How Do You Safely Store Fuel in A Building?

When you're designing a building or commercial complex where a critical power backup solution is required, you'll need to include a stand-by generator (genset) and a fuel source to ensure power is maintained for the specified number of hours should the power go out.

For critical situations such as data centers healthcare facilities and large commercial buildings, the most viable is currently diesel-powered generators and although other solutions are being researched, diesel is still the simplest to specify, install and manage for all parties involved in the foreseeable future.

Furthermore, emergency and stand-by diesel generators units are relied upon at many more sites, including coal and nuclear power plants, as well as industrial, commercial, medical, and educational facilities. This means that almost anywhere power is generated, you'll find diesel is stored. And it needs to be stored correctly and safely.

We recommend you go through the AS1940:2017 Australian Standard that will answer most questions. This can be purchased from: https://infostore.saiglobal.com/. The AS1940:2017 standard is recognized across Australia and New Zealand as well as many other Pasic Island nations and is written specifically for 'The Storage and Handling of Flammable and Combustible Liquids'. The objective of the Standard is to promote the safety of persons and prevent damage to property and the environment where flammable or combustible liquids are stored or handled. More specifically, this standard tells us how to correctly store fuel inside a building.

However, to make you compliance process and journey through the project simple, in this article we will highlight the areas you need to focus on. We'll be recommending varying solutions, some of which may not be the right fit for your project. But it any case, it is our mission to make your job simple, no matter what fuel storage method you end up specifying.

In this document, we go over the three different options you have when it comes to storing fuel in a building, helping you to specify a compliant solution for your project or client.

Tank Location

Refer to clause 5.6 of the AS1940 Standard mentioned above. This piece is related to the 'Location and Capacity of Indoor Tanks' and you'll find clause 5.6.2 outlines three ways or positions within a building where you can place your tank. See below some helpful hints we offer on each option.

a. A double-walled tank below the lowest floor level, installed in accordance with clause 5.12. this is an underground tank, or in common terms, **dig a hole and bury it**
b. A single wall tank placed in a tank chamber or a sand-filled chamber, in accordance with clause 5.13. this is commonly referred to as a single wall **tank in a fire-rated room.**
c. A tank having integral secondary containment with an FRL of 240/240/240 and complying with clause 5.9. this is commonly referred to as a '**Fire-rated tank'** and is fast becoming the simplest way to comply.

Here's a brief comment on these three options.

1. **Burying your tanks underground – go to clause 5.12 in AS1940:2017**

While this can be an excellent way of saving space in a tight location, it does come with some implications that need to be considered, including the overall cost, a more complex installation process, the possibility of hidden services. All these can cause delays during the construction process. The completed solution will need an on-going monitoring program and may be difficult to inspect and repair. Leaks aren't easily visible, and overall, the underground solution is a big expense with no ability to relocate or remove a 'end-of-life'.

The costs associated with installing underground tanks can be higher than those for setting up an above ground tank and may ***require expensive excavation work, including a variety of permits, land use consents and specialized equipment for the installation***. If burying a tank within a building, other factors you need to consider include access pits for servicing, proximity to property boundaries and building foundations and corrosion protection.

2. Tanks located in a fire-rated room – Go to clause 5.13 in AS1940:2017

This method is not as difficult as underground. In the construction phase, you will need to consider that the walls, roof, and all penetrations in/out of the room need to have an FRL (Fire Resistant Level) of 240/240/240. Fire-rated Ventilation/dampers will also need to be installed. *You will need to design a removable roof tank placement* and a fire-rated door that is designed to stay closed. There are specific separation distances from other tanks that need to be kept to, along with services, foundations of the building and boundaries or other properties to be considered in keeping a safe distance from. In addition, the whole room will require water-tight bunding to be able to contain the volume of the largest tank in it.

It's important to ensure that the concrete products used to construct the room have certification to the FRL (Although commonly referred to as fire-rating, the correct term to describe the fire resistance of a building element is FRL – Fire Resistant Level). The FRL is the ability of a building element to withstand a fire under test conditions for a certain period and consists of the three criteria being structural adequacy, structural integrity, and insulation. This means that if a building element was exposed to a standard fire test, it would not be expected to fail for 240 minutes, (4 hours) in each of the three criteria:

- Structural Adequacy: For a period of 240 minutes (4 hours) the product being tested was able to support a load while subject to fire conditions.
- Integrity: The product did not disintegrate or crack so as to see flames of the fire of for gases to escape.
- Insulation: The product being tested did not transfer an average temperature reading that exceeds 180°C above the ambient temperature.

In effect this comes with most of the difficulties and is potentially more expensive to install than going underground.

3. Using a Fire-Rated Tank with FRL of 240/240/240 – Go to clause 5.9.4 of AS1940:2017

Specifying a 4-hour fire-rated tank is fast becoming the simplest way to store fuel in a building. Although it takes up space where the underground tank does not, comments have been that the overall flexibility, cost, and time savings make it worthwhile. These few notes will explain clause 5.9.4 of the AS1940 Standard where

it discusses this option of storing fuel in a building.

While AS1940 defines fire resistant level (FRL) in terms of AS1530.4 and this standard applies specifically to building construction, clause 1.4.24 clearly requires each of structural adequacy, integrity, and insulation to be demonstrated on the complete tank. Where the complete tank is subject to a recognized US standard test, only a 4-hour fire rating would be deemed equivalent to an FRL of 240/240/240. An example of an appropriate test is the 4-hour liquid hydrocarbon pool fire test to an appropriate SwRI (Southwest Research Institute).

Accordingly, a 4-hour fire-rated tank that complies with AS-1940 in regard to the SwRI-93-01 & 95-03 Standards is permitted by clause 5.9.2(a) and (b) are, by virtue of clause 5.9.4(c), "regarded as complying with the requirements for tanks in chambers (see clause 5.13.1 and 5.13.2)". this means that accordingly, the 4-hour fire-rated tank may store flammable or combustible liquids inside a building.

So, in summary, in our opinion it is a sensible decision and one with a lot less implications to make your choice the 4-hour fire-rated tank that complies with the SwRI 93-01 & 95-03 standards and therefore meeting all compliance requirements. We are now in an age where the community is much more aware of the potential risks of pollution and flooding, and we have very strict regulations covering fuel storage and the consequences and penalties for any neglect can be huge.

Best engineering practice and design of fuel storage tanks has continued to develop to a point where about ground storage tanks offer 100% integrity. This has been achieved mainly by the introduction of the fire-rated tanks with advanced leak detection and online contents monitoring.

The Fuelchief team and our suppliers and manufacturers work very closely to provide the very best solution for your application.