

GRACE Davison - LAKE CHARLES PLANT

SAFETY
PROCEDURE
HOT WORK

APPROVED BY: _____

Mark A. LeDoux
REVISION # 19

PURPOSE:

To establish a standard procedure for protecting personnel and property from fires and explosions while performing hot work in the Grace Davison Lake Charles plant.

RESPONSIBILITY:

- 1.) It is the responsibility of personnel performing the Hot Work to follow these requirements and precautions and maintain safe conditions throughout the duration of a job.
- 2.) It is the responsibility of both the person(s) issuing and requesting the Hot Work Permit:
 - a.) to be knowledgeable of the Hot Work Permit procedure and its location,¹
 - c.) to ensure that all information on the Hot Work Permit has been addressed, understood and followed by all applicable personnel,
 - d.) to ensure that all safety precautions have been identified to all applicable personnel performing the Hot Work,
 - e.) to ensure that the Hot Work Permit has been posted where the work is to be performed.
 - f.) to ensure (when work is completed or the permit expires) the completed permit is attached to the Maintenance Order.

¹ Located in the Davison Interlan/Health & Safety/Hot Work Permit.

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DEFINITIONS:

- 1.) **Hot Work** is defined as any activity involving electric or gas welding, riveting, cutting, brazing, or similar flame or spark-producing operations.

Hot Work in the Hydrogen (Red) area at the XP plant will include any spark producing activities such as, but are not limited to:

- a.) the use of spark producing tools,
 - b.) any grinding, chipping, chiseling, sandblasting, drilling, or using power hand tools or non-intrinsically safe electrical equipment².
- 2.) **Custodian:** Is the person responsible for the area/equipment where the Hot Work is to be performed. This person will be identified on the applicable Maintenance Order. It will be the responsibility of the Custodian to properly complete the Hot Work Permit as defined and review all permit information with the applicable Craftsmen / Designee. The Custodians signature will be the authorizing signature.
- 3.) **Area Supervisor:** The area Shift Foreman, Maintenance Foreman or Area Foreman who will properly perform all atmospheric Test (when applicable). The Area Supervisor must review the Hot Work Permit side two (16 questions) for accuracy before signing the permit. He must enter (on side one) the %O₂, % Explosive and sign-off.

NOTE: The Maintenance Foreman or designated Craftsmen can sign-on in the Craftsmen block in the case where one person will represent a group of people. The **Designee** must sign-on (full name) under craftsmen.

- 4.) **Craftsmen:** Any worker (maintenance, laborers, contractor, etc.) performing the hot work. The Craftsmen must review the Hot Work Permit side two (16 questions) and any special instructions for accuracy before signing the permit. The Craftsmen must also insure that the integrity of the permitted area will not be changed during the duration of the job.
- 5.) **Fire Watch:** Will be responsible for monitoring areas where fires may start and where applicable continually saturate areas of concern with process water.

² Tools or equipment that are not non-sparking or explosion proof.

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- 6.) **Designated Hot Work Areas:** Are designated areas for fabrication and repairs where the integrity of the area will remain restricted for Hot Work at all times. These areas will be clearly marked and will have a Hot Work Permit displayed. The Area Foreman(s) will be responsible for completing the Hot Work Permit (if more than one Foreman will be responsible, all must sign as Custodian). He/she will complete the HW permit as defined. These permits shall be valid for 1 year only after the start date. It will be the responsibility of the Craftsmen Foreman to insure the area remains in compliance with the Hot Work Permit requirements for safe work at all times. If Craftsmen will be working in these areas during the permitted time, they must sign-on the permit and adhere to the HW permits integrity. After the area is removed from the designated Hot Work status, the permit must be returned to the Davison Maintenance Foreman for review and disposal.
- 7.) **Guards:** If the object to be welded or cut cannot be moved and if all the fire hazards cannot be removed, then guards shall be used to confine the heat, sparks, and slag, and to protect the immovable fire hazards.

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PERMIT USAGE:

- 1.) **Areas where Hot Work Permits shall be used:**
 - A.) A Hot Work Permit will be issued for all Hot Work performed in the Grace Davison Lake Charles Plant. This will also include the riverside of plant fence at dock. (U.S. Coast Guard must be notified).
- 2.) **Hot Work Not Permitted** – A Hot Work Permit will not be issued and hot work will not be permitted under the following conditions:
 - A.) if the selected CX100 Reactor:
 - a.1.) has not had been drained completely,
 - a.2.) has not been washed out with process water until cool (inside of tank only).
 - B.) if the hot work will be performed on or around the 1612, A, B, C, D and E XPS Reactors and steam is detected exiting any CX100 Reactor:
 - C.) if unsafe conditions exist in a surrounding work area, such as accidental spillage or releases of flammable/combustible material, (After an unsafe condition exists and is corrected, a new permit must be issued.)
 - D.) if the Explosimeter check shows any deflection of the needle, or the meter verifies an explosive hydrogen atmosphere,
 - E.) if the MSA Multigas Monitor measures percent oxygen is more than 20.8%, which may be an indication of a possible oxygen enriched atmosphere,
 - F.) if the MSA Multigas Monitor LEL (lower explosion limit) indicator has any reading,
 - G.) if process reactions are taking place in the CX100 Reactors, (unless the hot work will be a safe distance from the reaction and protected with fire retardant guards, curtains or otherwise shielded with metal),
 - H.) if it has been determined (on a vessel, tank, piping, etc.) that a consequence of any heat transfer could cause an uncontrolled fire, toxic vapors and/or explosion.
 - I.) if side 2 of the Hot Work Permit has not had all fifteen (16) questions completed with a YES or N/A (not applicable).

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8.) Fire Watch

NOTE: The need for a Fire Watch will be based on an on-site assessment of the Hot Work area by the Craftsmen and Custodian before work has started. It will be the responsibility of the Craftsmen to notify the Custodian if the site has changed or moved after the work has started.

- A.) Fire watches shall be required whenever Hot Work is performed in locations where other than a minor fire might develop, or any of the following conditions exist:
- a.1.) combustible material, in building construction or contents, closer than 35 feet to the point of operation,
 - a.2.) combustibles are more than 35 feet away but are easily ignited by sparks,
 - a.3.) wall or floor openings within a 35 feet radius of exposed combustible material in adjacent areas including concealed spaces in walls or floors,
 - a.4.) combustible materials are adjacent to the opposite side of metal partitions, walls, ceilings, or roofs and are likely to be ignited by conduction or radiation.
 - a.5.) CX100 Reactors are reacting and the hot work will be performed around the 1612, A, B, C, D and E XPS Reactors.

B.) Fire watches shall:

- b.1.) assess the type of fire hazards that may be present and obtain the applicable fire-extinguishing media needed.



Class A – Fires in ordinary combustible materials, such as wood, paper, cloth, rubber, and many plastics, where the quenching and cooling effects of water or of solutions containing large percentages of water are of prime importance.



Class B – Fires in flammable liquids, greases, oils, tars, oil-base paints, lacquers, and similar materials, where smothering or exclusion of air and interrupting the chemical chain reaction are most effective. This class also includes flammable gases.



Class C – Fires in or near live electrical equipment, where the use of a nonconductive extinguishing agent is of first importance. The material that is burning is, however, either Class A or Class B in nature.



Class D – Fires that occur in combustible metals, such as magnesium, lithium, and sodium. Special extinguishing agents and techniques are needed for fires of this type.

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- b.2) have applicable fire-extinguishing equipment available and be trained in its use.
 - b.3.) ensure a means of communication is available (radio, phone, or horn) to call for assistance in the event of an emergency.
 - b.4.) sign-on in the Fire Watch section of the Hot Work Permit (Side One).
 - b.5.) watch for fires in all exposed areas, try to extinguish them only when within the capacity of the equipment available, or otherwise sound the alarm and notify workers to evacuate affected area.
 - b.6) (where applicable) continually saturate areas of concern with process water.
 - b.7) monitor the CX100 reactors for any steam exiting the loading ports. If steam is detected, stop all hot work jobs above and/or around the 1612, A, B, C, D and E XPS Reactors.
 - b.8) be maintained for at least one half hour (30 minutes) after welding or cutting operations to detect and extinguish possible smoldering fires.
 - b.9.) (when applicable) be responsible for signing and removing (single line marked through) his/her name in the Fire Watch Section of the Hot Work Permit. Where a Designee is assigned, the Designee will be responsible for entering the name/s of the assigned personal.
 - b.10) return the Hot Work Permit to the Custodian.
- C.) If it is decided (by Custodian) that a Fire watch will be needed, the Craftsmen's Foreman / Area Foreman will assign the appropriate qualified people as Fire Watch. The assigned Fire Watch (s) must sign-on in the Fire Watch section of the permit.
- D.) If a Fire Watch will not be needed, the NO box must be checked.

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ATMOSPHERIC TEST:

- 1.) **Atmospheric Test** – Shall be performed when Hot Work (HW) is

NOTE: The atmospheric test should be performed inside and approximately 2 to 3 feet around openings in the gas fired equipment. On gas piping, the test should be done around the piping flanges, unions, valves, gauges, blinds etc.. If the gas piping is within the 35 radius of the Hot Work and is a straight section of welded pipe, no atmospheric test will be required unless the integrity of the piping is questionable. If the Gas Fired equipment has double block and bleed on the main and/or pilot gas line for the Burner Management System (BMS), the vent line to the atmosphere must (if within the 35' radius) be secured by the use of an air mover. The air mover must be directed at the vent discharge and positioned to blow away from the HW area. This is done to ensure that in the case of a BMS shutdown, the vented gas will be dissipated instantaneously.

- a.) Within 35 feet of any gas fired equipment and/or gas piping flanges, unions, valves, gauges, etc. in the plant,
- b.) On riverside of plant fence at dock. (U.S. Coast Guard must be notified) This communication is normally done by the Loader/Unloader Foreman,
- c.) Inside the red line area around the CX100 Reactors (Hydrogen Area),
- d.) All Sewers, Sumps and piping where gases (methane, etc.) may exist,
- e.) All Permit Required Confined Space where Hot Work is to be performed,
- f.) On any tank, drum, vessel or sump where the consequence of the Hot Work may cause sparks and/or slag to fall inside, (example. cutting a lid off a tank)
- g.) Within 35 feet of any portable or permanent flammable liquid storage tanks,
- h.) Within 35 feet of any portable or permanent flammable gas storage tanks,

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NOTE: *Relocation of combustibles:* Where feasible, all combustibles shall be relocated at least 35 feet from the work site. Where relocation is impractical, combustibles shall be protected with flameproof covers, shielded with metal, guards, curtains, or wet down material to help prevent ignition of material. The type of shielding and all special instructions must be noted in the Special Instructions part (side two) of the Hot Work Permit.

NOTE: *For elevated/overhead Hot Work activities,* combustible materials shall be either relocated a minimum of **50 feet** (15 m) from the Hot Work area; or properly protected with fire-resistant welding blankets (e.g., suspended/hung under Hot Work conducted near a ceiling); or the Hot Work operation isolated with welding screens (e.g., noncombustible screens placed around Hot Work at the floor to trap sparks). Every elevated Hot Work operation should be evaluated on a case-by-case basis to determine a reasonable safe distance from Hot Work to combustible occupancies or construction. The physical conditions involved may require relocation of combustibles beyond 50 feet (15 m).

- i.) Within 35 feet of any portable or permanent combustible liquid storage tanks,

Note: A new Atmospheric Test will have to be performed if there was a break in the Hot Work job, which exceeded one (1) hour.

- j.) if there is a break in the Hot Work job which exceeds one (1) hour (where an Atmospheric Test was required).
- 2.) **Atmospheric Testing** - The Atmospheric test can be retaken at anytime during the duration of the job and shall be retaken upon any request. All Explosimeter and MSA Multigas Monitor calibration checks will be logged on the Combustible Gas and O₂ Alarm Calibration Check Log Sheet.
- a.) The Explosimeter must be zeroed and the calibration tested before use by an Area Supervisor trained in the testing and use of the Explosimeter combustible gas indicator model 3 (calibration testing for Hydrogen). Explosimeter must be tested for calibration in accordance with the manufacturer's specifications.
- b.) The MSA Multigas Monitor (measures the oxygen and LEL) must be tested and zeroed before each use by an Area Supervisor trained in calibration testing and use of the MSA Multigas Monitor. The MSA Multigas Monitor must be tested for calibration in accordance with the manufacturer's specifications.
- c.) If either instrument fails to meet calibration specification during testing, it must be removed from service and returned to the Safety Department for repair/replacement immediately. Do not use any instrument that fails to meet its manufacturer's specifications for calibration.

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- d.) An Explosimeter (Hydrogen Areas) reading shall be taken and recorded when a Hot Work permit is to be issued.
- e.) A MSA Multigas Monitor reading shall be taken and recorded when a Hot Work permit is to be issued for work to be performed in areas with poor ventilation, any Permit Required Confined Space areas and areas where Natural and/or Methane Gas may be present.
- f.) When taking atmospheric readings with the Explosimeter and/or the Multigas Monitor :
 - i.) an assessment must be done of all possible areas where flammable vapors/gases may be stored or trapped.
 - ii.) The atmospheric testing should be done at the point of hot work and if possible 3 to 4 feet around it, and any other suspected areas.
 - iii.) If an Atmospheric test is being done because of its proximity to a gas line or gas fired equipment, the immediate area and the nearest gas piping flanges, valves, bleeds, gauges, etc. within ~35 feet of the Hot Work should also be tested.
- g.) Any deflection of the Explosimeter or Multigas monitor needle indicates that combustibles are present, further cleaning, purging, or isolation will be required prior to the atmosphere being re-tested.
- h.) If the MSA Multigas Monitor oxygen reading should read above a 20.8% the monitor should be rechecked for calibration. If the calibration is found to be accurate, Hot Work should not be permitted and the excessive oxygen level should be determined.

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10.) **Other Precautions:**

- a.) Identify and prevent situations that may occur due to heat transfer along conducting components.
 - a.1.) Before any hot work is performed on the outside of a vessel, tank, piping, etc. the content or residual must be identified and a consequence of heat transfer determined.
 - a.2.) No hot work shall be performed on used drums, barrels, tanks or other containers until they have been cleaned so thoroughly as to make absolutely certain that there are no flammable materials present or any substances such as greases, tars, acids, or other materials which when subjected to heat, might produce flammable or toxic vapors. Any pipelines or connections to the drum or vessel shall be disconnected, blinded or doubled blocked and bled. If there are any questions as to what was contained or stored, contact the Area Shift Foreman immediately.

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PROCEDURE:

Issuing of Permit:

I.) **Custodian:**

Side One:

- a.) Legibly print the starting Date, Time, Location (area that work will be performed) and Maintenance Order number.

Side Two:

Note: On side 2 of the Hot Work Permit, Review and complete all fifteen (16) questions with a YES or N/A (not applicable). If any question has not been addressed, the permit cannot be issued and Hot Work will not be permitted.

- c.) Answer safety questions 1 – 16 with a Yes or N/A.

Note: If “YES” has been checked for an atmospheric test, the test must be performed and readings noted on side one in atmospheric test block. All atmospheric tests will be performed, data entered and signed by the Area Supervisor.

d.) **Questions:**

1.) **Is an atmospheric test required?**

- a.) Refer to page 7 under the title of **Atmospheric Test** for details.

Note: It is important to remember that when any of the following questions do not apply to your Hot Work permitted area, mark it “N/A”. Marking “YES” would indicate that there was a concern in your area and you acted to remove or protect it.

2.) **Are sprinklers working and will not be taken out of service until burning or welding is completed.**

- a.) This is only applicable to Hot Work being performed in any area where fire sprinkler systems are present.

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3.) **Is barricading required and in place?**

- a.) This is applicable where any sparks, slag, metal and/or any hot debris produced during the Hot Work could injure personnel in or moving through the area. Always take into account any structure and/or piping that may deflect hot debris outside a barricaded area as well as any levels below the level of the Hot Work job. (Refer to the Temporary Barricades procedure in EDMS)

4.) **Is area stored combustibles and flammables secured?**

- a.) Combustible = Capable of igniting and burning. (example: wood, paper, cloth, metal shavings, diesel, oil, etc.)

Note: Always consider electrical wiring trays, plastic and fiberglass tanks and piping.

- b. Flammables = Easily ignited and capable of burning rapidly. (example: gasoline, paint thinner, kerosene, etc.)

5.) **Are area combustibles and flammables secured in floors, trenches and sewers?**

- a.) Are there any ignitable debris in floors, trenches and sewers, within a 35 feet radius of the work, that could ignite during the hot work? (example: wood chips, grass, paper, plastic, trash, metal shavings, etc.)
- b.) Are there any type of gas, paint, thinner, oil, containers (including spray cans), etc within 35 feet of the hot work.

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- 6.) **Are ducts and conveyors that may carry sparks to another area secured?**
 - a.) Sparks and hot debris must be blocked from traveling to a non-permitted area.
- 7.) **Are area openings, cracks and holes where sparks may drop into combustibles secured?**
 - a.) example: Flanges, grating, windows, manholes, etc. where sparks could fall out or through and ignite combustibles.
- 8.) **Is heat conduction or radiation to unobserved combustibles secured?**
 - a.) Check the opposite side of the tank, wall, floor, partition, ceiling, roof, etc, for materials that could be ignited from the heat of the hot work.
- 9.) **Are area walls, partitions, flooring, ceiling and roofing combustible materials protected?**
- 10.) **Is area sandwich construction with combustible interiors protected?**
 - a.) Places where a combustible (ex: insulation type) is between metal walls.
- 11.) **Is area clear of all active corrosion of metals by acids liberation hydrogen gases?**
 - a.) Places where acids and metals are reacting which will release a byproduct of hydrogen gas. (example: battery storage, charging batteries, etc.)

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- 12.) Is area clear of gas or liquid leaks that may cause flammable or explosive conditions?

Note: If any Hot Work is going to be performed above ground where access to a fire extinguisher and/or water hose will be restricted, the fire extinguisher and water hose must be brought to the work level.

- 13.) Are specified type fire extinguishers and/or water hose(s) on the job and readily available to handle incipient flames?

a.) Readily Available = Within a 35 foot radius of the hot work or at work level.

- 14.) Will the welding machine be grounded at the point where the welding is to take place?

a.) Electrical welding/cutting machines must be properly grounded to the working surface to operate correctly and safely. If not grounded correctly, it may try to ground through equipment, structures as well as instrumentation.

- 15.) Is the CX100 Reactor(s) empty and clean?

a.) This is applicable to Hot Work being performed on a CX100 Reactor(s) and/or within the CX100 Hydrogen area.

- 16.) Are the CX100 Reactors clear of steam exiting the loading ports?

a.) The XP Area Foreman must be contacted and if needed the loading port(s) can be blocked-in to restrict air flow and reestablish a negative draft in the reactor(s).

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Side One:

- e.) If a Fire Watch will be required, contact the Craftsmen's Foreman or Area Foreman for personnel assignment. Check "yes" and have the Fire Watch/Designee print his/her name in the fire watch section. If the Fire Watch has to be replaced (example: shift change, reassignment, illness, injury, etc.), it will be the responsibility of the old Fire Watch to mark through his/her name (single line) and the new Fire Watch add their name on the permit.

Note: All new craftsmen must review the safety questions and instructions before signing the permit and starting job.

- f.) Custodian must review all questions and any special Instructions with Craftsmen. When the Permit has been reviewed, and area is safe for Hot Work to begin, the Craftsmen/Designee and Custodian can Sign-on.

Note: If the Hot Work area cannot be personally examined due to any type of restricted access (Example: Confined Space), the Custodian must interview the Entry Supervisor. The Entry Supervisor must be knowledgeable of the Hot Work areas contents and hazards. This interview shall be noted in the special instruction section. The Entry Supervisor will also sign in the Craftsmen/Designee section. If all 16 questions cannot be answered by the Entry Supervisor, contact an Area Foreman and/or Area General Foreman.

- g.) Post the Hot Work permit on the job site.
- h.) When the Hot Work Permitted job has been completed or the permit is no longer valid, it will be the responsibility of the Craftsmen / Designee to return the Hot Work Permit to the Custodian.
- i.) The Custodian will then attach the completed Hot Work Permit to the applicable Maintenance Order and return both to the Craftsmen.

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Note: In the event of any emergency, immediately contact the Incident Commander Phone 3571 and/or Security East Gate 3542/3555. The Shift Foreman and Security monitor radio Zone 1 Channel 2 "Silica Sol"

Note: It is the responsibility for the Safety Department to evaluate periodic field audits of this procedure to ensure compliance. Records of these audits will be maintained by the Safety Department.

Reissuing of a Hot Work Permit: A Hot Work Permit must be reissued:

- a.) if the Craftsmen's shift has ended.

Permit Review: A Hot Work Permit must be reviewed and signed if there is a personnel change in the Custodian position during the hot work permitted job. This is done to insure that the new Custodian has knowledge of all sections of the Hot Work Permit. After a review has been conducted, the new Custodian must sign full name next to the original Custodian's signature.

Safety Concerns: If a safety concern is found during the permit review,

- a.) stop the permitted work,
- b.) contact the Custodian and/or Area Supervisor immediately for clarification,
- c.) if needed, issue a new Hot Work Permit.

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REVISION HISTORY

CHANGE DATE	DESCRIPTION OF CHANGE
04/09/02	New Hot Work Permit and Procedure Revision 11 (MOC HWP0201)
05/24/02	Hot Work Permit and Procedure Revision 12 (MOC HWP0202)
01/14/03	Hot Work Permit and Procedure Revision 13 (MOC HWP0300)
07/06/04	Hot Work Permit and Procedure Revision 14 (MOC HWP0400)
03/21/06	Hot Work Permit and Procedure Revision 15 (MOC HW0601)
12/03/07	Inserted note on bottom of each page "NOTE: This Procedure Is Invalid After Print Date"
07/10/08	Hot Work Permit and Procedure Revision 16 (MOC HW0801) Added "as well as any levels below the level of the Hot Work job" to the "Is barricading required and in place?"
02/18/10	If flammable gas cylinders 35' away from HW, if closer, they must be shielded. Hot Work Permit and Procedure Revision 17. (MOC HWP0400)
10/12/10	Remove Flammable Gas Cylinder (acetylene) restrictions and added Proper Grounding of Welding Machines. Hot Work Permit and Procedure Revision 18. (MOC HWOP1002)
08/31/11	Added 50 foot requirement for work above ground (MOC HWOP1101) No Revision Change.
01/07/13	Added the Entry Supervisor involvement for Confined Space HW jobs. Radio Channel (MOC HW1301).

END