Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA100 - INTRODUCTION TO HVAC

Unit Number: PA100

Dates: Spring 2016 **Hours:** 143.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to complete the required entry class/school forms, identify job opportunities, review course competencies, and demonstrate the safe use of tools safety practices and SDS protocol.

Tasks:

PA101 - Identify HVAC systems.

PA102 - Describe career opportunities in the HVAC profession.

PA103 - Demonstrate awareness of the occupational requirements.

PA104 - Explain the class rules and the rationale behind them.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12
Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
Standard CC.3.6.9-10.A Standard CC.3.6.11-12.A Write arguments focused on discipline specific content.

Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

RANGE OF WRITING GRADES 9-10-11-12
Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Review career opportunities using the internet
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Follow task sheet instructions to complete practical projects
Explain the basic principles of heating, ventilating, and air conditioning
Identify career opportunities available to people in the HVAC trade
Explain the purpose and objectives of an apprentice training program
Describe how certified apprentice training can start in high school
Describe what the Clean Air Act means to the HVAC trade

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Hone competition skills
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time

Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations.
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Pre/Post Test
Log/Journal
Time cards
Rubrics
Group Projects
Portfolio
Task grade sheet
Oral Presentation
Projects
Portfolio
Task project grade sheets
Diagrams

Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

Simutech Multimedia Inc. Simulators for HVAC Training. Ottawa, ON, Canada.
SIMUAIR ® Air Conditioner Simulator Information
SIMUPUMP ® Heat Pump Simulator Information
SIMUREFR ® Commercial Refrigeration Simulator Information
SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes:

<u>Pipe:</u>
Black
Copper
CPVC
PVC
Pex

<u>Welding:</u>
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components

<u>Refrigeration Test equipment:</u>
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels

HVAC/Plumbing Tools:

OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermo.
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladels
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA200 - BASIC SAFETY

Unit Number: PA200

Dates: Spring 2016 **Hours:** 32.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to complete and demonstrate the safe use of tools, safety practices, and SDS protocol.

Tasks:

PA201 - Identify causes of job site accidents and measures to prevent them from occurring.

PA202 - Identify job site hazards and describe measures to prevent them from occurring.

PA203 - Identify and demonstrate the use of personal protection equipment.

PA204 - Demonstrate the knowledge of OSHA regulations.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

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Supporting Anchor/Standards:

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Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices.
Perform research work by reading, reviewing, and deciphering content material from the Internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed.
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Identify the responsibilities and personal characteristics of a professional crafts person
Explain the role that safety plays in the construction crafts
Describe what job-site safety means
Explain the appropriate safety precautions around common job-site hazards
Demonstrate the use and care of appropriate personal protective equipment
Follow safe procedures for lifting heavy objects
Describe safe behavior on and around ladders and scaffolds
Explain the importance of the HazCom (Hazard Communication Standard) requirement and SDS (Safety Data Sheets).
Describe fire prevention and fire-fighting techniques
Define safe work procedures around electrical hazards

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Hone competition skills
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)

No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:

Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations.

Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Pre/Post Test
Log/Journal
Time cards
Rubrics
Group Projects
Portfolio
Task grade sheet
Oral Presentation
Projects
Portfolio
Task project grade sheets
Diagrams

Resources/Equipment:

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SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes:

<u>Pipe:</u>

Black
Copper
CPVC
PVC
Pex

<u>Welding:</u>

Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components

Refrigeration Test equipment:

Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels

HVAC/Plumbing Tools:

OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermo.
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladels
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA300 - TOOLS FOR VAC/R

Unit Number: PA300

Dates: Spring 2016 **Hours:** 32.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to safely use all tools in the VAC/R trade.

Tasks:

PA301 - Identify and safely use basic hand tools used in the trade.

PA302 - Identify and safely use basic power tools used in the trade.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

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CRAFT & STRUCTURE GRADES 9-10-11-12
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Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
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Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

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Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

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Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
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Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Take notes regarding safety procedures explained in safety DVD's
Identify the various hand and power tools used in the trade

Skill:

Complete time cards describing daily work completed.
Model projects to be fabricated as per specifications using VAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Recognize and identify some of the basic hand tools used in the construction trade
Use tools in a safe manner
Describe the basic procedures for taking care of these tools
Identify commonly used power tools of the construction trade
Use of power tools in a safe manner
Explain how to maintain power tools properly

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Hone competition skills
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement

Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

- Worksheets
- Quizzes
- Pre/Post Test
- Log/Journal
- Time cards
- Rubrics
- Group Projects
- Portfolio
- Task grade sheet
- Oral Presentation
- Projects
- Portfolio
- Task project grade sheets
- Diagrams

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

National Center for Construction Education and Research (NCCER). (2001). VAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

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SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial VAC/Plumbing equipment and Appliances for learning and testing purposes.

- Steel pipe
- Copper
- CPVC
- PVC
- Pex
- Arc
- Tig
- Oxy-Acetylene
- Brazing
- Soldering
- Electrical components
- Electrical Meters
- Freons
- Refrigeration Components
- Refrigeration Test Equipment
- Refrigeration Appliances
- Heating Components
- Heating Test equipment
- Heating Appliances
- Fuels
- OZ Recovery
- Turbo Tips
- Assorted NPT Taps
- Assorted Screw drivers
- Flashlights
- Allen key set
- Thermistor vacuum gauge
- Electronic leak detector
- Compressor Analyzer
- Sawblade set
- Duct board tools
- Nitrogen Regulator
- Charging scale
- Recovery tanks
- Digital thermometer
- Amprobe
- Multi-meter
- Mini- stripers
- Assorted benders
- Drill bit kit
- Strikers
- Insp. Mirror
- Chisel
- Assorted hammers
- Assorted pliers
- Assorted wrenches
- Levels
- Ref. Gauges
- Robinair charging station
- Efficiency test
- Angle Drill
- Hole Hawg
- Enviro-tech
- Vacuum pump

Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladels
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall

Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA400 - BLUEPRINT READING

Unit Number: PA400

Dates: Spring 2016 **Hours:** 30.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to recognize and identify basic blueprint terms, components, and symbols and related information on blueprints to actual locations on the print; recognize different classifications of drawings; and interpret and use drawing dimensions.

Tasks:

PA401 - Identify types of blueprint plans.

PA402 - Read and interpret blueprint plans.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.
RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
Standard CC.3.6.9-10.A Standard CC.3.6.11-12.A Write arguments focused on discipline specific content.

Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

RANGE OF WRITING GRADES 9-10-11-12
Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

NUMBERS AND OPERATIONS
Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

ALGEBRA
Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

GEOMETRY
Standard 2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
Standard 2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
Standard 2.3.HS.A.13 Analyze relationships between two dimensional and three dimensional objects.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Review career opportunities using the internet
Identify components by using drawings and schematics

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Recognize and identify basic blueprint terms, components, and symbols
Relate information on blueprints to actual locations on the print
Recognize different classifications of drawings
Interpret and use drawing dimensions

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
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Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
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Use of Computer (Access to)
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Have Student Repeat Directions
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Access to School Counselor
Use of Highlighter/Highlighted Text
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Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing

Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:

Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations

Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets
Quizzes
Pre/Post Test
Log/Journal
Time cards
Rubrics
Group Projects
Portfolio
Task grade sheet
Oral Presentation
Projects
Portfolio
Task project grade sheets
Diagrams

Resources/Equipment:

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SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Steel pipe
Copper
CPVC
PVC
Pex
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment

Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers

Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps

Grease gun
Lead Ladels
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA500 - PIPING PRACTICES

Unit Number: PA500

Dates: Spring 2016 **Hours:** 187.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to identify, assemble and install copper, plastic, and steel piping.

Tasks:

PA501 - Identify piping materials.

PA502 - Select, measure, cut, and ream piping and tubing.

PA503 - Assemble piping projects and pressure test according to trade standards.

PA504 - Identify and assemble PVC pipe and fittings.

PA505 - Assemble copper tubing projects and pressure test according to trade standards.

PA506 - Solder copper tubing.

PA507 - Braze ACR tubing.

PA508 - Identify and demonstrate proper use of fittings and tools for steel (black) pipe.

PA509 - Cut, ream, thread and assemble steel (black) pipe.

PA510 - Assemble corrugated stainless steel gas tubing (CSST) projects.

PA511 - Identify piping material such as PVC, ABS, copper, black iron.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

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CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

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Focus Anchor/Standard #2:

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Supporting Anchor/Standards:

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Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

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Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

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Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

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Standard 2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
Standard 2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
Standard 2.3.HS.A.13 Analyze relationships between two dimensional and three dimensional objects.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Assemble and operate the tools used for connection of piping material
Prepare tubing and fittings for assembly
Use appropriate method for assembly
Identify the purposes and uses of piping material
Identify inert gases needed to purge tubing for proper assembly

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
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Directions/Comprehension Check (frequent checks for understanding)
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Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:

Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

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National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

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SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Steel pipe
Copper
CPVC
PVC
Pex
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches

Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladels
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA600 - BASIC ELECTRICITY

Unit Number: PA600 **Hours:** 250.00

Dates: Spring 2016

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to state how electrical power is generated and distributed and describe how voltage, current, resistance, and power are related. Student will also know and be able to use Ohm's law to calculate the current, voltage, and resistance in a circuit and use the power formula to calculate how much power is consumed by a circuit. Finally, the student will know and be able to describe the differences between series and parallel circuits.

Tasks:

PA601 - Describe methods of producing electricity using appropriate terms.

PA602 - Calculate basic electrical quantities using Ohm's law.

PA603 - Explain how magnetism is used in different HVAC components.

PA604 - Identify safe electrical practices.

PA605 - Identify and draw various types of electrical schematics and symbols.

PA606 - Demonstrate proper wiring techniques.

PA607 - Demonstrate electrical testing to include mechanical/electronic relays.

PA608 - Wire series circuit, parallel circuit, and series / parallel circuit.

PA609 - Install electric disconnects, circuit breakers and fuses.

PA610 - Identify and test capacitors.

PA611 - Identify electrical motors and their applications.

PA612 - Identify motor control protection and start devices.

PA613 - Identify electrical codes.

PA614 - Demonstrate knowledge of transformers and their applications.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12
Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
Standard CC.3.6.9-10.A Standard CC.3.6.11-12.A Write arguments focused on discipline specific content.

Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

RANGE OF WRITING GRADES 9-10-11-12
Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

NUMBERS AND OPERATIONS
Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

ALGEBRA
Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

GEOMETRY
Standard 2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
Standard 2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
Standard 2.3.HS.A.13 Analyze relationships between two dimensional and three dimensional objects.

Instructional Activities:

Knowledge:

- Participate in co-operative group discussions
- Listen and participate in lecture by completing a review sheet
- Participate in co-operative group theory projects
- Review related rubric and procedures for project completion
- Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
- Perform research work by reading, reviewing, and deciphering content material from trade journals
- Perform research work by reading, reviewing, and deciphering content material from the Internet
- Review career opportunities using the internet
- Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
- Identify components by using drawings and schematics
- Take notes regarding safety procedures explained in safety DVD's

Skill:

- Complete time cards describing daily work completed
- Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
- Follow task sheet instructions to complete practical projects
- State how electrical power is generated and distributed
- Describe how voltage, current, resistance, and power are related
- Use Ohm's law to calculate the current, voltage, and resistance in a circuit
- Use the power formula to calculate how much power is consumed by a circuit
- Describe the differences between series and parallel circuits
- Recognize and describe the purpose and operation of the various electrical components used in HVAC equipment
- State and demonstrate the safety precautions that must be followed when working on electrical equipment
- Make voltage, current, and resistance measurements using electrical test equipment

Remediation:

- Re-teach major concepts
- Review with teacher assistance
- Provide individual tutoring
- Provide peer tutoring
- Engage student in study groups
- Use review games to provide reinforcement of material

Enrichment:

- Advancement to the next task or set of tasks
- Local HVAC/Plumbing competition
- Engage in advanced projects related to tasks

Special Adaptations:

- Extended Time (assignments and/or testing)
- Graphic Organizer
- Chunking of Assignments/Material
- Preferential Seating
- Directions/Comprehension Check (frequent checks for understanding)
- Study Guide
- Directions and/or Tests Read Aloud
- Adapted Tests and/or Assignments
- Use of Calculator
- Taking Tests in Alternate Setting (or if requested)
- Verbal/Gestural Redirection (prompts to remain on task)
- Drill and Practice (Repetition of Material)
- No Penalization for Spelling

Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

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Mini- stripers
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Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladels
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets
Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA700 - INTRODUCTION TO COOLING

Unit Number: PA700

Dates: Spring 2016 **Hours:** 151.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to explain how heat transfer occurs in a cooling system and demonstrate an understanding of the terms and concepts used in the refrigeration cycle.

Tasks:

PA701 - Measure temperature and pressure of a cooling system.

PA702 - Calculate superheat and sub cooling.

PA703 - Locate and describe components of the basic refrigeration cycle.

PA704 - Apply pressure temperature charts for various refrigerants.

PA705 - Describe the functions of compressors.

PA706 - Describe the functions of condensers.

PA707 - Describe the functions of evaporators.

PA708 - Describe the functions of metering devices.

PA709 - Identify secondary components used in the air conditioning and refrigeration industry.

PA710 - Evaluate effects of airflow on system performance.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

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Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12
Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
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Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

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Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

NUMBERS AND OPERATIONS
Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

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Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

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Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

GEOMETRY
Standard 2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
Standard 2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
Standard 2.3.HS.A.13 Analyze relationships between two dimensional and three dimensional objects.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Explain how heat transfer occurs in a cooling system, demonstrating an understanding of the terms and concepts used in the refrigeration cycle
Calculate the temperature and pressure relationships at key points in the refrigeration cycle
Under supervision, use temperature- and pressure-measuring instruments to make readings at key points in the refrigeration cycle
Identify commonly used refrigerants and demonstrate the procedures for handling these refrigerants.
Identify the major components of a cooling system and explain how each type works
Identify the major accessories available for cooling systems and explain how each works
Identify the control devices used in cooling systems and explain how each works
State the correct methods to be used when piping a refrigeration system

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
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Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
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Positive Reinforcement
Have Student Repeat Directions
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Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods

Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
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Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
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Resources/Equipment:

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Duct board tools
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Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
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Robinair charging station
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Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA800 - INTRODUCTION TO HEATING

Unit Number: PA800

Dates: Spring 2016 **Hours:** 210.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to explain the three methods by which heat is transferred and give an example of each, describe how combustion occurs and identify the by-products of combustion, and identify the various types of fuels used in heating.

Tasks:

PA801 - Describe the principles of combustion.

PA802 - Identify temperatures and pressures of a heating system.

PA803 - Identify components of various heating systems.

PA804 - Perform maintenance on a gas furnace.

PA805 - Troubleshoot conventional / condensing gas heating equipment.

PA806 - Identify oil heating equipment.

PA807 - Install and adjust oil fired equipment.

PA808 - Perform annual preventive maintenance on oil fired equipment.

PA809 - Troubleshoot oil fired equipment.

PA810 - Identify electric heating equipment.

PA811 - Install heating/air conditioning thermostats according to manufacturer's standards.

PA812 - RESERVED

PA813 - Perform combustion analysis on oil and gas fired equipment.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12
Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
Standard CC.3.6.9-10.A Standard CC.3.6.11-12.A Write arguments focused on discipline specific content.

Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

RANGE OF WRITING GRADES 9-10-11-12
Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

NUMBERS AND OPERATIONS
Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Explain the three methods by which heat is transferred and give an example of each
Describe how combustion occurs and identify the byproducts of combustion
Identify the various types of fuels used in heating
Identify the major components and accessories of an induced draft and condensing gas furnace and explain the function of each component
State the factors that must be considered when installing a furnace
Identify the major components of a gas furnace and describe how each works
With supervision, use a manometer to measure and adjust manifold pressure on a gas furnace
Identify the major components of an oil furnace and describe how each works.
Describe how an electric furnace works
With supervision, perform basic furnace preventive maintenance procedures such as cleaning and filter replacement

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods

Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations.
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book).
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

Simutech Multimedia Inc. Simulators for HVAC Training. Ottawa, ON, Canada.
SIMUAIR ® Air Conditioner Simulator Information
SIMUPUMP ® Heat Pump Simulator Information
SIMUREFR ® Commercial Refrigeration Simulator Information
SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Steel pipe
Copper
CPVC
PVC
Pex
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA900 - AIR DISTRIBUTION SYSTEMS

Unit Number: PA900

Dates: Spring 2016 **Hours:** 90.00

Last Edited By: HVAC (05-10-2016)

Unit Description/Objectives:

Student will know and be able to describe the airflow and pressures in a basic forced air distribution system, explain the differences between propeller and centrifugal fans and blowers, and identify the various types of duct systems and explain why and where each type is used. Student will also know and be able to demonstrate and explain the installation of metal, fiberboard, and flexible duct and demonstrate and explain the installation of fittings and transitions used in duct systems.

Tasks:

PA901 - Identify and sketch different types of duct systems.

PA902 - Identify and describe the different types of duct system components.

PA903 - Test velocity, temperature, humidity, and volume in a duct system.

PA904 - RESERVED

PA905 - RESERVED

PA906 - Perform basic duct fabrication functions.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

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INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12
Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

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Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

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Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

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Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

RANGE OF WRITING GRADES 9-10-11-12
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Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

NUMBERS AND OPERATIONS
Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

ALGEBRA
Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

GEOMETRY
Standard 2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
Standard 2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
Standard 2.3.HS.A.13 Analyze relationships between two dimensional and three dimensional objects.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Describe the airflow and pressures in a basic forced-air distribution system
Explain the differences between propeller and centrifugal fans and blowers
Identify the various types of duct systems and explain why and where each type is used
Demonstrate or explain the installation of:
metal
fiberboard
flexible duct
Demonstrate or explain the installation of fittings and transitions used in duct systems
Demonstrate of explain the use and installation of:
Diffusers used in duct systems
Registers used in duct systems
Grilles used in duct systems
Demonstrate or explain the use and installation of dampers used in duct systems

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
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Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
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Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
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Provide Frequent Feedback
Provide Frequent Breaks

Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
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Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
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Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

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Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
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SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Steel pipe
Copper
CPVC
PVC
Pex
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA1000 - INTRODUCTION TO HYDRONIC SYSTEMS

Unit Number: PA1000

Dates: Spring 2016 **Hours:** 15.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to describe hot-water heating system components.

Tasks:

PA1001 - Describe hot water heating system components.

PA1002 - Install and service hydronic systems.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12
Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
Standard CC.3.6.9-10.A Standard CC.3.6.11-12.A Write arguments focused on discipline specific content.

Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

RANGE OF WRITING GRADES 9-10-11-12
Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

NUMBERS AND OPERATIONS
Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

ALGEBRA
Standard 2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

GEOMETRY
Standard 2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
Standard 2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
Standard 2.3.HS.A.13 Analyze relationships between two dimensional and three dimensional objects.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart

All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:

Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

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Simutech Multimedia Inc. Simulators for HVAC Training. Ottawa, ON, Canada.
SIMUAIR ® Air Conditioner Simulator Information
SIMUPUMP ® Heat Pump Simulator Information
SIMUREFR ® Commercial Refrigeration Simulator Information
SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Steel pipe
Copper
CPVC
PVC
Pex
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA1100 - LEAK DETECTION, EVACUATION, RECOVERY AND CHARGING

Unit Number: PA1100

Dates: Spring 2016 **Hours:** 125.00

Last Edited By: HVAC (05-10-2016)

Unit Description/Objectives:
Student will know and be able to identify the common types of leak detectors and explain how each is used.

Tasks:

PA1101 - Locate refrigerant leaks using common types of leak detectors.

PA1102 - Perform refrigerant recovery.

PA1103 - Perform system evacuation and dehydration.

PA1104 - Determine when to charge with liquid versus vapor.

PA1105 - Weigh in correct system charge (when appropriate).

PA1106 - Charge systems using superheat method when appropriate (e.g., fixed restriction).

PA1107 - Charge systems using sub cooling method when appropriate (e.g., TXV, AXV).

PA1108 - Demonstrate knowledge of EPA Section 608.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12
Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
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Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

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Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

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Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

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Supporting Anchor/Standards:

NUMBERS AND OPERATIONS
Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Identify the common types of leak detectors and explain how each is used
Demonstrate skill in performing leak detection tests
Identify the service equipment used for evacuating a system and explain why each item of equipment is used
Demonstrate skill in performing system evacuation and dehydration
Identify the service equipment used for recovering refrigerant from a system and for recycling the recovered refrigerant, and explain why each item of equipment is used
Demonstrate skill in charging refrigerant into a system

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
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Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects

Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:

Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
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SIMUMKT ® Supermarket Refrigeration Simulator Information
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SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Steel pipe
Copper
CPVC
PVC
Pex
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA1200 - TROUBLESHOOTING GAS HEATING

Unit Number: PA1200

Dates: Spring 2016 **Hours:** 15.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to identify the major components of fuel systems and describe the function of each component including natural gas, LP gas, and fuel oil.

Tasks:

PA1201 - Perform gas burner flame proving tests according to trade standards.

PA1202 - Demonstrate how to install, trouble shoot, and service gas heating equipment.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

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Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

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Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

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Focus Anchor/Standard #2:

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Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
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Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

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- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

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Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Identify the major components of the following fuel systems and describe the function of each component:
    Natural gas
    LP gas
    Fuel oil
Identify the physical properties of each type of fuel
Identify the safety precautions and potential hazards associated with each type of fuel and system

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
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Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
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De-Escalation Opportunities
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Provide repetition During Initial Instruction
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Multiplication Chart
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Testing - Allow Dictation of Lengthy Answers
Time out
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Student must:
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Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
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Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA1300 – TROUBLESHOOTING COOLING

Unit Number: PA1300

Dates: Spring 2016 **Hours:** 15.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to explain the basic principles applicable to all control systems.

Tasks:

PA1301 - Identify control system components.

PA1302 - Demonstrate, install, trouble shoot, and service cooling equipment.

PA1303 - Demonstrate how to install electrical components.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.

CRAFT & STRUCTURE GRADES 9-10-11-12
Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.
RANGE OF READING GRADES 9-10-11-12

Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
Standard CC.3.6.9-10.A Standard CC.3.6.11-12.A Write arguments focused on discipline specific content.

Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

RANGE OF WRITING GRADES 9-10-11-12
Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Connecting Anchor/Standard:

- Pennsylvania Core Standards for Mathematics Standard 2.0

Supporting Anchor/Standards:

NUMBERS AND OPERATIONS
Standard 2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

Standard 2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multistep problems.

Standard 2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Standard 2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Participate in co-operative group theory projects
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Explain the basic principles applicable to all control systems
Identify the various types of electromechanical, electronic, and pneumatic HVAC controls
Explain the function of the various types of electromechanical, electronic, and pneumatic HVAC controls
Explain the operation of the various types of electromechanical, electronic, and pneumatic HVAC controls
Identify the service instruments needed to troubleshoot HVAC components

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
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Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA1400 - HEAT PUMPS

Unit Number: PA1400

Dates: Spring 2016 **Hours:** 35.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to describe the principles of reverse-cycle heating.

Tasks:

PA1401 - Explain heat pump modes of operation.

PA1402 - Identify and describe heat pump components.

PA1403 - Demonstrate how to install heat pumps.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
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Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

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Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics
Take notes regarding safety procedures explained in safety DVD's

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Describe the principles of reverse-cycle heating
Identify heat pumps by type and general classification
List the components of heat pump systems

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

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Handle material in a safe and work like manner

Use protective clothing and equipment

Use hand tools in a safe manner

Use adequate ventilation when working in enclosed areas

Follow manufacturer's directions when using any product, tool, equipment, etc.

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Use tools and equipment in a professional work like manner according to OSHA standards

Know and follow the established safety rules at all times

Assessment:

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Turbo Tips
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Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: PA1500 - COMPUTER FUNDAMENTALS

Unit Number: PA1500

Dates: Spring 2016 **Hours:** 35.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to complete PDP Internet research requirements set by Monroe Career & Technical Institute and demonstrate skills with computer software relating to HVAC.

Tasks:

PA1501 - RESERVED

PA1502 - Utilize the Internet for research.

PA1503 - Identify and demonstrate skills with computer software relating to HVAC.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- Pennsylvania Core Standards for Reading for Technical Subjects Standard 3.5

Supporting Anchor/Standards:

KEY IDEAS/DETAILS GRADES 9-10-11-12
Standard CC.3.5.9-10.A / Standard CC.3.5.11-12A Cite specific textual evidence, etc.

Standard CC.3.5.9-10 B / Standard CC.3.5.11-12 B Determine the central ideas or conclusions of a text; etc.

Standard CC.3.5.9-10.C / Standard CC.3.5.11-12.C Follow precisely a complex multistep procedure, etc.
CRAFT & STRUCTURE GRADES 9-10-11-12

Standard CC.3.5.9-10. D / Standard CC.3.5.11-12.D Determine the meaning of symbols, key terms, and other domain specific words.

Standard CC.3.5.9-10.E / Standard CC.3.5.11-12.E Analyze the structure of the relationships among concepts in a text, etc.

Standard CC.3.5.9-10.F / Standard CC.3.5.11-12.F Analyze the author's purpose in providing an explanation, describing a procedure...and Analyze the structure of the relationships among concepts in a text.

INTEGRATE KNOWLEDGE & IDEAS GRADES 9-10
Standard CC.3.5.9-10.G Translate quantitative or technical information expressed in a text into visual form (e.g. a table or chart).

Standard CC.3.5.9-10. H Assess the reasoning in a text to support the author's claim for solving a technical problem.

Standard CC.3.5.9-10. I Compare and contrast findings presented in a text to those from other sources, etc.

INTEGRATE KNOWLEDGE & IDEAS GRADES 11-12
Standard CC.3.5.11-12. G Integrate and evaluate multiple sources of information presented in diverse formats...to solve a problem.

Standard CC.3.5.11-12. H Evaluate the hypotheses, data, analysis, and conclusions in a technical text, verifying the data when possible.

Standard CC.3.5.11-12. I Synthesize information from a range of sources into a coherent understanding.

RANGE OF READING GRADES 9-10-11-12
Standard CC.3.5.9-10.J / Standard CC.3.5.11-12.J By the end of grades 9-10, AND 11- 12, read and comprehend technical texts independently and proficiently.

Focus Anchor/Standard #2:

- Pennsylvania Core Standards for Writing for Technical Subjects Standard 3.6

Supporting Anchor/Standards:

TEXT TYPES AND PURPOSE GRADES 9-10-11-12
Standard CC.3.6.9-10.A Standard CC.3.6.11-12.A Write arguments focused on discipline specific content.

Standard CC.3.6.9-10.B Standard CC.3.6.11-12.B Write informative or explanatory texts, including the narration of technical processes, etc.

PRODUCTION & DISTRIBUTION OF WRITING GRADES 9-10-11-12
Standard CC.3.6.9-10.C Standard CC.3.6.11-12 C Produce clear and coherent writing...appropriate to task, purpose, and audience.

Standard CC.3.6.9-10 D Standard CC.3.6.11-12.D Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.

Standard CC.3.6.9-10.E Standard CC.3.6.11-12.E. Use technology, including the internet, to produce, publish, and update individual or shared writing products.

RESEARCH GRADES 9-10-11-12
Standard CC.3.6.9-10.F Standard CC.3.6.11-12.F Conduct short and more sustained research to answer a question or solve a problem.

Standard CC.3.6.9-10.G. Standard CC.3.6.11-12.G Gather relevant information from multiple authoritative print and digital sources, following a standard format for citation.

Standard CC.3.6.9-10.H. Standard CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.
RANGE OF WRITING GRADES 9-10-11-12

Standard CC.3.5.9-10.I & Standard CC.3.5.11-12.I. Write routinely over extended time frames and shorter time frames for a range of tasks, purposes and audiences...etc.

Instructional Activities:

Knowledge:

- Participate in co-operative group discussions
- Listen and participate in lecture by completing a review sheet
- Participate in co-operative group theory projects
- Review related rubric and procedures for project completion
- Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
- Perform research work by reading, reviewing, and deciphering content material from trade journals
- Perform research work by reading, reviewing, and deciphering content material from the Internet
- Review career opportunities using the internet
- Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
- Identify components by using drawings and schematics
- Take notes regarding safety procedures explained in safety DVD's

Skill:

- Complete time cards describing daily work completed
- Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
- Follow task sheet instructions to complete practical projects
- Complete PDP requirements set by Monroe Career & Technical Institute

Remediation:

- Re-teach major concepts
- Review with teacher assistance
- Provide individual tutoring
- Provide peer tutoring
- Engage student in study groups
- Use review games to provide reinforcement of material

Enrichment:

- Advancement to the next task or set of tasks
- Local HVAC/Plumbing competition
- Engage in advanced projects related to tasks

Special Adaptations:

- Extended Time (assignments and/or testing)
- Graphic Organizer
- Chunking of Assignments/Material
- Preferential Seating
- Directions/Comprehension Check (frequent checks for understanding)
- Study Guide
- Directions and/or Tests Read Aloud
- Adapted Tests and/or Assignments
- Use of Calculator
- Taking Tests in Alternate Setting (or if requested)
- Verbal/Gestural Redirection (prompts to remain on task)
- Drill and Practice (Repetition of Material)
- No Penalization for Spelling
- Copy of Teacher/Student Notes/Skeleton Notes
- Small Group Instruction
- Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
- Teacher Modeling
- Use of Computer (Access to)
- Positive Reinforcement
- Have Student Repeat Directions
- Wait Time
- Access to School Counselor

Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:
Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Student practical tasks will be graded based on rubrics if applicable.
Tasks will be inspected, tested and graded to meet HVAC-R standards (Reference National Mechanical, Plumbing, and Electrical Code Book)
Practical tasks include related theory testing applicable to the task and will be graded
Practical tasks include related assignments applicable to the task and will be graded

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

Simutech Multimedia Inc. Simulators for HVAC Training. Ottawa, ON, Canada.
SIMUAIR ® Air Conditioner Simulator Information
SIMUPUMP ® Heat Pump Simulator Information
SIMUREFR ® Commercial Refrigeration Simulator Information
SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator
Skills USA Professional Development Program work books

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Steel pipe
Copper
CPVC
PVC
Pex
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: L1600 - CONSTRUCTION MATH

Unit Number: L1600

Dates: Spring 2016 **Hours:** 16.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to integrate and perform any mathematical computations required by the HVAC/Plumbing industry.

Tasks:

L1601 - Demonstrate Proficiency in Math as it relates to HVAC/R.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Anchor/Standards:

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.

3.4.10.C1 Apply the components of the technological design process.

3.4.12.C3 Apply the concept that many technological problems require a multi-disciplinary approach.

Focus Anchor/Standard #2:

- CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

Supporting Anchor/Standards:

CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.

CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.

CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.

CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.

Connecting Anchor/Standard:

- CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Anchor/Standards:

CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.

CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume.

CC.2.3.8.A.1 Apply the concepts of volume of cylinders, cones, and spheres to solve real-world and mathematical problems.

CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.

Instructional Activities:

Knowledge:

Listen and participate in lecture by completing a review sheet
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Troubleshoot HVAC/Plumbing hypothetical problems on computer program models identifying actual problems encountered on the job
Identify components by using drawings and schematics

Skill:

Complete time cards describing daily work completed.
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Add, subtract, multiply and divide whole numbers, with and without a calculator
Use a standard ruler and a metric ruler to measure
Add, subtract, multiply, and divide fractions
Add, subtract, multiply, and divide decimals, with and without a calculator
Convert decimals to percent's and percent's to decimals
Convert fractions to decimals and decimals to fractions
Explain what the metric system is and how it is important in the construction trade
Recognize and use metric units of length, weight, volume, and temperature
Recognize some of the basic shapes used in the construction industry and apply basic geometry to measure them

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Hone competition skills
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
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Small Group Instruction
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Teacher Modeling
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Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response

De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
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All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:

Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets	Rubrics	Projects
Quizzes	Group Projects	Portfolio
Pre/Post Test	Portfolio	Task project grade sheets
Log/Journal	Task grade sheet	Diagrams
Time cards	Oral Presentation	

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

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SIMUREFR ® Commercial Refrigeration Simulator Information
SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes:

Pipe
Black
Copper
CPVC
PVC
Pex
Welding:
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test equipment:
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
HVAC/Plumbing Tools:
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator
Charging scale
Recovery tanks
Digital thermo.
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: L1800 - BASIC COMMUNICATION

Unit Number: L1800

Dates: Spring 2016 **Hours:** 30.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to demonstrate the appropriate reading, writing, listening, and speaking skills required to communicate in his/her trade area and in society.

Tasks:

L1801 - Demonstrate Reading, Writing, Listening, and Speaking Skills.

L1802 - Complete a Resume and Mock Interview.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Anchor/Standards:

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.

Focus Anchor/Standard #2:

- CC.3.6.11-12.C. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience

Supporting Anchor/Standards:

CC.3.5.9-10.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9–10 texts and topics.

CC.3.5.11-12.D. Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11–12 texts and topics.

CC.3.5.11-12.G. Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.

CC.3.5.9-10.I. Compare and contrast findings presented in a text to those from other sources (including their own experiments), noting when the findings support or contradict previous explanations or accounts.

CC.3.5.11-12.J.By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently.

Connecting Anchor/Standard:

- CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Anchor/Standards:

CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from trade journals
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the Internet
Identify components by using drawings and schematics
Complete required levels of Professional Development Program

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Participate in mock interview sessions
Demonstrate good reading, writing and speaking skills
Complete resume
Complete required levels of Professional Development Program

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)
Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
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Cue for Oral Response
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Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:

Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations

Handle material in a safe and work like manner

Use protective clothing and equipment

Use hand tools in a safe manner

Use adequate ventilation when working in enclosed areas

Follow manufacturer's directions when using any product, tool, equipment, etc.

Use proper safety precautions when using /operating hand tools

Use tools and equipment in a professional work like manner according to OSHA standards

Know and follow the established safety rules at all times

Assessment:

Resume rubric

PDP worksheets

Time cards

Mock interview rubric

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

SkillsUSA Publications, 2008. Professional Development Program Levels 1 and 2

Simutech Multimedia Inc. Simulators for HVAC Training. Ottawa, ON, Canada.
SIMUAIR ® Air Conditioner Simulator Information
SIMUPUMP ® Heat Pump Simulator Information
SIMUREFR ® Commercial Refrigeration Simulator Information
SIMUMKT ® Supermarket Refrigeration Simulator Information
SIMUGAS ® Gas Furnace Simulator Information
SIMUOIL ® Oil Furnace Simulator Information
SIMUHYDRO ® Hot Water Boiler Simulator

Use of residential and commercial HVAC/Plumbing equipment and Appliances for learning and testing purposes.

Steel pipe
Copper
CPVC
PVC
Pex
Arc
Tig
Oxy-Acetylene
Brazing
Soldering
Electrical components
Electrical Meters
Freons
Refrigeration Components
Refrigeration Test Equipment
Refrigeration Appliances
Heating Components
Heating Test equipment
Heating Appliances
Fuels
OZ Recovery
Turbo Tips
Assorted NPT Taps
Assorted Screw drivers
Flashlights
Allen key set
Thermistor vacuum gauge
Electronic leak detector
Compressor Analyzer
Sawblade set
Duct board tools
Nitrogen Regulator

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Charging scale
Recovery tanks
Digital thermometer
Amprobe
Multi-meter
Mini- stripers
Assorted benders
Drill bit kit
Strikers
Insp. Mirror
Chisel
Assorted hammers
Assorted pliers
Assorted wrenches
Levels
Ref. Gauges
Robinair charging station
Efficiency test
Angle Drill
Hole Hawg
Enviro-tech
Vacuum pump
Hand grinder
Assorted saws
Picks
Shovels
Rakes
Prestolite Torch
1" snake
1/4 elect. snake
Wire casing rip.
1/8" to 2" cutter
Shop Vac
Oilers
Clamps
Grease gun
Lead Ladles
Wire strippers
Cats paw
Elec. Hammer Drill
Sawzall
Solder gun
Putty Knives
Aviation Snips
Assorted cutters
16' Tape Measures
Burring Reamers
Soil Pipe Assembly tool
Tri-Squares
Squares
Crow Bars
Closet auger
1/2" Breaker Bar
1/2" Snap-On Ratchet
1/2"x 10" extension
1/2" x 5" extension
Assorted deep well
Assorted drivers
Assorted sockets

Hyperlinks:

Monroe Career & Technical Institute
Course: HVAC Technology

Unit Name: L1900 - BASIC EMPLOYABILITY

Unit Number: L1900

Dates: Spring 2016 **Hours:** 30.00

Last Edited By: HVAC (05-10-2016)

Unit Description / Objectives:

Student will know and be able to demonstrate employability skills and interpersonal skills.

Tasks:

L1901 - Demonstrate Employability Skills.

L1902 - Demonstrate Interpersonal Skills.

Standards / Assessment Anchors

Focus Anchor/Standard #1:

- 13.2.11 E Demonstrate, in the career acquisition process, the application of essential workplace skills/knowledge, such as, but not limited to: commitment, communication, dependability, health/safety, laws and regulations (that is Americans with Disabilities Act, Child Labor Law, Fair Labor Standards Act, OSHA, Material Safety Data Sheets), personal initiative, Self-advocacy, scheduling/time management, team building, technical literacy and technology.

Supporting Anchor/Standards:

3.4.10.A2 Interpret how systems thinking applies logic and creativity with appropriate comprises in complex real-life problems.

Focus Anchor/Standard #2:

- CC.3.5.11-12.J. By the end of grade 12, read and comprehend science/technical texts in the grades 11–12 text complexity band independently and proficiently

Supporting Anchor/Standards:

CC.3.6.11-12.F. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.

CC.3.6.11-12.H. Draw evidence from informational texts to support analysis, reflection, and research.

Connecting Anchor/Standard:

- CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.

Supporting Anchor/Standards:

CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.

Instructional Activities:

Knowledge:

Participate in co-operative group discussions
Listen and participate in lecture by completing a review sheet
Review related rubric and procedures for project completion
Participate in a literacy (RWLS or Math) strategy to familiarize students with material, procedures, and practices
Perform research work by reading, reviewing, and deciphering content material from the Internet
Review career opportunities using the internet

Skill:

Complete time cards describing daily work completed
Model projects to be fabricated as per specifications using HVAC/Plumbing material and recommended material
Follow task sheet instructions to complete practical projects
Complete PDP requirements set by Monroe Career & Technical Institute

Remediation:

Re-teach major concepts
Review with teacher assistance
Provide individual tutoring
Provide peer tutoring
Engage student in study groups
Use review games to provide reinforcement of material

Enrichment:

Advancement to the next task or set of tasks
Local HVAC/Plumbing competition
Engage in advanced projects related to tasks

Special Adaptations:

Extended Time (assignments and/or testing)
Graphic Organizer
Chunking of Assignments/Material
Preferential Seating
Directions/Comprehension Check (frequent checks for understanding)
Study Guide
Directions and/or Tests Read Aloud
Adapted Tests and/or Assignments
Use of Calculator
Taking Tests in Alternate Setting (or if requested)
Verbal/Gestural Redirection (prompts to remain on task)
Drill and Practice (Repetition of Material)
No Penalization for Spelling
Copy of Teacher/Student Notes/Skeleton Notes
Small Group Instruction
Provide Visual Model to Accompany Verbal Directions (Written/Oral Directions)
Teacher Modeling
Use of Computer (Access to)

Positive Reinforcement
Have Student Repeat Directions
Wait Time
Access to School Counselor
Use of Highlighter/Highlighted Text
Positive Reinforcement
Provide Frequent Feedback
Provide Frequent Breaks
Variety of Assessment Methods
Regular Notebook Check
Use of Assistive Device (i.e. notepad, laptop, etc.)
Highly Structured Classroom
Syllabus for Major Projects
Limited, Short Directions
Grading Rubric
Communication Regarding Behavior & Consequences (PBS)
Clear Language for Directions
Use of Multisensory Approach
Provide Opportunities to Retest
Frequent Review Sessions
Use a variety of Modalities when Introducing Skills/Concepts
Books on Tape or CD
Allow Oral Answers for Testing
Provide Editing Assistance
Copies of Text for Home
Cue for Oral Response
De-Escalation Opportunities
Daily Classwork Check
Encourage Student to Check Work Before Turning In
Opportunities for Repeated Practice of MATH Skills
Provide repetition During Initial Instruction
Allow Pre-read of Questions Before Reading Written Passage
Provide Verbal and Written Directions
Multiplication Chart
All Vocabulary to be Defined Before Testing
Testing - Allow Dictation of Lengthy Answers
Time out
Graph Paper for Math
Encouragement to Participate in Positive Leadership Roles
Assistance with Bubble Sheets
Student Self-Evaluation for Behavior
Exempt from reading Aloud in Front of Peers

Safety:

Student must:

Comply with personal and environmental safety practices associated with shop recommended clothing, eye protection and the handling, storage, and disposal of chemicals/materials in accordance with school, local, state, and federal safety and environmental regulations
Handle material in a safe and work like manner
Use protective clothing and equipment
Use hand tools in a safe manner
Use adequate ventilation when working in enclosed areas
Follow manufacturer's directions when using any product, tool, equipment, etc.
Use proper safety precautions when using /operating hand tools
Use tools and equipment in a professional work like manner according to OSHA standards
Know and follow the established safety rules at all times

Assessment:

Worksheets	Rubrics	Projects
Quizzes	Group Projects	Portfolio
Pre/Post Test	Portfolio	Task project grade sheets
Log/Journal	Task grade sheet	Diagrams
Time cards	Oral Presentation	

Resources/Equipment:

National Association of Home Builders (NAHB) Plumbing Second Edition By Michael A. Joyce 2012

National Association of Home Builders (NAHB) HVAC Second Edition By Eugene Silberstein 2012

National Center for Construction Education and Research (NCCER). (2001). HVAC Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

National Center for Construction Education and Research (NCCER). (2000). Core Curriculum Trainee Guide, Wheels of Learning. Upper Saddle River, NJ: Prentice Hall.

Simutech Multimedia Inc. Simulators for HVAC Training. Ottawa, ON, Canada.
SIMUAIR ® Air Conditioner Simulator Information
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Skills USA 2008 Professional Development Program work books

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