MERCURY

Advanced Post-Weld Heat Treatment: Codes and Field Practice

7 – 18 February 2027
Dubai (UAE)

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Advanced Post-Weld Heat Treatment: Codes and Field Practice

Ref: 15956_999951 **Date:** 7 – 18 February 2027 **Location:** Dubai (UAE) **Fees:** 8500 Euro

Advanced Post-Weld Heat Treatment: Codes and Field Practice is a two-week course for engineers, inspectors and site supervisors who must decide when stress relief is required, write the procedure and prove it was done. You read the governing code clauses, plan thermocouple layouts and heating bands, and judge chart records. You leave with your own Field Stress-Relief Procedure Pack. The course is delivered by Mercury Training Center.

About This Course

Projects lose days when a joint is stress-relieved without need, or skipped when the code demands it, and when a chart cannot be defended at handover. You should already review fabrication records or supervise piping and vessel work. You practice on code extracts, procedure templates, thermocouple sketches and recorder charts from real job types.

Who It Is For

- Engineers who decide which joints need stress relief and sign the procedure.
- Inspectors who witness thermal cycles and accept or reject chart records.
- Site supervisors who plan heating crews, power supply and insulation on live projects.
- Metallurgy and materials staff who set soak bands for alloy and stainless piping.
- Quality staff who compile turnover dossiers for pressure equipment.

This course is not for newcomers who need the basic purpose and methods of stress relief first, who are better served by a shorter introductory course. It also does not suit welders seeking a hands-on welding skills course, which focuses on depositing sound joints rather than code decisions after welding.

Competencies You Will Build

- Code Interpretation: you read the PWHT clauses of the governing code and state whether a joint is mandatory, exempt or conditional.
- Procedure Writing: you draft a site procedure that names heating method, bands, rates, soak and cooling.
- Thermocouple Planning: you place and attach measurement points so the whole soak band is proven.
- Field Supervision: you run a local heating job with insulation, power and hold points under control.
- Record Review: you read a recorder chart and accept it, or raise a deviation with a reason.
- Failure Diagnosis: you trace hardness or cracking findings back to the thermal cycle and fix the next one.

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What You Will Be Able to Do

By the end of the course you will be able to:

- Given a weld map and material list for a process piping line, mark which joints ASME B31.3 requires to be stress-relieved and which are exempt.
- From a pressure vessel drawing, set the holding temperature, time and heating and cooling rates using ASME Section VIII Division 1 tables.
- Using a pipe size and wall thickness, size the soak band, heated band and insulation band for a local resistance job.
- From a recorder chart with a gap or overshoot, decide whether the cycle can be accepted, repeated or referred to the engineer.
- Given post-cycle hardness readings above limits, identify likely causes and set corrective steps.
- Using your site's own forms, assemble the records an owner needs at turnover.

Course Content

Day 1: Why Stress Relief Is Specified

- Residual Stress Formation in Butt and Fillet Joints
- Hardness, Toughness and Hydrogen Effects After Welding
- Stress Relief Compared With Annealing, Normalizing and Tempering
- Joint Types and Service Conditions That Call for PWHT
- Metallurgy Basics for Carbon, Low-Alloy and Stainless Steels

Day 2: Process Piping Code Clauses

- ASME B31.3 Requirements for When Stress Relief Is Mandatory
- Exemptions by Material Group and Wall Thickness
- Governing Thickness Rules for Branches and Dissimilar Joints
- Holding Temperature and Time Tables for Piping
- Hardness Limits and Their Testing After the Cycle

Day 3: Power Piping and Vessel Codes

- ASME B31.1 Requirements for Boiler and Power Piping
- ASME Section VIII Division 1 UCS-56 Holding Requirements
- Heating and Cooling Rate Limits for Vessels
- Comparing Code Clauses on the Same Joint
- Owner Specifications That Add to Code Minimums

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Day 4: Heating Methods and Their Selection

- Furnace Cycles for Whole Vessels and Spools
- Electric Resistance Mats for Local Field Joints
- Induction Coils for Thick Sections and Fast Ramp-Up
- Flame and Gas Firing Limits on Site
- Method Selection by Geometry, Access and Power Supply

Day 5: Bands, Insulation and Thermal Gradients

- Soak Band, Heated Band and Gradient Control Band Sizing
- Insulation Layout to Limit Through-Wall Temperature Differences
- Internal Air Flow and End Closures on Piping
- Support and Expansion Allowance During the Cycle
- Nozzle, Branch and Valve Body Heating Arrangements

Day 6: Temperature Measurement and Recording

- Thermocouple Types and Capacitor-Discharge Attachment
- Thermocouple Location Plans for Control and Monitoring
- Recorder Calibration and Chart Speed Settings
- Reading Ramp, Soak and Cool-Down on a Chart
- Handling Power Loss, Gaps and Overshoots Mid-Cycle

Day 7: Writing the Site Procedure

- Procedure Template Sections From Scope to Acceptance
- Joint Schedules Linked to Weld Maps and Isometrics
- Hold Points and Witness Points for Inspectors
- Safety Rules for Electrical Heating Crews and Hot Surfaces
- Permit and Isolation Needs for Work in Operating Plants

Day 8: Alloys and Repair Situations

- Chrome-Moly Piping Soak Ranges and Tempering Risks
- Stainless and Nickel Alloy Cases Where Heating Harms Corrosion Resistance
- Dissimilar Metal Joints and Choosing the Governing Material
- Repair Welds on Previously Stress-Relieved Equipment
- Alternatives to Heating Allowed by Code for Repairs

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Day 9: Verification and Failure Analysis

- Portable Hardness Testing After the Cycle
- NDT Timing Relative to the Thermal Cycle
- Reheat Cracking and Distortion Causes
- Root Cause Review of Rejected Charts
- Turnover Records and Traceability for Pressure Equipment

Day 10: Code and Field Practice on Your Project

- Exercise: Code Decision Matrix for a Mixed Piping Line
- Exercise: Thermocouple and Band Layout for a Nozzle
- Exercise: Chart Review and Accept or Reject Decision
- Peer Review of Draft Site Procedures
- Completing Your Field Stress-Relief Procedure Pack

Case Studies and Exercises

The following are suggested activities.

- Case study: On an oil and gas process piping tie-in, a recorder lost power during soak; you decide whether the cycle stands and what the repeat must achieve.
- Case study: In a power generation boiler piping outage, chrome-moly joints show high hardness after the cycle; you trace the cause and set the corrective plan.
- Exercise: For a construction-stage pressure vessel, you choose between furnace and local heating for a late nozzle weld and justify the choice from the code.
- Exercise: You write the thermocouple location plan and band sizes for a thick-wall field joint.

What You Take Back

You return with your Field Stress-Relief Procedure Pack, built around a joint type from your own work. In your first month back you use it to screen new weld maps against the code, brief heating crews and review the first charts submitted for acceptance.

- A code decision matrix for mandatory and exempt joints.
- A site procedure template with hold points.
- Thermocouple and band layout sheets.
- A chart review and deviation checklist.

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Quick Answers FAQ

What do I need before Advanced Post-Weld Heat Treatment: Codes and Field Practice?

You need working experience with piping or pressure vessel fabrication, either reviewing records, inspecting or supervising. You should know the purpose of stress relief; the course moves straight to code clauses, procedures and chart decisions.

How does advanced PWHT code training differ from an introductory PWHT course?

An introductory course explains why and how stress relief is done. The advanced course spends its time on deciding when codes require it, writing the site procedure, placing thermocouples and accepting or rejecting the recorded cycle.

When is PWHT mandatory under ASME B31.3?

It depends on the material group, the governing thickness and any owner requirement. The code lists holding temperatures and times per material, with exemptions for some thin or low-alloy joints, so each joint is checked against the table rather than assumed.

What do I take back from advanced post-weld heat treatment training?

You take back a Field Stress-Relief Procedure Pack: a code decision matrix, a procedure template, thermocouple and band layouts and a chart review checklist, built on a joint type from your own projects.

For Your Manager

After this course the team member can decide from the code which joints require stress relief, write the site procedure and judge recorded cycles before turnover. They bring back a Field Stress-Relief Procedure Pack, first used to screen the next weld map and review the first charts on the current project.