete mix, Grade GEN3/C20 or similar is suggested, but may vary dependent on-site conditions.

Typical Installation of a SPEL tank with feet/chocks



**Where the ribs are not bedding onto the concrete base, we recommend timber wedges are inserted under every third rib from alternate sides. This is to safeguard undue strain on the unsupported shell during installation.*

Concrete Surround Dimensions

Excavation details for concrete surround		Series 100/200	Series 300	Series 400	Series 500	Series 600
Max. burial depths (m). For your specific requirements refer to burial depth and water table depth charts on pages 7.4-7.7 and 7.19						
Minimum hardcore (mm), dependent on ground conditions		150	200	250	300	300
Concrete base slab (mm)	Slab thickness	100-150*	150*	220-240	240-300	250-300
Concrete surround (mm), dependent on ground conditions		100-150	150	200-250	250-300	250-300
Maximum initial water fill depths, prior to backfilling (mm)		200	300	400	500	500
Tank internal diameter (mm)		1,250/1,200	1,800	2,600	3,500	4,000
Tank external diameter (mm)		1,300/1,225	1,875	2,700	3,650	4,150

**If using SPEL mechanical anchoring straps, a 220mm concrete base slab is required.*

Installation of Tanks Surrounded in Concrete

Installation Guidance

Excavation

Excavate allowing for easy placing of the tank and concrete and for consolidating concrete around the bottom half of the tank when backfilling. Allowance should be made for any timbering or sheeting that may be required. If the base of the excavation consists of unstable ground – loose gravel, running sand, landfill type areas, peat, swamp or in clay areas subject to swelling/shrinking etc., excavate to allow for 250-300mm of hardcore and cover with a polythene membrane prior to placing concrete.

Procedure

Where the level of the tank is important, chocks can be fitted during manufacture to enable the tank to be placed on a flat concrete base and levelled up prior to surrounding with concrete.

Note: It is recommended to cover the access shaft openings with polythene or plywood sheets to prevent concrete and debris entering the tank.

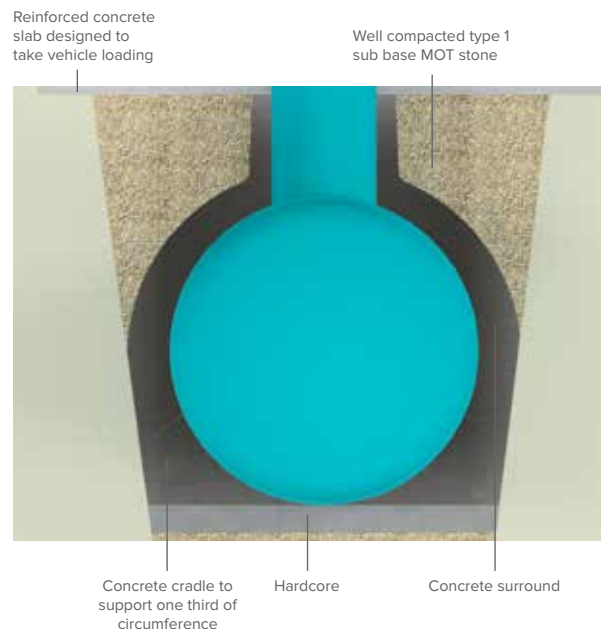
1. Pour concrete base to correct depth and level off. Base should be reinforced as necessary.
2. When the concrete is set sufficiently, place the tank in position and check for level. Place the initial water fill depth in accordance with chart on Page 7.10 depending on the tank diameter to provide ballast for the first concrete pour.
3. Place back-fill concrete up to the depth of the water in the tank ensuring the concrete is properly consolidated under the tank to prevent voids. Consolidate by hand – do not use vibrating poker.
4. Continue by placing concrete round the tank, at the same time filling with water to equalise pressure and resist floatation. Ensure all chambers are filled equally.
5. Connect up pipework, fix extension access shaft with waterproof mastic/adhesive or bolt to the stub access shaft as appropriate (see below).
6. Fit extension shafts if required: Extension access shafts are available in 500mm increments with socket joints or if required, flanged joints with neoprene gaskets. Prior to surrounding in concrete if required, ensure access shafts are shuttered internally to support the sides and prevent distortion. This is especially important when guide rails are installed for pumps or coalescer units. With a high water table ensure all joints are double sealed to prevent ingress of water. (See page 7.29 for extension shaft detail.)
7. Top up the tank with water to invert level and place remainder of concrete.
8. Where the concrete slab over the tank is to take vehicle loading it should be reinforced in accordance with good practice to take the maximum load and should be extended onto unexcavated ground. It is important that vehicle loading is not transferred to the tank itself.
9. Incorporate inspection cover frames in the normal manner.

Wet hole procedure

Where there is water entering the excavation, the water level should be maintained below the foundation level by pumping with or without the aid of a pump well in one corner of the excavation.

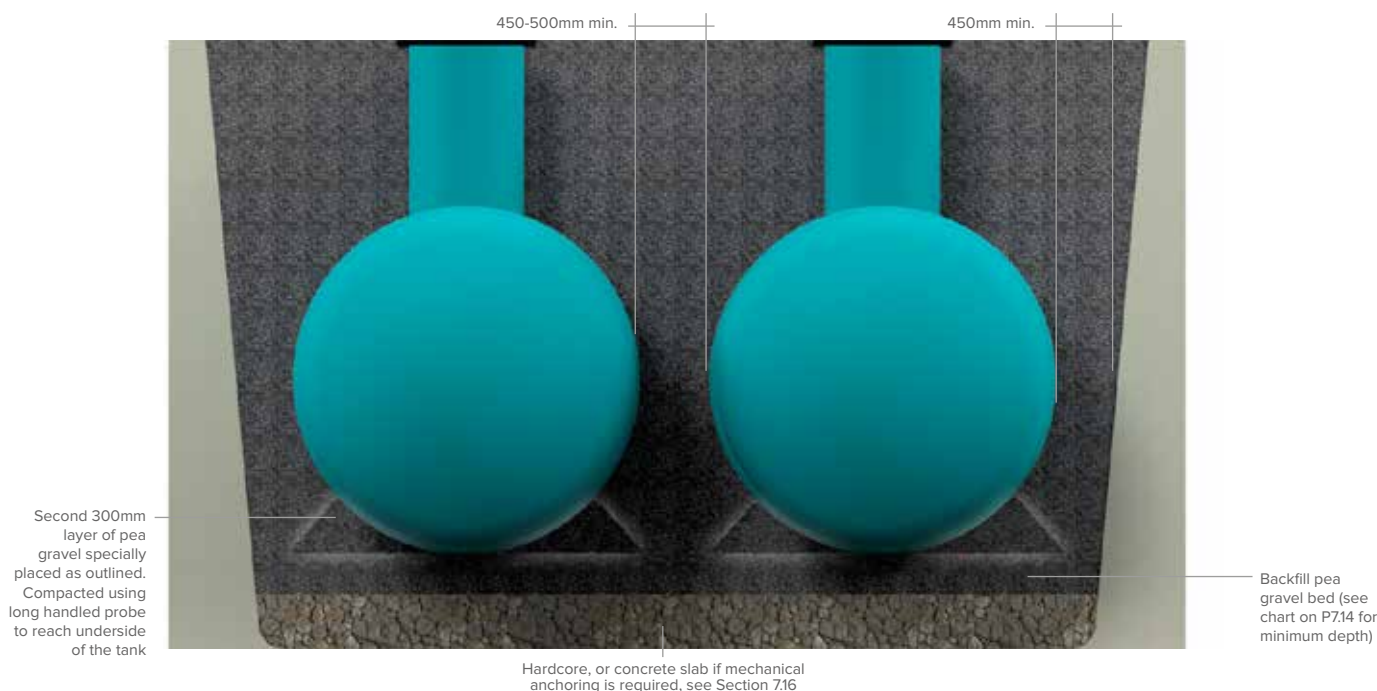
Typical Installation of Smaller Tanks Without Feet/Chocks (100, 200 & 300 Series)

1. Place concrete along the centre of the excavation base and lower the tank into position 'puddling' it into the concrete to form a cradle. Consolidate under the tank to prevent voids. Consolidate by hand – do not use vibrating poker.
2. Check the tank is truly vertical and level.
3. After the concrete has reached its initial set, fill with water to approximately 500mm deep.
4. As per instructions 4-10 to the left or if suitable, the tank can be surrounded in pea gravel or approved free flowing crushed rock. (See under tanks installed with granular backfill) When the concrete surround has fully cured, cesspools should be completely emptied ready for use.



Installation of Tanks Surrounded with Pea Gravel Backfill

Installation Guidance



Tank dimensions

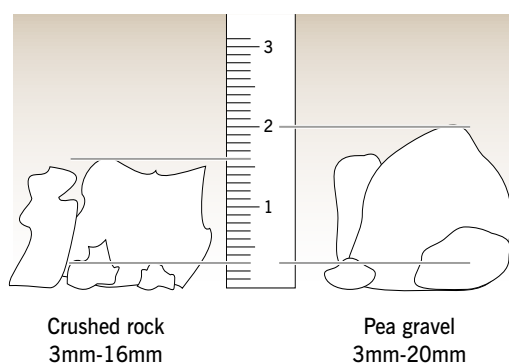
Dimensions given on the drawings and literature are subject to manufacturing tolerances and should be physically checked prior to installation. This applies to overall length, connection positions, their size and invert dimensions. Also check the correct way the tank shall be installed and alignment with site drainage. If you have an installation situation that is not covered by this Data Manual please contact our technical services department. It is important that only properly trained and experienced contractors perform this method of installation.

Backfill material

Pea gravel or crushed rock is preferred as backfill material. Requirements for backfill material are:

- Clean and washed.
- Non-cohesive, inert material.
- Pea gravel or crushed rock.
- Particle not larger than 20mm (as below diagram).
- Material free from rocks, ice, snow or organic material.

Approved backfill material for tanks and pipes



Excavation size

Unstable Ground Conditions

Where the ground is unstable, eg. landfill type areas, peat, swamp or in clay areas subject to swelling/shrinking, the width of the backfill must be increased to a minimum of half the tank diameter between the tank sides and the ends of excavation.

If the base of the excavation is also of unstable ground, allow for 250-300mm of hardcore. After placing the hardcore, consolidate to ensure a firm base for the backfill.

Excavating General

Excavate allowing for easy placing of the tank and backfill around the bottom half of the tank. Allowance should be made for any timbering or sheeting that may be required.

Filter Fabric

To prevent future damage to the tank due the migration of the surrounding soil into the pea shingle the excavation must be lined with geotextile or other suitable barrier material.

Filling Tanks

Do not fill tanks until backfill is to the top of the tank. (Exception; Wet Hole see page 7.14).

Where the tank is divided into chambers ensure all chambers are filled equally.

Note: Where the chambers may require to be separated by load bearing partitions to accommodate different liquid levels the tank must be surrounded in concrete.

Installation of Tanks Surrounded with Pea Gravel Backfill

Installation Guidance

SPEL Mechanical Anchoring System

SPEL Mechanical Anchoring System is highly recommended for all pea gravel installations for ease of installation and to resist any tank floatation.

If you are using the SPEL Mechanical Anchoring System and a concrete base slab, the tank must be bedded on pea gravel - see 7.16.

Depth of cover for standard and heavy specification tanks

No vehicle loads

300/400 series tanks are designed for a minimum cover of 600mm of backfill or 300mm plus 100mm reinforced concrete slab.

500/600 series 1100mm backfill or 900mm backfill plus 100-150mm reinforced concrete slab.

Vehicle loads

300/400 series tanks subjected to vehicle loading must have a minimum cover of 600mm of backfill plus a minimum 150mm reinforced concrete slab designed to take the maximum load without such loadings being transferred to the tank itself.

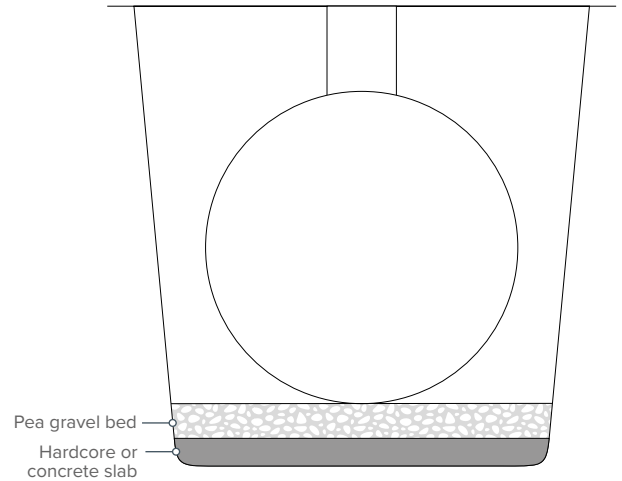
500/600 series as above but 1000mm backfill plus a minimum 150mm reinforced concrete slab as above. The maximum depth of the cover is governed by the maximum drain invert depth and periodic high water table when encountered.

For the depth of cover for Extra Heavy and special specification tanks, contact our technical services department.

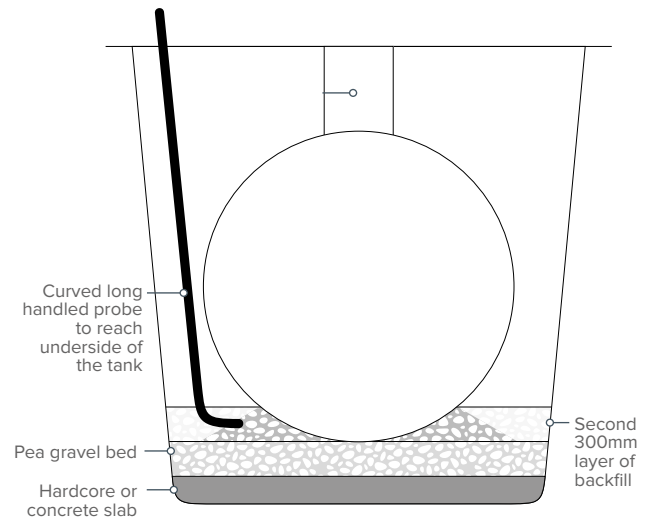
Tanks & Separators with Internal Components

With tanks and separators with internal components it is important the shell over its life remains truly circular to ensure the internal components do not come under stress forcing the joints of these component to break away from the shell or become damaged and effect the performance of the tanks operation. With any such danger over time we recommend surrounding the tank with concrete to ensure long term stability.

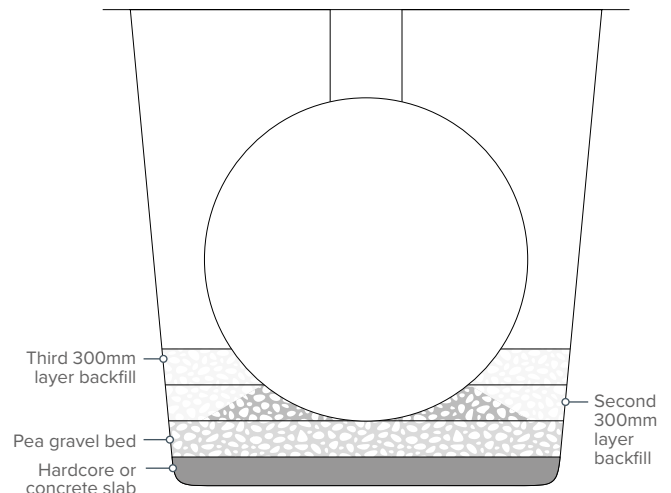
Dry Hole - Backfill Bed



Dry Hole - Place Backfill Around Tank



Dry Hole - Complete Backfill as per Step 4 on next page



Installation of Tanks Surrounded with Pea Gravel Backfill

Installation Guidance

Installation - Dry hole

1. Place a minimum of 150-300mm of approved backfill over the excavation bottom. Refer to table below.
2. Position the tank carefully onto backfill bed and check for levels including inlet/outlet inverts.
3. It is recommended to cover access shafts with polythene or plywood to prevent backfill entering the tank.
4. Place first 300mm lift of backfill evenly around the tank by shovelling and pushing beneath the tank bottom, between ribs and end domes to ensure complete support and to eliminate voids. (Where access is confined, long handled probes, curved to enable reaching the underside of the tank, can be used). Place and compact further 300mm lifts, as above, to a minimum depth of 1/3 of the tank diameter. The remainder of the backfill can be poured without consolidation except where required to support a cover slab.
5. Connect up inlet, outlet and vent pipework, seat access shaft into socket and apply waterproof mastic/adhesive or as applicable. (See page 7.29 for extension shaft detail.)
6. Where a concrete slab is to be constructed over the tank to take vehicle loading, it should be reinforced in accordance with good practice to take the maximum load and should be extended onto unexcavated ground. It is important that vehicle loading or any superimposed loads are not transferred to the tank itself. Important: Before surrounding circular or rectangular shafts with backfill, shutter internally to support the sides and safeguard against distortion.
7. Incorporate inspection cover frames in the normal manner.

Alternative pea gravel surround installation with concrete cradle see page 7.15

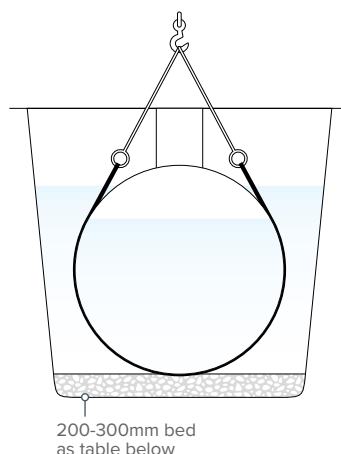
Wet hole procedure

Where there is water entering the excavation, the water level should be maintained below the foundation level by pumping with or without the aid of a pump well in one corner of the excavation.

If the water level cannot be lowered you will need to ballast the tank very carefully. Place the tank in the excavation adding only enough water ballast to sink it. The water level in the tank must never exceed the water level in the excavation. While adding the ballast use only a lifting strap to keep the tank in position.

It is essential the backfill is distributed evenly round the base of the tank and thoroughly consolidated with the aid of long handled probes to eliminate any voids as set out in point 4 'Dry hole procedure'.

To prevent flotation, mechanical anchoring may be required, see page 7.16.



Backfill bed

Please refer to this table for the minimum amount of approved backfill to be used over the excavation bottom for your series tank.

Tank	min. backfill bed
300 Series	200mm
400 Series	250mm
500 Series	300mm
600 Series	300mm

Installation of Tanks Surrounded with Pea Gravel Backfill

Alternative Method with Concrete Cradle

This method of installation combines the economy of pea gravel backfill and the safety of a concrete cradle. For the less experienced contractor this is a safer option than bedding on pea gravel.

Excavation size Stable Ground Conditions

Determine the size of the excavation from the dimensions of the tank and the incoming drain invert depth, allowing for a minimum of 450mm of backfill between the tank sides and the ends of the excavation.

Excavation Size Unstable Ground Conditions

Where the ground is unstable, eg. landfill type areas, peat, swamp or in clay areas subject to swelling/shrinking, the width of the backfill must be increased to a minimum of half the tank diameter between the tank sides and the ends of the excavation.

If the base of the excavation is also of unstable ground, allow for 250-300mm of hardcore. After placing the hardcore, consolidate and cover with a polythene membrane prior to placing concrete.

Note: If mechanical anchoring is required, see mechanical anchoring on page 7.16 - 7.17

1. Place concrete along the centre of the excavation base and lower the tank into position 'puddling' it into the concrete to form a cradle. Consolidate under the tank to

prevent voids. Consolidate by hand – do not use vibrating pokers.

2. Check the tank is truly vertical, level and inlet/outlet invert levels are correct.

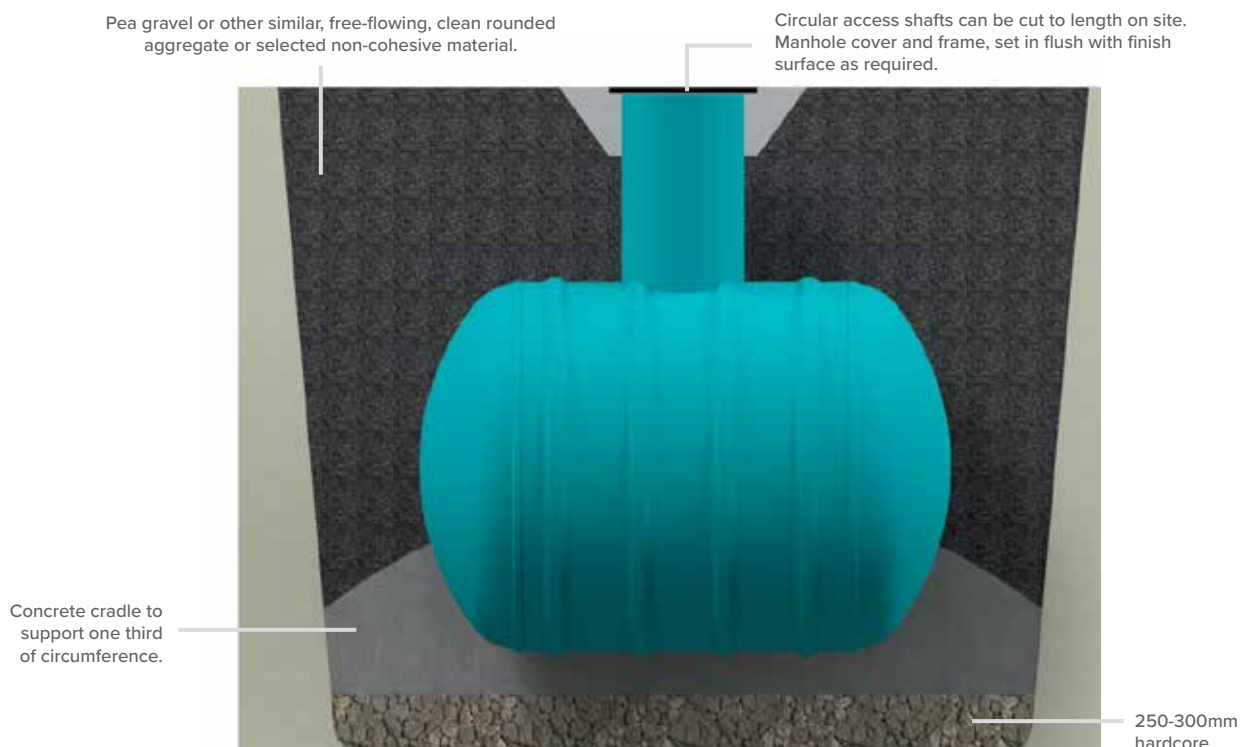
3. Place first 300mm lift of backfill evenly around the tank by shovelling and pushing around the tank sides, between ribs and end domes to ensure complete support and to eliminate voids. (Where access is confined long handled probes, curved to enable reaching the underside of the tank, can be used). After placing first lift of backfill the remainder of the backfill can be poured without further consolidation by hand.

4. Connect up inlet, outlet and vent pipework, seat access shaft into socket and apply waterproof mastic/adhesive or as applicable (see page 7.29 for extension shaft detail).

5. Where the concrete slab is to be constructed over the tank to take vehicle loading it should be reinforced in accordance with good practice to take the maximum load and should be extended onto unexcavated ground. It is important that vehicle loading is not transferred to the tank itself.

6. Incorporate inspection cover frames in the normal manner.

Note: Where the tank is divided into chambers ensure all chambers are filled equally. Where the chambers may require to be separated by load bearing partitions to accommodate different liquid levels the tank must be surrounded in concrete.



SPEL Underground Tank Mechanical Anchoring

SPEL Mechanical Anchoring System



SPEL mechanical anchoring system

Mechanical anchoring is required where the tank is to be surrounded in pea gravel and where water could enter into the excavation (underground water table, rainwater run-off etc.) or where the tank is to be surrounded in concrete and it is imperative the tank does not shift during the placement of this concrete.

SPEL mechanical anchoring straps are available for all tanks. These are located over the designated ribs and held in position by locators positioned over the said ribs. Cables or straps should not be used between the ribs on the tank.

It is the responsibility of the tank owner or their technical representative to determine if mechanical anchoring is required for a specific installation.

If water could enter the excavation (underground water table, rainwater run-off etc.) we recommend the tank is mechanically anchored unless the minimum depth from tank top is, as per table on left.

The weight of over burden on top of the concrete anchor pad provides the anchoring force.

The pad is to prevent buoyancy but should be designed taking

into account soil conditions eg. thickness and reinforcement.

Anchor points should be spaced equal to the tank diameter plus 300mm on each side of the tank regardless of tank diameter. The anchor points must be aligned in accordance with the designated ribs plus or minus 25mm.

All anchor straps must be uniformly tightened with the ratchets. Straps should be a tight, snug fit to the ribs but must not cause the tank to deflect. It is recommended that the ratchets are positioned on alternate sides of the tank to ensure the tank remains vertical during tensioning.

Check the tanks internal diameter before and after tensioning the straps with a gauge rod to ensure against deflection.

Do not fill with product or water until backfill is level with top of tank except when backfilling with concrete.

When backfilling with concrete, we advise that the tank is filled with water to a corresponding level with the concrete to equalise pressure.

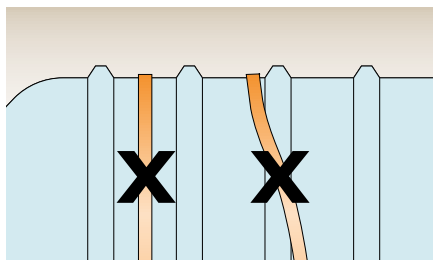
Where the tank is divided into chambers, ensure all chambers are filled equally. See installation procedure for surrounding in concrete.

Minimum burial depth

The following table shows minimum cover depths when mechanical anchoring is not required.

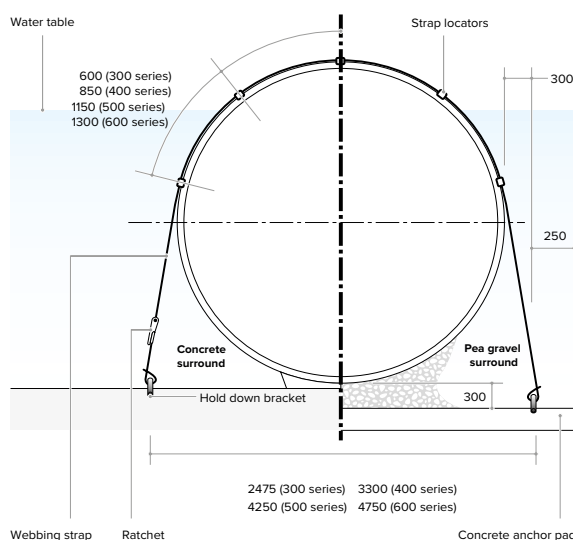
Tank Series	Dia. (mm)	No cover slab (mm)	150mm cover slab (mm)
300	1,800	1,200	1,100
400	2,600	1,500	1,400
500	3,500	1,800	1,700
600	4,000	2,100	2,000

Do not strap here



Straps must not be placed between the ribs or passed over from one side to the other as stress will be transferred to the weakest part of the tank wall. Unless the SPEL system is used and positioned correctly the 25 year warranty will be nullified.

The 'holding down' ribs are indicated on the tank by a 'strap' label



SPEL Underground Tank Mechanical Anchoring

Procedure for 'anchoring' tanks down

1. Check contents of kit.

2. Galvanised Hold-down Brackets:

a) Position brackets so they line up with the ribs of the tank as indicated by 'strap' label. Check position from side of tank and edge of slab as shown in Figure 1 on previous page.

b) Thread loop of short length through hold-down bracket (see Sketch 1). Note: the arm of the ratchet should be facing outwards. (Do the same for long length on opposite side of the tank.)

c) Drill a 20mm dia x 150mm deep hole in concrete slab.

d) Clear the hole of dust and hammer in the anchor bolt.

e) Drill the second hole and hammer in the second anchor bolt.

f) Tighten the nuts to 200Nm.

NB. For strength the bolts must be at least 130mm deep into the slab and the concrete strength C25/30 or higher.

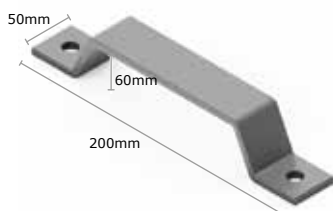
3. Then throw the remaining length of the long length of webbing over the tank, making sure that the webbing is not twisted.

4. Position the 'long' length of webbing over the designated rib and 'clip in' the strap locators underneath the webbing and position as shown in the drawing (see Figure 1 previous page).

5. Taking the end of the 'long' length of webbing, thread it through the slot of the ratchet (see Sketch 1) and tighten up using the ratchet arm to give required tension.

6. On completion the ratchet tensioners should be well wrapped in 'DENSO' or similar tape for long-term protection if the tank is surrounded in pea gravel or similar backfill.

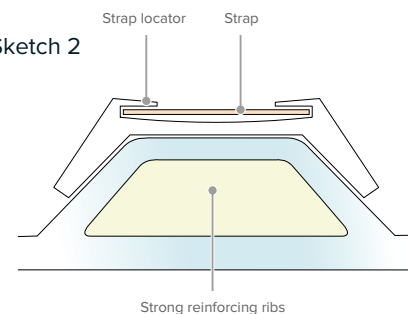
Galvanised Hold-down Brackets



Sketch 1



Sketch 2



Anchoring kit contents 300 series:

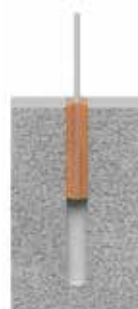
Ratchet c/w short length of webbing x 1
Long length of webbing x 1
Hold-down brackets x 2
Rubber strap locators x 3
Bolts x 4

Anchoring kit contents 400, 500 & 600 series:

Ratchet c/w short length of webbing x 1
Long length of webbing x 1
Hold-down brackets x 2
Rubber strap locators x 5
Bolts x 4



Position fixture and drill correct diameter hole to correct depth



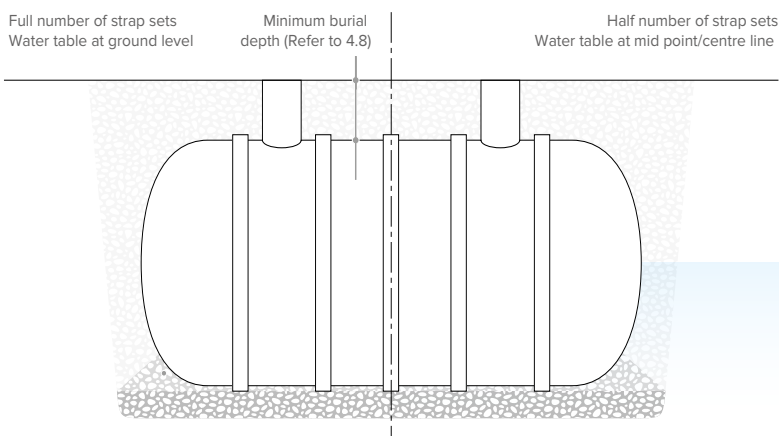
Clean hole by brushing and blowing to remove dust and drilling debris



Insert assembled anchor through fixture into concrete



Tighten with torque wrench to Installation Torque



Wellpoint Dewatering and Long Excavations

Wellpoint Dewatering

Where sandy, permeable ground is saturated with water, wellpoint dewatering is a technique that lowers the ground water level over a defined area. This is achieved by simultaneously pumping from a number of wellpoints inserted into the water table.

Without wellpoint dewatering the contractor would be trying to work or dig in ground that is virtually quicksand. The sides of the excavated hole would keep collapsing and any sand removed would be replaced by more sand running in, thus, filling up the hole. This can result in danger to men, adjacent structures, roads, etc.

Once the wellpoints have been installed and the system has been running for some time, the contractor can then excavate in stable conditions.

As a general rule, any dewatering system must be kept running 24 hours a day because the water removed from the ground is replaced from the surrounding areas.

Modular bracing systems

Where excavations exceed 4m and extend to 22m or more, a propriety bracing system, where no internal cross bracing is required, should be used.

Systems available comprise telescopic, hydraulic and rough adjustment walling modules connected to fixed length extension beams designed to provide support to interlocking sheet piling.

Where excavations are 20m or more in length a goal post arrangement is normally required to provide cross bracing support at the central point. This arrangement enables the SPEL tank to be passed under and into the excavation.

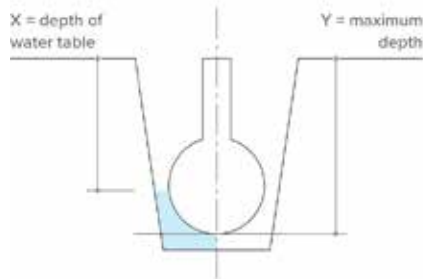


Dewatering at RAF Coningsby

Burial Depths for Underground Tanks

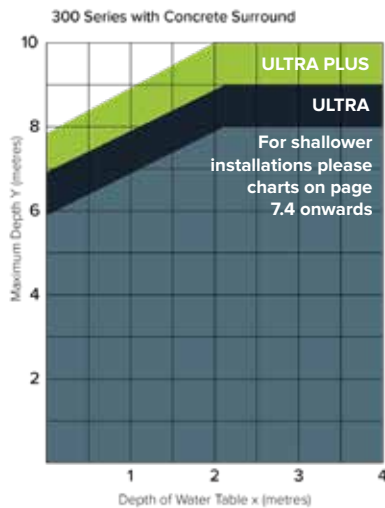
Ultra Deep 300, 400, 500 & 600 Series - Concrete Surround Only

X & Y Axis Explained:

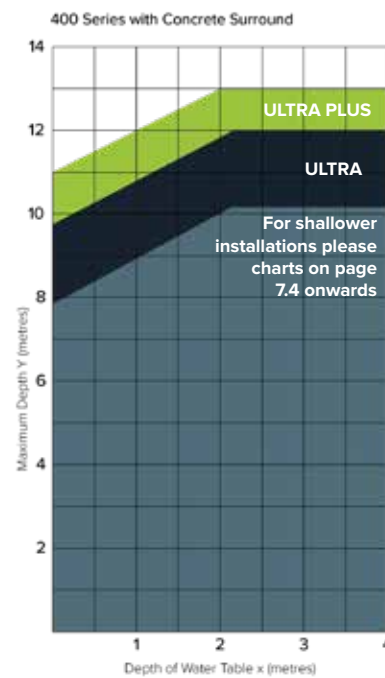


NOTE: The 'X' axis relates to ground water and is measured from cover level to the highest potential ground water level. The 'Y' axis relates to the base invert of the tank, measured from cover level.

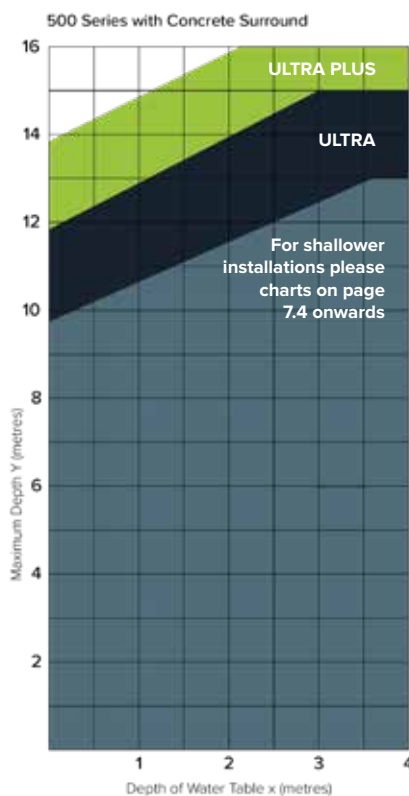
300 Series



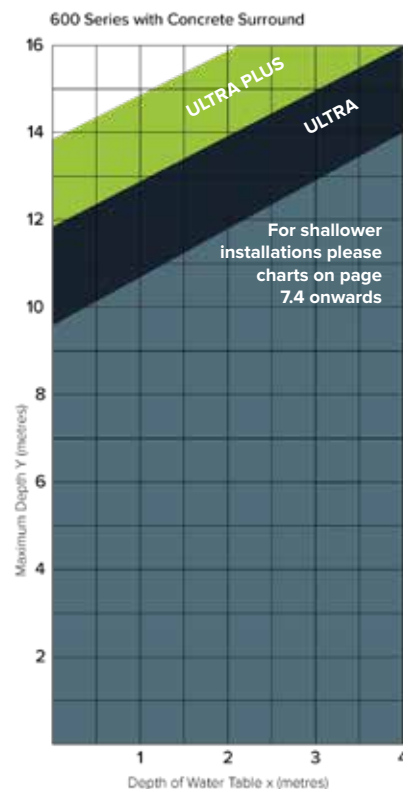
400 Series



500 Series

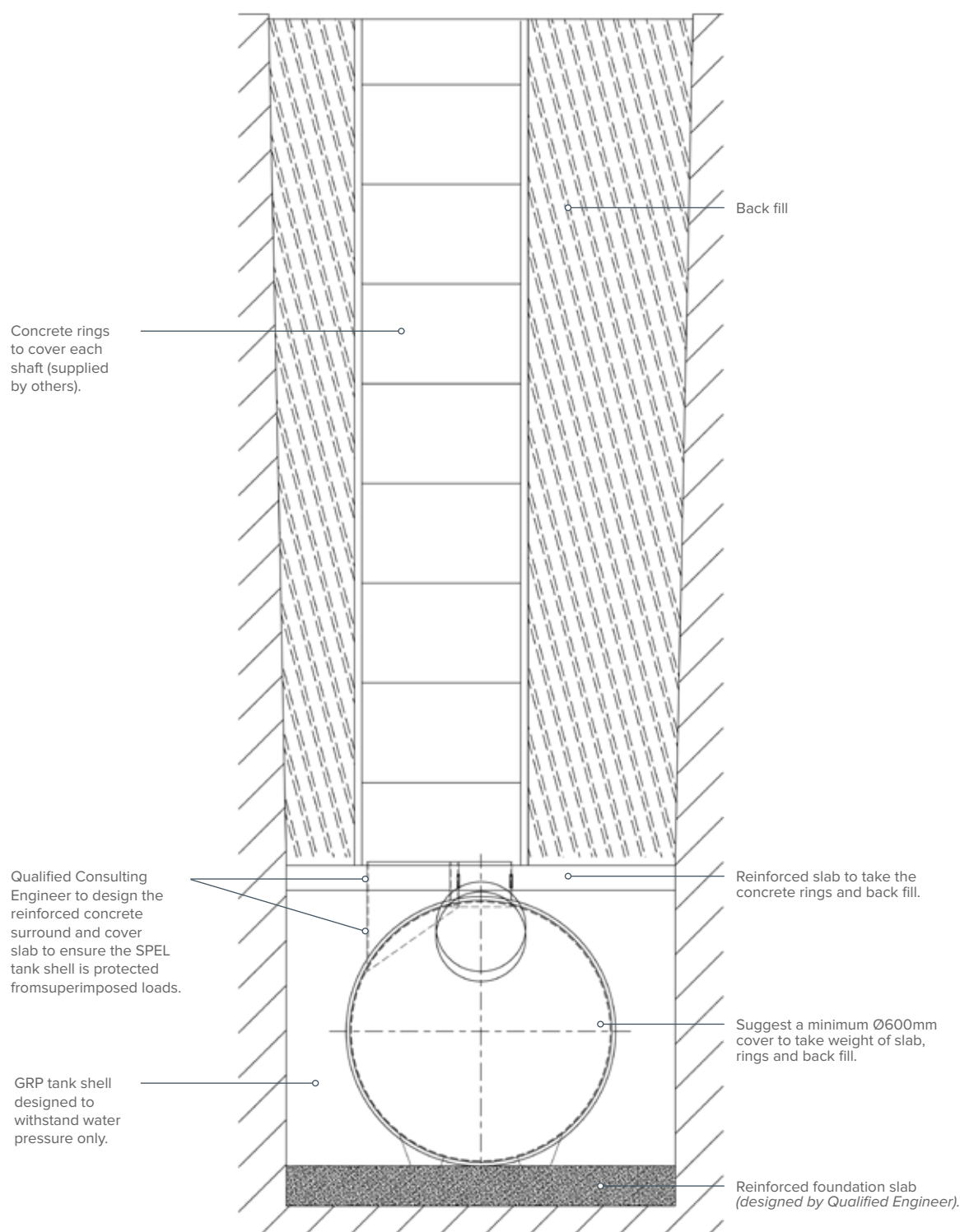


600 Series



SPEL Underground Tanks - Ultra Deep Installation Guidance

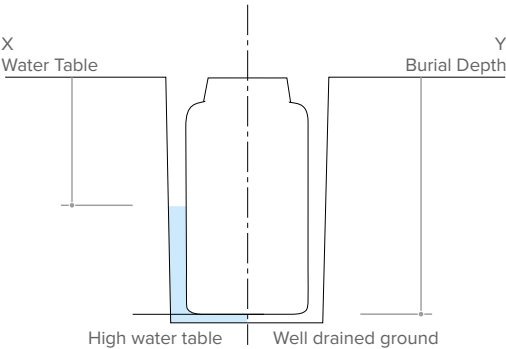
In the event that the design requires deeper inverts than are covered in the standard installation section, the Ultra Deep installation option is available. It is critical that you contact our technical team to discuss this option and follow the dedicated instructions for Ultra Deep installations on the following pages.



SPEL Vertical Underground Tanks

Specifications to Suit Invert Depths and Ground Water Conditions - Concrete Surrounds

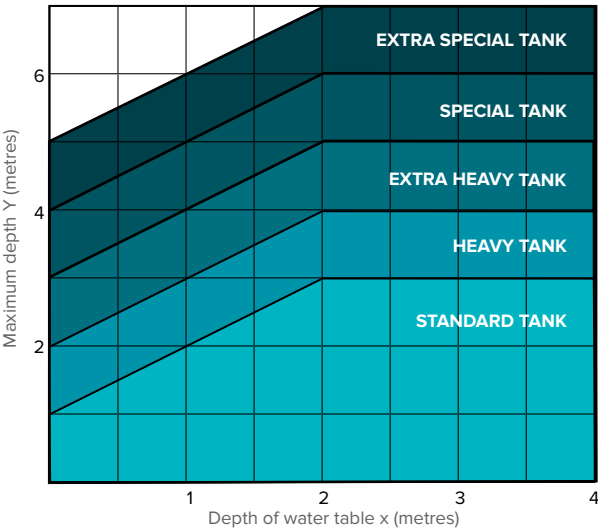
X & Y Axis Explained:



NOTE: The 'X' axis relates to ground water and is measured from cover level to the highest potential ground water level. The 'Y' axis relates to the base invert of the tank, measured from cover level.

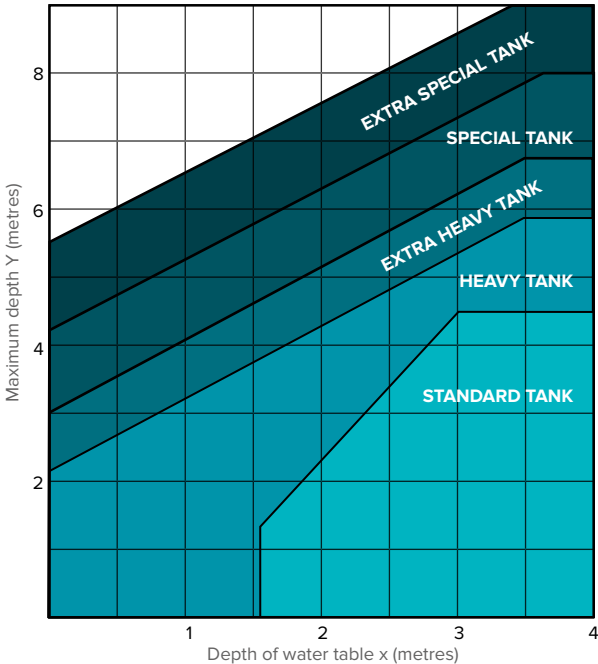
200 Series

Concrete Surround



300 Series

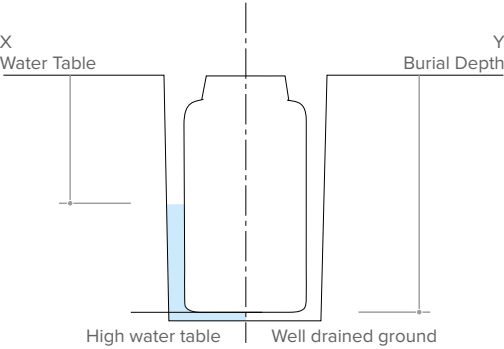
Concrete Surround



SPEL Vertical Underground Tanks

Specifications to Suit Invert Depths and Ground Water Conditions - Concrete Surrounds

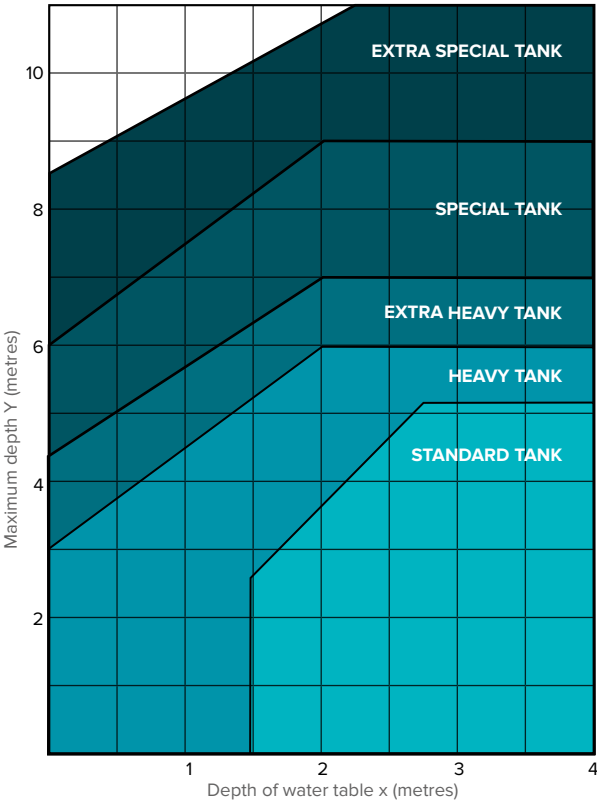
X & Y Axis Explained:



NOTE: The 'X' axis relates to ground water and is measured from cover level to the highest potential ground water level. The 'Y' axis relates to the base invert of the tank, measured from cover level.

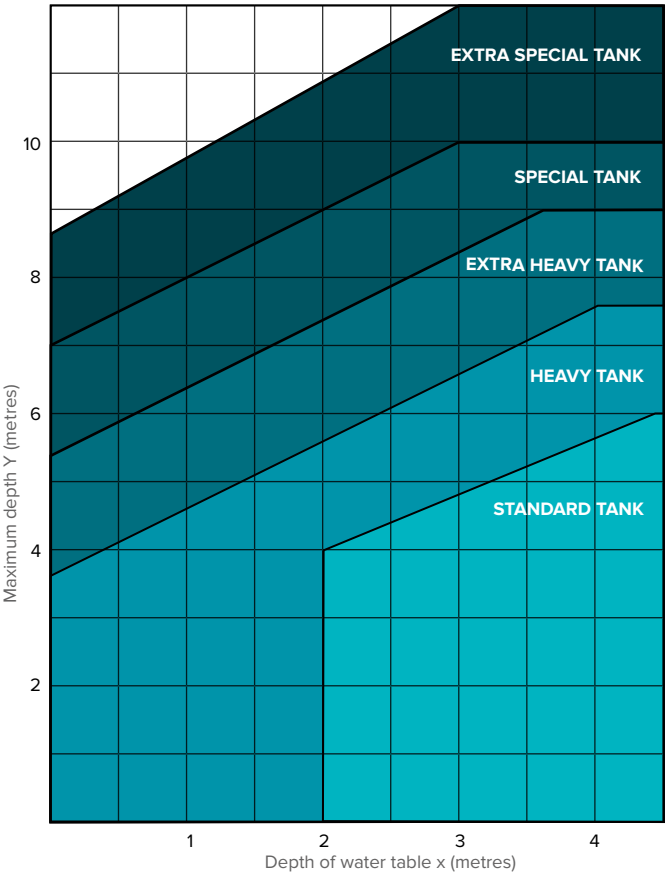
400 Series

Concrete Surround



500 Series

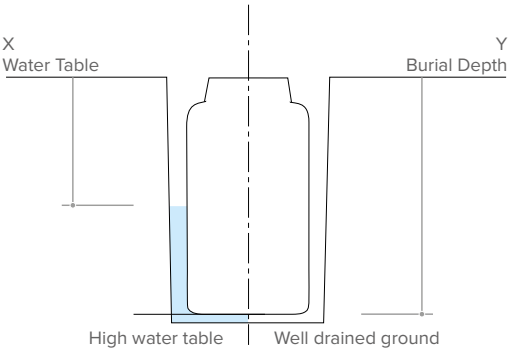
Concrete Surround



SPEL Vertical Underground Tanks

Specifications to Suit Invert Depths and Ground Water Conditions - Concrete Surrounds

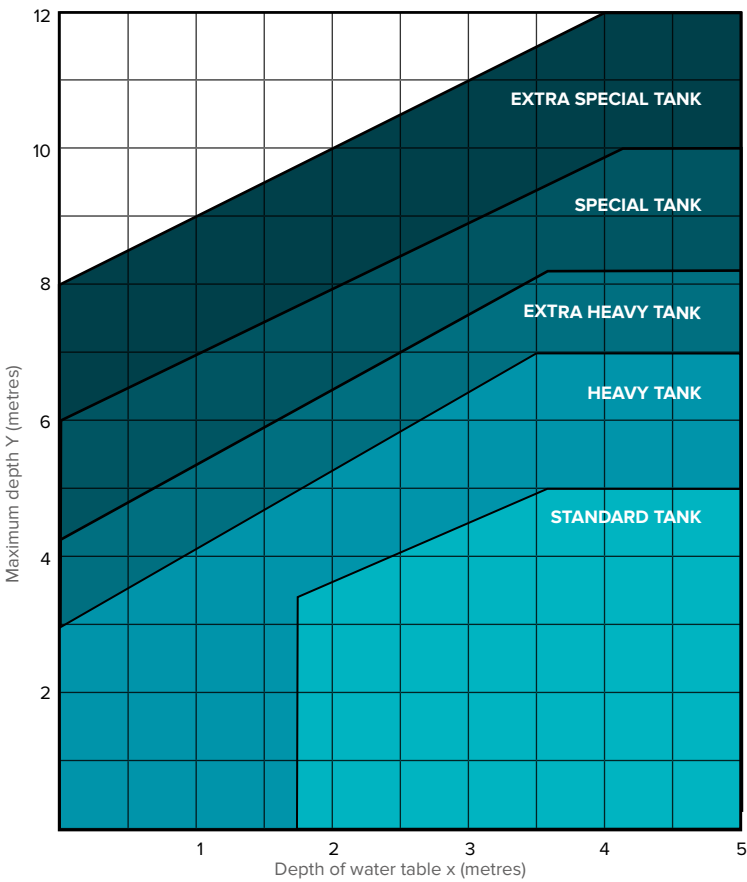
X & Y Axis Explained:



NOTE: The 'X' axis relates to ground water and is measured from cover level to the highest potential ground water level. The 'Y' axis relates to the base invert of the tank, measured from cover level.

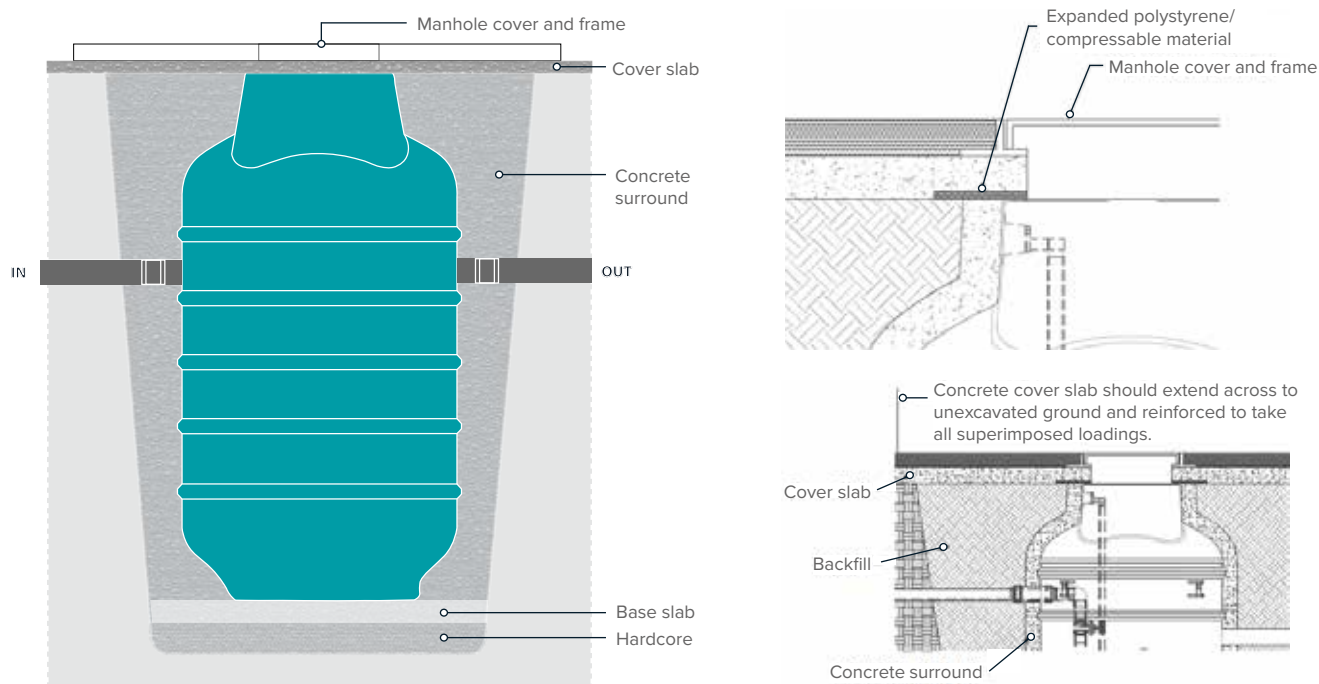
600 Series

Concrete Surround



SPEL Vertical Below Ground Tank Installation Guidance

Installation Instructions



Preliminary

Determine the size of the excavation from the dimensions of the tank and the incoming drain invert depth allowing for a minimum of 200-250mm (250-300mm for 500/600 Series tanks) of concrete all round the tank. Where difficult ground conditions or the possibility of external loading exist, the concrete surround should be designed accordingly, i.e. extra thickness and/or the use of reinforcing.

All lifting brackets must be used, each lifting bracket is included to take an even amount of weight each.

Excavation

Excavate allowing for easy placing of the tank and concrete and for consolidating concrete around the bottom half of the tank when backfilling. Allowance should be made for any timbering or sheeting that may be required. If the base of the excavation is of unstable ground – loose gravel, running sand, landfill type areas, peat, swamp or in clay areas subject to swelling/shrinking etc., excavate to allow for 250-300mm of hardcore and cover with a polythene membrane prior to placing concrete.

Procedure

1. Pour concrete base to correct depth and level off. Base to be reinforced as necessary.
2. When this concrete has set sufficiently, place the tank in position, check for levels including inlet/outlet inverts and fill with water in accordance with table below. Ensure concrete slab is clean ready for placing concrete surround. Surround should preferably be placed within 48hrs of casting the base slab.

3. Place backfill concrete (ST4 mix) up to the depth of the water in the tank ensuring the concrete is properly consolidated under the tank to prevent voids. Consolidate by hand – do not use vibrating poker.

4. Continue by placing concrete around the tank at the same time filling with water to equalise pressure and resist floatation. Where the tank is divided into chambers ensure all chambers are filled equally.

5. Connect up pipework, seat access shaft into socket and apply waterproof mastic/adhesive, or as applicable (see page 7.29 for extension shaft detail).

6. Top up the tank with water to inlet/outlet invert level and place remainder of concrete to a depth of approximately 250mm above the top of the tank. Where extension access shafts are fitted, these can be surrounded in concrete once the main tank surround concrete has set. Important: Before surrounding circular or rectangular shafts with concrete, shutter to safeguard against distortion.

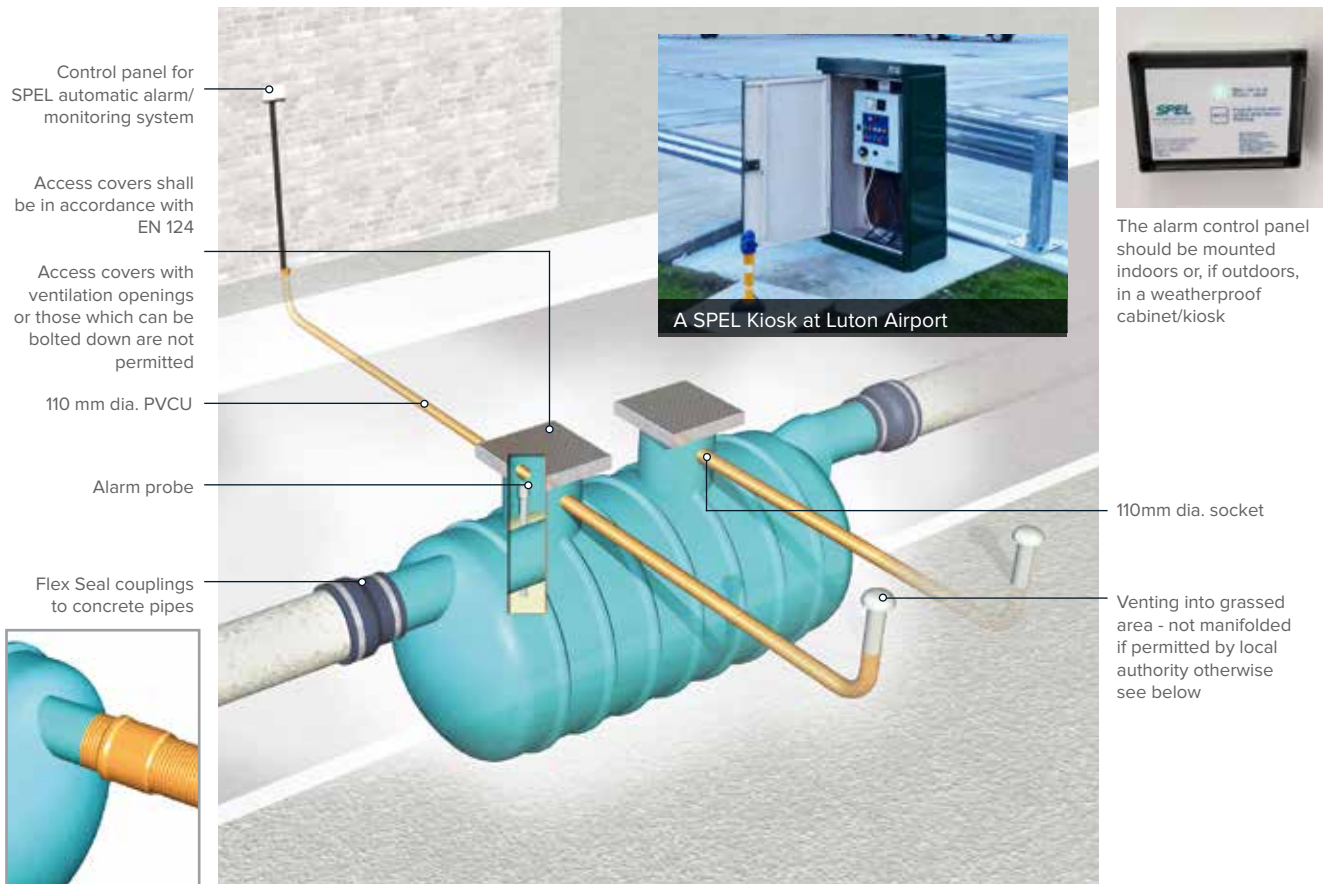
7. Where the concrete slab over the tank is to take vehicle loading, it should be reinforced in accordance with good practice to take the maximum load and should be extended onto unexcavated ground. It is important that vehicle loading is not transferred to the tank itself.

8. Incorporate inspection cover frames in the normal manner.

Excavation details (mm)	200 Series	300 Series	400 Series	500 Series	600 Series
Minimum hardcore thickness - dependent on ground conditions	100	200	250	300	300
Concrete base slab thickness	150	150	220-240	240-300	250-300
Concrete surround thickness - dependent on ground conditions	100-150	150	200-250	250-300	250-300
Maximum initial water fill depths prior to backfilling	200	300	400	500	500
Tank internal diameters	1,200	1,800	2,600	3,500	4,000
Tank external diameter including ribs	1,250	1,875	2,700	3,650	4,150

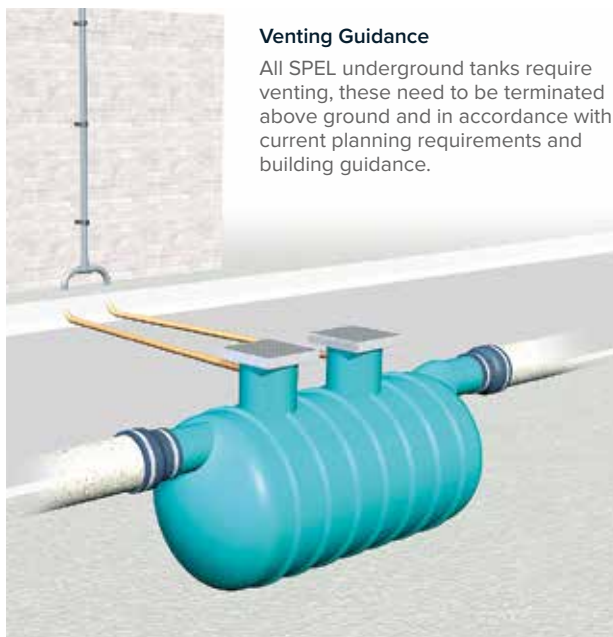
Venting SPEL Underground Tanks

General Venting Guidance



150, 225 and 300mm pipes are connected using Marley Quantum underground pipe system.

SPEL Stormceptor® by-pass separator installation illustrating venting and the SPEL automatic alarm/monitoring system.



Venting Guidance

All SPEL underground tanks require venting, these need to be terminated above ground and in accordance with current planning requirements and building guidance.

Venting and Ducting

All underground tanks must be vented to prevent the build-up of pressure/vacuum and/or dangerous and explosive gasses within the tank. The location of vent pipes must be considered at design stage to ensure the exit point is positioned where gasses and vapours will be dispersed safely into the atmosphere and meet current regulations for your specific site.

SPEL strongly recommend that this design is carried out by a suitably qualified engineer.

The vent pipe layout and design are the responsibility of the Engineer or Contractor, but we recommend checking for the following:

- 1 The vent pipe must fall back to the tank to avoid condensation build up blocking the vent.
- 2 Each chamber of the tank must be vented. Two or more vent connections can be manifolded into one vent stack above ground. If a vent stack per chamber is not possible, ensure the manifolding is above the highest possible surcharge point. This is to ensure no captured pollutants in the separation chamber/s can pass through and into other chambers or straight to the outlet.
- 3 Vent pipe termination locations should be chosen carefully to ensure they are in accordance with prevailing regulations for height and distance from building etc.
- 4 Wind and/or unusual air currents should be considered and allowed for.
- 5 The vent termination should not be less than 2.4m above the paving level, and no less than 1 m above the top, and 3m horizontally of any window or door opening.
- 6 Vent pipes must be 3m or more from any boundary.
- 7 SPEL vent systems are designed to be in 100mm pipe, and the terminations should be fitted with a fresh air inlet cowl or an air admittance valve to prevent flammable vapours escaping and to prevent animals and other debris from entering the vent.



Most SPEL tanks come with vent connections in the form of a grommeted 110mm socket where a 110mm O/D standard drainage pipe can simply be inserted. There is an option to request additional vent sockets, or these can be cut on site with the correct tools.

Alarms

Introduction

All SPEL tanks can be fitted with alarms depending on application and client requirement. These include oil and silt level detection for oil separators and SuDS treatment systems, through to level monitoring alarms for pump stations and fluid storage tanks.

Each alarm systems is supplied with instructions and can be fitted by a qualified person or SPEL offer a commissioning and support service to carry out the on-site setup and provide certification.

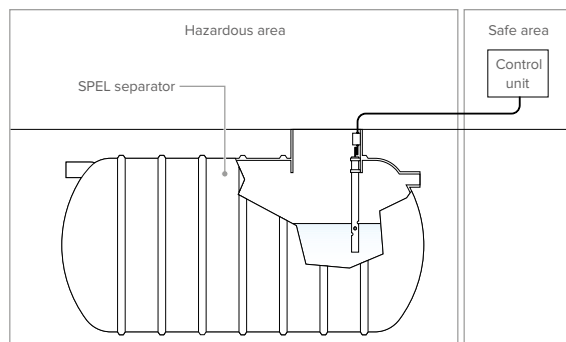
SPEL alarm systems include the following:

- Float switch alarms for high level monitoring
- Ultrasonic alarms for active level monitoring
- Oil and silt alarms for pollution monitoring
- System monitoring alarms for pump stations

For full details refer to Section 8.

Commissioning & Maintenance

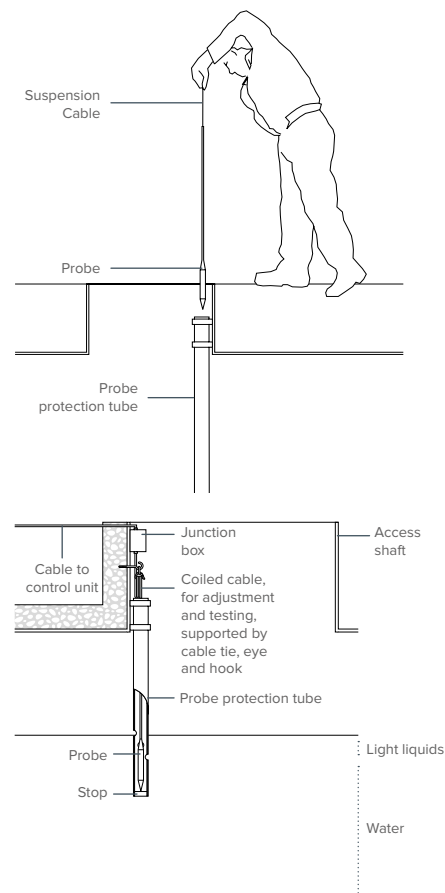
SPEL alarm systems are all designed to be commissioned and serviced from ground level.



Inserting probe on site

All that is required on site is to undertake the electrical installation in accordance with the instructions provided. Fix the plated hook provided in the position indicated and lower the probe into the probe protection tube until it locates onto the stop at the base. Coil excess cable and secure with the nylon cable-tie provided. The cable-tie eyelet is then hooked onto the hook to maintain the probe in the vertical position just touching the stop.

The probe protection tube is factory fitted and positioned to ensure the probe activates the alarm when the light liquids retained reach 90% of the storage volume the SPEL Separator is designed for.



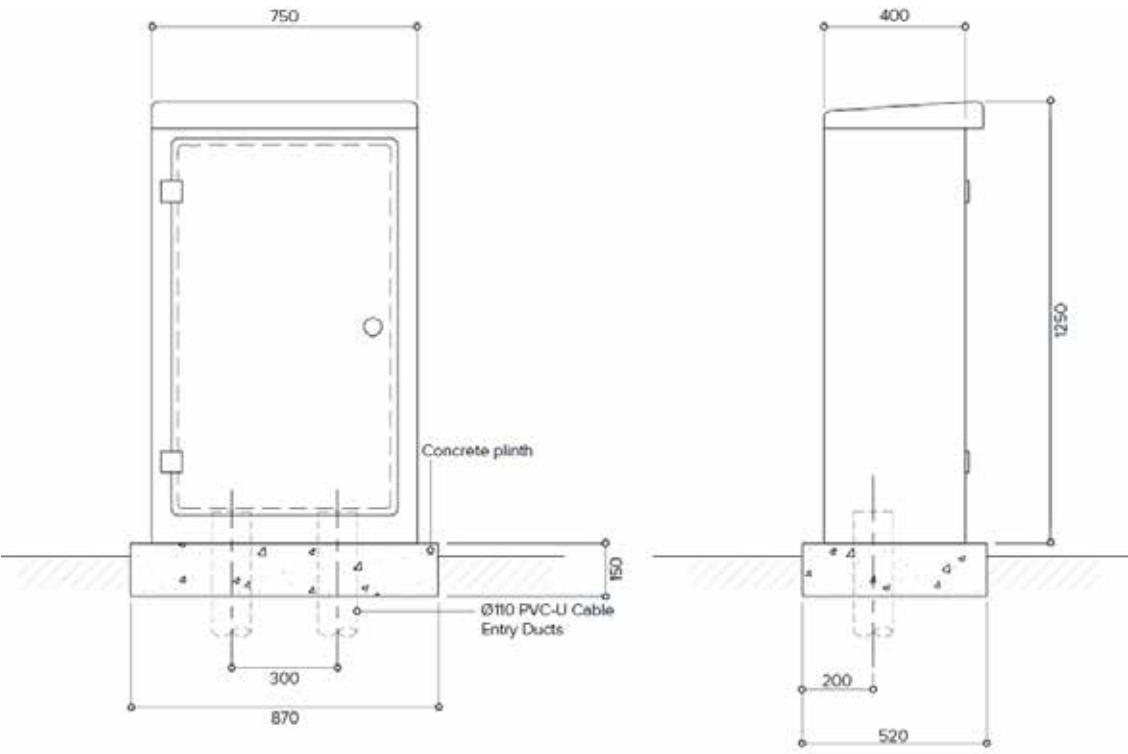
Alarm/Control Panel Kiosks

SPEL stock a range of kiosks designed to house the different alarm/control panels that come with the range of systems we supply. A full range of sizes is listed below and these are available with a single door on the smaller units and double doors on the larger units. For more details, contact our team.

Range of Steel and GRP Kiosks

Description	Size (mm H x W x D)
Mild Steel Small Single Door Kiosk	900 x 350 x 250
Mild Steel Medium Single Door Kiosk	1,250 x 750 x 400
Mild Steel Large Double Door Kiosk	1,250 x 1250 x 400
GRP Single/Double Door Kiosk	Similar sizes available on request

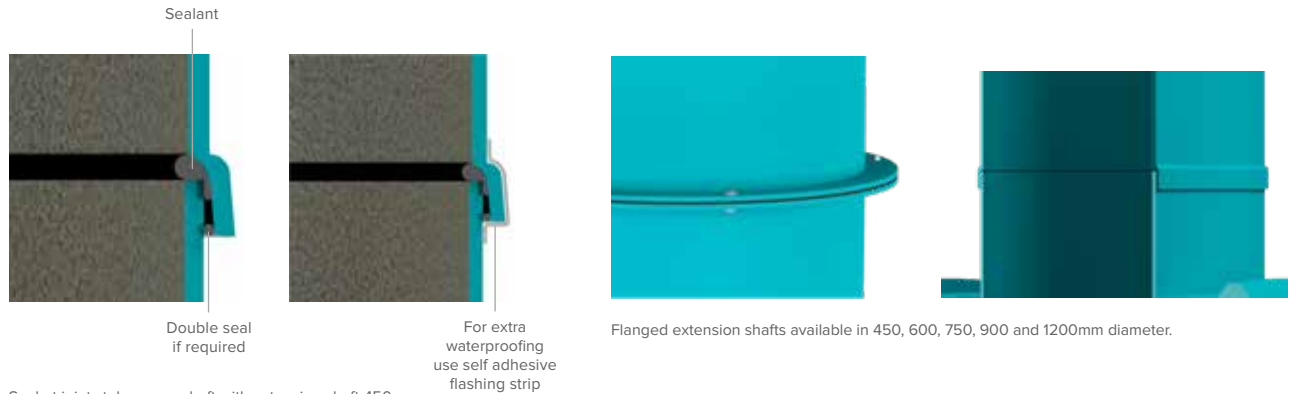
Concrete Plinth Detail



Kiosk Installation

SPEL Alarm/control panel kiosks usually have an internal fixing flange (as shown in below photograph) around the perimeter for bolting down to the concrete plinth. To install the kiosk, M10/M12 Concrete Anchor Bolts or Thunderbolts are suggested and a low modulus mastic sealant, to seal between the concrete and the internal fixing flange.

Extension Shafts



Socket joint stub access shaft with extension shaft 450, 600, 750, 900 and 1200mm diameter.

Access shafts are supplied in 450, 600, 700, 900 and 1200mm diameter. Rectangular shafts are supplied in 800, 900 and 1000 in 1000/1250/1500. GRP ladders can be incorporated for more access, complete with stainless steel fixings.

These are supplied in 500mm increments and are available in different laminate specifications to suit site-specific invert levels, ground conditions, and applications.

Backfill thickness for extension access shafts

Where tank backfilled with concrete surround a minimum of 150mm of concrete backfill around the extension shaft is recommended. Ensure the extension shaft is braced so that it does not distort. Ensure sealing of the socket of the extension shaft has been completed as either a single or double seal dependent on the water table level to ensure no water ingress into the tank. Consolidate by hand - do not use vibrating pokers.

Where tank backfilled with pea gravel surround a minimum of 200mm of pea gravel backfill/surround around the extension shaft is recommended. Ensure the extension shaft is braced so that it does not distort. Ensure sealing of the socket of the extension shaft has been completed as either a single or double seal dependent on the water table level to ensure no water ingress into the tank.

**All shafts come with flanges can be supplied with sealing strip for extra waterproofing. The be installed as two lines, each side of fixing holes.*

Manhole Covers and Frames

All SPEL tanks require manhole covers for the access shafts, a range is in stock to cover all diameters and in different load ratings. Please contact our team for further details.

Manhole covers range from the pedestrian rated smaller covers right through to large D900 covers for use in high load environments and can include options such as gas assisted lifting, 'fall arrest', and security grills.



SPEL Coalescer System

Installation

Important: ensure all coalescers are correctly seated in the coalescer cone moulding in the base of the tank prior to filling the tank with water.

SPEL Coalescer System without Guide Rails

Coalescers are factory installed in all 100, 200 and 300 Series Treatment Systems.

Coalescers for 400, 500 and 600 are delivered loose for on-site installation. It is important these are installed prior to filling the tank with water.

Optional lifting chains available for ease of maintenance.



SPEL Coalescer Guide Rail Systems

SPEL Guide Rail Systems are optional but strongly recommended for all tanks with deeper inverts or larger than 300 Series (1.8m dia.).

Coalescers with this system are always factory fitted.



SPEL Coalescer Lifting, Locating and Locking System (3L)

The SPEL 3L System has all the benefits of the above SPEL Guide Rail System and includes a locking mechanism and rigid lifting handle, this locks the coalescer in position and makes for easier lifting and locating.

3L System coalescers are delivered loose for on-site fitting, unless extension shafts are not required.



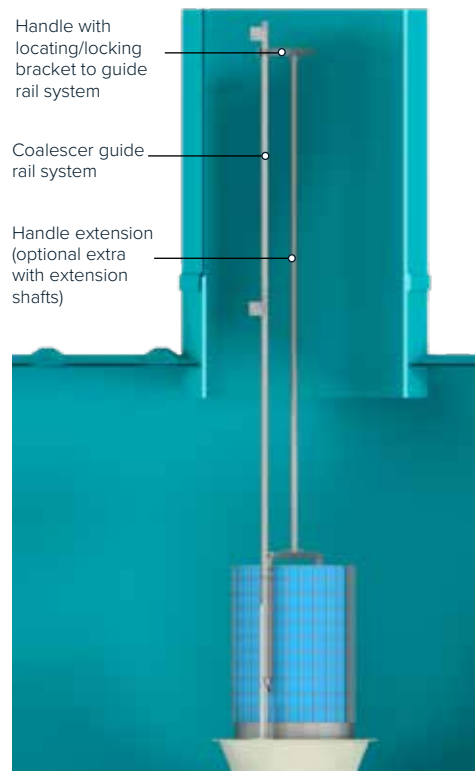
SPEL Clarifier Pack & Coalescer Installation

Installation Guidance



SPEL Smartceptor®

SPEL Smartceptors are supplied with a unique clarifier pack inserted in a stainless steel basket this needs to be positioned after the tank has been installed. Please note the clarifier pack must be positioned prior to the water ballast level reaching the basket location point.

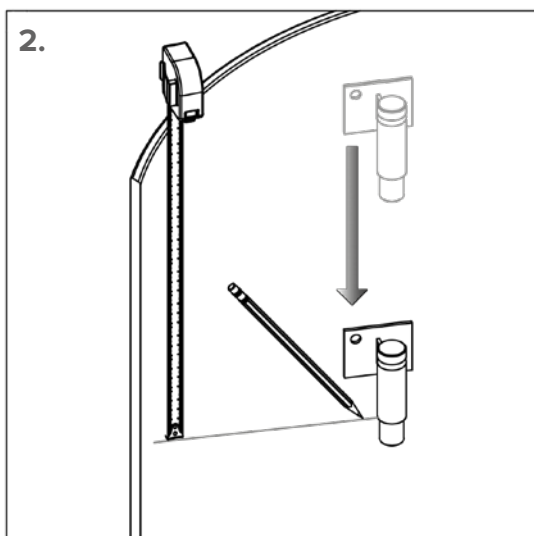
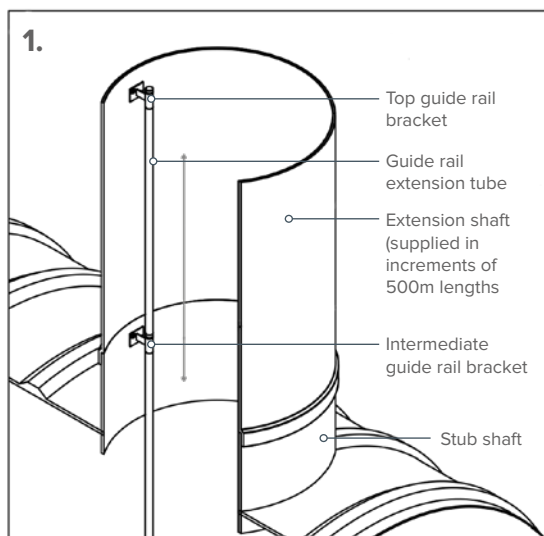


SPEL Coalescer

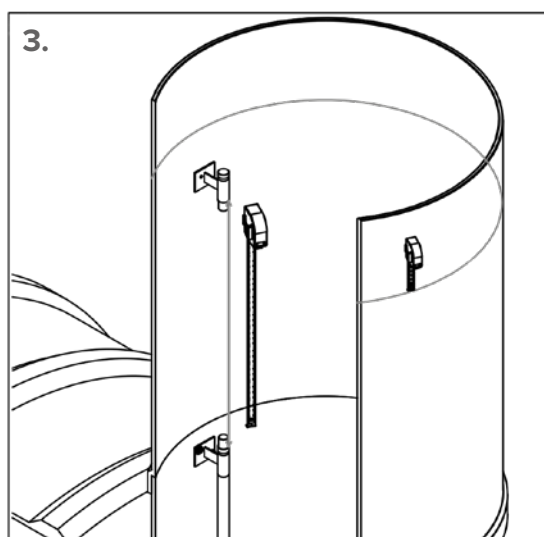
Normal servicing of the smaller SPEL Separators frequently requires emptying the unit completely providing access for the coalescer units to be taken out, cleaned and returned and guided accurately to their seating positions. However larger SPEL Separators may only require the hydrocarbon pollutants and silt to be removed.

In order to limit the servicing to sucking off the fuel/oil from the top and the silt from the bottom guide rails are required to ensure coalescer units are replaced into their correct positions.

Trimming SPEL Guide Rail Extensions



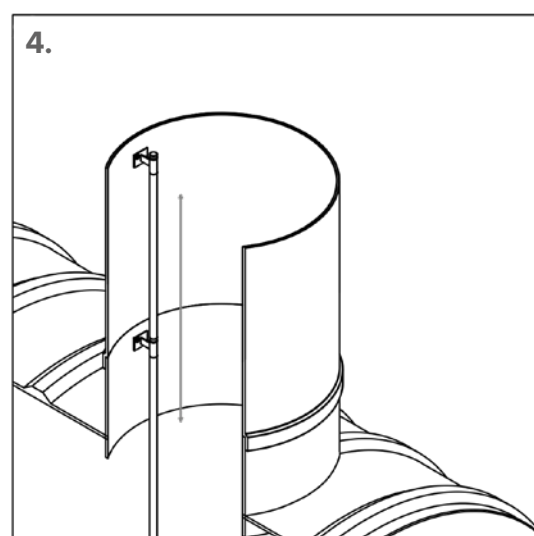
Measure the required depth from the top of the shaft, & mark a line from the underside of the top guide rail bracket spigot.



Measure the distance from the underside of top guide rail bracket and the top of the intermediate bracket in the stub shaft.

Cut the extension tube to length, then re-position between the brackets ensuring the guide rail is vertical and fix the top bracket to the extension shaft using the bolt, washers & nut sets.

Mark the required height of the extension shaft.



Cut the extension shaft to the correct height.

SPEL Automatic Closure Device (ACD) Installation

Overview

The purpose of the Automatic Closure Device (ACD) is to close the separator off automatically when the maximum capacity of light liquid/oil is reached.

The ACD is to ensure that in the event of a major spillage, pollutants do not pass into the drainage system; it should not be regarded as a substitute for an automatic alarm/monitoring system. The oil alarm and ACD are both required to comply with BS EN 858.

If the tank should fill with light liquid/oil the ACD, which is calibrated for a specific gravity of 0.85, will automatically sink and close off the SPEL Puraceptor®.

Normally routine maintenance would include removing light liquid intercepted within the Puraceptor®. If a SPEL automatic alarm/monitoring system is incorporated, it will automatically indicate when the Puraceptor® should be emptied. Only in an emergency will the Puraceptor® fill to its maximum and activate the ACD.

In such an event the Puraceptor® should be completely sucked out/emptied and the ACD lifted out.

Prior to installation

Prior to installation the ACD retaining tube should be covered with polythene to prevent ingress of concrete etc., which would fall onto the ACD and cause a malfunction.

Commissioning

SPEL Puraceptor® Smaller Models	SPEL Puraceptor® Larger Models	SPEL Puraceptor® Two Chamber models
<i>Class 1, single chamber models: Models P004/1C - P050/1CSC</i>	<i>Class 1, single chamber models: Models P065/1CSC and larger</i>	<i>Class 1 Two Chamber Models and Class 2 Single Chamber Models</i>
After the tank has been installed, leave the water in.	Where the ACD is already positioned in the unit, proceed as follows:	After the tank has been installed, leave the water in.
1. Remove the ACD from the packing box, taking care not to cause damage. <i>When moving the ACD ensure to carry by holding the float plates and stem. Do not carry using float ball.</i>	1. Before putting any water in the tank, lift rope attached to ACD up to the next knot and hang it from the rope hook. This is now in the 'operating position'.	1. Remove the ACD from the packing box, taking care not to cause damage.
2. Remove the retaining cap from the top of the retaining tube in the separator.	2. As soon as the water level in the tank is above the ACD, the rope must be removed altogether and the rope hook must be unbolted. Do not leave the rope hook attached to the shaft. Ensure the ACD automatically remains in the 'operating position'.	2. Remove the retaining cap from the top of the retaining tube in the separator.
3. Insert the ACD into the retaining tube using the lifting eye provided. Allow it to sink to the bottom. The stainless steel retaining plate should seat on the base flange and the ACD attain its operating position as shown in the open position.	3. Tape up or fill the hole(s) in the shaft where the rope hook was attached to prevent any backfill seeping into the shaft.	3. Insert the ACD into the retaining tube using the lifting eye provided, ensuring it floats correctly with the float just visible above the water level.
4. Replace the retaining cap. This is to safeguard against the removal of the float by unauthorised persons or rising above the tube under abnormal conditions.		4. Replace the retaining cap. This is to safeguard against the removal of the float by unauthorised persons or the ACD rising above the tube under abnormal conditions.

SPEL Automatic Closure Device (ACD) Installation

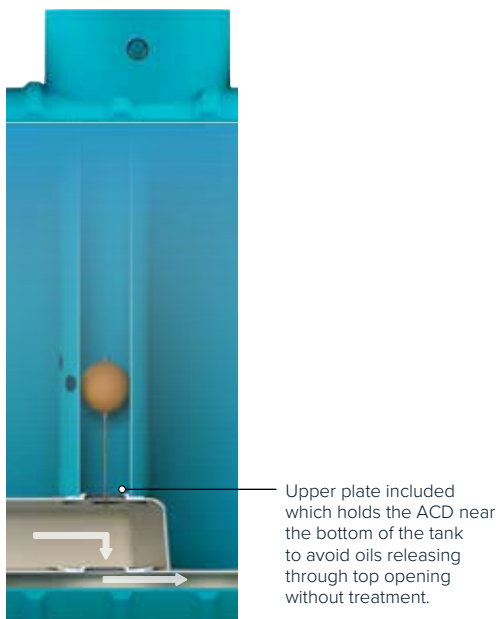
Installation

Note: If the tank's invert depth exceeds 1m it is advisable to remove the retaining cap prior to installation and only replace after inserting the ACD, if it is possible to do so from ground level.

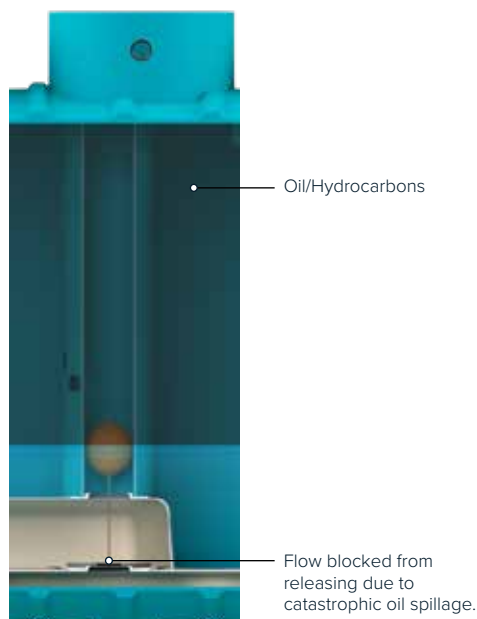
Retained ACD

Automatic closure device Type R (Retained) SPEL Puraceptor® class 1 separator (single chamber).

Open



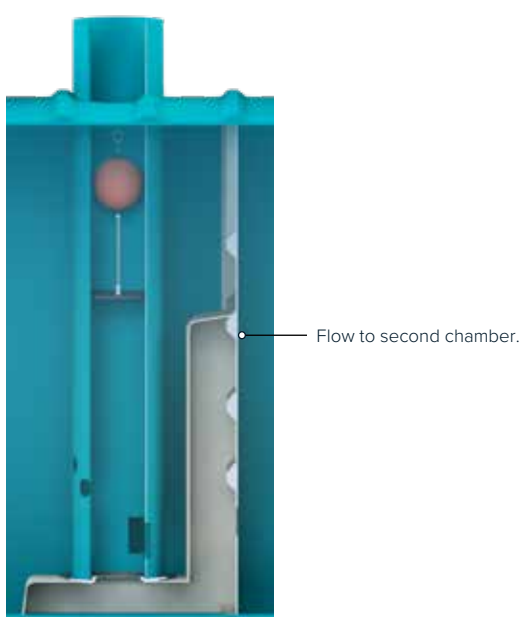
Closed



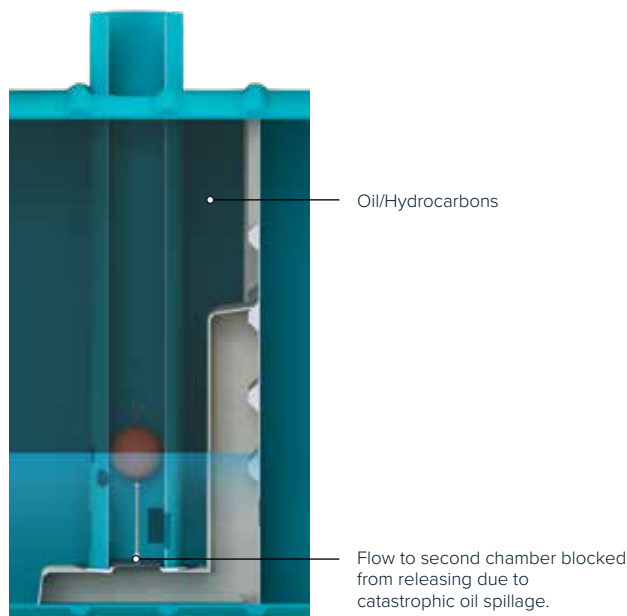
Floating ACD

Automatic closure device Type F (Floating) - SPEL Puraceptor® class 1 separators (two chamber) & full retention class 2 separators.

Open



Closed



Maintenance

Dependent upon site conditions it is advisable to remove the ACD periodically taking care not to raise it too quickly and damage the plastic/copper float. Clean from debris/silt to prevent premature closing. Check the seating in the base unit is free of debris/silt that could prevent proper closing in an emergency.

SPEL Silt Trap Installation Guidance

Installation

The SPEL Silt Traps are designed to be installed where the grating is at ground level.
The installation procedure is as follows:

1. Excavate allowing for a minimum thickness of concrete around the tank of 150mm.
2. Ensure the base of the excavation is stable ground or excavate to allow for 200mm of hardcore and cover with a polythene membrane prior to placing concrete.
3. Ensure the excavation is dry or dig a well in the corner of the excavation and pump water away.
4. Pour the concrete base slab, level off and allow to set.
5. Insert the tank, check inlet/outlet levels and position the grating onto the top flange.
6. Fill the tank with water to the outlet.
7. Backfill with concrete to half the height (500mm) and consolidate by hand. Do not use vibrating pokers. Allow to set.
8. Complete the backfilling with concrete up to the underside of the top tank flange.

IMPORTANT – Ensure the Grating flange is completely supported so that vehicle loadings are transferred from the grating through to the concrete surround and not onto the tank itself.

Standard Installation



SPEL Vertical Above Ground Tanks Installation Guidance

Introduction

These installation guidelines are set out to ensure that the SPEL Vertical Tanks are properly handled and installed. Failure to follow these installation instructions will make our warranty void and may result in tank failure.

Site access and conditions

It is the responsibility of the contractor to ensure sufficient access to good hard ground that is safe and suitable for off-loading.

Wide/long loads

Where the tank is of such size that police/private escort is required, delivery times given are estimates only. In the event of delays outside our control eg. police re-routing or escort delays, any extra charges that result will be forwarded to the contractor.

Off-loading/handling

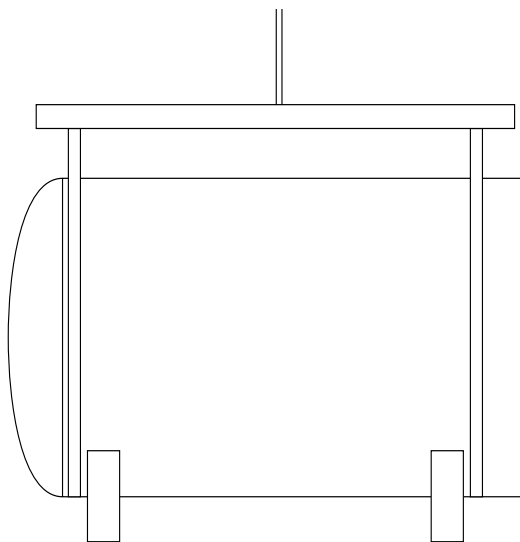
The contractor is responsible for off-loading. Tank handling during off-loading must be carried out with care to prevent rolling off the vehicle. Care must also be exercised to prevent accidental damage from impact or contact with sharp objects. Tanks should be lifted using slings, not chains or wire ropes. Do not drag tanks along. Do not lift with water in the tank.

Note: Where transport height restrictions prevent the tank being loaded in the vertical position on the transport vehicle, the tank will be loaded horizontally.

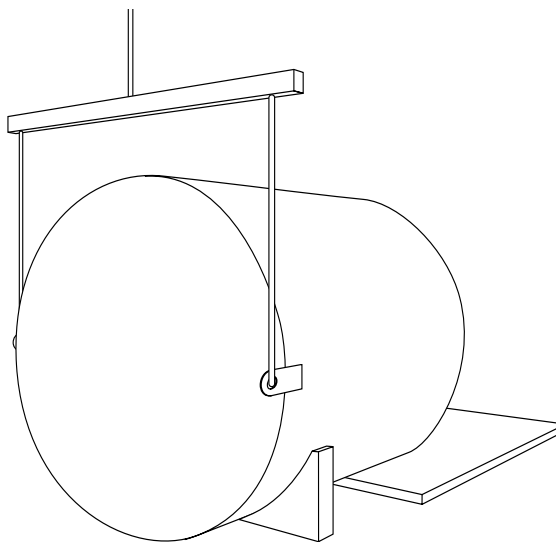
A spreader bar and lines to appropriate lifting lugs, or a clevis and lines to lifting lugs shall be used to unload tanks delivered on a flat-bed trailer. The angle between the lifting lines and top of tank must always be 60° or greater. When lifting lugs are not provided, tanks should be lifted off using two webbing slings and a spreader bar.

This method of unloading is shown in Figure 1. Large tanks should be righted, as shown in Figure 2, by hoisting with spreader bar and lines to lifting lugs. Adequate padding is necessary to protect the pivot joint. Care should be taken to keep control over the tank with guidelines to ensure the tank is gently brought to rest upon its base.

Use a spreader bar and lines or clevis lines to appropriate lift lugs to move tank when in an upright position. Ensure lifting equipment, lines and clevises are capable of handling the weight of the tank.



Lifting using two webbing slings and a spreader bar.



Hoisting with spreader bar and lines to lifting lugs

SPEL Vertical Above Ground Tanks Installation Guidance

Installation Instructions

SPEL Tankstor® tanks are designed to withstand normal handling procedures. Here are some normal precautions to follow to prevent damage to the tank.

1. Operators of hoist equipment should follow the proper rigging procedures at all times. Care should be taken to prevent the tank from swinging out of control.
2. Always lift - NEVER roll or slide a tank.
3. When moving a tank, do not drop or allow hard impact.
4. Never let tools strike or drop on either the inside or outside of the tank.
5. Ladders used inside the tanks should be wooden or have rubber protectors.
6. Workmen entering a tank should wear soft-soled shoes.
7. Never use cables or chains around the tank.
8. Never lift a tank by using any fittings or appurtenance other than lift lugs. When lifting lugs are not provided as part of the equipment, webbing slings of 75mm (3") minimum are recommended.

Note: Lifting brackets have been tested to 1/5 tonne each without failure. Using four brackets provides a minimum 4 tonne capacity.

9. When storing tanks prior to installation, tie down securely. Tanks should be placed only on firm level surfaces which are free of stones, tools and other small hard objects because these cause high stress points. When stored outdoors, vessels should be adequately secured to prevent movement due to wind or water floatation.
10. Do not allow cables, hooks, or the spreader bar to swing against the tank.
11. All connections to above ground tanks must be fully supported, no load should be exerted onto the tank connection.

Storage

Set the tank on smooth ground free of bricks and sharp objects. Chock/tie down to prevent rolling and movement especially in high winds.

Tank dimensions

Dimensions given on drawings and literature shall be subject to manufacturing tolerances and it is crucial that they are physically checked prior to installation.

Health and safety

Installation should be carried out by a competent contractor in accordance with the above procedures,

Health and Safety at Work legislation and good building practice.

It is not possible to cover every condition in these instructions, therefore if in doubt contact us.

Installation procedures

1. The support for flat bottomed vertical vessels should provide full and uniform support over the entire bottom area. The support base should be properly designed to prevent settling or deflection under maximum design loads.
2. The support base surface should be non-porous and free of cracks, depressions and vertical projections.
3. Vertical equipment having a cone or dished bottom will have an alternate type of mounting arrangement such as GRP skirt or steel support for legs. These must be considered as special cases, for each unit will have its own condition of load concentration. Special support design is therefore required for each individual installation.
4. Each flat bottomed unit should be set on a cushioning pad to minimise stresses caused by seams, shrinkage distortion and/or support base irregularities. Recommended supports for vertical vessels and tanks.

The recommended supports for vertical vessels and tanks are either:-

- a. a properly prepared concrete plinth; or
- b. a steel plate supported on an adequate grillage and of sufficient thickness to ensure that local strains in the flat bottom are not greater than the design's strain.
- c. sand or other granular material are not adequate supports and should not be used

When concrete bases are specified, departure from nominal level should not exceed $\pm 1\text{mm/m}$. Before bedding the tank or vessel, the concrete should be covered with bitumen sand to a thickness of 25mm.

A suitable bitumen sand can be produced by hot-mixing in the following proportions by mass:-

- $9\% \pm 0.5\%$ non-toxic cut back bitumen (ie fluxed with kerosene and not creosote)
- $10\% \pm 1\%$ filler either limestone dust passing a sieve of nominal aperture (size 75um in accordance with BS410) or Portland cement. $81\% \pm 1.5\%$ clean dry washed sand in accordance with table 2 of BS 882:1992.

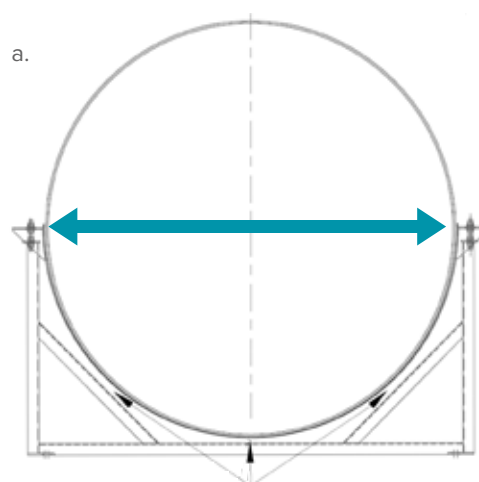
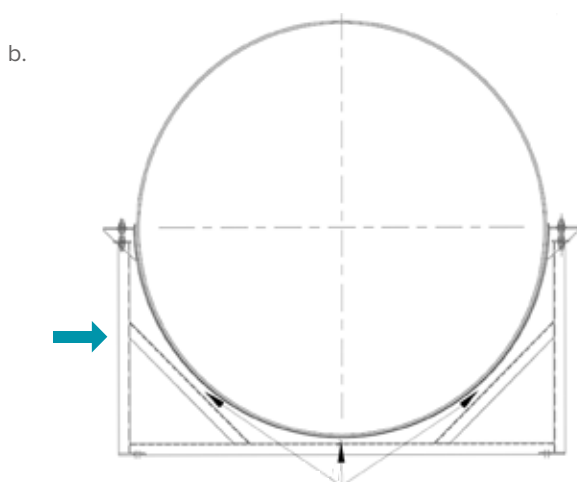
As an alternative to the sand, crushed rock types 1 to 7, slag or limestone in accordance BS 4987 may be used/

An alternative a suitable 25mm thick bedding mat that can stand a minimum 12 tonne/m² pressure can be used. (Polymaz Protek available from Poymax Ltd.)

SPEL Horizontal Above Ground Tanks Installation Guidance

Installation Using Galvanised Adjustable Cradles

1. Prepare a flat, smooth concrete base designed to take the required loadings.
2. Position the cradles on the concrete base in the exact positions as shown in the site specific SPEL Drawing provided after an order is placed.
 - a. When lining up the cradles, line them up against the vertical section, rather than the adjustable top plates. Vertical section shown by blue arrow in drawing below.
4. The steel straps must be adjusted by loosening the adjusting bolts on the adjusting plate and then retightening them at the required width. The gap at the top of the adjusting plates (the dimension shown by the blue arrows in the drawing below) should be around 50mm wider than the outside diameter of the tank shell to ensure that the tank does not touch the cradles as the tank is lowered into position. For example, on a SPEL 600 Series, the width between the adjusting plates should be 4050mm.



3. Drill for and fit suitable M20 hold-down concrete anchor bolts in the base plates of the steel cradles. Tighten them lightly so that the cradles will not fall over, but do not do them up tight at this point.
5. Check that the bottom of the Galvanised Steel straps on all the cradles are in-line and level to ensure that the tank is supported by all the cradles and is level along its length. The strap should be as low as possible, however a 5-10mm gap above the steel frame is required.



6. a.



- b. The SPEL Galvanised Steel Cradles in position and set out inline with the above instructions – ready for the tank to be carefully lowered into position.

SPEL Horizontal Above Ground Tanks Installation Guidance

Installation Using Galvanised Adjustable Cradles

7. Position the tank into the cradles, ensuring that the cradles line up with the tank exactly as per the site-specific SPEL drawing provided.

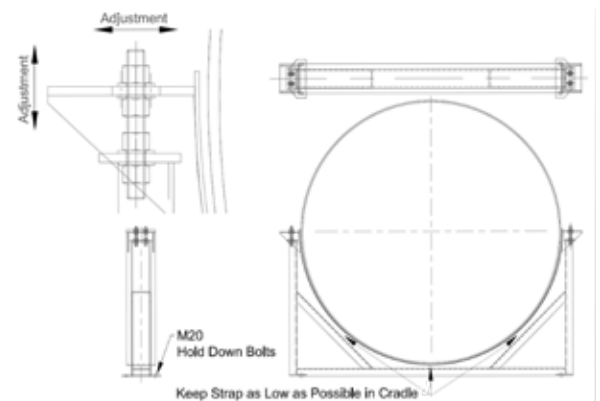
a.



- b. A photograph of an aboveground tank being lowered into position.

8. The tank should sit as low as practical in the cradles (i.e. the cradle straps should be as low as practical) to minimise any bending movement applied to the threaded studs.
9. The bolts on the adjusting plates should now be slowly loosened to allow the adjusting plates (and therefore the steel straps) to slowly close in towards the tank to ensure the tank sits snugly all the way around the steel strap. The adjusting bolts can be loosened on both sides of the cradle to ensure that the tank sits snugly in the cradle. Once the tank is sitting snugly in the strap, the adjusting bolts should be tightened up.
 - a. It is suggested that you start at one end of the tank and move down the tank one cradle at a time.
 - b. The strap should be as low as possible, however a 5-10mm gap above the steel frame is required.

10. After adjusting all the cradles to sit the tank snugly onto the cradles, it is worth checking every cradle again to ensure that the loosening of other cradles has not affected the snug fit of every cradle. Loosen and readjust any cradles as required to ensure that the tank sits snugly in every cradle. Only adjust 1 cradle at a time.
11. Once all adjusting is complete, it is essential that all adjusting bolts are tightened up to prevent any further movement.
12. Fill the tank with up to 400mm of water and check underneath the tank to ensure that every strap is supporting the tank shell.
13. Tighten the anchor bolts to fix the cradles to the concrete slab and prevent no further movement of the cradles.



DS.150 June 2008 Amended Dec 09