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COURSE BROCHURE

Piping and Boiler Design Calculations and Operation Training Course

19 – 23 September 2027
Doha

Piping and Boiler Design Calculations and Operation Training Course

Ref: 1471_54602 **Date:** 19 – 23 September 2027 **Location:** Doha **Fees:** 6500 GBP

Piping and Boiler Design Calculations and Operation is a 1-week training course for mechanical engineers and boiler plant staff, built around a piping and boiler calculation workbook that checks wall thickness, pressure drop, expansion loads, support spans, heat balance and boiler efficiency for a real steam system. Fuel costs, ageing steam networks and modifications made without fresh calculations put both efficiency and safety at risk. Jupiter Prime Training delivers this piping and boiler design calculations and operation course.

Why Piping and Boiler Design Calculations and Operation Matters Now

Three forces push engineers back to first-principles calculations: rising fuel costs that make every point of boiler efficiency visible on the balance sheet, plant modifications that add branches, loads and temperatures to steam piping designed decades ago, and fewer senior engineers available to check a younger colleague's numbers. Sites that calculate and operate well avoid overstressed nozzles, steam hammer damage and wasted fuel; sites that skip the checks meet cracked supports, leaking flanges and furnace upsets. The course draws on ISO 55001 for linking engineering checks to asset decisions and EN 13306 for maintenance and failure terminology.

Who Gains Most from Piping and Boiler Design Calculations and Operation

- Engineers who check piping modifications for pressure, temperature and load changes
- Staff who run boilers and adjust firing, feedwater and blowdown
- Engineers who assess boiler efficiency and fuel consumption trends
- Engineers who specify pipe supports, expansion loops and anchors
- Staff who investigate steam leaks, hammer events and support failures

A utilities or steam plant group gains most when its piping engineers and boiler operators attend together and share one set of calculation sheets.

Piping and Boiler Design Calculations and Operation Capabilities

Participants move from rule-of-thumb sizing to transparent hand calculations that a colleague can check and an operator can act on.

- Calculate required pipe wall thickness with pressure, corrosion and mill tolerance allowances — informing material and schedule choices
- Calculate pressure drop in steam and water lines with friction factors and fittings — guiding line sizing
- Assess thermal expansion and the need for loops, guides and anchors — supporting piping layout decisions
- Specify support spans and loads for insulated piping — informing civil and maintenance teams
- Build a boiler heat balance and efficiency estimate by the direct and indirect methods — serving energy and operations managers
- Apply safe firing, drum level and blowdown practices — protecting boiler operators and equipment

Key Piping and Boiler Design Calculations and Operation Terms

- Corrosion allowance — extra wall thickness added to a pipe so it remains safe as metal is lost over its service life.
- Friction factor — a dimensionless value used to estimate pressure loss along a pipe from flow, roughness and diameter.
- Expansion loop — a planned bend in a pipe route that absorbs thermal growth without overloading anchors or nozzles.
- Support span — the maximum distance between pipe supports that keeps sag and bending stress within limits.
- Indirect efficiency method — estimating boiler efficiency by subtracting each heat loss from total fuel energy input.
- Steam hammer — a pressure surge caused by condensate slugs carried at high velocity in steam lines.

Piping and Boiler Design Calculations and Operation Day by Day

Day 1: Steam System Context and Duties

- Steam Generation and Distribution Layouts — Identifying Critical Lines and Boilers
- Steam Tables and Enthalpy Look-Up — Setting Up Heat Calculations
- ISO 55001 Asset Decisions for Steam Systems — Linking Calculations to Investment
- EN 13306 Failure Terms for Piping and Boilers — Recording Damage Consistently
- Design Pressure and Temperature Selection — Defining Calculation Inputs

Day 2: Piping Wall and Flow Calculations

- Pipe Wall Thickness Calculation with Allowances — Choosing Pipe Schedule
- Material Allowable Stress and Temperature Derating — Selecting Pipe Material
- Darcy Friction Factor and Moody Chart Use — Estimating Line Pressure Drop
- Fittings and Valve Equivalent Length Method — Completing Network Pressure Losses
- Steam and Condensate Line Velocity Limits — Preventing Erosion and Noise

Day 3: Expansion, Supports and Loads

- Thermal Expansion Calculation for Hot Lines — Sizing Movement to Absorb
- Expansion Loops, Bellows and Offsets — Choosing Flexibility Method
- Support Span and Load Calculation — Placing Hangers and Shoes
- Anchor and Guide Load Estimation — Protecting Nozzles and Structures
- Condensate Drainage and Trap Location — Avoiding Steam Hammer

Day 4: Boiler Heat Balance and Operation

- Direct Efficiency Method from Fuel and Steam Flows — Tracking Daily Performance
- Indirect Efficiency Method and Heat Loss Breakdown — Targeting Improvement Areas
- Combustion Air, Excess Oxygen and Flue Gas Checks — Tuning Firing Conditions
- Drum Level, Feedwater and Blowdown Control — Protecting Tubes and Steam Quality
- Examples from Refineries and Food Processing Plants — Comparing Steam System Practice

Day 5: Practising the Piping and Boiler Calculation Workbook

- Wall Thickness and Pressure Drop Check for a Modified Line — Approving the Change
- Expansion and Support Review of a Hot Header — Locating Overloaded Points
- Boiler Heat Balance from Plant Readings — Ranking Loss Reduction Options
- Safe Start-Up and Shutdown Sequence Review — Confirming Operating Limits
- Piping and Boiler Calculation Workbook — Completing Inputs, Checks and Results

Applying Piping and Boiler Design Calculations and Operation After the Course

- Lead a calculation check on the next piping modification, documenting wall thickness, pressure drop and support spans in the workbook.
- Run an indirect efficiency estimate on one boiler using flue gas readings and agree two loss reduction actions with operations.

Piping and Boiler Design Calculations and Operation Questions FAQ

What is piping and boiler design calculations and operation and why does it matter now?

It is the hand calculation of pipe thickness, flow, expansion and supports together with boiler efficiency and safe operation. Fuel costs and frequent plant modifications make these checks essential.

Which roles gain most from piping and boiler design calculations and operation training?

Mechanical engineers, boiler operators, energy engineers and piping designers gain most. You benefit if you approve modifications, run boilers or investigate steam system failures.

How does piping and boiler design calculations and operation differ from a pressure equipment code course?

A code course explains how to read and apply code clauses. This course works through the calculations themselves and links them to everyday boiler operation and steam piping decisions.

What do you bring back from piping and boiler design calculations and operation training?

You bring back a piping and boiler calculation workbook with worked examples, plus a boiler efficiency estimate and operating checks you can reuse on your own plant.

Piping and Boiler Design Calculations and Operation: The Way Forward

The piping and boiler calculation workbook first informs whether the next steam line modification can proceed as designed. Piping engineers, boiler staff and energy engineers use it to check changes and track efficiency. After its first use, revisit the support and expansion sheets with site walkdown findings, since real hanger condition often differs from drawings.