COURSE OVERVIEW FE0040
ASME B31 Piping & Pipeline Design, Construction, Inspection, Pigging, Maintenance, Repair & Integrity Assessment (ASME B31, API 570 & API 579 Standards)

Course Title
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Course Date/Venue
May 11-15, 2025/Al Khobar Meeting Room, Hilton Garden Inn, Al Khobar, KSA

Course Reference
FE0040

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

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

This course provides a comprehensive coverage of the ASME B31 Code requirements. It has been completely revised, reorganized and updated, and includes descriptions of important new requirements of ASME B31, including the philosophy behind the changes. Further, the course has been enriched with the latest requirements of the API 570 and API 579.

General topics in the course include: Code organization and intent, pressure design, design for sustained loads including support design, flexibility analysis, equipment loads, expansion joints, supports and restraints, materials, fabrication, examination, testing, pigging, and, for existing piping & pipeline systems: risk-based inspection, pigging, maintenance, repair, rehabilitation, fitness-for-service and mechanical integrity.

Applications of these concepts, including simple hand analysis methods and computer-based analysis methods, will be demonstrated. Examples of the required analysis and sources of further information will be provided.

The course covers design, fabrication, examination and testing requirements of ASME B31. It covers Code requirements from design through start-up of new piping & pipeline systems, as well as standards for inspection, integrity and repair of piping & pipeline systems that have been in service, as provided in API 570 and API 579. The course covers the practical aspects of piping and pipeline integrity, maintenance and repair. Participants will be introduced to the technical basis of the ASME and API integrity rules, and their application to case studies and exercises. The participants will be able to recognize causes of degradation in-service, whether mechanically induced (pressure, vibration, fatigue, pressure transients, external damage) or due to corrosion (wall thinning, pitting, cracking), and apply integrity analysis techniques to make run-or-repair decisions.

The course provides a working knowledge of the Code, how it is organized, its intent, the basis for requirements, including both design and construction (fabrication, erection and testing) aspects. It provides a foundation of knowledge necessary for those responsible for assuring the mechanical integrity of existing systems, as well as those responsible for designing and constructing new systems. The participants will become knowledgeable in the technical basis and application of ASME B31.3, B31.4 and B31.8 piping codes, ASME B31G, API 570 and API 579 Fitness-for-Service and Flaw Evaluation.

Course Objectives

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

- Apply an in-depth knowledge and skills in piping and pipeline design, construction, operation, inspection, pigging, maintenance, repair, integrity and rehabilitation in accordance with the latest ASME and API codes
- Design, analyze, fabricate and install new piping and pipeline systems according to the latest revision of ASME B31 Code and have a working knowledge of the Code, how it is organized, its intent, the basis for requirements and the philosophy behind the new changes
- Inspect, maintain, repair and assess the integrity of existing (in-service) piping and pipeline systems according to API 570 and API 579 Codes and recognize the causes of degradation, whether mechanically induced (pressure, vibration, fatigue, pressure transients, external damage) or due to corrosion (wall thinning, pitting, cracking)
- Implement the physical phenomena which affect the design of piping and pipeline systems including the ASME formulas and other methods by which these phenomena can be analyzed to determine resulting stresses, evaluation of those stresses relative to ASME code limitations, and the methods by which piping and pipeline systems are fabricated, inspected and tested
- Identify the technical basis of the ASME and API integrity rules and apply integrity analysis techniques to make run-or-repair decisions
- Make the right decisions for the development of new piping/pipeline pigging systems, the operation of existing systems and the selection of cleaning pigs and ILI tools

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 practical aspects and considerations of piping & pipeline systems for those who are involved in the design, analysis, fabrication, installation, inspection, repair, pigging, rehabilitation, integrity assessment, maintenance or ownership of piping & pipeline systems. Engineers, Draftsmen, maintenance, inspection, quality assurance, and manufacturing personnel who work in the chemical, petrochemical, petroleum, utility, plastic processing, pulp and paper, and manufacturing fields will find it a time-saving means to broaden and update their knowledge of piping & pipeline systems. Those who must comply with Code requirements will benefit from the practical approach presented in this course in obtaining satisfactory and economical piping & pipeline systems.

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$ 5,500 per Delegate + **VAT**. 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: -

- 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.

- 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. Den Bazley, PE, BSc, is a **Senior Piping & Pipeline Engineer** with over **40 years** of industrial experience within **Oil**, **Gas**, **Petrochemical** and **Power** industries. His specialization widely covers **ASME B31 Piping & Pipeline** Design & Inspection, **Process Piping** Design & Maintenance, **Pipeline & Piping** Operation & Testing, **Pipeline** Equipment Operation Standard & Procedures, **Pipeline** Operation & Maintenance, Fitness-for-Service (**FFS**), **Pigging**, **Mechanical Integrity & Reliability**, **Integrity** Assessment, Integrity & Rehabilitation (**ASME B31 & API 579** Standards), **Process Plant Equipment** Maintenance & Repair, **Piping** Systems - Mechanical Design & Specification, **Pressure Vessels**, **Piping & Storage** Facilities, **Pipe** Work Design & Fabrication, Layout of **Piping Systems** & Process Equipment, **Welding** Technology, **Welding** Fabrication & Inspection and **ASME Sec IX: Welding & Brazing**. Further, he is also well-versed in **Pump** Installation & Troubleshooting, **Valve** Maintenance & Troubleshooting, **Bearing & Lubrication** Troubleshooting & Failure Analysis, **Compressor & Turbine** Maintenance & Troubleshooting, **Dry Gas Seal** Installation & Commissioning, **Heat Exchanger** Inspection & Maintenance, **Tank & Tank Farms** Maintenance & Troubleshooting, **ASME VIII Code: Pressure Vessel** Fabrication & Testing, **ASME Section 1: Power Boilers**, **Maintenance & Reliability** Management, Reliability Centred Maintenance (**RCM**), Total Plant Maintenance (**TPM**), Reliability-Availability-Maintainability (**RAM**), **Process Plant** Shutdown & Turnaround, **Rotating Equipment** Reliability Optimization, **Maintenance** Planning, Scheduling & Work Control, **Preventive & Predictive Maintenance** & Machinery Failure Analysis (**RCFA**), Equipment's Reliability & Optimization, **Housing & Facilities** Maintenance Management, **Machinery** Failure Analysis & Troubleshooting, **Maintenance Auditing & Benchmarking**, **Material** Cataloguing & Handling, Laser & Dial **Mechanical Alignment**, **Engineering Drawings**, **Codes & Standards** and **P&ID** Reading.

During his career life, Mr. Bazley has gained his practical and field experience through his various significant positions and dedication as the **Engineering Manager**, **Maintenance Manager**, **Construction Manager**, **Project Engineer**, **Mechanical Engineer**, **Pipeline Engineer**, **Mechanical Services Superintendent**, **Pipeline Construction Supervisor**, **Quality Coordinator** and **Planning Manager** for numerous international companies like ESSO, **FFS Refinery**, Dorbyl Heavy Engineering (VECOR), Vandenbergh Foods (Unilever), **Engen Petroleum**, Royle Trust **and Pepsi-Cola.**

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Mr. Bazley is a **Registered Professional Engineer** and has a **Bachelor's** degree in **Mechanical Engineering**. Further, he is a **Certified Engineer** (Government Certificate of Competency GCC Mechanical Pretoria), a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership and Management** (**ILM**), an active member of the **Institute of Mechanical Engineers** (**IMechE**) and has delivered numerous trainings, courses, seminars and workshops 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, 11th of May 2025

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0945	***Introduction*** *History of Piping & Pipeline Technology • Overview of Codes and Standards • Difference Between Design Codes and Integrity Codes • ASME B31 Piping & Pipeline Codes • ASME B&PV Pressure Vessel Codes • API Tank Standards • API Pipeline Inspection Standards • ASME B16 Fitting Standards • NACE, MSS-SP, PFI Standards • Company Policies and Regulations*
0945 – 1000	*Break*
1000 – 1115	***Materials*** *Overview of Ferrous Pipe and Pipeline Materials • Carbon and Alloy Steels • Chemistry & Positive Material Identification • Introduction to Metallurgy of Base Metal & Welds • Heat Treatment: When and Why • Fabrication of Line Pipe & Forged Fittings • Mechanical Properties: Strength and Toughness • Ductile and Brittle Fracture • API 5L and ASTM Material Specifications • Marking Pipe and Fittings*
1115 – 1215	***Metallic Pipe and Fitting Selection*** *Piping System Failure, Bases for Selection, Listed versus Unlisted Piping Components, Fluid Service Requirements, Pipe, Joining Method, Fittings, Branch Connections, Flanges, Gaskets, Bolting*
1215 – 1230	*Break*
1230 – 1400	***Design Pressure & Failure Margins*** *How to Establish the System Design Pressure • Introduction to Pressure Relief Valves • Pipe and Pipeline Sizing Formula with Applications • Factors Affecting Flow and Throughput • Flange and Fitting Class: Origins and Application • Branch Reinforcement, Stopple and Hot Taps*
1400 – 1420	***Valve Selection*** *Code Requirements, Selection by Valve Type*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advice Them of the Topics to be Discussed tomorrow*
1430	*Lunch & End of Day One*

Day 2: Monday, 12th of May 2025

0730 – 0830	***Flanged Joint Design & Bolt-Up*** *Design, Bolt-Up*
0830 – 0930	***Layout, Support & Reactions*** *General Considerations • Sustained loads • Displacement Loads • Support Spacing • Support Locations • Support Elements • Fixing Problems • Reaction Design Criteria • Fabricated Equipment • Rotating Equipment • Supports • Flanged Joints • Cold Spring*
0930 – 0945	*Break*

0945 – 1215	***Flexibility & Flexibility Analysis (cont'd)*** *General Considerations • Friction • Stress Intensification • Elbow Flexibility • Thermal Expansion • Spring Hangers • The Displacement Load Analysis • Elastic Follow-up Fixing Problems • Cautions • When to Perform a Detailed Analysis • Computer Program Attributes • Considerations • Typical Errors • Sample Computer Flexibility Analysis • Flexibility Analysis Example*
1215 – 1230	*Break*
1230 – 1330	***Designing with Expansion Joints*** *Types of Expansion Joints, Pressure Thrust, Installation of Expansion Joints, Metal Bellows Expansion Joints, Other Considerations*
1330 – 1420	***Fabrication and Installation*** *Welder/Brazer Qualification, Welding Processes, Weld Preparation, Typical Welds, Preheating and Heat Treatment, Bending and Forming, Typical Owner Added Requirements, Installation*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advice Them of the Topics to be Discussed tomorrow*
1430	*Lunch & End of Day Two*

Day 3: ***Tuesday, 13th of May 2025***

0730 – 0900	***Risk-Based Inspection & Integrity Management*** *Failure Modes: Leak, Break and Fracture • A Practical Approach to Assessing Damage Mechanisms • Predicting Remaining Life of Piping and Pipelines • Making Run-or-Repair Decisions • Analysis of Inspection Results: Integrity Management • Company Policies and Regulations*
0900 – 0915	*Break*
0915 – 1030	***Corrosion & Integrity: Wall Thinning*** *How to Evaluate Wall Thinning • Application of ASME B31G to Determine Remaining Life • Application of API 579 to General and Local Corrosion • Application of API 579 to Analyze Pitting*
1030 – 1215	***Corrosion & Integrity: Cracking*** *Environmental Effects • Fatigue Cracking • Hydrogen and H2S Effects • Introduction to Fracture Mechanics • How to Evaluate Cracks in Piping and Pipelines • Prediction of Failure Mode: Leak, Break or Fracture*
1215 – 1230	*Break*
1230 – 1330	***Third Party Damage*** *Analysis of Dents and Gouges in Pipelines • Analysis of Distortion and Permanent Deformation*
1330 – 1420	***Fundamentals of Flow in Pipes & Pipelines*** *Basic Design and In-Service Modifications • Flow Rate and Throughput*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advice Them of the Topics to be Discussed tomorrow*
1430	*Lunch & End of Day Three*

Day 4: Wednesday, 14th of May 2025

0730 – 0830	***Pressure Transients*** *The Four Classes of Pressure Transients • Recognizing and Solving Liquid Hammer • Pump Station Transients • Study of Pipeline Failures Due to Transients • Two-Phase Liquid-Vapor Transients • Two-Phase Liquid-Gas Transients • Gas Line Pulsing and Transients*
0830 – 0930	***Vibration In Service*** *How to Classify the Cause of Vibration In-Service • Mechanical and Hydraulic Induced Vibration in Piping • How to Measure Vibration • How to Analyze Vibration and Decide if it is Acceptable • Options for Resolving Vibration*
0930 – 0945	*Break*
0945 – 1045	***Temperature Effects*** *Layout, Expansion and Contraction: Rules of Good Practice • Analysis for Flexibility and Failure Margins • Fatigue Evaluation and Remaining Life Prediction • Local Thermal Shocks*
1045 – 1215	***Pressure And Leak Testing*** *The Difference Between Leak Testing and Pressure Testing • Review of Different Testing Techniques • The Purpose of Hydrotest • How to Conduct a Hydrotest • Pipeline and Piping Systems Testing • Pneumatic Testing • Sensitive Leak Testing Methods • Pressure and Leak Testing of Repairs*
1215 – 1230	*Break*
1230 – 1420	***API 570: Inspection, Repair, Alteration & Rerating*** *Inspection Techniques • Liquid Penetrant Testing: Advantages and Limitations • Magnetic Particle Testing: Advantages and Limitations • Radiographic Testing: Advantages and Limitations • Ultrasonic Testing: Advantages and Limitations • Eddy Current, Acoustic Emission, Thermography • Pulsed Eddy Current Inspections Through Insulation • Digital Radiography Through Insulation*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advice Them of the Topics to be Discussed tomorrow*
1430	*Lunch & End of Day Four*

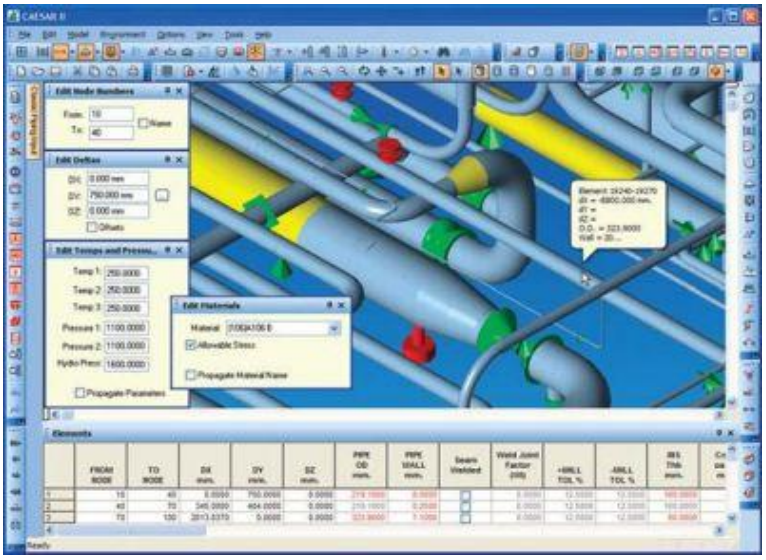
Day 5: Thursday, 15th of May 2025

0730 – 0830	***Pigging Technology*** *Type of Pigs • Intelligent Pig Applications • Overview of 49CFR Regulations for In-Line Inspections*
0830 – 0930	***Pigging Technology (cont'd)*** *ASME B31.8S Integrity of Unpiggable Lines • Surface Assessment Techniques*
0930 – 0945	*Break*
0945 – 1200	***Maintenance & Inspection Strategies*** *Key Questions: What, Where and How to Inspect • A Guide for Pipe and Vessel Inspections • Workmanship Standards (ASME B31) • Integrity Standards (B31G, API 1104, API 579) • Application of Inspections and Analysis of Results • Corrective and Predictive Maintenance • Reliability Engineering: Maintenance Analysis and Trending*
1200 – 1215	*Break*

1215 – 1300	***Repair & Rehabilitation Techniques*** *The New ASME Post-Construction Code: Repair Standards • The Fundamentals of Repair Packages • Welding on Line (In-Service) • Pipe and Component Replacement • Grinding and Welding • Welded Sleeve: Type A and Type B • Flush Patch Repair*
1300 – 1345	***Repair and Rehabilitation Techniques (cont'd)*** *Fillet Welded Patch • Weld Overlay Repair • Mechanical Clamp with Sealant Injection • Mechanical Clamp without Sealant Injection • Insertion Liners • Painted and Brushed Liners • Pipe Coating Repairs*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course Topics that were Covered During the Course*
1400 – 1415	***POST-TEST***
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.



CAESAR II

Course Coordinator

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