COURSE OVERVIEW ME1235
Design and Fabrication of Storage Tanks in Accordance with API 650

Course Title
Design and Fabrication of Storage Tanks in Accordance with API 650



Course Date/Venue
Session 1: March 14-18, 2027/TBA Meeting Room, Royal Tulip Hotel, Muscat, Oman
Session 2: May 09-13, 2027/TBA Meeting Room, Royal Tulip Hotel, Muscat, Oman

Course Reference
ME1235

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 is designed to provide participants with a detailed and up-to-date overview on the Design and Fabrication of Storage Tanks in Accordance with API 650 Standard. It covers the aboveground storage tanks, tank components and construction materials; the design data, basic engineering requirements and design loads; the tank classification and selection and shell design requirements; the bottom plate design, roof design, desig n of nozzles and openings and wind girder and structural reinforcement design; and the foundations and settlement considerations and fabrication planning.

During this interactive course, participants will learn the welding requirements under API 650 and assembly and erection procedures; the inspection during fabrication, non-destructive examination (NDE), quality assurance and quality control; the hydrostatic testing, dimensional verification, coating and corrosion protection; the commissioning procedures, safety during fabrication and construction; the environmental and operational considerations, advanced API 650 design features and inspection and maintenance according to API 653; and the common design and fabrication defects including emerging technologies and best practices.

Course Objectives/Outcomes & Benefits for the Participants

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

- Apply and gain a comprehensive knowledge on design and fabrication of storage tanks in accordance with API 650 standard
- Discuss aboveground storage tanks, API standards and codes including tank components and construction materials
- Identify design data and basic engineering requirements and design loads according to API 650
- Apply tank classification and selection and recognize shell design requirements
- Illustrate bottom plate design, roof design, design of nozzles and openings and wind girder and structural reinforcement design
- Discuss foundations and settlement considerations and apply fabrication planning
- Identify welding requirements under API 650 and apply assembly and erection procedures
- Employ inspection during fabrication, non-destructive examination (NDE), quality assurance and quality control
- Carryout hydrostatic testing, dimensional verification and coating and corrosion protection
- Apply commissioning procedures, safety during fabrication and construction as well as environmental and operational considerations
- Identify advanced API 650 design features and apply inspection and maintenance according to API 653
- Identify common design and fabrication defects including emerging technologies and best practices

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 design and fabrication of storage tanks in accordance with API 650 standard for storage tank design engineers, mechanical engineers, static equipment engineers, tank engineering managers, project engineering managers, EPC project engineers, design verification engineers, structural engineers, civil/foundation engineers, inspection engineers, API 650/API 653 inspectors, QA/QC engineers, welding engineers, fabrication engineers, construction engineers, site engineers and other technical staff.

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
Haward's certificates are accredited by the following international accreditation organizations:

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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.

- 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.

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.

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. Karl Thanasis, PEng, MSc, MBA, BSc, is **Senior Mechanical & Maintenance Engineer** with over **30 years** of extensive industrial experience. His wide expertise includes **Aboveground Storage Tanks, Tank** Inspection, Repair, Alteration & Reconstruction, **Heat Exchangers**, Heat Transfer, Coolers, **Power Plant** Performance, Efficiency & Optimization, **Storage Tank** Design & Fabrication, **Thermal Power Plant** Management, **Boiler & Steam** System Management, **Pump** Operation & Maintenance, **Chiller & Chiller Plant** Design & Installation, **Pressure Vessel**, **Safety Relief Valve** Sizing & Selection, **Valve** Disassembling & Repair, Pressure Relief Devices (**PSV**), **Hydraulic & Pneumatic** Maintenance, Advanced **Valve** Technology, **Pressure Vessel** Design & Fabrication, **Pumps**, Turbo-Generator, Turbine **Shaft Alignment**, **Lubrication**, Mechanical **Seals**, Packing, **Blowers**, **Bearing** Installation, **Couplings**, **Clutches** and **Gears, Piping & Pipeline**, Maintenance, Repair, **Shutdown**, **Turnaround & Outages**, **Maintenance & Reliability** Management, **Mechanical Maintenance** Planning, Scheduling & Work Control, Advanced Techniques in **Maintenance** Management, **Predictive & Preventive** Maintenance, **Maintenance & Operation Cost Reduction** Techniques, Reliability Centered Maintenance (**RCM**), **Machinery Failure** Analysis, **Rotating Equipment Reliability** Optimization & Continuous Improvement, **Material Cataloguing**, **Mechanical & Rotating Equipment** Troubleshooting & Maintenance, **Root Cause Analysis & Reliability** Improvement, **Condition** Monitoring, **Root Cause Failure Analysis** (RCFA), **Steam Generation**, **Steam Turbines**, **Power Generator Plants**, **Gas Turbines**, **Combined Cycle Plants**, **Boilers**, **Process Fired Heaters**, Air Preheaters, Induced Draft Fans, All Heaters Piping Work, Refractory Casting, Heater Fabrication, Thermal & Fired Heater Design. Further, he is also versed in **Wastewater Treatment** Technology, **Networking** System, **Piping** System, Water Movement, Water Filtering, Mud Pumping, **Sludge Treatment** and **Drying**, **Aerobic Process** of **Water Treatment** that includes **Aeration**, **Sedimentation** and **Chlorination Tanks**. His strong background also includes **Design** and **Sizing** of all **Waste Water Treatment Plant Associated Equipment** such as **Sludge Pumps**, **Filters**, **Metering Pumps**, **Aerators** and **Sludge Decanters**.

Mr. Thanasis has acquired his thorough and practical experience as the **Project Manager**, **Plant Manager**, **Area Manager - Equipment Construction**, **Construction Superintendent**, **Project Engineer** and **Design Engineer**. His duties covered **Plant Preliminary Design**, **Plant Operation**, **Write-up** of **Capital Proposal**, **Investment Approval**, **Bid Evaluation**, **Technical Contract Write-up**, **Construction** and **Sub-contractor Follow up**, **Lab Analysis**, **Sludge Drying** and **Management** of **Sludge Odor** and **Removal**. He has worked in various companies worldwide in the **USA**, **Germany**, **England** and **Greece**.

Mr. Thanasis is a **Registered Professional Engineer** in the **USA** and **Greece** and has a **Master's** and **Bachelor's** degree in **Mechanical Engineering** with **Honours** from the **Purdue University** and **SIU** in **USA** respectively as well as an **MBA** from the **University of Phoenix** in **USA**. Further, he is a **Certified Internal Verifier/Trainer/Assessor** by the **Institute of Leadership & Management** (**ILM**) a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, seminars, workshops and conferences worldwide

Training Methodology

Our courses employ an interactive, learner-centred methodology that integrates theoretical knowledge with practical application. The training is delivered through a suitable combination of some or all of the following methods, selected according to the course content and learning objectives:

- Instructor-led presentations and facilitated discussions
- Practical workshops and participant presentations
- Hands-on exercises and real-world case studies
- Equipment demonstrations and technical drawings
- Hardware- and software-based simulations
- Gamification & Role Play in soft-skills courses only
- Virtual Reality (VR) and Augmented Reality (AR)
- Instructional videos and other relevant training resources

This blended approach encourages active participation, strengthens practical skills and supports the effective application of acquired knowledge in the workplace.

Learning Design & Customization

This course can be customized to the exact requirements of clients. Haward Technology is so proud of our huge capabilities in tailoring our courses to the training needs of our valued clients.

Accommodation

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

Course Program

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

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Aboveground Storage Tanks*** *Types and Applications of Storage Tanks • Fixed Roof, Floating Roof, and Specialty Tank Configurations • API 650 Scope, Limitations, and Applicability • Relationship Between API 650 and Other International Standards*
0930 – 0945	*Break*
0945 – 1030	***Overview of API Standards & Codes*** *API 650 Structure and Design Philosophy • Comparison with API 620, API 653, and API 2000 • Applicable ASME, ASTM, and AWWA Standards • Regulatory and Environmental Compliance Requirements*
1030 – 1130	***Tank Components & Construction Materials*** *Shell, Bottom, Roof, and Structural Components • Material Selection in Accordance with ASTM Specifications • Mechanical Properties of Carbon Steel and Low-Alloy Steels • Corrosion Resistance and Material Limitations*
1130 – 1215	***Design Data & Basic Engineering Requirements*** *Design Pressure and Design Temperature • Product Characteristics and Specific Gravity • Corrosion Allowance and Service Conditions • Site Environmental and Operational Considerations*
1215 – 1230	*Break*

1230 – 1330	***Design Loads According to API 650*** *Hydrostatic Loading • Wind Loading Requirements • Seismic Loading Principles • External Loads and Roof Loads*
1330 – 1420	***Tank Classification & Selection*** *Atmospheric Versus Low-Pressure Storage Tanks • Selection Criteria Based on Stored Products • Capacity Determination and Dimensional Considerations • Design Documentation and Engineering Workflow*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2

0730 – 0830	***Shell Design Requirements*** *One-Foot Method • Variable Design Point Method • Shell Thickness Calculations • Shell Course Arrangement and Optimization*
0830 – 0930	***Bottom Plate Design*** *Bottom Plate Layout • Annular Plate Requirements • Lap Joints and Butt Joints • Settlement Considerations*
0930 – 0945	*Break*
0945 – 1100	***Roof Design*** *Cone Roof Design • Dome Roof Design • Internal and External Floating Roofs • Roof Framing and Supporting Structures*
1100 – 1215	***Design of Nozzles & Openings*** *Nozzle Reinforcement Calculations • Manways and Inspection Openings • Pipe Connections and Flanges • Nozzle Orientation and Spacing*
1215 – 1230	*Break*
1230 – 1330	***Wind Girder & Structural Reinforcement Design*** *Top Wind Girder Requirements • Intermediate Wind Girders • Compression Ring Design • Structural Stiffening Methods*
1330 – 1420	***Foundations & Settlement Considerations*** *Ringwall Foundations • Concrete Slab Foundations • Soil Investigation Requirements • Settlement Monitoring and Allowable Limits*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3

0730 – 0830	***Fabrication Planning*** *Fabrication Drawings and Material Control • Plate Cutting and Edge Preparation • Rolling and Forming Shell Plates • Fabrication Tolerances*
0830 – 0930	***Welding Requirements Under API 650*** *Qualified Welding Procedures (WPS) • Welder Qualification Requirements • Welding Sequence and Distortion Control • Welding Consumables Selection*
0930 – 0945	*Break*
0945 – 1100	***Assembly & Erection Procedures*** *Bottom Plate Installation • Shell Erection Methods • Roof Assembly Procedures • Temporary Supports and Lifting Methods*

1100 – 1215	***Inspection During Fabrication*** *Dimensional Inspections • Weld Visual Inspection • Alignment and Verticality Verification • Surface Preparation Inspections*
1215 – 1230	*Break*
1230 – 1330	***Non-Destructive Examination (NDE)*** *Radiographic Testing (RT) • Ultrasonic Testing (UT) • Magnetic Particle Testing (MT) • Liquid Penetrant Testing (PT)*
1330 – 1420	***Quality Assurance & Quality Control*** *Inspection and Test Plans (ITPs) • Material Traceability • Documentation and Records Management • Final Fabrication Acceptance Criteria*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4

0730 – 0830	***Hydrostatic Testing*** *Hydrotest Planning • Filling Procedures • Monitoring During Testing • Acceptance Criteria*
0830 – 0930	***Dimensional Verification*** *Tank Roundness Measurement • Verticality and Plumbness Checks • Settlement Measurements • Roof Geometry Verification*
0930 – 0945	*Break*
0945 – 1100	***Coating & Corrosion Protection*** *Surface Preparation Standards • Internal Lining Systems • External Coating Systems • Cathodic Protection Fundamentals*
1100 – 1215	***Commissioning Procedures*** *Pre-Startup Inspection • Mechanical Completion Verification • Operational Readiness Review • Documentation Turnover*
1215 – 1230	*Break*
1230 – 1330	***Safety During Fabrication & Construction*** *Working at Height Safety • Hot Work Controls • Confined Space Entry • Lifting and Rigging Safety*
1330 – 1420	***Environmental & Operational Considerations*** *Emission Control Requirements • Spill Prevention Measures • Drainage Systems • Environmental Compliance During Construction*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

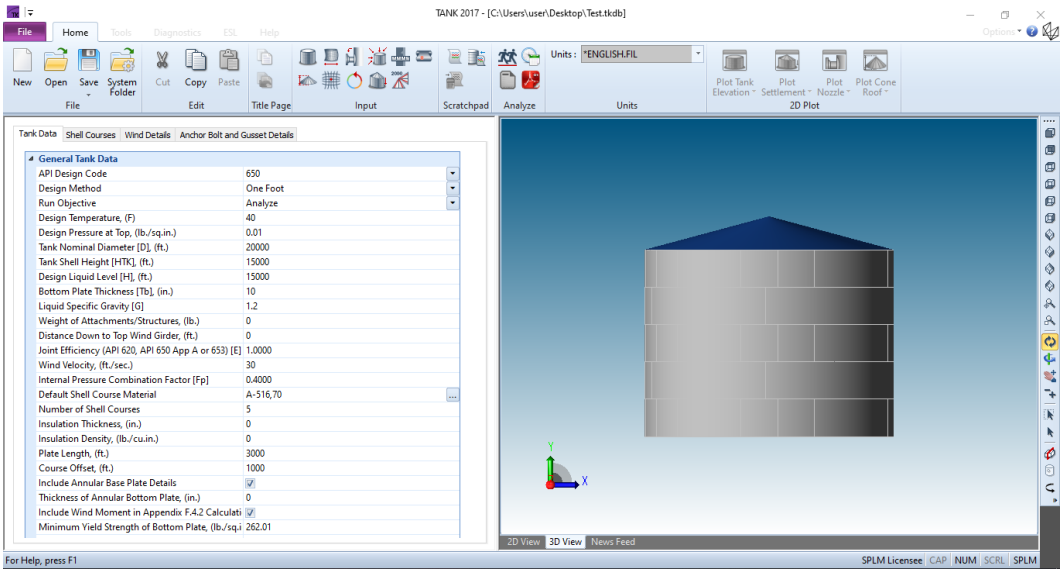
Day 5

0730 – 0830	***Advanced API 650 Design Features*** *Double-Bottom Tanks • Internal Floating Roof Systems • Refrigerated and Specialty Storage Applications • Design Modifications for Special Services*
0830 – 0930	***Inspection & Maintenance According to API 653*** *In-Service Inspection Philosophy • Remaining Life Assessment • Fitness-for-Service Concepts • Repair and Alteration Requirements*

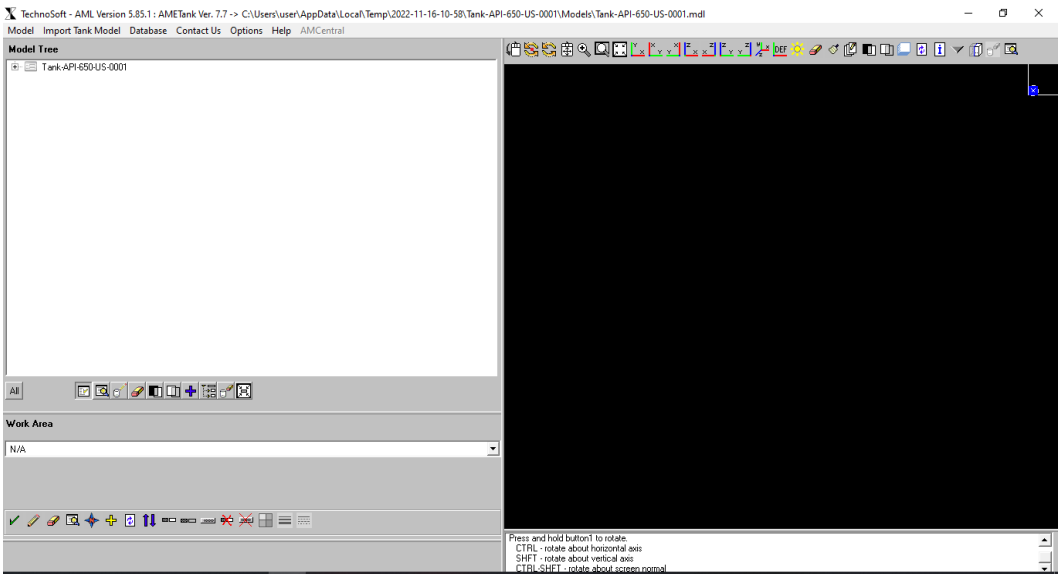
0930 – 0945	*Break*
0945 – 1100	***Common Design & Fabrication Defects*** *Weld Defects and Corrective Actions • Shell Distortion and Buckling • Settlement-Related Failures • Roof Deformation Issues*
1100 – 1215	***Design Calculations Workshop*** *Shell Thickness Calculation Exercises • Roof Design Examples • Nozzle Reinforcement Calculations • Wind and Seismic Design Examples*
1215 – 1230	*Break*
1230 – 1315	***Case Studies & Lessons Learned*** *Analysis of Storage Tank Failures • Construction Quality Issues • Successful Project Implementation Examples • Root Cause Analysis of Design Deficiencies*
1315 – 1345	***Emerging Technologies & Best Practices*** *Digital Engineering and 3D Tank Modeling • Automated Welding Technologies • Drone-Assisted Tank Inspections • Future Developments in API Storage Tank Design and Fabrication*
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)

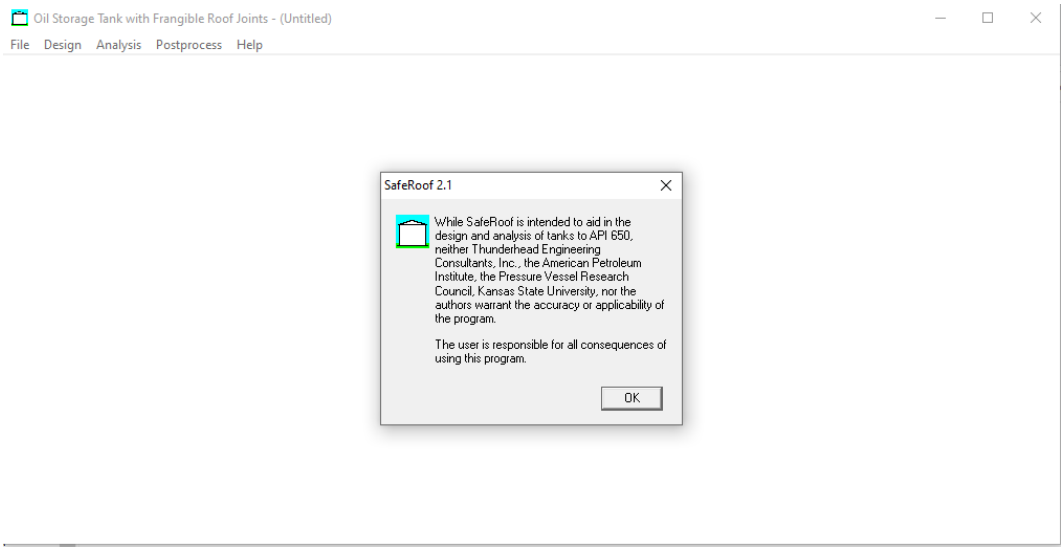
Practical sessions will be organized during the workshop for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulators Hexagon PPM COADE TANK 2017 SP1 v9.00.01 (Integraph Tank)", "AME Tank v7.7" and "SafeRoof v2.1" Simulator.



Hexagon PPM COADE TANK 2017 SP1 v9.00.01 (Integraph Tank)



AME Tank v7.7



SafeRoof v2.1

Course Coordinator

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