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Space Administration

**John C. Stennis Space Center**  
Stennis Space Center, MS 39529-6000

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**July 2020**

## **John C. Stennis Space Center Hot Work Program Procedure**

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## Approval/Concurrence

*Signature on file*

Kenneth E. Volante

NASA SSC Center Operations Directorate, Institutional Division

## Document History Log

Status/Change/ Revision	Change Date	Originator/ Phone	Description
Basic	02/25/2009	Clyde Dease, ext. 8-1905	Initial Release This issuance supersedes and replaces instruction on the subject previously provided in SPR 8715.3, released Nov. 15, 2004
A	02/10/2011	Clyde Dease, ext. 8-1905	Section 5: Added exclusions for soldering equipment and heat guns; added process for permit review and approval. Section 6: Added firewatch requirements. Added Section 7.0 and Appendix D for use of Sterno. Formatted in accordance with SPR 1400.1. Updated references throughout. Updated records section.
B	04/15/2014	Clyde Dease, ext. 8-1905	Updated Section 5.0 Procedure/Process with reduction of distance requirements on propellant vessels and systems. Updated Sec. 6.0 with Fire Watch requirements for designated, trained fire watch.
B-1	11/20/2015	Kenneth Volante, ext. 8-2160	Updated Section 6.0 Hot Work on Propellant Systems with additional requirements for Fire Watch personnel and adjustments for hot work under various weather conditions.
B-2	04/05/2016	Kenneth Volante, ext. 8-2160	Updated all references of FOOSC to SACOM.

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C	12/7/2016	Kenneth Volante ext. 2160	Added 5.0 (k) fire reporting requirements; Updated Section 5.0 (m.) and 6.0 (c) clarifying requirements for safe atmosphere checks; Updated section 6.0 (d) clarifying requirements for LEL levels with hot work on propellant systems; Added section 8.0 roof work requirements.
D	10/25/2019	Kenneth Volante Ext. 2160	Added Internal combustion engines to section 2.0; added 5.0(n): addition of SCWI-8715-0012 use when defining classified locations; added 5.0(o): Use of internal combustion engines in classified locations
D-1	7/23/2020	Kenneth Volante Ext. 2160	Moved section 6.0 I thru m to section 5.0 to ensure section covers all hot work processes. Added note to beginning of section of 6.0.

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## 1.0 Purpose

This work instruction establishes the requirements and procedures for the Hot Work Permit Program at Stennis Space Center (SSC) whereby strict protocols are followed to reduce the risk of fire injuries and damage to life and property.

## 2.0 Applicability

This instruction is applicable to all NASA SSC organizations including civil service and support contractors, and to other tenants of NASA SSC to the extent formal agreement is reached between NASA and the tenant.

This document covers all hot work operations involving, but not limited to, electric arc welding, oxy-acetylene cutting/welding/heating operations, operations of electrical pneumatic or mechanical tools and internal combustion engines operated in hazardous classified areas that are not intrinsically safe, soldering torches powered by flammable gases, and open-flame-producing devices or devices that produce hot sparks during operations.

## 3.0 References and Applicable Documents

All references are assumed to be the latest version unless otherwise specified.

- a. 29 CFR 1910.252, *Welding, Cutting and Brazing, General Requirements*
- b. 29 CFR 1910.253, *Welding, Cutting and Brazing, Oxygen-fuel Welding and Cutting*
- c. Form SSC-90, Process Plan
- d. Form SSC-68, Flame "Hot Work" Permit
- e. SACOM document ST-P-46, *Employee Certifications*
- f. SACOM document S3-3100-PR1, *Safe Plan of Action*
- g. SACOM document MT-P-03, *Welding/Cutting/Brazing Operations*
- h. NASA-STD-8719.7, *Facility System Safety Guidebook*
- i. NASA-STD-8719.11, *Safety Standard for Fire Protection*
- j. NASA-STD-8719.12, *Safety Standard for Explosives, Propellants, and Pyrotechnics*
- k. NFPA 51B, *Standard for Fire Prevention during Welding, Cutting, and other Hot Work*
- l. NPR 8715.3, *NASA Safety Manual*
- m. SCWI-8715-0012 *Work in Hazardous Classification Areas*
- n. MSDS #11305, Sterno Brand Wick Food Warming Material

## 4.0 Responsibilities

### 4.1 NASA Center Operations

The NASA SSC Center Operations Fire Protection Program Manager has overall responsibility for development of this instruction and approves all organizations requesting

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approval of facilities or construction sites for hot work without daily permits. Organizations requesting authorization to issue Hot Work Permits (Form SSC-68) shall make formal requests in writing to the Fire Protection Program Manager.

#### **4.2 Fire Protection Services**

The SSC Fire Chief of the Synergy-Achieving Consolidated Operations and Maintenance Contract (SACOM) will provide support to the NASA Fire Protection Program Manager by reviewing, updating, implementing, and maintaining the SSC Hot Work Program Procedure.

#### **4.3 Civil Servant Personnel**

Civil servant personnel will not be assigned tasks that include potential exposure to hot work. If assignments are made in the future, civil servants will comply with this instruction.

#### **4.4 Contractors and Tenants**

Contractors and tenants will identify any hot work tasks and comply with this instruction.

### **5.0 Procedure/Process**

a. Hot Work Permits (Form SSC-68) provide documented approval to conduct welding, cutting, brazing, or other spark/flame/heat-producing operation. Electric soldering equipment is excluded from the hot work permitting process, by the direction of the Fire Protection Program Manager.

b. Daily Hot Work Permits are required for all welding, cutting, brazing, and spark/heat/flame-producing operations in all areas at SSC, except those unique areas suitable for hot work operations that qualify for permanent and specific duration permits.

c. Hot Work Permits issued are valid for the duration of the work shift unless otherwise limited by the Permit Authorizing Individual (PAI). Such limitations will be noted on the form in the expiration (date/time) block of Form SSC-68.

d. Requests for permanent permits for welding or designated welding facilities will be processed through the SSC Fire Department and approved by the NASA SSC Fire Protection Program Manager. Requests shall consist of a copy of the written Facility Safety Plan and inspection criteria. Such welding or designated welding facilities will be issued permanent permits for a maximum of 24 months. These facilities must meet the following requirements as a minimum:

1. A written Facility Safety Plan (as outlined in NPR 8715.3 and NASA-STD- 8719.7) shall be maintained and address the hazards in the area associated with hot work

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operations.

2. The facility must be constructed and maintained in such a manner that hot work operations do not jeopardize the fire safety of the facility.

3. Appropriate fire detection and fire alarm systems must be operational at all times as approved by the SSC Fire Department.

4. The facility will be inspected at least annually to ensure compliance with the requirements of the authorization letter for operating the facility without a daily permit. SSC Fire Department will document and maintain inspections.

5. The responsible supervisor for the unique facility shall ensure specific conditions, unique to the site and location, to remain in continual compliance with original permit requirements.

e. The SSC Fire Department is responsible for controlling and issuing Hot Work Permits, and is thereby the Hot Work Permit Program Administrator.

f. The SSC Fire Department will maintain a list of PAIs. PAIs will be certified to issue Hot Work Permits through the SSC Fire Department. Approval for all other PAI authorization will be in accordance with Section 4.1.

g. Either the SSC Fire Department, SACOM Safety or NASA S&MA will brief SSC contractors and subcontractors on the Hot Work Permit Program and its requirements at all preconstruction briefings. The SSC Fire Department will be present at all preconstruction meetings to answer any questions on the program.

h. Facility Managers or their designees shall approve Hot Work Permits for their assigned areas, before the PAI will issue the permit. If the Facility Manager or designee is unavailable, the person responsible for the system/facility area or hot work operation (such as Test Operations Engineer (TOE), construction engineer, lead person) will approve the Hot Work Permit.

i. In Test Complex areas, the TOE shall approve Hot Work Permits for their assigned areas. TOEs will:

1. Help identify potential flammable sources for safe atmospheric checks.
2. Coordinate test stand activity around the hot work activity.
3. Notify the lead person listed on the Hot Work Permit and the PAI to void the permit if it

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is necessary to change configuration of the system involved.

j. All personnel engaged in welding, cutting, spark-producing, or heat-producing operation are responsible for knowing the exact locations of the nearest telephone and/or nearest fire alarm pull station to be used in case of an emergency.

k. Performing organization shall:

1. Display at the work site a duplicate copy of the Hot Work Permit. At the end of each shift, or upon completion of the job, attach the Hot Work Permit to the Form SSC-90 (Process Plan) or Work Authorizing Document. The copy will become a permanent record of the performing organization.

2. Make fire extinguishers available for use during all welding, cutting, brazing, spark-producing, or heat-producing operations. Select the type of fire extinguisher according to Appendix A.

3. Remove combustibles from the immediate vicinity (within 35 feet) of open flame/spark/heat work to reduce possibility of fire. Cover adequately with a fire retardant blanket any items that cannot be removed. Remove fire retardant blankets from the site at the completion of each work project, unless otherwise instructed by the shop supervisor.

4. Make necessary adjustments for weather conditions (i.e. high winds), to include stopping work.

5. Ensure that cables from electrical welding machines and similar equipment are in serviceable condition and that grounding cable(s) are adequately connected before starting operations.

6. Fire watch Requirements:

- A designated, trained fire watch shall be required for all hot work activity conducted in areas and facilities not designated as Permanent Weld/Metal Fabrication Shops.
- The designated fire watch person shall have no other duties or responsibilities except for fire watch.
- On test stands, additional fire watch personnel may be required at lower levels.
- The fire watch shall have fire extinguishing equipment readily available and be trained in its use. Ref. Section 6.h.2.



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- The fire watch shall be familiar with the facility and procedures for alerting/notification in the event of a fire.
- The fire watch shall look out for incipient fires in all exposed areas and attempt to extinguish the fire only when within the capability of the available equipment and training received. In all other instances, sound the alarm immediately and evacuate.
- The fire watch shall remain on-site at the vicinity of hot work for 30 minutes after the hot work has been completed.

l. Welding operations supervisors shall ensure cables are inspected and are maintained in good working condition.

m. Performing organization/individual shall:

1. Use fire retardant blankets or other suitable materials as catchments during operations producing hot slag, sparks, etc., to reduce potential fire hazard. This is especially important when performing welding/cutting/brazing operations overhead.
2. Check areas where welding, cutting, spark-producing, or heat-producing operations are performed after completion to detect smoldering fires that may have gone unnoticed.

*NOTE: If a smoldering fire occurs, use the fire extinguisher at hand and notify the SSC Fire Department immediately.*

3. Protect nearby workers from welding “flashes,” especially in operations involving heli-arc. Flash panels are required in congested personnel areas.

n. If heat/spark/flame work is interrupted, the hot work operations supervisor shall verify that no changes or other hazardous conditions have been introduced into the work operation before resuming work.

o. If work is in test complex area, the lead person overseeing hot work shall notify TOE when hot work is complete.

p. If at any time during the hot work operation a fire occurs, the Fire Department shall be notified immediately and the building evacuated. No persons other than the Fire Department are authorized to declare an extinguished fire to be “fire safe”. All fires must be reported.

q. Welding, brazing, or cutting on lines containing pressure is prohibited. Operational requirements may dictate blanket purge pressures to be maintained. Slight inert purge(s) may be maintained during open system work for cleanliness, but shall not exceed an audible “hiss” level.

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r. Welding, cutting, brazing, spark-producing, or heat-producing operations are prohibited at all times (except with prior approval of the cognizant safety representative) within 50 feet of a propellant storage vessel, transfer or vent line, or vessels that contain a propellant or a flammable atmosphere. In the event heat/spark/flame operations are required within the 50-foot limit, the following precautions must be verified as in place before issuing a Hot Work Permit:

1. Propellant system is in, and will remain in, a static mode configuration with integrity established (no leaks). The system configuration shall be verified with the system owner.
2. System pressure relief (venting) will not be accomplished during the heat/spark/flame work. A qualified operator will monitor the system for excessive pressure buildup. In the event that emergency venting is necessary, the heat/spark/flame work will be discontinued until the system is again in a static-mode configuration.
3. The affected area's atmosphere will be evaluated to verify the absence of flammable/combustible vapors and hazardous chemical substances in the work area. Safe Atmosphere Checks will be taken with approved portable gas (vapor) detectors. Periodic safe atmosphere checks will be taken if the hot work is required for an extended period of time. All safe atmosphere checks shall be performed with an approved, calibrated portable gas (vapor) detector spanned gas tested (bumped against know span gas prior to use) for the specific gas/vapor. All measurements will be recorded on Form SSC-68, Hot Work Permit, and applicable hazard assessment report.
4. Heat/spark/flame work will not be performed directly on propellant containers or on lines containing pressure. Containers or lines will be depressurized at near-ambient pressure and inerted.
5. Adequate fire extinguishers will be in serviceable condition and easily accessible in the work area for emergency use.
6. The welding, cutting, or brazing operations will be segregated to ensure limited access to the area. Placards reading, "WELDING, CUTTING OR BRAZING OPERATIONS IN PROGRESS" will be prominently displayed for warning purposes at all approaches approximately 35 feet from the job being performed.

s. SCWI-8715-0012 shall be used when defining classified locations where hot work may be accomplished. In Classified locations the default distance from locations shall be 50 feet unless the specific hazard calls for a greater distance.

t. Use of static internal combustion engines in classified locations shall be required a hot work permit and or atmospheric check within 50 feet of a classified location. Internal combustion

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engines traversing welded cross country propellant lines, such as a truck or lawn cutting tractor shall not be required a permit.

u. The Fire Department shall audit the Hot Work Permit Program annually and document the results of the audit(s). Audit points are listed in Appendix B, Hot Work Permit Program Audit Points.

v. The authorization to work shall become invalid if the supervisor/lead person in charge of a heat/spark/flame producing operation fails to comply with the precautions listed on the permit.

w. Requests for specific duration permits (such as for specific duration construction sites, unique operations, etc) shall be submitted in writing to the NASA SSC Fire Protection Program Manager. These specific duration permits will allow hot work operations to proceed without requiring daily Hot Work Permits. These permits will be approved only under certain conditions depending upon location and will be addressed on a case-by-case basis. These areas will be subject to continual audit, for specific duration permits exceeding 7 days, to ensure specific conditions unique to the site and location, and will remain in compliance with original permit requirements. A master original of the specific duration hot work permit will be kept at the work site. The “fire watch” and “hot work operator” signature blocks will be left blank on the specific duration permit. Prior to each day’s work, the hot work operator(s) and fire watch will review, sign and date a photocopy of the master specific duration permit indicating they have ensured all the conditions of the hot work permit have been met.

x. Exception: Heat gun operations do not require a fire watch during and 30 minutes after the operation, since they do not produce flames, slag, sparks, molten metal, etc, which may result in secondary fires or sources of ignition, contingent upon operator’s adherence to SCWI-8715-0012 *Work in Hazardous Classification Areas*.

## **6.0 Hot Work on Propellant Systems (Including Oxidizers)**

All sections of 5.0 shall be followed as well as the following when hot work is performed on propellant systems.

a. Before contacting the SSC Fire Department to conduct a Hot Work Permit inspection, the organization performing the hot work shall ensure:

1. The job site is ready for inspection.
2. All signing authorities for the work are present.
3. All pertinent paperwork and tools are on site and ready for inspection.

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b. Before starting work, an event that requires heat/spark/flame operations on any propellant system or any component thereof requires approval from the cognizant S&MA Office.

c. The performing organization shall introduce and maintain an inert gas purge in the unit/system to inert the system. (Use of personal atmospheric monitors is prohibited for final verification of inert atmosphere. Bulk Sample (i.e. watermelon sample) analysis by a qualified laboratory is required to verify inert atmospheres, with samples taken as close to the point of operation as possible and under supervision. Portable atmospheric monitors that are calibrated and spanned (bumped against known sample daily) for the specific gas/vapor shall be used for repeatable checks of the system's inert status.)

d. Prior to performing hot work on a propellant system, you must verify the system is properly inerted and/or below 10% of the Lower Explosive Limit (LEL) (preferable 0% of the LEL). The table below provides acceptable percent LEL level (or parts per million, ppm) for hot work for typical propellants used at Stennis: (Refer to the Safety Data Sheet for LEL of other flammable/Combustible gases/vapors used)

Propellant or Oxidizer	Propellant LEL Percent by volume in air (ppm)	Required Level for Hot Work <10% of the LEL (ppm)
Hydrogen	4% (40,000 ppm)	0.4% (4000 ppm)
RP-1	0.7 % (7000 ppm)	0.07 % (700 ppm)
Methane (CH <sub>4</sub> )	5% (50,000 ppm)	0.5 % (5000 ppm)
Isopropyl Alcohol (IPA)	2% (20,000 ppm)	0.2% (2000 ppm)
Oxygen	No LEL	< 20.9% by volume

e. The performing organization shall notify all non-operating personnel in the vicinity of the heat/spark/flame work that the work is to be performed and precautions should be taken.

f. SSC Fire Department and SACOM S&MA, or other PAI, approved by the SSC Fire Protection Program Manager, shall:

1. Inspect the work site, review the Hazard Assessment, and ensure a safe atmosphere has been determined prior to issuing a Hot Work Permit. Record the findings information on the Hot Work Permit.
2. Document the specific location and time period, required preparations, precautions and related permit requirements using Form SSC-68, Hot Work Permit.

g. The PAI shall complete the Hot Work Permit with required information, giving special attention to the necessary safety precautions. Assessment of special instructions or precautions

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to be observed due to the nature of work to be performed, or the area in which the work will be accomplished should be notated on Form SSC-68. The cognizant safety officer of the performing organization or other representative may make notations on the hazard assessment form, if applicable.

h. Facility Manager or designee, the performing organization, and the hot work operator shall sign the completed Form SSC-68.

## 7.0 Use of Sterno Fuel or Similar Products

The sterno fuel handling tips below shall be followed at all SSC events that utilize sterno fuel or similar products:

- a. Always make sure cans are placed securely in sterno holder before lighting.
- b. Always use a long-handled match or butane lighter to light cans.
- c. Decorative materials on the tables with sterno should be flame-resistant.
- d. Flammable items such as napkins, paper and plastic cups, plastic table wares, and similar products should be separated a minimum of three feet from the sterno.
- e. All SSC food preparation staff and those who may operate sterno on site shall notify the SSC Fire Department of the planned use/location/time, be knowledgeable of the hazards, and be trained in the proper use of sterno fuels.
- f. The SSC Fire Chief will consult with the users, the Cafeteria or Conference Center staff and any other appropriate department(s) or individual(s) at their request regarding all Sterno Fuel Use Policy or to address issues and/or policy violation.
- g. In the event that any fire ensues, pull the fire alarm, exit the building, then call 911 from an onsite telephone (or 228-688-3636 from a cell phone) immediately to report the fire. The Fire Department shall be dispatched even if the fire is extinguished before they arrive.

## 8.0 Roof Work

The following requirements shall be followed for torch down roofing operations at SSC:

- a. All personnel on the roof during torch application shall be trained on the proper use of a fire extinguisher.
- b. At least two 2 ½ gallon containers of water and two 20 pound ABC (dry chemical) shall be available within 10 feet of torch operation, per torch for use during the fire watch.

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c. Fire Watch personnel shall be provide during torch application and for two hours after completion of torch application.

d. At least one calibrated infrared heat detection gun per torch shall be provided for use during the fire watch to verify cool, safe, and a non-combustible conditions exist.

e. For at least 2 hours, fire watch personnel properly trained shall be provided to survey the underside of the roof deck (whenever possible), as well as the topside for possible smoldering elements.

f. All fire extinguishers prior to the completion of the day's work shall be examined to make sure they are full and operable.

## 9.0 Records and Forms

All records and forms are assumed to be the latest version unless otherwise indicated. Quality Records are identified in the SSC Master Records Index. The following records must be maintained in accordance with this instruction:

Record	Description	Responsible Individual or Organization	Media, Location, and Indexing Method	Minimum Retention Time	Disposition
SSC-68	Hot Work Permit Original	Fire Department	Hard copies on file for 45 days in captain's office, then transferred to chief's office	1 year	Destroy
SSC-68	Hot Work Permit Red Copy	Performing organization	Display on site	Duration of the project, then attach to Process Plan	N/A
SSC-90	Process Plan	Performing organization	Hard copy on file in administrative area	1 year	Destroy
SSC-717	SSC Test Preparation Sheet	NASA and NTOG	Hard copy on file in administrative area	1 year	Destroy

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## 10.0 Acronyms and Abbreviations

CFR	Code of Federal Regulations
MSDS	Material Safety Data Sheet
NFPA	National Fire Protection
Association NPR	NASA Procedural Requirements
PAI	Permit Authorizing Individual
SACOM	Synergy-Achieving Consolidated Operations and Maintenance
S&MA	Safety and Mission Assurance
SSC	Stennis Space Center
TOE	Test Operations Engineer

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## Appendix A – Criteria for Fire Extinguishers

TYPE OF POTENTIAL FIRE	EXTINGUISHING AGENT
CLASS A – Combustibles (wood, paper, rubbish, grass, etc.)	Water, foam, Multipurpose Dry chemical
CLASS B – Volatile flammables (oil, grease, paint, etc.)	CO <sub>2</sub> , Foam, Dry Chemical
CLASS C – Electrical	CO <sub>2</sub> , Dry Chemical
CLASS D – Combustible Metals	Dry Chemical – Purple K Powder




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## Appendix B – Hot Work Permit Program Audit Points

1. Review of completed Hot Work Permits to ensure accuracy of form completion.
2. Review of listing of designated PAIs to ensure adequate training and certification is in place.
3. Review of unique facilities (those not requiring daily permits) to ensure facility conditions are in compliance with authorization letter.
4. Review of specific duration permits and construction site permits to ensure compliance with established requirements.

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<b>SUBJECT: Hot Work Permit Program Procedure</b>		

## Appendix C – Sample Form, SSC-68 Hot Work Permit

 National Aeronautics and Space Administration John C. Stennis Space Center		<h1>SSC Hot Work Permit</h1>	
		No. _____	
Date and Time Issued	Expiration (Date and Time)	Exact Location Permit is issue for:	
Issued To (Company)	Work Authorization Document No. or Contract Number		
<b>Type of Operation (Flame Producing)</b>			
<input type="checkbox"/> Spark-producing Grinders/Tools <input type="checkbox"/> Brazing <input type="checkbox"/> Other Open Flame-producing Devices (Explain)	<input type="checkbox"/> Welding <input type="checkbox"/> Fuel-fired Heaters <input type="checkbox"/> Internal Combustion Engine Used Within a "Hazardous (Classified) Area"	<input type="checkbox"/> Oxy-fuel Cutting <input type="checkbox"/> Soldering <input type="checkbox"/> Benzomatic Torch	
Type of Operation <input type="checkbox"/> (Non-Flame Producing) but Occurring within a "Hazardous (Classified) Area" and Requiring Safe Atmospheric Verification (Explain Below)			
<b>— ATTENTION —</b> Before approving any cutting, welding, grinding, brazing, soldering, open flames, or other hot work, the responsible Permit Authorizing Individual (PAI) for the area shall inspect the proposed work area and identify the precautions taken. Any special instructions required will be addressed.			
Yes No N/A <input type="checkbox"/> If not <input type="checkbox"/> If yes signed	— Site Preparation — Atmospheric Monitoring: _____ %LEL Checked by: _____ AM/PM Frequency: <input type="checkbox"/> Continuous <input type="checkbox"/> Hourly		
Fire Known: <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Work — <input type="checkbox"/> Wet <input type="checkbox"/> Dry Flammable materials removed. Fire-resistant shields used. Fire-resistant shields. HVAC ducts/chutes Other side of walls, ceilings, roof, or partitions to be protected. Equipment — Flammable liquids, vapors, or gases. <input type="checkbox"/> No pressure in piping/storage of vessels. <input type="checkbox"/> Piping/pressure vessels purged with inert gas and verified.		
Printed last name and signature of individual responsible for fire watch:		Printed last name and signature of individual responsible for Hot Work:	
Safety Eng. printed name and signature (if required)		Fire Department printed name and signature (if required)	
Facility Manager or Construction Engineer printed name and signature (I permit this work to be performed in the location noted.)			
Printed name, signature, date and organization of Permit Authorizing Individual issuing Permit (I verify all proper precautions have been taken and the area is ready for Hot Work.)			
<b>In Case of Fire—Call 911</b> or <b>Use Your radio to Notify SSC Security Dispatch by Depressing the Emergency Alarm on Top of the Radio</b>			
SSC-68 (05/2004) Previous Versions Shall Not be Used.			