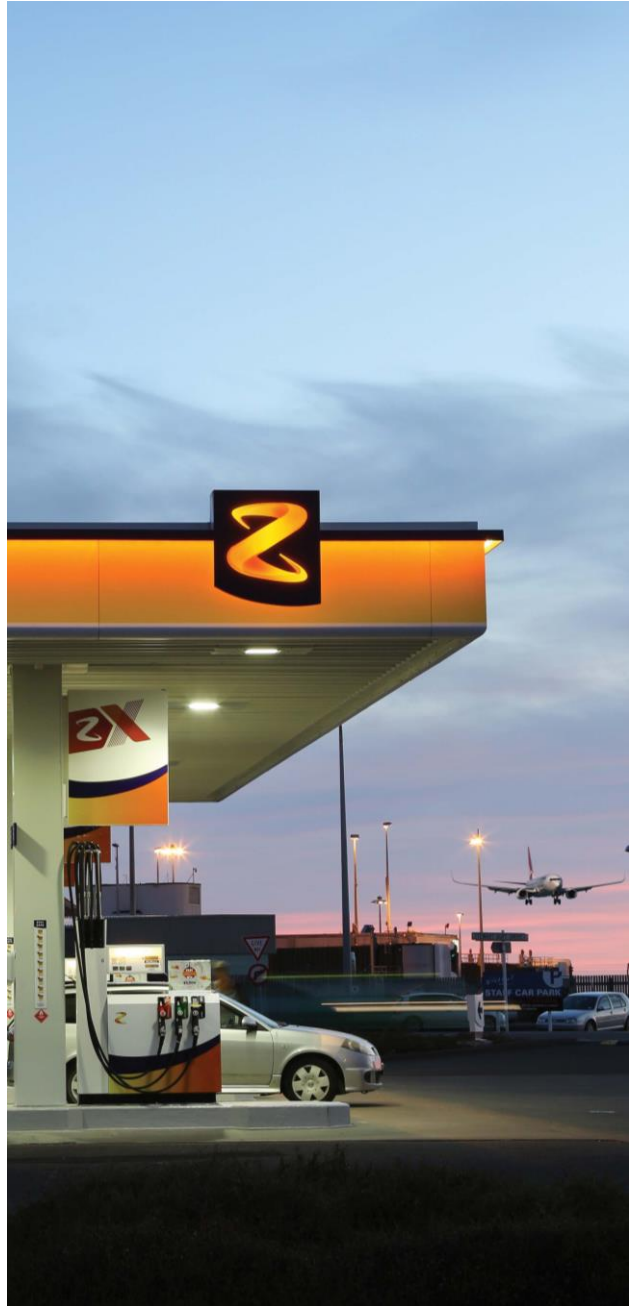


Hot work

HS-IOA-GUI-013



Revision Summary

Version	Author	Reasons for Change	Approver	Date Approved
1.0	M Imamura	New document	M Guantero	29 Aug 2018



1: Purpose and scope

This document sets the requirements for performing Hot Work for and on behalf of Z Energy Limited (Z).

Definition of Hot Work

Hot Work is work that may create sufficient energy to ignite flammable gases or combustible dusts. As Hot Work involves the use of ignition sources, sufficient controls must be in place – as recorded in the relevant HITRA, that assures separation or isolation from any plant / process / procedural activity that include the handling of fuel resulting in release of fuel or vapour

The following are some examples of Hot Work:

- Welding, soldering
- Fires or naked flames
- Use of non-flameproof or non-intrinsically safe electrical equipment, including, but not limited to electronic measuring devices e.g. lasers, thickness testers, cameras, non-rated torches etc. Exceptions to this are low energy, (<3v), enclosed devices e.g. hearing aids, car key remotes, and watches).
- Power cutting/drilling
- Hand tools that may create a spark
- Spark ignition or non-approved combustion ignition engines in operating areas and tank compounds
- Work on live electrical conductors and opening live electrical enclosures
- All welding, grinding and allied work. Such work shall comply with AS1674 "Safety in Welding and Allied Processes" (Parts 1 and 2).
- Water blasting

Flammable gases/combustible dusts

Flammable or explosive vapours may be present in a vessel that has held any of the following:

- Any volatile liquid that releases flammable vapour at atmospheric pressure. Examples: petrol, acetone, white spirit, methanol.
- A non-volatile oil or solid that releases flammable vapour when heated (some of these substances undergo thermal cracking). Examples: diesel oil, tar, greases, linseed oil, tallow, soap.
- An acid that reacts with metals to form hydrogen. Examples: sulphuric acid, nitric acid, hydrochloric acid.
- Combustible solid, finely divided particles of which may be present in the form of an explosive dust cloud. Examples: fibreglass, milk powder, sulphur.

Ignition source

A source of energy sufficient to ignite a flammable or explosive atmosphere, or material (dust, grass, paper, timber, etc.)

Applicability

This document applies to all persons working for and on behalf of Z or its subsidiaries, i.e. employees, contractors, sub-contractors, franchisees, and retail site staff, as well as visitors and other third parties on premises operated by Z or its subsidiaries.

Compliance shall be the responsibility of all employee, contractor, retailer and retail site staff or 3rd parties working for or on a Z area of business. This is a Z document and adherence is not required in any area controlled exclusively by another third party.

The requirements of this document, shall apply in addition to any applicable laws and regulatory requirements, including the latest code of practice such as NZS 4781:1973 Code of practice for safety in welding and cutting and WorkSafe Guidance on Hot Work on Drums and Tanks. This document takes precedence only where its requirements exceed those of applicable laws and regulatory requirements.

All applicable laws and regulations shall be complied with when performing any work, either within or beyond the scope of this document.



2: Hazards



Electrical



Mechanical equipment



Hazardous atmosphere



Tools

Applicable LifeSavers



Comply with safety document requirements

Always get an approved permit before work starts



Work in clear air

Check for gas when working in hazardous zones and keep all ignition sources out



Be clear headed and alert

Never let alcohol, drugs or other factors impact your ability to work safely and effectively

3: References

External References

- Health and Safety at Work Act 2015
- WorkSafe Guidance on Hot Work on Drums and Tanks (<https://worksafe.govt.nz/topic-and-industry/hot-work-on-tanks-and-drums/>)
- AS1674 "Safety in Welding and Allied Processes" (Parts 1 and 2)
- NZI Hot Work Fire Safety (<http://www.nzi.co.nz/Documents/NZI%20Risk%20Solutions%20%20Hot%20Work%20Safety.pdf>)

ZORM Documents

- Z's Approach to managing operational risks
- Z's Approach to managing operational integrity
- Z's Permit to Work Manual
- Z's Drug and Alcohol Policy
- Managing fatigue at Z - QRG
- PPE Matrix - QRG
- PPE Specifications – QRG
- Work Permit form
- Hot Work Certificate

4: Roles and responsibilities

General Manager-BU	<ul style="list-style-type: none"> • Ensure business unit compliance to this procedure
HSSE Operations Manager	<ul style="list-style-type: none"> • Responsible for maintaining and confirming the implementation of this procedure
Senior Permit Issuer	<ul style="list-style-type: none"> • Ensure any tasks that involves hot work is managed under the Z Permit to Work System (PTW)
Permit Issuer	<ul style="list-style-type: none"> • Confirm that the hazards associated with the hot work have been identified and assessed and that the identified controls are adequate to perform the work in a safe and environmentally-sound manner prior to authorising and issuing the Permit to Work • Verify work location after 30-minute cool down period (where fire watcher continuously monitor) is safe and no fire hazard remains.
Permit Holder	<ul style="list-style-type: none"> • Completes a Safe Work Method Statement (SWMS)/Hazard Identification and Task Risk Assessment (HITRA)/Job Safety Analysis (JSA) that reflects the Hierarchy of Control before hot work commences • Ensure only a competent person performs hot work • Ensure all equipment used comply with relevant code of practice or regulation, be fit for purpose, well maintained and certified where required



Fire Watch

- Trained (within the last 24 months) in the use of fire extinguishers
- Be familiar with the facility's fire alarms, emergency stops and emergency equipment and procedures.
- Monitor the Gas Detector/s, and will stop Hot Work activity in the event of an alarm.

In the event of a fire, the Fire Watch shall immediately:

- Extinguish any fire, where it is possible and safe to do so.
- Raise the alarm, using the most appropriate fire call point, site emergency telephone number (where this exists), radio, or other pre-planned means.
- Notify the Site Manager and/or the Permit Issuer.

In a non-emergency situation, the Fire Watch shall:

- Ensure that the conditions specified on the permit are being met.
- Prevent ignition of any flammable material.
 - Stop the job and notify the Permit Issuer, and/or the Site Manager, of any change in conditions that may affect the work.
 - Be alert at all times for any changes in process conditions that may affect the work.
 - Prevent the taking of samples, venting or opening of piping or equipment in the immediate area of the Hot Work where such action would release flammable liquids or vapours.

Upon completion of the job,

- Maintain a continuous worksite presence for 30mins allowing for a cool-down period.
- Ensure that any fire-fighting equipment is returned to its original location and condition.

For hot work within a confined space, at the discretion of the Permit Issuer, and where there is deemed to be no compromise to safety, the roles of Fire Watch and Standby Person for the same job may be filled by the same person. A Fire Watch, however, must be a separate person to that physically doing the hot work.

For hot work outside of a confined space at the discretion of the Permit Issuer, and where there is no compromise to safety, the Fire Watch can be a designated member of the work crew not directly involved in the Heat source, such as a Tradesman's assistant (TA) or similar. Where the work is within 8 meters of a potential open source of vapour or liquid such as a Pump raft or Loading rack then a dedicated Fire Watch shall be appointed.

Authorised Gas Tester

- Appointed by the Permit Holder
- Responsible for taking the necessary steps to confirm that the atmosphere in, on and about the work area means the work can be performed in a safe manner.
- Trained and experienced to perform the gas testing and to operate the gas testing device.
- Verify the instrument is working correctly, interpret and apply the results given by the equipment.
- Bump test gas detectors, before each day of use and record results .
Remove gas detectors from service that have failed bump test.

5: Requirements

All Hot Work shall be managed under the **Z Permit to Work System** (PTW).

Work permit is required for all Hot Works in a hazardous zone.

A **Hot Work Certificate** must be used in conjunction with the permit to provide a higher level of detail on the controls to be put in place to manage the activity.

Ensure **hazardous zone classification** is up-to-date and followed, and **hazardous zone drawings** are available and accessible. Zones are marked and demarcated on site. The classification system is up to date. In areas where hazardous zones extend over the boundary into the public domain, ensure hazards are isolated or controlled.



5.1 Hierarchy of controls

At all times, when performing Hot Works make a risk assessment and apply the “Hierarchy of Controls”, in descending order. Apply additional risk controls so far as reasonably practicable.

5.1.1 Eliminate the risk

Avoid hot work where possible. To eliminate requirements for hot work activities, consider the following:

- Install equipment that is assembled with mechanical connections instead of welded ones.
- Change existing equipment designs to use bolted assemblies instead of welded ones.
- Use safer alternative equipment:
 - Replace tack welding or brazing with self-tapping screws.
 - Replace sweat-soldered pipe with threaded pipe.

5.1.2 Isolate the hazard

- When hot work is essential, ensure that workers are not exposed to unnecessary risks. Designate an area specifically constructed, protected and arranged to accommodate and manage hot work.
- If the hot work object cannot be moved and if all fire hazards cannot be relocated, provide guards to confine the heat, sparks and slag and protect the immovable fire hazards.

The following should also be considered to ensure area within 10 meters of any hot work is managed appropriately:

- Floors are clean and free from combustibles
- Combustible floors are wet down and covered with damp sand, metal or other shields (e.g. fire blanket)
- Any combustible material or liquid is removed from the area
- Immovable combustibles are protected with covers (e.g. fire blanket), guards or metal shields
- All drains are covered
- If working at an elevated area, ensure that area below is barricaded

5.1.3 Minimise the hazard

- Where it is not possible to eliminate the risk, reduce hot work hazards by substituting tools, such as:
 - Substituting electric arc-stick welding with Heli arc welding
 - Replacing open-flame torches with electric heat gun
 - Trading torch soldering for electric soldering iron
- Control release of dangerous substances at source. Prevent the formation of an explosive atmosphere, ventilate, drain and/or purge all equipment and piping before hot work is conducted. Collect, contain and remove any releases to a safe place.
- Establish a “Fire Watch Duty” to oversee the hot work. By default, a **Fire Watch is required for all hot work in hazardous area**. The PI may, however, apply judgment and an assessment of any risks likely or present on the site during the work, to waive the requirement (e.g. Electrician conducting circuit testing using low voltage multimeter).
- Ensure that the sprinkler system and fire alarm system (if installed) are operational and hand operated fire extinguishers are readily available
- Check that all equipment are in good working condition
- Restrain and secure all compressed gas cylinders
- Reduce the number of employees exposed to the risk – Ensure only the require worker complement work in the area. Isolate area from unauthorised persons.

5.2 Gas testing

5.2.1 Pre-work testing

Worksite Gas Testing is to be completed as part of the Permit Issuer initial worksite inspection. **Gas testing must be conducted for all Hot Work where there is potential for flammable atmosphere to exist**, performed by a Z Authorised Gas Tester. The test results shall be recorded on the Worksite Gas Testing section of the relevant Permit form.

When a known source of ignition is present, the intention is to keep the work area clear of flammable vapours. Examples include; Welding, thermal or oxygen cutting, heating, including fire-producing or spark-producing operations that may increase the risk of fire or explosion.



A hot work permit shall not be issued if the atmosphere is found, by measurement with an approved and correctly calibrated gas detector, to be anything other than 0% LEL.

The worksite gas test should be taken as close as practicable to the time of commencement of the work. When the work ceases, the atmosphere shall be retested before recommencement of work. The extent of gas testing required before a permit is issued or revalidated shall be determined by risk assessment, and shall take into account conditions including but not limited to vapours coming from adjacent operations.

Test the area. When in the vicinity of storage tanks and other containers, properly test and if necessary continuously monitor all surrounding tanks or adjacent spaces (not just the tank or container being worked on) for the presence of flammables and eliminate potential sources of flammables, including the opposite side of any plating to that on which the hot work is to be carried out.

Gas detectors

Gas Detectors shall be bump tested each day before use.

In addition to the required start of day bump test, the requirement for, and frequency of any on-going testing, shall be determined by the Permit Issuer who shall record the result of each gas test. These records shall be maintained for the life of the instrument. A separate log is to be retained for each instrument.

5.2.2 Continuous gas testing

With a view to best practice - **Continuous Monitoring will be the default requirement for gas testing for Hot Work within Hazardous Areas.**

Gas Detection is to remain in place at the worksite for the duration of the Hot Work activity. Continuous monitoring at the worksite is the only way to have "live" information on the current condition of the atmosphere at the worksite. Results are to be recorded on the Hot Work Certificate.

Factors such as wind conditions and adjacent activities need to be considered on the day, and taken into account when positioning the gas detector/s. Consider where vapours could migrate from into the Hot Work site. For example - it is acknowledged that welding activities do produce toxic fumes that can interfere with detectors, therefore, the gas detector location needs to allow for this, and be in an "up-stream" position of the welding activity. This will also aid in detecting vapours coming from upwind.

The appointed Fire Watch will have responsibility for monitoring of the Gas Detector/s, and will stop Hot Work activity in the event of an alarm. Work can only re-commence once the source of the alarm is determined, retesting confirms 0% LEL, and the permit issuing PI has authorised work to restart.

5.3 Hot work activity

As flammable vapours can migrate unseen, all Hot Work activities within the facility except in designated safe areas need to be considered as possible sources of ignition and therefore Hot Work controls need to be employed. Of particular concern are drainage systems feeding interceptors, which have the potential to hold product/vapours. Work within 15metres of these areas needs to employ specific controls – e.g. drain covers to prevent vapours entering/exiting.

Unless working in a designated safe area (refer Permit Manual definition), due to varying day-to-day activities and simultaneous operations (SIMOPS), the Permit Issuer will need to consider what is happening, before ruling out the need for gas detection.

1. Where flammable vapours are expected - NO Hot Work will proceed until area has been confirmed clear of vapours.
2. Where flammable vapours are possible, i.e. draining and disconnecting of pipework, this will be performed under a Work permit. Where the work is in the public area – which presents additional un-controlled sources of ignition - an area cordon around the worksite is to be established. For example - 3-metre cordon "Public Exclusion Zone" from vapour source is set-up around the worksite. This may need to include traffic management where appropriate.

This assumes low levels of vapour and dispersion through natural ventilation. Hot Work can only proceed once gas testing has confirmed area is gas freed Examples include;

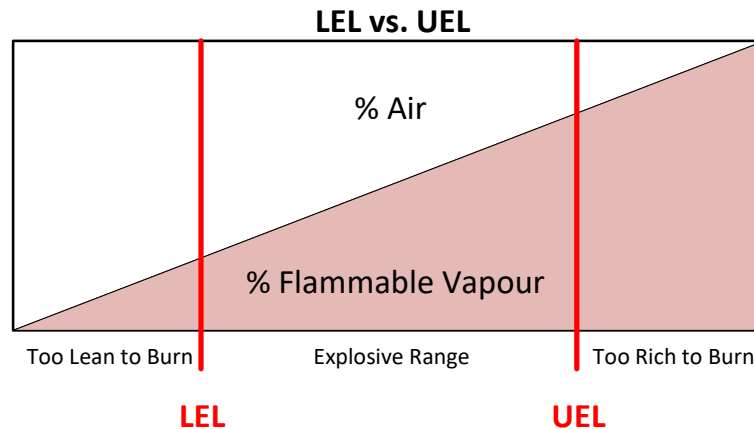
- Repairs to underground pipework within an excavation



5.3.3 Work around Un-blanketed Tanks in Service

Periodically un-blanketed tanks are “burped” to relieve the build-up of vapour pressure generated due to increase in temperature. During a planned pressure release of flammable vapours; Hot Work activities shall cease; with sufficient prior notice to allow hot surfaces to cool - i.e. welding pipe. Where continuous monitoring is being used, detection equipment should be removed from the area to avoid un-necessary contamination. Following the release of vapour, the worksite and adjacent area will need to be retested and continuous monitoring re-established. Refer Re-establishing Worksite.

Flammable Vapours in the “headspace” of the un-blanketed tank will be above the UEL (Upper Explosive Limit). However, upon release these vapours will disperse outside the tank, going through the Explosive Range.



5.3.4 Work around Blanketed Tanks in Service

A “floating-blanket” is used to contain vapours given off from product, as the name suggests the blanket is floating directly on the product via pontoons, and sealing against the walls of the tank using a “shoe seal”. It is likely that the headspace above a floating blanket will contain some flammable vapours, however, through natural ventilation this headspace should generally be below the LEL (Low Explosive Limit).

5.3.5 Hot Work in Confined Spaces

Refer to Confined Space Safety Work Practice for controls that needs to be implemented. Ensure that anyone who conducts hot work on any container or pipe that has contained a combustible substance carries the following additional safety measures:

- Hot work equipment is cleaned and all combustibles removed.
- Confined space is flushed out and all flammable vapours extracted.

5.3.6 Hot Work in Excavations

Trenches/Excavations have the possibility of holding flammable vapours that are heavier than air, either from migration from adjacent areas, previous work activities such as breaking into or draining of a containment system, or possible residual product in the ground. Therefore, Hot Work activities within trenches/excavations require Pre-Work Testing, and Continuous Monitoring.

5.3.7 Re-Establishing Worksite

Permits are only valid for the period specified on the permit, and only while conditions remain unchanged. If conditions change significantly, the permit shall become invalid. In such cases, all tests and inspections must be repeated before work recommences, and the permit revalidated by the Permit Issuer.

In cases such as stopping work for meal breaks, the Hot Work area shall be retested by the Permit Issuer or a delegated authorised gas tester to confirm absence of vapours before work recommences.

5.3.8 Delivery of hazardous product to a site

If a delivery of hazardous products is made to a site during work being conducted under a hot work permit conditions, work must be stopped, be assessed for additional HSSE risk and stay stopped for a minimum of 30 minutes after the delivery has been completed. A gas test must be passed before hot work recommences.

5.3.9 Use of Electronic devices at Z Sites

Use of standard digital cameras that have a battery or flash requires a hot work certificate when used in a hazardous zone.

Use of Z owned “Ex-Rated” electronic device is allowed in Zone 1 and 2 areas without a permit.



5.4 Competency

Specialised training and competencies are required before an individual is to be assigned a specific PTWS operational responsibility. Table 1 specifies training requirements for personnel involved in performing hot work.

Table 1 – Training and competency requirements for hot work

Role	Training	Description
Authorised Gas Tester	NZQA US 3058	Perform gas tests for an energy and chemical plan
	NZQA US 25510	Operate an atmospheric testing device to determine a suitable atmosphere exists to work safely
	AND Must be trained in the use of the gas-detector device used during the work permit activity	
Fire watch	NZQA US 3271	Supress fire with hand extinguishers and fixed hose reels
	NZQA US 4647	Explain principles of fire science
	AND Must be familiar with the site's fire alarms, emergency equipment and procedures	

5.5 Fitness for work

- A competent person must be physically fit for the task, must have the ability to identify hazardous conditions, and must take action to maintain a safe workplace.
- If workers are exposed to extreme temperatures or physical demands, refer to **Managing Fatigue at Z guidelines** to address the risks of fatigue (HS-HAW-H-GUI-001).
- Workers must comply with **Z's Drug and Alcohol policy**. Z requires the performance of its staff, contractors and others on Z premises or operating equipment on Z's behalf to be unimpaired by alcohol or drugs.

