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Parts I and II
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HEATING, VENTILATION, AIR CONDITIONING AND REFRIGERATION

Wage Grade Series
5306/5309/2606/4742/5301/5352/5402/5415

CAREER FIELD EDUCATION AND TRAINING PLAN

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WAGE GRADE SERIES 5306/5309/2606/4742/5301/5352/5402/5415

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OPR: Air Force Civil Engineer Functional Advisory Council Wage Grade Panel
Certified by: Dave Perkins and Greg ZseDenny, Wage Grade Panel Chairs

PREFACE

This Career Field Education and Training Plan (CFETP) is a comprehensive education and training document that identifies life-cycle education/training requirements and training support resources for the HVAC Equipment Mechanic/Boiler Mechanic/EMCS Equipment Mechanic Wage Grade series. The CFETP will provide wage grade personnel with a clear career path to success and instill rigor in all aspects of our Job Series training.

The CFETP consists of two parts used by the supervisor to plan, manage, and control training within the job series.

Part I provides information necessary for overall management of the job series.

- Section A provides general information about how the CFETP will be used.
- Section B identifies job series field progression information, duties and responsibilities, training strategies, and the job series path.

Part II includes the following:

- Section A identifies the Group Series Training Standard (GSTS) to include duties, tasks, and technical references to support civilian Wage Grade training programs.
- Section B identifies available support materials.
- Section C identifies a training course index supervisors can use to determine resources available to support training. Included here are both mandatory and optional courses, and exportable courseware.

Note: At unit level, supervisors and trainers must use Part II to identify, plan, and conduct training commensurate with the overall goals of this guide.

Using guidance provided in the CFETP will ensure individuals in these wage grade series receive effective and efficient training at the appropriate point in their careers. This plan will enable us to train today's work force for tomorrow's jobs. At the unit level, supervisors and trainers must use Part II to identify, plan, and conduct training commensurate with the overall goals of this guide.

ABBREVIATIONS/TERMS EXPLAINED

Advanced Distributive Learning (ADL). Anytime, anyplace learning within DoD consisting of instructional modules comprised of sharable content objectives in an Internet/Intranet environment.

Air Force Civilian Career Field Manager (AFCCFM). An individual on the Air Staff charged with the responsibility for overseeing all training and career field management aspects of an Air Force series or group of series.

Air Force Civil Engineer Center (AFCEC). The focal point for all Civil Engineer training development. All Force Development Managers (FDM) are located at AFCEC.

Air Force Institute of Technology (AFIT). Provides vital, relevant, and connected education that enables Airmen to be ready engineers and great leaders who know how to build sustainable installations to last while leading the change for the Civil Engineer career field. Course list can be accessed at http://www.afit.edu/cess/index.cfm.

Air Force Training Record (AFTR). Electronic training data base to document training and access is located at the CE-VLC.

Air Force Wage Grade Series Qualification Standard (AFWGSQS). A comprehensive task list that describes a particular series or duty position. Used by supervisors to document task qualifications. The tasks on the AFJQS are common to all persons serving in the described duty position.

Air Force Qualification Training Package (AFQTP). An instructional package designed for use as a training resource to qualify, or aid qualification, in a duty position or program, or on a piece of equipment. AFQTPs identify the Air Force's standardized method for performing the task. The AFQTP may be printed (paper-based), computer-based, in other audiovisual media formats, or all three.

Career Development Course (CDC). Self-paced, correspondence course published to provide the information necessary to satisfy the career knowledge component of on-the-job training (OJT). These courses are developed from references identified in the CFETP correlating with mandatory knowledge items listed in the Air Force Enlisted Classification Directory (AFECD). CDCs will contain information on basic principles, techniques, and procedures common to an AFSC. They do not contain information on specific equipment or tasks unless best illustrating a procedure or technique having utility to the entire AFSC.

CE Portal. The one-stop for all things Civil Engineering. Contains link to CE Force Development and Civilian Development Resource Center/Wage Grade Training Assets at: https://cs2.eis.af.mil/sites/10041/Pages/default.aspx.

Civil Engineer Virtual Learning Center (CE-VLC). Anytime, anyplace learning within the Civil Engineer Community consisting of instructional modules and skill-level awarding course material specific to the AFSC.

Commercial Off The Shelf (COTS). Commercially-procured training products.

Computer-Based Training (CBT). A self-paced stand-alone computer product used to deliver interactive subject and task knowledge.

Distance Learning (DL). Includes Video Tele-seminar (VTS), Video Tele-training (VTT), and CBT. Formal courses that a training wing or a contractor develops for export to a field location (in place of resident training) for trainees to complete without the on-site support of the formal school instructor. For instance, courses are offered by Air Force Institute of Technology, Air University, and Training Detachment.

Duty Position Tasks. Tasks identified by the workcenter supervisor as critical and common training tasks needed for the duty position and mission accomplishment.

Enlisted Professional Military Education (EPME). EPME provides a continuum of learning through progressive courses concentrated on developing airmanship and war-fighting skills. EPME plays a vital role in preparing Airmen for increased supervision, leadership, and management challenges. The three levels of Air Force EPME are Airman Leadership School, Noncommissioned Officer Academy and Air Force Senior Noncommissioned Officer Academy. EPME is available to Wage Grade civilians.

Functional Advisory Council Wage Grade Panel. The Wage Grade Panel is one of the three panels that make up the Civil Engineer Functional Advisory Council (FAC). The Wage Grade Panel charter is to work issues, develop policy, and provide recommendations to the FAC on matters related to civilian wage grade requirements. The Wage Grade Panel works through the FAC, in service to the CE Total Force community.

Just-in-Time (JIT) Training. Training required just prior to a selected deployment or tasking that delivers training necessary for mission accomplishment. It is typically predicated on hard-to-obtain contingency skill.

On-the-Job Training (OJT). Hands-on, over-the-shoulder training conducted to certify personnel in job qualification (duty position certification) training.

Proficiency Training. Additional training, either in-residence, advanced/supplemental training courses, or on-the-job training provided to personnel to increase their skills and knowledge beyond the minimum.

Regional Training Site (RTS). Total Force training centers managed by the Air National Guard.

Resource Constraints. Resource deficiencies, such as money, facilities, time, manpower, or equipment that precludes desired training from being delivered.

Wage Grade Series Training. A mix of formal training (technical school) and informal training (on-the-job) to maintain and enhance wage grade series specific technical skills.

Group Series Training Standard (GSTS). Describes skills and knowledge that Airmen in a particular job series need on the job and for future career development opportunities. It further serves as the overall training requirements for a Wage Series taught in the resident and

nonresident courses.

Total Force. All collective Air Force components (Active Duty, Reserve, Guard, and Civilian elements) of the United States Air Force.

Career Field Education and Training Plan (CFETP). A comprehensive, multipurpose document encapsulating the entire spectrum of education and training for various wage grade series. It outlines a logical growth plan that includes training resources and is designed to make job series training identifiable, to eliminate duplication, and to ensure this training is budget defensible.

PART I

SECTION A - GENERAL INFORMATION

A1. Purpose: This CFETP provides a formalized tool for supervisors and managers of civilian wage grade employees to ensure required knowledge and skill levels are achieved, documented, and maintained. The CFETP also indicates training opportunities and methods for employee to gain leadership and management experience for career development.

A1.1. The CFETP has several purposes:

A1.1.1. Serves as a management tool to plan, manage, conduct, and evaluate a wage grade series training program. It is used to help supervisors identify training at the appropriate point in an individual's career.

A1.1.2. Identifies task and knowledge training requirements for this wage grade series and recommends education/training throughout each phase of an individual's career.

A1.1.3. Lists training courses available in this wage grade series and identifies sources of training and the delivery methods. It is used as a tool for collecting and demonstrating the need for training resources.

A2. Uses. Managers and supervisors may use the plan at all levels to ensure comprehensive and cohesive training programs are available for each individual in the wage grade series.

A2.1. Wage Grade Panel of the Functional Advisory Council will develop/revise formal resident, non-resident, field, and exportable training based on requirements established by the users and documented in Part II of the CFETP. They will also work with the Air Force Civil Engineer Center Force Development Division (AFCEC/COF) to develop acquisition strategies for obtaining resources needed to provide the identified training.

A2.2. The Wage Grade Panel will ensure their training programs complement the CFETP training requirements and identify requirements that can be satisfied by OJT, resident training, contract training, or exportable courses.

A2.3. Supervisors guide each individual through completion of training specified in this plan.

A2.4. Each individual completes training requirements specified in this plan. The list of courses in Part II of this CFETP will be used as a reference to support training.

A3. Coordination and Approval. The Wage Grade Panel Chairs are the approval authority for the CFETP. The Wage Grade Panel will identify and coordinate on wage grade series training requirements. Using the list of courses in Part II, they will eliminate duplicate training

SECTION B - WAGE GRADE SERIES PROGRESSION AND INFORMATION

B1. Series Descriptions. See each individual's Core Personnel Document for the description.

B1.1**.** Wage Grade Series Summary. Installs, operates, maintains, and repairs heating, ventilation, air conditioning, and refrigeration (HVAC/R) systems, combustion equipment,

environmental control systems and industrial air compressors.

B2. Skill and Career Progression. Adequate training for progression from the apprentice to the mechanic level, and possibly into a supervisory position play an important role in the Air Force's ability to accomplish its mission. It is essential everyone involved in training do their part to participate in, plan, manage, and conduct effective training. The guidance provided in this part of the CFETP will identify viable training at appropriate points in an individual's career.

B2.1. Apprentice/Helper (A/H).

B2.1.1. Upon completion of initial skills training, an employee may work with a trainer to enhance their knowledge and skills to perform at the highest attainable level within their series.

B2.1.2. Utilize the Career Development Course (CDC) and other exportable courses for subject and task fundamentals in the series.

B2.1.3. Encourage apprentice/helpers to continue academic education and begin EPME by enrolling in Airman Leadership School either in-residence or by correspondence course.

B2.2. Journeyman (J).

B2.2.1. Journeymen may continue to advance their skills by completing additional training. Upon completing training, they may be assigned job positions such as team leader, trainer, or task certifier. Journeymen can pursue leadership training and skills in order to qualify for potential advancement to Work Leader or Work Supervisor positions.

B2.2.1.Encourage journeyman to enroll in the Noncommissioned Officer Academy (NCOA) either in-residence or by correspondence course.

B2.3. Craftsman (C).

B2.3.1. Craftsmen may continue to advance their skills by completing additional training. They may be assigned job positions such as team leader, trainer, or task certifier Craftsmen are encouraged to pursue leadership training and skills in order to qualify for potential advancement to Work Leader or Work Supervisor positions.

B2.3.2. Encourage craftsmen to continue academic education and complete Noncommissioned Officer Academy (NCOA) either in-residence or by correspondence course.

B2.3.3. A Master Craftsman is typically graded higher than WG-10 where skills, knowledge and abilities require higher technical abilities than standard craftsmen. They are duty/location specific and not for all job series.

B2.4. Work Leader (WL).

B2.4.1. A Work Leader can be expected to perform limited functions of a First Line Supervisor or act as a Team Lead.

B2.4.2. Completion of AFIT Civilian Supervisors Course (WMGT 571) is highly encouraged.

B2.4.3. Should pursue increased knowledge of budget, manpower, resources, and personnel management.

B2.4.4. Recommend pursuit of additional higher education and completion of courses outside of their job series for career broadening opportunities.

B2.4.5. Encourage Work Leader to continue academic education and complete Noncommissioned Officer Academy (NCOA) either in-residence or by correspondence course.

B2.5. First Line Supervisor.

B2.5.1. A supervisor can be expected to fill positions such as the Element Chief or Special Projects Supervisor.

B2.5.2. Completion of AFIT Civilian Supervisors Course (WMGT 571) is highly encouraged.

B2.5.3. Should pursue increased knowledge of budget, manpower, resources, and personnel management.

B2.5.4. Recommend pursuit of additional higher education and completion of courses outside of their job series for career broadening opportunities.

B2.5.5. Encourage supervisors to continue academic education and complete Senior Noncommissioned Officer Academy (SNCOA) by correspondence.

B3. Correspondence Course Directions. Nonresident attendance for professional military education courses is accomplished through the Air Force Portal.

B3.1. Login to the AF Portal (https://www.my.af.mil/).

B3.2. Copy and paste the URL https://www.my.af.mil/aurepmprod/auportal/welcome.AirUniversity into your browser.

B3.3. Create an account and/or login.

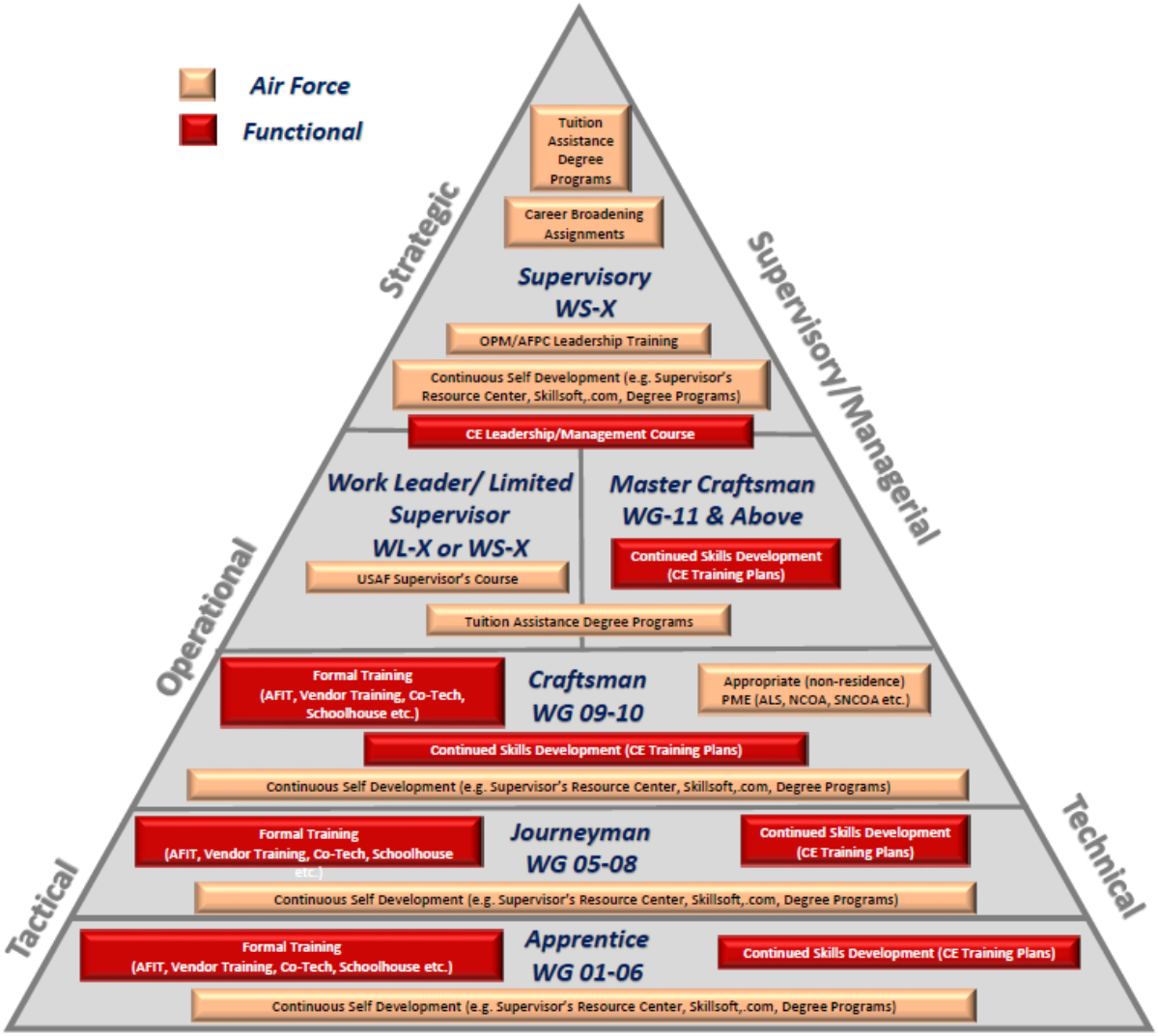
B3.4. Once logged in, "Distance Learning" on the left hand side.

B3.5. Select the appropriate course.

PART I

B4. Wage Grade Career Field Pyramid.

Figure 1.



PART II

SECTION A - GROUP SERIES TRAINING STANDARD

A1. **Purpose.** The CFETP is designed to be a tool for supervisors to use in assessing the skill level of current and new employees. The CFETP may be used to document training and proficiency of the employee on associated task/s by the supervisor or certified trainer.

A1.1. **Column 1 (*Tasks, Knowledge, and Technical References*).** Lists the most common tasks, knowledge, and supporting technical references (TR) necessary for Airmen to perform duties in the Apprentice, Journeyman, Craftsman, and Supervisor level.

A1.2. **Column 2 (*Tasks and Proficiency Codes*).** Identifies duty position tasks (series training requirements) with a proficiency code and indicates training requirements. It shows the proficiency to be demonstrated on the job by the employee as a result of training on the task, knowledge and the career knowledge provided by formal courses, CDC, distance learning (DL) web-based training (WBT) and AFQTPs. CDC listing maintained by the unit education and training manager for current CDC listings.

A1.3. **Column 3 (*Certification of Training*)**. Used to record completion of tasks and knowledge training requirements. Task certification requires the task to be trained by a trainer designated by the supervisor. The trainer can be either civilian or military. Use the automated training record application to document individual qualifications. The training start and completion date are documented, the task is signed by the trainee and either the workcenter supervisor, a Master Sergeant (or above) or the unit training manager. This action will complete the task certification.

Note: The "trainer" signing the record MUST be the workcenter supervisor, work leader, a Master Sergeant (or above) or the Unit Training Manager. This person does not necessarily train the task, but will ensure the training is conducted by a qualified trainer prior to completing task certification.

Note: If a workcenter supervisor, work leader, a Master Sergeant (or above) or the unit training manager are not available in a shop or unit to certify a task, the Operations Flight deputy commander will designate a certifier within the flight and grant the UTM role in AFTR so as to certify training tasks in AFTR. This person does not necessarily train the task, but will ensure the training is conducted by a qualified trainer prior to completing task certification.

A1.4. **Qualitative Requirements.** Contains the proficiency code key used to indicate the level of training and knowledge provided by WBT, resident training and career development courses.

A1.5. **Job Qualification Standard (JQS).** The Group Series Training Standard (GSTS) becomes the JQS for OJT when entries are made in the GSTS. For OJT, the tasks in Column 1 are trained and qualified to the go/no go level. "Go" means the individual can perform the task without assistance and meets local requirements for accuracy, timeliness, and correct use of procedures. AFQTPs, when available, shall be used to identify Air Force standardized procedures. When used as a JQS, the following requirements apply:

A1.5.1. **Documentation.** Document and certify completion of training.

A1.6. **Transcribing from previous versions to the new CFETP.** Most items should transcribe

automatically during the update of the new CFETP if AFTR is used to document training and certifications. The supervisor must conduct a review of the new GSTS to identify any new duty position tasks and add those tasks to their duty positions.

A1.6.1. **Previous training certification not listed.** If previous training certification is not listed in the individual record, select the parent task to be transcribed, check the task title(s) block, and click on the transcribe button. Enter the date of the original certification and sign off the task(s). The trainee will then sign off the task(s) to finalize the transcription of previous training certification.

A1.6.2. **Transcribing external training certification.** If a trainee attended a formal training course and received appropriate accreditation, select the 623 III section of the user's automated training record and locate the course title in the master task list, then enter the completion date. If the course title is not listed, contact the UTM to have it loaded from the master catalog. If it is not listed in the master catalog contact the Force Development Manager at AFCEC to have it loaded in the master catalog. Update MyBiz with additional training certificates through the self-certification process.

A1.6.3. **Training Standard.** Tasks are trained and certified to the "go" level. Go means the individual can perform the task without assistance and meets the local requirements for accuracy, timeliness, and correct use of procedures. AFQTPs, when available, shall be used to identify Air Force standardized procedures.

A2. Recommendations. This training plan is a living document. Comments and recommended changes are welcome. Recommendations for changes must be coordinated through the FDM and Functional Advisory Council (FAC) Wage Grade Panel for adjudication.

SECTION B - SUPPORT MATERIAL

B1. Air Force Qualification Training Packages.

B1.1. For a complete list of up-to-date AFQTPs applicable to the series, go to CE-VLC.

B1.2. The UTM or supervisor can download paper-based AFQTP's. Paper-based AFQTP's can be found on the CE-VLC under the Library link and then by selecting Resources.

B1.2.1. In addition to the paper-based AFQTPs there are web-based courses or assessments developed for certain tasks that are available on the CE-VLC under the Course List link and Group Series topic area.

B1.3. CDC listings are maintained by the unit education and training manager for current CDC listings.

PART II

SECTION C – EDUCATION AND TRAINING COURSE INDEX

C1. **Purpose**. This section of the CFETP identifies training courses available for HVAC systems series. Refer to Education and Training Course Announcements (ETCA) web site for information on the Air Force in-residence and mobile courses. The web site address is https://etca.randolph.af.mil/.

J8AQR3E131 00AA - Heating, Ventilation, Air Conditioning/Refrigeration (HVAC/R) Apprentice
J3ACR3E171 00AB - Heating, Ventilation, Air Conditioning/Refrigeration (HVAC/R) Craftsman

OFFICIAL

DAVID A. PERKINS, NH-04, DAF
Wage Grade Panel Co-Chair

GREGORY P. ZSEDENNY, WS-16, DAF
Wage Grade Panel Co-Chair

Attachments:
1. Qualitative Requirements (Proficiency Code Key)
2. Wage Grade Group Series Training Standard (GSTS)
3. Locally Developed Training Supplement

Attachment 1

This Block Is For Identification Purposes Only		
Name Of Trainee		
Printed Name (*Last, First, Middle Initial*)	**Initials (Written)**	
Printed Name Of Trainer/Training Official And Written Initials		
N/I	*N/I*	
N/I	*N/I*	
N/I	*N/I*	
N/I	*N/I*	
N/I	*N/I*	
N/I	*N/I*	
N/I	*N/I*	
N/I	*N/I*	

Explanations

- This mark is used to indicate training is provided in a formal course.

Behavioral Statement GSTS Coding System	
Code	Definition
K	Subject Knowledge Training - The verb selection identifies the individual's ability to identify facts, state principles, analyze, or evaluate the subject.
P	Performance Training - Identifies that the individual has performed the task to the satisfaction of the trainer/certifier; however, the individual may not be capable of meeting the field requirements for speed and accuracy.
pk	Performance Knowledge Training - The verb selection identifies the individual's ability to relate advanced facts, procedures, operating principles, and operational theory for the task.
-	Assumes element knowledge and/or proficiency at the higher level

Attachment 2

1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng Strt	Trng Com	Trne Init	Trnr Init
1. CIVIL ENGINEER (CE) CORE CONCEPTS COURSE TR: CE Virtual Learning Center (CE-VLC); AFDD 2-4-2; AFIs 10-209, 10-210, 10-211, 32-1022, 36-2101, 38-101, 51-903; Enlisted Classification Directory; AF PAM 32-1004 Vol 1-6; War Mobilization Plan (WMP) 1, Annex S								
1.1. Civil Engineer (CE) 3-Level Core Concepts Course	K	-	-	-				
1.2. Civil Engineer (CE) 7-Level Core Concepts Course			K	-				
2. HVAC/R SAFETY TR: AFOSH 91-501, NFPA 70E								
2.1. Electrical safety standards for AFS	K	-	-	-				
2.2. Remove victim from energized circuits	pk	-	-	-				
2.3. Apply first aid procedures for electrical shock	pk	-	-	-				
2.4. Arc flash safety	K	-	-	-				
3. HVAC/R PUBLICATIONS TR: Fundamentals of HVAC/R 2nd Ed AHRI								
3.1. Technical Orders and Manufacturer's Manuals		K	-	-				
3.2. Data Plate Specifications	K	-	-	-				
3.3. National/DoD Certification requirements		K	-	-				
4. TOOLS & TEST EQUIPMENT TR: TO's 32,33,34,35,38 series; Fundamentals of HVAC/R 2nd Ed AHRI								
4.1. Maintain and use tools (hand and powered)	pk	-	-	-				
4.2. Maintain and use precision measuring instruments		pk	-	-				
4.2.1. Digital temp sensors		pk	-	-				
4.2.2. Digital Hydrothermagraph		pk	-	-				
4.2.3. Oscilloscopes		pk	-	-				
4.2.4. Pyrometers		pk	-	-				
4.2.5. Anemometers		pk	-	-				
4.2.6. Gas Analyzers		pk	-	-				
4.2.7. Psycrometers		pk	-	-				
4.3. Maintain and use electrical test equipment								
4.3.1. Digital Multimeter	pk	-	-	-				
4.3.2. Analog Multimeter	pk	-	-	-				

Attachment 2

1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng Strt	Trng Com	Trne Init	Trnr Init
4.3.3. Ammeter	pk	-	-	-				
4.3.4. Signal Generators		pk	-	-				
4.3.5. F/O Copper Testers		pk	-	-				
4.4. Computer Equipment								
4.4.1 Laptop computer stations	pk	-	-	-				
5. PIPING/TUBING TR: Fundamentals of HVAC/R 2nd Ed								
5.1. Types & sizes	K	-	-	-				
5.2. Fittings	K	-	-	-				
5.3. Piping systems fabrication								
5.3.1. Fabricate piping and tubing	pk	-	-	-				
5.3.2. Install piping and tubing systems		pk	-	-				
5.4. Types and operation of valves	K	-	-	-				
5.5. Interpret system drawings	K	-	-	-				
6. BRAZING & SOLDERING TR: ASM Handbook V-6 Welding Brazing and soldering								
6.1. Theory of operation	K	-	-	-				
6.1.1. Acetylene equipment (air and hydrocarbon)	K	-	-	-				
6.1.2. Oxyacetylene equipment	K	-	-	-				
6.2. Use equipment								
6.2.1. Cut	P	-	-	-				
6.2.2. Braze and solder	P	-	-	-				
6.3 Maintain equipment		P	-	-				
7. HVAC/R PHYSICS TR: Fundamentals of HVAC/R 2nd Ed; AHRI Environmental Systems Technologies 2nd Ed; Principles of Refrigeration 5th Ed								
7.1. Structure of matter	K	-	-	-				
7.2. Energy (Stored, Nonstored, Conversion)	K	-	-	-				
7.3. Laws of thermodynamics	K	-	-	-				
7.4. Heat flow (Energy, Measurement, Transfer)	K	-	-	-				
7.5. Fluid flow (Properties, Statics, Dynamics)	K	-	-	-				
7.6. Psychrometrics	K	-	-	-				
7.6.1. Properties of air	K	-	-	-				
7.6.2. Air-vapor relationship	K	-	-	-				
7.6.3. Psychrometric Chart	K	-	-	-				
7.6.3.1. Terms	K	-	-	-				
7.6.3.2. Psychrometric processes								
7.6.3.2.1. Plot processes of conditioned air		pk	-	-				

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1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng	Trng	Trne	Trnr
					Strt	Com	Init	Init
7.6.3.2.2. Interpretation of plotted processes			K	-				
7.7. Load Calculations								
7.7.1. Calculate building heat load			pk	-				
7.7.2. Determine system requirements			pk	-				
8. AIR and HYDRONIC SYSTEMS TR: Environmental Systems Technology 2nd Ed; Trane Air Conditioning Manual; Principles of Refrigeration 5th Ed.; Refrigeration and Air Conditioning 4th Ed (ARI)								
8.1. Air Systems								
8.1.1. Principles of fans (types, ratings, motors, and drives)	K	-	-	-				
8.1.2. Principles of air distribution systems	K	-	-	-				
8.1.3. Constant Volume	K	-	-	-				
8.1.4. Variable Air Volume (VAV)	K	-	-	-				
8.1.5. Duct airflow characteristics	K	-	-	-				
8.1.6. Multi-zone	K	-	-	-				
8.1.7. Fan and system curve relationships			K	-				
8.1.8. Adjust dampers and linkages			pk	-				
8.1.9. Perform air balancing			pk	-				
8.1.10. System drawings	K	-	-	-				
8.2. Hydronic Systems								
8.2.1. Principles of hydronic distribution systems	K	-	-	-				
8.2.2. Pumps								
8.2.2.1. Types and construction features	K	-	-	-				
8.2.2.2. Install circulating pumps		P	-	-				
8.2.2.3. Adjust centrifugal water pump flow		P	-	-				
8.2.2.4. Replace packing on water pumps			P	-				
8.2.2.5. Replace mechanical seals/couplings			P	-				
12.2.2.6. Pump and system curve relationships	K	-	-	-				
8.2.3. Hydronic system flow								
8.2.3.1. Hydronic volume measurement (methods, interpretation)			pk	-				
8.2.3.2. Balance hydronic system			P	-				
8.2.4. Interpret system drawings			pk	-				
8.3. Associated Components and Equipment								
8.3.1. Coils (Types & Applications)								
8.3.1.1. Cooling	K	-	-	-				

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1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng Strt	Trng Com	Trne Init	Trnr Init
8.3.1.2. Heating	K	-	-	-				
8.3.1.3. Preheat	K	-	-	-				
8.3.1.4. Reheat	K	-	-	-				
8.3.2. Fan coil units	K	-	-	-				
8.3.3. Filters	K	-	-	-				
8.4. Perform Preventive Maintenance								
8.4.1. Inspect and replace drive belts		pk	-	-				
8.4.2. Adjust drive belt tension		P	-	-				
8.4.3. Adjust pulleys		P	-	-				
8.4.4. Clean strainers		P	-	-				
8.4.5. Clean air filters		P	-	-				
8.4.6. Inspect water valves for leaks		pk	-	-				
8.4.7. Inspect fan coil units		pk	-	-				
8.4.8. Clean air handlers	P	-	-	-				
8.4.9. Clean coils	P	-	-	-				
8.4.10. Service water pumps		P	-	-				
9. ELECTRICAL TR: ANSI Y32.2; 32-1064; National Electric Code (NFPA 70); National Electrical Safety Code Handbook; Fundamentals of HVAC/R 2nd Ed AHRI								
9.1. Principles of electricity (AC and DC)	K	-	-	-				
9.2. Types of circuits								
9.2.1. Line Circuit	K	-	-	-				
9.2.2. Load Circuit	K	-	-	-				
9.2.3. Control Circuit (110/208vt)	K	-	-	-				
9.3. Relationship of current, voltage, and resistance in circuits	K	-	-	-				
9.4. Wiring Diagrams	K	-	-	-				
9.5. Wiring Requirements								
9.5.1. Supply Voltage		K	-	-				
9.5.2. Wiring color code		K	-	-				
9.5.3. Wire sizes			K	-				
9.5.4. Distribution Panels			K	-				
9.6. Protective devices								
9.6.1. Circuit Breakers	K	-	-	-				
9.6.2. Fuses	K	-	-	-				
9.6.3. Ground Fault Current Interrupters (GFCI)	K	-	-	-				
9.7. Devices								
9.7.1. Switches	K	-	-	-				
9.7.2. Receptacles	K	-	-	-				
9.7.3. Timers	K	-	-	-				
9.7.4. Transformers	K	-	-	-				

Attachment 2

1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng Strt	Trng Com	Trne Init	Trnr Init
9.7.5. Types and principles of electromagnetic devices (relays, contactors, and across-the-line starters)		K	-	-				
9.8. Motors								
9.8.1. Single phase and three phase	K		-	-				
9.8.2. Replace motors		P	-	-				
9.8.3. Perform operational test			pk	-				
9.8.4. Align pulleys/couplings			P	-				
9.8.5. Electrically connect (single-phase and three phase)		pk	-	-				
9.8.6. Reverse rotation of electric motors		pk	-	-				
9.8.7. Measure motor current draw		P	-	-				
9.8.8. Service electrical motors		pk	-	-				
9.9. Types and principles of motor controllers and variable frequency drives			K	-				
9.10. Repair Components								
9.10.1. Troubleshoot electrical circuits and components			pk	-				
9.10.2. Correct malfunctions			pk	-				
9.11. Solder electrical connections			P	-				
10. HVAC CONTROL SYSTEMS TR: AFMAN 32-1093; Fundamentals of HVAC/R 2nd Ed AHRI								
10.1. Types								
10.1.1. Pneumatic HVAC Control	K	-	-	-				
10.1.2. Electrical HVAC Control	K	-	-	-				
10.1.3. Electronic HVAC Control	K	-	-	-				
10.1.4. Constant Air Volume (CAV)	K	-	-	-				
10.1.5. Variable Air Volume (VAV)	K	-	-	-				
10.1.6. Direct Digital Control (DDC)	K	-	-	-				
10.2. Components								
10.2.1. Frequency drives	K	-	-	-				
10.2.2. Principles of operation	K	-	-	-				
10.2.3. Perform preventive maintenance		pk	-	-				
10.3. Repair Components								
10.3.1. Troubleshoot			pk	-				
10.3.2. Correct Malfunctions			P	-				
10.4. Calibrate and adjust control circuits								
10.4.1. Controls Physics	K	-	-	-				
10.4.1.1. Boolean Math Logic			pk	-				
10.4.1.2. Truth Table			pk	-				
10.4.1.3. Logic Circuits			K	-				
10.4.1.4. Component Timing			pk	-				
10.4.1.5. Microprocessors/PLC's,			pk	-				
10.4.1.6. Amplified Control Circuits			pk	-				

Attachment 2

1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng Strt	Trng Com	Trne Init	Trnr Init
10.5. System/Subsystem control								
10.6. Subsystem control strategies			K	-				
10.6.1. Naming Conventions			K	-				
10.7. Perform system changes			K	-				
10.7.1. Programing			pk	-				
10.7.2. Motion and timing			pk	-				
10.7.3. Loop Tuning			pk	-				
10.8. Energy monitoring & control systems (EMCS) operating principles and components								
10.8.1. Energy Reports		K	-	-				
10.8.2. Trending		pk	-	-				
10.8.3. Alarming		pk	-	-				
10.8.4. Reporting/Metering			K	-				
10.9. Computer Systems								
10.9.1. Administrative Privileges			K	-				
10.9.2. Network Security			K	-				
10.9.3. Encryption Standards			K	-				
10.9.4. Network Topologies			K	-				
10.9.5. Principles of Network Distribution Cabling		K	-	-				
10.9.6. Software Programing			pk	-				
10.9.7. Communications			pk	-				
10.9.7.1. BACnet, Modbus,		K	-	-				
10.9.7.2. Wireless		K	-	-				
10.9.7.3 Point/Multi Point to Point		K	-	-				
11. HEATING & HOT WATER SYSTEMS TR: ASHRAE Std 14								
11.1. Characteristics of fuels (oil, gas)	K	-	-	-				
11.2. Types and principles of fuel systems	K	-	-	-				
11.3. Environmental concerns	K	-	-	-				
11.4. Inspect systems for leaks		pk	-	-				
11.5. Install and maintain fuel lines		pk	-	-				
12. BURNERS								
12.1. Construction features and operation of burners (oil and gas)	K	-	-	-				
12.2. Properties of combustion	K	-	-	-				
12.3. Combustion analyzers		pk	-	-				
12.4. Perform pre-operational inspections		pk	-	-				
12.5. Perform operational test			P	-				
12.6. Perform combustion analysis			P	-				
12.7. Compute combustion efficiency			pk	-				
12.8. Adjust fuel/air ratio for proper combustion efficiency			P	-				
12.9. Perform recurring maintenance		P	-	-				
12.10. Repair components								

Attachment 2

1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng Strt	Trng Com	Trne Init	Trnr Init
12.10.1. Troubleshoot			pk	-				
12.10.2. Correct malfunctions			P	-				
12.10.3. Environmental requirements	K	-	-	-				
12.10.4. Electronic linkageless burner			P	-				
12.10.4.1. Install			P	-				
12.10.4.2. Set-up			pk	-				
12.10.4.3. Troubleshoot			pk	-				
12.10.4.4. Adjust efficiency			pk	-				
13. FORCED AIR AND RADIANT HEATING								
13.1. Types and operation	K	-	-	-				
13.2. Perform Pre-operational Inspection		pk	-	-				
13.3. Perform operational test		pk	-	-				
13.4. Preventive maintenance		pk	-	-				
13.5. Repair								
13.5.1. Troubleshoot		pk	-	-				
13.5.2. Correct malfunctions		P	-	-				
13.6. High efficiency condensing furnace								
13.6.1. Install		P	-	-				
13.6.2. Troubleshoot and repair			pk	-				
13.6.3. Preventive Maintenance			pk	-				
13.7. Portable Oil Fired Heaters								
13.7.1. Set-up		pk	-	-				
13.7.2. Troubleshoot and repair			pk	-				
13.7.3. Preventive maintenance		pk	-	-				
13.8. Radiant Heating								
13.8.1. Types	K	-	-	-				
13.8.2. Operation	K	-	-	-				
13.8.3. Perform pre-operational inspection		pk	-	-				
13.8.4. Perform operational test		pk	-	-				
13.8.5. Troubleshoot			pk	-				
13.8.6. Correct malfunctions			P	-				
13.8.7. Preventive maintenance		pk		-				
14. STEAM GENERATION								
14.1. Properties of steam	K	-	-	-				
14.2. Principles of distribution systems	K	-	-	-				
14.3. Principles of boilers (fire tubes, water	K	-	-	-				
14.4. Construction features of boilers	K	-	-	-				
14.5. Auxiliary equipment (feedwater	K	-	-	-				
14.6. Perform pre-operational inspection		pk	-	-				
14.7. Perform operational test		pk	-	-				
14.8. Perform preventive maintenance		pk	-	-				
14.9. Repair boilers and/or auxiliary								
14.9.1. Troubleshoot			pk	-				
14.9.2. Correct malfunctions			P	-				

Attachment 2

1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng Strt	Trng Com	Trne Init	Trnr Init
14.9.3. Replace/remove boiler sections			P	-				
14.10. Prepare boiler for inspection (Types			pk	-				
14.11. High efficiency condensing boilers								
14.11.1. Install			P	-				
14.11.2. Troubleshoot and repair			pk	-				
14.11.3. Perform maintenance			pk	-				
14.11.4. Function and maintenance of flue		pk	-	-				
14.12. In floor heating systems								
14.12.1. Repair and troubleshoot			pk	-				
14.13. Sidewalk heating systems								
14.13.1. Repair and troubleshoot			pk	-				
15. AIR CONDITIONING & REFRIGERATION SYSTEMS TR: Fundamentals of HVAC/R 2nd Ed AHRI; Modern Refrigeration and Air Conditioning, 19th Ed								
15.1. Refrigerants (types and uses)	K	-	-	-				
15.2. Oils (types and uses)	K	-	-	-				
15.3. Universal Certification	pk	-	-	-				
15.4. Process refrigerants for air								
15.4.1. Locate refrigerant leaks		P	-	-				
15.4.2. Recover and recycle refrigerant		P	-	-				
15.4.3. Pump down system		P	-	-				
15.4.4. Pressure check system		P	-	-				
15.4.5. Charge system		pk	-	-				
15.4.6. Retrofit with alternative			pk	-				
15.5. Basic refrigeration cycle	K	-	-	-				
15.6. Principles of Operation &								
15.6.1. Components								
15.6.1.1. Compressors (reciprocating,	K	-	-	-				
15.6.1.2. Evaporators (direct and indirect	K	-	-	-				
15.6.1.3. Condensers (air and water	K	-	-	-				
15.6.1.4. Cooling towers	K	-	-	-				
15.6.1.5. Metering devices/flow controls	K	-	-	-				
15.6.1.6. Accessories	K	-	-	-				
15.6.1.7. Capacity control	K	-	-	-				
15.6.2. Refrigeration systems								
15.6.2.1. Commercial	K	-	-	-				
15.6.2.2. Ice machines	K	-	-	-				
15.6.2.3. Cold storage	K	-	-	-				
15.6.3. Air conditioning systems								
15.6.3.1. Package units	K	-	-	-				
15.6.3.2. Split systems	K	-	-	-				
15.6.3.3. Heat pumps	K	-	-	-				

Attachment 2

1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng	Trng	Trne	Trnr
					Strt	Com	Init	Init
15.6.3.4. Industrial systems								
15.6.3.4.1. Reciprocating chiller	K	-	-	-				
15.6.3.4.2 Centrifugal chiller	K	-	-	-				
15.6.3.4.3. Screw chiller	K	-	-	-				
15.6.3.4.4. Scroll chiller	K	-	-	-				
15.6.3.5. Equipment cooling	K	-	-	-				
15.7. Calculate and adjust superheat			pk	-				
15.8. Calculate subcooling		pk	-	-				
15.9. Plot pressure enthalpy chart			pk	-				
15.10. Use pressure-temperature charts		pk	-	-				
15.11. Perform pre-operational inspection		pk	-	-				
15.12. Perform operational test			pk	-				
15.13. Perform preventive maintenance		pk	-	-				
15.13.1. Perform Acid/Moisture Test		pk	-	-				
15.13.2. Indirect Expansion System	K	-	-	-				
15.13.2.1. Geo-thermal	K	-	-	-				
15.13.2.2. Chillers	K	-	-	-				
15.14. Plot Pressure Enthalpy Chart			pk	-				
15.16. Repair								
15.16.1. Troubleshoot			pk	-				
15.16.2. Correct malfunctions			P	-				
16. AIR COMPRESSING EQUIPMENT (non-aircraft generation/non-breathable) TR: AFI 32-1068)								
16.1. Types of systems	K	-	-	-				
16.2. Construction features and	K	-	-	-				
16.3. Perform pre-operational inspection		pk	-	-				
16.4. Perform operational test		pk	-	-				
16.5. Perform preventive maintenance		pk	-	-				
16.6. Repair								
16.6.1 Troubleshoot			pk	-				
16.6.2. Correct malfunctions			P	-				
17. WATER TESTING & TREATMENT TR: AFI 32-1054; BETZ Handbook of Industrial Water Conditioning; Principles of Industrial Water Treatment 9th Ed								
17.1. Water characteristics	K	-	-	-				
17.2. Purpose and types of tests	K	-	-	-				
17.3. Internal treatment methods								
17.3.1. Determine and adjust water levels		pk	-	-				
17.3.2. Determine and adjust treatment		pk	-	-				
17.3.3. Determine and adjust		pk	-	-				

Attachment 2

1. Tasks, Knowledge and Technical References	2. Duty Position Tasks and Proficiency Codes				3. Certification of Training			
	A/H	J	C/WL	S	Trng Strt	Trng Com	Trne Init	Trnr Init
17.4. External treatment methods								
17.4.1. Chemical feeding	K	-	-	-				
17.4.2. Environmental requirements	K	-	-	-				
17.4.3. Glycol characteristics	K	-	-	-				
17.4.3.1. Chemical constituents (pH,	K	-	-	-				
17.4.4. Perform water treatment		P	-	-				
18. CIVILIAN SUPERVISION								
18.1. Civilian Supervisor Course				X				
18.2. WMGT 571 Course				X				
ANY ADDITIONAL REQUIREMENTS CAN BE ADDED HERE								

Attachment 3

Locally Developed Training Supplement