

GENERAL SERVICES ADMINISTRATION

Federal Supply Service

Authorized Federal Supply Schedule Price List

On-line access to contract ordering information, terms and conditions, up-to-date pricing, and the option to create an electronic delivery order are available through *GSA Advantage!*, a menu-driven database system. The INTERNET address *GSA Advantage!* is: [GSAAdvantage.gov](http://GSAAdvantage.gov).

Schedule Title: Mission Oriented Business Integrated Services (MOBIS) **874**

Contract number: **GS02F0070S**

For more information on ordering from Federal Supply Schedules click on the FSS Schedules button at [fss.gsa.gov](http://fss.gsa.gov).

Contract period: **25 Jan 2011** thru **24 Jan 2016**

Contractor's name, address, and phone number (include toll-free and FAX number, if applicable):

**Air Conditioning Training Specialists, Inc**  
**3430 N. Mountain Ridge #68**  
**Mesa, Arizona 85207-1075**  
**Phone: 480.830.1634**  
**Fax: 480.654.3604**

Contractor's internet address/web site where schedule information can be found (as applicable): **N/A**

Contract administration source (if different from preceding entry): **N/A**

Business size: **Small**

- 1a. Table of awarded special item number(s) with appropriate cross-reference to item descriptions and awarded price(s):

Course	Days	Published Tuition Price	GSA <sup>1</sup> Tuition Price
EPA Refrigerant Certification Training & Testing Program	1	\$290.00	\$215.00
R-410A Refrigerant Certification Training & Testing Program Certification	1	\$290.00	\$225.00
HVAC Electrical Motor Testing & Replacement	2	\$525.00	\$430.00
Refrigeration – Technical Service & Troubleshooting	4.75	\$1,095.00	\$975.00
Electrical – Technical Service & Troubleshooting	4.75	\$1,095.00	\$975.00
Air Side Fundamentals – Psychrometrics and Air Measurement	4.5	\$1095.00	\$975.00
Screw Liquid Chiller – Technical Service,	4.75	\$1,270.00	\$1,150.00

<sup>1</sup> Valid through 24 January 2016

Course	Days	Published Tuition Price	GSA <sup>1</sup> Tuition Price
Troubleshooting & Maintenance			
Reciprocating Liquid Chiller – Technical Service, Troubleshooting & Maintenance	4.75	\$1,095.00	\$975.00
Principles of Refrigerant Piping – for Service Technicians	2	\$580.00	\$525.00

- 1b. Identification of the lowest priced model number and lowest unit price for that model for each special item number awarded in the contract. This price is the Government price based on a unit of one, exclusive of any quantity/dollar volume, prompt payment, or any other concession affecting price. Those contracts that have unit prices based on the geographic location of the customer, should show the range of the lowest price, and cite the areas to which the prices apply:

**The EPA Refrigerant Certification & Testing (and its price) is the lowest priced model**

- 1c. If the Contractor is proposing hourly rates, a description of all corresponding commercial job titles, experience, functional responsibility and education for those types of employees or subcontractors who will perform services shall be provided. If hourly rates are not applicable, indicate “Not applicable” for this item: **N/A**
2. Maximum order: **\$1,000,000**
3. Minimum order: **\$100.00**
4. Geographic coverage (delivery area): **US 48 contiguous states and Pacific Rim**
5. Point(s) of production (city, county, and State or foreign country): **Mesa, Maricopa County, Arizona**
6. Discount from list prices or statement of net price: **See table in 1a above. Prices attached are NET**
7. Quantity discounts: **Prices attached are NET**
8. Prompt payment terms: **NET 30 days ARO**
- 9a. Notification that Government purchase cards are accepted at or below the micro-purchase threshold: **Government purchase cards are accepted at or below the micro-purchase threshold**
- 9b. Notification whether Government purchase cards are accepted or not accepted above the micro-purchase threshold: **Government purchase cards are accepted above the micro-purchase threshold**
10. Foreign items (list items by country of origin): **N/A**
- 11a. Time of delivery. (Contractor insert number of days.): **seven (7) days after acceptance of order**

- 11b. Expedited Delivery. The Contractor will insert the sentence “Items available for expedited delivery are noted in this price list.” under this heading. The Contractor may use a symbol of its choosing to highlight items in its price lists that have expedited delivery: **Items available for expedited delivery are noted in this price list**
- 11c. Overnight and 2-day delivery. The Contractor will indicate whether overnight and 2-day delivery are available. Also, the Contractor will indicate that the schedule customer may contact the Contractor for rates for overnight and 2-day delivery: **No overnight or 2-day delivery is accepted**
- 11d. Urgent Requirements. The Contractor will note in its price list the “Urgent Requirements” clause of its contract and advise agencies that they can also contact the Contractor’s representative to effect a faster delivery: **N/A**
12. F.O.B. point(s): **Destination**
- 13a. Ordering address(es):  
  
**ACTS, Inc  
3430 N. Mountain Ridge #68  
Mesa, Arizona 85207-1075**
- 13b. Ordering procedures: **For supplies and services, the ordering procedures, information on Blanket Purchase Agreements (BPA’s), and a sample BPA can be found at the GSA/FSS Schedule homepage ([fss.gsa.gov/schedules](https://fss.gsa.gov/schedules)).**
14. Payment address(es):  
  
**ACTS, Inc  
3430 N. Mountain Ridge #68  
Mesa, Arizona 85207-1075**
15. Warranty provision: **None**
16. Export packing charges, if applicable: **N/A**
17. Terms and conditions of Government purchase card acceptance (any thresholds above the micro-purchase level): **Government purchase cards accepted upon mutual written agreement between ACTS, Inc and the PCO.**
18. Terms and conditions of rental, maintenance, and repair (if applicable): **N/A**
19. Terms and conditions of installation (if applicable): **N/A**
20. Terms and conditions of repair parts indicating date of parts price lists and any discounts from list prices (if applicable): **N/A**
- 20a. Terms and conditions for any other services (if applicable): **N/A**
21. List of service and distribution points (if applicable): **Mesa, Arizona**
22. List of participating dealers (if applicable): **N/A**
23. Preventive maintenance (if applicable): **N/A**

- 24a. Special attributes such as environmental attributes (e.g., recycled content, energy efficiency, and/or reduced pollutants): **N/A**
- 24b. If applicable, indicate that Section 508 compliance information is available on Electronic and Information Technology (EIT) supplies and services and show where full details can be found (e.g. contractor's website or other location.) The EIT standards can be found at: [www.Section508.gov/](http://www.Section508.gov/): **N/A**
25. Data Universal Number System (DUNS) number: **045259616**
26. Notification regarding registration in Central Contractor Registration (CCR) database: **ACTS, Inc is registered in the System for Award Management (SAM) database**

# HVAC Technical Service Training GSA Customers 2012 Course Offerings

**Air Conditioning Training Specialists, Inc.**

**3430 N. Mountain Ridge #68**

**Mesa, Arizona 85207-1075**



#GS-02F-0070S



*Air Conditioning Training Specialists, Inc. is pleased to provide advanced technical training courses for GSA customers on a variety of HVAC topics. Listed are descriptions of our GSA course offerings.*

*"All prices shown herein are Net" (discount deducted)*



## GSA 2012 HVAC Technical Service Courses

### EPA Refrigerant Certification Training & Testing Program (Section 608) (1 Day) - \$215.00

**Course Description** - This course is designed to review the technical subject areas necessary to prepare HVACR technicians to take and pass an EPA approved refrigerant transition and recovery certification program administered by Ferris State University. The objective of the course is to have attendees achieve a universal certification rating pursuant to the U.S. Clean Air Act (Section 608) Title VI, 40 CFR Part 82, Subpart F.



#### Topics to include –

- EPA Exam Expectations
- General HVACR Systems
- Basic Refrigeration
- Refrigerant Chemistry
- Refrigerant Oils
- Ozone Depletion
- Global Warming
- Montreal Protocol
- United States Legislation & Regulations
- Recovery Recycling & Reclaiming Refrigerants
- Safe Handling & Transportation of Refrigerants
- Conservation – Servicing & Testing of Systems
- Waste Oils
- High & Low Pressure Chillers
- Exam Rules Regulations and Structure



### R-410A Refrigerant Certification Training & Testing Program (1 Day) - \$225.00

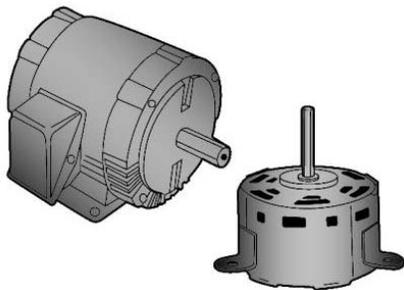
**Course Description** - This one-day certification course will discuss

proper servicing procedures when working with refrigerant R-410A in residential and light commercial applications. As the air conditioning industry transitions from the use of R-22 to R-410A in new package and split systems, it is important that all contractors and technicians understand refrigerant safety, handling procedures, proper charging techniques, POE oil concerns and the operating characteristics of R-410A. EPA regulations have prohibited the use of R-22 in new equipment starting January 1, 2010 and a complete phase out of R-22 production and importation scheduled for the year 2020. Installation, servicing and replacement of equipment with R-410A will require special tools, instruments and procedures. The operating pressures and thermal performance of R-410A are significantly higher than conventional R-22 machines and care must be exercised when working with these systems. A detailed comparison of the thermal performance of R-22 and R-410A will be discussed as well as the new federally mandated minimum 13 SEER that went into effect January 2006. Unlike the federally mandated certification requirements for section 608 of the US Clean Air Act, the equipment manufacturers and distributors of R-410A products require this certification program because of safety and liability issues when working with very high-pressure refrigerants.



## HVAC Electrical Motor Testing & Replacement Course (2 Days) - \$430.00

**Course Description** – Detailed analysis of electrical motor manufacture's warranty results have identified that a great majority of the field return motors have no defect found. Good motors are routinely returned in error due to mis-diagnostics by service technicians. Data analyzed also concluded that many of the defective motors that did return were the result of multiple repeat failures concluding that the original root cause of the problem was never determined. The goal of this seminar is to develop troubleshooting skills for service technicians to become proficient in motor testing and replacement for common single and three phase motors. Attendees will be taught root cause analysis to prevent repeat failures.



### Topics to include –

- Alternating current fundamentals and sine wave analysis
- Principles of electromagnetic induction
- Single phase motor theory, testing, construction and replacement guidelines
- Three phase motor theory, testing, construction and replacement guidelines
- Motor identification techniques
- Design characteristics of (6) common single phase motors
- Calculation of motor horsepower for single & three phase motors
- Power factor and power factor correction
- Winding resistance and resistance to ground guidelines
- Electric motor starting gear – start relay/start capacitor/soft start kits
- Run and start capacitor failure modes
- Capacitor testing methods
- Replacement rules for start and run capacitors
- Schematic wiring diagrams – emphasis on motors
- Motor terminal arrangements of single and three phase motors
- Three phase voltage and current imbalance calculations
- Discuss CSR motor circuit operation and failure analysis
- Variable speed motors
- Multi speed motor operation and troubleshooting
- ECM motors and application
- Discuss three phase wye and delta connected motors
- Reduced inrush starters -wye delta starters, part winding start
- Common three phase motors - 3,6, and 9 lead motors
- Part winding verses across the line start motors
- Perform root cause analysis and prevention of repeat failures
- Safe electrical motor testing guidelines and recommendations



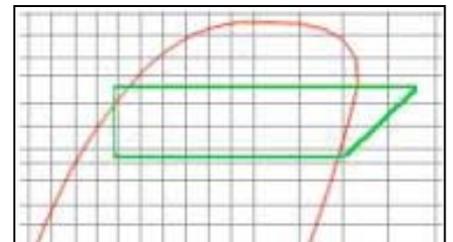
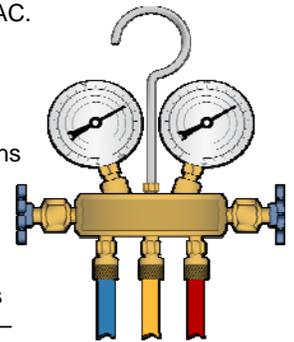
## Refrigeration - Technical Service & Troubleshooting Course (4.75 Days) - \$975.00 NATE approved 40 CEU's 1712-0001

**Course Description:** This course is designed to teach the principles of the mechanical refrigeration process. Students will gain an understanding of the basic skills necessary to properly service, troubleshoot and maintain modern HVAC systems. Studies of adult education have identified that the majority of adults learn by doing and our state of the art lab does just that. Technical lecture material taught in the classroom is re-enforced in our supervised lab where students will work on actual equipment and put to practice what was just learned in the classroom. Attendees will be taught practical service procedures and troubleshooting techniques that will enhance their performance back on the job. This course was developed for equipment operators, maintenance personnel and service technicians who maintain, troubleshoot, and service residential and commercial HVAC.



### Topics to include:

- Identification of essential system component parts and accessories
- Review of ARI system classifications
- Thermodynamic mechanical refrigeration cycle analysis
- Pressure enthalpy diagrams and practical applications
- Direct and indirect cooling systems
- System troubleshooting to include – identifying refrigerant over/under charge, low air flow evaporator/condenser, restricted liquid line, and system non-condensables
- Superheat and sub cooling determination for common refrigerant types
- Proper system evacuation and dehydration techniques
- Machine room guidelines and refrigeration safety concerns
- Basics of heat transfer methods and measurement
- Identifying refrigeration system irregularities and proper use of refrigerant data logs
- Refrigerant charging procedures
- EPA concerns and guidelines per section 608 US Clean Air Act
- Single component and blended refrigerant mixture service considerations
- HVAC service practices and procedures
- System performance factors and design considerations
- Common compressor types, operation, service and troubleshooting
- Compressor and system capacity control methods
- Air and water cooled condenser types, operation, service and troubleshooting
- Common evaporator types, operation, service and troubleshooting
- Various metering devices, operation, service and troubleshooting
- Effective system clean up after mild and severe burnouts



**Electrical - Technical Service & Troubleshooting Course  
(4.75 Days) - \$975.00 NATE approved 40 CEU's 1712-0002**

**Course Description** – The majority of field problems in the HVAC industry are the result of electrical system malfunctions. Properly identifying and correcting these malfunctions in a timely manner represents the greatest challenge to the skills of service technicians. This course was specifically designed to address these concerns and give attendees the “technical tools” and confidence necessary to fix the problem right the first time and reduce costly callbacks. The course takes a logical and practical approach in teaching wiring diagram interpretation and the application of time proven troubleshooting procedures and techniques. Studies of adult education have identified that the majority of adults learn by doing and our state of the art lab does just that. Technical lecture material taught in the classroom is re-enforced in our supervised troubleshooting lab where students will work on actual equipment and put to practice what was learned in the classroom by troubleshooting actual systems with electrical faults. Attendees are taught practical service procedures and troubleshooting techniques that will enhance their performance back on the job. This course was developed for maintenance personnel and service technicians who maintain, troubleshoot, and service residential and light commercial HVAC equipment.



**Topics to include –**

- Reading and interpretation of various electrical schematics for residential and light commercial heating and cooling systems - determining the sequence of operation
- Applying factual ladder schematics and component location diagrams to various systems
- Use and application of common electrical meters in electrical troubleshooting
- Developing a logical approach to troubleshooting and timely correction of system malfunctions – prevention of repeat failures
- Troubleshooting common electromechanical safety and operating controls
- Troubleshooting various printed circuit boards and solid state controls – identifying function of boards and testing inputs/outputs
- Develop safe electrical troubleshooting practices and procedures – hopscotch method of troubleshooting
- Troubleshooting single phase motor starting gear – hard and soft start kits
- Single and three phase motor theory and construction
- Troubleshooting common single and three phase motors
- Three phase voltage and current imbalance determination
- Motor testing and replacement guidelines
- Determining root cause and failure analysis



**Screw Liquid Chiller - Technical Service, Troubleshooting & Maintenance Course (4.75 days) - \$1,150.00 NATE approved 40 CEU's 1712-0003**

**Course Description:** This course is specifically designed to meet the needs of service technicians who service, maintain and install screw liquid chillers. The seminar is a blend of practical theory and application involving the specific concepts of screw liquid chillers. Comparisons to reciprocating and centrifugal chillers will help to define and position screw chillers in today's HVAC marketplace. Attendees will develop an in depth working knowledge of the oil management system, refrigerant circuitry, waterside and compression processes unique to screw chillers. Studies will focus on Product Integrated Control™ (PIC) and the latest version of the *ComfortLink™* control platforms. Students will gain the practical skills and confidence required to operate, maintain, troubleshoot, and service screw liquid chillers. Carrier models 30GX/HXC/HXA economized and non-economized chillers will be discussed. As indicated by the topics covered, this will be a comprehensive training course and one that you will not want to miss.



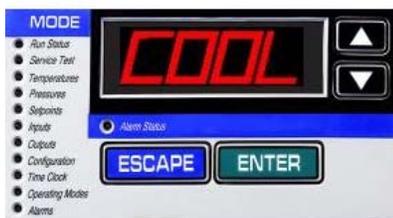
**Topics to include:**

- Liquid chiller classifications
- Direct versus indirect cooling systems
- World chiller market – Applied and Heavy Chillers
- Compressor Performance Factors – Balance Diagrams
- Reciprocating, centrifugal and screw chiller comparisons (pro/con)
- Chiller system design envelop, application guidelines, operational parameters
- Discussion of various water piping systems,  $\Delta T$  and approach temperatures
- Loop volume and water flow rate requirements and determination
- Factory installed options (FIOPS) and field installed accessories
- Refrigeration and waterside troubleshooting techniques
- Cooler construction, heat transfer, flow rate and performance testing
- Liquid level sensor operation and troubleshooting
- Electronic flow switch operation and setting
- Condenser coil options to suit environmental conditions
- Chiller installation recommendations – water, service and air flow
- Low and high frequency sound consideration



## Screw Liquid Chiller - Technical Service, Troubleshooting & Maintenance Course (Cont'd)

- 06N 104MM GTS compressor familiarization, operation and service considerations. Screw compression process, motor cooling algorithm.
- Oil circulation, oil pressure, oil level, lubrication filters, system pressure drop
- Oil management, oil separators and external pre lubrication oil pumps
- Refrigerant R-134a and POE 220 weight oil. Global warming & ozone depletion concerns. Machine room safety ASHRAE 15, safety group classifications
- Split system piping design and layout considerations, back pressure valves
- Across the line and wye delta start (open transition) reduced inrush starters
- Part load performance, capacity control loaders and minimum load control
- Refrigerant charging procedures package/split system chillers
- Microprocessor configuration, operation and troubleshooting. ESD/EMI awareness
- PSIO-1 microprocessor input/output testing. Alarm and alert codes.
- Control module operation and testing DSIO-HV, DSIO-EXV, PSIO-2, CPM
- Proportional Integral Derivative (PID) control algorithm, lead lag control
- Electronic Expansion Valve (EXV) operation and testing
- Electronic Expansion Device (EXD) operation and testing
- Economized/Non-Economized chillers – thermodynamic review and NRE comparison
- Flash tank economizers and brazed plate heat exchangers
- Familiarization and operation of the HSI0, scrolling marquee display, and hand held Navigator. Communication bus wiring
- Thermistor operation and troubleshooting
- Energy Management Module (EMM) installation and operation
- Compressor Expansion Board (CXB), Screw Compressor Board (SCB), Main Base Board (MBB) operation
- Temperature reset and demand limit configuration and operation
- *ComfortLink*<sup>TM</sup> Compressor Protection board (CCP) operation
- Pressure transducer operation, troubleshooting and calibration
- Refrigerant selection considerations and EPA recovery guidelines
- Machine commissioning startup sheets, system data logs



## Reciprocating Liquid Chiller - Technical Service, Troubleshooting & Maintenance Course (4.75 days) - \$975.00 NATE approved 40 CEU's 1712-0004

**Course Description:** This course is specifically designed for personnel that operate, service, maintain and install reciprocating liquid chillers. Attendees will develop an in depth working knowledge of the electrical control systems of microprocessor based chillers, lubrication system, refrigerant circuitry, waterside and compression processes of reciprocating chillers. Studies will concentrate on Carrier Flotronic<sup>TM</sup> and *ComfortLink*<sup>TM</sup> control platforms used in reciprocating chillers. Technical lecture material taught in the classroom is re-enforced in our supervised troubleshooting lab where students will work on electrical control panels and put to practice what was just learned in the classroom by troubleshooting trainers with electrical faults. Attendees will be taught practical service procedures and troubleshooting techniques that will enhance their performance back on the job when servicing and maintaining reciprocating liquid chillers.



### Topics to include:

- Liquid chiller classifications - Direct verses indirect cooling systems
- Compressor operation and performance factors – Reduced inrush starting
- Reciprocating chiller operation – Flotronic<sup>TM</sup> & *ComfortLink*<sup>TM</sup> machines
- Chiller system design envelop, application guidelines, operational parameters
- Discussion of various water piping systems,  $\Delta T$  and approach temperatures
- Loop volume and water flow rate requirements and determination
- Factory installed options (FIOPS) and field installed accessories
- Refrigeration and waterside troubleshooting techniques
- Cooler construction, heat transfer, flow rate and performance testing
- Condenser coil options to suit environmental conditions
- Chiller installation recommendations – water, service and air flow
- Oil circulation, oil pressure and oil level requirements
- Refrigerant considerations - R-22, R-134a EPA recovery guidelines
- Global warming & ozone depletion concerns. Machine room safety ASHRAE 15, safety group classifications



## Reciprocating Liquid Chiller - Technical Service, Troubleshooting & Maintenance Course (Cont'd)

- Split system chiller piping design and layout concerns
- Part load performance, capacity control systems and hot gas bypass applications
- Refrigerant charging procedures package/split system chillers
- Microprocessor configuration, operation and troubleshooting. ESD/EMI awareness
- Alarm and alert codes
- Proportional Integral Derivative (PID) control algorithm, lead lag & pull down control
- Electronic Expansion Valve (EXV) operation and testing
- Familiarization and operation of the HSI0, scrolling marquee display, and hand held Navigator. Communication bus wiring
- Thermistor operation and troubleshooting
- Energy Management Module (EMM) installation and operation
- Compressor Expansion Board (CXB), Main Base Board (MBB) operation
- Temperature reset and demand limit configuration and operation
- Machine commissioning startup sheets, system data logs



*All pricing is valid through December 31, 2012.*

## Air Conditioning Training Specialists, Inc.

Air Conditioning Training Specialists, Inc. (ACTS) is a provider of quality technical training solutions for the HVACR industry. We designed our skills related training programs based on an underlying philosophy that "adults learn by doing." ACTS reinforces this approach to learning through a delicate balance of classroom lecture applied with "hands on" troubleshooting labs. *The goal of ACTS is to offer cost effective HVAC training that exceeds the expectations of the learner.*

Air Conditioning Training Specialists, Inc. 2012



*All one week long classes listed are NATE recognized and approved for 40 hour's of CEU's.*

**NATE Approved Training Organization**

## Principles of Refrigerant Piping – For Service Technicians (2 Days) - \$525.00

**Course Description** - This course will teach the principles of proper refrigerant piping in respect to design and layout. Service technicians will gain an understanding of accepted methods of proper pipe sizing and layout in regard to pressure drop (full load), oil return (light load) and off cycle drainage. Improper refrigerant piping practices result in a loss of system capacity and efficiency as well as contribute to compressor failures in both residential and commercial equipment. Attendees will be taught practical sizing procedures using a system design manual and ASHRAE piping guidelines not only to design and layout a proper piping system but also to recognize piping deficiencies on existing systems. Piping recommendations for Refrigerants R-22, R-410A and R-134a will be discussed. This course was designed specifically for service technicians who maintain, troubleshoot, and service residential and commercial HVAC.

### Topics to include:

- Basic system design considerations - balance diagrams, refrigerant velocities, oil return, off cycle drainage, refrigerant and oil miscibility, refrigerant migration, temperature limitations. Residential long line set limitations and adjustments for cooling and heat pump systems refrigerant charge/metering device concerns.
- Refrigerant line pressure drop limitations expressed in saturated refrigerant temperature drop °F.
- Calculations of pressure drop from line length, fittings and accessories. Residential, commercial & duct free splits.
- Equivalent length verses actual pipe length.
- Discussions on why refrigerant vapor lines are more critical to design as compared to liquid lines.
- Compressor performance factors and its effect on pipe design and sizing.
- AC&R refrigerant piping physical properties for types (M, K, L) tubing.
- Buried line set issues and recommendations.
- Vertical hot gas, liquid and suction line risers – issues pertaining to oil return and sub-cooling losses. Interpretation of pipe sizing charts and oil return tables.
- Pipe sizing examples hot gas, liquid and suction lines to include single standard risers, reduced risers and double suction/hot gas risers.
- Capacity control methods effects on refrigerant velocities – mechanical unloading and loading systems, two stage reciprocating and scroll compressors, digital scrolls and hot gas bypass applications and concerns.
- Liquid line solenoid use to include solenoid drop, pump down and pump out control.
- Suction line accumulators, crankcase heaters, traps, inverted traps, filter driers applications and recommendations.
- TXV sizing procedures use of bleed valves and hard shut off applications. Flash gas control.

**Student Evaluation:** Student progress incorporates various classroom worksheets for design sizing exercises.

### Suggested Prerequisite:

Students should have a minimum of three years of field experience in the installation, startup, service and maintenance of residential or commercial air conditioning and refrigeration systems coupled with appropriate levels of vocational and/or HVACR technical education.

**Air Side Fundamentals – Psychrometrics and Air Measurement (4.5 Days) - \$975.00**

**Course Description** - This course will provide a practical approach to the understanding and application of psychrometrics and the methods and procedures for field measurement of air flow for residential and commercial HVAC equipment. The course will discuss the psychrometric treatment of air for both process and comfort cooling applications. During the hands on lab students will perform air flow measurement and calculations utilizing common field procedures and instruments such as pitot tubes, anemometers, temperature rise, external static pressure and measurement of cooling coil static pressure drop methods.

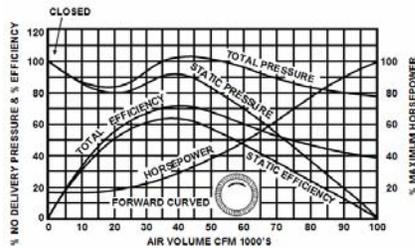


This course was designed specifically for service technicians who maintain, troubleshoot, and service residential and commercial HVAC equipment and are knowledgeable on the refrigeration and electrical aspects of air conditioning systems but wish to expand their knowledge of the air side of the business. In too many cases existing HVAC systems do not perform to their design expectations due to improper air flow which goes undetected. HVAC systems will not produce the design efficiency, performance or reliability with improper air flow. This course will give the service technician the skills necessary to diagnosis and correct air side problems.

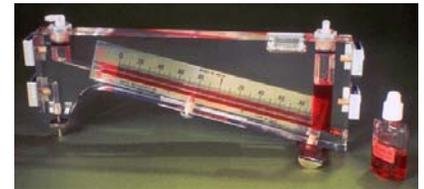


**Topics to include:**

- Discussion of human comfort to include:
  - Metabolic Rate
  - Body's heat rejection methods
  - Conduction, convection and, evaporation
  - Thermal equilibrium
  - Wind chill factor
  - Humidity index
  - Psychrometric chart comfort zones
  - summer/winter
- Discussion of the earth's atmosphere to include:
  - Barometric pressure
  - Pressure measurement scales
  - Various altitudes and temperature psychrometric charts
  - Ideal gas laws of Charles, Boyle and Dalton
  - Dry & wet air composition, gas constants and specific heat
  - Definition of standard air conditions
- Psychrometric chart overview
- Properties of air (8)
- Plotting state points and psychrometric chart interpretation
- History and development of the psychrometric chart
- Birth of air conditioning industry and historical milestones
- World's first scientific air conditioning unit
- Psychrometric chart construction
- Dew point discovery



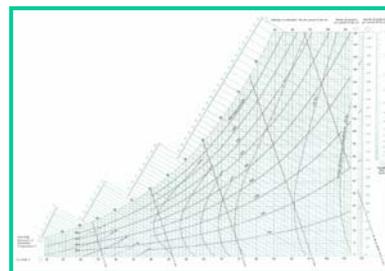
- Sling & electronic psychrometers
- Adiabatic saturators
- Air spray washers
- Evaporative cooling
- Cooling & dehumidification process
- Total heat formula, sensible heat formula and latent heat formula
- Sensible heating & cooling processes
- Rational psychrometric formulae
- Dew point, vapor barriers & IAQ issues – avoid equipment over sizing
- Heating & humidification processes
- Direct refrigerant expansion coil design
- Row split, face split and intertwined circuitry
- Cooling coil bypass factors and typical applications
- Ventilation & mixed air processes
- Setting outside air dampers for ventilation
- Hospital operating room considerations
- Calculating % outside air & room air changes
- Chemical dehydration
- Humidification processes & setting humidistats
- Cooling towers
- Air moving devices – fan rating points
- Centrifugal & axial fan types
- Fan curves and practical interpretation
- Duct system pressures – static, velocity & total
- Velocity profiles and pressure measurement points
- Sources of system resistance to air flow
- System effect concerns and recommendations
- Air flow measurement methods & procedures
- Inclined manometers & magnehelics
- Pitot tubes, anemometers, temp rise, external static pressure, cooling coil pressure drop calculations
- Individual room cfm requirements
- Altitude correction factors
- Fan laws and practical applications



**Student Evaluation:** Student progress incorporates various classroom worksheets for psychrometric plotting and problem solving including a hands on lab incorporating methods and procedures for performing air measurement checks.

**Suggested Prerequisite:**

Students should have a minimum of three years of field experience in the installation, startup, service and maintenance of residential or commercial air conditioning and refrigeration systems coupled with appropriate levels of vocational and/or HVACR technical education.



## United States Government Orders via GSA Schedule –



#GS- 02F-0070S

Please note that Air Conditioning Training Specialists, Inc. is an active and registered company with the United States Department of Defense under the Central Contractor



Registration (CCR) as listed with the Defense Logistics Agency. The CAGE Code number for Air Conditioning Training Specialists, Inc. is 1JMV9 and the DUNS number is 045259616. All ORCA representations and certifications are current and up to date. The Federal Identification number for Air Conditioning

Training Specialists, Inc is 20-3185963. James P. Curley is the instructor for these courses is a certificated proctor for the Ferris State University Refrigerant Transition and Recovery Program (FSU Registration: F000948). Mr. Curley is also an approved electrical continuing education instructor for the State of Washington and Oregon Department of Labor & Industries Electrical Program and has over 40 years of HVACR industry experience.



### Custom On-Site Training Courses – Worth Considering

The best way to obtain the maximum value for your training budget is to schedule us to conduct the courses at your place of business. By arranging custom on-site training at your work place you can:

- Reduce travel related expenses for your employees
- Reallocate travel funds to training dollars
- Train and motivate a greater number of employees
- Maintain normal schedule of employees
- Audit the training program to ensure compliance to your training needs and objectives
- Retain the employees on-site in case of emergencies

What a great way to invest in your staff while at the same time stretching your training dollars. Training is an Investment in your most valuable commodity – your employees. Training reduces callbacks and makes your business more profitable. If you are interested in discussing this option further please give us a call at (480) 830-1634.



**James P. Curley** is the President of Air Conditioning Training Specialists, Inc. (ACTS), a company that provides specialized training and services to the HVACR Industry. Prior to starting this company, Jim was a Master Instructor and Instructional Designer with over 35 years experience for the Commercial Systems and Services Division of Carrier Corporation, a United

Technologies Company. Jim's career at Carrier involved assignments based from Syracuse NY, Los Angeles CA, and Phoenix AZ. Jim grew up in the air conditioning business, as his father was a successful contractor in central New York specializing in commercial refrigeration and air conditioning. Jim majored in heating, ventilation, air conditioning, and refrigeration at Hudson Valley Community College and upon completion was hired by Carrier Corporation's headquarters in Syracuse, NY. His first assignment was a technician for the engineering test laboratories from 1969 to 1974. It was in these laboratories that concepts on a piece of paper for equipment design became a reality. Prototype machines were developed and built in a model shop and then tested to meet rigorous manufacturing and industry standards to ensure compliance. This assignment gave Jim the insight to component and system design to add to his practical and theoretical knowledge of air conditioning. From 1974 until his retirement from Carrier in January 2005, Jim was responsible for instructional course development, computer based training programs, scheduling, marketing and implementation of the factory training operations throughout the United States for the North American Operations of Carrier, Bryant, Day & Night and Payne divisions of Carrier Corporation. Jim was also Carrier's Director of Customer Assurance for the Western United States for the Commercial Unitary Division. This position gave him responsibilities for service engineering and warranty administration on a variety of commercial products. He has designed and managed custom on-site training programs for diverse applications of cooling systems ranging from applications for nuclear power plants, coalmines, oilrigs, submarines, inter-continental ballistic missiles, the federal penitentiary system, water treatment and pumping plants, minesweeping ships and various industrial complexes. He has developed specialized training programs for technician development in air conditioning service, psychrometrics, heat pumps, gas heating, refrigerant management, and chilled water systems. He has conducted several hundred classes and trained several thousand people around the world. Jim has taught on four continents spanning 24 countries. Jim is dedicated to and has extensive training obligations for United States military bases located throughout the world for the US Air Force, US Army and the US Coast Guard. He has written and published training books for Carrier Corporation on product specific equipment, solar energy, air measurement, psychrometrics, and advanced heat pump systems. Jim is the author of a technical publication titled "Air Flow Measurement" for the Refrigeration Service Engineers Society's SAMS manual. Jim has developed technical training programs for colleges, trade schools, unions, government agencies, end user customers, trade associations, utilities and air conditioning distributors throughout the United States and is committed to training excellence.

*On a personal note, Jim is the father of five daughters and the proud grandfather of 13 grandchildren & 5 great grandchildren. Jim and his wife Joyce reside in Mesa, Arizona.*

**HVAC Technical Service Training**      **Please Print Clearly and Fill in Completely**      **Registration Form**

<b>Student Information</b>	Name		Phone (    )	
	PO Box/Street			
	City	State	Zip Code	
	Fax (    )	Email		
<b>Company Information</b>	Name		Phone (    )	
	PO Box/Street			
	City	State	Zip Code	
	Fax (    )	Point of Contact		

PLEASE CHECK DESIRED COURSE, DATE AND LOCATION		Location	Date	Tuition
1. <input type="checkbox"/>	Refrigeration – Technical Service & Troubleshooting Course	Industry, CA	02/13/12 – 02/17/12	\$975.00
2. <input type="checkbox"/>	EPA Refrigerant Certification Training & Testing (Section 608)	Industry, CA	02/18/12	\$215.00
3. <input type="checkbox"/>	Electrical – Technical Service & Troubleshooting Course	Industry, CA	02/27/12 – 03/02/12	\$975.00
4. <input type="checkbox"/>	Air Side Fundamentals - <i>Psychrometrics &amp; Air Measurement</i> <i>New Course!</i>	Industry, CA	03/12/12 – 03/16/12	\$975.00
5. <input type="checkbox"/>	Screw Liquid Chiller – Technical Service & Troubleshooting Course	Brea, CA	03/26/12 – 03/30/12	\$1,150.00
6. <input type="checkbox"/>	Air Side Fundamentals - <i>Psychrometrics &amp; Air Measurement</i> <i>New Course!</i>	San Diego, CA	04/16/12 – 04/20/12	\$975.00
7. <input type="checkbox"/>	Electrical – Technical Service & Troubleshooting Course	Tolleson, AZ	04/23/12 - 04/27/12	\$975.00
8. <input type="checkbox"/>	Reciprocating Liquid Chiller –Service, Troubleshooting & Maintenance Course	Tolleson, AZ	04/30/12 - 05/04/12	\$975.00
9. <input type="checkbox"/>	Principles of Refrigerant Piping - for Service Technicians	Albuquerque, NM	05/09/12 - 05/10/12	\$525.00
10. <input type="checkbox"/>	Electrical – Technical Service & Troubleshooting Course	Albuquerque, NM	05/14/12 - 05/18/12	\$975.00
11. <input type="checkbox"/>	R-410A Refrigerant Certification Training & Testing (Ferris State University)	Honolulu, HI	09/05/12	\$225.00
12. <input type="checkbox"/>	HVAC Electrical Motor Testing & Replacement Course	Honolulu, HI	09/06/12 – 09/07/12	\$430.00
13. <input type="checkbox"/>	Refrigeration – Technical Service & Troubleshooting Course	Honolulu, HI	09/10/12 – 09/14/12	\$975.00
14. <input type="checkbox"/>	Electrical – Technical Service & Troubleshooting Course	Honolulu, HI	09/17/12 – 09/21/12	\$975.00
15. <input type="checkbox"/>	Air Side Fundamentals - <i>Psychrometrics &amp; Air Measurement</i> <i>New Course!</i>	Honolulu, HI	09/24/12 – 09/28/12	\$975.00
16. <input type="checkbox"/>	Reciprocating Liquid Chiller –Service, Troubleshooting & Maintenance Course	Honolulu, HI	10/01/12 – 10/05/12	\$975.00
17. <input type="checkbox"/>	EPA Refrigerant Certification Training & Testing (Section 608)	Honolulu, HI	10/10/12	\$215.00
18. <input type="checkbox"/>	Principles of Refrigerant Piping - for Service Technicians	Honolulu, HI	10/11/12 - 10/12/12	\$525.00
19. <input type="checkbox"/>	Screw Liquid Chiller – Technical Service & Troubleshooting Course	Honolulu, HI	10/15/12 – 10/19/12	\$1,150.00
20. <input type="checkbox"/>	Air Side Fundamentals - <i>Psychrometrics &amp; Air Measurement</i> <i>New Course!</i>	Brea, CA	10/29/12 – 11/02/12	\$975.00
21. <input type="checkbox"/>	Refrigeration – Technical Service & Troubleshooting Course	Tolleson, AZ	11/05/12 – 11/09/12	\$975.00
22. <input type="checkbox"/>	Air Side Fundamentals - <i>Psychrometrics &amp; Air Measurement</i> <i>New Course!</i>	Tolleson, AZ	11/12/12 – 11/16/12	\$975.00
23. <input type="checkbox"/>	Air Side Fundamentals - <i>Psychrometrics &amp; Air Measurement</i> <i>New Course!</i>	Albuquerque, NM	11/26/12 – 11/30/12	\$975.00
24. <input type="checkbox"/>	Refrigeration – Technical Service & Troubleshooting Course	San Diego, CA	12/03/12 – 12/07/12	\$975.00
25. <input type="checkbox"/>	Electrical – Technical Service & Troubleshooting Course	San Diego, CA	12/10/12 – 12/14/12	\$975.00
26. <input type="checkbox"/>				
27. <input type="checkbox"/>				
28. <input type="checkbox"/>				
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30. <input type="checkbox"/>				
31. <input type="checkbox"/>				
32. <input type="checkbox"/>				
33. <input type="checkbox"/>				
34. <input type="checkbox"/>				

## Please Specify Payment Method

## PAYMENT FORM

Credit Card	<input type="checkbox"/> 	<input type="checkbox"/> 	<input type="checkbox"/>  #GS-02F-0070S	<input type="checkbox"/> 
Card Number:				
Signature:				
Expiration Date:	(    )/(    ) mm/yy	Credit Card Code Number (    )		
<input type="checkbox"/> Purchase Order - copy of PO <b>MUST</b> accompany registration PO Number:				
<input type="checkbox"/> Checks - make payable to <b>Air Conditioning Training Specialists, Inc.</b> – payment due 10 days prior to start of class – must accompany registration				
<input type="checkbox"/> <b>US Government Orders</b> Please Apply GSA Schedule #GS-02F-0070S James P. Curley of Air Conditioning Training Specialists, Inc. is proud to be a GSA Schedule partner with the Federal Supply Service and registered with the United States Department of Defense under Central Contractor Registration (CCR) 1JMV9.				

## Questions &amp; Registrations

Fax or mail this payment form along with the registration form to the appropriate point of contact, then mail tuition check or purchase order.

**For questions please contact**

**James P. Curley**

**Phone: (480) 830-1634**

**Air Conditioning Training Specialists, Inc.**  
 PO Box 20190  
 Mesa, Arizona 85277-0190

**Phone: (480) 830-1634**

**Fax: (480) 654-3604**

**Email: [jamespcurleyhvac@aol.com](mailto:jamespcurleyhvac@aol.com)**

***We look forward to seeing you in class!***

## POINT OF CONTACT &amp; GENERAL INFORMATION

			
<p><b>Marie Rohde</b>          16900 Chestnut Street          Industry, CA 91748          Telephone: (626) 854-6833          Fax: (626) 854-6840          Email: <a href="mailto:m.rohde@us-ac.com">m.rohde@us-ac.com</a></p>	<p><b>Larry Siller</b>          9702 W. Tonto Street          Tolleson, AZ 85353          Telephone: (623) 388-1335          Fax: (623) 388-5188          Email: <a href="mailto:techservice@siglers.com">techservice@siglers.com</a></p>	<p><b>Airefco Marketing</b>          18755 SW Teton Avenue          Tualatin, OR 97062          Telephone: (503) 691-4319          Fax: (503) 454-4253          Email: <a href="mailto:marketing@airefco.com">marketing@airefco.com</a></p>	<p><b>James P. Curley</b>          PO Box 20190          Mesa, AZ 85277          Telephone: (480) 830-1634          Fax: (480) 654-3604          Email: <a href="mailto:jamespcurleyhvac@aol.com">jamespcurleyhvac@aol.com</a></p>
<p>6435 S. Valley View Blvd Suite D          Las Vegas, NV 89118</p> <p>3333 Orange Grove Avenue          North Highlands, CA 95660</p> <p>4770 Ruffner Street          San Diego, CA 92111</p>	<p><b>Darren K. Lanear</b>          205 South Puente Street          Brea, CA 92821          Telephone: (714) 578-5182          Fax: (714) 578-5101          Email: <a href="mailto:dlanear@siglers.com">dlanear@siglers.com</a></p> <p><b>Dave Soto</b>          Russell Sigler, Inc.          3330 Pan American Freeway          Albuquerque, NM 87107          Telephone: (505) 881-2929          Email: <a href="mailto:dsoto@siglers.com">dsoto@siglers.com</a></p>	<p>3985 70<sup>th</sup> Avenue East Suite A          Fife, WA 98424</p> <p>11005 117<sup>th</sup> Place, NE          Kirkland, WA 98033</p> <p>Please Note:  <i>State of WA &amp; OR approved          credit hours for electrical          license renewal</i></p>	<p><b>Barbara Koizumi</b>          2060 Lauwiliwili Street          Kapolei, HI 96707          Telephone: (808) 792-1745          Fax: (808) 671-6241          Email: <a href="mailto:bkoizumi@carrierhawaii.com">bkoizumi@carrierhawaii.com</a></p> <p><b>Class Location</b>          Carrier Hawaii          2060 Lauwiliwili Street          Kapolei, HI 96707          Telephone: (808) 677-6339</p>
Instructors	Courses are taught by experienced and industry recognized HVAC professionals.		
Lodging	Rooms and meals are available at hotels, motels, and restaurants and are within driving distance to course locations. Tuition fee covers cost of the course and related materials. It does not include meals, housing, or transportation. These arrangements are the responsibility of the student.		
Hours	Courses begin promptly and run from <b>7:30 am – 5:00 pm.</b>		
What To Wear	Comfortable work clothes and work shoes. Class rooms are air conditioned and at times may be too cool for some so dress accordingly.		
Acceptance	We will confirm your registration with a confirmation letter and provide detailed information on local lodging and reporting instructions to class: <b>IMPORTANT:</b> Please <b>Do Not</b> make travel reservations until you receive <b>confirmation</b> from us that the class is confirmed. All tuition fees are in US dollars. We reserve the right to change class dates or cancel classes as deemed necessary at which point you may elect to be rescheduled or receive a full tuition refund.		
Student Cancellation Policy	Cancellations or rescheduling received <b>16 or more</b> working days prior to the class start date will be refunded in <b>full</b> , <b>11 – 15</b> working days prior to the class start date will be <b>charged 50%</b> of the class fee. Cancellations made <b>10 or less</b> working days prior to the class start date <b>no refund</b> will be issued and the full class fee will be charged, you will receive a <b>1 year tuition credit</b> to attend any class of equal value. There will be <b>no tuition credit</b> issued for <b>NO SHOWS.</b>		