

**COURSE OVERVIEW FE0015**  
**Piping Mechanical Design & Specification**

**Course Title**

Piping Mechanical Design & Specification

**Course Date/Venue**

October 13-17, 2024/Boardroom, Warwick Hotel  
 Doha, Doha, Qatar

**Course Reference**

FE0015

**Course Duration/Credits**

Five days/3.0 CEUs/30 PDHs



**Course Description**



***This practical highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.***

This course is designed to provide participants with a detailed and up-to-date overview of Piping Mechanical Design and Specification. It covers the principles of piping mechanical design and the role of mechanical design in piping systems; the codes and standards relevant to piping mechanical design and considerations for various process conditions and materials; the material selection criteria based on process conditions and fluid properties; the piping material specifications and standards; the corrosion resistance and material compatibility considerations, temperature and pressure limitations for different materials; and the documentation and traceability requirements for piping materials.



Further, the course will also discuss the types of loads acting on piping systems; the methods for determining loads and stresses; the stress categories and allowable stress analysis, thermal expansion, contraction analysis and software tools for stress analysis; the pipe wall thickness calculation, pressure design thickness calculation methods, accounting for corrosion allowances and mill tolerance; the external pressure design calculations and verification of pipe wall thickness using applicable codes and standards; the piping supports and restraints; the load distribution and selection of support types; the design considerations for spring hangers, snubbers and restraints; and the analysis of piping systems with variable loads and movements.



During this interactive course, participants will learn the pipe stress analysis, load case development and analysis procedure, flexibility analysis and pipe displacement evaluation; the piping vibration analysis and mitigation measures for addressing excessive vibration; the piping component design and selection, expansion joints and flexible joints; and the piping specification development and documentation.

### **Course Objectives**

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on piping mechanical design and specification
- Discuss the principles of piping mechanical design and the role of mechanical design in piping systems
- Explain the codes and standards relevant to piping mechanical design and considerations for various process conditions and materials
- Discuss material selection criteria based on process conditions and fluid properties and identify piping material specifications and standards
- Analyze corrosion resistance, material compatibility considerations, temperature and pressure limitations for different materials and documentation and traceability requirements for piping materials
- Identify the types of loads acting on piping systems and calculate methods for determining loads and stresses
- Recognize stress categories and allowable stress analysis, thermal expansion and contraction analysis and software tools for stress analysis
- Carryout pipe wall thickness calculation, pressure design thickness calculation methods, accounting for corrosion allowances and mill tolerance, external pressure design calculations and verification of pipe wall thickness using applicable codes and standards
- Identify piping supports and restraints, load distribution and selection of support types, design considerations for spring hangers, snubbers and restraints and analysis of piping systems with variable loads and movements
- Apply pipe stress analysis, load case development and analysis procedure, flexibility analysis and pipe displacement evaluation
- Employ piping vibration analysis and mitigation measures for addressing excessive vibration
- Determine piping component design and selection, expansion joints, flexible joints and piping specification development and documentation

### Exclusive Smart Training Kit - H-STK®



Participants of this course will receive the exclusive “Haward Smart Training Kit” (H-STK®). The H-STK® consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.

### Who Should Attend

This course provides an overview of all significant aspects and considerations of piping mechanical design and specification for piping engineers, mechanical engineers, plant designers, project managers, construction professionals, piping inspectors and those who are interested in pursuing a career in mechanical engineering or related fields.

### Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Practical Workshops & Work Presentations
- 30% Hands-on Practical Exercises & Case Studies
- 20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

### Course Fee

**US\$ 6,000** per Delegate. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

### Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

### Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

### Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -


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The International Accreditors for Continuing Education and Training (IACET - USA)

Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

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British Accreditation Council (BAC)

Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

### Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:



**Mr. Andrew Ladwig** is a **Senior Process & Mechanical Engineer** with over **25 years** of extensive experience within the **Oil & Gas, Refinery, Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting, Distillation Towers, Crude Oil Distillation, Fundamentals of Distillation** for Engineers, **Distillation Operation and Troubleshooting, Advanced Distillation Troubleshooting, Distillation Technology, Vacuum Distillation, Ammonia Storage & Loading Systems, Ammonia Plant Operation, Troubleshooting & Optimization, Ammonia Recovery, Ammonia Plant Safety, Hazard of Ammonia Handling, Storage & Shipping, Operational Excellence in Ammonia Plants, Fertilizer Storage Management (Ammonia & Urea), Fertilizer Manufacturing Process Technology, Sulphur Recovery, Phenol Recovery & Extraction, Wax Sweating & Blending, Petrochemical & Fertilizer Plants, Nitrogen Fertilizer Production, Petroleum Industry Process Engineering, Refining Process & Petroleum Products, Refinery Planning & Economics, Safe Refinery Operations, Hydrotreating & Hydro-processing, Separators in Oil & Gas Industry, Gas Testing & Energy Isolations, Gas Liquor Separation, Industrial Liquid Mixing, Wax Bleachers, Extractors, Fractionation, Operation & Control of Distillation, Process of Crude ATM & Vacuum Distillation Unit, Water Purification, Water Transport & Distribution, Steam & Electricity, Flame Arrestors, Coal Processing, Environmental Emission Control, R&D of Wax Blending, Wax Molding/Slabbing, Industrial Drying, Principles, Selection & Design, Certified Process Plant Operations, Control & Troubleshooting, Operator Responsibilities, Storage Tanks Operations & Measurements, Process Plant Troubleshooting & Engineering Problem Solving, Process Plant Performance, Efficiency & Optimization, Continuous Improvement & Benchmarking, Process Troubleshooting Techniques, Oil & Gas Operation/Introduction to Surface Facilities, Pressure Vessel Operation, Process Equipment Performance & Troubleshooting, Plant Startup & Shutdown, Startup & Shutdown the Plant While Handling Abnormal Conditions, Flare & Relief System, Process Gas Plant Start-up, Commissioning & Problem Solving, Process Liquid and Process Handling & Measuring Equipment. Further, he is also well-versed in **Compressors & Turbines** Operation, Maintenance & Troubleshooting, **Heat Exchanger Overhaul & Testing Techniques, Balancing of Rotating Machinery (BRM), Pipe Stress Analysis, Valves & Actuators** Technology, Inspect & Maintain **Safeguarding Vent & Relief System, Certified Inspectors for Vehicle & Equipment, Optimizing Equipment Maintenance & Replacement Decisions, Certified Maintenance Planner (CMP), Certified Planning and Scheduling Professional (AACE-PSP), Tank Design, Construction, Inspection & Maintenance, Material Cataloguing, Specifications, Handling & Storage, Steam Trap Design, Operation, Maintenance & Troubleshooting, Steam Trapping & Control, Column, Pump & Exchangers, Troubleshooting & Design, Rotating Equipment Operation & Troubleshooting, Control & ESD System, Detailed Engineering Drawings, Codes & Standards, Budget Preparation, Allocation & Cost Control, Root Cause Analysis (RCA), Production Optimization, Permit to Work (PTW), Project Engineering, Data Analysis, Process Hazard Analysis (PHA), HAZOP Study, Sampling & Analysis, Training Analysis, Job Analysis Techniques, Storage & Handling of Toxic Chemicals & Hazardous Materials, Hazardous Material Classification & Storage/Disposal, Dangerous Goods, Environmental Management System (EMS), Supply Chain, Purchasing, Procurement, Logistics Management & Transport & Warehousing & Inventory, Risk Monitoring Authorized Gas Tester (AGT), Confined Space Entry (CSE), Personal Protective Equipment (PPE), Fire & Gas, First Aid and Occupational Health & Safety.****

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer, Project Engineer, Reliability & Maintenance Engineer, Maintenance Support Engineer, Process Engineer, HSE Supervisor, Warehouse Manager, Quality Manager, Business Analyst, Senior Process Controller, Process Controller, Safety Officer, Mechanical Technician, Senior Lecturer and Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's degree in Chemical Engineering** and a **Diploma in Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer, a Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management (ILM)** and has delivered various trainings, workshops, seminars, courses and conferences internationally.

## Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

### Day 1: Sunday, 13<sup>th</sup> of October 2024

0730 – 0800	Registration & Coffee
0800 – 0815	Welcome & Introduction
0815 – 0830	<b>PRE-TEST</b>
0830 – 0930	<b>Introduction to Piping Mechanical Design</b> Piping Mechanical Design Principles • The Role of Mechanical Design in Piping Systems • Codes & Standards Relevant to Piping Mechanical Design • Mechanical Design Considerations for Various Process Conditions & Materials • Stress Analysis & Its Relationship to Mechanical Design
0930 – 0945	Break
0945 – 1100	<b>Piping Material Selection &amp; Specifications</b> Material Selection Criteria Based on Process Conditions & Fluid Properties • Piping Material Specifications & Standards (ASME B31.3, ASTM, etc.)
1100 – 1215	<b>Piping Material Selection &amp; Specifications (cont'd)</b> Corrosion Resistance & Material Compatibility Considerations • Temperature & Pressure Limitations for Different Materials
1215 – 1230	Break
1230 – 1420	<b>Piping Material Selection &amp; Specifications (cont'd)</b> Documentation & Traceability Requirements for Piping Materials
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day One

### Day 2: Monday, 14<sup>th</sup> of October 2024

0730 – 0930	<b>Piping Loads &amp; Stresses</b> Types of Loads Acting on Piping Systems (Thermal, Pressure, Deadweight, etc.) • Calculation Methods for Determining Loads & Stresses • Stress Categories & Allowable Stress Criteria (ASME B31.3)
0930 – 0945	Break
0945 – 1100	<b>Piping Loads &amp; Stresses (cont'd)</b> Thermal Expansion & Contraction Analysis • Introduction to Software Tools for Stress Analysis (e.g., Caesar II)
1100 – 1215	<b>Pipe Wall Thickness Calculation</b> Design Considerations for Determining Pipe Wall Thickness • Pressure Design Thickness Calculation Methods (ASME B31.3) • Accounting for Corrosion Allowances & Mill Tolerance
1215 – 1230	Break
1230 – 1420	<b>Pipe Wall Thickness Calculation (cont'd)</b> External Pressure Design Calculations • Verification of Pipe Wall Thickness Using Applicable Codes & Standards
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Two



**Day 3: Tuesday, 15<sup>th</sup> of October 2024**

0730 – 0930	<b>Piping Supports &amp; Restraints</b> Introduction to Piping Support Design Principles • Types of Supports & Restraints in Piping Systems • Load Distribution & Selection of Support Types
0930 – 0945	Break
0945 – 1100	<b>Piping Supports &amp; Restraints (cont'd)</b> Design Considerations for Spring Hangers, Snubbers & Restraints • Analysis of Piping Systems with Variable Loads & Movements
1100 – 1215	<b>Pipe Stress Analysis &amp; Flexibility</b> Pipe Stress Analysis Principles • Load Case Development & Analysis Procedures • Flexibility Analysis for Accommodating Thermal Expansion & Contraction
1215 – 1230	Break
1230 – 1420	<b>Pipe Stress Analysis &amp; Flexibility (cont'd)</b> Evaluating Pipe Displacements, Nozzle Loads & Equipment Interactions • Case Studies & Practical Exercises Using Stress Analysis Software
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Three

**Day 4: Wednesday, 16<sup>th</sup> of October 2024**

0730 – 0930	<b>Piping Vibration Analysis &amp; Mitigation</b> Piping Vibration & Its Impact on Mechanical Design • Types of Vibration & their Causes (Flow-Induced, Mechanical, etc.) • Vibration Analysis Techniques & Criteria
0930 – 0945	Break
0945 – 1100	<b>Piping Vibration Analysis &amp; Mitigation (cont'd)</b> Mitigation Measures for Addressing Excessive Vibration • Design Considerations for Supporting & Isolating Vibrating Equipment
1100 – 1215	<b>Piping Component Design &amp; Selection</b> Design Considerations for Pipe Fittings, Valves & Flanges • ASME B16.5 & ASME B16.9 Standards for Flange & Fitting Design • Material Selection & Specifications for Components
1215 – 1230	Break
1230 – 1420	<b>Piping Component Design &amp; Selection (cont'd)</b> Gasket Selection & Flange Face Design Considerations • Valve Selection Criteria Based on Process Requirements
1420 – 1430	<b>Recap</b>
1430	Lunch & End of Day Four

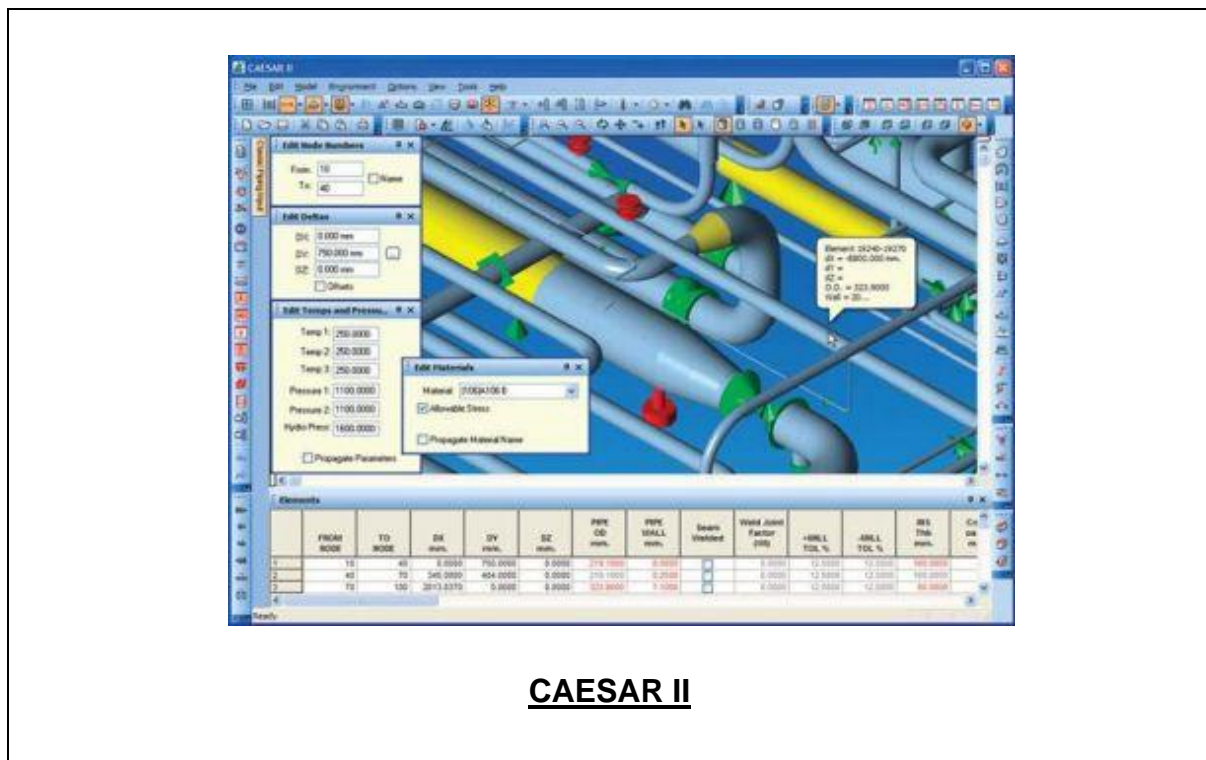
**Day 5: Thursday, 17<sup>th</sup> of October 2024**

0730 – 0830	<b>Expansion Joints &amp; Flexible Elements</b> Introduction to Expansion Joints & Their Function in Piping Systems • Types of Expansion Joints (Bellows, Gimbal, Universal, etc.) • Selection Criteria & Design Considerations for Expansion Joints
0930 – 0945	Break
0945 – 1100	<b>Expansion Joints &amp; Flexible Elements (cont'd)</b> Flexible Hoses & Connectors in Piping Systems • Installation, Maintenance & Inspection of Expansion Joints

1100 – 1215	<b>Piping Specification Development &amp; Documentation</b> Creating Piping Specifications Based on Project Requirements • Documenting Mechanical Design Considerations in Specifications • Piping Material Takeoff & Bill of Materials Development
1215 – 1230	Break
1230 - 1345	<b>Piping Specification Development &amp; Documentation (cont'd)</b> Coordinating with Other Engineering Disciplines (Civil, Electrical, etc.) • Reviewing & Finalizing Piping Mechanical Design Deliverables
1345 – 1400	<b>Course Conclusion</b>
1400 – 1415	<b>POST-TEST</b>
1415 – 1430	Presentation of Course Certificates
1430	Lunch & End of Course

**Simulator (Hands-on Practical Sessions)**

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using the “CAESAR II” simulator.



**Course Coordinator**

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