Protection of Flammable and Combustible liquids relies on 5 things:

**ISOLATION**

**CONTAINMENT**

**VENTILATION**

**CONTROL OF IGNITIONS**

**ACTIVE PROTECTION**

The purpose of this guide is to help you assess the protection at your facility. However this document should only be considered a guide and not a definitive document. For further information on the hazards and protection requirements please contact AIG.

**Isolation**

- Ideally all flammable and combustible liquids should be stored in detached buildings, located downhill and away from any areas of value. Although this is rarely possible, this should be the first consideration.
- Alternatively all areas with flammable and combustible liquids should be in cut-off rooms with 2hr fire walls designed to prevent a spill of liquids leaving the area.
- Maximum volume within a single flammable liquid control area depends on the liquid characteristics. Contact AIG if you would like guidance on the acceptable volumes of your liquids.

**Containment**

In all areas where flammable and combustible liquids are stored or used, adequate containment is required to limit the size of a pool fire.

**Sizing Containment**

- Containment should be designed to hold:
  - 100% of the largest spill;
  - an allowance for 30 minute sprinkler water discharge;
  - an additional 5cm freeboard.
- The largest spill should be considered the two largest metal containers and 100% of the contents of all glass or plastic bottles.
- Smaller containment areas reduce the surface area of the liquid which means less heat is generated. The risk is reduced and any protection will be more effective.

**Minimizing the Size of Bunds**

Containing the liquid in a smaller area means larger bunds which are often difficult to install, and can limit access and operations. However, before looking to increase the containment area, first consider the following:

- Minimise the amount of liquids stored within any area. In process areas the volume should be limited to the requirement of only 1 shift;
- Replace plastic or glass containers for flammable or combustible liquids with metal safety containers to reduce the size of the largest spill.
- Provide flammable liquid safety cabinets to store small quantities of flammable liquids, however remember:
  - the bunding within the cabinets should still be capable of containing the largest spill; and,
  - where provided, Flammable Liquid Safety Cabinets should always be kept shut.
- Enhance your sprinkler protection with foam and reduce the allowance of sprinkler water discharge from 30 minutes to 10 minutes. This is because flammable and combustible liquids are often lighter than water so float above the water discharged from sprinklers. However, foam will sit on top of the burning liquid extinguishing the flames.
- Install emergency drainage capable of draining the sprinkler water, at the rate of discharge, to a safe location and remove the allowance for sprinkler water discharge.
- Install Listed or Approved Pop-up Barriers, which lay flat during normal conditions but that rise automatically when a leak is detected.

**Liquid Transfer**

When transferring liquids from one area to another, containment remains critical to prevent a large spill.

**Hard Piped Systems**

Hard piped systems are considered the safest way to transport flammable and combustible liquids around your facility as they;

- Ensure only the liquid immediately required is within a process area;
- Offer a safe way to isolate the movement of liquid in the case of a fire; and,
- Remove the human element from the process.
If flammable and combustible liquids are hard piped at your facility, the following should be checked:

- Ensure the bulk tank is isolated from the main operation and the liquid is contained.
- All pipework within your facility should be welded or seamless steel piping.
- Threaded pipe fittings, flanged connections and grooved couplings should be avoided.
- Do not use piping materials that could fail in a fire such as plastic, rubber or copper.
- If flexible piping is required use a braided metal hose.
- Ensure the system is bonded and grounded.

**Pumped Systems**

Pumping flammable and combustible liquids is the preferred method to feed hard piped systems as they offer maximum control of the liquid and easy shutdown.

If flammable and combustible liquids are pumped at your facility check:

- The arrangement of the system to ensure that the minimal amount of liquid is automatically pumped, only when there is a demand. For example a diesel generator should only be filled when the level is low, and the generator is operating. This will mean that the pump does not start if a downstream pipe breaks.
- Provide high-level alarms to shut off pumps if required.
- Install interlocks between the pumps and the site fire alarm system to shutdown all systems not associated with fire protection safely and quickly if a fire is detected the pump should shut down.

**Gravity fed systems**

Gravity fed systems can be more difficult to isolate than a pumped system, however if properly arranged the result is the same.

If flammable and combustible liquids are transferred via a gravity fed system at your facility ensure:

- A safety shut-off valve is available on the flammable liquids bulk container, interlocked with:
  - the fire alarm system;
  - leak detection installed in all areas where the liquid is piped or used; and,
  - high-level alarms.
- The system is arranged to only transfer a minimum amount of liquid.

**Manual transport**

If a hard pipe solution is not available, only self-closing, Approved or Listed Flammable Liquids safety containers should be used to transport liquids around the site.

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**Ventilation**

Remember - It is not the liquids that burn, but the vapours that are released from the liquids surface.

To understand if ventilation is required at your facility, please contact AIG.

Remember if mechanical ventilation is provided, it is important that the ventilation is operating. Provide alarms, interlocked with process equipment to ensure operations are stopped if ventilation fails.

**Control of Ignitions**

**Hot work**

Hot work should not be permitted in any Flammable Liquid Areas. If any work is required then all liquid and residues should be removed from the room and equipment.

**Electrical Equipment**

Within Flammable Liquid Areas, electrical equipment should be either:

- removed from the area, or
- Intrinsically safe Hazardous Atmosphere Electrical Equipment that is Listed or Approved for the hazardous environment should only be used. to the extent required by the local or national regulatory standards.

**Static**

When dispensing liquids from one container to another, efficient earthing and bonding should be provided between the two containers to prevent the generation of static.

**Oily Rags**

When not in use, cleaning rags and other flammable liquid contaminated waste materials must be kept in self closing and tightly sealed metal containers.

**Combustible Absorbents**

Do not use sawdust or other combustible materials to clean-up flammable or combustible liquid spills due to the risk of spontaneous combustion. Ensure non-combustible industrial absorbents are available for this purpose.

**Other Combustibles**

Flammable Liquid Areas should not be used for the storage of other combustible materials such as packaging or wooden pallets.

**Active Protection**

- Fixed automatic sprinkler protection should be considered essential for all flammable liquid operations.
- Foam enhancement should be considered as this will improve the effectiveness of the protection and can limit other factors such as bund size as mentioned above.
- Gaseous extinguishing systems are less effective as they are unable to cool the liquid. If you have a gaseous system protecting your flammable liquid operations, contact AIG to understand the adequacy and effectiveness of your protection.

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Bring on tomorrow