

# **Steam Generation and Distribution System Safety**

**MSC-PRO-105**

**Revision 2**

**Effective Date: January 24, 2013**

**Topic: Safety and Health**

Approved for Public Release;  
Further Dissemination Unlimited

## Steam Generation and Distribution System Safety

### CHANGE SUMMARY

#### Rev. 2

#### **Description of Change:**

Minor editorial revision to reflect the MSC Contract Modification 244 that added Supp Rev 1 to contract requirement CRD O 430.1B, Chg 1 cited within the body of the procedure. No evident impact on actual performance of the procedure.

# Steam Generation and Distribution System Safety

## 1.0 PURPOSE

The purpose of this procedure is to ensure that safe work practices associated with operation and maintenance of steam generation and distribution systems are established and practiced at a worker level, that personnel directly engaged in the operation and maintenance of such systems obtain a level of understanding of potential steam system hazards and a working knowledge of facility specific operational and maintenance practices sufficient to ensure personal safety, and that affected personnel are trained in the causes and prevention of Condensate Induced Water Hammer (CIWH).

## 2.0 SCOPE

This Level 2 Management Control Procedure is applicable to Mission Support Contract (MSC) employees involved in operation and/or maintenance of steam generation and distribution systems operating at pressures >5 psig, within the MSC scope of work.

Use of the term "steam system(s)" in this document is intended to be interchangeable with the term "steam generation and distribution system(s)", and includes condensate lines.

Use of the term "affected facility personnel" in this procedure is intended to include any individual assigned to supervision, operation, maintenance, work document preparation, inspection of a steam system, or system design/modification.

**NOTE:** *Other Technical/Administrative support personnel would not normally be considered "affected facility personnel", unless determined otherwise through job hazard analysis.*

## 3.0 IMPLEMENTATION

This procedure is effective upon publication.

## 4.0 REQUIREMENTS

### 4.1 General

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

#	REQUIREMENT	TYPE V or I	SOURCE
1.	To ensure an effective preventive maintenance program, periodic inspection and maintenance of operating steam systems for safe component operability (e.g., steam traps, safety valves) and system integrity shall be performed, using currently qualified personnel.	I	CRD O 430.1B, Chg 1, Supp Rev 1

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2.	Maintenance work on steam systems that may affect the normal system operation must be planned and executed in accordance with <a href="#">MSC-PRO-12115</a> , <i>Work Management</i> , and reviewed for hazard identification and control per <a href="#">MSC-PRO-079</a> , <i>Job Hazard Analysis</i> .	I	CRD O 430.1B, Chg 1, Supp Rev 1
3.	<p>If a CIWH is identified or suspected during steam system operation, a shutdown and securing of the system is required.</p> <ul style="list-style-type: none"> <li>• An immediate walk down of the system shall be performed to ensure the safety and well-being of personnel (e.g., no injuries incurred).</li> <li>• The CIWH event must be evaluated for application of occurrence reporting requirements.</li> <li>• A critique of the CIWH event must be conducted to determine its cause, implement corrective actions, and establish lessons learned prior to restart.</li> <li>• A walk down of the steam system by currently qualified personnel must be performed to inspect for component damage.</li> <li>• Steam traps and bleed valves must be verified as operating properly.</li> </ul> <p>A Pre-Job briefing with affected facility personnel must be completed prior to restarting the system. At a minimum, the briefing must include an identification of staff/discipline support; discussion of the restart procedural requirements; review of lessons learned from the Event; assignment of appropriate personal protective equipment; determination of emergency egress routes, CIWH response actions, and access control; identification of work area hazards and control measures; and other information deemed relevant by restart management.</p>	I	CRD M 231.1-2;  CRD O 422.1, Attachment 2 Section 2.f.
4.	<ul style="list-style-type: none"> <li>• Restart of a steam system, following shutdown, shall be authorized by Operations management.</li> </ul>	I	CRD O 422.1, Attachment 2 Section 2.h.

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### 4.2 Training

1.	<p>Affected facility personnel shall receive general training in steam distribution system operation and safety, and CIWH.</p> <ul style="list-style-type: none"> <li>• Initially. (plus bi-annual refresher for CIWH)</li> <li>• When the affected worker skills have diminished, or as determined by either the affected worker or management.</li> </ul>	I	<p>CRD O 422.1, Attachment 2 Section 2;</p> <p>CRD O 5480.20A, Chg 1 (Supp Rev 1), Chapter I, Section 7</p>
2.	<p>General training course content shall include, as a minimum, the subject matter identified below, and shall be reviewed and approved before use.</p> <p><b><u>Condensation Induced Water Hammer</u></b>                  Students are taught about the causes, prevention, types, and identification of a CIWH; gain an understanding of its destructive force; recognize the importance of proper steam trap sizing, selection, and operation; review CIWH case studies and lessons learned; review emergency response to CIWH, and how to apply safety principles, supporting recommendations, and best industry operating practices to achieve safe steam system operations.</p> <p><b><u>Steam Distribution System, Operation and Safety</u></b>                  Students are taught how to properly start up, operate, and shut down steam distribution systems; instructed on the safety hazards associated with steam systems; informed on selection and use of personal protective equipment; indoctrinated to basic steam fundamentals (to include pressure/temperature relationships, and purpose, function, and operating characteristics of major steam line components -- e.g., piping, insulation, valves, strainers, steam traps, mud legs/drip legs, safety valves, expansion joints &amp; loops, and instrumentation).</p> <p><b>NOTE 1:</b> <i>The Training Program Descriptions provide guidance for selecting applicable training. This document can be accessed via the HAMMER/Hanford Training web page.</i></p> <p><b>NOTE 2:</b> <i>The use of audio-visual aids, demonstrations, and practical application exercises should be used to enhance the learning process.</i></p>	I	<p>CRD O 422.1, Attachment 2 Section 2.e &amp; 2f.</p>

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3.	<p>Affected facility personnel shall be provided with facility-specific orientations relating to the configuration and operating characteristics of the steam system upon which they are assigned to work, as follows.</p> <ul style="list-style-type: none"> <li>• Prior to performing operational or maintenance activity on a new, modified, or a system unfamiliar to the worker.</li> <li>• Upon the introduction of changes in work procedures or requirements.</li> <li>• When new hazards are identified.</li> </ul>	I	<p>CRD O 422.1, Attachment 2 Section 2.b &amp; 2.f;</p> <p>CRD O 5480.20A Chg 1 Supp Rev 1, Chapter I, Section 7</p>
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### 5.0 PROCESS

#### 5.1 General

<i>Actionee</i>	<i>Step</i>	<i>Action</i>
Facility Manager	1.	Ensure an appropriate engineering review is conducted in accordance with MSA engineering standards and practices as a part of system design, installation and modification to a steam system.
Engineering Manager	2.	Designate engineering Design Authorities for facility steam systems in accordance with <a href="#">MSC-RD-1819</a> , <i>MSC Engineering Requirements</i> .
	3.	Ensure that modifications to steam systems are reviewed in accordance with MSC-RD-1819, and associated modification procedures.
Facility Manager	4.	Designate and ensure that trained and currently qualified personnel are assigned to operate and maintain the steam system(s).
	5.	Verify that hazards associated with the scope of steam system work have been identified and analyzed during the job planning process, and an appropriate set of controls are established, communicated (see <a href="#">step 4.1.4</a> ) and implemented.
Facility Maintenance Manager	6.	Ensure that steam system maintenance is performed on a priority basis.
Facility Operations Manager	7.	Authorize steam system re-start activities.
Steam System Worker	8.	Start up, operate, and shut down steam systems safely and in accordance with established operational procedures.
	9.	Shut down and secure steam systems where a CIWH occurs or is suspected, and notify Operations management.

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### 5.2 Training

<i>Actionee</i>	<i>Step</i>	<i>Action</i>
Facility Manager	1.	Identify the affected facility personnel for the steam system(s), and ensure they are trained.
Facility Training Manager	2.	Ensure that the level of any facility-developed training and orientations are adequate in addressing: <ul style="list-style-type: none"> <li>• Fundamental safety practices for steam system startup, operation, maintenance, and shutdown, and</li> <li>• Identification, causes, prevention, and response to a CIWH, and</li> <li>• Facility-specific requirements and work controls.</li> </ul>
Facility Training Manager	3.	File for training course equivalency in accordance with <a href="#">MSC-PRO-179</a> , <i>Obtaining Training Equivalencies, Waivers, and Extensions</i> , where a substitution is being considered in lieu of HAMMER Training Courses.
Affected Facility Personnel	4.	Complete steam system safety training in accordance with Section 4.2.1.
	5.	Participate in facility-specific steam system safety orientation.
Instructor	6.	Ensure that Training completion rosters are submitted.

### 6.0 FORMS

None

### 7.0 RECORD IDENTIFICATION

**Records Capture Table**

Name of Document	Submittal Responsibility	Retention Responsibility
Training Completion Roster	Instructor	MIS

### 8.0 REFERENCES

#### 8.1 Source References

- CRD M 231.1-2 (Supp Rev 7), *Occurrence Reporting and Processing of Operations Information*  
 CRD O 430.1B, Chg 1 Supp Rev 1, Real Property Asset Management  
 CRD O 422.1, Conduct of Operations  
 CRD O 5480.20A Chg 1 (Supp. Rev 1), *Personnel Selection, Qualification, and Training Requirements for DOE Nuclear Facilities*

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### 8.2 Working References

[MSC-PRO-079](#), *Job Hazard Analysis*

[MSC-PRO-179](#), *Obtaining Training Equivalencies, Waivers, and Extensions*

[MSC-PRO-12115](#), *Work Management*

[MSC-RD-1819](#), *MSC Engineering Requirements*