State-Approved Technical Skill Assessments

5/2/2017

Pathway: Maintenance/ Operations

Cluster: Architecture and Construction

CLUSTER/ PATHWAY/ PROGRAM	CERTIFICATION / ASSESSMENT TITLE	TYPE	ISSUING ORGANIZATION	WEBSITE Please report broken weblinks	ELIGIBILITY REQUIREMENTS / PREREQUISITES	ADMINISTRATION ELIGIBILITY (Written, Oral, Practical, etc.)	PASSING SCORE	COST	COMMENTS
● For use at SECONDARY	For use at SECONDARY	For use at SECONDARY	For use at SECONDARY	For use at SECONDARY					
Architecture & Construction (Cluster)	Carpentry	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA Carpentry	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Construction careers.	Online; Estimated time for assessment: Approximately 1 hour	60%	$10 per exam if SkillsUSA member; $20 per exam	50 questions included in exam
	SkillsUSA Work Force Ready System	SkillsUSA	SITE COORDINATOR	Click below for the SkillsUSA Work Force Ready System Web site and browse the various Assessment Links and other details:	Each institution / consortium should have a coordinator who contacts SkillsUSA to obtain assessment exams, proctoring information, data management needs, and other important functions. Your Proctor name, email address and phone number are required when ordering assessments to be administered to students.Click below for the SkillsUSA Work Force Ready System Web site and browse the various Assessment Links and other details.				
Architecture & Construction (Cluster)	Carpentry	Academic Assessment	NOCTI	NOCTI Carpentry	Job-ready assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Construction careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	Job-Ready Assessment - 171 item multiple choice exam

	NOCTI Testing Information for Consortia Leaders and/or High School Testing Coordinators	NOCTI	TESTING AGREEMENT	Click here for the NOCTI Testing Agreement form: http://www.nocti.org/forms.cfm	Each institution/ consortium should have a Testing Coordinator who contacts NOCTI to obtain assessment exams, proctoring information, data management needs, and other important functions.				
Architecture & Construction (Cluster)	Carpentry	Academic Assessment	NCCER (discuss with group)	NCCER	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Construction careers.	Series of entry- and journey-level written assessments as part of its National Craft Assessment and Certification Program.		TBD	Written Assessments taken at Accredited Locations
Architecture & Construction (Cluster)	Construction Trainee	Academic Assessment	CareerTech	CareerTech Construction Trainee	Entry Level Assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Construction careers.	Online; Estimated time for assessment: Approximately 1 hour	70%	$12 per exam	Approximately 40 multiple-choice questions
	Careertech Testing Information for Consortia Leaders and/or High School Testing Coordinators	Careertech	TESTING AGREEMENT	Click here for the Careertech Testing Agreement form: http://www.okcareertech.org/about/state-agency/divisions/testing	Each institution/ consortium should have a Testing Coordinator who contacts Careertech to obtain assessment exams, proctoring information, data management needs, and other important functions.				

Architecture & Construction (Cluster)	Introduction to Engineering Design (IED)	Academic Assessment	Project Lead the Way (PLTW)	http://www.pltw.org	End of Course assessment that verifies student mastery of the knowledge and skills that provide the foundation for engineering including architecture & construction.	On Line, 45 minute-timed	Pass/Fail	*No Fee; assessment is part of the annual license.	*There is no fee to PLTW Certified high schools.
Architecture & Construction (Cluster)	Civil Engineering and Architecture (CEA)	Academic Assessment	Project Lead the Way (PLTW)	http://www.pltw.org	End of Course assessment that verifies student mastery of the knowledge and skills that provide the foundation for engineering including architecture & construction.	On Line, 45 minute-timed	Pass/Fail	*No Fee; assessment is part of the annual license.	*There is no fee to PLTW Certified high schools.
Architecture & Construction (Cluster)	Electrical Construction Wiring	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA Electrical Construction Wiring	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Construction Electrical careers.	Online; Estimated time for assessment: Approximately 1 hour	60%	$10 per exam if SkillsUSA member; $20 per exam	50 questions included in exam
Architecture & Construction (Cluster)	Electrical Construction	Academic Assessment	NOCTI	NOCTI Electrical Construction	Job-ready assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Construction Electrical careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	Job-Ready Assessment - 171 item multiple choice exam

Maintenance Operations	Maintenance Operations	Academic Assessment	NOCTI	http://www.nocti.org/PDFs/JobReady/1129_Maintenance_Operations.pdf	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Maintenance/ Operations careers.	Online; Estimated time for assessment: Up to 2 hours; in 1 or 2 sessions	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	Pathway Assessment - 101 item multiple choice exam
Heating, Ventilation, and Air Conditioning	Heating, Ventilation, and Air Conditioning (HVAC) **Not available at this time, 2014	Academic Assessment	SkillsUSA Work Force Ready System	http://www.workforcereadysystem.org/technical_areas.shtml	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for Heating, Ventilation, and Air Conditioning careers.	Online; Estimated time for assessment: Approximately 1 hour	TBD	$10 per exam if SkillsUSA member; $20 per exam	Upon completion of assessment, will be available to pilot.

● For use at POSTSECONDARY	For use at POSTSECONDARY	For use at POSTSECONDARY				For use at POSTSECONDARY			
Heating, Ventilation, and Air Conditioning	HVAC Technician	Academic Assessment	CareerTech	CareerTech HVAC Technician	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Heating and Air Conditioning careers.	Online; Estimated time for assessment: Approximately 1 hour	70%	$12 per exam	Approximately 40 multiple-choice questions
Heating, Ventilation, and Air Conditioning	HVAC: Process Piping Technician	Academic Assessment	CareerTech	http://www.okcareertech.org/educators/assessments-and-testing/testing/study-guides/study-guides-ok-works-2015-2016/HVACRSerie	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for Heating and Air Conditioning - Process Piping Technician careers.	Online; Estimated time for assessment: Approximately 1 hour	70%	$12 per exam	Approximately 40 multiple-choice questions
Heating, Ventilation, and Air Conditioning	HVAC: Sheet Metal Technician	Academic Assessment	CareerTech	http://www.okcareertech.org/educators/assessments-and-testing/testing/study-guides/study-guides-ok-works-2015-2016/HVACRSerie	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Heating and Air Conditioning - Sheet Metal Technician careers.	Online; Estimated time for assessment: Approximately 1 hour	70%	$12 per exam	Approximately 40 multiple-choice questions
Heating, Ventilation, Air Conditioning, and Refrigeration	HVAC: Refrigeration Technician	Academic Assessment	CareerTech	http://www.okcareertech.org/educators/assessments-and-testing/testing/study-guides/study-guides-ok-works-2015-2016/HVACRSerie	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Heating and Air Conditioning - Refrigeration Technician careers.	Online; Estimated time for assessment: Approximately 1 hour	70%	$12 per exam	Approximately 40 multiple-choice questions

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Heating, Ventilation, and Air Conditioning	Heating, Ventilation, and Air Conditioning (HVAC)	Academic Assessment	NOCTI	NOCTI Heating, Vent, Air Conditioning	Job-ready assessment that verifies student mastery of the knowledge and skills that provide the foundation for Heating, Ventilation, and Air Conditioning careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	200 item multiple choice exam
Heating, Ventilation, Air Conditioning, and Refrigeration	Heating, Ventilation, Air Conditioning, and Refrigeration (HVAC/R)	Academic Assessment	NOCTI	NOCTI Heating, Vent, Air Conditioning	Job-ready assessment that verifies student mastery of the knowledge and skills that provide the foundation for Heating, Ventilation, Air Conditioning, and Refrigeration careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	118 item multiple choice exam
Heating, Ventilation, Air Conditioning, and Refrigeration	HVAC/R - Installation and Start-Up	Academic Assessment	NOCTI	NOCTI Heating, Vent, Air Conditioning	Job-ready assessment that verifies student mastery of the knowledge and skills in Heating/Ventilation, Air Conditioning, and Refrigeration installation and start up.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	143 item multiple choice exam
Heating, Ventilation, Air Conditioning, and Refrigeration	HVAC/R - Service and Repair	Academic Assessment	NOCTI	NOCTI Heating, Vent, Air Conditioning	Job-ready assessment that verifies student mastery of the knowledge and skills in Heating/Ventilation, Air Conditioning, and Refrigeration service and repair.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	138 item multiple choice exam

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Heating, Ventilation, and Air Conditioning	Heating, Ventilation, and Air Conditioning (HVAC) **Not available at this time, 2014	Academic Assessment	SkillsUSA Work Force Ready System	http://www.workforcereadysystem.org/technical_areas.shtml	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for Heating, Ventilation, and Air Conditioning careers.	Online; Estimated time for assessment: Approximately 1 hour	TBD	$10 per exam if SkillsUSA member; $20 per exam	Upon completion of assessment, will be available to pilot.
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Heating and Air Conditioning	CFC Universal Certification	Certification	Environmental Pollution Agency (EPA)	https://www.epa.gov/section608/types-section-608-technician-certification	The areas are Type I (covers small appliances), Type II (high-pressure and very high-pressure appliances) and Type III (low-pressure appliances).	Online		$285 for certification & training	
Plumbing	Plumbing	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA Plumbing	Job-ready assessment that verifies student mastery of the knowledge and skills that provide the foundation in plumbing.	Online; Estimated time for assessment: Approximately 1 hour	60%	$10 per exam if SkillsUSA member; $20 per exam	50 questions included in exam

Plumbing	Plumbing	Academic Assessment	NOCTI	NOCTI Plumbing	Job-ready assessment that verifies student mastery of the knowledge and skills that provide the foundation in plumbing.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	171 item multiple choice exam
Plumbing	Licensed Plumber in Minnesota	Journeyman Plumber assessment	Minnesota Department of Labor & Industry	MN Dept. of Labor & Industry- Journeyman Plumber	To qualify for the journeyman plumber exam you need four years of Department-approved plumbing experience.	Department On - Site Saint Paul plus several outstate locations		$53	$53 For License + Fees.
Boiler Operator	Boiler Operator License	Special Boiler License	Minnesota Department of Labor & Industry	http://www.dli.mn.gov/CCLD/Boiler.asp	To qualify for the special license, you do not need experience.	Department On - Site Saint Paul plus several outstate locations	70%	$50 for Application Fee (Includes Exam)	50 questions on exam.
Heavy Equipment Maintenance & Repair	Heavy Equipment Maintenance & Repair	Academic Assessment	NOCTI	http://www.nocti.org/PDFs/JobReady/3046_Heavy_Equipment_Maintenance_Repair.pdf	Job- ready assessment that verifies student mastery of the knowledge and skills that provide the foundation for all heavy equipment operator careers.	Online; Estimated time for assessment: Approximately 1 hour	National Criterion-Cut Score	$19 for post-test; $31 for pretest/ posttest	174 item multiple choice exam

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES (Consensus among work group)		COMMENTS
		Secondary	Post-secondary	
TOPIC 1: ACADEMIC FOUNDATIONS: Achieve additional academic knowledge and skills required to pursue the full range of career and education opportunities within a career cluster and/or career pathway.				
INDICATOR 01.01 Complete required training, education, and certification to prepare for employment in the Maintenance/ Operations career pathway.	**MEASURE 01.01.01** Identify training, education and certification requirements for occupational choice.	**Y**	**Y**	
	MEASURE 01.01.02 Participate in career-related training and/or degree programs.	**Y**	**Y**	
	MEASURE 01.01.03 Pass certification tests to qualify for licensure and/or certification in chosen occupational area.	**N**	**Y**	
INDICATOR 01.02 Perform math operations such as estimating and distributing materials and supplies to complete jobsite/workplace tasks.	**MEASURE 01.02.01** Use basic math functions to complete jobsite/workplace tasks.	**Y**	**Y**	**Comment from Business/Industry:** Many employers are using a basic math assessment as a gateway to employment. *e.g., Identify whole numbers, decimals, and fractions.* *e.g., Apply basic arithmetic add, subtract, multiply, and divide operations.*
	MEASURE 01.02.02 Use geometric formulas to determine areas and volumes of various structures.	**Y**	**Y**	*e.g., Calculate areas and volumes of structures.* *e.g., Estimate materials and supplies needed.*
	MEASURE 01.02.03 Use appropriate formulas to determine percentages/ decimals.	**O**	**Y**	*e.g., Calculate percentages/decimals.* *e.g., Use percentages/decimals to perform measurement tasks.*

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	MEASURE 01.02.04 Use appropriate formulas to determine ratios, fractions, and proportion measures.	**Y**	**Y**	*e.g., Calculate ratios, fractions and proportion measures.* *e.g., Use ratios, fractions and proportion measures to perform measurement tasks.*
	MEASURE 01.02.05 Conceptualize a three-dimensional form from a two-dimensional drawing to visualize proposed work.	**Y**	**Y**	*e.g. field notes, sketching, map reading*
INDICATOR 01.03 Apply principles of physics as they relate to worksite/jobsite situations to work with materials and load applications.	**MEASURE 01.03.01** Relate electricity to nature of matter & apply Ohm's Law.	**O**	**Y**	*e.g. Identify sources of electricity; define voltage, current, resistance, power and energy; & define Ohm's Law.*
	MEASURE 01.03.02 Demonstrate knowledge of basic electrical theory and operation of loads.	**Y**	**Y**	*e.g. Define physical & electrical characteristics of electric components; define magnetic properties of circuits & devices.*
	MEASURE 01.03.03 Demonstrate knowledge of the theory of heat.	**O**	**Y**	*e.g. Latent heat, sensible heat, specific heat, superheat, sub-cooling, heat of compression, & heat of evaporation.*
TOPIC 2: COMMUNICATIONS - Communicate clearly and effectively with reason including technical terminology and information.				
INDICATOR 02.01 Demonstrate oral and written communications in creating, expressing, and interpreting informatin and ideas including technical terminology and information.	**MEASURE 02.01.01** Know and use technical terminology to present to customers.	**Y**	**Y**	**Comment from Business/Industry:** Present in terms that customer can understand. Employees need to provide different options to customer for best service to customer's situation.
	MEASURE 02.01.02 Compose written reports and technical terminology using correct grammar, spelling, and format.	**O**	**Y**	*e.g. Requisitions, consent form, work orders*

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	MEASURE 02.01.03 Interpret and follow oral and written technical information.	**Y**	**Y**	*e.g. Installation manuals, service manuals, tool operating manuals, & talking to customers*
INDICATOR 02.02 Interpret verbal and nonverbal cues/behaviors to enhance communication with co-workers and clients/participants.	**MEASURE 02.02.01** Interpret verbal and nonverbal behaviors when communicating with clients and co-workers.	**Y**	**Y**	**Comment from Business/Industry**: Selling is part of the job today (e.g. appliance repair plan). Often the employee will "plan" on a clip board. Etiquette is very important in customer relations/ service. Businesses are now requiring a dress code.
INDICATOR 02.03 Apply active listening skills to obtain and clarify information.	**MEASURE 02.03.01** Interpret a given verbal message/information by responding with restatement and clarification techniques to clarify information.	**Y**	**Y**	*e.g. Show interest, ask questions and clarify, rephrase to show understanding*
INDICATOR 02.04 Interpret tables, charts, and figures to support written and oral communications.	**MEASURE 02.04.01** Interpret tables, charts, and figures used to support written and oral communication.	**Y**	**Y**	*e.g. Installation manuals, service manuals, tool operating manuals, & talking to customers*
INDICATOR 02.05 Listen to and speak with diverse individuals to enhance communication skills.	**MEASURE 02.05.01** Apply factors and strategies for communicating with a diverse community.	**Y**	**Y**	**Comment from Business/Industry:** Technicians must respect the client at all times. If language is a barrier, request an interpreter for the situation. If you see an issue, you are a mandated reporter & must report it immediately. Getting along with coworkers is also important.
	MEASURE 02.05.02 Adapt language for audience, purpose, situation. (i.e. diction/structure, style).	**Y**	**Y**	*e.g. coworkers, clients*
	MEASURE 02.05.03 Demonstrate ability to communicate and resolve conflicts within a diverse community.	**Y**	**Y**	*e.g. coworkers, clients*

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INDICATOR 02.06 Exhibit public relations skills to increase internal and external customer/client satisfaction.	**MEASURE 02.06.01** Communicate effectively when developing positive customer/client relationships.	**Y**	**Y**	
	MEASURE 02.06.02 Respond to compliments, complaints, conflicts, and criticism appropriately.	**Y**	**Y**	*e.g. Use proper grammar, pronounce words distinctly*
TOPIC 3: PROBLEM-SOLVING AND CRITICAL THINKING - Utilize critical thinking skills to make sense of problems and persevere in solving them. Employ valid, reliable research strategies. Demonstrate creativity and innovation.				
INDICATOR 03.01 Solve problems using critical thinking skills independently and in teams.	**MEASURE 03.01.01** Critically analyze information to determine value to the problem-solving task.	**Y**	**Y**	**Comment from Business/Industry:** Confidence & ability to make decisions, especially service technicians.
	MEASURE 03.01.02 Use problem-solving critical thinking and creativity skills to improve a situation or process.	**Y**	**Y**	
INDICATOR 03.02 Use troubleshooting procedures when solving a maintenance problem to maintain buildings and structures.	**MEASURE 03.02.01** Isolate a maintenance problem using troubleshooting procedures.	**Y**	**Y**	*e.g., Identify the problem using at least one appropriate troubleshooting method; communicate problem and course of action to others.*
	MEASURE 03.02.02 Select a solution that addresses an identified maintenance problem.	**Y**	**Y**	*e.g., Identify strategies for implementing the solution; identify tools and equipment needed.*
	MEASURE 03.02.03 Implement a solution using required strategies, tools and equipment.	**Y**	**Y**	*e.g., Use tools and equipment safely, effectively and efficiently; test & verify that the problem is solved.*

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TOPIC 4: TECHNOLOGY APPLICATIONS - Use technology to enhance productivity.				
INDICATOR 04.01 Use Personal Information Management (PIM) applications to increase workplace efficiency.	**MEASURE 04.01.01** Manage personal schedules and contact information.	**Y**	**Y**	
INDICATOR 04.02 Employ technological tools to expedite workflow.	**MEASURE 04.02.01** Use information technology tools to manage and perform work responsibilities.	**Y**	**Y**	*e.g. Create memos and notes using computer, SMART phones, Ipads.*
INDICATOR 04.03 Operate electronic mail applications to communicate within a workplace.	**MEASURE 04.03.01** Use electronic mail applications to communicate within a workplace.	**Y**	**Y**	
	MEASURE 04.03.02 Utilize Internet applications to perform workplace tasks.	**Y**	**Y**	
	MEASURE 04.03.03 Utilize writing and publishing applications to prepare business communications/ documents.	**Y**	**Y**	
INDICATOR 04.04 Operate Internet applications to perform workplace tasks.	**MEASURE 04.04.01** Utilize presentation applications to prepare presentations.	**Y**	**Y**	**Comment from Business/Industry:** e.g. Consult with customer on selling new plan or new product.
	MEASURE 04.04.02 Use spreadsheet and database applications to manage data.	**Y**	**O**	**Comment from Business/Industry:** Industry-specific software

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TOPIC 5: ORGANIZATIONAL AND GLOBAL SYSTEMS – Understand the environmental, social, and economic impacts of decisions within an organization. Understand global context of industries and careers.				
INDICATOR 05.01 Examine how the roles and responsibilities among trades/professions work in relationship to complete a project/job.	**MEASURE 05.01.01** Describe how relationships between trades/professions can facilitate smooth workflow and outcome to meet project goals.	**O**	**Y**	*e.g., Coordinate work between trades.*
	MEASURE 05.01.02 Explain how the hierarchy of roles on a jobsite facilitate smooth workflow and outcome to meet project goals.	**Y**	**Y**	*e.g., Incorporate job functions in the reporting chain of supervision.*
INDICATOR 05.02 Understand and manage company management relationships and contracts to create a cooperative work environment.	**MEASURE 05.02.01** Analyze a proposed contract in terms of the company's position and union's position in labor contract negotiations.	**O**	**O**	*e.g., Document how quality improves profitability; report on issues that affect quality.*
	MEASURE 05.02.02 Assess a situation for compliance with terms of a contract.	**O**	**O**	**Comment from Business/Industry:** "Understand" what you signed off on on employee handbook - e.g. noncompete clause in contract.
TOPIC 6: SAFETY, HEALTH, AND ENVIRONMENT – Understand the importance of safety, health, and environmental management systems and their importance to organizational performance and regulatory compliance.				
INDICATOR 06.01 Demonstrate safety and environmental skills.	**MEASURE 06.01.01** Demonstrate knowledge of safety regulations and procedures.	**Y**	**Y**	*e.g. safety data sheet, right to know*

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	MEASURE 06.01.02 Demonstrate knowledge of/comply with regulations for handling and disposing of hazardous materials.	**Y**	**Y**	*e.g. Federal, state, and local*
	MEASURE 06.01.03 Demonstrate knowledge of/ comply with Environmental Protection Agency (EPA) Regulations on refrigerants and oils.	**O**	**Y**	*e.g. Obtain appropriate certification, venting, recovery, reclaiming, recycling, handling, disposal, container*
	MEASURE 06.01.04 Demonstrate knowledge of/comply with the Department of Transportation (DOT) Regulations on the transportation and handling of hazardous materials.	**N**	**Y**	**Comment from Business/Industry:** Know the regulations of the state where you travel.
	MEASURE 06.01.05 Demonstrate knowledge of/comply with the Occupation Safety and Health Act (OSHA) regulations.	**Y**	**Y**	
	MEASURE 06.01.06 Demonstrate knowledge of/comply with Environmental Protection Agency (EPA) regulation on indoor air quality.	**Y**	**Y**	
INDICATOR 06.02 Recognize and employ universal construction signs and symbols to function safely in the workplace.	**MEASURE 06.02.01** Identify universal signs and symbols such as colors, flags, stakes and hand signal that apply to construction workplace situations.	**O**	**O**	e.g., Explain functions of signs and symbols.
				e.g., Inspect all signs and symbols for safe and proper use.
				e.g., Use proper signs and signals for the work area.

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	MEASURE 06.02.02 Select the most appropriate sign or symbol to use upon analysis of a given workplace situation.	**N**	**O**	**Comment from Postsecondary:** Job specific *e.g. Confined work space*
TOPIC 7: LEADERSHIP AND TEAMWORK - Use leadership in collaborating with others to accomplish productive organizational goals and objectives with an awareness of cultural/global competence.				
INDICATOR 07.01 Employ leadership skills to accomplish organizational goals and objectives.	**MEASURE 07.01.01** Analyze the various roles of leaders within organizations.	**Y**	**Y**	*e.g. contribute ideas; share in building an organization; act as role models to employees by adhering to company policies, procedures, and standards; promote the organization's vision; and mentor others.*
	MEASURE 07.01.02 Exhibit personal and interpersonal skills appropriate to the workplace.	**Y**	**Y**	
	MEASURE 07.01.03 Participate in civic and community leadership and teamwork opportunities to enhance skills.	**O**	**O**	
INDICATOR 07.02 Use teamwork skills to achieve collective goals and use team members' talents effectively.	**MEASURE 07.02.01** Promote the involvement and use of team members' individual talents and skills.	**Y**	**Y**	
	MEASURE 07.02.02 Take responsibility for shared group and individual work tasks.	**Y**	**Y**	
	MEASURE 07.02.03 Assist team members in completing their work.	**Y**	**Y**	
	MEASURE 07.02.04 Adapt effectively to changes in projects and work activities.	**Y**	**Y**	

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INDICATOR 07.03 Establish and maintain effective working relationships with all levels of personnel and other departments in order to accomplish objectives and tasks.	**MEASURE 07.03.01** Use positive interpersonal skills to work cooperatively with co-workers representing different cultures, genders and backgrounds.	**Y**	**Y**	
	MEASURE 07.03.02 Manage personal skills to accomplish assignments.	**Y**	**Y**	
	MEASURE 07.03.03 Treat people with respect.	**Y**	**Y**	
	MEASURE 07.03.04 Provide constructive praise and criticism.	**Y**	**Y**	
	MEASURE 07.03.05 Take appropriate measures to manage stress.	**Y**	**Y**	**Comment from Secondary/Postsecondary:** Embedded in coursework.
INDICATOR 07.04 Establish specific goals to manage project assignments in a timely manner.	**MEASURE 07.04.01** Establish project goals that assist in meeting project specifications and deadlines.	**Y**	**Y**	*e.g., Define and describe project goals; identify and list key project activites; identify and report activity deadlines.*
	MEASURE 07.04.02 Organize work teams that effectively manage assignments.	**Y**	**Y**	*e.g., Determine and list assignments by activity and personnel; complete assignments; monitor and write a report on progress of the project; evaluate completed project according to customer requirements.*

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
TOPIC 8: ETHICS AND LEGAL RESPONSIBILITIES –Know, understand, and model the importance of ethics, integrity, and legal responsibilities.				
INDICATOR 08.01 Recognize legal and ethical relationships between employees and employers to establish workplace/jobsite rules, regulations and guidelines in a design and/or construction setting.	**MEASURE 08.01.01** Access appropriate resources to identify the roles, rights and responsibilities of an employee and an employer.	**O**	**Y**	*e.g., Practice workplace/jobsite conduct incorporating employee and employer roles, rights and responsibilities.*
	MEASURE 08.01.02 Examine insurance documentation to determine liability issues associated with a job.	**N**	**Y**	*e.g., Describe liability issues as needed.*
	MEASURE 08.01.03 Comply with employer policies, procedures, and job specific agreements such as sexual harassment avoidance and substance abuse control to prevent ethical and legal problems.	**N**	**Y**	*e.g., Comply with employer policies and procedures; comply with project labor agreements.*
INDICATOR 08.02 Read regulations and contracts to ensure ethical and safety elements are observed.	**MEASURE 08.02.01** Locate and comply with local, state, and/or Federal regulations and codes applicabel to tasks and projects.	**N**	**Y**	
	MEASURE 08.02.02 Understand the various aspects of service contracts to ensure compliance.	**N**	**Y**	*e.g., Evaluate and follow service contracts.*
	MEASURE 08.02.03 Recognize the definition of specialized words or phrases to fully understand documents and contracts.	**N**	**Y**	*e.g., Use industry jargon or terminology appropriately; use industry acronyms correctly; uise words with multiple meanings correctly in context.*

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
INDICATOR 08.03 Use ethical and legal standards to avoid conflicts in a design and/or construction setting.	**MEASURE 08.03.01** Identify conflicts relating to a job or project to prevent ethical or legal problems.	**N**	**Y**	**Comments from Business/Industry:** Identify potential conflicts before it happens. *e.g., Resolve issues relating to potential conflicts of interest.*
TOPIC 9: CAREER DEVELOPMENT, EMPLOYABILITY, AND CITIZENSHIP –Attend to personal health and financial well-being. Know and understand the importance of employability skills. Plan education and career paths aligned to personal goals and employability goals. Act as a responsible and contributing citizen and employee.				
INDICATOR 09.01 Develop a personal career plan to meet career goals and objectives.	**MEASURE 09.01.01** Develop career goals and objectives as part of a plan for future career direction.	**Y**	**Y**	
	MEASURE 09.01.02 Organize electronic or physical portfolio for use in demonstrating knowledge, skills and experiences.	**Y**	**Y**	*e.g. educational & work history highlights; licenses, certifications; resume, letter of application, employment application, interview techniques*
	MEASURE 09.01.03 Practice interview skills for employment and exhibit qualifications to potential employer.	**Y**	**Y**	
INDICATOR 09.02 Describe how to accept employment positions that match career goals.	**MEASURE 09.02.01** Compare & evaluate employment opportunities to individual needs and career plan objectives.	**O**	**Y**	
	MEASURE 09.02.02 Demonstrate appropriate methods for accepting or rejecting employment offers.	**O**	**Y**	
INDICATOR 09.03 Explain how to maintain employment once secured.	**MEASURE 09.03.01** Model behaviors that demonstrate reliability and dependability.	**Y**	**Y**	

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
	MEASURE 09.03.02 Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.	**Y**	**Y**	
INDICATOR 09.04 Know the importance of professional development to keep current on relevant trends and information within the industry.	**MEASURE 09.04.01** Read trade magazines and journals, manufacturers' catalogues, industry publications and Internet sites to keep current on industry trends.	**O**	**Y**	
	MEASURE 09.04.02 Participate in relevant conferences, workshops, mentoring activities and in-service training to stay current with recent changes in the field.	**O**	**Y**	
INDICATOR 09.05 Examine employment opportunities in entrepreneurship to consider entrepreneurship as an option for career planning.	**MEASURE 09.05.01** Describe the opportunities for entrepreneurship in a given industry.	**O**	**O**	
TOPIC 10: TECHNICAL LITERACY – Apply technical knowledge and skills required to pursue careers in a specific career cluster and/or career pathway.				
INDICATOR 10.01 Plan and practice preventative maintenance activities to service existing structures.	**MEASURE 10.01.01** Develop a checklist to track preventative maintenance.	**O**	**Y**	*e.g., Read and interpret technical manuals.* *e.g., List maintenance needs for a variety of equipment, systems, and structures.*
	MEASURE 10.01.02 Establish time-based schedules to perform preventative maintenance.	**N**	**Y**	*e.g., Follow a maintenance schedule & maintain preventative maintenance records.*

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
INDICATOR 10.02 Maintain and inspect operational systems to achieve smooth operation of facilities.	**MEASURE 10.02.01** Use maintenance and inspection strategies on fire prevention, HBAX, security/alarm, environmental, and process systems according to safety, code and customer requirements.	**O**	**Y**	*e.g., Read and interpret technical manuals.* *e.g., Apply information from technical manuals.*
	MEASURE 10.02.02 Maintain facility operation systems.	**Y**	**Y**	**Comment from Secondary:** Maintenance of classroom/ lab area
Subtopic 10.02 - Knowledge of Tools & Equipment				
MEASURE 10.02 Identify tools and materials needed to perform equipment repair, preventative maintenance, and installation.	**MEASURE 10.02.01** Demonstrate knowledge of hand tools & accessories.	**O**	**Y**	*e.g. Hand tools - socket wrench set, wrenches, hammers, pliers, screwdriver sets, nut drivers, pin sets, hack saws, solder gun, etc.*
	MEASURE 10.02.02 Identify electrical testing devises & meters.	**O**	**Y**	*e.g. Digital multi-meters, inductive amp probe, capacitor analyzer, clamp-on ammeter; wattmeter, ohmmeter, megohmmeter, voltage tester, etc.*
	MEASURE 10.02.03 Identify refrigeration service & testing equipment.	**O**	**Y**	*e.g. Manifold gauge set, thermometers, psychometers, refrigeration leak detectors, charging cylinder, vacuum gauge, vacuum pump, etc.*
	MEASURE 10.02.04 Identify heating service & testing equipment.	**O**	**Y**	*e.g. U-tube manometer, inclined manometer, carbon monixide tester, pressure gauge, combustion anlayzer, air velocity instruments, thermostat & anticipator, etc.*
	MEASURE 10.02.05 Identify sheet metal tools.	**O**	**Y**	

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
Subtopic 10.03 - AC/DC Circuits				
INDICATOR 10.03 Demonstrate knowledge of alternating current (AC)/ direct current (DC) circuits.	**MEASURE 10.03.01** Demonstrate knowledge of alternating current (AC) and direct current (DC) circuits.	**O**	**Y**	
	MEASURE 10.03.02 Measure circuits and components using VOM meter.	**O**	**Y**	
	MEASURE 10.03.03 Troubleshoot AC and DC circuits.	**O**	**Y**	*e.g. AC circuits include capacitive, inductive, completed, open, short, grounded, series, parallel, complex, ampacity, & transformers. DC circuits include series circuits, parallel circuits, series-paralled circuits.* *e.g. DC circuits include series circuits, parallel circuits, series-paralled circuits.*
	MEASURE 10.03.04 Set up and operate AC/DC circuits .	**O**	**Y**	*e.g. VOM meter & specific equipment analyzers.* **Comments from Secondary**: Essential for VOM meter; Optional for specific equipment analyzers.
	MEASURE 10.03.05 Construct and interpret schematic and diagrams.	**O**	**Y**	*e.g. Pictorial, line, & ladder.* **Comment from Secondary**: Essential for pictorial; Optional for line & ladder. **Comment from Business/Industry:** Critical - need to know symbols & read a schematic.
Subtopic 10.04 - Electric Motors				
INDICATOR 10.04 Demonstrate knowledge of electrical motors.	**MEASURE 10.04.01** Demonstrate knowledge of electrical motors.	**O**	**Y**	*e.g. Operating principles of electric motors; application of various types of electric motors, start & run components; and principles & operations of electric motor protection devices.*

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
	MEASURE 10.04.02 Install/ replace/ retrofit electric motors.	**O**	**Y**	*e.g. Disassemble/ inspect/ clean/reassemble motors: permanent split capacitor; capacitor start-capacitor run; split-phase; shaded-pole; & three-phase.*
	MEASURE 10.04.03 Troubleshoot electric motors (AC & DC) and motor circuits.	**O**	**Y**	*e.g. Characteristics & specification of a motor: type, wattage, power, RPM, size, & application.*
				e.g. Identify/troubleshoot/replace parts of the motor: protection devices, belts, pulleys, bearings starting components, starting motor relay, rotation, resistance of windings, motor controls, air-moving devices, and shafts.
Subtopic 10.05 - Refrigeration System Controls				
INDICATOR 10.05 Demonstrate knowledge of refrigeration system controls.	**MEASURE 10.05.01** Demonstrate knowledge of principles of safety & operating control devices.	**O**	**Y**	*e.g. Pressure, temperature, electric, pneumatic, & DDC .*
	MEASURE 10.05.02 Install/ service/ troubleshoot electro-mechanical control devices.	**O**	**Y**	*e.g. Relays, contactors, magnetic starters, timers, sequencers, thermostats, pressure switches, & solid state ignition modes.*
	MEASURE 10.05.03 Install/ service/troubleshoot pneumatic control devices.	**O**	**Y**	*e.g. Thermostats, actuators, switches, and relays.*
	MEASURE 10.05.04 Trouble shoot direct digital control (DDC).	**O**	**O**	**Comment from Business/Industry:** *e.g. Circuit boards (power in/ power out)*

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
Subtopic 10.06 - Refrigeration Piping Principles and Practices				
INDICATOR 10.06 Demonstrate knowledge of refrigeration system controls.	**MEASURE 10.06.01** Read & interpret piping layouts.	**N**	**Y**	*e.g. Schematics, blueprints, diagrams, charts, & engineering specifications.*
	MEASURE 10.06.02 Identify/ select/ install proper fittings (s) or valve(s) for specific applications.	**N**	**Y**	
	MEASURE 10.06.03 Identify/apply principles of piping system.	**N**	**Y**	*e.g. Pipe materials, pipe size, system design, installation, & pipe auxiliary accessories.*
	MEASURE 10.06.04 Perform metallic tubing operations.	**N**	**Y**	*e.g. Cleaning, pipe fitting, set up soldering/brazing system, cutting, flaring, mechanical joints, soldering, brazing, bending, swaging, reaming, & proper tool usage.*
	MEASURE 10.06.05 Perform metallic & non-metallic pipe operations & test for leaks.	**N**	**Y**	**SPECIAL NOTE**: Includes cutting, reaming, threading, mechanical joints, welding, fitting, fusion, solvent cementing, & bending.
	MEASURE 10.06.06 Install & connect piping to equipment, devices, supports & accessories.	**N**	**Y**	
	MEASURE 10.06.07 Install/service condensate drain systems.	**N**	**Y**	

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
INDICATOR 10.07 Demonstrate knowledge of refrigerant system components.	**MEASURE 10.07.01** Understand metering devices.	**N**	**O**	**Comment from Postsecondary:** Program-specific **Comment from Business/Industry:** Essential in HVAC
	MEASURE 10.07.02 Understand evaporation types.	**N**	**O**	**Comment from Postsecondary:** Program-specific **Comment from Business/Industry:** Essential in HVAC
	MEASURE 10.07.03 Understand compressor types.	**N**	**O**	**Comment from Postsecondary:** Program-specific **Comment from Business/Industry:** Essential in HVAC
	MEASURE 10.07.04 Understand access valves.	**N**	**O**	**Comment from Postsecondary:** Program-specific **Comment from Business/Industry:** Essential in HVAC
Subtopic 10.08 - Refrigeration Cycle				
INDICATOR 10.08 Demonstrate maintenance/operations of refrigeration cycle.	**MEASURE 10.08.01** Demonstrate knowledge of refrigerants.	**O**	**Y**	*e.g. Characteristics & identificatios of boiling points, pressure temperature relations, dew points, hazards,*
	MEASURE 10.08.02 Read & interpret pressure temperature curves & charts.	**O**	**Y**	*e.g. How to determine pressures & temperatures of a refrigeration system; psychometrics.*
	MEASURE 10.08.03 Demonstrate knowledge of mechanical refrigeration cycle.	**O**	**Y**	*e.g. Compressors, condensers, metering devices, evaporators, & other components .*
	MEASURE 10.08.04 Demonstrate knowledge of 3R's -recover, recycle, and reclaim.	**N**	**Y**	
	MEASURE 10.08.05 Evacuate a refrigeration system.	**N**	**Y**	*e.g. Measure vacuum & triple evacuate.*
	MEASURE 10.08.06 Charge a refrigeration system.	**N**	**Y**	*e.g. Superheat, sub-cooling, & manufacturer's specifications.*

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
	MEASURE 10.08.07 Adjust pressure controls.	**N**	**Y**	
Subtopic 10.10 - Refrigeration Systems				
INDICATOR 10.09 Demonstrate knowledge of and maintenance of refrigeration systems.	**MEASURE 10.09.01** Demonstrate knowledge of refrigerant types.	**N**	**Y**	*e.g. All levels of temperatures - high, medium, low, & ultra-low.*
	MEASURE 10.09.02 Demonstrate knowledge and install/service/ troubleshoot/replace refrigeration systems.	**N**	**Y**	*e.g. Walk-in coolers, walk-in freezers, self-service cooler & freezer cases, multiple evaporator systems, packaged systems (unitary refrigeration) & water coolers.* **Comment from Postsecondary:** Program-specific
	MEASURE 10.09.03 Demonstrate knowledge & install/ service/troubleshoot/ replace electric & hot gas defrost operations.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.09.04 Install/ service/ troubleshoot refrigeration systems including but not limited to: * power element. * evaporator pressure control devices. * defrost components. * pressure control settings. * thermostatic motor controls. * crankcase heater. * compressor.	**N**	**O**	**Comment from Postsecondary:** Program-specific

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
Subtopic 10.10 - Sheet Metal Fabrication				
INDICATOR 10.10 Demonstrate knowledge of and maintenance of sheet metal fabrication.	**MEASURE 10.10.01** Demonstrate knowledge of sheet metals and fittings used in ductwork systems.	**O**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.10.02 Demonstrate knowledge on how to fabricate sheet metal duct.	**O**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.10.03 Demonstrate knowledge on how to line duct.	**O**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.10.04 Demonstrate knowledge on how to layout duct fittings & components.	**O**	**O**	**Comment from Postsecondary:** Program-specific
Subtopic 10.11 - Heat Pump Systems				
INDICATOR 10.11 Identify knowledge of heat pump systems.	**MEASURE 10.11.01** Identify heat pump systems.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.11.02 Understand heat pump terminology.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.11.03 Analyze heat pump systems for service & problems.	**N**	**O**	**Comment from Postsecondary:** Program-specific

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
Subtopic 10.12 - Heating Systems				
INDICATOR 10.12 Demonstrate knowledge of heating systems.	**MEASURE 10.12.01** Understand heating systems.	**N**	**O**	*e.g. oil, electric, forced air, hydronic, and alternative systems* **Comment from Postsecondary:** Program-specific
	MEASURE 10.12.02 Test and balance equipment.	**N**	**O**	*e.g. Natural gas, LP propane, oil, electric, alternative fuels* **Comment from Postsecondary:** Program-specific
	MEASURE 10.12.03 Analyze heating systems for service and problems.	**N**	**O**	**Comment from Postsecondary:** Program-specific
INDICATOR 10.13 Demonstrate knowledge of hydronic systems	**Measure 10.13.01** Understand types of hydronic piping systems	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.13.02 Understand types of boilers	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.13.03 Understand different zone valve opeation.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.13.04 Analyze hydronic systems for service and problems.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.13.05 Analyze geothermal systems for service and problems.	**N**	**O**	**Comment from Postsecondary:** Program-specific **Comment from Business/Industry:** Essential in HVAC
Indicator 10.14 Demonstrate knowledge of oil furnaces	**Measure 10.14.01** Understand types of oil furnaces	**N**	**O**	**Comment from Postsecondary:** Program-specific
	Measure 10.14.02 Understand maintenance requirements of oil furnaces	**N**	**O**	**Comment from Postsecondary:** Program-specific

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
	Measure 10.14.03 Anaylze oil furnace for service and problems	**N**	**O**	**Comment from Postsecondary:** Program-specific
Indicator 10.15 Demonstrate knowledge of electric furnaces	**Measure 10.15.01** Understand types of electric furnaces	**N**	**O**	**Comment from Postsecondary:** Program-specific
	Measure 10.15.02 Inspect electrical elements, insulators and connections	**N**	**O**	**Comment from Postsecondary:** Program-specific
	Measure 10.15.03 Anaylze electric furnace operation	**N**	**O**	**Comment from Postsecondary:** Program-specific
	Measure 10.15.04 Anaylze commercial roof unit.	**N**	**O**	**Comment from Postsecondary:** Program-specific
Subtopic 10.16 - Air Handling				
INDICATOR 10.16 Demonstrate knowledge of air handling.	**MEASURE 10.16.01** Understand air flow principles/ duct design.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.16.02 Understand mechanical and electronic filtration.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.16.03 Understand different types of fans/blowers.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.16.04 Analyze air handling systems for service and problems.	**N**	**O**	**Comment from Postsecondary:** Program-specific

Core Competencies

Career Pathway: Maintenance/Operations
Career Cluster: Architecture/Construction

KEY: **Y**=Essential **N**=Not Essential **O**=Optional

PERFORMANCE INDICATOR	PERFORMANCE MEASURE	COMMON CORE COMPETENCIES Consensus among work group		COMMENTS
		Secondary	Post-secondary	
Subtopic 10.17 - Indoor Air Quality				
INDICATOR 10.17 Demonstrate knowledge of indoor air quality.	**MEASURE 10.17.01** Understand Indoor Air Quality (IAQ) as defined by ASHRAE Std. 62.	**N**	**Y**	**Comment from Postsecondary:** Program-specific
Subtopic 10.18 - Heat Load Calculations				
INDICATOR 10.18 Understand knowledge of heating load calculations.	**MEASURE 10.18.01** Understand knowledge of heating load calculations.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.18.02 Understand the operations of zoning in hydronics.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.18.03 Understand the operations of zoning in forced air.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.18.04 Understand the psychometric chart.	**N**	**O**	**Comment from Postsecondary:** Program-specific
	MEASURE 10.18.05 Understand the healthy loads.	**N**	**O**	**Comment from Postsecondary:** Program-specific

Technical Skill Assessment Blueprint

7/1/2014

Pathway: Maintenance/ Operations
Cluster: Architecture and Construction

An "assessment blueprint" is a document that indicates the knowledge and skills that will be covered in an assessment instrument and the percentage of the assessment that will be devoted to each area of knowledge and skills. The Minnesota assessment blueprints will be used to review the appropriateness of existing assessments by determining how closely those assessments match up to what the Architecture & Construction: Maintenance/ Operations career pathway working groups have determined should be assessed. The assessment blueprints can also be used to guide the development of new assessments where suitable third-party assessments do not exist.

		SECONDARY % of Assessment ↓	POST-SECONDARY % of Assessment ↓	BUSINESS & INDUSTRY % of Assessment ↓
TOPIC 1	**ACADEMIC FOUNDATIONS:** Achieve additional academic knowledge and skills required to pursue the full range of career and education opportunities within a career cluster and/or career pathway.	10%	5%	7%
TOPIC 2	**COMMUNICATIONS -** Communicate clearly and effectively with reason including technical terminology and information.	10%	13%	15%
TOPIC 3	**PROBLEM-SOLVING AND CRITICAL THINKING -** Utilize critical thinking skills to make sense of problems and persevere in solving them. Employ valid, reliable research strategies. Demonstrate creativity and innovation.	25%	16%	20%
TOPIC 4	**TECHNOLOGY APPLICATIONS -** Use technology to enhance productivity.	15%	5.0%	7%
TOPIC 5	**ORGANIZATIONAL AND GLOBAL SYSTEMS –** Understand the environmental, social, and economic impacts of decisions within an organization. Understand global context of industries and careers.	5%	6%	7%
TOPIC 6	**SAFETY, HEALTH, AND ENVIRONMENT –** Understand the importance of safety, health, and environmental management systems and their importance to organizational performance and regulatory compliance.	10%	10%	13%
TOPIC 7	**LEADERSHIP AND TEAMWORK -** Use leadership in collaborating with others to accomplish productive organizational goals and objectives with an awareness of cultural/global competence.	5%	8%	7%
TOPIC 8	**ETHICS AND LEGAL RESPONSIBILITIES –**Know, understand, and model the importance of ethics, integrity, and legal responsibilities.	5%	15%	10%
TOPIC 9	**CAREER DEVELOPMENT, EMPLOYABILITY, AND CITIZENSHIP –**Attend to personal health and financial well-being. Know and understand the importance of employability skills. Plan education and career paths aligned to personal goals and employability goals. Act as a responsible and contributing citizen and employee.	5%	7%	7%
TOPIC 10	**TECHNICAL LITERACY –** Apply technical knowledge and skills required to pursue careers in a specific career cluster and/or career pathway.	10%	15%	7%
		100%	100%	100%

Architecture & Construction: Maintenance/ Operations Pathway

Career Pathway Plan of Study for ►Learners ►Parents ►Counselors ►Teachers/Faculty--Effective Graduates 2015 & Beyond

This Career Pathway Plan of Study (based on the Maintenance/ Operations Pathway of the Architecture & Construction Career Cluster) can serve as a guide, along with other career planning materials, as learners continue on a career path. Courses listed within this plan are only recommended coursework and should be individualized to meet each learner's educational and career goals. This Plan of Study, used for learners at an educational institution, should be customized with course titles and appropriate high school graduation requirements as well as college entrance requirements.

EDUCATION LEVELS	GRADE	English/ Language Arts	Math	Science	Social Studies/ Sciences	Other Required Courses Other Electives Recommended Electives Learner Activities	Career and Technical Courses and/or Degree Major Courses for the Maintenance/ Operations Career Pathway	SAMPLE Occupations Relating to This Pathway
	Interest Inventory Administered and Plan of Study Initiated for all Learners							
SECONDARY	9	English/ Language Arts I	Geometry	Earth or Life or Physical Science	Government & Citizenship/ Geography	All plans of study should meet local and state high school graduation requirements and college entrance requirements including art, health, and physical education. Certain local student organization activities such as SkillsUSA or FFA are also important for personal growth and leadership development.	• Introduction to Construction Technology & Construction Occupations • Architecture/Drafting I	►Boiler Operator ►Carpenter ►Carpet Installer ►Concrete Finisher ►Construction Engineer ►Construction Foreman/ Manager ►Construction Inspector ►Cost Estimator ►Demolition Engineer ►Drywall Installer ►Electrician ►Environmental Engineer ►Equipment & Material Manager ►General Contractor/Builder ►Glazier ►Heating, Ventilation, Air Conditioning & Refrigeration - Technician, Wholesale Vendor, Project Manager, Owner ►Hydo Testing Technician ►Insulation Worker ►Maintenance Estimator/ Planner ►Manufacturer's Representative ►**Mason** ►Painter/ Paperhanger ►Project Estimator/ Inspector/ Manager ►Remodeler ►Safety Director ►Service Contractor ►Superintendent ►System Installer ►Thermal Control Technician ►Tile & Marble Setter
	10	English/ Language Arts II	Algebra II	Biology	U.S. History		• Metals/ Woods • Architecture/ Drafting	
	11	English/ Language Arts III	Probability & Statistics	Chemistry or Physics or CTE Science Equivalent	World History		• Construction Occupations (Production & Woods) • Mathematical Construction	
	College Placement Assessments-Academic/Career Advisement Provided							
	12	English/ Language Arts IV	Math Elective (i.e., Business Math or other CTE Math Equivalent)	Science Elective (i.e., CTE Science Equivalent)	Economics (Ag. Ed./ Bus. Ed./ Social Studies)		• Contructions Occupations II • Introduction to Technology (Alternate Energy) • Internship in Maintenance/ Operations Careers	
	Articulation/Dual Credit Transcripted-Postsecondary courses may be taken/moved to the secondary level for articulation/dual credit purposes.							
POSTSECONDARY	Year 1	Required Goals Determined by Local College Program in College Year 1 and 2 - **Goal 1:** Communication; **Goal 2:** Critical Thinking/Problem-Solving; **Goal 4:** Mathematical/Logical Reasoning; **Goal 5:** History and the Social and Behavior Sciences; **Goal 6:** The Humanities and the Arts; **Goal 7:** Human Diversity; **Goal 8:** Global Perspective; **Goal 9:** Ethical and Civic Responsibility; **Goal 10:** People and the Environment				All plans of study need to meet learners' career goals with regard to required degrees, licenses, certifications or journey worker status. Certain local student organization activities such as SkillsUSA may also be important to include.	• Core Classes in Heating, Ventilation, & Air Conditioning; Industry Maintenance; Heavy Equipment Operator	
	Year 2						• Advanced Classes in Heating, Ventilation, & Air Conditioning; Industry Maintenance; Heavy Equipment Operator	
	Year 3	Continue courses in the area of specialization.					• Continue Courses in the Area of Specialization	
	Year 4						• Complete Architecture, Civil Engineering, or Interior Design Major (4-year degree program)	