

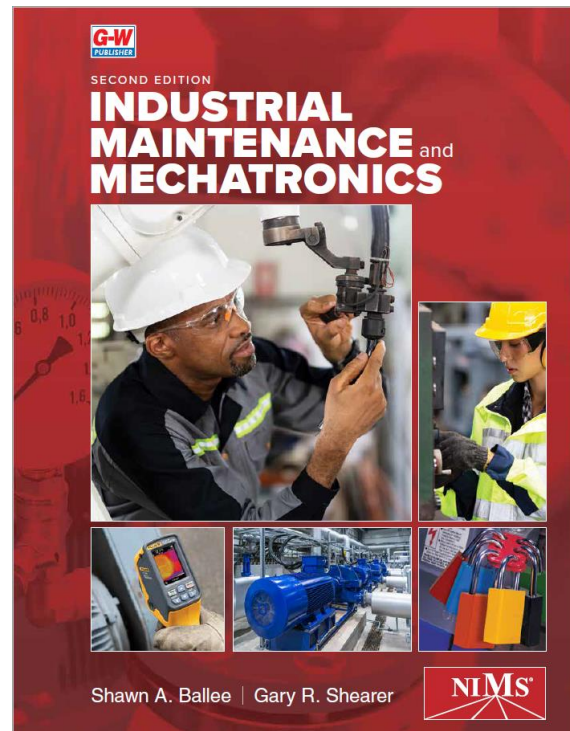


*Correlation of*  
**Industrial Maintenance and Mechatronics,**  
**Shawn A. Ballee and Gary R. Shearer**  
 Goodheart-Willcox Publisher ©2024  
 to  
**NIMS (National Institute for Metalworking Skills)**  
 Classic Credential:  
**Maintenance Piping**

*Industrial Maintenance and Mechatronics* carries NIMS' exclusive endorsement and supports attainment of NIMS credentialing in Industrial Technology Maintenance (ITM).

The textbook is designed to work hand-in-glove with the NIMS Standards for Industrial Technology Maintenance. The standards-based learning package will help students pass the testing and performance requirements for NIMS credentialing.

The correlation below lists the standards for a specific NIMS Classic ITM Credential. The Classic ITM areas covered in *Industrial Maintenance and Mechatronics* include Maintenance Operations, Basic Mechanical Systems, Basic Hydraulic Systems, Basic Pneumatic Systems, Electrical Systems, Electronic Control Systems, Process Control Systems, and Maintenance Piping.



Standards	G-W Content
<b>Duty Title: 9.01. Adhere to piping system safety rules.</b>	
Identify roles and responsibilities for safety, health, and environment.	Textbook: pg. 13, 24-28, 36-44, 70
Adhere to OSHA, NIOSH, EPA, and other federal and state safety requirements for the workplace.	Textbook: pg. 18, 24-25, 43-44
Identify and recognize common industrial hazards, per OSHA standards (including, ergonomics, laser safety, NFPA arc flash, confined space, gases and combustibles, steam and compressed air).	Textbook: pg. 24-26
Define elements of a lockout/tagout (LOTO) program, describe the LOTO process and test to ensure a zero energy state.	Textbook: pg. 28-32 Lab Workbook: Activity 2-1, Lockout/Tagout Procedure

**Correlation of *Industrial Maintenance and Mechatronics* to NIMS Duty Area 9: Maintenance Piping—page 2**

Standards	G-W Content
Identify and explain how to select the appropriate personal protective equipment (eyes, head, breathing air apparatus, body, feet, hands, ears) for a job.	Textbook: pg. 13, 32-35 Lab Workbook: Activity 2-2, Personal Protective Equipment
Explain how to locate a material Safety Data Sheet (SDS) and describe how you interpret the information.	Textbook: pg. 24-27
List and select proper fall protection for working at heights and using ladders, scaffolding, and lifts.	Textbook: pg. 37
Identify and recognize hazardous situations and apply proper procedures (includes following guidelines to prevent spread of bloodborne pathogens, spill control, proper storage, handling, protection of equipment, first aid).	Textbook: pg. 28-32, 36-43
Describe the process used to perform a job safety analysis.	Textbook: pg. 43 Lab Workbook: Activity 2-3, Job Safety Analysis
Explain the principles of 6S program (Sort, Sweep, Sanitize, Set-to-order, Sustain, Safety).	Textbook: pg. 43
Identify fuel source and selection of correct extinguisher class.	Textbook: pg. 43
<b>MP-Specific:</b>	
Identify required machine guarding for piping systems.	Textbook: pg. 317, 321, 333–334, 345, 360
Identify different types of materials being handled by piping systems and their hazards.	Textbook: pg. 332–334, 872–873
Describe safety procedures for tightening, disconnecting, or connecting piping system components.	Textbook: pg. 884–885, 909–916 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly Lab Workbook: Activity 40-2, Flange Assembly Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
Describe procedures for safe handling and disposal of piping contents.	Textbook: pg. 872–873, 886
Describe dangers of personal contact with pressurized hot or cold piping systems.	Textbook: pg. 873, 902, 915
Adhere to guidelines to avoid contact with hot surfaces in piping systems.	Textbook: pg. 873, 915
Describe proper set-up, cleaning, isolation, and purging procedures of working on process gases and combustible piping systems.	Textbook: pg. 384–385, 872–873, 887, 902,

Standards	G-W Content
<b>Duty Title: 9.02. Interpret basic piping schematics.</b>	
Identify basic piping components given their ISA schematic symbol, including: Directional control valves, pressure control valve, flow control valves, cylinders, motors, instrumentation, pumps, various types of operators, filters	Textbook: pg. 128, 131,132, 133, 877–879
Interpret piping line types and symbols on a schematic.	Textbook: pg. 131, 800, 877–879
Identify and explain connectors and fittings specifications for processes.	Textbook: pg. 916–919
Interpret the operation of a basic piping system given a schematic.	Textbook: pg. 130, 800, 877–880
<b>Duty Title: 9.03. Identification and selection of piping material.</b>	
Select the proper tools to use with piping systems.	Textbook: pg. 902–909 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly Lab Workbook: Activity 40-2, Flange Assembly Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
Define piping types and size by schedule and material.	Textbook: pg. 888–893 Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
Define tubing type and size by OD/ID and material.	Textbook: pg. 891–893 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly
Describe sealants, gaskets, and solder types.	Textbook: pg. 910, 913–915 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-3, Pipe Threading and Assembly
Explain types and ratings of hoses.	Textbook: pg. 332–333
Explain types and uses of hangers.	Textbook: pg. 893

Standards	G-W Content
Identify and select correct materials for process/medium compatibility: Fitting, connections Pipe or tubing Sealants, gaskets or solder/weld	Textbook: pg. 888–893, 909–919 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
<b>Duty Title: 9.04. Measurement and preparation of piping.</b>	
Interpret or detail the appropriate measurement of materials for cutting or bending.	Textbook: pg. 904–905, 908 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
Calculate pipe length required for installation or repair.	Textbook: pg. 880, 908–909 Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
Use threading machines, tubing benders, and cutting devices to prepare pipe and tubing.	Textbook: pg. 902, 904–908 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
Perform surface preparation for all types of connections.	Textbook: pg. 887, 906, 911–913, 915, Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly Lab Workbook: Activity 40-2, Flange Assembly Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
Measure, cut, and prepare iron pipe for installation or replacement.	Textbook: pg. 889–890, 904–907 Lab Workbook: Activity 40-3, Pipe Threading and Assembly
Measure, cut, and prepare PVC, CPVC pipe for installation.	Textbook: pg. 891, 904–907, 908, 915–916 Lab Workbook: Activity 40-4, PVC Piping

Standards	G-W Content
Measure, cut, and prepare tubing for installation.	Textbook: pg. 891–893, 904–907, 912, 913–915 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly
<b>Duty Title: 9.05. Installation of piping systems.</b>	
Explain support devices for all types of pipe systems.	Textbook: pg. 893–894
Describe the effect of pipe strain on equipment.	Textbook: pg. 180, 240, 306, 887
Explain importance of proper torque.	Textbook: pg. 102, 191–192, 887, 902 Lab Workbook: Activity 39-1, Centrifugal Pump Teardown, Inspection, and Repair Lab Workbook: Activity 40-2, Flange Assembly Lab Workbook: Activity 40-3, Pipe Threading and Assembly
Explain proper installation of sealants and gaskets.	Textbook: pg. 909, 910–911, 918 Lab Workbook: Activity 40-2, Flange Assembly Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab Workbook: Activity 40-4, PVC Piping
Remove and install threaded pipe and fittings.	Textbook: pg. 906, 907, 908, 909, 916, 917 Lab Workbook: Activity 40-3, Pipe Threading and Assembly Lab workbook: Activity 40-4, PVC Piping
Remove and install tubing and fittings.	Textbook: pg. 887, 891–893, 906, 916–918 Lab Workbook: Activity 39-2, Joining Copper Tubing Lab Workbook: Activity 40-1, Tubing Bending and Fitting Assembly
Remove and install PVC and CPVC pipe and fittings.	Textbook: pg. 891, 892–893, 915–917 Lab Workbook: Activity 40-4, PVC Piping
Remove and install bolted piping flanges.	Textbook: pg. 887, 910–911 Lab Workbook: Activity 40-2, Flange Assembly