COURSE OVERVIEW ME0150
Advanced Heating, Ventilation & Air-Conditioning Systems (HVAC)
Design, Installation & Maintenance

Course Title
Advanced Heating, Ventilation & Air-Conditioning Systems (HVAC): Design, Installation & Maintenance

Course Reference
ME0150

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

Course Date/Venue

Session(s)	Date	Venue
1	April 27-May 01, 2025	Oryx Meeting Room, Double Tree by Hilton Al Saad, Doha, Qatar
2	July 28-Auguest 01, 2025	Ajman Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
3	October 26-30, 2025	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
4	November 30-December 04, 2025	Al Khobar Meeting Room, Hilton Garden Inn, Al Khobar, KSA

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt in the class will be applied the following practical methods:

(**1**) **Industrial Facility Visit:** Course participants will be taken to an industrial facility where they will practice testing, maintenance and troubleshooting. In case that this course is organized inside client premises (In-House), then client shall provide access to its HVAC and refrigeration workshop for practical sessions.

(**2**) **HVAC Simulator:** Participants will use in the class the state-of-the-art HVAC Simulator to practice some of the skills learnt.

This course is designed to assist experienced practitioners review and become more familiar with the particular system parts required for the design, installation, and maintenance of heating, ventilation and air-conditioning systems for all types of institutional, commercial, and industrial building envelopes. As the participant progresses through this five-day course, it will also serve as a refresher providing information about HVAC safety requirements, improved healthy indoor air quality, and emission reduction strategies.

During the course, there will be opportunities to practice using the ASHRAE Pocket Guide for Air Conditioning, Heating, Ventilation & Refrigeration. This easily carried reference provides fast, authoritative HVAC&R information on site. It is packed with practical and useful information that; includes properties performance and pipe sizing for new refrigerants, new data on refrigeration safety, ventilation requirements for residential and non-residential occupancies, occupant thermal comfort, more extensive data on sound and vibration control, thermal storage, radiant panel heating and cooling, air-to-air recovery and more. The participants also will receive a summary review of how to source HVAC related, building envelope, electrical, fire protection, ozone depletion protection, back-flow, and cross-connection controls codes and standards.

Slide shows of installed operational energy management systems computer controls and instrumentation will enable a broader understanding of future real time data logger systems. The participant will learn about HVAC utilization of advanced metering infrastructures, automated water meter readings for leak detection of district chilled water loops, and end user consumption. Demand response electricity systems using smart meters controlling; air conditioning, thermal storage systems, lighting, variable speed motors for fans, and pumps. These applications plus studying the re-use of waste-water produced by HVAC systems supplying grey-water, are tools HVAC professionals may add to their portfolio of utilities cost reduction for building operations. Similar to energy management systems demand responsiveness is easier, less expensive, and simpler when the control protocol is incorporated into the original design. Practice work sheets will be made available to prove these systems are capable of tracking emissions reductions, and providing an additional revenue stream for building owners by lowering energy consumption.

In class exercises for selecting correct equipment, loop checking sequence of operations and locating control points for HVAC systems will provide familiarization of the products available on the market today. A particular emphasis will be on understanding the advantages and disadvantages of commonly available types of electric, pneumatic, self-powered; sensors, actuators, valves, dampers, direct drives, analog and digital controls. We will also review the different types of compressors, coils, exchangers, filters, condensers, dryers, chillers, expansion tanks, cooling towers, split-systems, forced air, boilers, associated piping, duct work, insulation, and common trade practices used in HVAC applications today.

An introduction to predictive, preventative, troubleshooting, and emergency repair maintenance tips will be taught along with a re-cap of balancing air, and water systems. How to source information to maintain glycol densities, chemical treatment biocides and corrosion inhibitors, air handler unit ultraviolet lights for continuous coil cleaning, and disinfection, should help ensure the buildings investors realize improved life cycle costs, minimal downtime for equipment servicing, and public health protection, Worker safety will be reviewed to ensure clear communications between building operations and the personnel working on the of equipment. A strong emphasis will be for HVAC professionals to learn how to have a written safety plan detailing procedures for lock-out, and tagging, the importance of following original manufacturer's information for installation, starting up, and shutting down, will be reiterated throughout the course.

The course will finish with examples of emerging dual use technologies such as dedicated fire protection lines as a component of the distribution network for deep lake or seawater district cooling systems, grey-water heat pump systems, types of building roofs, road, and building thermal energy systems. A basic introduction to the application of electricity power producing high temperature fuel cells, internal combustion engine, micro-turbine, distributed electric power co-generators use-able waste heat for domestic hot water, heating, and cooling applications will be presented.

The course is condensed and assumes that the participants have prepared themselves by self-study of the ASHRAE e-book for Air Conditioning, Heating, Ventilation, Refrigeration prior to attending. In addition to the e-book, the delegates should bring their scientific calculators.

Course Objectives

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

- Apply and gain a comprehensive knowledge on advanced HVAC design, installation, maintenance and failure prevention
- Review the fundamentals of HVAC covering thermodynamics and psychrometrics
- Review the current ASHRAE standards covering ASHRAE 62 ventilation for acceptable air quality and ASHRAE standard 90 energy standard for buildings except low rise buildings
- Recognize energy use and part load efficiency that covers fan systems, part load chiller performance and part load performance of direct expansion units
- Carryout computer based load estimation, energy use calculation and building control
- Illustrate advanced HVAC control systems, build automation and the design of advanced HVAC system
- Identify compressors, coils, exchangers, filters, condensers, dryers, chiller, expansion tanks, cooling towers, split-systems, forced air and boilers
- Employ piping, duct work, insulation and the common trade practices used in HVAC applications today
- Carryout maintenance and troubleshooting, predictive maintenance, preventative maintenance and emergency repair
- Describe balancing air and water systems, glycol densities, chemical treatment biocides, corrosion inhibitors and air handler unit ultraviolet lights for continuous coil cleaning and disinfection
- Employ HVAC systems daily checks, 3-6 months scheduled preventive maintenance procedures and HVAC systems annual scheduled preventive maintenance procedure
- Demonstrate how to pump down, charge and evacuate the HVAC units and discuss ANSI-ASHRAE-ACCA 180-2010 maintenance and inspection standard according to ANSI

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 a complete and up-to-date overview of advanced heating, ventilation and air-conditioning systems for HVAC, utilities, maintenance and project engineers and other technical staff. Basic knowledge in HVAC is a pre-requisite for attending this advanced course.

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

Doha	**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.
Dubai	**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.
Al Khobar	**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.
Abu Dhabi	**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:-

- 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.

- 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 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 **45 years** of extensive industrial experience. His wide expertise includes **Boiler** Maintenance, **Boiler** Control, **Pressure Vessel** Operation, **Advanced Pressure Vessel** Design, **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, **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**. Further, he is also versed in **Wastewater Treatment** Technology, **Networking** System, **Water Network Design**, Industrial **Water Treatment** in Refineries & Petrochemical Plants, **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.

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

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introductions*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Review of Fundamentals*** *Thermodynamics • Psychrometrics*
0930 – 0945	*Break*
0945 - 1100	***Psychrometrics & HVAC Process Simulation*** *Software • Practical Exercises With Software*
1100 – 1230	***Current ASHRAE Standards*** *ASHRAE 62 Ventilation for Acceptable Air Quality • ASHRAE Standard 90 Energy Standard For Buildings Except Low Rise Buildings • What Makes a "Good" Design*
1230 – 1245	*Break*
1245 – 1420	***Energy Use & Part Load Efficiency*** *Fan Systems • Part Load Chiller Performance • Part Load Performance of Direct Expansion Units*
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 – 0930	***Computer Based Load Estimation & Energy Use Calculation***
0930 – 0945	*Break*
0945 – 1100	***Building Control*** *Fundamentals • Types of Control for Reheat, VAV, Single Zone, Humitity Control*
1100 – 1230	***Advanced HVAC Control Systems*** *Selecting Correct Equipment • Loop Checking • Sequence of Operations*
1230 – 1245	*Break*
1245 – 1420	***Advanced HVAC Control Systems (cont'd)*** *Locating Control Points • Advantages and Disadvantages of Commonly Available Types of Electric, Pneumatic, Self-Powered; Sensors, Actuators, Valves, Dampers, Direct Drives, Analog and Digital Controls*
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 – 0930	***Building Automation*** *Technology • Smart Meters Controlling*
0930 – 0945	*Break*

0945 – 1100	***Building Automation (cont'd)*** *Energy Savings • Lighting*
1100 – 1230	***Design of Advanced HVAC System*** *Compressors • Coils • Exchangers • Filters*
1230 – 1245	*Break*
1245 – 1420	***Design of Advanced HVAC System (cont'd)*** *Condensers • Dryers • Chillers • Expansion Tanks*
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 – 0930	***Design of Advanced HVAC System (cont'd)*** *Cooling Towers • Split-Systems • Forced Air • Boilers*
0930 – 0945	*Break*
0945 – 1100	***Design of Advanced HVAC System (cont'd)*** *Piping • Duct Work • Insulation • Common Trade Practices Used in HVAC Applications Today*
1100 – 1215	***Maintenance & Troubleshooting*** *Predictive Maintenance • Preventative Maintenance • Troubleshooting • Emergency Repair • Maintenance Tips*
1215 – 1230	*Break*
1230 – 1420	***Maintenance & Troubleshooting (cont'd)*** *Balancing Air and Water Systems • Glycol Densities • Chemical Treatment Biocides • Corrosion Inhibitors • Air Handler Unit Ultraviolet Lights for Continuous Coil Cleaning and Disinfection*
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

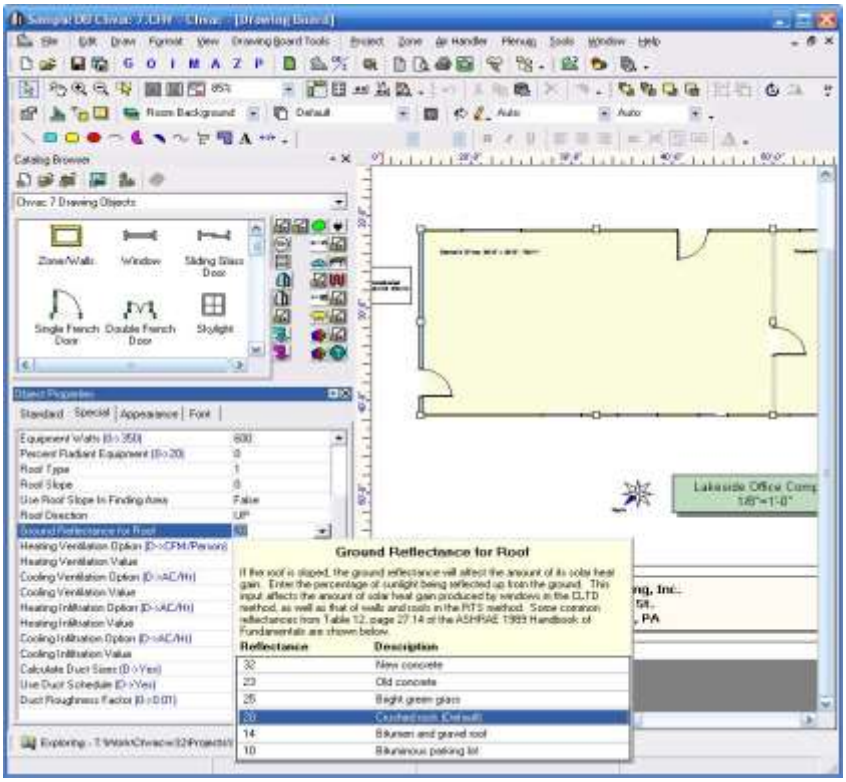
0730 – 0830	***HVAC Systems Daily Checks***
0830 – 0930	***HVAC Systems 3 Months Scheduled Preventive Maintenance Procedures***
0930 – 0945	*Break*
0945 – 1100	***HVAC Systems 6 Months Scheduled Preventive Maintenance Procedures***
1100 – 1230	***HVAC Systems Annual Scheduled Preventive Maintenance Procedure***
1230 – 1245	*Break*
1245 – 1315	***How to Pump Down, Charge & Evacuate the HVAC Units***
1315 – 1345	***ANSI-ASHRAE-ACCA 180-2010 Maintenance & Inspection Standard According to American National Standard Institute (ANSI), American Society of Heating, Refrigerating & Air Conditioning Engineers (ASHRAE) & Air Conditioning Contractors of America (ACCA)***
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Practical Sessions/Site Visit

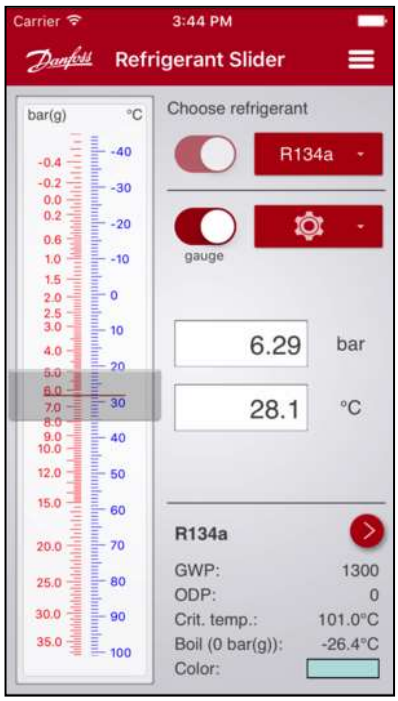
Simulator (Hands-on Practical Sessions)

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 one of our state-of-the-art simulators "Hourly Analysis Program (HAP) Software", "Elite CHVAC Simulator", "Danfoss Refrigerant Slider App", "Danfoss Trouble Shooter App", "Air Light Psychrometric Calcs" Simulators".

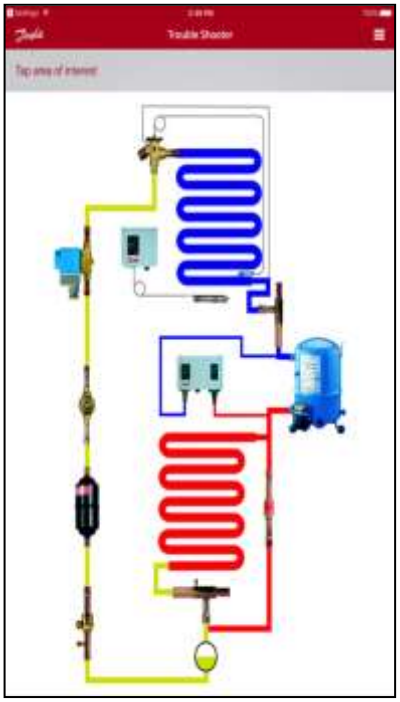
Hourly Analysis Program (HAP) Software



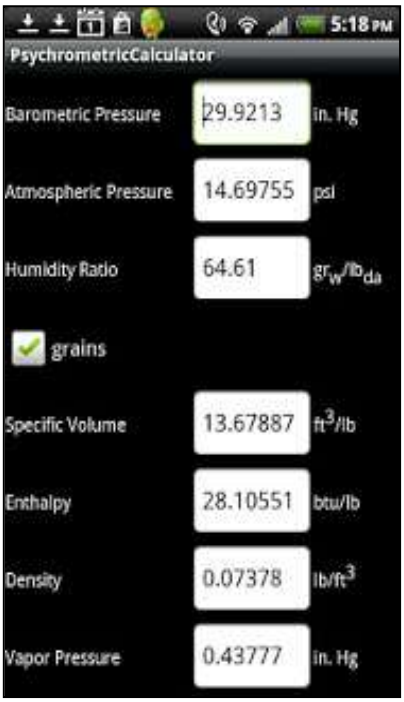
Elite CHVAC Simulator



Danfoss Refrigerant Slider App



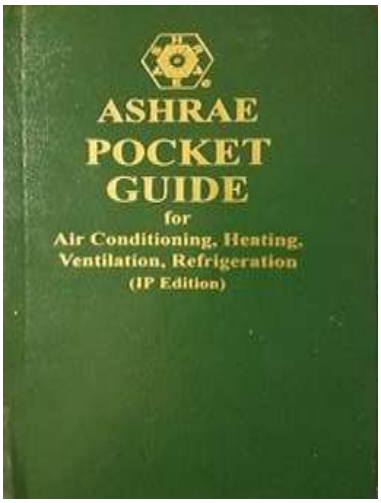
Danfoss Trouble Shooter App



Air Lite Psychrometric Calcs

Book(s)

As part of the course kit, the following e-book will be given to all participants:



Title	:	ASHRAE Pocket Guide for Air Conditioning, Heating, Ventilation, Refrigeration
Edition	:	IP Edition
ISBN	:	9781931862783
Author	:	ASHRAE
Publisher	:	ASHRAE

Course Coordinator

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