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Driving Operational Excellence[™]



Mechanical Integrity Standard

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1 Introduction

Commitment to the safe operation of all facilities requires that potential safety hazards are systematically identified and the risk from these hazards is managed in a way that employees, the public, and the environment are protected. Risk management is integrated in the design, construction, maintenance, and operation of all facilities. This Mechanical Integrity (MI) Standard provides the requirement for each facility to comply with Process Safety Management (PSM) and the Environmental Protection Agency (EPA) Risk Management Program (RMP) requirements for MI.

2 Purpose

The purpose of this Standard is to establish comprehensive management systems that focus on Process Safety Management and Risk Management Program (PSM/RMP). It's consistent with company health and safety values, principles of Responsible Care and regulatory compliance to achieve process safety excellence in our operations. This Standard should assist in achieving best in class performance at your facilities.

This Standard outlines the requirements to ensure compliance with:

- 29 CFR 1910.119 paragraph (j) Mechanical Integrity (MI) of the Occupational Safety and Health Administration (OSHA) PSM regulation
- The MI requirements of the EPA RMP rule 40 CFR 68.73

This document identifies the Process Safety Critical Equipment (PSCE) Determination as a subset of the site's overall maintenance and reliability (M&R) program.

3 Scope

The MI program shall include as a minimum, the PSCE within PSM Covered areas, plus site PSCE, such as emergency equipment that are supporting PSM covered areas, as identified by the Process Safety Critical Equipment Determination Procedure.

Each facility shall develop its own written MI program that:

- Provides a management system that sustains the long-term reliability of your Chemical Process Safety Critical Equipment
- Includes the MI roles and responsibilities associated with development and implementation of the MI management system
- Includes the specific list of PSCE and a method for keeping the list current
- Includes the procedures required to comply with the elements of this Standard

The MI Program shall contain the following elements:

- Process Safety Critical Equipment Determination
- Equipment Deficiencies
- Quality Control (QC) of Equipment and Spare Parts
- Maintenance & Reliability (M&R) Procedures

10.2 Appendix B – Inspection Codes

Vessels and Heat Exchangers	<ul style="list-style-type: none"> • API 510 – Pressure Vessel Inspection Code • API RP 572 – Inspection of Pressure Vessels • API 581 – Risk Based Inspection Base Resource Document
LPG Spheres and Bullets	<ul style="list-style-type: none"> • API 510 – Pressure Vessel Inspection Code • API RP 572 – Inspection of Pressure Vessels • API 581 – Risk Based Inspection Base Resource Document
Boilers and Steam Generators	<ul style="list-style-type: none"> • API RP 573 – Inspection of Fired Boilers and Heaters • NBIC / ANSI / NB-23 – National Board Inspection Code
Fired Heaters	<ul style="list-style-type: none"> • API RP 573 – Inspection of Fired Boilers and Heaters • API 530 – Calculation of Heater Tube Thickness
Storage Tanks	<ul style="list-style-type: none"> • API RP 575 – Guidelines and Methods for Inspection of Existing Atmospheric and Low-Pressure Storage Tanks • API 653 – Tank Inspection, Repair, Alteration, and Reconstruction
Piping Systems (Process and Relief)	<ul style="list-style-type: none"> • API 570 – Piping Inspection Code • API RP 574 – Inspection Practices for Piping System Components • API RP 578 – Material Verification Program for New and Existing Alloy Piping Systems • API 581 – Risk Based Inspection Base Resource Document
Valves	<ul style="list-style-type: none"> • API 570 – Piping Inspection Code

10.3 Appendix C – ITPM Matrices

C.1 Matrix 1 – Fixed Equipment Minimum Inspection, Test and Preventive Maintenance (ITPM) Matrix

Equipment Class	Minimum ITPM Tasks	Maximum Task Interval	Basis	Remarks
General				
Pressure Vessels, including LPG spheres and bullets	External visual inspection	5 years, local jurisdictional requirement, or the required internal / on-stream inspection interval, whichever is less	API 510 local jurisdictional requirements	An RBI assessment may be used to extend this inspection task beyond the previously established inspection interval as predicated in API 510, Section 6.3. "Fitness for Service calculation per API 579 may be used to maintain the current inspection interval."
	Internal visual inspection or external on-stream inspection	10 years or half the remaining corrosion life, whichever is less	API 510, local jurisdictional requirements	Same as above
	Ultrasonic thickness (UT) measurement	10 years or half the remaining corrosion life, whichever is less	API 510, local jurisdictional requirements	Same as above
Heat exchangers, including: • Shell and tube exchangers	External visual inspection	5 years, local jurisdictional requirement, or the required internal / on-stream inspection interval,	API 510, local jurisdictional requirements	Same as above
Relief Devices and Systems				
Relief valves (all types)	Offline repair	Based on inspection and performance history with a 10 year maximum	API 510, local jurisdictional requirements	An RBI assessment may be used to extend this inspection task beyond the previously established inspection interval as predicated in API 510, Section 6.3
	External visual inspection	5 years maximum	API 510 or API 570 and local jurisdictional requirements	
Rupture discs	Complete replacement of rupture disc	Based on inspection and performance history with a 10 year maximum	API RP 576 a	Rupture discs are considered a single use disposable commodity. They are replaced any time the rupture disc holder is disturbed (i.e., loosened or disassembled).
Flare tips	External visual inspection	Maximum 10 years or based on inspection history, whichever is less	This equipment is typically only accessible during unit TARs	This equipment is considered EXEMPT from codes; they are inspected as-needed and as requested by the operational or maintenance departments

Additional Technical Content for Mechanical Integrity Is Available

- MI Standard
- MI Audit Protocol
- PSM Critical Equipment Determination Procedure
- PSM Critical Equipment Identification Training Deck
- Quality Assurance Procedure
- Approved Equipment Suppliers Procedure
- Quality Assurance Standard for Suppliers of PSM Critical Equipment, MRO Materials and Spare Parts
- Quality Assurance Technical Attributes Evaluation for Suppliers of Pressure Vessels
- Quality Assurance Technical Attributes Evaluation for Suppliers of Storage Tanks
- Quality Assurance Technical Attributes Evaluation for Suppliers of Rotations Equipment
- Quality Assurance Technical Attributes Evaluation for Suppliers of Piping Fabrication
- Quality Assurance Technical Attributes Evaluation for Suppliers of Heat Exchangers
- Quality Assurance Technical Attributes Evaluation for Suppliers of Electrical-Electronics and Controls
- Quality Control of Equipment & Spare Parts Procedure
- Receiving Inspections – O-rings
- Receiving Inspections – Pipe
- Receiving Inspections – Plastic Lined Pipe
- Receiving Inspections – Fabricated Pipe
- Receiving Inspections – Refractory Materials
- Receiving Inspections – Instrumentation
- Receiving Inspections – Bolts and Studs
- Receiving Inspections – Nuts
- Receiving Inspections – Spiral Wound Gaskets
- Receiving Inspections – Fittings and Flanges
- Receiving Inspections – FRP Pipe
- Receiving Inspections – Tubing
- Receiving Inspections – Expansion Joints
- Receiving Inspections – Cut and Envelop Gaskets
- Receiving Inspections – Valves
- Receiving Inspections – Flexible Hose
- Receiving Inspections – Cable
- Receiving Inspections – Rolling Element Bearings
- Receiving Inspections – Rupture Discs
- Receiving Inspections – Welding Filler Material
- Receiving Inspections – Bladders
- Maintenance Training Procedure
- Reliability Engineering Procedure
- Equipment Deficiencies Management
- Testing and Inspection Procedure
- Maintenance Procedures

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