Level One

MODULE 34101 - INTRODUCTION TO BOILERMAKING

1. List the various uses of boilers in industry today.
2. Describe the various career opportunities available to a boilermaker.
3. Identify the various tasks performed by a typical boilermaker.
4. Define several key terms used in the field of boilermaking.

MODULE 34102 - BOILERMAKING SAFETY

1. List the specific hazards associated with the boilermaking field.
2. Describe the various respiratory hazards encountered by boilermakers.
3. Discuss the hazards associated with working at height.
4. Describe the equipment used to work at height and identify the certification requirements needed to operate that equipment.
5. Discuss the fact that plant-specific safety requirements exist for every facility.
6. Explain the contractor/client relationship as it relates to safety.

MODULE 34103 - BOILERMAKING TOOLS

1. Discuss the safety precautions associated with boilermaking hand tools.
2. Identify various boilermaking hand tools.
3. Discuss the safety precautions associated with pneumatic tools.
4. Identify various pneumatic tools.
5. Discuss the safety precautions associated with electrical tools.
6. Identify various electrical tools.
7. Discuss the safety precautions associated with hydraulic tools.
8. Identify various hydraulic tools.

MODULE 34104 - BASIC MATERIALS

1. Discuss materials used in boiler construction and where these materials are used.
2. Describe the different types of iron and steel. Discuss their material properties.
3. Identify codes and markings used in material identification.
4. Discuss material properties of the refractory and insulation material used in boiler construction.
MODULE 34105 - OXYFUEL CUTTING
1. Explain oxyfuel cutting safety.
2. Identify and explain oxyfuel cutting equipment.
3. Set up oxyfuel equipment.
4. Light and adjust an oxyfuel torch.
5. Shut down oxyfuel cutting equipment.
6. Disassemble oxyfuel equipment.
7. Change empty cylinders.
8. Perform oxyfuel cutting activities:
   • Straight lines and square shapes
   • Piercing and slot cutting
   • Bevels
   • Washing
   • Heat metal with a rosebud until red hot
   • Gouging

MODULE 34106 - CUTTING AND FITTING GASKETS
1. Identify and explain gasket types.
2. Identify and explain gasket materials.
3. Lay out and cut gaskets.
4. Install gaskets.

MODULE 34107 - WELDING BASICS
1. Identify the different welding processes commonly used on boilers.
2. Set up a shield-gas purge on a pipe to be welded.
3. Identify the specialized personal protective equipment needed when performing welding and be able to use this equipment properly.
4. Identify the specific safety hazards associated with welding in a boiler environment.
5. Identify the different welded joint designs, weld types, and groove designs used when welding.
6. Identify the key measurements of a welded joint.
7. Discuss the criteria used to select the electrodes and filler metals used when welding on a boiler.
8. Properly receive, store, and care for welding electrodes and filler metal.
9. Discuss the different code requirements that apply to the construction and maintenance of boilers.
10. Explain the different qualification and certification requirements that apply to a welder working on a boiler.
11. Run a simple SMAW bead on plate steel.
Level Two

**MODULE 34201 - INTRODUCTION TO BOILER COMPONENTS**
1. Identify and discuss the differences between boiler designs.
2. Discuss the operation of various types of boiler auxiliary equipment.
3. Discuss the operation of pollution control equipment commonly used in conjunction with a boiler.
4. Discuss the operation of the internal components of a common boiler.
5. Discuss the operation of distillation-related equipment commonly maintained by a boilermaker.

**MODULE 34202 - WELDING SYMBOLS**
1. Identify and explain AWS Standard A2.4, Standard Symbols for Welding, Brazing and Nondestructive Examination.
2. Identify and explain the various parts of a welding symbol.
3. Identify and explain fillet and groove weld symbols.
4. Read welding symbols on drawings, specifications, and Welding Procedure Specifications (WPSs).

**MODULE 34203 - DRAWINGS AND DETAIL SHEETS**
1. Identify and explain parts of drawings.
2. Identify and explain types of drawings.
3. Make field sketches.

**MODULE 34204 - IDENTIFYING AND INSTALLING VALVES**
1. Identify types of valves that start and stop flow.
2. Identify types of valves that regulate flow.
3. Identify valves that relieve pressure.
4. Identify valves that regulate the direction of flow.
5. Identify types of valve actuators.
6. Explain how to properly store and handle valves.
7. Explain valve locations and positions.
8. Install valves with threaded ends.
9. Install valves with welded ends.
10. Install valves with flanged ends.

**MODULE 34205 - BASE METAL PREPARATION**
1. Clean base metal for welding or cutting.
2. Identify and explain joint design.
3. Explain joint design considerations.
4. Prepare base metal joints for welding.
MODULE 34206 - PLASMA ARC CUTTING (PAC)
1. Set up plasma arc cutting equipment.
2. Prepare the work area to safely perform plasma arc cutting.
3. Select the correct amperage and gas pressures or flow rates for the type and thickness of metal to be cut.
4. Use plasma arc cutting equipment to pierce and cut slots in metal.
5. Use plasma arc cutting equipment to square cut metal.
6. Use plasma arc equipment to bevel cut metal.
7. Dismantle and store the equipment and clean the work area.

MODULE 34207 - AIR CARBON ARC CUTTING AND GOUGING
1. Identify and explain the air carbon arc cutting process and equipment.
2. Explain how to select and install air carbon arc cutting electrodes.
3. Prepare the work area and air carbon arc cutting equipment for safe operation.
4. Use air carbon arc cutting equipment for washing and gouging activities.
5. Perform storage and housekeeping activities for air carbon arc cutting equipment.

MODULE 34208 - TUBE WELDING PREPARATION AND FITTING
1. Describe the proper methods to prepare a single boiler tube or section of boiler tube for replacement.
2. Describe the various methods used to obtain access to a boiler tube requiring repair.
3. Fit-up a section of boiler tube for replacement.
4. Describe the welding procedures when performing butt welds on standard carbon steel tubes as well as composite tubes.

MODULE 34209 - PIPE HANGERS AND SUPPORTS
1. Identify types of pipe hangers and supports.
2. Identify and interpret pipe support drawings and symbols.
3. Determine field placement of hangers.
4. Identify and install concrete fasteners.

MODULE 34210 - FASTENERS
1. Identify threaded fasteners and explain how they are used.
2. Identify nonthreaded fasteners and explain how they are used.
3. Identify insulation fasteners and explain how they are used.
4. Install fasteners.

MODULE 34211 - SPRING CAN SUPPORTS
2. Identify the types of spring can supports and explain how they are used.
3. Identify the types of variable spring can supports and explain how they are used.
4. Identify the types of constant spring can supports and explain how they are used.
5. Explain how to select spring can supports.
6. Explain the storing and handling procedures for spring can supports.
7. Explain how to install spring can supports.
8. Maintain spring can supports.
MODULE 34212 - BUTT WELD PIPE FABRICATION

1. Identify butt weld piping materials.
2. Identify butt weld fittings.
3. Read and interpret butt weld piping drawings.
4. Prepare pipe ends for fit-up.
5. Determine pipe lengths between fittings.
6. Select and install backing rings.
7. Use and care for clamps and alignment tools.
8. Perform alignment procedures for various types of fittings.
MODULE 34301 - BOILER PRESSURE COMPONENTS

1. Identify the pressure components of a boiler and their locations.
2. Identify the tools and procedures required to repair the pressure components of a boiler.

MODULE 34302 - BOILER NONPRESSURE COMPONENTS

1. Identify the nonpressure components of a boiler and their locations.
2. Identify the tools required to repair the nonpressure components of a boiler.
3. Identify the precautions required to repair the nonpressure components of a boiler.

MODULE 34303 - ADVANCED TUBE WORK

1. Discuss the method for identifying problem tubes.
2. Discuss the method for rolling tubes.
3. Discuss the method for plugging tubes.
4. Discuss the method for extracting tubes.

MODULE 34304 - SPECIAL RIGGING

1. Describe and explain the uses of the following special rigging equipment:
   - Air tugger
   - Chicago boom
   - A-frame
   - Davit
   - Balancing beam
   - High lines
   - Rolling devices
2. Erect or rig the following safely and correctly:
   - Chicago boom
   - A-frame
   - Balancing beam
   - High lines

MODULE 34305 - BRIL (BRICK, REFRACTORY, INSULATION, AND LAGGING)

1. Discuss the various types of BRIL.
2. Explain the functions of BRIL.
3. Discuss the hazards associated with each type of BRIL.

MODULE 34306 - BOILER AUXILIARIES

1. Identify and describe the theory of operation of a boiler plant’s auxiliary components.
2. Describe the location of auxiliary components of a boiler plant.
3. Explain the uses of the tools required for repair of the auxiliary components.
4. Explain the maintenance and tools required for repair of the auxiliary components.
MODULE 34307 - TOWERS AND EXCHANGERS

1. Identify the various types of towers and their components.
2. Discuss the functions of various types of towers.
3. Identify various types of exchangers and their components.
4. Discuss the functions of various types of exchangers.

MODULE 34308 - TESTING PIPING SYSTEMS AND EQUIPMENT

1. Perform pretest requirements.
2. Perform service and flow tests.
3. Perform head pressure tests.
4. Perform hydrostatic tests.
5. Explain how to perform steam blow tests.
Level Four

MODULE 34401 - ADVANCED TRADE MATH

1. Use tables of equivalents.
2. Use unit conversion tables.
3. Explain thermal expansion.
4. Perform right angle trigonometry.
5. Calculate take-outs using trigonometry.

MODULE 34402 - ADVANCED BLUEPRINT READING

1. Identify symbols and abbreviations on P&IDs.
2. Identify piping arrangement drawings.
3. Read and interpret coordinates, control points, and elevations.
4. Read and interpret P&IDs, plan views, and section views.
5. Identify isometric drawings.
6. Read isometric drawings taken from plan views.
7. Draw isometric drawings.
8. Read and interpret boiler plan views, section views, and details.

MODULE 34403 - ADVANCED TOWERS AND EXCHANGERS

1. Identify all safety precautions for towers and exchangers.
2. Identify the types of trays to be installed and their applications.
3. Identify materials, components, and layout of a tray.
4. Perform typical maintenance procedures on a tower:
   - Removal of trays
   - Cleaning and inspection
   - Installation of trays
5. Properly remove and install an exchanger.

MODULE 34404 - ADVANCED BOILER TUBE SYSTEMS

1. Identify safety precautions associated with boiler tube systems.
2. Identify materials used in various boiler systems and locations.
3. Describe removing tubing and attachments.
4. Describe tube preparation and installation for the following boiler components:
   - Economizers
   - Superheaters
   - Reboilers
   - Generator banks
   - Wall panels
   - Condensers/exchangers/coolers
MODULE 34405 - ADVANCED PIPE FABRICATION

1. Calculate and fabricate simple piping offsets.
2. Calculate and fabricate three-line, 45-degree, equal-spread offsets around a vessel.
3. Calculate and fabricate three-line, 45-degree, unequal-spread offsets.
4. Fabricate tank heating coils.

MODULE 34406 - STRESS RELIEVING

1. Explain thermal expansion.
2. Describe stress-relief procedures.
3. Explain types of misalignment.

MODULE 34407 - QUALITY ASSURANCE

1. Recognize governing jurisdictions (NBIC, ASME, and BLRBAC) and be able to relate codes to projects.
2. Describe weld preparation and welding inspection.
3. Describe non-destructive testing methods.
4. Describe hydrostatic testing.

MODULE 34408 - BOILER DESIGN

1. Name the various designers of boilers.
2. Describe the various types of boilers.

MODULE 34409 - PLANNING WORK ACTIVITIES

1. Plan daily work activities.
2. Coordinate work activities with other crafts.
3. Ensure safe working conditions.
4. Determine material needs.
5. Secure equipment and materials.
6. Sequence operations specific to the task.
7. Field-check the installation.