

Requirements Documents

HMIS-RD-FP-9900

Hot Work Performance Requirements

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Change Summary

Description of Change

Response to HMIS-CR-2022-0251-007 to remove implementing work steps that would be more appropriately contained in a PRO type procedure.

Publication Correction 41530: uploaded correct version

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1.0 PURPOSE

This document provides the requirements for conducting hot work activities safely and in accordance with established codes and standards including the National Fire Protection Association (NFPA) and U.S. Department of Energy (DOE) directives as identified below.

2.0 SCOPE

This Level 1 Requirements document is applicable to Hanford Mission Integration Solutions (HMIS) employees and all subcontractors involved in HMIS scope of work.

This document also supports the implementation of the Integrated Safety Management System (ISMS) Core Function 2: *Identify and Analyze the Hazards*, Core Function 3: *Develop and Implement Hazard and Environmental Controls*, Guiding Principle 2: *Clear Roles and Responsibilities*, Guiding Principle 5: *Identification of Safety and Environmental Standards and Requirements*, and Guiding Principle 6: *Hazard Controls Tailored to Work Being Performed*.

NOTE: For the purpose of this document, Hot work is defined as – Any work involving burning, welding or similar operations that are capable of initiating fires or explosions. Such activities include cutting, welding (with electric arcs or oxy-fuel gas flames) working with open flames, grinding and brazing activities.

Hot work is categorized according to the relative degree of hazard that the operation represents. These categories are “high hazard, low hazard, and exclusion.” [Appendix A](#) of this document provides a categorized listing of the various hot work activities. The list is not all inclusive and is intended to provide a means of consistent categorization of the most common hot work processes. Contact your Deputy Fire Marshal (DFM) for categorization of processes not on this list.

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3.0 REQUIREMENTS**3.1 General Requirements**

NOTE 1: For the tables in this section under the requirement "type" column, "V" means verbatim and, "I" means interpreted.

NOTE 2: In addition to the requirements identified in this document, all Hot Work requirements found in the most recent edition of NFPA 51B, 2019 Edition and ANSI Z49.1 , 2012 Edition shall be complied with.

#	Requirement	Type V or I	Source
1.	A Job Hazards Analysis (JHA) shall be completed for hot work activities, when applicable, in accordance with HMIS-PRO-SP-079 , <i>Job Hazard Analysis</i> . NOTE: Consultation with industrial hygiene may be necessary to ensure hot work hazards related to each specific activity are properly addressed, as found in HMIS-PLN-SP-32219 , <i>HMIS Worker Safety and Health Program, Appendix A, Item 2[b]</i> .	I	10 CFR 851 Worker Safety & Health Program
2.	The JHA must be reviewed and updated (if necessary) when field changes occur that could impact the validity of the current JHA.	I	10 CFR 851 Worker Safety & Health Program
3.	Those performing hot work shall wear flame-resistant (FR) Personal Protective Equipment (PPE) to at least the level determined through the JHA process to protect the worker from the effects of heat, sparks, and flame.	I	10 CFR 851 Worker Safety & Health Program; 29 CFR 1910.252, (b)(3) ANSI Z49.1; Section 4.3
4.	Exceptions to wearing FR PPE are required to be approved by the job supervisor for low and high hazard work and by the responsible DFM for high hazard work on the hot work permit.	I	ANSI Z49.1; 3.2.2.4
5.	In no case shall the FR PPE requirement be waived in a designated area per Section 3.3 if a designated fire watch is not provided.	I	ANSI Z49.1; 3.2.2.4

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#	Requirement	Type V or I	Source
6.	The safety precautions (including the use of flame-resistant PPE) for exclusion activities shall be determined by the job supervisor and the worker. <i>NOTE: The DFM and/or Safety organization (Industrial safety and/or Industrial Hygiene) should be consulted if additional assistance is needed.</i>	I	ANSI Z49.1; 3.2.2.4
7.	The Job Supervisor shall be consulted to determine the categorization of the operation when it is not clear, i.e., high, low or exclusion (Appendix A).	I	ANSI Z49.1; 3.2.2.3
8.	If any of the materials (including welding rod and fluxes) used in the hot work process contain or are coated with zinc, lead, mercury, beryllium, cadmium, chromium, magnesium or the materials contain stainless steel or other chrome containing alloy metals, appropriate methods and controls shall be in place. <i>NOTE: For additional information relating to use of metals with chrome or chrome containing alloys see HMIS-PRO-SP-31697, Controlling Exposures to Hexavalent Chromium.</i>	I	10 CFR 851 Worker Safety & Health Program, Appendix A, Section 6
9.	Coveralls shall be flame-resistant. In the case of double set of coveralls being worn only outer set must be flame-resistant. <i>NOTE: Red FR coveralls (including hoods and boots) for use in radiological areas and brown FR coveralls for use in non-radiological areas are available through the Hanford Central Warehouse.</i>	I	ANSI Z49.1; 3.4
10.	Hot work equipment (torches, regulators, pressure-reducing valves, and manifolds, etc.) shall be listed or approved by a nationally recognized testing laboratory for the intended use.	I	ANSI Z49.1; 3.2.1.4
11.	Oxygen-fuel gas systems (e.g., oxygen/acetylene welding) shall be equipped with listed and/or approved backflow valves, flash arrestors, and pressure-relief devices.	I	ANSI Z49.1; 3.2.1.4

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#	Requirement	Type V or I	Source
12.	Where hot work is planned outdoors, (non-designated areas) the applicant shall take into consideration wildland fire hazards including the location, wind conditions, and current fire danger level. A Hot Work Permit (A-6000-895.1) is required.	I	NFPA 51B, 5.3.1
13.	Fire extinguishers that are required shall be in accordance with NFPA 10.	I	NFPA 51B; 5.2

3.2 Fire Watch Requirements

#	Requirement	Type V or I	Source
1.	A fire watch shall be required for all hot work outside of designated hot work areas or when required by the responsible FPE or DFM inside designated areas.	I	NFPA 51B; 5.6.1
2.	Fire watchers shall be posted where welding or cutting is done and where a large fire might develop, or whenever any of the following conditions exist: <ul style="list-style-type: none"> a. Proximity of Combustibles – Combustible materials in building construction or contents are closer than a radius of 35 feet to the point of operation. b. Openings – There are wall or floor openings within a radius of 35 feet which expose combustible material in adjacent areas, including concealed spaces in walls, ceilings or floors. c. Metal Walls and Pipes – Combustible materials adjacent to the opposite side of metal partitions, walls, ceilings, or roofs, or in contact with pipes, and are likely to be ignited by conduction or radiation. 	V	Z49.1-2005; 6.2.2
3.	Fire watch personnel should additionally monitor workers performing hot work or nearby hot work area, especially where visual observation might impair normal viewing of the work area.	V	DOE-STD-1066-2016, Section 5.1.6.2
4.	A Fire watch shall be required where combustible materials adjacent to the opposite side of partitions, walls, ceilings, or roofs and likely to be ignited.	V	NFPA 51B; 5.6.1(4)

NOTE: Employees may print off this document for reference purposes but are responsible to check HMIS Procedure System to ensure the most current version is used to prevent unintended use of obsolete versions.

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#	Requirement	Type V or I	Source
5.	More than one fire watch shall be required if combustible materials that could be ignited by the hot work operation cannot be directly observed by the initial fire watch.	V	NFPA 51B; 5.6.2
6.	Fire watches shall be assigned no other duties.	V	NFPA 241; 5.1.3.1
7.	The fire watch shall have successfully completed Fire Watch Training (Course #044400) and be within the re-certification training date.	I	NFPA 51B; 4.4.1
8.	The fire watch shall watch for fires in all exposed areas and try to extinguish them only when the fires are obviously within the capacity of the equipment available.	V	NFPA 51B; 4.4.6
9.	If the fire watch determines that the fire is not within the capacity of the equipment, the fire watch shall sound the alarm immediately.	V	NFPA 51B; 4.4.6
10.	<p>The fire watch shall:</p> <ul style="list-style-type: none"> a. Be trained to recognize the inherent hazards of the work site and hot work operations. b. Ensure safe conditions are maintained during hot work operations. c. Have the authority to stop hot work operations if unsafe conditions develop. d. Have fire-extinguishing equipment readily available and shall be trained in its use. e. Be familiar with the facilities and procedures for sounding an alarm in the event of a fire. f. Watch for fires in all exposed areas and try to extinguish them only when the fires are obviously within the capacity of the equipment available. If the fire watch determines that the fire is not within the capacity of the equipment, the fire watch shall sound the alarm immediately. 	V	NFPA 51B; 4.4, 5.5.1.10

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#	Requirement	Type V or I	Source
	g. Fully charged and operable fire extinguishers that are appropriate for the type of possible fire shall be available immediately at the work area.		
11.	A fire watch shall be maintained for at least one hour after completion of hot work operations in order to detect and extinguish smoldering fires.	V	NFPA 51B; 5.6.1.1
12.	Where a fire watch is not required, the Permit Authorizing Individual* (PAI) shall make a final check 1/2 hour after the completion of hot work operations to detect and extinguish smoldering fires. NOTE* - <i>The term PAI in this procedure refers to the Job Supervisor.</i>	V	NFPA 51B; 4.2.7
13.	A fire watch shall be posted for the duration of the work and for 2 hours thereafter for torch-applied roofing operations.	V	NFPA 241; 5.1.3.2
14.	The duration of the fire watch shall be permitted to be extended if the PAI determines the fire hazards warrant the extension.	V	NFPA 51B; 5.6.1.3

3.3 Hot Worked Performed in Designated Area

#	Requirement	Type V or I	Source
1.	A Fire Marshal Permit shall be required to authorize an area as a designated hot work area per HMIS-RD-FP-8589, Hanford Fire Marshal Permits. The Fire Marshal Permit shall be posted at the designated area, unless directed by the approving DFM. The permit shall address the following as a minimum: <ul style="list-style-type: none"> a. Criteria to which the area shall be maintained. b. PPE requirements for fire related hazards. c. Fire watch requirements per item 2.2.1 above. d. Special circumstances pertaining to PPE/fire watch requirements. (Example: Establishing a fire watch in 	I	NFPA 51B; 5.3.2.1

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#	Requirement	Type V or I	Source
	<p>lieu of PPE requirements or vice versa for specific hot work operations.)</p> <p>e. Criteria that would require a new permit, (i.e., facility modifications, etc.)</p>		
2.	The DFM shall specify the need for a dedicated fire watch.	I	NFPA 51B; 5.6.1
3.	<p>Existing designated areas shall be:</p> <p>a. Fire resistive or noncombustible construction.</p> <p>b. Provided with noncombustible/fire retardant barriers against hot slag and sparks if fire resistive or noncombustible construction is not provided.</p> <p>c. Free of combustible materials and floor, ceiling, wall, and duct openings within 35 feet of the designated area.</p> <p>d. If c., above, can't be met, then the perimeter of the area and the openings must be provided with noncombustible/fire retardant barriers against hot slag and sparks.</p>	I	NFPA 51B; 5.3.2.1
4.	<p>New designated areas shall be:</p> <p>a. A specific area designed or approved for hot work.</p> <p>b. Fire resistive or of noncombustible construction.</p> <p>c. Essentially free of combustible and flammable contents.</p> <p>d. Suitably segregated from adjacent areas.</p>	I	NFPA 51B; 5.3.2.1
5.	The area shall be provided with a fully charged and serviced portable fire extinguisher (minimum 2A-10B:C rating).	I	ANSI Z49.1; 6.2.1.1 NFPA51B; 5.3.2.1.2

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#	Requirement	Type V or I	Source
6.	Adequate ventilation shall be provided for all welding, cutting, brazing, and related operations. Adequate ventilation shall be enough ventilation such that personnel exposures to hazardous concentrations of airborne contaminants are maintained below the allowable limits. NOTE: <i>Industrial Hygiene establishes allowable limits</i>	V	ANSI Z49.1; 5.1
7.	Inside buildings, the designated area shall be provided with visual protection, i.e. surrounded by a booth or screen constructed of one of the following materials: <ul style="list-style-type: none"> a. Metal, b. Flame resistant fabric that is opaque to most optical radiation, or c. Transparent colored polyvinyl chloride material that is formulated with a flame retardant and UV-visible absorber in the range of 200 to 3000 nanometers. 	I	ANSI Z49.1; 4.1.3, 4.1.3, 4.1.4 NFPA 51B; 5.5.1

3.4 Hot Work Performed Outside of Designated Area

#	Requirement	Type V or I	Source
1.	Hot work that is performed at locations other than Designated Areas per section 3.3 require an approved <i>Hot Work Permit</i> (A-6000-895.1).	I	NFPA 51B; 5.3.2.2 NFPA 51B; 5.5.4, 5.5.5
2.	The Hot work permit shall identify the fire related PPE requirements.	I	NFPA 51B; 5.3.2.2 NFPA 51B; 5.5.4, 5.5.5
3.	New Permits shall be issued after existing permits have been re-validated using the log sheet for up to six months.	I	NFPA 51B; 5.3.2.2 NFPA 51B; 5.5.4, 5.5.5

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#	Requirement	Type V or I	Source
4.	Hot work activities classified as “high hazard” shall require DFM approval on the hot work permit.	I	ANSI Z49.1; 3.2.2.3
5.	Before starting the hot work a fire-watch must be in place. <i>NOTE: The fire watch may not provide assistance as a welder’s helper, supervisor, or perform any task that may detract from the duties of the fire watch.</i>	I	NFPA 51B; 5.6.1
6.	Combustibles found in the work area shall be addressed by one of the following controls. a. The job relocated to avoid exposure, or b. The combustibles moved at least 35 feet away from the work, or c. The combustible materials within 35 feet of the work are protected by using noncombustible/fire retardant covers, shields, or blankets or, if appropriate, the combustible materials may be wetted. <i>NOTE 1: The separation distance and protective measures may be modified where warranted by the hazard and location of the hot work. Deviations for high hazard hot work must be approved by the DFM.</i> <i>NOTE 2: Welding blankets, pads, and curtains shall be listed/approved for their use.</i>	I	NFPA 51B; 4.2.2 NFPA 51B 4.2.3 NFPA 51B; 5.5, 5.6
7.	Openings or cracks in walls, floors, or ducts within 35 feet of the work shall be covered or sealed to prevent the passage of sparks to adjacent areas.	V	NFPA 51B; 5.5.1.4
8.	If hot work is done near walls, partitions, ceilings or roofs of combustible construction, they shall be protected by a listed welding curtain, welding blanket, welding pad, or equivalent.	V	NFPA 51B; 5.5.1.6

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#	Requirement	Type V or I	Source
9.	If hot work is to be performed on a wall, partition, ceiling or roof, precautions shall be taken to prevent ignition of combustibles on the other side by relocating combustibles. If it is impractical to relocate combustibles, a fire watch on the opposite side from the work shall be provided.	I	NFPA 51B; 5.5.1.7
10.	Hot work shall not be attempted on a partition, wall, ceiling, or roof that has a combustible covering or insulation, or on walls or partitions of combustible sandwich-type panel construction.	V	NFPA 51B; 5.5.1.8
11.	Hot work that is performed on pipes or other metal that is in contact with combustible walls, partitions, ceilings, roofs, or other combustibles shall not be undertaken if the work is close enough to cause ignition by conduction.	V	NFPA 51B; 5.5.1.9
12.	Automatic fire suppression systems shall be operable unless additional precautions are taken as determined by the DFM. In buildings without fire suppression systems a Hot Work Permit shall be required through the Hanford Fire Marshal's Office. <i>NOTE: Special precautions need to be taken to avoid accidental operation of the system. The DFM may be consulted for their special precautions to avoid inadvertent actuation of fire protection systems.</i>	I	NFPA 51B; 5.4 NFPA 51B; 4.1.1
13.	Installed smoke/heat detectors affected by the work shall be bypassed by the Hanford Fire Department before the hot work begins (and restored to service as soon as possible after the job). <i>NOTE: Depending on the operation, detectors may need to be covered or removed.</i>	I	NFPA 51B; 5.5.1.12
14.	The worksite and/or area shall have adequate ventilation. See section 3.3.6 above.	I	ANSI Z49.1; 5.1
15.	Fully charged and operable fire extinguishers that are appropriate for the type of possible fire shall be available immediately at the work area.	V	NFPA 51B; 5.5.1.10

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3.5 Hot Work in Confined Spaces/Area

#	Requirement	Type V or I	Source
1.	An approved <i>Hot Work Permit</i> (A-6000-895.1) is required before each job.	I	NFPA 51B; 5.3.2.2
2.	Hot work in spaces classified as confined spaces as defined in DOE-0360, Hanford Site Confined Space Procedure (HSCSP), shall additionally adhere to the following requirements. <ul style="list-style-type: none"> a. The interior of any confined spaces such as pipes, tanks, etc., used for flammable/combustible liquids or gases shall be cleaned of residue and purged. b. The confined space atmosphere shall be tested for the presence of ignitable contaminants. c. The area shall be purged/ventilated as required to ensure the concentration does not exceed 10% of the lower explosion limit. 	I	DOE-0360 HMESC J-2.8 ANSI Z49.1; 7.1 ANSI Z49.1; 7.1;29 CFR 1926.353 (b)
3.	During the work, atmospheric testing shall be performed as required by the confined space permit or work package.	I	NFPA 326; Ch.4
4.	Ventilation in confined spaces shall be sufficient to assure adequate oxygen for life support, to prevent accumulation of asphyxiants or flammable or explosive mixtures, to prevent oxygen enriched atmospheres, and to keep airborne contaminants in breathing atmospheres below allowable limits.	I	ANSI Z49.1; 7.1

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#	Requirement	Type V or I	Source
5.	<p>a. During gas welding or cutting in a confined space when suspended or interrupted for any substantial period of time (such as during lunch or overnight), the following shall be implemented:</p> <ol style="list-style-type: none"> 1. The gas supply shall be shut off (and pressure released) at some point outside the confined area to eliminate the possibility of gas escaping through leaks or improperly closed valves. 2. The torch and hose shall be removed (if practical) from the confined space. <p>b. During arc welding in a confined space when suspended or interrupted for any substantial period of time (such as during lunch or overnight) the following shall be implemented:</p> <ol style="list-style-type: none"> 1. Removal of electrodes from the holders. 2. Holders located where they are not accidentally touched. 3. Machine power supply disconnected or shut off. 	V	<p>29 CFR 1910.252 (a)(4) (ii)</p> <p>29 CFR 1926.350(c)(1)</p>

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3.6 Hot Work on Tanks, Containers, and Piping That Cannot be Entered

#	Requirement	Type V or I	Source
1.	<p>Where hot work operations are to be performed on tanks, containers, or piping that have contained ignitable liquids or other combustible materials, such operations shall be permitted only if the tanks, containers, or piping have been cleaned or purged in accordance with NFPA 326.</p> <p><i>NOTE: Guidance can be found in ANSI/AWS F4.1, Recommended safe Practices for the Preparation for Welding and Cutting Containers and Piping, NFPA 326, Standard Procedures for Cleaning or Safeguarding Small Tanks and Container, API 1104, Standard for Welding Pipelines and Related Facilities, API PUBL 2013, Cleaning Mobile Tanks in Flammable or Combustible Liquid Service, and API PUBL 2201, Procedures for Welding or Hot Tapping on Equipment in Service.</i></p>	V	NFPA 51B; 5.5.1.16

4.0 RECORD IDENTIFICATION

Performance of this process generates the following records which are maintained in accordance with HMIS-PRO-RM-10588, *Records Management Processes*.

Records Capture Table

Name of Document	Submittal Responsibility	Retention Responsibility
Work Package	Job Supervisor	Job Supervisor / IDMS
Hanford Fire Marshal Permit (for designated areas)	HFD/Fire Marshal's Office	HFD / IDMS
Hot Work Permit (for non-designated Hot Work areas)	Requesting Organization	Requesting Organization / IDMS

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5.0 SOURCES**5.1 Source Requirements**

10 CFR 851, *Worker Safety & Health Program*
29 CFR 1910; *Subpart Q, Welding, Cutting and Brazing*
29 CFR 1926, *Subpart J, Welding, Cutting*
ANSI Z49.1, 2012 Edition, *Safety in Welding, Cutting and Allied Processes*
NFPA 51B, 2019 Edition, *Standard for Fire Prevention During Welding, Cutting, and Other Hot Work*
NFPA 326, 2020 Edition, *Standard for the Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair*
NFPA 241, 2019 Edition, *Safeguarding Construction, Alteration and Demolition Activities*
DOE-STD-1066-2016, *DOE Standard Fire Protection*
HMESC J-2.8

5.2 References

ANSI/AWS F4.1, *Recommended safe Practices for the Preparation for Welding and Cutting of Containers and Piping*
API 1104, *Standard for Welding Pipelines and Related Facilities*,
API PUBL 2013, *Cleaning Mobile Tanks in Flammable or Combustible Liquid Service*
API PUBL 2201, *Procedures for Welding or Hot Tapping on Equipment in Service*
DOE-0360, *Hanford Site Confined Space Procedure (HSCSP)*
HMIS-PLN-SP-32219, *HMIS Worker Safety and Health Program*
HMIS-PRO-RM-10588, *Records Management Processes*
HMIS-PRO-RM-32281, *Electronic Records Management*
HMIS-PRO-SP-079, *Job Hazard Analysis*
HMIS-PRO-SP-31697, *Controlling Exposures to Hexavalent Chromium*
HMIS-RD-FP-8589, *Hanford Fire Marshal Permits*

5.3 Forms

A-6000-895.1, [Hot Work Permit](#)

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Appendix A. Hot Work Permit Information

HOT WORK PROCESSES	
WELDING	HAZARD CATEGORY
SMAW-Shielded Metal Arc Welding-Stick welding	High
GMAW-Gas Metal Arc Welding –MIG Welding (Metal Inert Gas) wire feed welding, squirt gun welding	High
FCAW-Flux Cored Arc Welding-Wire feed welding with a flux core in the wire	High
GTAW-Gas Tungsten Arc Welding-TIG welding (Tungsten Inert Gas), heli-arc welding	Low
SAW-Submerged Arc Welding-Sub-arc	Low
PAW-Plasma Arc Welding	Low
EBW-Electron Beam Welding	Low
LBW-Laser Beam Welding	Low
TW-Thermit Welding-Used in attaching grounding straps by electricians	Low
TS-Torch Soldering	Low
SW-Stud Welding-Used for attaching threaded studs to metal plate or studs for attaching insulation	Low
OAW-Oxy-Acetylene Welding	Low
TB-Torch Brazing	Low
Fusing Plastic Pipe (e.g., HDPE)	Exclusion

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CUTTING	HAZARD CATEGORY
CAC-A - Air Carbon Arc Cutting	High
CAC-Carbon Arc Cutting (no air)	High
PAC-Plasma Arc Cutting	High
LBC-Laser Beam Cutting	Low
OFC-Oxy-Fuel Cutting (Cutting torch)	High

GRINDING	HAZARD CATEGORY
Heavy Grinding-using Bayflex grinder, side grinder, 6" to 8" grinding wheel (disc)	High
Light Grinding-using 4" and smaller grinding wheel	High
Sanding-using above grinders with sanding disc	Low
Rotary Grinding tool (Peanut)	Exclusion
Dremel® tool grinding	Exclusion
Cut-off Saw	High
Pedestal Grinder	Exclusion
Pedestal Sander (belt sander)	Exclusion
Rotary File	Exclusion
Electric Soldering	Exclusion

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