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caring counts

Why hot work permits still do not prevent fires

Johan van den Heever – September 2020

Purpose of this presentation

- To provide insight to what should be the **minimum** procedures and precautions in place before, during and after hot works are performed.
- To have a better understanding of what a hot work permit system actually is.
- To identify the bottom-line reasons why it still has the potential to fail in preventing fires.

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Introduction

- What is hot works?
- Legislative requirements: OHS Act.
- Workplace requirements: General Safety Regulations.
- What is a hot works permit?
- Precautions.
- Case studies: analyzing actual hot work permits.
- Insurer approach.

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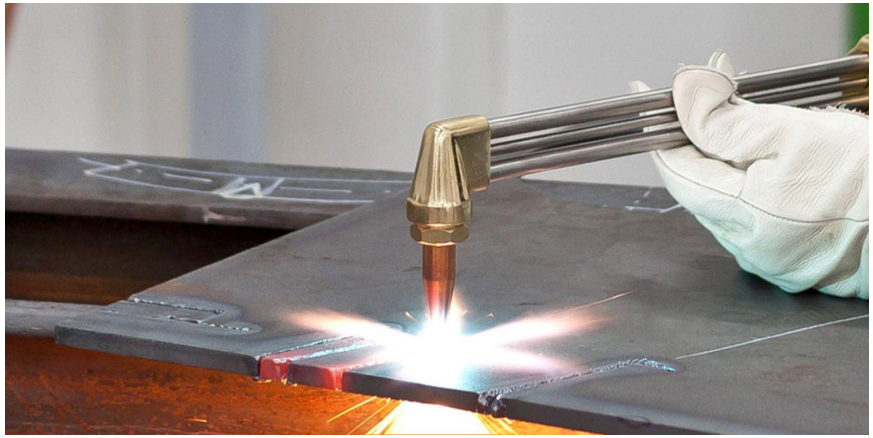
What is hot works?

- Hot work is often synonymous with welding and cutting but also includes any work activity with potential to produce ignition sources or excess heat, such as burning, brazing, grinding, soldering, thermal resistance heating, or torch applied roofing.
- According to the OHS Act:

  ‘’Welding, flame cutting, soldering and similar operations’’



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Welding: most common is arc-welding.

Arc welding is a welding process that is used to join metal to metal by using electricity to create enough heat to melt metal, and the melted metals when cool result in a binding of the metals. It is a type of welding that uses a welding power supply to create an electric arc between a metal stick ("electrode") and the base material to melt the metals at the point of contact.

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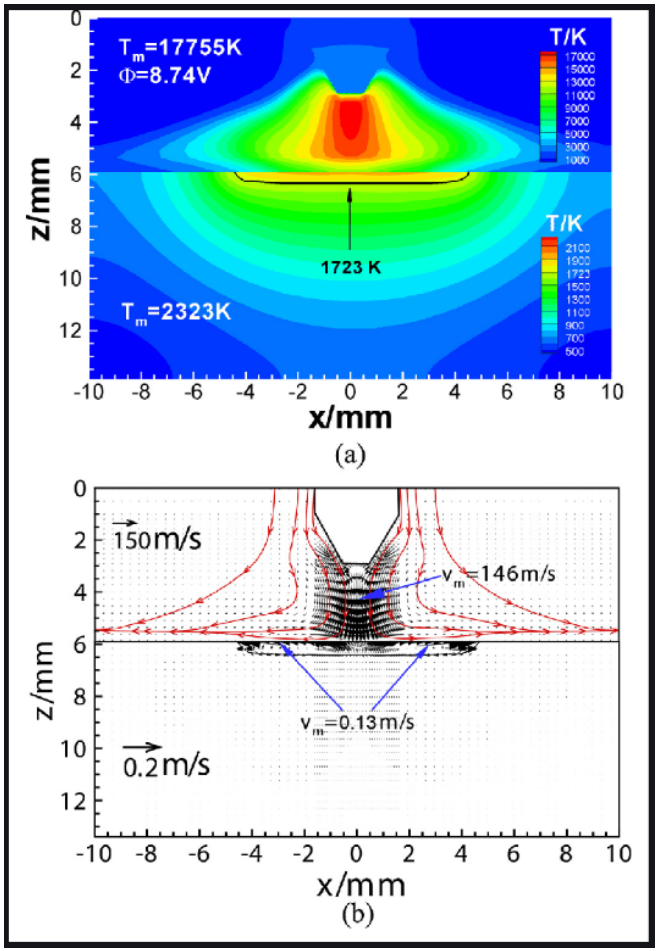
Welding temperatures

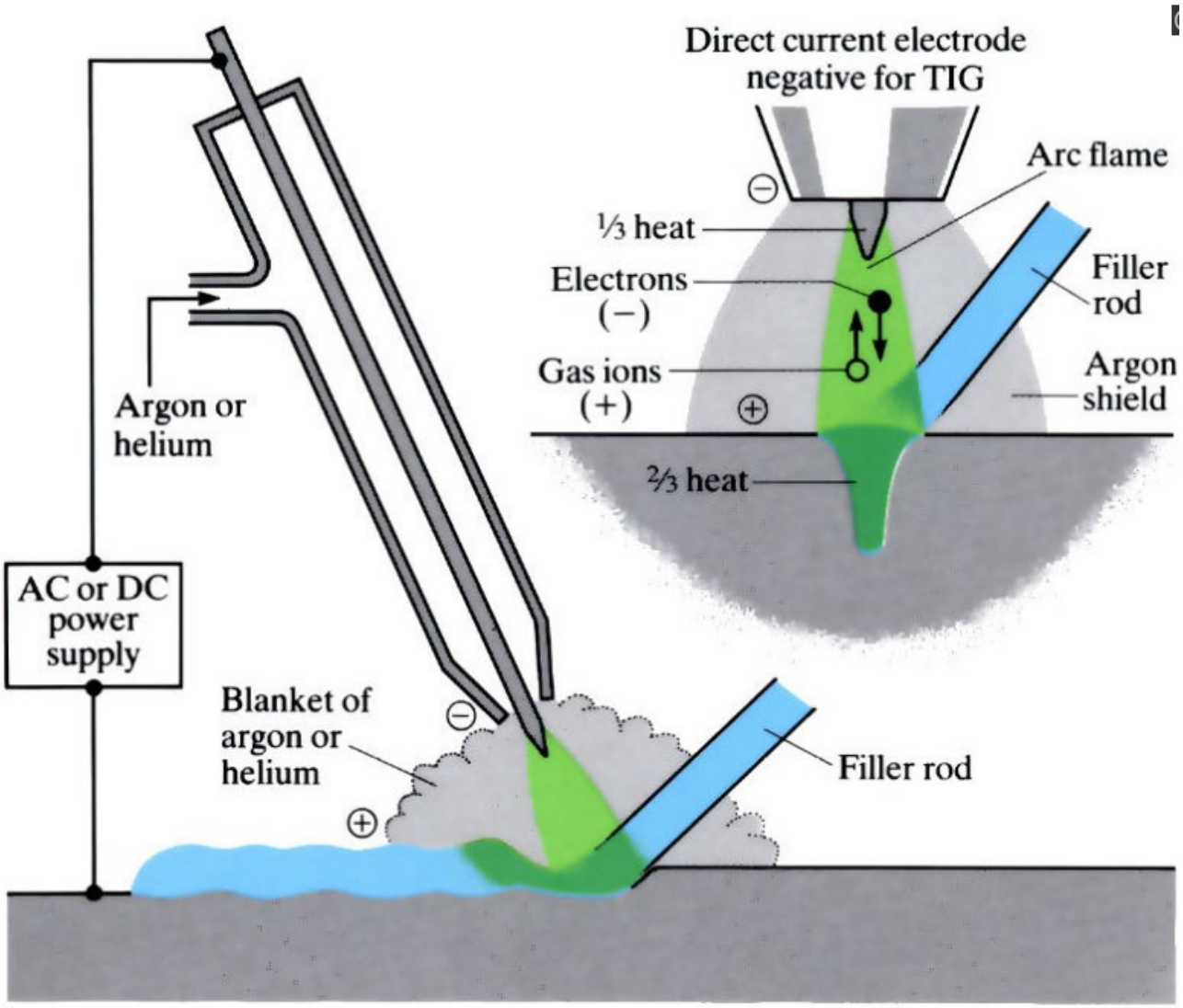
- MIG – metal inert gas
- 1 Kelvin = -272,15 degrees Celsius

Bibliographic Entry	Result (w/surrounding text)	Standardized Result
Bowditch, William A. Welding Technology Fundamentals. Tinley Park: The Goodheart-Willcox Company, Inc. 1997: 269.	"Ionized gas or plasma is extremely hot — temperatures as high as 43,000 °F (24,000 °C) have been reached. The plasma arc is an excellent heat source for welding or cutting"	24,000 °C
Pierre-Jean Cunat.Chromium in Stainless Steel Welding Fumes. The Chromium File, 17 June 2003.	"In the electric arc, the temperature is very high(of the order of 6,000-8,000 °C for the GTAW, GMAW, FCAW and SAW processes, and up to 10,000 20,000 °C for the PAW process) and well above the boiling point of the base and filler materials …."	6,000-8,000 °C
Welds [pdf]. The University of Tennessee at Martin, 6 June 2003	"Electric current flowing through high resistance air gap generates an intense arc with temperatures ranging from 6,000 to 10,000 °F."	3,000-6,000 °C
Cary, B. Howard. Modern Welding Technology. Upper Saddle River: Prentice Hall, 1998: 466, 108.	"The electric arc has a temperature of from 5000 to 20,000 °C"	5000-20,000° C
	"The plasma operates at a very high temperature, approximately 6,000 °C (10,000 °F)"	6,000 °C



Metal Inert Gas welding:

The principles of the TIG welding torch



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Braising and soldering

- Brazing and soldering, are metal-joining processes in which two or more metal items are joined together by melting and flowing a filler metal into the joint, the filler metal having a lower melting point than the adjoining metal.
- Filler metals include Copper, Silver, and alloys such as copper-silver, copper-zinc, copper-tin, nickel alloy, etc.
- Lead-free alloys are now used for soldering.

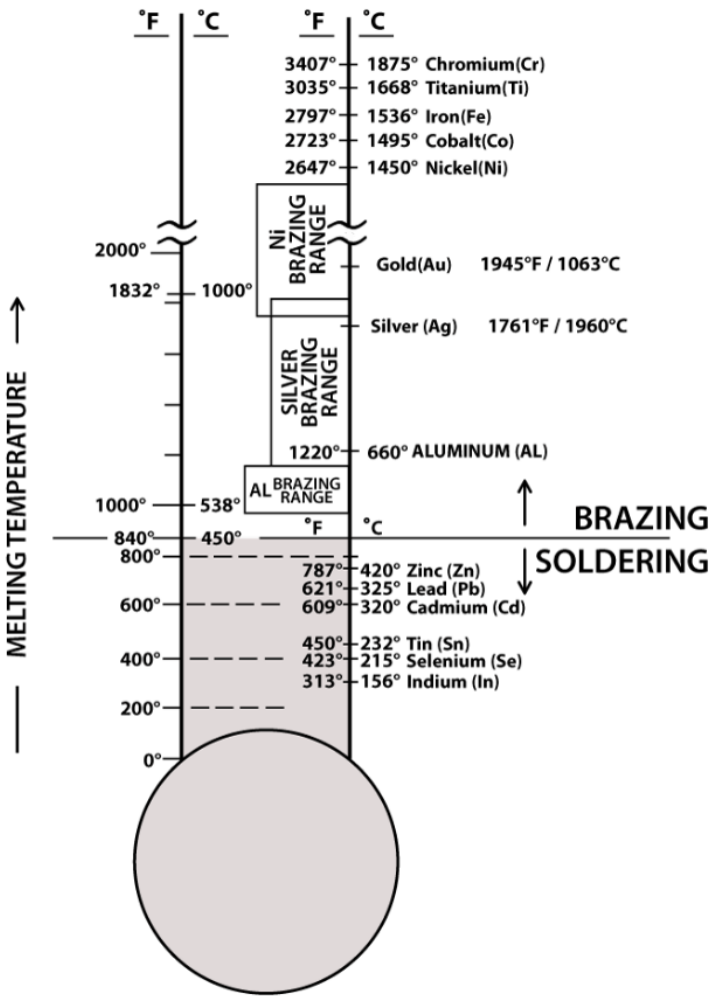

Fig. 2 – Thermometer chart showing the melting temperatures of a variety of pure base-metals, and the division of brazing from soldering.

Grinding work

- Also known as abrasive cutting.
- Is an abrasive machining process that uses a grinding wheel as the cutting tool.
- Grinding sparks has a typical temperature of 538 degrees Celsius.
- Enough to ignite paper, flammable substances, etc.

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Common dangers involving hot works

- Sparks and molten material from hot work can be scattered more than 10 meters during welding, cutting, and grinding.
- These sparks and slag are typically at a temperature above 537.7 degrees Celsius (1,000 degrees F) when thrown from the hot work operations—a temperature which can easily ignite paper, wood, flammable liquids, vapors, and many other combustibles if they are allowed to come into contact.
- **Sparks** can fall through cracks and other floor openings, thus starting fires in hidden locations.
- **Ducts and conveyor systems** can carry sparks to distant combustibles.

Temperature

1	=	-17,2222
Fahrenheit		Celsius

Formula (1°**F** − 32) × 5/9 = -17,22°**C**

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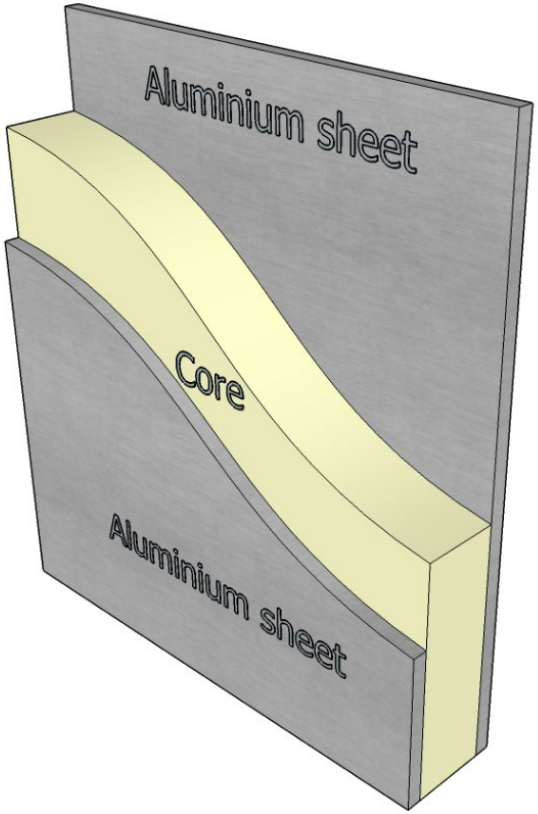
Common dangers involving hot works

- **Hot work on pipes or other metal** that is in contact with combustible walls, partitions, ceilings, roofs, or other combustibles can lead to ignition through conductive heating.
- **With containers and piping,** there is the possibility of explosions, fires, and the release of toxic vapors or fumes.
- **Hot work done near** a partition, wall, ceiling, or roof that has a combustible covering or insulation, or on walls or partitions of combustible sandwich-type panel construction, can lead to ignition.
- **Hot work on one side** of a wall can ignite combustibles on the other side.



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Precautions

❑ Before Beginning:

- Evaluate the decision to perform hot work. The first step of the hot work management process is to determine whether the hazard can be avoided or minimized.

❑ Where practical:

- **Avoid** hot work if possible.
- **Relocate** the object requiring hot work outdoors or to specially designated areas that have been designed and constructed to minimize fire risk.
- Good housekeeping should be maintained and the area **routinely audited** to ensure it remains safe for hot work.

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Precautions

- **Schedule hot work during shutdowns**

- If it cannot be avoided or relocated.
- If it is determined that hot work is necessary and the object cannot be relocated to a designated hot work area, the persons requesting and those who will be performing the hot work should contact a Hot Work Permit issuing supervisor and begin the permit process.

- **Hot Work Permit issuing supervisor = a person in authority**

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Legislative requirements: Occupational Health and Safety Act: Act 85 of 1993

- **Section 8: General duties of employers to their employees:**

(b) taking such steps as may be reasonably practicable to eliminate or mitigate any hazard or potential hazard to the safety or health of employees, before resorting to personal protective equipment;

(d)establishing, as far as is reasonably practicable, what **hazards to the health or safety of persons** are attached to any work which is performed, any article or substance which is produced, processed, used, handled, stored or transported and any plant or machinery which is used in his business, and he shall, as far as is reasonably practicable, further establish **what precautionary measures should be taken** with respect to such work, article, substance, plant or machinery in order to protect the health and safety of persons, **and he shall provide the necessary means to apply such precautionary measures**;

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- **Welding, flame cutting, soldering and similar operations**

9. (1) No employer or user of machinery shall **require or permit** welding or flame cutting operations to be undertaken, unless -

(a) the person operating the equipment has been **fully instructed** in the safe operation and use of such equipment and in the hazards which may arise from its use;

(b) **effective protection** is provided and used for the eyes and respiratory system and, where necessary, for the face, hands, feet, legs, body and clothing of persons performing such operations, as well as against heat, incandescent or flying particles or dangerous radiation;

(c) leads and electrode holders are **effectively insulated**; and

(d) the workplace is **effectively partitioned** off where practicable and where not practicable all other persons exposed to the hazards contemplated in paragraph (b) are **warned and provided with suitable protective equipment**.

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General Safety Regulations continued:

(2) No employer or user of machinery shall require or permit welding or name cutting operations to be undertaken in a confined space, unless --

(a) **effective ventilation** is provided and maintained; or

(b) masks or hoods maintaining a **supply of safe air** for breathing are provided and used by the persons performing such operations.

(3) No employer or user of machinery shall require or permit electric welding to be undertaken in wet or damp places, inside metal vessels or in contact with large masses of metal, unless --

(a) the **insulation** of the electrical leads is in a sound condition;

(b) the electrode holder is **completely insulated** to prevent accidental contact with current-carrying parts; the welder is completely insulated by means of boots, gloves or rubber mats; and

(d) at least one other person who has been properly instructed to assist the welder in case of an emergency **remains in attendance** during operations: Provided that the provisions of this sub-regulation shall not apply to a welding process where the maximum voltage to earth does not exceed 50 volts.

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General Safety Regulations continued:

(4) No employer or user of machinery shall require or permit welding, flame cutting, grinding, soldering or similar work to be undertaken in respect of any tube, tank, drum, vessel or similar object or container where such object or container --

(a) is completely closed, unless a rise in internal pressure cannot render it dangerous; or

(b) contains any substance which, under the action of heat, may --

(i) ignite or explode; or

(ii) react to form dangerous or poisonous substances,

unless a person who is competent to pronounce on the safety thereof has, after examination, **certified in writing** that any such danger has been removed by opening, ventilating or purging with water or steam, or by any other effective means.

(5) Where hot work involving welding, cutting, brazing or soldering operations is carried out at places, other than workplaces which have been specifically designated and equipped for such work, the employer shall take steps to ensure that proper and adequate fire precautions are taken.

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What is a hot works permit?

- It is a **best practice** and highly advisable to use a hot work permit system for all hot work operations outside the designated area.
- Like any other safety program, the first and most critical step in implementing a hot work permit program is a comprehensive **written policy** and firm management support.
- Employees and contractors must fully understand that before undertaking any welding outside designated areas, a **permit must be obtained** from an authorized supervisor and violation of the hot work policy may lead to **disciplinary procedures**.
- Even if a facility does not have welding equipment or trained welders and hot work would be a very seldom occurrence performed by outside contractors, a **hot work policy and permit** system should be in place and included in the contractor management program.

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What is a hot works permit?

- The permit issuing supervisor's role in completing the permit is to ensure the **area or equipment is properly prepared** for hot work and **the operation is conducted safely**.
- Any supervisor selected to issue permits **should be trained** in the hazards of hot work and the site-specific hazards, such as flammable liquids, hazardous processes, and storage areas.
- They must **understand the situations** that can prevent hot work from being performed and how to interpret atmospheric monitoring results.

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What is a hot works permit?

- **One of the most common errors in hot work management programs is the issuance of hot work permits from an office or other production area.**
- To properly issue a permit, the supervisor **should inspect** the proposed hot work area and **visually verify** that all permissive conditions of the permit are met.
- Once the permits are properly completed, there should be a copy of the permit kept with those performing the hot work— such as affixed to the welding equipment— and a copy should remain in the supervisor's office or possession during the hot work operations.

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What is a hot works permit?

❑ Permit Components

- Permits should contain a section, preferably highlighted or otherwise set apart from the other items, saying that if any of the situations within exist, hot work cannot be performed and no permit can be issued.
- The permit also should include a checklist section for confirmation of general conditions.
- In addition to the hazards checklist portion, permits should contain a section that describes the location, nature, and time of the work and those responsible for the hot work, fire watch, and supervision.

A HOT WORK PERMIT SYSTEM MUST BE DYNAMIC AND CONSTANTLY APPLIED THROUGHOUT THE ACTUAL HOT WORK BEING PERFORMED.

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Safety Precautions:

- Ensure that persons conducting hot works, **are trained** in the use of the equipment and performing the hot work such as welding.
- Ensure the equipment to be used is in **good working** order, has been **maintained**, and is **inspected** before it is brought onto the premises and/or connected to power supply.
- A Portable electrical equipment register must be in place.

A SAFETY FILE MUST THEREFORE BE COMPILED WHICH CONTAINS EVIDENCE OF COMPLIANCE WITH THE HOT WORK PERMIT SYSTEM

THE FILE MUST BE SIGNED OFF BY THE PERSON IN AUTHORITY PRIOR TO THE HOT WORK PERMIT BEING ISSUED

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❑Vessel, Container, and Piping Precautions

- The heat from the hot work can release hazardous and potentially flammable fumes from materials hidden in cracks and crevices, even in containers appearing empty. Even containers and piping containing water should be considered hazardous until verified otherwise because byproducts of corrosion can result in hydrogen accumulation and potentially explosive atmospheres.
- **Do not perform hot work** on any equipment, drums, tanks, or other containers that have previously contained materials that could develop explosive atmospheres until they have been sufficiently purged, cleaned, and verified as non-hazardous by a qualified person.

Safety Precautions:

- **For enclosed vessels and confined spaces** , a qualified person should check the atmosphere for:
  - Suitable oxygen content
  - Combustibles or reactive gases
  - Toxic gases
- **When working on piping,** where feasible, isolate lines by capping.

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During and After Hot Work

- Once the hot work has been approved, often the only two employees or contractors in the area are the hot work operator and the fire watch. There is no set guideline for the supervisor to remain in the area or to routinely audit areas while hot work is being performed, but it is a good practice to make **periodic rounds** to ensure conditions remain safe.

- During hot work, the operator and fire watch must **ensure the ongoing safety** of the hot work operation throughout the process.

- If unsafe conditions develop, the operator should **immediately stop** the hot work operation and notify management, the area supervisor, or the permit issuing supervisor for reassessment of the situation.

❑ Fire Watch

- The fire watch, just as the hot work issuing supervisor, should be **trained** to understand the inherent hazards of the work site and of the hot work and **ensure safe conditions** are maintained **during** hot work operations. The fire watch should have adequate fire extinguishers and/or small hose lines available and be trained in their use. *The fire watch has two principal duties during hot work operations and during the minimum 30-minute post-hot work fire watch period*:

Watch for fires in all exposed areas and try to extinguish them as long as they are in the incipient stage. If the fire watch determines the fire is not within the capacity of the equipment, the fire watch and operator should leave the area and sound the fire alarm immediately.

Safety Precautions:

Watch for and stop the hot work operations if unsafe conditions develop. During the post-hot work period, the fire watch may be allowed to perform additional tasks as long as they do not distract him or her from their primary duty of fire watch responsibility. When the fire watch period is completed, the fire watch should make a final check of the area, sign the permit in the appropriate location, and return the completed permit to the supervisor.

Hot work diligence: Ensuring proper safety in a hot work program should be done with the same diligence as an electrical and equipment lockout/tagout program. One would never open electrical switchgear or climb inside equipment capable of moving without absolute verification that it is not live and is properly locked out to prevent activation during work.

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Permit:

PERMIT NO.
686/10

HOT WORK PERMIT

This Permit must be used for ALL Cutting, Welding & other Hot Work performed outside a dedicated workshop area. The Permit must be displayed at the work site & returned upon completion of work.

[redacted]

APPLICATION FOR HOT WORK

Company/Dept Performing Work: [redacted]

Contact Name: [redacted] Phone: [redacted] (bus) ..... (mobile)

Location of Work: [redacted] Roof

Description of Work: Waterproofing and stripping of waterproofing

Equipment to be used: Torch

PERMIT BEGINS	PERMIT EXPIRES
Date: 16/10/19 Time: 8:59 am / pm	Date: 18/10/19 Time: 5 am / pm

EMERGENCY INFORMATION

If a fire occurs, call : [redacted] at Phone: [redacted]

Nearest fire alarm: [redacted]

AUTHORISATION BY COMPANY REPRESENTATIVE

The above work is authorised to proceed subject to the following action being taken prior to work starting and procedures being maintained for the duration of the work. Each item is to be checked by the Authorised Company Representative prior to work starting for each period (delete & initial if & where Not Applicable):

Authorised by: [redacted] Signed: [redacted] Date: 16/10/19

1. Fire Sprinklers and/or Thermal Detectors must be confirmed as operational (where installed).	☐	7. All floor & wall openings within 10 m must be covered to prevent transmission of sparks.	☐
2. Smoke Detectors must be isolated in the work area and Impairment Procedures followed.	☐	8. The hot work area and any adjoining areas must be patrolled from the start of work until 30 minutes after the work is completed (including break periods).	☐
3. Fire equipment to be provided as follows: • Fire Hose Reel: • Fire Extinguisher:	☐ ☑	9. Special Conditions:	
4. Barricades, warning signs & spark/flash screens must be provided.	☐		
5. Work area, trenches, pits, etc. must be clear of flammable liquids, gases, or vapours.	☐		
6. Combustible materials located within 10 m must be removed or protected with non-combustible curtains, metal guards or flame proof covers (not ordinary tarpaulins).	☐		

WORK COMPLETED & AREA SAFE

The work area has been inspected by the Authorised Company Representative 30 minutes after completion of work:

Signed: [redacted] Date: ..../..../..... Time: ..... am / pm

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Prohibition

G.P.-S. 007-4064 MAN 793

DEPARTMENT OF LABOUR | **DEPARTEMENT VAN ARBEID**

OFFICE OF THE PROVINCIAL DIRECTOR | KANTOOR VAN DIE PROVINSIALE DIREKTEUR

Sfiso.dube@labour.gov.za

Telephone/Telefoon 082 563 1076

Enquiries/Navrae Sfiso Dube

The Manager

[redacted]

Ref. No.
Verw. No.

DEPARTMENT OF LABOUR: GAUTENG
RECEIVED / ONTVANG
Office stamp / Kantoorstempel
2019 -10- 16
JOHANNESBURG 11
DEPARTEMENT VAN ARBEID: GAUTENG

Date of inspection / Datum van inspeksie 16/10/2019

Accompanied by / Vergesel deur [redacted]

PROHIBITION NOTICE

OCCUPATIONAL HEALTH AND SAFETY ACT, 1993

I am of the opinion that the circumstances specified below threaten, or are likely to threaten, the health and/or safety of persons.

In terms of the powers vested in me by section 30 of the aforesaid Act, I hereby prohibit you from continuing or commencing with the following:

VERBODSKENNISGEWING

WET OP BEROEPSGESONDHEID EN VEILIGHEID, 1993

Na my oordeel word die gesondheid en/of veiligheid van persone vanweë die omstandighede hieronder uiteengesit, bedreig of sal dit waarskynlik bedreig word.

Kragtens die bevoegdheid aan my verleen deur artikel 30 van die voormelde Wet, verbied ek u hiermee om met die volgende voort te gaan of te begin:

From continuing to work on the roof of [redacted] at Mandela [redacted] Since the incident had occured there, the internal investigation have to be conducted and its findings shall be communicated to all employees involved with waterproofing activity. Inspector Sfiso Dube must be informed of the outcome of the investigation and he will then give a go ahead to work

I will consider revoking or amending this prohibition only after arrangements to my satisfaction have been made to dispose of or substantially reduce the threat which gave rise to the imposition of this prohibition.

Ek sal oorweeg om hierdie verbod op te hef of te wysig slegs indien reëlings tot my bevrediging getref is om die bedreiging wat tot die oplegging van hierdie verbod aanleiding gegee het uit die weg te ruim of wesenlik te verminder.

Received
Designation
Signature [redacted]

Inspector / Inspekteur

REVOCATION OF A PROHIBITION NOTICE

In terms of section 30 (1) (d) of the aforesaid Act, the prohibition notice served on you on ..... is hereby revoked.

Inspector / Inspekteur .....

OPHEFFING VAN 'N VERBODSKENNISGEWING

Ingevolge artikel 30 (1) (d) van die voormelde Wet word die verbodskennisgewing wat op ..... op u bestel is hierby opgehef.

Date / Datum .....

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G.P.-S. 68/17

MAN 794

labour
Department:
Labour
REPUBLIC OF SOUTH AFRICA

Bfiso.dube@labour.gov.za

Telephone 082 563 1076

Enquiries Bfiso Dube

Ref. No:

The Manager

[redacted]

Office stamp

Date of inspection 16/10/2019

Accompanied by [redacted]

DIRECTION NOTICE: CONTRAVENTION / ~~IMPROVEMENT~~

OCCUPATIONAL HEALTH AND SAFETY ACT, ACT 85 OF 1993 AS AMENDED

In terms of section 30 of the Act, you are hereby directed to take the following steps specified below within **60 days** from the date of this notice. Should you be unable to meet this deadline, you may make representations to this office stating when and how you propose to comply herewith, in order that an extension of time may be considered.

FAILURE TO COMPLY WITH THE REQUIREMENTS OF THIS NOTICE, OR WITH THE PROVISIONS OF THE REGULATIONS, CONSTITUTES A CRIMINAL OFFENCE AND WILL RENDER YOU LIABLE TO PROSECUTION.

General Administrative Regulations (GAR), 2003

	Recording and investigation of incidents
GAR 9(2)	An employer or user shall cause every incident which must be recorded in terms of subregulation (1), to be investigated by the employer, a person appointed by him or her, by a health and safety representative

Inspector:

Date:

Employer Representative: [redacted]

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Regulation
Regulasie

or a member of a health and safety committee within 7 days from the date of the incident and finalised as soon as is reasonably practicable, or within the contracted period in the case of contracted workers
(The incident investigator have to be appointed in writting)

Construction Regulations, 2014 (CR)

Risk assessment for construction work

CR9(1) A contractor must before the commencement of any construction work and during such construction work, have risk assessments performed by a competent person appointed in writing, which risk assessments form part of the health and safety plan to be applied on the site, and must include –

(a) the identification of the risks and hazards to which persons may be exposed to

(b) an analysis and evaluation of the risks and hazards identified based on a documented method

(c) a documented plan and applicable safe work procedures to mitigate, reduce or control the risks and hazards that have been identified

(d) a monitoring plan

(e) a review plan

(The risk assessor has to be appointed in writting)

Designation : Project Manager

Signature : [redacted]

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[redacted] GROUP OF COMPANIES [redacted]

HOT WORKS PERMIT

Permit Issue No: 0312/19

PART A - TO BE COMPLETED BY THE PRINCIPAL CONTRACTOR

PERMISSION IS GRANTED TO: [redacted] (Name of Company / Operator)

TO USE: Cutting torch oxy acytelyn (Type of Equipment or Operation

BETWEEN: 07:00 am/pm AND 16:30 am / pm ON DATE: 03/11/19

IN LOCATION:

WITH THE FOLLOWING CONDITIONS (inserted by contractor or issuer): Fire extinguisher to be close by incase of emergencies

PART B - TO BE COMPLETED BY THE CONTRACTOR CARRYING OUT THE HOT WORK

1. Area checked, cleared, covered for combustibles ✓
2. LPG/Flammables removed ✓
3. Noxious fumes will/will not be given off ✓
4. Extinguishers are available (type) ABC ✓
5. Alarms & exits located at Main Parking ✓
6. Additional supervision will/will not be required N/A
7. Operative briefing including PPE ✓

Signed:

PART C - TO BE COMPLETED BY THE PRINCIPAL / MAIN CONTRACTOR in cross check of contractor's declaration

Signature of person approving this permit for use: [redacted]

Print Name Here: [redacted] Date / Time: 03/11/119

PART D - TO BE COMPLETED BY THE CONTRACTOR AFTER CARRYING OUT THE WORKS

The hot works are now complete. The work area and adjacent areas, to which heat, flame or sparks may have spread have been thoroughly checked for at least thirty (30) minutes from completion of work to check for any residual fire risk and none found.

Work Complete at: 16:00 (Time / Date)

Work Checked At: 16:00 Signature: [redacted] Print Name: [redacted]

PART E - TO BE COMPLETED BY THE CONSTRUCTION SUPERVISOR

The works area has been thoroughly checked one hour after the final check by the contractor for smouldering or latent risks and none found

Permit is now closed off. Any further hot work requires a new permit

Time: 16:30 Signature: [redacted] Print Name: [redacted]

Project/Site Amendments:	Site Revision No:	Date:

Doc: HSE-TMP-008/109
Rev: 3
Hot Work Permit

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Insurer approach

- Improve the knowledge and conceptual understanding of hot work permit systems - internal - underwriters, claims technicians, etc.
- Improve the knowledge and understanding of hot works permits – external - broker/advisors, surveyors, etc.
- Compile specific clauses / policy wording / conditions of insurance instead of generic wording.
- Formulate conditions specific to the type of risk, for example:

  A school (employer) who uses a contractor to erect security gates and burglar bars (POE)

  The contractor who physically conducts the hot works has a huge responsibility to comply with OHS Act (POE)
- Policy wording and warranties must be specific.
- A promise to implement a hot work permit system is not good enough.
- Portfolio of Evidence (POE) must be compiled that the insured is implementing an **effective** hot work permit system and not just a desk top system. **(Completion of paperwork does not prevent fires).**

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THANK YOU FOR YOUR TIME

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