

Bulk LPG Storage at Fixed Installations – Buried / Mounded LPG Storage Vessels

The following points should be taken into consideration when designing underground LPG installations.

Layout of Vessels

Before installing tanks it must be ensured that:

- There is a clear line of sight for a person whilst in position to control a product transfer to see both the receiving vessel and the delivery vehicle.
- The site must be properly accessible.
- Suitable provision must be made for positioning of cathodic protection anodes.
- Adequate emergency escape routes are available.

Location and Spacing of Vessels

Storage vessels, whether buried or mounded, should in general be spaced and located in accordance with Table 2. The distances refer to the horizontal distance in plan between the valve assembly or vessel shell (as specified) and the nearest point of a specified feature (such as an adjacent storage vessel, building or boundary).

Underground Services and Installations

Other services, gas water, electricity, telecommunications etc., should not pass through the vessel excavation.

Table 2: Minimum Separation Distances for Mounded / Buried Vessels

Vessel Water Capacity (Litres)	Distance from Buildings, Boundary, Property Line or Fixed Source of ignition			
	To Vessel Surface (Metres)	To Valve Assembly (Metres)		Distance between Vessels (Metres)
		Without Gas Dispersion Wall	With Gas Dispersion Wall	
150 to 500	1	2,5	1,5	1
>500 to 2 500	1	3	1,5	1
>2 500 to 9 000	3	7,5	4	1
9 000 to 135 000	3	7,5	4	*
135 000 to 337 000	3	11	6	*
>337 000	3	15	8	*

• The spacing between adjacent vessels should be determined by site conditions and need for safe installation, testing and maintenance.

Flooding

Buried storage vessels should not be sited in areas prone to flooding. Consultation with the local river authority may be appropriate.

Protection from damage from Vehicles

Vessel location should be selected to minimise the risk of physical damage to vessels from vehicles. Where necessary, protection should be provided by bollards, barriers or other suitable means. Vessels should not be located under public rights of way.

Covering the Vessel Area

The vessel should be back filled to the top of the hood with sand. Where cathodic protection is used, no continuous concrete or tarmac covering should be permitted over this area.

Trees or deep-rooted shrubs should not be permitted within the separation distances shown in Table 2.

Multiple Vessel Installation

Multiple vessel installations should be designed and installed as follows:

- (a) The minimum separation distance between vessels, buildings and boundaries should be as shown in Table 2.
- (b) LPG vessels should not be installed above or below other LPG vessels.
- (c) Consideration should be given to the possible effects of additional excavations on existing buried tank installations.

Gas Dispersion Walls

General

Gas dispersion walls permit separation distances to be reduced. They should be of such a length that the distance from the valve assembly to a boundary or fixed source of ignition source measured around the end of the wall is not less than the relevant separation distance given in Table 2 for an installation without a gas dispersion wall.

Construction and Siting

The following considerations apply to the construction and siting of gas dispersal walls:

- (a) A gas dispersion wall should be imperforate, substantially constructed from brick, concrete or solid masonry and should not be less than 0.5m in height.
- (b) Gas dispersion walls should not be provided on more than two sides and normally only on one side. Where two walls are being considered the Enforcing Authority should be consulted.
- (c) If a dispersion wall is built on a property boundary it should be wholly under the control of the occupier of the LPG site.
- (d) There should be no holes or openings in the wall.
- (e) Gas dispersion walls should be constructed on sub-soil and with the foundations clear of inert back fill material.
- (f) Gas dispersion walls should not be sited so as to direct rain water onto the LPG vessel.

Vaporisation Rates

Available propane vapour off take rates from buried / mounded vessels will generally be less than those for equivalent size above ground vessels because the heat transfer from soil / backfill is generally lower than can be achieved in the open air.

The many factors involved preclude an accurate calculation method for assessing the off take rate available for a particular service requirement. Practical experience has nevertheless indicated that a rate of 50% of that for an equivalent above ground vessel in equivalent service conditions is a reasonable basis for vessel sizing.

Back-Filling and Mounding

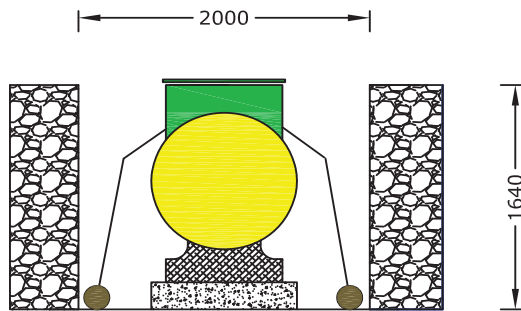
Appropriate Materials for Backfilling and Mounding

For vessels with a cathodic protection system, graded sand, uncontaminated soil or other inert material should be used for the back fill or mound.

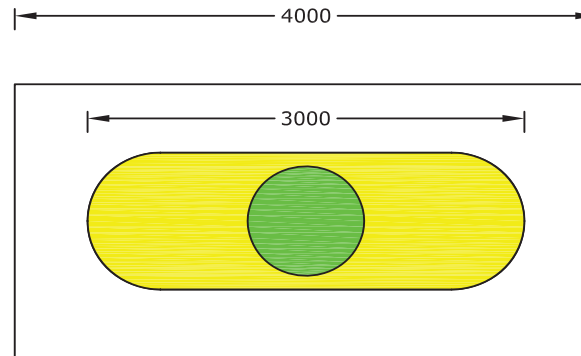
Excavated material may be used for back-filling provided that it doesn't contain sharp rocks or stones that could damage the surface protection of the vessel and graded sand is immediately adjacent to the vessel shell.

As required excavation depths vary, please contact Flogas Technical Services for more detail when required.

BELOW GROUND TANKS 1 TONNE UNDERGROUND TANK

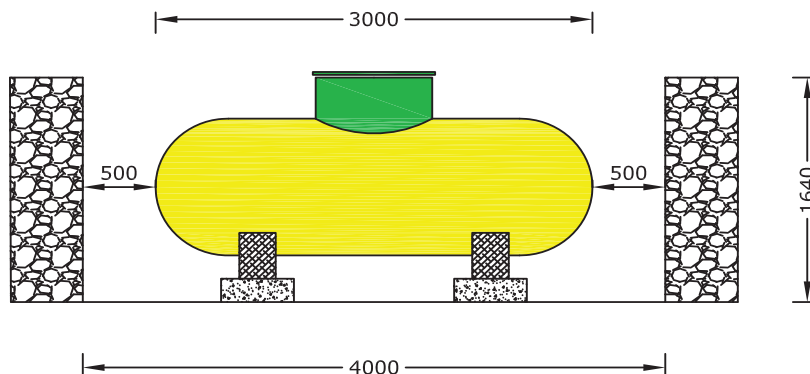


Flogas Engineers will carefully place the cathodic protection.



Tank base should be at least 4000mm x 2000mm and be a minimum depth of 100mm concrete on a hardcore fill.

The area surrounding the tank should be back filled with sand up to the level of the tank hood.



Gas tanks must be 3000mm from buildings, boundaries and fixed sources of ignition, or 1500mm from boundary with a fire wall inbetween.
The tanks should be no more than 30m from the gas tanker and the driver must have a clear line of sight from the tanker to the vessel being filled.

FLOGAS TECHNICAL SERVICES MUST BE CONSULTED TO CONFIRM DIMENSIONS BEFORE PREPARING ANY UNDERGROUND TANK EXCAVATION.



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PROJECT:
TECHNICAL SERVICES MANUAL

TITLE:
1 TONNE UNDERGROUND TANK

DATE: JULY 2008

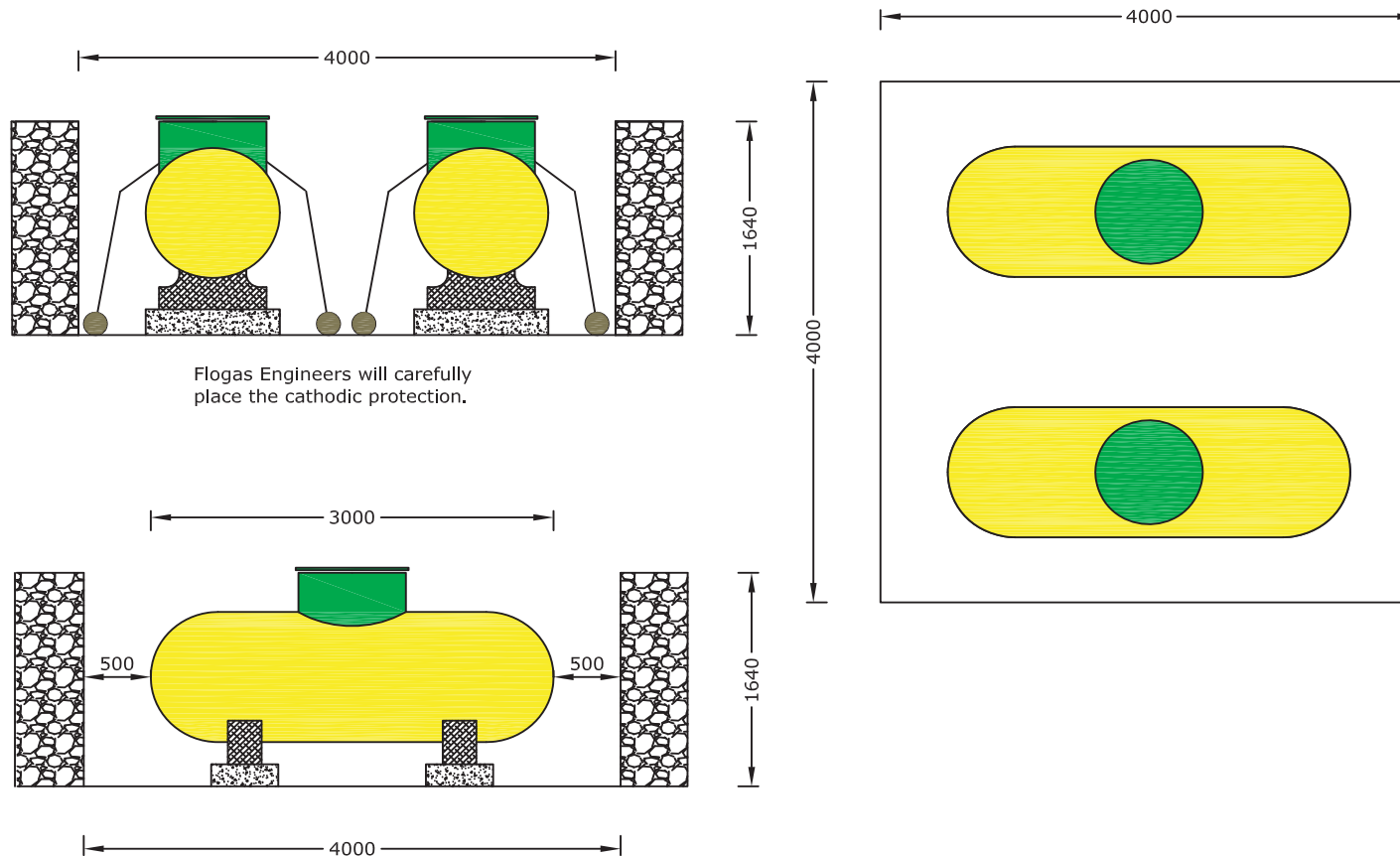
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BELOW GROUND TANKS 1 TONNE UNDERGROUND TANK (2 TANK LAYOUT)



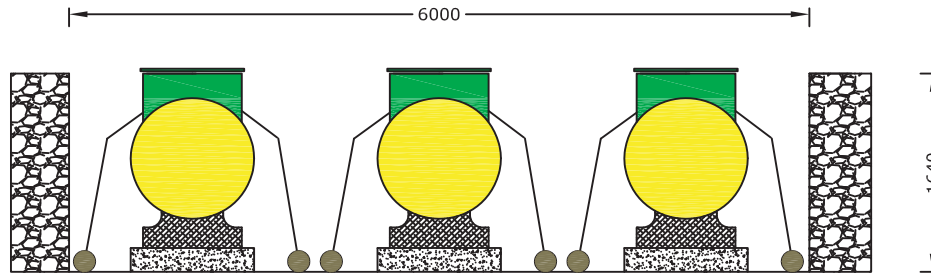
Tank base should be at least 4000mm x 4000mm and be a minimum depth of 100mm concrete on a hardcore fill.

The area surrounding the tank should be back filled with sand up to the level of the tank hood.

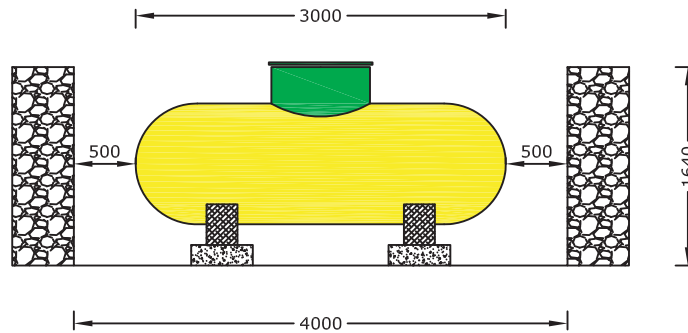
Gas tanks must be 3000mm from buildings, boundaries and fixed sources of ignition, or 1500mm from boundary with a fire wall inbetween.
The tanks should be no more than 30m from the gas tanker and the driver must have a clear line of sight from the tanker to the vessel being filled.

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BELOW GROUND TANKS 1 TONNE UNDERGROUND TANK (3 TANK LAYOUT)

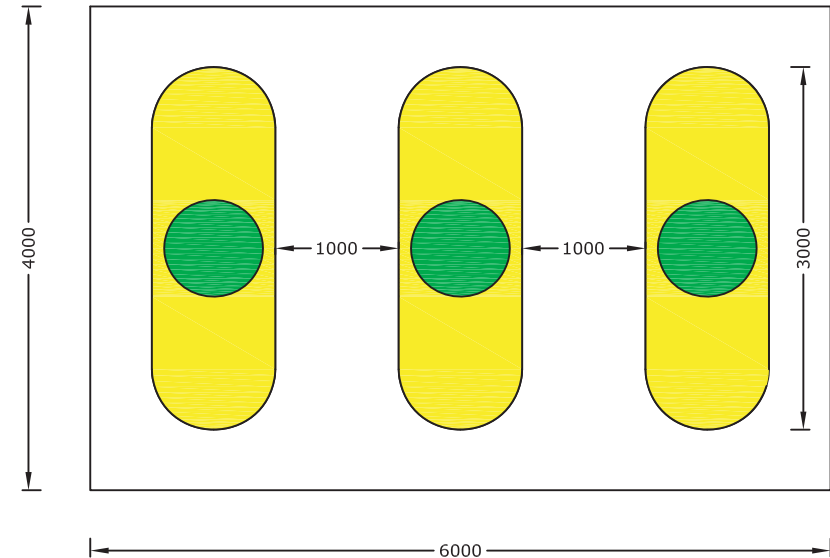


Flogas Engineers will carefully place the cathodic protection.



Gas tanks must be 3000mm from buildings, boundaries and fixed sources of ignition, or 1500mm from boundary with a fire wall inbetween.
The tanks should be no more than 30m from the gas tanker and the driver must have a clear line of sight from the tanker to the vessel being filled.

FLOGAS TECHNICAL SERVICES MUST BE CONSULTED TO CONFIRM DIMENSIONS BEFORE PREPARING ANY UNDERGROUND TANK EXCAVATION.



Tank base should be at least 6000mm x 4000mm and be a minimum depth of 100mm concrete on a hardcore fill.

The area surrounding the tank should be back filled with sand up to the level of the tank hood.

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PROJECT:
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TITLE:
1 TONNE UNDERGROUND TANK
3 TANK LAYOUT

DATE: JULY 2008

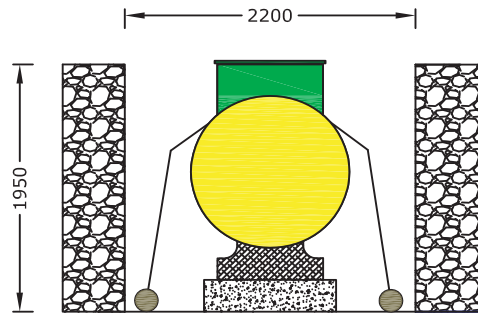
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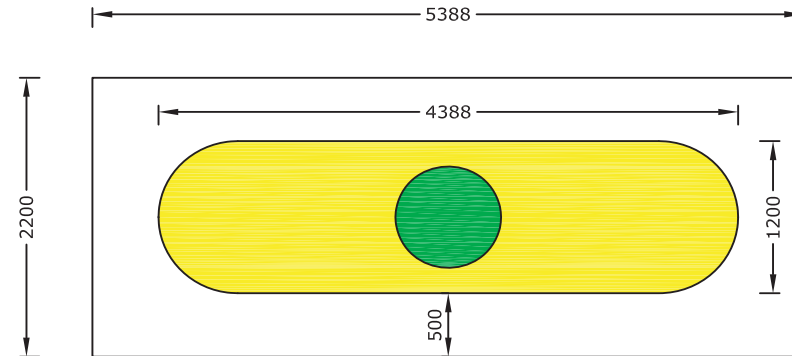
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BELOW GROUND TANKS 2 TONNE UNDERGROUND TANK

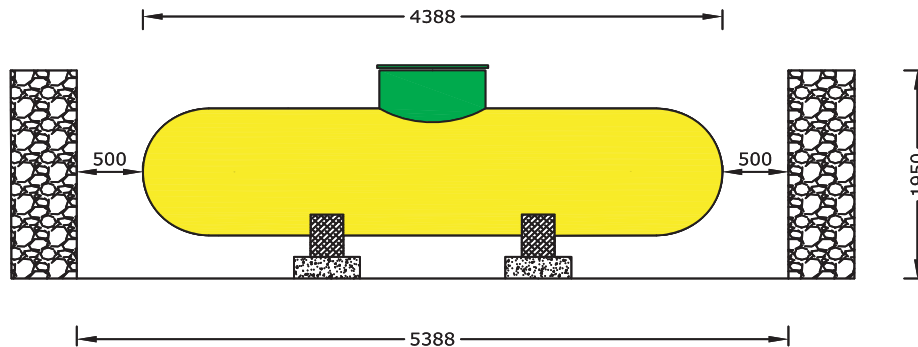


Flogas Engineers will carefully place the cathodic protection.



Tank base should be at least 5388mm x 2200mm and be a minimum depth of 150mm concrete on a hardcore fill.

The area surrounding the tank should be back filled with sand up to the level of the tank hood.



Gas tanks must be 7500mm from buildings, boundaries and fixed sources of ignition, or 4000mm with a fire wall inbetween. The tanks should be no more than 30m from the gas tanker and the driver must have a clear line of sight from the tanker to the vessel being filled.

FLOGAS TECHNICAL SERVICES MUST BE CONSULTED TO CONFIRM DIMENSIONS BEFORE PREPARING ANY UNDERGROUND TANK EXCAVATION.



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PROJECT:
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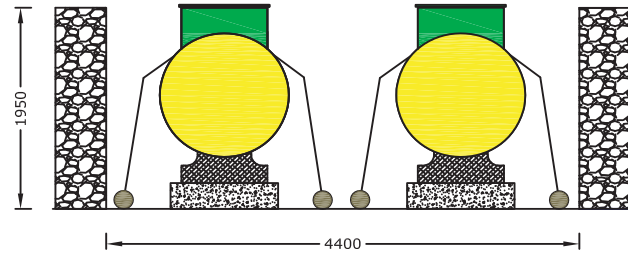
TITLE:
2 TONNE UNDERGROUND TANK

DATE: JULY 2008 SCALE: NTS

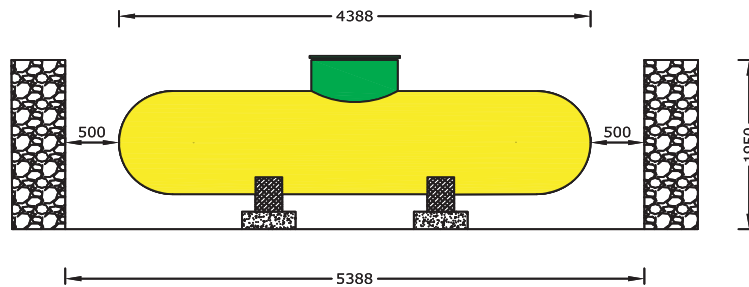
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BELOW GROUND TANKS 2 TONNE UNDERGROUND TANK (2 TANK LAYOUT)

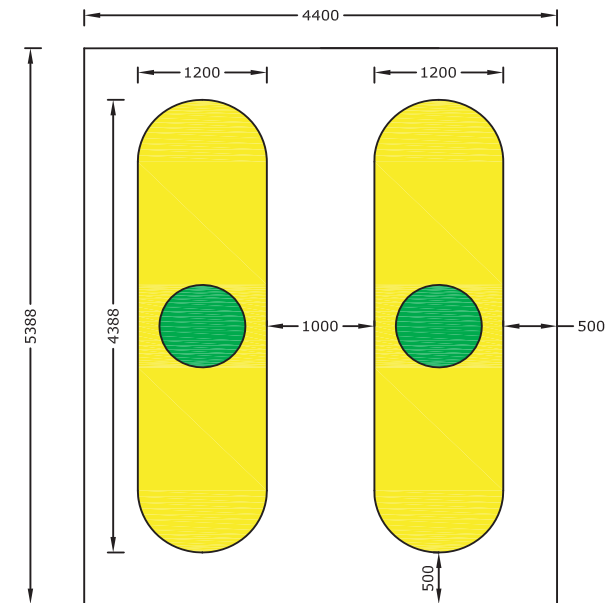


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Gas tanks must be 7500mm from buildings, boundaries and fixed sources of ignition, or 4000mm with a fire wall inbetween.
The tanks should be no more than 30m from the gas tanker and the driver must have a clear line of sight from the tanker to the vessel being filled.

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Tank base should be at least 4400mm x 5300mm and be a minimum depth of 150mm concrete on a hardcore fill.

The area surrounding the tank should be back filled with sand up to the level of the tank hood.



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PROJECT:

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TITLE:

2 TONNE UNDERGROUND TANK
2 TANK LAYOUT

DATE: JULY 2008

SCALE: NTS

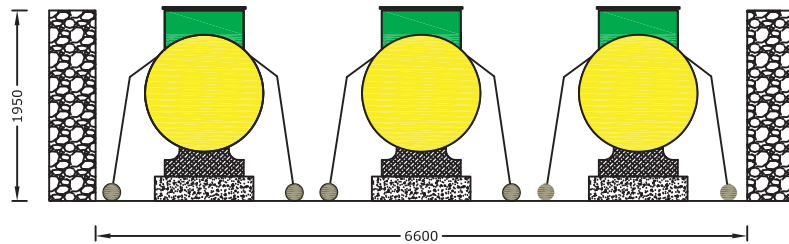
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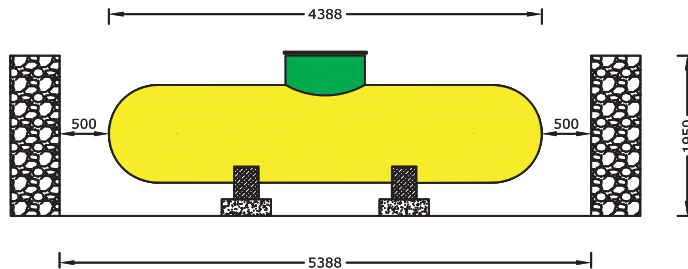
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BELOW GROUND TANKS 2 TONNE UNDERGROUND TANK (3 TANK LAYOUT)

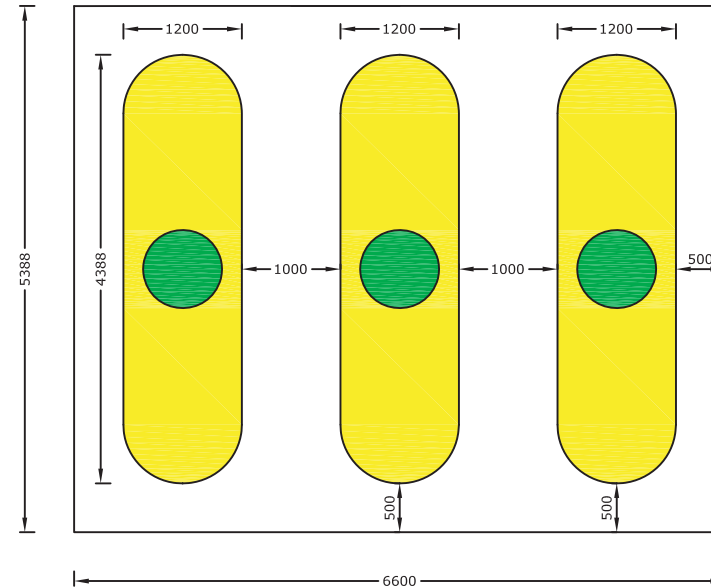


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The area surrounding the tank should be back filled with sand up to the level of the tank hood.

Tank base should be at least 5388mm x 6600mm and be a minimum depth of 150mm concrete on a hardcore fill.