

**American Council on Education
College Credit Recommendation Service**

**UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE
PLUMBING AND PIPEFITTING INDUSTRY OF THE US & CANADA
LOCAL NO. 9 TRAINING CENTER
450 ROUTES 33 AND IRON ORE ROAD
ENGLISHTOWN, NJ 07726**

NOVEMBER 16-18, 2005

**Review Conducted By
Thomas Edison State College
Trenton, New Jersey**

**UNITED ASSOCIATION OF JOURNEYMEN AND
APPRENTICES OF THE
PLUMBING AND PIPEFITTING INDUSTRY
OF THE US & CANADA**

The United Association is predominantly a craft union, with nearly 90 percent of its active membership employed in the construction industry. Work performed by members includes construction, renovation, expansion and repair of facilities in every sector of the economy. Members perform high purity process piping installations in pharmaceutical, chemical and semiconductor plants. They install piping systems, plumbing fixtures, heating, air conditioning and ventilation systems and power generation facilities.

Their work is also found in schools, libraries and other government buildings, as well as single-family homes, hotels, high-rise apartment buildings, condominiums and virtually every place that people live, work and play. The United Association also provides comprehensive training for apprentices, journeymen and trade teachers through fully-accredited institutions of higher learning.

This is a formal program that provides not only industry-accepted certifications for pipe trades workers, but also allows members to pursue Associate's, Bachelor's and Master's degrees in a variety of subject areas.

Source of Official Student Records: Registry of Credit Recommendations, American Council on Education, One Dupont Circle, Washington, DC 20036-1193.

Additional information about the courses: Office of Corporate Higher-Education Programs, Thomas Edison State College, 101 West State Street; Trenton, New Jersey 08608-1176, (609) 633-6271; corpinfo@tesc.edu .

ACE/College Credit Recommendation Service Evaluation
Conducted By
Thomas Edison State College

For

UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE
PLUMBING AND PIPEFITTING INDUSTRY OF THE US & CANADA

on

November 16-18, 2005

Review Team Members:

Prof. Alkis W. Dimopoulos
Lecturer of Civil Engineering
School of Computer Sciences &
Engineering
Fairleigh Dickinson University
Teaneck, New Jersey

Dr. Timothy R. Jacobsen
Director of Aquaculture Technology
Program
Cumberland County College
Vineland, New Jersey

Dr. Janet Paulson-Smith
National Education Director
National Institute for Construction Excellence
Overland Park, Kansas

Dr. Dilip Trikamji Shah
Associate Professor
Department of Construction
Management and Safety,
School of Technology
North Carolina A&T State University
Greensboro, North Carolina

ACE Coordinator:

Mr. Dan Negrón
Director
Corporate-Higher Education Programs
Thomas Edison State College
Trenton, New Jersey

UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE
PLUMBING AND PIPEFITTING INDUSTRY OF THE US & CANADA

November 16-18, 2006

Index of Course Exhibits

Page #	Title/Course Number	Credit Recommendation	Dates
9.	Advanced Plan Reading & Related Drawing I	*	September 1995-Present
10.	Advanced Plan Reading & Related Drawing II (Plumbers)	3 LL	September 1995-Present
11.	Advanced Plan Reading & Related Drawing II (Pipefitters)	Ver. 1: 2 LL Ver. 2: 3 LL	September 2006-Present September 2006-Present
12.	Air Conditioning	*	September 1995-Present
13.	AutoCAD	4 LL	September 1995-Present
14.	Backflow Prevention and Cross-Connection Control	Ver. 1: 2 LL Ver. 2: 3 LL	September 1995-August 2006 September 2006-Present
15.	Basic Electricity	2 LL	September 1995-Present
16.	Blueprint Interpretation & Quantity Takeoff I	1 LL	September 2006-Present
17.	Blueprint Interpretation & Quantity Takeoff II	2 LL	September 2006-Present
18.	Certified Medical Gas Systems Installers & Brazer Qualification	Ver. 1: 1 LL Ver. 2: 3 LL	September 1995-August 2006 September 2006-Present
19.	Conservation and Safe Handling of Refrigerants	1 LL	September 1995-Present
20.	Drainage	2 UL/LL	September 1995-August 2006
21.	Drawing Interpretation and Plan Reading I	1 LL	September 1995-August 2006

*Course must be taken in combination with other courses to receive the credit recommendation. For detailed information on course combination; see credit recommendation description on the course exhibit.

UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE
PLUMBING AND PIPEFITTING INDUSTRY OF THE US & CANADA

November 16-18, 2006

Index of Course Exhibits
(continued)

Page #	Title/Course Number	Credit Recommendation	Dates
22.	Drawing Interpretation and Plan Reading II	2 LL	September 1995-August 2006
23.	Electric Controls for Mechanical Equipment Service Part I	2 LL	September 1995-Present
24.	Electric Controls for Mechanical Equipment Service Part II	3 LL	September 1995-Present
25.	Gas Installations	2 LL	September 1995-Present
26.	Gas Tungsten Arc Welding	3 LL	September 1995-Present
27.	A Guide to Service Work I	2 LL	September 1995-August 2006
28.	A Guide to Service Work II	3 LL	September 1995-August 2006
29.	Heritage	3 LL	September 2006-Present
30.	Hydronic Heating and Cooling	*	September 1995-Present
31.	Instrumentation and Process Control	Ver. 1: 2 LL Ver. 2: 3 LL	September 1995-August 2006 September 2006-Present
32.	Introduction to Start, Test and Balance	1 LL	September 1995-Present
33.	Introduction to Safety and Health	1 LL	September 2006-Present
34.	Job Safety and Health, OSHA Smart Mark	1 LL	September 1995-August 2006
35.	Leadership Course	Ver. 1: 2 UL Ver. 2: 3 UL	September 1995-August 2006 September 2006-Present
36.	On The Job Training 1 st Year Plumbing/Pipefitting	3 LL	September 1995-Present
38.	On The Job Training 2nd Year Plumbing/Pipefitting	3 LL	September 1995-Present

*Course must be taken in combination with other courses to receive the credit recommendation. For detailed information on course combination, see credit recommendation description on the course exhibit.

UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE
PLUMBING AND PIPEFITTING INDUSTRY OF THE US & CANADA

November 16-18, 2006

Index of Course Exhibits
(continued)

Page #	Title/Course Number	Credit Recommendation	Dates
39.	On the Job Training 3 rd Year Field Experience-Pipefitter	3 LL	September 1995-Present
41.	On the Job Training 3 rd Year Field Experience –Plumber	3 LL	September 1995-Present
42.	On The Job Training 4 th Year Field Experience-Pipefitter	3 LL	September 1995-Present
44.	On The Job Training 4 th Year Field Experience-Plumber	3 LL	September 1995-Present
45.	On The Job Training 5 th Year Field Experience-Pipefitter	3 LL	September 1995-Present
47.	On The Job Training 5 th Year Field Experience-Plumber	3 LL	September 1995-Present
49.	Oxy Fuel Cutting & Welding and Shielded Metal Arc Welding I	*	September 1995-Present
50.	Oxy Fuel Cutting & Welding and Shielded Metal Arc Welding II	*	September 1995-Present
51.	Personnel Management in Service Work I	2 LL	September 2006-Present
52.	Pipe, Fittings, Valves, Supports and Fasteners	*	September 1995-Present
53.	Plumbing Code	3 LL	September 1995-Present
54.	Plumbing Fixtures and Appliances	3 LL*	September 1995-Present
55.	Project Management in Service Work II	3 LL	September 2006-Present

*Course must be taken in combination with other courses to receive the credit recommendation. For detailed information on course combination, see credit recommendation description on the course exhibit.

UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE
PLUMBING AND PIPEFITTING INDUSTRY OF THE US & CANADA

November 16-18, 2006

Index of Course Exhibits
(continued)

Page #	Title/Course Number	Credit Recommendation	Dates
56.	Pumps	*	September 1995-Present
57.	Refrigeration	6 UL/LL*	September 1995-Present
58.	Related Math II	3 LL	September 1995-Present
59.	Related Math III	1 LL	September 1995-Present
60.	Related Sciences	*	September 1995-Present
61.	Rigging	Ver. 1: 1 LL Ver. 2: 3 LL	September 1995-August 2006 September 2006-Present
62.	Shielded Metal-Arc Welding Leading to Certification	*	September 1995-Present
63.	Soldering and Brazing	8 LL*	September 1995-Present
64.	Steam Systems	6 LL*	September 1995-Present
65.	Use and Care of Tools	*	September 1995-Present
66.	Valve Repair Training	3 LL*	September 1995-Present
67.	Water Resources	3 UL/LL	September 2006-Present
68.	Water Supply	6 LL*	September 1995-Present

Total Courses - 55
Total Credits - 120-128

*Course must be taken in combination with other courses to receive the credit recommendation. For detailed information on course combination, see credit recommendation description on the course exhibit.

UNITED ASSOCIATION OF JOURNEYMEN AND APPRENTICES OF THE
PLUMBING AND PIPEFITTING INDUSTRY OF THE US & CANADA

November 16-18, 2006

Course combinations
for credit recommendations

<u>Course Name</u>	<u>Credit Recommendation</u>
1) Advanced Plan Reading & Related Drawing I	3 LL in Blueprint Reading & Quantity Takeoff II
2) Advanced Plan Reading & Related Drawing II (Plumbers)	
1) Air Conditioning	3 UL/LL in Thermodynamics I & 3 UL/LL in Thermodynamics II for a total of 6 semester hours
2) Hydronic Heating and Cooling	
3) Refrigeration	
1) Oxy Fuel Cutting & Welding and Shielded Metal Arc Welding I	4 LL in Oxy-fuel Fabrication Methods and 4 LL in Arc Welding Fabrication Methods, for a total of 8 semester hours
2) Oxy Fuel Cutting & Welding and Shielded Metal Arc Welding II	
3) Shielded Metal Arc Welding Leading to Certification	
4) Soldering and Brazing	
1) Pipe, Fittings, Valves, Supports and Fasteners	3 LL in Plumbing Fixtures
2) Plumbing Fixtures and Appliances	
1) Pumps	For Plumbers: 3 LL in Fluid Mechanics I and 3 LL in Fluid Mechanics II, for a total of 6 semester hours
2) Related Sciences	
3) Water Supply	
1) Pumps	For Pipefitters: 3 LL in Fluid Mechanics I and 3 LL in Fluid Mechanics II, for a total of 6 semester hours
2) Related Sciences	
3) Steam Systems	
1) Use and Care of Tools	3 LL in Care and Maintenance of Valves
2) Valve Repair Training	

Credit Recommendation

Course: Advanced Plan Reading & Related Drawing I

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 36 Hours

Date(s): September 1995 - Present

Objective: To train the student in advanced plan reading skills.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how the various trades must coordinate their respective plans to insure accurate and timely installations; create a time calendar from plans reflecting installation sequences; understand how the sequencing of the various trades installations affect the piping installation and the ability to produce field installation sketches from coordinated building plans.

Instruction: Major topics covered in the course are: Advanced Plan Reading and Sketching. Methods of instruction include: lecture and lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Blueprint Reading and Quantity Takeoff II (11/05). Note: Students must complete the following courses: *Advanced Plan Reading & Related Drawing I* and *Advanced Plan Reading and Related Drawing II (Plumbers)* to receive the credit recommendation.

Credit Recommendation

Course: Advanced Plan Reading & Related Drawing II (Plumbers)

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: *Version 1:* 36 Hours; *Version 2:* 45 Hours

Date(s): *Version 1:* September 1995 – August 2006; *Version 2:* September 2006 - Present

Objective: To train the student in the most complicated use of plans and specifications.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand plumbing systems drawings; understand how specifications are formulated and applied; coordinate piping plans with structural, architectural and other sub-contractor crafts to avoid conflicts; describe how computer aided drawing (CAD) is fast becoming the norm rather than the exception on jobs; prepare a slot and sleeve drawing to make the installation of the piping system easier.

Instruction: Major topics covered in the course are: (*Version 1*) Sleeve Drawing and Deck Layout, Drawing Coordination and Piping Systems Design and Computer Aided Drafting. (*Version 2*) Additional topic: Quantity Takeoff of pipe, fittings, and appurtenances. Methods of instruction include: lecture and lab. Evaluation criteria include examinations.

Credit Recommendation: (*Version 1*) In the lower division baccalaureate/associate degree category, 3 semester hours in Blueprint Reading and Quantity Takeoff II (11/05). Note: Students must complete the following courses: *Advanced Plan Reading & Related Drawing I* and *Advanced Plan Reading and Related Drawing II (Plumbers)* to receive the credit recommendation. (*Version 2*) In the lower division baccalaureate/associate degree category, 3 semester hours in Blueprint Reading and Quantity Takeoff II (11/05).

Credit Recommendation

Course: Advanced Plan Reading & Related Drawing II (Pipefitters)

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: *Version 1:* 42 Hours; *Version 2:* 45 Hours

Date(s): *Version 1 & 2:* September 2006 - Present

Objective: To train the student in the most complicated use of plans and specifications.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand mechanical systems drawings; understand how specifications are formulated and applied; coordinate piping plans with structural; architectural and other sub-contractor crafts to avoid conflicts; describe how computer aided drawing (CAD) is fast becoming the norm rather than the exception on jobs; prepare a slot and sleeve drawing to make the installation of the piping system easier.

Instruction: Major topics covered in the course are: (*Version 1*) Sleeve Drawing and Deck Layout, Drawing Coordination and Piping Systems Design and Computer Aided Drafting. Methods of instruction include: lecture and lab. Evaluation criteria include examinations. (*Version 2*) Includes additional topic: Quantity takeoff of pipe, fittings and appurtenances.

Credit Recommendation: (*Version 1*) In the lower division baccalaureate/associate degree category, 2 semester hours in Blueprint Reading and Quantity Takeoff II (11/05). (*Version 2*) In the lower division baccalaureate/associate degree category, 3 semester hours in Blueprint Reading and Quantity Takeoff II (11/05).

Credit Recommendation

Course: Air Conditioning

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 42 Hours

Date(s): September 1995 to Present

Objective: To train the student in proper installation of air conditioning equipment and piping.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how to install piping and equipment for comfort control air-conditioning systems in residential and commercial applications; explain how the new types of energy saving equipment such as variable frequency drive motors are more efficient; describe the psychrometric charts and how they influence system design and installation; troubleshoot and repair the different types of air conditioning equipment and piping.

Instruction: Major topics covered in the course are: Fundamentals of Air Conditioning, Review of Basic Science, Properties of Air, Principles of Heat Transfer, Heat Flow through Building Construction, Infiltration, ventilation and Moisture flow, Human Comfort, Heat Losses and Heat Gains, Heating and Cooling Loads, Psychrometric Charts, General Applications of Psychrometrics, Psychrometrics of the Conditioned Air Supply, Cooling and Heating Coils, Energy Conservation Applications of Refrigeration Equipment, Heat Pumps, Air Conditioning Equipment Combinations, Automatic Controls, Single Path All Air Systems, Multipath All Air Systems and Air and Water and All-Water Systems. Method of instruction include: lecture. Evaluation criteria includes examinations.

Credit Recommendation: : In the upper division baccalaureate degree category or in the lower division baccalaureate/associate degree category, 3 semester hours in Thermodynamics I and 3 semester hours in Thermodynamics II, for a total of 6 semester hours (11/05). Note: Students must complete the following courses to receive the credit recommendation: *Air Conditioning, Hydronic Heating and Cooling-Pipefitter and Refrigeration.*

Credit Recommendation

Course: AutoCAD

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 66 Hours

Date(s): September 1995 - Present

Objective: To train the student in basic CAD skills.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how CAD is fast becoming more and more popular on construction sites; draw a piping system using CAD software; describe how to insert fittings from manufacturers websites; coordinate piping drawings and construction drawings electronically.

Instruction: Major topics covered in the course are: Creating a Simple Drawing, Making Your Drawings More Precise, Drawing Organization & Information, Creating More Complex Objects, Preparing to Print, Annotating Your Drawing, Productivity Tools, Creating and Organizing Blocks and Drawing Setup and Utilities. Methods of instruction include: Lecture/Lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 4 semester hours in AutoCAD (11/05).

Credit Recommendation

Course: Backflow Prevention and Cross-Connection Control

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: *Version 1:* 40 Hours; *Version 2:* 56 Hours (32 Hours-lecture; 24 Hours-lab)

Date(s): *Version 1:* September 1995 – August 2006; *Version 2:* September 2006 - Present

Objective: To make the student become a certified installer and tester of backflow prevention devices.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand what backflow and back pressure are and how to deal with each to prevent contamination of the potable water supply; design and install the proper device to deal with the specific hazard posed by potential contaminants; describe the various components of backflow preventers and their operation; demonstrate the ability to test vacuum breakers, double check valves and reduced pressure zone backflow preventers.

Instruction: Major topics covered in the course are: Introduction, Laws and Regulations, Definitions, Public Health Significance of Cross-Connection, Principles of Backflow, Backpressure and Backsiphonage, Methods, Devices, and Approved Assemblies, Thermal Expansion, Safety, Test Procedures, Maintenance, Repair and Troubleshooting, Cross-Connection Control Surveys, Documentation and Record Keeping, and Establishing and Implementing a Cross-Connection Control Program/Ordinance. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: (*Version 1*) In the baccalaureate/associate degree category, 2 semester hours in Backflow Prevention and Cross-Connection Control (11/05). (*Version 2*) In the baccalaureate/associate degree category, 3 semester hours in Backflow Prevention and Cross-Connection Control (11/05).

Credit Recommendation

Course: Basic Electricity

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 36 Hours

Date(s): September 1995 - Present

Objective: To make the student aware of the electrical principles used in the piping industry.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand electrical circuits and laws pertaining to them, identify electrical devices and their use in piping systems, describe a basic electrical circuit and wire it and demonstrate the analysis of an electrical circuit using a multimeter to measure watts, volts, amperage and resistance

Instruction: Major topics covered in the course are: Electrical Safety, Fundamentals of Electricity, producing electricity, magnetism and electricity, electromagnetism, fundamentals of electric circuits, electric power and energy, direct current series and parallel circuits, compound circuits, electrical conductors and wiring methods, alternating current, inductance and capacitance, alternating current systems, transformers, alternating current motors, motor controls and alternating current meters and instruments. Method of instruction includes: lecture. Evaluation criteria include examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 2 semester hours in Basic Electricity (11/05).

Credit Recommendation

Course: **Blueprint Interpretation and Quantity Takeoff I**

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 30 Hours

Date(s): September 2006 - Present

Objective: To make the student aware of how drawings can convey information about piping systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the language of standard drawing symbols; identify the various lines and drawing formats; describe the tools used to produce drawings; demonstrate drawing various objects from different points of view.

Instruction: Major topics covered in the course are: Introduction to Basic Drawing Tools, Measuring Tools and Lettering Skills, Three-View, Plan View and Elevation View Drawings, Graphic Symbols for Pipe Fittings and Valves, Interpretation of Technical Drawings. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 1 semester hour in Drawing and Plan Reading I (11/05).

Credit Recommendation

Course: **Blueprint Interpretation and Quantity Takeoff II**

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 48 Hours

Date(s): September 2006 - Present

Objective: To make the student aware of how drawings can convey information about piping systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand standard drawing symbols and building specifications; identify the various drawing formats such as plan, elevation and isometric; describe tools used to produce drawings and demonstrate how to read drawings properly.

Instruction: Major topics covered in the course are: Interpretation of Isometric Drawings, Interpretation of Piping Drawings, Interpretation of Building Plans, and Building Specifications. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 2 semester hours in Drawing and Plan Reading II (11/05).

Credit Recommendation

Course: Certified Medical Gas Systems Installers & Brazier Qualification

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: *Version 1:* 40 Hours; *Version 2:* 80 Hours (40 Hours-lecture; 40 Hours-Lab)

Date(s): *Version 1:* September 1995 – August 2006; *Version 2:* September 2006 - Present

Objective: To make the student a certified installer of Medical Gas Systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how medical gas systems are designed and installation practices; explain the testing criteria to insure an efficient and safe medical gas system; describe the valves and controls for a system to comply with NFPA 2003; demonstrate proper brazing techniques to qualify for ASME accreditation.

Instruction: Major topics covered in the course are: Administration, Referenced Publications, Definitions, Gas and Vacuum Systems, Environmental Systems, Laboratories, Hospital Requirements, Other Health Care Facilities, nursing Home Requirements, Limited Care Facility Requirements, Hyperbaric Facilities, Freestanding Birthing Centers. Methods of instruction include: lecture and lab. Evaluation criteria includes examinations.

Credit Recommendation: (*Version 1*) In the lower division baccalaureate/associate degree category, 1 semester hour in Medical Gas System Installation (11/05). (*Version 2*) In the lower division baccalaureate/associate degree category, 3 semester hours in Medical Gas System Installation (11/05).

Credit Recommendation

Course: Conservation and Safe Handling of Refrigerants

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 18 Hours

Date(s): September 1995 - Present

Objective: To train the student to safely handle various refrigerants.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand what refrigerants are, what they do and the safe way to handle them; use a refrigerant recovery machine to safely remove old/contaminated refrigerants and properly dispose of them; describe the difference between the old “freon” refrigerants and the new “puron” refrigerants; pass the EPA Universal test required for refrigerant handling.

Instruction: Major topics covered in the course are: EPA certification categories, history of refrigeration, cfc and hcfc refrigerants, the ozone layer, ozone depletion, ozone depletion potential, global warming, Montreal protocol, hcfc phaseout schedule, laws and regulations, violations of the law, complying with the section 608 refrigerant recycling rule, service requirements, certification of recovery and recycling equipment, certification of technicians, restriction on sales of refrigerants, certification by owners of recycling or recovery equipment, certification of reclaimers, safe disposal program, definitions of recovery, recycle and reclaim, refrigerant recovery, liquid recovery, vapor recovery, refrigerant cylinders, refrigerant safety, refrigerant classifications, new safety requirements for refrigerants, examples of types and equipment and tools used on refrigeration systems, leak testing will require using old techniques in new ways, refrigerant containment strategies, good soldering and brazing techniques prevent leaks, safety procedures, refrigerant oils, certification – type I, certification – type II, certification – type III and evacuation level exceptions. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 1 semester hour in Conservation and Safe Handling of Refrigerants (11/05).

Credit Recommendation

Course: Drainage

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 66 Hours

Date(s): September 1995 – August 2006

Objective: To train the student to design and install drainage and venting systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the difference between sanitary and storm, vacuum and gray water drainage systems; describe the various treatment processes, from cesspools to septic tanks to full-scale sewage treatment plants; understand how the venting system interrelates with the drainage system to promote effective operation; demonstrate the ability to use their local plumbing code in drainage system sizing, design and installation.

Instruction: Major topics covered in the course are: Sewage Disposal, Sewers and Drains, Building Drainage Systems, The Plumbing Trap and venting the drainage system. Method of instruction includes: lecture. Evaluation criteria include examinations and sizing projects.

Credit Recommendation: In the upper division baccalaureate degree category or in the lower division baccalaureate/associate degree category, 2 semester hours in Waste Water Treatment (11/05).

Credit Recommendation

Course: Drawing Interpretation and Plan Reading I

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 30 Hours

Date(s): September 1995 – August 2006

Objective: To make the student aware of how drawings can convey information about piping systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the language of standard drawing symbols; identify the various lines and drawing formats; describe the tools used to produce drawings; demonstrate drawing various objects from different points of view.

Instruction: Major topics covered in the course are: Introduction to Basic Drawing Tools, Measuring Tools and Lettering Skills, Three-View, Plan View and Elevation View Drawings, Graphic Symbols for Pipe Fittings and Valves, Interpretation of Technical Drawings. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 1 semester hour in Drawing and Plan Reading I (11/05).

Credit Recommendation

Course: Drawing Interpretation and Plan Reading II

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 48 Hours

Date(s): September 1995 – August 2006

Objective: To make the student aware of how drawings can convey information about piping systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand standard drawing symbols and building specifications; identify the various drawing formats such as plan, elevation and isometric; describe tools used to produce drawings and demonstrate how to read drawings properly.

Instruction: Major topics covered in the course are: Interpretation of Isometric Drawings, Interpretation of Piping Drawings, Interpretation of Building Plans, and Building Specifications. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 2 semester hours in Drawing and Plan Reading II (11/05).

Credit Recommendation

Course: Electric Controls for Mechanical Equipment Service I

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 36 Hours

Date(s): September 1995 - Present

Objective: To train the student to install electric controls for heating, air conditioning and other mechanical equipment.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how electric controls are used to monitor, measure and adjust system components; layout a circuit incorporating various electric control devices to maintain temperatures and/or pressures; describe the sequence of operation of various control circuits in refrigeration piping; design and specify the appropriate devices for controlling process piping equipment.

Instruction: Major topics covered in the course are: Essentials of Control Systems, Fundamentals of Measurement, Types of Automatic Control Systems, Types of Control Action, Auxiliary Control Equipment, Electrical Diagrams, Fuses and Control Circuits, Purpose and Construction of Motor Controllers, Application of Motor Controllers, Starters for Large Motors, Capacitors and Single-Phase Motors, Push-Button and Relay Applications/Control Action of Magnetic Starters, Applications of Thermostats, Thermostats and Actuators for Two-Position Control, Thermostats and Actuators for Floating and Proportional Controls, Humidity, Pressure and Miscellaneous Controls, Valves and Dampers, Primary Source and Secondary Temperature Control, Temperature Control and Air Flow, Control of Refrigeration Machinery and Water Piping Systems, Humidity, Electric Heating and Heat Pump Control, Combustion Controls for Fuel Burning Equipment, and Application of Combustion Controls. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 2 semester hours in Electric Controls for Mechanical Equipment Service I (11/05).

Credit Recommendation

Course: Electric Controls for Mechanical Equipment Service – Part II

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 54 Hours

Date(s): September 1995 – Present

Objective: To train the student to service and maintain electric controls for Heating, Air Conditioning and other Mechanical Equipment.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the relationships between all components of a piping system under electric control and how they interrelate to each other; troubleshoot a typical system that is malfunctioning; describe step-by-step procedure for determining where the faulty component is in a control system; analyze and measure voltage and amperage values and how they affect system performance.

Instruction: Major topics covered in the course are: Essentials of Control Systems, Fundamentals of Measurement, Types of Automatic Control Systems, Types of Control Action, Auxiliary Control Equipment, Electrical Diagrams, Fuses and Control Circuits, Purpose and Construction of Motor Controllers, Application of Motor Controllers, Starters for Large Motors, Capacitors and Single-Phase Motors, Push-Button and Relay Applications/Control Action of Magnetic Starters, Applications of Thermostats, Thermostats and Actuators for Two-Position Control, Thermostats and Actuators for Floating and Proportional Controls, Humidity, Pressure and Miscellaneous Controls, Valves and Dampers, Primary Source and Secondary Temperature Control, Temperature Control and Air Flow, Control of Refrigeration Machinery and Water Piping Systems, Humidity, Electric Heating and Heat Pump Control, Combustion Controls for Fuel Burning Equipment, and Application of Combustion Controls. Method of instruction includes lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Electric Controls for Mechanical Equipment Service – Part II (11/05).

Credit Recommendation

Course: Gas Installations

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 45 Hours

Date(s): September 1995 - Present

Objective: To train the student in design and installation of natural and manufactured gas.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the properties of common fuel gases such as methane, propane, butane and their applications; design a piping system to safely and efficiently deliver fuel gas; describe the valves, controls and meters associated with fuel gas delivery and monitoring; demonstrate knowledge of orifices, venting, air supply and appliance function.

Instruction: Major topics covered in the course are: Properties of Gas and the Combustion Process, Gas Piping Systems, Clocking and Orifice Sizing, Air Supply and Venting, Valves and Regulators, Electrical Systems and Controls and Appliances. Method of instruction includes: lecture. Evaluation criteria include

Credit Recommendation: In the baccalaureate/associate degree category, 2 semester hours in Gas Installations (11/05).

Credit Recommendation

Course: Gas Tungsten Arc Welding

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 84 Hours

Date(s): September 1995 - Present

Objective: To train the student in the gas-tungsten arc welding (tig) process.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how using a tungsten electrode in an inert gas envelope provides a pure environment for welding certain metals; set-up, adjust and use the welding machine, the gas purge equipment and the hand-held torch; describe how the shielding gas protects the weld puddle from contamination from the atmosphere; produce a contaminate free weld on various metals in various positions.

Instruction: Major topics covered in the course are: Fundamentals for the GTAW Process, GTAW Equipment, Preparation for Welding, Techniques for Basic Weld Joints, Shielding Gas, Tungsten Electrodes for GTAW, Guided Bend Testing and Quality Weld Inspection, Safe Work Practices and Safety Precautions and Exercises in Gas Tungsten Arc Welding. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Tungsten Arc Welding (11/05).

Credit Recommendation

Course: A Guide to Service Work I

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 42 Hours

Date(s): September 1995 – August 2006

Objective: To make the student aware of how human relations affects customer satisfaction.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand why customers will call or not call again because of technician's people skills; assure the customer that they and the contractor will solve the customer's piping problem; make potential additional sales after the original service call; plan and execute a successful service call.

Instruction: Major topics covered in the course are: Human Relations and Salesmanship. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 2 semester hours in Personnel Management (11/05).

Credit Recommendation

Course: A Guide to Service Work II

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 54 Hours

Date(s): September 1995 – August 2006

Objective: To train the student in effective and profitable service related piping jobs.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how to approach complicated, sophisticated piping systems safely and efficiently; properly repair and/or replace non-functional piping to the satisfaction of the customer; describe components of various plumbing fixtures, appliances and piping systems subject to maintenance; demonstrate how to keep the customer and the contractor happy, despite the natural tendency of each party to feel taken advantage of.

Instruction: Major topics covered in the course are: Planning Service Work and Troubleshooting Plumbing Systems. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Introduction to Project Management (11/05).

Credit Recommendation

Course: Heritage

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 45 Hours

Date(s): September 2006 - Present

Objective: To make the student aware of the Plumbing/Pipe Fitting trade and industry history and possibilities for the future.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the history of the plumbing/pipe fitting industry and general labor history; identify key people and events that shaped the industry; describe the current state of the industry and demonstrate how the future of the industry may be shaped.

Instruction: Major topics covered in the course are: Your New Partners, Getting off to the right start study and discussion, your collective voice study and discussion, your employer as your partner study and discussion and tools of the future; General Labor History in the US. Methods of instruction include: lecture (including outside lecturers/authorities having expertise in labor history) and readings on affiliated building and construction trade crafts. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Labor History (11/05).

Credit Recommendation

Course: Hydronic Heating and Cooling - Pipefitter

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 36 Hours

Date(s): September 1995 - Present

Objective: To train the student in heating and/or cooling with water as a medium

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how water can be used to heat and/or cool spaces with various equipment and piping arrangements, be able to lay out a hot water heating and/or cooling system with all controls and components; describe the difference between conduction, radiation and convection when used in a hydronic system; demonstrate how solar energy can be used in space heating applications for efficiency.

Instruction: Major topics covered in the course are: Hydronic Heating, Hydronic Cooling and Hydronic Systems. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the upper division baccalaureate degree category or in the lower division baccalaureate/associate degree category, 3 semester hours in Thermodynamics I and 3 semester hours in Thermodynamics II, for a total of 6 semester hours (11/05). Note: Students must complete the following courses to receive the credit recommendation: *Hydronic Heating and Cooling-Pipefitter, Air Conditioning and Refrigeration*.

Credit Recommendation

Course: Instrumentation and Process Control

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: *Version 1:* 56 Hours; *Version 2:* 90 Hours (45 hours-lecture; 45 hours-lab)

Date(s): *Version 1:* September 1995 – August 2006; *Version 2:* September 2006 - Present

Objective: To train the student in installing and servicing instrumentation systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how pneumatic and electrical controllers are used in the control of process piping systems; install sensors to measure pressure, temperature, flow and level in piping systems used in industrial applications; describe the symbols used for various measuring and control devices used in steam generating facilities; perform a control loop test to determine if the system is capable of performing properly.

Instruction: Major topics covered in the course are: Introduction, process, Instrumentation diagrams and symbols, instrument loop diagrams, documentation, flow, electricity, pneumatic measuring instruments and test equipment, pneumatic control valves, liquid level instruments, fiber optic signals, analyzers and ph, tubing, tube fittings and tube bending. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: (*Version 1*) In lower division baccalaureate/associate degree category, 2 semester hours in Instrumentation and Process Control (11/05). (*Version 2*) In lower division baccalaureate/associate degree category, 3 semester hours in Instrumentation and Process Control (11/05).

Credit Recommendation

Course: Introduction to Start, Test and Balance

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 24 Hours

Date(s): September 1995 - Present

Objective: To train the student in starting, testing and balancing heating and air conditioning systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how the original startup of heating and cooling equipment is accomplished; test the air and/or water flows in an air conditioning system to determine if it is in compliance with the engineers specification; describe how air flow, temperature and fan speed affect heating and/or cooling system performance; balance the distribution of heated and/or cooled air in a commercial office building.

Instruction: Major topics covered in the course are: Introduction to testing, balancing and adjusting, review of basic science, review of properties of air and the psychrometric chart, problems in psychrometrics, air distribution systems and accessories, air flow in duct, fans, tachometers; belt drives, instruments for measuring air temperature and humidity, instruments for measuring air pressures, instruments for measuring air velocity, applications for instruments for measuring air velocities, start-up and initial tests of air handling systems, balancing air distribution systems, electrical principles, characteristics of hydronic systems, fluid flow in piping systems, centrifugal pumps, hydronic balancing instruments and devices, automatic controls, equipment. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In lower division baccalaureate/associate degree category, 1 semester hour in Installation and Maintenance of HVAC Systems (11/05).

Credit Recommendation

Course: Introduction to Safety and Health

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 30 Hours

Date(s): September 2006 - Present

Objective: To make the student aware of safe working practices and requirements as mandated by OSHA.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand OSHA Safety requirements on the job site; identify possible unsafe conditions while working; describe safe working practices under various job conditions; demonstrate safe working skills while installing pipe.

Instruction: Major topics covered in the course are: General Safety and Health Provisions, Ladders and Stairways, Personal Protective and Life Saving Equipment Respirators, First Aid, Electrical, Tools-hand and Power, Lifting and Handling Materials, Fire Protection, Welding and Cutting, Excavations, Scaffolding, Work Platforms and Aerial Devices, and Occupational Health and Environmental Controls. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 1 semester hour in Introduction to Safety and Health (11/05).

Credit Recommendation

Course: Job Safety and Health, OSHA Smart Mark)

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 30 Hours

Date(s): September 1995 – August 2006

Objective: To make the student aware of safe working practices and requirements as mandated by OSHA.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand OSHA Safety requirements on the job site; identify possible unsafe conditions while working; describe safe working practices under various job conditions; demonstrate safe working skills while installing pipe.

Instruction: Major topics covered in the course are: General Safety and Health Provisions, Ladders and Stairways, Personal Protective and Life Saving Equipment Respirators, First Aid, Electrical, Tools-hand and Power, Lifting and Handling Materials, Fire Protection, Welding and Cutting, Excavations, Scaffolding, Work Platforms and Aerial Devices, and Occupational Health and Environmental Controls. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 1 semester hour in Introduction to Safety and Health (11/05).

Credit Recommendation

Course: Leadership Course

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: *Version 1:* 40 Hours; *Version 2:* 45 Hours

Date(s): *Version 1:* September 1995 – August 2006; *Version 2:* September 2006 - Present

Objective: To train the student to be a more effective leader on-the-job.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how important it is to be a good leader to foster harmonious working conditions on a jobsite; measure their own traits and compare them to the traits of others for compatibility or non-compatibility; describe jobsite situations that require communication skills to avoid conflicts; demonstrate how good leadership skills benefit the worker, the contractor and the customer.

Instruction: Major topics covered in the course are: Introduction, Differences between Managing and Leading, Importance of Leadership, Leadership Styles, Quality Assurance, Concepts of Improvement, Developing an Action Plan. Method of instruction includes: lecture. Evaluation criteria includes: *Version 1:* examinations; *Version 2:* a team student project of a real world construction problem to be evaluated by instructor; and examinations.

Credit Recommendation: (*Version 1*) In the upper division baccalaureate/associate degree category, 2 semester hours in Leadership or Project Management (11/05). (*Version 2*) In the upper division baccalaureate/associate degree category, 3 semester hours in Leadership or Project Management (11/05).

Credit Recommendation

Course: On the Job Training First Year Plumbing/ Pipefitting

Location: Englishtown, NJ (9), Jersey City (14 and 855), Newark (24, 475 and 696), Ridgefield (274), Southern New Jersey (322) and All United Association Local Unions

Length: 1500 on the job training field experience hours

Date(s): September 1995 to Present

Objective: To enable a student to aid in installing basic piping systems.

Learning Outcomes: Upon successful completion of this On the Job Training - field experience course, the student will be able to: understand the history of the piping industry and its practices; identify tool and materials used in piping systems; describe basic instruction practices of piping systems; demonstrate soldering and brazing skills and oxy-fuel cutting and welding skills.

Instruction: Major topics covered in the course are: Tools of the Future, Safety and Safe Work Practices, Layout and Measuring Tools, Screwdrivers, Pliers and Nut drivers, Wrenches, Vises and Clamps, Hammers and Saws, Files, Punches and Chisels, Pipe Wrenches and Vises, Pipe Cutters and Reamers, Pipe Threading, Power-Operated equipment for Cutting and Threading Pipe, Tube Fabrication, Special Pipe and Tube Tools, Drilling and Boring Tools, Screw Threads for Bolts and Rods, Miscellaneous Tools and Equipment, Ladders, Scaffolds, and Hoists, Pipe, Pipe Fittings, Flanges and Gaskets, Methods of Joining Pipe, Understanding the Function of Valves, Types of Valves, Valve Bonnets, Valve Stems and Stuffing Boxes, Valve Installation, Pipe Hangers, Pipe Supports, Anchors, Guides and Fasteners. General Safety & Health Provisions, Occupational Safety and Health Act, Hazards, Housekeeping, Wall Openings, Corrosives and Irritants, Systemic Poisons, Radiation, Ultraviolet Rays, Hot and Cold Weather Precautions, Successful Accident Prevention – Training Workers, Sanitation, Insects, Radon, Illumination, Falls, Compressed Gas Cylinders, LP Gas, Confined Spaces, Ladders and Stairways, Personal Protective and Life Saving Equipment Respirators, First Aid, Electrical, Tools – Hand and Power, Lifting and Handling Materials, Fire Protection, Welding & Cutting, Excavations, Scaffolding, Work Platforms and Aerial Devices, Occupational Health and Environmental Controls, Ionizing Radiation, Emergency Eye Wash Equipment, Threshold Limit Values, Airborne Contaminants, Hazards of Asbestos and Asbestos Fibers, Noise, Hazards from other forms of Energy, Hazard Communication Occupational and Health Standard, Right to Know Law, Material Safety Data Sheets, Provisions of the Act, Safety and Safe Work Practices, The Soldering and Brazing Process, Types and Uses of Copper Tube, Solders, Brazing Filler Metals and Fluxes, Joint Preparation and Assembly, Heating Equipment, Making a Soldered Joint, Performance Test for Soldering, Making a Brazed Joint, Performance Test for Brazing, Brazeable Metals, Basic Math Review, Pipe

On the Job Training First Year Plumbing/ Pipefitting
(Continued)

Instruction: (cont'd)

Measurements, Multiplication Table, Dimensions for Laying Out Angles, Conversion of Inches and One-Eighth Inches to Decimal Feet, Butt, Close, Shoulder and Short Nipple Lengths in Inches, Fiber Rope, Knots and Hitches, Wire Rope, Slings, Helicopter Hoisting, Cranes and Crane Signals, Hoisting and Jacking, Equipment, Rigging Hardware, Determining Load Weights, Introduction to Basic Drawing Tools, Measuring Tools and Lettering Skills, Three-View, Plan View and Elevation View Drawings, Graphic Symbols for Pipe Fittings and Valves, Interpretation of Technical Drawings. Methods of instruction include: This is a field experience course required under apprenticeship guidelines and Department of Labor (DOL) standards. The student will work under the supervision of a foreman and or journeymen as she or he applies the knowledge and skills learned in the classroom. The student may maintain a logbook of knowledge and skills applied in the field. The foreman may provide skill and safety demonstrations and will observe, coach and assess the student's performance. Evaluation criteria include: successful completion of all field experience activities as demonstrated by completion of the logbook.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Internship for Plumbing and Pipefitting I (11/05).

Credit Recommendation

Course: On the Job Training Second Year Plumbing/Pipefitting

Location: Englishtown, NJ (9), Jersey City (14 and 855), Newark (24, 475 and 696), Ridgefield (274), Southern New Jersey (322) and All United Association Local Unions

Length: 1500 on the job training field experience hours

Date(s): September 1995 - Present

Objective: To enable a student to aid in installing basic piping systems.

Learning Outcomes: Upon successful completion of this On the Job Training - field experience course, the student will be able to: understand how drawing interrelate to installing piping systems; identify system components and how they affect system performance; describe how physics and electricity play a role in Piping systems; demonstrate the basic arc welding skills.

Instruction: Major topics covered in the course are: Properties and Characteristics of Water and Steam, Hydraulics and Pneumatics, Mechanics, Metals, Alloys and Synthetics, Corrosion, Interpretation of Isometric Drawings, Interpretation of Piping Drawings, Interpretation of Building Plans, Building Specifications, Electrical Safety, Fundamentals of Electricity, Producing Electricity, Magnetism and Electricity, Electromagnetism, Fundamentals of Electric Circuits, Electric Power and Energy, Direct Current series and Parallel circuits, Compound circuits, Electrical Conductors and Wiring methods, Alternating Current, Inductance and Capacitance, Alternating current systems, Transformers, Alternating current motors, Motor Controls, Alternating current meters and instruments, The Shielded Metal Arc Welding Process, Exercises in Shielded Metal Arc Welding, Pipe Welding Clamps and Accessories, United Association Welding Certification Program. Methods of instruction include: This is a field experience course required under apprenticeship guidelines and Department of Labor (DOL) standards. The student will work under the supervision of a foreman as she or he applies the knowledge and skills learned in the classroom. The student may maintain a logbook of knowledge and skills applied in the field. The foreman may provide skill and safety demonstrations and will observe, coach and assess the student's performance. Evaluation criteria include: successful completion of all field experience activities as demonstrated by completion of the logbook.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Internship II for Plumbers and Pipefitters (11/05).

Credit Recommendation

Course: On the Job Training Third Year Pipefitting

Location: Englishtown, NJ (9), Jersey City (14 and 855), Newark (24, 475 and 696), Ridgefield (274) , Southern New Jersey (322) and All United Association Local Unions

Length: 1500 on the job training field experience hours

Date(s): September 1995 - Present

Objective: To enable the student to aid in installing basic heating and Air-Conditioning systems.

Learning Outcomes: Upon successful completion of this On the Job Training - field experience course, the student will be able to: understand the theory of electrical control systems for Heating and Air Conditioning; identify steam and hydronic heating components; describe basic refrigeration principles; demonstrate safe handling of refrigerants.

Instruction: Major topics covered in the course are: Pumps, Pump Theory, Types of Pumps, Pump Installation, Pumps in Systems, Electric Controls for Mechanical Equipment Service Part I, Essentials of Control Systems, Fundamentals of Measurement, Types of Control Action, Auxiliary Control Equipment, Electrical Diagrams, Fuses, and Control Circuits, Purpose and Construction of Motor Controllers, Application of Motor Controllers, Starters for Large Motors, Capacitors and Single-Phase Motors, Push-Buttons and Relay Applications/Control Action of Magnetic Starters, Applications of Thermostats, Thermostats and Actuators for Two-Position Control, Thermostats and Actuators for Floating and Proportional Control, Humidity, Pressure and Miscellaneous Control, Valves and Dampers, Primary Source and Secondary Temperature Control, Temperature Control and Air Flow, Control of Refrigeration Machinery and Water Piping Systems, Humidity, Electric heating and Heat Pump Control, Combustion Controls For Fuel Burning Equipment, Application of Combustion Controls, Steam Systems, Properties of Saturated Steam, Basic equipment in a one-pipe steam heating system, One-pipe steam heating system, Steam Traps, Two-pipe steam heating systems, Vacuum steam heating systems, Vapor steam heating systems, Variable Vacuum (Sub-atmospheric) steam heating systems, Steam Piping, Heat transfer equipment, Steam heating unit connections, Low-pressure steam boilers, Water feeders, low-water cutoffs and water level controllers, High-pressure steam boilers, Steam generating plants, Basic Physical Principles, Elementary Refrigeration Methods, Refrigerants, Pressure-Enthalpy Diagrams, Handling Refrigerants and oil, Application of the Vapor compression Refrigeration Cycle, Evaporators, Introduction to compressors, Reciprocating Compressors, Capacity control of Reciprocating compressors, Condensers, general principle water-cooled condensers, Water supply for water-cooled condensers, Evaporative condensers air-cooled condensers, Refrigerant expansion devices, Application for the Thermostatic expansion valve, Miscellaneous valves and

On the Job Training Third Year Pipefitting
(Continued)

Instruction: (cont'd)

refrigerant control devices, Refrigerant Piping Accessories, Refrigerant Piping – General requirements and Pipe Sizing, Refrigerant Piping design and arrangement, Refrigerant piping installation, Electrical Fundamentals, Alternating current motors, Motor overload protection, Motor controllers, Related electrical equipment, Centrifugal refrigeration machines, Control of refrigeration equipment, Heat pumps, Commercial medium and low temperature refrigeration, Absorption refrigeration, Checking refrigerant temperatures and pressures, Leak testing, Evacuating and charging, Testing Electrical components, Servicing procedures, Related Mechanical equipment, Tube Cleaning and retubing tools, EPA Certification Categories, History of Refrigeration, CFC and HCFC Refrigerants, The Ozone Layer, Ozone Depletion, Ozone Depletion Potential, Global Warming, Montreal Protocol, HCFC Phaseout Schedule, Laws and Regulations, Violations of the Law, Complying with the Section 608 Refrigerant Recycling Rule, Service Requirements, Certification of Recovery and Recycling Equipment, Certification of Technicians, Restriction on Sales and Refrigerants, Certification by Owners of recycling or Recovery Equipment, Certification of Reclaimers, Safe Disposal Program, Definitions of Recovery, Recycle and Reclaim, Refrigerant Recovery, Liquid Recovery, Vapor Recovery, Refrigerant Cylinders, Refrigerant Safety, Refrigerant Classifications, New Safety Requirements for Refrigerants, Examples of Types of Equipment & tools used on Refrigeration Systems, Leak Testing will require using old techniques in new ways, Refrigerant Containment Strategies, Good Soldering and Brazing Techniques prevent Leaks, Safety Procedures, Refrigerant Oils, Certification – Type I, Certification – Type II, Certification – Type III, Evacuation Level Exceptions, Hydronic Heating, Hydronic Cooling, Hydronic Systems. Methods of instruction include: This is a field experience course required under apprenticeship guidelines and Department of Labor (DOL) standards. The student will work under the supervision of a foreman and or journeymen as she or he applies the knowledge and skills learned in the classroom. The student may maintain a logbook of knowledge and skills applied in the field. The foreman may provide skill and safety demonstrations and will observe, coach and assess the student's performance. **Evaluation criteria include:** successful completion of all field experience activities as demonstrated by completion of the logbook.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Internship I for Pipefitters (11/05).

Credit Recommendation

Course: On the Job Training Third Year Plumbing

Location: Englishtown, NJ (9), Jersey City (14 and 855), Newark (24, 475 and 696), Ridgefield (274) , Southern New Jersey (322) and All United Association Local Unions

Length: 1500 on the job training field experience hours

Date(s): September 1995 - Present

Objective: To enable the student to aid in installing basic plumbing systems.

Learning Outcomes: Upon successful completion of this On the Job Training - field experience course, the student will be able to: understand how drainage systems function; identify water supply components and functions; describe how pumps are utilized in plumbing systems; demonstrate knowledge of interpersonal relationships with customers.

Instruction: Major topics covered in the course are: Related Mathematics, Multiplication Table, Dimensions for Laying Out Angles, Conversion of Inches and One-Eighth Inches to Decimal Feet, Water Supply, Water Treatment, Water Mains and Services, Building Water Supply Systems, Hot Water Supply, Pumps, Pump Theory, Types of Pumps, Pump Installation, Pumps in Systems, Drainage, Sewage Disposal, Sewers and Drains, Building Drainage Systems, The Plumbing Trap, Venting the Drainage System, A Guide to Service Work, Human Relations and Salesmanship. Methods of instruction include: This is a field experience course required under apprenticeship guidelines and Department of Labor (DOL) standards. The student will work under the supervision of a foreman and or journeymen as she or he applies the knowledge and skills learned in the classroom. The student may maintain a logbook of knowledge and skills applied in the field. The foreman may provide skill and safety demonstrations and will observe, coach and assess the student's performance. Evaluation criteria include: successful completion of all field experience activities as demonstrated by completion of the logbook.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Internship I for Plumbers (11/05).

Credit Recommendation

Course: On the Job Training Fourth Year Pipefitting

Location: Englishtown, NJ (9), Jersey City (14 and 855), Newark (24, 475 and 696), Ridgefield (274) , Southern New Jersey (322) and All United Association Local Unions

Length: 1500 on the job training field experience hours

Date(s): September 1995 - Present

Objective: To enable the student to develop field-level skills using plans and become certified in shielded metal arc welding and valve repair.

Learning Outcomes: Upon successful completion of this On the Job Training - field experience course, the student will be able to: understand how drawings aid in the coordination of the construction process; identify all components of an air conditioning system and their roles; describe the procedures for repairing various valves; demonstrate the ability to produce a certifiable test sample of shielded metal arc welding.

Instruction: Major topics covered in the course are: Sleeve Drawing and Deck Layout, Drawing Coordination and Piping System Design, Computer Aided Drafting, Fundamentals of Air Conditioning, Review of Basic Science, Properties of Air, Principles of Heat Transfer, Heat Flow Through Building Construction, Infiltration, Ventilation and Moisture Flow, Human Comfort, Heat Losses and Heat Gains, Heating and Cooling Loads, Psychrometric Charts, General Applications of Psychrometrics, Psychrometrics of the Conditioned Air Supply, Cooling and Heating Coils, Energy Conservation Applications of Refrigeration Equipment, Heat Pumps, Air Conditioning Equipment Combinations, Automatic Controls, Single Path All Air Systems, Multipath All Air Systems, Air and Water and All-Water Systems, EPA Certification Categories, History of Refrigeration, CFC and HCFC Refrigerants, The Ozone Layer, Ozone Depletion, Ozone Depletion Potential, Global Warming, Montreal Protocol, HCFC Phaseout Schedule, Laws and Regulations, Violations of the Law, Complying with the Section 608 Refrigerant Recycling Rule, Service Requirements, Certification of Recovery and Recycling Equipment, Certification of Technicians, Restriction on Sales and Refrigerants, Certification by Owners of recycling or Recovery Equipment, Certification of Reclaimers, Safe Disposal Program, Definitions of Recovery, Recycle and Reclaim, Refrigerant Recovery, Liquid Recovery, Vapor Recovery, Refrigerant Cylinders, Refrigerant Safety, Refrigerant Classifications, New Safety Requirements for Refrigerants, Examples of Types of Equipment & tools used on Refrigeration Systems, Leak Testing will require using old techniques in new ways, Refrigerant Containment Strategies, Good Soldering and Brazing Techniques prevent Leaks, Safety Procedures, Refrigerant Oils, Certification – Type I, Certification – Type II, Certification – Type III, Evacuation Level Exceptions, The Shielded Metal Arc Welding Process, Piping

On the Job Training Fourth Year Pipefitting (Continued)

Instruction: (cont'd)

Welding Clamps and Accessories Valve Information and Prints, Basic Precision Measuring Instruments, Fasteners and Torturing, Flanges, Gaskets, Pressure Seals and O-Rings, Valve Packing, Gate Valves, Globe Valves, Diaphragm Valves, Butterfly, ball and Plug Valves, Introduction to Control Valves, Check Valves, Safety and Relief Valves, General Guidelines for the Maintenance and Repair of Valves, Seat Repair, Common Valve Terminology. Methods of instruction include: This is a field experience course required under apprenticeship guidelines and Department of Labor (DOL) standards. The student will work under the supervision of a foreman and or journeymen as she or he applies the knowledge and skills learned in the classroom. The student may maintain a logbook of knowledge and skills applied in the field. The foreman may provide skill and safety demonstrations and will observe, coach and assess the student's performance. Evaluation criteria include: successful completion of all field experience activities as demonstrated by completion of the logbook.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Internship II for Pipefitters (11/05).

Credit Recommendation

Course: On the Job Training Fourth Year Plumbing

Location: Englishtown, NJ (9), Jersey City (14 and 855), Newark (24, 475 and 696), Ridgefield (274) , Southern New Jersey (322) and All United Association Local Unions

Length: 1500 on the job training field experience hours

Date(s): September 1995 - Present

Objective: To enable the student to aid in installing more advanced plumbing systems

Learning Outcomes: Upon successful completion of this On the Job Training - field experience course, the student will be able to: understand isometric sketches for use in installations; identify plumbing fixtures and appliances; describe a proper gas installation; demonstrate understanding of the plumbing code.

Instruction: Major topics covered in the course are: Advanced Plan Reading and Sketching, Plumbing Fixtures, Installation Practices, Institutional Fixtures and Equipment, Fixture Controls, Appliances and Accessories, Properties of Gas and the Combustion Process, Gas Piping Systems, Clocking and Orifice Sizing, Air Supply and Venting, Valves and Regulators, Electrical Systems and Controls, Appliances, Code Construction, General Use of Codes, Code Applications, Planning Service Work, Troubleshooting Plumbing Systems. Methods of instruction include: This is a field experience course required under apprenticeship guidelines and Department of Labor (DOL) standards. The student will work under the supervision of a foreman and or journeymen as she or he applies the knowledge and skills learned in the classroom. The student may maintain a logbook of knowledge and skills applied in the field. The foreman may provide skill and safety demonstrations and will observe, coach and assess the student's performance. Evaluation criteria include: successful completion of all field experience activities as demonstrated by completion of the logbook.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Internship II for Plumbers (11/05).

Credit Recommendation

Course: On the Job Training Fifth Year Pipefitter

Location: Englishtown, NJ (9), Jersey City (14 and 855), Newark (24, 475 and 696), Ridgefield (274) , Southern New Jersey (322) and All United Association Local Unions

Length: 1500 on the job training field experience hours

Date(s): September 1995 - Present

Objective: To enable the student to aid in the installation of advanced electrical controls, start test and balance and instrumentation components.

Learning Outcomes: Upon successful completion of this On the Job Training - field experience course, the student will be able to: understand how electrical controls are utilized in heating and air conditioning systems; identify tools and equipment used in the start, test and balance process; describe how to control process piping installations with the proper instrumentation; demonstrate their ability in the gas tungsten arc welding process under field conditions.

Instruction: Major topics covered in the course are: Essentials of Control Systems, Fundamentals of Measurement, Types of Control Action, Auxiliary Control Equipment, Electrical Diagrams, Fuses, and Control Circuits, Purpose and Construction of Motor Controllers, Application of Motor Controllers, Starters for Large Motors, Capacitors and Single-Phase Motors, Push-Buttons and Relay Applications/Control Action of Magnetic Starters, Applications of Thermostats, Thermostats and Actuators for Two-Position Control, Thermostats and Actuators for Floating and Proportional Control, Humidity, Pressure and Miscellaneous Control, Valves and Dampers, Primary Source and Secondary Temperature Control, Temperature Control and Air Flow, Control of Refrigeration Machinery and Water Piping Systems, Humidity, Electric heating and Heat Pump Control, Combustion Controls For Fuel Burning Equipment, Application of Combustion Controls, Introduction to Testing, Balancing and Adjusting, Review of Basic Science, Review of Properties of Air and the Psychrometric Chart Problems in Psychrometrics, Air Distribution systems and accessories, Air Flow in Duct, Fans, Tachometers; Belt Drives, Instruments for measuring air temperature and humidity, Instruments for measuring air pressures, Instruments for measuring air velocity, Applications of instruments for measuring air velocities, Start-up and initial tests of air handling systems, Balancing air distribution systems, Electrical principles, Characteristics of Hydronic systems, Fluid flow in piping systems, Centrifugal pumps, Hydronic balancing instruments and devices, Start-up and initial tests of hydronic systems, Hydronic balance procedures, Automatic controls, Equipment, Process, Instrumentation Diagrams and Symbols, Instrument Loop Diagrams, Documentation, Flow, Electricity, Pneumatic Measuring Instruments and Test Equipment, Pneumatic

On the Job Training Fifth Year Pipefitter
(Continued)

Instruction: (cont'd)

Control Valves, Liquid Level Instruments, Fiber Optic Signals, Analyzers and PH, Tubing, Tube Fittings and Tube Bending, Butt, Close, Shoulder and Short Nipple Lengths in Inches, Fundamentals of the GTAW Process, GTAW Equipment, Preparation for Welding, Techniques for Basic Weld Joints, Shielding Gas, Tungsten Electrodes for GTAW, Guided Bend Testing and Quality Weld Inspection, Safe Work Practices and Safety Precautions, Exercises in Gas Tungsten Arc Welding. Methods of instruction include: This is a field experience course required under apprenticeship guidelines and Department of Labor (DOL) standards. The student will work under the supervision of a foreman and or journeymen as she or he applies the knowledge and skills learned in the classroom. The student may maintain a logbook of knowledge and skills applied in the field. The foreman may provide skill and safety demonstrations and will observe, coach and assess the student's performance. Evaluation criteria include: successful completion of all field experience activities as demonstrated by completion of the logbook.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Internship III for Pipefitters (11/05).

Credit Recommendation

Course: On the Job Training Fifth Year Plumbing

Location: Englishtown, NJ (9), Jersey City (14 and 855), Newark (24, 475 and 696), Ridgely (274) , Southern New Jersey (322) and All United Association Local Unions

Length: 1500 on the job training field experience hours

Date(s): September 1995 - Present

Objective: To enable the student to become certified in medical gas and backflow installation/testing including Computer Aided Drawing, advanced math and drawing concepts and leadership skills.

Learning Outcomes: Upon successful completion of this On the Job Training - field experience course, the student will be able to: understand how coordination of plans especially CAD expedites the installation of piping systems; identify properly installed medical gas systems; describe backflow prevention operation; demonstrate leadership talents and abilities.

Instruction: Major topics covered in the course are: Sleeve Drawing and Deck Layout, Drawing Coordination and Piping System Design, Computer Aided Drafting, Butt, Close, Shoulder and Short Nipple Lengths in Inches, Gas and Vacuum Systems, Environmental Systems, Laboratories, Hospital Requirements, Other Health Care Facilities, Nursing Home requirements, Limited Care Facility requirements, Hyperbaric Facilities, Freestanding birthing Centers, Public Health Significance of Cross-Connections, Principles of Backflow, Backpressure and Backsiphonage Thermal Expansion, Safety, Test Procedures, Maintenance, Repair and Troubleshooting, Cross-Connection Control Surveys, Documentation and Record Keeping, Establishing & Implementing a Cross-Connection Control Program/Ordinance, Differences between Managing and Leading, Importance of Leadership, Leadership Styles, Quality Assurance, Concepts of Improvement, Developing an Action Plan Creating a Simply Drawing, Making Your Drawings more Precise, Drawing Organization & Information, Creating More Complex Objects, Preparing to Print, Annotating Your Drawing, Productivity Tools, Creating and Organizing Blocks, Drawing Setup and Utilities. Methods of instruction include: This is a field experience course required under apprenticeship guidelines and Department of Labor (DOL) standards. The student will work under the supervision of a foreman and or journeymen as she or he applies the knowledge and skills learned in the classroom. The student may maintain a logbook of knowledge and skills applied in the field. The foreman may provide skill and safety demonstrations and will observe, coach and assess the student's performance. Evaluation criteria include: successful completion of all field experience activities as demonstrated by completion of the logbook.

On the Job Training Fifth Year Plumbing
(Continued)

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Internship III for Plumbers (11/05).

Credit Recommendation

Course: Oxy-Fuel Cutting & Welding and Shielded Metal Arc Welding I

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 108 Hours

Date(s): September 1995 - Present

Objective: Safe Use of Oxy-Fuel equipment for cutting and welding steel.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the use of oxy-fuel equipment to regulate torch use; identify the proper equipment for welding and/or cutting steel; describe the safe use of oxy-fuel torches; demonstrate proper cutting, beveling and welding techniques.

Instruction: Major topics covered in the course are: Safety in welding, cutting and allied processes, the oxy-fuel cutting and welding process, oxyacetylene and other types of oxy-fuel gases, oxyacetylene cutting and welding equipment, procedure for setting up oxy-fuel cutting and welding equipment, lighting, adjusting and extinguishing the torch flame, exercises in oxy-fuel cutting and welding, safe work practices and safety precautions for shielded metal arc welding, the shielded metal arc welding process, exercises in shielded metal arc welding. Methods of instruction include: lecture/lab. Evaluation criteria include examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 4 semester hours in Oxy-fuel Fabrication Methods, and 4 semester hours in Arc Welding Fabrication Methods, for a total of 8 semester hours (11/05). Note: Students must complete the following four courses to receive the credit recommendation: *Oxy Fuel Cutting and Welding and Shielded Metal Arc Welding I*, *Oxy Fuel Cutting and Welding and Shielded Metal Arc Welding II*, *Shielded Metal-Arc Welding Leading to Certification*, and *Soldering and Brazing*.

Credit Recommendation

Course: Oxy-Fuel Cutting & Welding and Shielded Metal Arc Welding II

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 48 Hours

Date(s): September 1995 - Present

Objective: To train the student to weld pipe using the shielded metal arc welding process.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the use of various welding rods; identify the voltage/amperage/polarity to use with welding rods, joint configuration for welding procedures; demonstrate welding in the horizontal, vertical and overhead positions.

Instruction: Major topics covered in the course are: The shielded metal arc welding process, exercise in shielded metal arc welding, pipe welding clamps and accessories and the United Association Welding Certification Program. Methods of instruction include: lecture/lab. Evaluation criteria include examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 4 semester hours in Oxy-fuel Fabrication Methods, and 4 semester hours in Arc Welding Fabrication Methods, for a total of 8 semester hours (11/05). Note: Students must complete the following four courses to receive the credit recommendation: *Oxy Fuel Cutting and Welding and Shielded Metal Arc Welding I*, *Oxy Fuel Cutting and Welding and Shielded Metal Arc Welding II*, *Shielded Metal-Arc Welding Leading to Certification*, and *Soldering and Brazing*.

Credit Recommendation

Course: Personnel Management in Service Work I

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 42 Hours

Date(s): September 2006 – Present

Objective: To make the student aware of how human relations affects customer satisfaction.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand why customers will call or not call again because of technician's people skills; assure the customer that they and the contractor will solve the customer's piping problem; make potential additional sales after the original service call; plan and execute a successful service call.

Instruction: Major topics covered in the course are: Human Relations and Salesmanship. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 2 semester hours in Personnel Management (11/05).

Credit Recommendation

Course: Pipe, Fittings, Valves, Supports, and Fasteners

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 24 Hours

Date(s): September 1995 - Present

Objective: To make the student aware of the various materials and support systems used in the Piping Industry.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the various materials and their use in the industry; identify the fittings used to join those materials; describe the support system for the materials and fittings; demonstrate proper selection of valves for certain applications.

Instruction: Major topics covered in the course are: Pipe, Pipe Fittings, Flanges and Gaskets, Methods of Joining Pipe, Understanding the Function of Valves, Types of Valves, Valve Bonnets, Valve Stems and Stuffing Boxes, Valve Installation and Pipe Hangers, Pipe Supports, Anchors, Guides and Fasteners. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Plumbing Fixtures (11/05). Note: Students must complete the following courses to receive the credit recommendation: *Pipe, Fittings, Valves, Supports and Fasteners* and *Plumbing Fixtures and Appliances*.

Credit Recommendation

Course: Plumbing Code

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 54 Hours

Date(s): September 1995 - Present

Objective: To train the student in the use of their local plumbing coded.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how plumbing codes are promulgated and enforced; search for and find applicable sections of the code pertaining to specific installations; describe the proper installation of drainage, water and gas piping; demonstrate the ability to find code violations in drawings and/or specifications.

Instruction: Major topics covered in the course are: Code Construction, General Use of Codes and Code Applications. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Plumbing Code (11/05).

Credit Recommendation

Course: **Plumbing Fixtures and Appliances**

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 57 Hours

Date(s): September 1995 - Present

Objective: To train the student in the design, handling and installation of plumbing fixtures and accessories.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how design plays an important role in the operation of various plumbing fixtures; identify the proper fixture controls, their function and maintenance requirements; know what accessories are required for an American with disabilities act (ADA) installation; troubleshoot various plumbing fixture problems and correct them.

Instruction: Major topics covered in the course are: Plumbing Fixtures, Installation Practices, Institutional Fixtures and Equipment, Fixture Controls and Appliances and Accessories. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Plumbing Fixtures (11/05). Note: Students must complete the following courses to receive the credit recommendation: *Plumbing Fixtures and Appliances* and *Pipe, Fittings, Valves, Supports and Fasteners*.

Credit Recommendation

Course: Project Management in Service Work II

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 54 Hours

Date(s): September 2006 - Present

Objective: To train the student in effective and profitable service related piping jobs.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how to approach complicated, sophisticated piping systems safely and efficiently; properly repair and/or replace non-functional piping to the satisfaction of the customer; describe components of various plumbing fixtures, appliances and piping systems subject to maintenance; demonstrate how to keep the customer and the contractor happy, despite the natural tendency of each party to feel taken advantage of.

Instruction: Major topics covered in the course are: Planning Service Work and Troubleshooting Plumbing Systems. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Introduction to Project Management (11/05).

Credit Recommendation

Course: Pumps

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 12 Hours

Date(s): September 1995 – Present

Objective: To train the student in the science and mechanics of pumping fluids.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the physics that come into play when pumping fluids horizontally and vertically through various piping materials; compute the horsepower requirements and other characteristics of different types of pumps; understand what cavitation is and how to minimize or eliminate it in pumping system; have the skills in designing, installing and maintaining pumps.

Instruction: Major topics covered in the course are: Pump Theory, Types of Pumps, Pump Installation and Pumps in Systems. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Fluid Mechanics I and 3 semester hours in Fluid Mechanics II, for a total of 6 semester hours (11/05). Note 1: Students who are Plumbers must complete the following courses to receive the credit recommendation: *Related Sciences, Pumps, and Water Supply*. Note 2: Students who are Pipefitters must complete the following courses to receive the credit recommendation: *Related Sciences, Pumps, and Steam Systems*.

Credit Recommendation

Course: Refrigeration

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 96 Hours

Date(s): September 1995 - Present

Objective: To train the student in the various ways refrigeration is used in the piping industry.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the basic refrigeration cycle that captures and releases heat to make something cooler; layout a basic refrigeration loop with all controls and valves necessary for efficient operation; describe the difference between centrifugal and absorption systems and the uses for each; troubleshoot and resolve malfunctions in all types of refrigeration applications.

Instruction: Major topics covered in the course are: Basic physical principles, elementary refrigeration methods, refrigerants, pressure-enthalpy diagrams, handling refrigerants and oil, application of the vapor compression refrigeration cycle, evaporators, introduction to compressors, reciprocating compressors, capacity control of reciprocating compressors, condensers, general principle water-cooled condensers, water supply for water-cooled condensers, evaporative condensers air-cooled condensers, refrigerant expansion devices, application of the thermostatic expansion valve, miscellaneous valves and refrigerant control devices, refrigerant piping accessories, refrigerant piping-general requirements and pipe sizing, refrigerant piping design and arrangement, refrigerant piping installation, electrical fundamentals, alternating-current motors, motor overload protection, motor controllers, related electrical equipment, centrifugal refrigeration machines, control of refrigeration equipment, heat pumps, commercial medium and low temperature refrigeration, absorption refrigeration, checking refrigerant temperatures and pressures, leak testing, evacuating and charging, testing electrical components, servicing procedures, related mechanical equipment and tube cleaning and retubing tools. Methods of instruction include: Lecture/Lab. Evaluation criteria includes examinations.

Credit Recommendation: In the upper division baccalaureate degree category or in the lower division baccalaureate/associate degree category, 3 semester hours in Thermodynamics I and 3 semester hours in Thermodynamics II, for a total of 6 semester hours (11/05). Note: Students must complete the following courses to receive the credit recommendation: *Refrigeration, Hydronic Heating and Cooling-Pipefitter*, and *Air Conditioning*.

Credit Recommendation

Course: Related Math II

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 54 Hours

Date(s): September 1995 – Present

Objective: To train the student in advanced piping mathematics using metric and standard measurements.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how to calculate offsets using 30 degree, 60 degree and 72 degree fittings; calculate rolling offsets using combinations of 30 degree, 45 degree, 60 degree and 72 degree fittings; describe the trigonometric procedures for developing 3, 4 and 5 piece fitting fabrication; demonstrate how to create a template for making lateral connections of various angles to main lines.

Instruction: Major topics covered in the course are: Multiplication Table, Dimensions of Laying Out Angles, Conversion of Inches and One-Eighth Inches to Decimal Feet. Methods of instruction include: lecture. Evaluation criteria include examinations assignments and projects.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Basic Math and Trigonometry for Plumbers and Pipefitters (11/05).

Credit Recommendation

Course: Related Math III

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 28 Hours

Date(s): September 1995 - Present

Objective: To make the student aware of basic pipe trades mathematics.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the use of mathematics in the installation of piping systems; identify the applicable math process for solving basic piping problems; describe the steps involved in solving pipe installation situations; demonstrate effective use of mathematics for job-site problem solving.

Instruction: Major topics covered in the course are: Multiplication Table, Dimensions of Laying Out Angles, Conversion of Inches and One-Eighth Inches to Decimal Feet. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 1 semester hour in Introduction to Surveying and Instrumentation (11/05).

Credit Recommendation

Course: Related Sciences

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 54 Hours

Date(s): September 1995 - Present

Objective: To make the student aware of how science affects piping systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the laws of physics as they apply to piping systems; identify the scientific principles that appear in piping installations; describe how pressure and force interact with fluids; demonstrate how expansion and contraction are used in piping arrangements.

Instruction: Major topics covered in the course are: Properties and Characteristics of Water and Steam, Hydraulics and Pneumatics, Mechanics, Metals, Alloys and Synthetics and Corrosion. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Fluid Mechanics I and 3 semester hours in Fluid Mechanics II, for a total of 6 semester hours (11/05). Note 1: Students who are Plumbers must complete the following courses to receive the credit recommendation: *Related Sciences, Pumps, and Water Supply*. Note 2: Students who are Pipefitters must complete the following courses to receive the credit recommendation: *Related Sciences, Pumps, and Steam Systems*.

Credit Recommendation

Course: Rigging

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: *Version 1:* 24 Hours; *Version 2:* 45 Hours

Date(s): *Version 1:* September 1995 – August 2006; *Version 2:* September 2006 - Present

Objective: To make the student aware of safe, effective rigging practices in the piping industry.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how to use the various equipment and procedures to safely move material and tools; identify the appropriate knot or practice for securing lines; describe the step-by-step procedures for moving and mounting equipment; demonstrate the safe movement of pipe and fittings with machinery. (*Version 2*) Additional learning outcome: understand materials and the science of their performance in rigging situations.

Instruction: Major topics covered in the course are: (*Version 1*) Fiber Rope, Knots and Hitches, Wire Rope, Slings, Rigging Hardware and Determining Load Weights. (*Version 2*) Add topics of material science. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: (*Version 1*) In the lower division baccalaureate/associate degree category, 1 semester hour in Rigging (11/05). (*Version 2*) In the lower division baccalaureate/associate degree category, 3 semester hours in Rigging (11/05).

Credit Recommendation

Course: Shielded Metal Arc Welding Leading to Certification

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 110 Hours

Date(s): September 1995 - Present

Objective: To train the student to pass the weld certification test.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how joint fit-up affects the weld process; perform a multiple pass weld in various positions; describe how each pass blends in with previous passes and when interpass temperatures are too high; produce an ASME approved weld sample for certification in shielded metal arc welding on carbon steel pipe.

Instruction: Major topics covered in the course are: The Shielded Metal Arc Welding Process and Piping Welding Clamps and Accessories. Methods of instruction include: lecture/lab. Evaluation criteria include examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 4 semester hours in Oxy-fuel Fabrication Methods, and 4 semester hours in Arc Welding Fabrication Methods, for a total of 8 semester hours (11/05). Note: Students must complete the following four courses to receive the credit recommendation: *Oxy Fuel Cutting and Welding and Shielded Metal Arc Welding I*, *Oxy Fuel Cutting and Welding and Shielded Metal Arc Welding II*, *Shielded Metal-Arc Welding Leading to Certification*, and *Soldering and Brazing*.

Credit Recommendation

Course: Soldering and Brazing

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 24 Hours

Date(s): September 1995 - Present

Objective: To make the student aware of safe effective methods of joining copper tube by soldering and brazing.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the various types of soldering and brazing alloys; identify the proper alloy for a specific application; describe the proper preparation, cleaning and fluxing of joints; demonstrate proper heating and application of the selected alloy.

Instruction: Major topics covered in the course are: Safety and Safe Work Practices, Soldering and Brazing process, types and uses of copper tube, solders, brazing filler metals and fluxes, joint preparation and assembly, heating equipment, making a solid joint, performance test for soldering, making a brazed joint, performance test for brazing and brazeable metals. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 4 semester hours in Oxy-fuel Fabrication Methods, and 4 semester hours in Arc Welding Fabrication Methods, for a total of 8 semester hours (11/05). Note: Students must complete the following four courses to receive the credit recommendation: *Oxy Fuel Cutting and Welding and Shielded Metal Arc Welding I*, *Oxy Fuel Cutting and Welding and Shielded Metal Arc Welding II*, *Shielded Metal-Arc Welding Leading to Certification*, and *Soldering and Brazing*.

Credit Recommendation

Course: Steam Systems

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 60 Hours

Date(s): September 1995 - Present

Objective: To train the student how steam systems are installed and operated.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand what steam is, how it is utilized in heating, cooling and process piping; layout a basic one-pipe steam heating system; describe how two pipe steam systems function and name all of the essential components; troubleshoot low and high pressure steam installation malfunctions.

Instruction: Major topics covered in the course are: Properties of saturated steam, basic equipment in a one-pipe steam heating system, one-pipe steam heating systems, steam traps, two-pipe steam heating systems, vacuum steam heating systems, vapor steam heating systems, variable vacuum (sub-atmospheric) steam heating systems, steam piping, heat transfer equipment, steam heating unit connections, low-pressure steam boilers, water feeders, low-water cutoffs and water level controllers, high-pressure steam boilers and steam generating plants. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Fluid Mechanics I and 3 semester hours in Fluid Mechanics II, for a total of 6 semester hours (11/05). Note: Students who are Pipefitters must complete the following three courses to receive the credit recommendation: *Steam Systems, Pumps and Related Sciences*.

Credit Recommendation

Course: Use and Care of Tools

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 24 Hours

Date(s): September 1995 - Present

Objective: To make the student aware of tools used in the Plumbing/Pipe Fitting Trade.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the use of industry tools; identify the proper tool for the application; demonstrate the safe use of tools and describe the proper use of various tools.

Instruction: Major topics covered in the course are: Safety and Safe Work Practices, Layout and Measuring Tools, screwdrivers, pliers and nut drivers, wrenches, vises and clamps, hammers and saws, files, punches and chisels, pipe wrenches and vises, pipe cutters and reamers, pipe threading, power-operated equipment for cutting and threading pipe, tube fabrication, special pipe and tube tools, drilling and boring tools, screw threads for bolts and rods, miscellaneous tools and equipment and ladders, scaffolds and hoists. Methods of instruction include: lecture/Lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Care and Maintenance of Valves. Note: Students must complete the following courses to receive the credit recommendation: *Use and Care of Tools* and *Valve Repair Training* (11/05).

Credit Recommendation

Course: Valve Repair Training

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 40 Hours

Date(s): September 1995 - Present

Objective: To train the student in the repair of various valves used in process piping.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the difference between a gate valve, globe valve and a plug valve; refinish valve surfaces so that they seal properly; describe the different types of packing material that is used to seal the stems of valves; repair valves to manufactures original specifications.

Instruction: Major topics covered in the course are: Introduction, Valve Information and Prints, Basic Precision Measuring Instruments, Fasteners and Torquing, Flanges, Gaskets, Pressure Seals, and O-Rings, Valve Packing, Gate Valves, Globe Valves, Diaphragm Valves, Butterfly, Ball and Plug Valves, Introduction to Control Valves, Check Valves, Safety and Relief Valves, General Guidelines for the Maintenance and Repair of Valves, Seat Repair, Common Valve Terminology. Methods of instruction include: lecture/lab. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Care and Maintenance of Valves. Note: Students must complete the following courses to receive the credit recommendation: *Valve Repair Training* and *Use and Care of Tools* (11/05).

Credit Recommendation

Course: Water Resources

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 66 Hours

Date(s): September 2006 - Present

Objective: To train the student to design and install drainage and venting systems.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand the difference between sanitary and storm, vacuum and gray water drainage systems; describe the various treatment processes, from cesspools to septic tanks to full-scale sewage treatment plants; understand how the venting system interrelates with the drainage system to promote effective operation; demonstrate the ability to use their local plumbing code in drainage system sizing, design and installation.

Instruction: Major topics covered in the course are: (*Version 1*) Sewage Disposal, Sewers and Drains, Building Drainage Systems, The Plumbing Trap and venting the drainage system; Hydrology Components and key concepts; and Pipe Sizing. Method of instruction includes: lecture. Evaluation criteria include examinations and sizing projects.

Credit Recommendation: In the upper division baccalaureate degree category or in the lower division baccalaureate/associate degree category, 3 semester hours in Waste Water Treatment (11/05).

Credit Recommendation

Course: Water Supply

Location: Englishtown, NJ (9), Jersey City (14), Newark (24, 475, & 696), Ridgefield (274) and Southern NJ (322)

Length: 72 Hours

Date(s): September 1995 - Present

Objective: To train the student to design and specify materials for a domestic hot and cold water supply system.

Learning Outcomes: Upon successful completion of this course, the student will be able to: understand how to protect potable water supplies with proper backflow devices; design a hot water supply system using different types of water heating equipment; describe the difference between wells and other sources of potable water; plan a hot and cold water supply system in high-rise buildings.

Instruction: Major topics covered in the course are: Water Treatment, Water Mains and Services, Building Water Supply Systems, Hot Water Supply. Method of instruction includes: lecture. Evaluation criteria includes examinations.

Credit Recommendation: In the lower division baccalaureate/associate degree category, 3 semester hours in Fluid Mechanics I and 3 semester hours in Fluid Mechanics II, for a total of 6 semester hours (11/05). Note: Students who are Plumbers must complete the following courses to receive the credit recommendation: *Water Supply, Related Sciences, and Pumps.*