

# Hot Work

## 1. Purpose

Hot work is work that could produce a source of ignition, such as sparks, flames, or temperatures high enough to cause the ignition of flammable gases or combustible materials.

The purpose of this policy is to define the requirements for performing hot work that requires a permit and the responsibilities of individuals serving in roles regarding hot work operations.

## 2. Scope

This policy applies to all employees and contractors while performing hot work for USPL.

The following policies in this safety manual are either referenced or are applicable to this policy and should be consulted for specific related requirements and guidance:

Air Monitoring	Electrical Safety
Authorization to Work	Level 2 Hazards Identification and Task Risk Assessment (HITRA)
Confined Space Entry	

## 3. Minimum Requirements

	Minimum Requirements	Supporting Documentation
1.	A Hot Work Permit shall be completed and issued prior to conducting Primary Source Ignition (PSI) hot work (except in a designated area <b>or performing shielded PSI outside a Class 1 area</b> ); and Secondary Source Ignition (SSI) Class 1 hot work.	Sections 6 and 7, Appendices I and II
2.	All Hot Work Permits shall be issued by an Asset Operator or Asset Operator Designee and shall be received by a Performing Authority. <i>Self-permitting is prohibited.</i>	Section 5
3.	An Area Monitoring Plan shall be developed and implemented before Class 1 hot work is performed.	Section 10, Section A of Hot Work Permit
4.	Air monitoring for the presence of flammable gas shall be conducted prior to conducting Class 1 hot work and shall be performed continuously while performing PSI Class 1 hot work, and if LEL > 0% while performing SSI Class 1 hot work.	Section 10, Appendices III and IV
5.	If air monitoring (initial or continuous) detects the presence of flammable gas (LEL > 0%), hot work shall not proceed until an LEL Mitigation Plan is developed and implemented to identify the source of the flammable gas and verify that the LEL is less than 10%.	Section 10, Section A of Hot Work Permit
6.	Hot work <i>is prohibited</i> in explosive atmospheres (LEL ≥10%).	Section 8 and 10
7.	Designated areas shall be kept free of combustible materials and shall be physically marked around the perimeter.	Section 6
8.	A Fire Watch is required while PSI Class 1 hot work is being performed and additionally	Section 11,

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	during PSI non-Class 1 hot work performed within 35 feet of shielded combustible materials.	Appendix V
9.	Individuals performing hot work roles shall be trained to execute their responsibilities as defined in this policy	Section 12
10.	All personnel performing hot work on behalf of USPL have the responsibility and authority to stop any work they consider to be unsafe.	Section 7

## 4. Definitions

**Asset Operator (AO)**—A BP employee who is responsible for the operation of the asset where work is being performed. The Asset Operator shall be accountable for the asset equipment being in a safe condition for the scope of work to be performed. **The Asset Operator or an Asset Operator Designee (if used) is responsible for the completion of the ATW form.**

**Asset Operator Designee (AOD)**—A BP employee or contractor individual who is authorized to issue **ATWs and / or** permits on behalf of the Asset Operator.

*Note: Reference the Authorization to Work policy for additional information*

**Authorized Gas Tester**—An individual responsible for operating air monitoring equipment to monitor the area where hot work will be performed for the presence of flammable gas.

**Class 1 area**—An area in which flammable gases or vapors are or might be present in the air in quantities sufficient to produce explosive or ignitable mixtures. *For the purposes of this policy, Class 1 areas are defined to include Division 1 and Division 2 classified areas. Consult Facility Hazardous Area Classification diagrams to identify where Class 1 areas are defined. For hot work not performed at a facility, such as on the Right-of-Way the following are examples of Class 1 areas:*

- Within 100 feet of all leak sites or pipeline repair operations where a line will be or has been opened. This can be expanded due to the size of the leak.
- Within 10 feet of any at-grade or below-grade sumps or drains.
- Within 50 feet horizontally in all directions from any edge of pumps located outdoors where pressure  $\geq$  275 PSIG.
- Within 10 feet horizontally of an outdoor valve, flange, manifold, meter, or scraper trap.

**Combustible material**—**A material that, in the form in which it is used and under the conditions anticipated, will ignite and burn.**

**Designated area**—**A specific location designed and approved for hot work operations that is maintained fire-safe, such as a maintenance shop or a detached outside location, that is of noncombustible or fire-resistive construction, essentially free of combustible and flammable contents, and suitably segregated from adjacent areas.** Hot work performed in a designated area does not require a Hot Work Permit.

*Note: Class 1 areas are never designated areas.*

*Note: Designated areas are not required to be “structures”.*

**Fire Watch**—An individual who is assigned the responsibility of monitoring hot work and the surrounding area for incipient fires and changing conditions.

**Flammable gas**—A term used for brevity in this policy to include all combustible and flammable gases and vapors that burn in air when the concentration of the gas or vapor is within the range of concentration where combustion can occur.

**Hot work**—Work that could produce a source of ignition or temperatures high enough to cause the ignition of flammable gases and combustible materials. Examples of hot work include but are not limited to:

Arc welding

Sandblasting

Grinding

Using electrical and electronic equipment that is not certified or intrinsically safe or explosion-proof (such as mobile phones, cameras)

Using internal combustion engines (including vehicles) in a Class 1 area (e.g., a tank dike)

Thermite brazing (e.g. Thermite welding, Cadwelding, welding test leads.)

Applying hot coatings(e.g. shrink sleeves, Tapecoat 20)

Using holiday detectors for checking coating integrity

Using torches to remove casing from line pipe

Using torches to solder test lead wires

Installing vent pipes to a casing

**Note:** Pneumatic tools are considered a safer alternative to other power tools but consideration must be given to heat generated at the point of operation.

**Hot work operator**—An individual who operates hot work equipment to perform hot work operations.

**Lower Explosive Limit (LEL)**—The minimum concentration (percentage) of a flammable gas that will propagate a flame in the presence of an ignition source. The more explosive the gas, the lower the LEL. A mixture below this level is considered too “lean” to burn. LEL is usually expressed as a percentage (from zero to 100% explosive) and is often used interchangeably with Lower Flammability Limit (LFL).

**Performing Authority (PA)**—A BP employee or contractor individual who receives a permit issued by the Asset Operator or Asset Operator Designee.

*Note:* Reference the Authorization to Work policy for additional information.

**Permit Issuance**—The act of the Asset Operator or Asset Operator Designee issuing a permit to a Performing Authority. Permit Issuance is documented in Section C of the ATW form.

*Note:* Reference the Authorization to Work policy for additional information

**Non-permissible Area**—An area where hot work is prohibited.

**Primary Source Ignition (PSI) hot work**—Work with equipment and tools that, when used in a normal manner, are likely to ignite a flammable or combustible atmosphere, solid materials, and liquids. PSI hot work is often referred to as “naked flame” hot work. High energy is present in the form of a flame, electric arc, or incandescent sparks. Examples of PSI hot work include but are not limited to the following:

Welding and burning

Grinding / spark producing abrasive blasting

Preheating or annealing welded fabrications where the surface temperatures may exceed 392°F.

**Primary Source Ignition (PSI) Class 1 hot work**—PSI hot work that is performed either inside a Class 1 area or outside a Class 1 area that could be impacted by the hot work.

*Note:* PSI hot work such as grinding has been known to generate sparks with enough force to transport them up to 35 feet from the point of the hot work; therefore, it is possible to perform PSI hot work up to 35 feet away from a Class 1 location and yet still introduce an ignition source into a Class 1 area.

**Primary Source Ignition (PSI) non-Class 1 hot work**—PSI hot work that is performed outside of and will not impact a Class 1 area.

**Secondary Source Ignition (SSI) hot work**—Any work with equipment and tools that, when used in a normal manner or due to errors or malfunctions, may create lower-energy sparks and ignite a flammable or combustible atmosphere. SSI hot work is also referred to as “spark potential” hot work. Examples of SSI hot work include but are not limited to the following:

- Using electrical and electronic equipment that is not intrinsically safe or explosion-proof (e.g., most electronic communication devices, flashlights, power tools)
- Using internal combustion engines (including vehicles) in a Class 1 area (vehicle entry into tank dike)
- Using a rotating steel brush
- Electrical isolation testing
- Producing a friction spark, typically from a rusty surface

*Note:* The use of hand tools such as hammers and chisels is not considered hot work.

*Note:* The use of watches, hearing aids, and other medical devices are specifically exempted as SSI sources.

**Secondary Source Ignition (SSI) Class 1 hot work**—SSI hot work that is performed inside a Class 1 area.

**Secondary Source Ignition (SSI) non-Class 1 hot work**—SSI hot work that is performed outside a Class 1 area. SSI non-Class 1 hot work *does not* require a Hot Work Permit.

**Shall**—Is used where a provision is mandatory

**Should**—Is used where a provision is preferred

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## 5. Roles and Responsibilities

### 5.1. Asset Operator (or designee)

- A. Shall issue permits to the Performing Authority or can delegate permit issuance to the AOD.
- B. Shall determine if changes can be made to a permit if permit conditions are exceeded or if the permit should be cancelled and a new permit issued
  1. If the Asset Operator determines that changes to the permit can be made, he/she shall document their approval of the changes by initialing the changes where they are documented on the permit
- C. Shall evaluate hot work with regard to simultaneous operations (SIMOPS) so that operations that could likely expose flammable gas or combustible materials to ignition in the hot work area do not occur, or are controlled during hot work operations.

*Note:* Refer to the Authorization to Work policy for additional requirements

### 5.2. Authorized Gas Tester (can also be the Fire Watch)

- A. Shall not be a PSI Hot Work Operator **while performing AGT duties**.
- B. Can be a Hot Work Operator during SSI Class 1 hot work.
- C. Shall verify that the air monitoring device to be used is calibrated according to the manufacturer's instructions.
- D. Shall perform initial, continuous, and repeat air monitoring of the hot work area for the presence of flammable gas per the area monitoring plan, when required (see Section 10)
- E. Shall verify that an LEL Mitigation Plan is developed and implemented when required (see Section 10.6).

- F. Stops hot work if at any time air monitoring readings are  $\geq 10\%$  of the LEL

*Note:* Refer to the Air Monitoring policy for additional information regarding the Authorized Gas Tester and air monitoring equipment.

### 5.3. Fire Watch (can also be Authorized Gas Tester)

- A. Shall not be a PSI Hot Work Operator while performing Fire Watch duties.
- B. Shall verify that fire protection equipment is in place and ready for use (see Section 11).
- C. Shall stop work if unsafe conditions develop during hot work operations (e.g. combustible materials are introduced into the hot work area).
- D. Shall remain within communication range of the person(s) performing the hot work and shall maintain a line of sight with the hot work.
- E. Shall watch for fires in all areas exposed to hot work and, if a fire occurs, shall communicate to hot work operators to cease all hot work.
  - 1. The Fire Watch can try to extinguish a fire only when the fire is obviously within the capacity of the equipment available.
  - 2. If the Fire Watch determines that the fire is not within the capacity of the equipment, the Fire Watch shall implement evacuation procedures immediately.
- F. Shall remain in the hot work area at least 30 minutes after the hot work has ceased (including for work breaks) to detect and extinguish possible smoldering fires.
  - 1. Shall document that the above requirement was completed on the Hot Work permit (Section E).

### 5.4. Hot Work Operators

- A. Shall verify hot work equipment is fit for purpose and intact.
- B. Shall review and sign the Hot Work Permit to acknowledge their agreement to abide by the conditions documented on the permit.
- C. Shall cease hot work operations if unsafe conditions develop and notify the Performing Authority immediately for evaluation and appropriate action.

### 5.5. Performing Authority

- A. Shall receive issued Hot Work Permits from the Asset Operator.
- B. Shall verify that all hot work operators have signed the Hot Work Permit to acknowledge their agreement to abide by the conditions documented on the permit.
- C. Shall observe the permitted hot work to verify that the work is performed within the conditions documented on the Hot Work Permit.
- D. Shall reassess the job site and revalidate the permit before work can resume if permitted work is interrupted or if the job site is left unattended, or if necessary, cancels the permit and returns it to the AO / AOD.
- E. Shall stop work, suspend the permit and notify the AO / AOD if permit conditions are exceeded.

*Note:* Refer to the Authorization to Work policy for additional requirements.

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## 6. Designated Areas

The purpose of a designated area is to provide a safe area where PSI hot work can be performed without permitting. A designated or “free burn” area does not require a Hot Work Permit, a Fire Watch, or air

monitoring because the procedures for establishing the designated area eliminate or effectively control flammable and combustible hazards.

- A. Designated areas shall be:
  - 1. located at least 35 feet from a Class I area;
  - 2. kept **essentially** free of combustible materials; and
  - 3. physically marked around the perimeter.

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## 7. Hot Work Permit

The Hot Work Permit (Appendix I) has five purposes: (1) to serve as written permission to do the work; (2) to provide a *minimum* safety checklist; (3) to show the steps necessary for making the worksite safe for conducting hot work; (4) to alert operating personnel to work in progress; and (5) to provide a record of safety steps taken so that the work is performed within established conditions. Appendix II offers guidelines for determining whether a Hot Work Permit is required. Appendix III summarizes specific permit requirements.

### 7.1. General Requirements

A. Before beginning hot work, an assessment shall confirm that other options not involving hot work have been considered and ruled out.

B. The following activities are exempted from hot work permitting:

- 1. Performing hot work in a designated area.
- 2. Bulk liquid transport loading / unloading operations.

*Note:* Bulk liquid transport loading / unloading operations are based on the requirements of NFPA 30 and are therefore exempt from hot work permitting.

- 3. Performing SSI hot work outside of a Class 1 area.

- 4. Performing shielded PSI hot work outside of a Class 1 area.

*Note:* For the purposes of this policy, shielded PSI refers to equipment which is considered PSI but intrinsically shielded in a way that prevents ignition of nearby ordinary combustibles, e.g. using a gasoline powered / diesel fired hot water pressure washer cleaning pipeline pigs in a non-Class 1 area. Performing shielded PSI hot work in a Class 1 area shall require a PSI Class 1 Hot Work permit.

- 5. Replacing the Scully cord at the truck loading rack.

C. Individuals who have a role in the hot work permit process, possessing the technical and procedural competencies as defined by the USPL Training and Competency Matrix (for employees) and the contractor management process (for contractors), shall provide input to the permit to address permit conditions related to the hot work.

D. For SSI Class 1 hot work (e.g. vehicle entry into tank dikes, snow plowing under the load rack, the use of tools that are not intrinsically safe in a Class 1 area), the Asset Operator can validate the conditions as well as issue the Hot Work Permit to the Performing Authority via telephone. In such instances, the Performing Authority shall sign the Hot Work Permit on behalf of the Asset Operator in Section E of the permit under "Performing Authority (SSI Class 1) Phone Validation of Permit with Asset Operator".

E. A Hot Work Permit is valid for no more than one work shift for the individuals working under the permit, or for the duration of the scope of work documented on the permit, whichever period is shorter.

F. If hot work is suspended and the job site is left unattended (including normal work breaks) during a shift, the permit shall be revalidated before further hot work can continue; revalidation involves

inspecting the hot work area for any change in previous conditions and conducting and documenting air monitoring if PSI hot work is to recommence in a Class 1 area.

- G. If permit conditions are exceeded (e.g. LEL  $\geq$  10%) work and the permit shall be suspended until the Asset Operator determines if changes can be made to the permit or if the permit should be cancelled and a new permit issued.
  - 1. If the Asset Operator / Asset Operator Designee determines that changes to the permit can be made, he/she shall document their approval of the changes by initialing the changes where they are documented on the permit
- H. The Hot Work Permit **should** be at the job site until the hot work is completed or the permit expires. **At the Asset Operator's discretion, the Hot Work Permit may be kept at an alternate location, e.g. in the office for the permit for cutting grass.**
- I. All personnel involved in the hot work operation have the authority and responsibility to stop work that they consider to be unsafe.
- J. The original completed Hot Work Permits shall be retained **locally** for a minimum of one year.

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## 8. Non-Permissible Areas

- A. Hot work is prohibited in the following areas:
  - 1. In areas prohibited by management.
  - 2. In sprinkler-equipped buildings where sprinklers are impaired, unless the requirements of NFPA 25 are met, specifically Chapter 15 – Impairments.
  - 3. In the presence of explosive atmospheres ( $\geq$ 10% of the LEL).
  - 4. In the presence of uncleaned or improperly prepared tanks, vessels, or other containers and equipment that have previously contained flammable or combustible materials when their contents might be exposed to an ignition source.
    - a) Reference the Confined Space Entry policy for requirements regarding post-cleaning certification of a gas / product space.

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## 9. Hot Work Site Preparation

Hot work shall be assessed in relation to simultaneous operations (SIMOPS). In completing the ATW, the Asset Operator shall determine whether the hot work to be performed will negatively impact any other operations occurring at the same time. The Asset Operator shall decide whether the hot work can proceed and shall identify what controls are necessary to perform the hot work safely with respect to other operations.

### 9.1. All PSI Hot Work

- A. The following conditions shall be verified before PSI hot work is performed:
  - 1. Combustible materials shall be **protected from ignition by relocating, shielding, or by other protective means:**
    - Note:* Consideration should be given to spark containment techniques which lessen the distance sparks are able to travel freely.
  - 2. A fully charged and operable 20-pound (minimum) fire extinguisher appropriate for the type of potential fire shall be available for use in the work area.
  - 3. Sewer openings, ducts, and drains within 35 feet of the point of hot work shall be sealed with an impervious material. Where sealing is insecure or impractical, other methods shall be implemented to prevent sparks from entering.

4. The location of the hot work relative to combustible and flammable materials and classified areas will determine the need for a Fire Watch, as outlined in this policy (see Section 11).

#### 9.1.1. **Welding, Torch Cutting, and Brazing in a Confined Space or Partially Enclosed Space**

- A. When welding, cutting, or brazing operations are to be conducted in a confined space or partially enclosed space the following ventilation requirements shall apply:
  1. General mechanical ventilation at a rate of 2,000 cubic feet per minute (cfm) per welder shall be provided; or
  2. Local mechanical ventilation using freely movable hoods placed by the welder as near as practicable to the work being welded and provided with a rate of air-flow sufficient to maintain a velocity in the direction of the hood of 100 linear feet (30 m) per minute in the zone of welding when the hood is at its most remote distance from the point of welding shall be provided.
  3. Local mechanical ventilation or airline respirators are required when welding, cutting, or brazing on hazardous metals (e.g. galvanized, stainless, chrome-molly, metals containing lead other than as an impurity).
  4. All replacement air shall be from a clean source outside of the confined space or partially enclosed space.

*Note:* Refer to Appendix VII General Mechanical Ventilation Guidance for Welding, Cutting and Brazing in Confined Spaces or Partially Enclosed Spaces for additional information.

- B. If the minimum rates stated above cannot be achieved, supplied air respiratory protection shall be worn by all entrants in the confined space or partially enclosed space in conjunction with ventilation.

*Note:* For the purposes of this policy, a partially enclosed space is a space that does not meet the definition of a confined space but is configured in a manner that would cause the accumulation of welding fumes without mechanical ventilation.

#### 9.1.2. **PSI Class 1 Hot Work**

- A. The following conditions shall be verified before PSI Class 1 hot work is performed:
  1. A Fire Watch shall be assigned.
  2. Affected excavations, conduits, and manholes within 35 feet of the hot work shall either be monitored for the presence of flammable gas or shielded so that an ignition source is not introduced.
  3. Initial and continuous air monitoring shall be performed and initial air monitoring results shall be documented on the Hot Work Permit (see Section 10 and the Air Monitoring policy).

#### 9.1.3. **PSI Hot Work within 35 Feet of Buildings or Other Structures**

- A. The following conditions shall be verified before PSI hot work is performed inside of or within 35 feet of buildings or structures whose building materials or contents may be combustible or flammable:
  1. Openings or cracks in walls, floors, or ducts within 35 feet of the hot work shall be tightly covered with fire-retardant or noncombustible material to prevent the passage of sparks to adjacent areas.
  2. Ducts that might carry sparks to distant combustible or flammable materials shall be shielded and / or shut.
  3. If hot work is done on one side of a wall, partition, ceiling, or roof, one of the following precautions shall be taken:
    - a) Combustibles on the other side shall be relocated.
    - b) If it is impractical to relocate combustibles, a Fire Watch shall be provided on the side of the combustibles.

## 9.2. SSI Class 1 Hot Work

- A. The following condition shall be verified before SSI Class 1 hot work is performed:
  - 1. Initial air monitoring shall be performed and documented on the Hot Work Permit (see Section 10 and the Air Monitoring policy).

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# 10. Air Monitoring (Class 1 Areas)

Flammable and combustible liquids and gases are or might be present within Class 1 areas. In order to perform hot work safely in these areas, air monitoring is required so that flammable gas in the work area is detected and properly controlled. Appendix IV summarizes air monitoring requirements for hot work.

*Note:* If the hot work will be performed in a tank or vessel, the air monitoring requirements for confined spaces shall apply (see the Air Monitoring and Confined Space Entry policies).

*Note:* When the possibility exists for an oxygen-deficient atmosphere, the oxygen level could be below the level required by the air monitoring device to give the correct flammability (LEL) reading. This could occur where a tank, vessel, or piping contains an inert gas such as nitrogen or carbon dioxide. For this reason it is important to monitor oxygen levels prior to monitoring for LEL.

## 10.1. General Requirements

- A. All BP equipment used for air monitoring shall be in accordance with the Air Monitoring policy.
- B. Initial air monitoring shall be conducted prior to the issuance of all Hot Work Permits.
- C. Initial air monitoring should be conducted as close to the start of the hot work as possible
- D. Initial air monitoring shall be conducted according to the Area Monitoring Plan (Section D of the Hot Work Permit).
- E. If air monitoring indicates the presence of flammable gas, the hot work shall not proceed until an LEL Mitigation Plan is developed and implemented (see Section 10.6).
- F. Hot work is prohibited if air monitoring readings are  $\geq 10\%$  of the LEL.

## 10.2. Initial Hot Work Air Monitoring (PSI Class 1)

- A. Initial air monitoring shall be performed by an Authorized Gas Tester surveying at least a 35-foot radius from the point of the hot work.

## 10.3. Continuous Hot Work Air Monitoring (PSI Class 1)

- A. PSI Class 1 hot work requires attended continuous air monitoring by the Authorized Gas Tester while the hot work is being performed.
- B. The Authorized Gas Tester should survey the perimeter of the permitted area at least once an hour.
- C. When not conducting a periodic perimeter survey, the Authorized Gas Tester should be primarily positioned between the hot work and any potential sources of flammable gas.

*Note:* The use of several air monitors around the hot work should be considered, depending on the work location. If more than one continuous monitor is in use, only one instrument is required to be actively attended.

*Note:* Readings from continuous air monitoring and hourly surveys are not required to be recorded on the Hot Work Permit.

- D. Repeat air monitoring shall be performed, and the results documented on the Hot Work Permit (Section A) prior to recommencing PSI Class 1 hot work if hot work was suspended and the worksite is left unattended (including for normal work breaks) during a shift

#### 10.4. Air Monitoring (SSI Class 1)

Vehicles, mobile plant equipment, and other non-intrinsically safe equipment present potential ignition sources. Consequently, SSI hot work in Class 1 areas (such as a tank dike) requires a Hot Work Permit to be issued and air monitoring performed.

- A. Initial air monitoring shall be performed prior to conducting SSI hot work in Class 1 areas.
  - 1. Before a vehicle or equipment that is not intrinsically safe is allowed to enter the Class 1 area, an Authorized Gas Tester shall survey the area along the planned path of the vehicle or equipment to its destination.
  - 2. Only when flammability readings are 0% LEL, or less than 10% of the LEL with an implemented LEL Mitigation Plan, can the vehicle or equipment proceed into the classified area.
- B. Continuous air monitoring is not required while performing SSI hot work in Class 1 areas if the initial air monitoring readings are 0% of the LEL for the area.
  - 1. If while SSI Class 1 hot work is being performed the hot work operator suspects the presence of flammable gas, the hot work shall cease immediately, and air monitoring shall be conducted so that a safe atmosphere can be verified before the hot work can continue.
- C. If initial air monitoring readings are greater than 0% of the LEL, continuous air monitoring shall be conducted while the hot work is performed.
- D. If hot work is suspended and the worksite is left unattended, repeat air monitoring shall be conducted as part of revalidating the permit for recommencing SSI Class 1 hot work if:
  - 1. The initial air monitoring readings were > 0% of the LEL for the Class 1 area, or
  - 2. Flammable gas is suspected in the Class 1 area (e.g. there is visual indication of a release, or abnormal hydrocarbon odor).
- E. Performing SSI Class 1 Hot Work for multiple Class 1 areas (e.g. lawn mowing multiple tank dikes at a facility, corrosion surveys) can be performed using a single Hot Work Permit as long as the following requirements are adhered to:
  - a) The full scope of the hot work to be performed is defined on the permit (e.g. lawn mowing tank dike 3, 5, & 7).
  - b) Initial air monitoring is performed for the first Class 1 area and the results documented on the Hot Work Permit.
  - c) After the Hot Work Permit is issued, air monitoring is performed for each subsequent Class 1 area prior to entering the area with an ignition source. The results of the air monitoring from each Class 1 area shall be recorded on the Hot Work Permit (Section A).
  - d) The Hot Work permit is updated as necessary (e.g. LEL Mitigation Plan is developed and implemented if subsequent Class 1 areas register the presence of LEL).

#### 10.5. Area Monitoring Plan

- A. An Area Monitoring Plan shall be developed before Class 1 hot work is performed.
- B. The Area Monitoring Plan can be documented in Section D of the Hot Work Permit, or can be attached as a separate document.
- C. The following information shall be included in the Area Monitoring Plan:
  - 1. The area that will be monitored by the Authorized Gas Tester
    - a) For PSI Class 1 hot work, at a minimum, this includes a 35-foot radius from the point of the hot work.
    - b) For SSI Class 1 hot work, at a minimum, this includes the planned path of the vehicle or equipment to its destination

- c) Hot work in a confined space requires air monitoring for flammable gas throughout the *entire* space (see the Confined Space Entry policy).
2. Potential sources of flammable gas within the area to be monitored.  
*Note:* Examples of potential sources of flammable gas include sumps, drains, flanges, valves, liquid boots, excavations, and all confined areas and equipment located within them, such as floating roof pontoons, piping, excavations, and vessels.
3. The wind direction.

## 10.6. LEL Mitigation Plan

The LEL Mitigation Plan documents the location of confirmed sources of flammable gas and the controls needed to reduce the LEL reading to less than 10%.

- A. An LEL Mitigation Plan shall be developed and implemented if the presence of flammable gas is detected (LEL > 0%) at any time prior to or during the hot work.
- B. If at any time the LEL reading is  $\geq 10\%$  of the LEL, the hot work shall stop immediately and shall not be allowed to resume until controls are implemented to reduce the LEL level to less than 10% and the Asset Operator / Asset Operator Designee approves changes to the permit
- C. The LEL mitigation plan shall reduce and / or maintain the LEL to less than 10% and shall include the following information:
  1. The percent LEL that was detected.
  2. The identified source(s) of the flammable gas within the hot work area.
  3. The controls, if any, that shall be implemented to effectively reduce the flammability level to less than 10% of the LEL within the hot work area.
  4. The percent LEL measured after controls, if any, have been implemented.
- D. If the LEL is > 0% after controls have been implemented, an assessment shall be performed to determine if a Cold Work Permit for Toxic Substance Exposure is required.

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## 11. Fire Watch

- A. A Fire Watch shall be required whenever the hot work meets any of the following criteria:
  1. The hot work consists of PSI Class 1 hot work.
  2. The hot work will be performed:
    - a) within 35 feet of shielded combustible material;
    - b) within a 35-foot radius of wall or floor openings that expose combustible materials;
    - c) where combustible material is adjacent to the opposite side of walls, ceilings, or roofs being worked on; or
    - d) where fire alarms or suppression systems have been disabled.

*Note:* These criteria are summarized in Appendix V.
- B. The Fire Watch shall be in the ready position at all times while hot work is being performed. The ready position consists of:
  1. being attentive to the hot work being performed;
  2. having the fire extinguisher in position at the job site prior to the start of work; and
  3. maintaining a line of sight to the hot work being performed

- C. A second Fire Watch shall be required if one Fire Watch cannot directly observe combustible materials that could be ignited by the hot work operation.

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## 12. Training and Competency

- A. All personnel serving in roles listed in Section 5 of this policy shall complete training in the requirements of this policy. The following persons shall complete additional training:
1. Authorized Gas Testers—shall be trained in the use of the air monitoring equipment they will be operating.
  2. Fire Watch—shall be trained in the selection and use of fire extinguishers including a hands-on component.

*Note:* Refer to the USPL Control of Work Training and Competency matrix for specific training requirements.

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## 13. References

1. American Petroleum Institute, API Recommended Practice 500, "Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2," 2nd ed., November 1997.
2. American Petroleum Institute, API Recommended Practice 2009, "Safe Welding, Cutting, and Other Hot Work Practices in the Petroleum and Petrochemical Industries," 7th ed., February 2002.
3. BP GP 44-60, "Guidance on Practice for API RP 500 Area Classification."
4. *Facility Hazardous Area Classification* diagrams.
5. National Fire Protection Association, NFPA 25, "Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems," 2002.
6. National Fire Protection Association, NFPA 51B, "Standard for Fire Prevention during Welding, Cutting, and Other Hot Work," 2003.
7. OSHA, U.S. Department of Labor, 29 CFR 1910.252, "Welding, Cutting, and Brazing: General Requirements."
8. National Fire Protection Association, NFPA 101, "Life Safety Code," 2012.

# Appendix I

## Hot Work Permit

This example of the Hot Work Permit is for reference only. Yellow highlighting represents revisions made to the permit and will not appear on the printable form. For a downloadable version of the permit, go to DRM. The electronic version can be filled out online or printed and completed as hard copy.

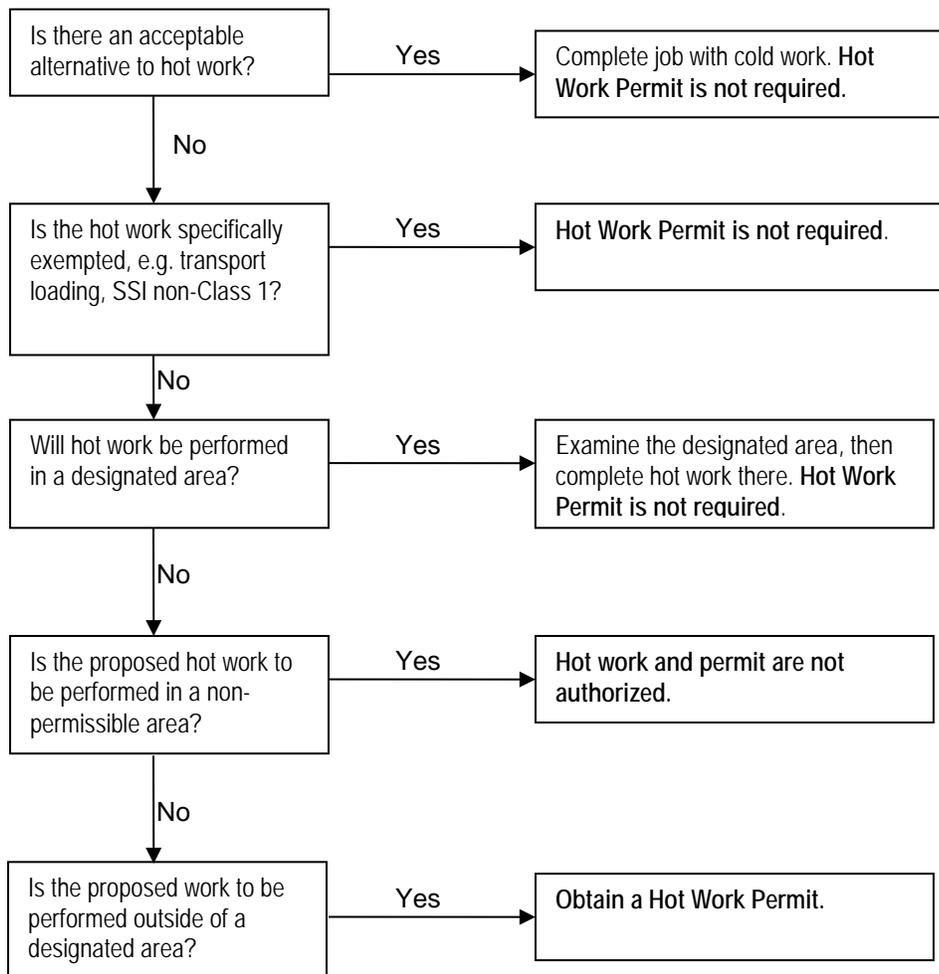
Permit Number: HW - [REDACTED]  
(Use the ATW number associated with this job; add an alpha character if more than one Hot Work Permit is required.)

<b>Hot Work Permit</b>			
(Use mm/dd/yyyy when entering dates. Use hh:mm am/pm when entering times.)			
<b>General</b>			
Date:	Location:	Time Issued:	am/pm Time Expired: am/pm
<input type="checkbox"/> PSI Class 1 (complete full permit)	<input type="checkbox"/> PSI non-Class 1 (complete Sections B,C,D,E)	<input type="checkbox"/> SSI Class 1 (complete Sections A & E)	
This excludes shielded PSI non-Class 1 Hot Work			
Detail the scope of work:			
1. Hot work task(s) to be performed: [REDACTED]			
2. The location of the tasks (if performing SSI Hot Work in multiple Class 1 areas, identify each area): [REDACTED]			
3. Any affected asset equipment: [REDACTED]			
<b>A. Atmospheric Monitoring</b>		Air monitoring is required for all Class 1 hot work (PSI & SSI) <input type="checkbox"/> Section not applicable	
Authorized Gas Tester (Name): [REDACTED]		Authorized Gas Tester 2 (Name): [REDACTED]	
Initial air monitoring results: O <sub>2</sub> : % LEL: %		Time: am/pm	
<b>Area Monitoring Plan</b> If LEL > 0% at any time, LEL Mitigation Plan shall be developed			
Document the following (or attach):			
1. The area that will be monitored for potential sources of flammable gas by the Authorized Gas Tester:			
- Minimum of 35ft radius from hot work for PSI Class 1 hot: [REDACTED]			
- Minimum, the planned path of travel for SSI hot work: [REDACTED]			
2. The potential sources of flammable gas within the area to be monitored: [REDACTED]			
3. The wind direction: [REDACTED]			
If performing SSI hot work in multiple Class 1 areas (as detailed in the scope above), record each areas initial air monitoring results below prior to introducing an ignition source in each subsequent Class 1 area: <input type="checkbox"/> NA			
Area:	Initial air monitoring results: O <sub>2</sub> : % LEL: %	Time: am/pm	
Area:	Initial air monitoring results: O <sub>2</sub> : % LEL: %	Time: am/pm	
Area:	Initial air monitoring results: O <sub>2</sub> : % LEL: %	Time: am/pm	
Area:	Initial air monitoring results: O <sub>2</sub> : % LEL: %	Time: am/pm	
<b>Continuous air monitoring</b> in place for PSI Class 1 hot work or for SSI Class 1 hot work if LEL > 0%: <input type="checkbox"/> Yes <input type="checkbox"/> NA			
<b>Repeat air monitoring</b> is conducted prior to recommencing hot work if the job site is left unattended while performing PSI Class 1 hot work, or SSI Class 1 hot work when initial LEL readings were >0% or flammable gas is suspected. <input type="checkbox"/> NA			
Repeat air monitoring results: O <sub>2</sub> : % LEL: %		Time: am/pm	
Repeat air monitoring results: O <sub>2</sub> : % LEL: %		Time: am/pm	
Repeat air monitoring results: O <sub>2</sub> : % LEL: %		Time: am/pm	
Repeat air monitoring results: O <sub>2</sub> : % LEL: %		Time: am/pm	
<b>LEL Mitigation Plan</b>			
% LEL detected: [REDACTED]		<input type="checkbox"/> NA, no LEL detected	
Document the location of confirmed source(s) of flammable gas: [REDACTED]			
Document the controls (if any) that have been implemented to control the LEL to < 10%: [REDACTED]			
<input type="checkbox"/> NA (No additional controls will be implemented other than continuous monitoring of the flammable gas source).			
% LEL after controls implemented: [REDACTED]		If LEL is > 0% after controls have been implemented, has an assessment been performed to determine if a Cold Work Permit for Toxic Substance Exposure is required? <input type="checkbox"/> Yes <input type="checkbox"/> No (LEL 0%)	
<b>B. Fire Watch</b>		<input type="checkbox"/> Section not applicable	
Will PSI Class 1 hot work be performed?		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Will PSI non-Class 1 hot work be performed within 35 feet of combustible materials?		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Will PSI hot work be performed where wall or floor openings within 35 feet would expose combustibles in adjacent areas?		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Is PSI hot work to be performed where combustibles are adjacent to the opposite side of partitions, ceilings, roofs being worked on?		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Will fire alarms/suppression systems be disabled for hot work?		<input type="checkbox"/> Yes <input type="checkbox"/> No	
Note: If Yes is checked for any of the Fire Watch conditions above, a Fire Watch shall be assigned.			
Note: The Fire Watch can also serve as the Authorized Gas Tester.			
Fire Watch 1:		[REDACTED]	
Fire Watch 2:		[REDACTED]	

Permit Number: HW - [redacted]

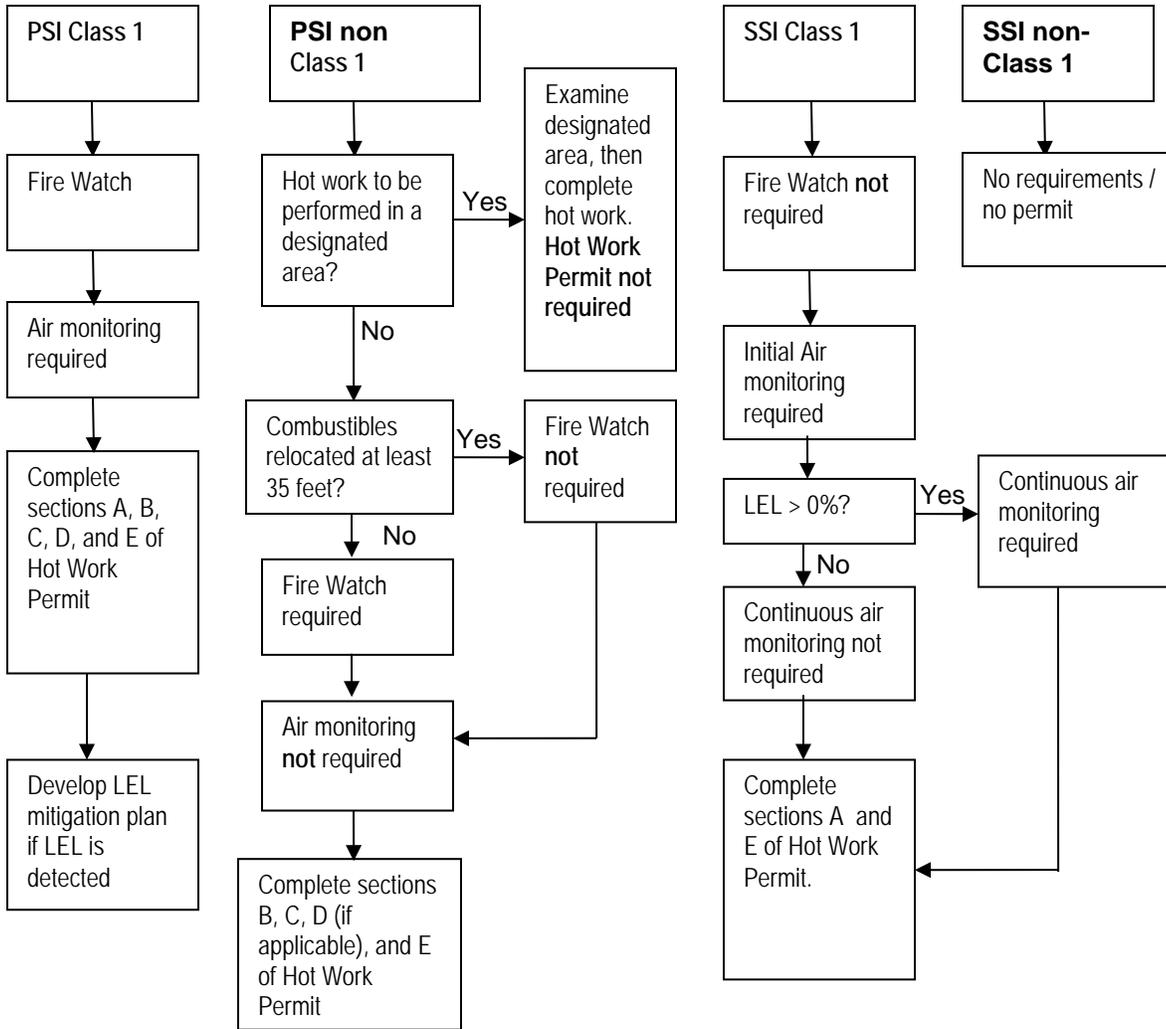
<b>C. Work Area Preparation for PSI Hot Work</b>		<input type="checkbox"/> Section not applicable
Combustible materials are relocated, shielded, or otherwise protected to prevent ignition?		<input type="checkbox"/> Yes
If arc welding equipment will be used, have measures been taken to protect personnel from shock?		<input type="checkbox"/> Yes <input type="checkbox"/> NA
Is a fully charged 20 lb. (minimum) fire extinguisher available at the job site and appropriate for the type of fire expected?		<input type="checkbox"/> Yes
If performing hot work indoors, are openings and cracks shielded to prevent the passage of sparks?		<input type="checkbox"/> Yes <input type="checkbox"/> NA
Ducts, drains, and sewers within 35 ft of hot work are adequately shielded to prevent sparks from entering?		<input type="checkbox"/> Yes <input type="checkbox"/> NA
If hot work is to be performed in or on containers, vessels, tanks, or similar equipment, which previously contained flammable or combustible materials has the container been cleaned, purged, ventilated, or other precautions taken to keep their contents from being exposed to an ignition source?		<input type="checkbox"/> Yes <input type="checkbox"/> NA
If welding, cutting, or brazing on hazardous metals (e.g. galvanized, stainless, chrome-molly, metals containing lead other than as an impurity) is local mechanical ventilation or supplied air respirators used?		<input type="checkbox"/> Yes <input type="checkbox"/> NA
<b>D. Welding, Torch Cutting, or Brazing Conducted in a Confined Space or Partially Enclosed Space</b>		<input type="checkbox"/> Section not applicable
Welding gas cylinders and welding machines are stationed outside of the confined / enclosed space?		<input type="checkbox"/> Yes
If General Mechanical ventilation is used, is 2000 cfm achieved per welder?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
If Local Mechanical ventilation is used, is 100 fpm airflow achieved?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> NA
If either of the above ventilation rate questions are "no", are supplied air respirators worn by all entrants:		<input type="checkbox"/> Yes <input type="checkbox"/> NA
<b>Note: If respiratory protection is required, a Cold Work Toxic Substance Exposure Permit is required.</b>		
<b>E. Authorizing Signatures (Print and Sign name)</b>		
<b>Asset Operator or Asset Operator Designee</b>		
I have reviewed the completed permit, and based on my review of the documented conditions with respect to the scope of work and affected equipment, I believe that asset equipment involved or affected by this work has been prepared for this scope of work and that it is appropriate for the work to proceed. I have reviewed the Level 2 HITRA (if applicable), agree that it is appropriate for this scope of work, verify it identifies Hot Work in the Permit Type(s) section, and that it has been properly approved. I understand that if permit conditions are exceeded and changes to this permit are necessary, I am responsible for documenting my approval by initialing where the changes are made.		
(Leave the AO/AOD signature line blank and check the box if issuing permit via telephone)		
AO/AOD (print and sign): [redacted]		<input type="checkbox"/> Phone validation below
<b>Performing Authority</b>		
I have read and understand the above conditions and precautions. I understand I am responsible to instruct individuals performing work under this permit to read, and to document their understanding of, this permit. I understand I am responsible to stop work if I become aware that conditions of this permit are exceeded, and to notify the AO/ AOD upon completion or interruption of this work. I understand that upon interruption of work or if the job site is left unattended, I am responsible for reassessing the work environment and to revalidate the permit conditions before work resumes, or I will cancel the permit. If changes to this permit are necessary, I understand the Asset Operator or Asset Operator Designee shall approve them by initialing where the changes are made, and that I shall communicate them to the workforce.		
Performing Authority (print and sign): [redacted]		
<b>Performing Authority (SSI Class 1) Phone Validation of Permit with Asset Operator</b>		<input type="checkbox"/> NA
I have contacted the Asset Operator and have communicated the conditions of the above completed permit. The Asset Operator has verified the permit conditions and has authorized me to sign on his/her behalf to issue this permit.		
Performing Authority signature on behalf of the Asset Operator: [redacted]		
<b>Authorized Gas Tester(s)</b>		<input type="checkbox"/> NA
Initial air monitoring has been performed with a survey of the hot work area. I understand I am responsible for performing continuous air monitoring per the area monitoring plan while PSI Class 1 hot work is being performed, and if SSI Class 1 hot work is performed in atmospheres >0% of the LEL, and to stop hot work operations if the LEL reading is $\geq 10\%$ . I understand that I am not to perform PSI Hot Work Operator duties while performing AGT duties.		
AGT (print and sign): [redacted] (Responsible for performing initial air monitoring)		AGT 2 (print and sign): [redacted]
<b>Fire Watch</b>		<input type="checkbox"/> NA
I understand I am responsible for maintaining a line of sight with the hot work operation, to have immediate access to a fire extinguisher, and to remain in the hot work area for 30 minutes after the hot work has ceased including during work breaks to verify the area is fire safe. I understand that I am not to perform PSI Hot Work Operator duties while performing Fire Watch duties.		
Fire Watch (print and sign): [redacted]		Fire Watch 2 (print and sign): [redacted]
I/we remained in the hot work area for 30 minutes after the hot work was completed to verify the area was fire safe: <input type="checkbox"/> Yes		
<b>Hot Work Operators</b>		
I have reviewed and understand the permit conditions specific to the scope of work. I have inspected the hot work equipment I will use and deem it fit for purpose and intact. I understand my responsibility to perform hot work operations within these conditions, to stop any work that I deem to be unsafe, and to notify the Performing Authority upon completion or interruption of this permitted work. (print and sign)		
Hot Work Operator 1: [redacted]		Hot Work Operator 2: [redacted]
Hot Work Operator 3: [redacted]		Hot Work Operator 4: [redacted]
Hot Work Operator 5: [redacted]		Hot Work Operator 6: [redacted]
Hot Work Operator 7: [redacted]		Hot Work Operator 8: [redacted]

## Appendix II Hot Work Permit Applicability



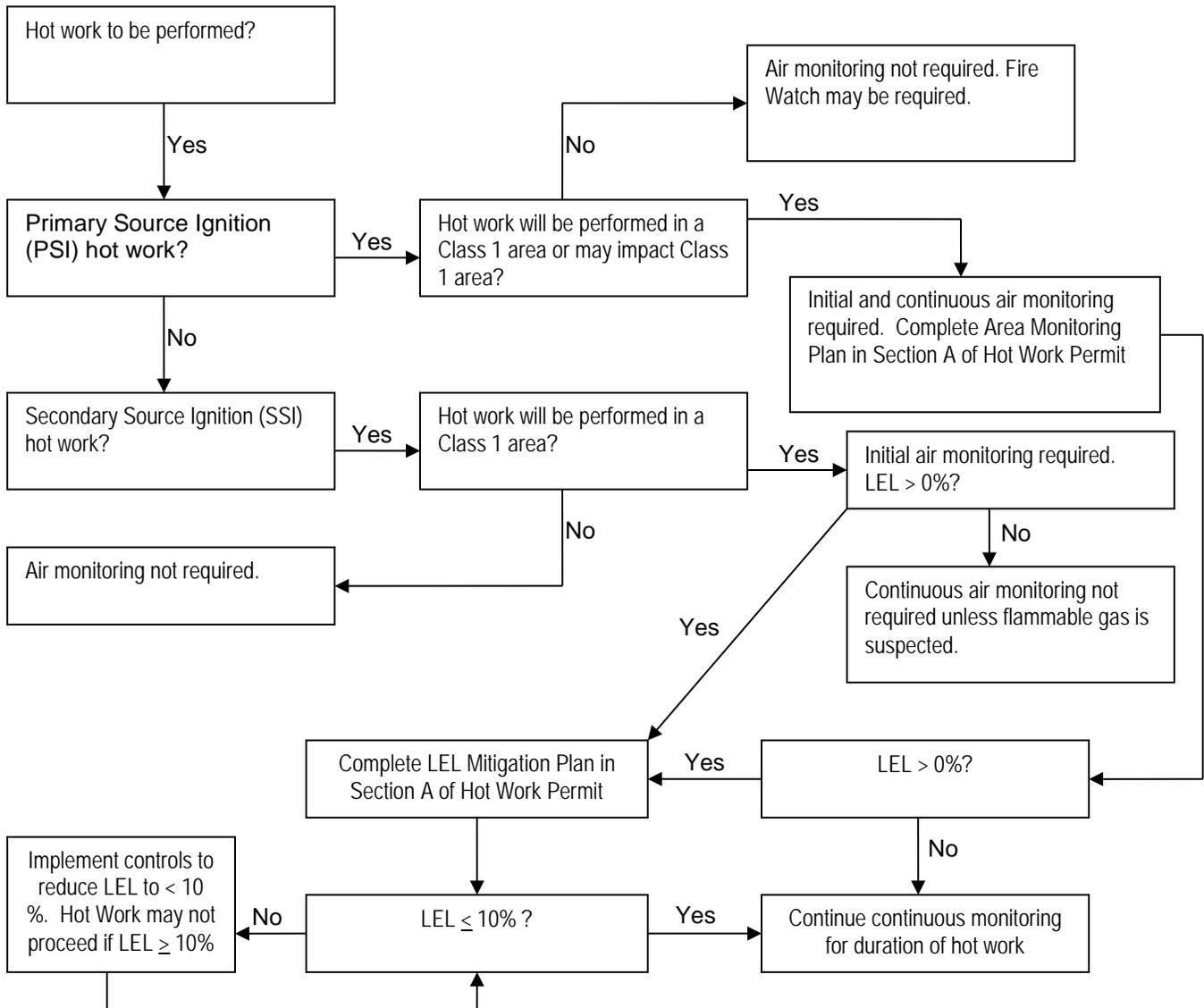
# Appendix III

## Hot Work Permit Requirements

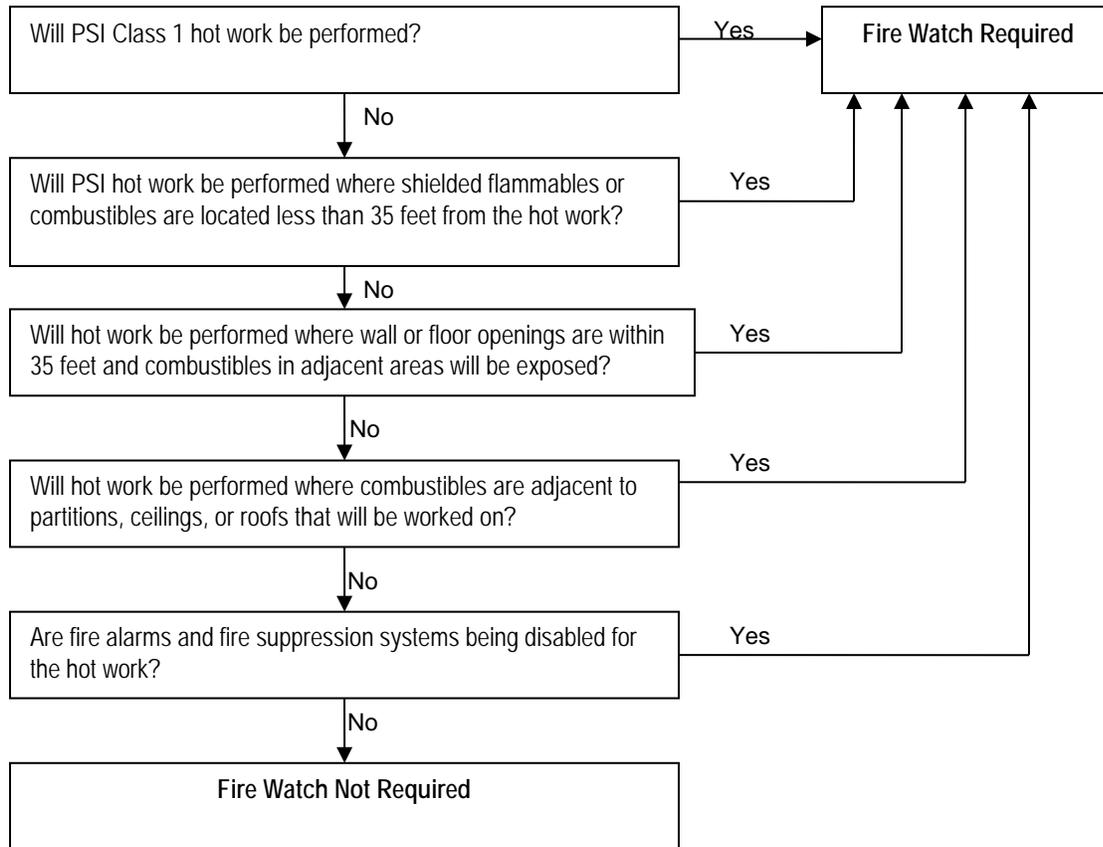


# Appendix IV

## Initial and Continuous Hot Work Air Monitoring Requirements



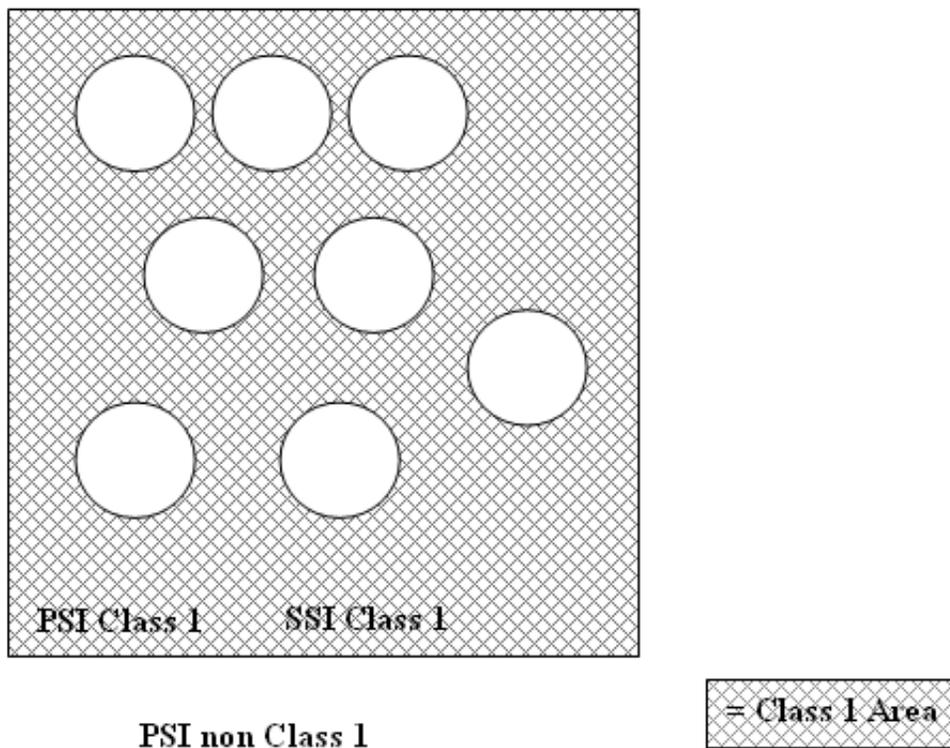
## Appendix V Situations Requiring a Fire Watch



## Appendix VI Types of Hot Work

Example: Tank Dike

The entire area inside the tank dike is a Class 1 area, so hot work performed inside the dike area is Class 1 hot work. Hot work performed outside the dike is non-Class 1 hot work.



## Appendix VII General Mechanical Ventilation Guidance for Welding, Cutting and Brazing in Confined Spaces or Partially Enclosed Spaces

The following table provides guidance in determining the appropriate fan/blower configuration to achieve the required 2,000 cfm per welder:

No. of Fans or Horns	Size/Type of Fans or Horns with Minimum CFM Ratings per Number of Welders in the Confined Space	Maximum Number of Welders in a Confined Space
1	20" air-driven entryway-mounted reaction fan = 10,000 cfm	4
2	20" air-driven entryway-mounted reaction fan = 20,000 cfm	8
3	20" air-driven entryway-mounted reaction fan = 30,000 cfm	12
1	24" air-driven entryway-mounted reaction fan = 15,000 cfm	6
2	24" air-driven entryway-mounted reaction fan = 30,000 cfm	12
1	Model 3 HP Coppus air horn = not adequate cfm	0
2	Model 3 HP Coppus air horn = 2,500 cfm	1
3	Model 3 HP Coppus air horn = 2,500 cfm	1
1	Model 6 HP Coppus air horn = 2,500 cfm	1
2	Model 6 HP Coppus air horn = 7,500 cfm	3
3	Model 6 HP Coppus air horn = 12,500 cfm	5
1	Model 8 HP Coppus air horn = 5,000 cfm	2
2	Model 8 HP Coppus air horn = 10,000 cfm	4
3	Model 8 HP Coppus air horn = 17,500 cfm	7
1	Model 9 HP Coppus air horn = 7,500 cfm	3
2	Model 9 HP Coppus air horn = 15,000 cfm	6
3	Model 9 HP Coppus air horn = 22,500 cfm	9

The maximum number of welders allowed in a confined space or partially enclosed space in the above table was calculated using the total airflow (cfm) provided by the manufacturer for each model of air mover. An inlet air pressure of 80 psi to drive the air movers was used. This must be maintained at the site for all the air movers. Because of ventilation inefficiencies and losses due to entryway attachments, internal airflow restrictions, and variations in the actual air inlet pressure, a safety factor of 0.75 was incorporated into the equation to determine the maximum number of welders.

There must be enough fresh, breathable, makeup air entering the confined space or partially enclosed space to balance the volume being exhausted to effectively "flush" the space with clean air. Consequently, some entryways and nozzles should be left open to allow clean air to enter the space. Open entryways and nozzles should preferably be located at the lower levels and the exhaust air fans/blowers at higher levels above the work. Most welding fumes are heavier than air and adding ducting near the floor or work area to the Coppus-type fan is recommended to move the fumes away from the welder.