State-Approved Technical Skill Assessments

Pathway: Maintenance, Installation, and Repair

Cluster: Manufacturing

CLUSTER/ PATHWAY/ PROGRAM(S)	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					
Manufacturing; Metals Manufacturing	Manufacturing Technology	Academic Assessment	NOCTI	NOCTI Manufacturing Technology	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Average for Secondary	$19 for post-test only; $31 for pre-test and post-test.	Job-Ready Assessment - 195 item multiple choice exam
	NOCTI Testing Information for Consortia Leaders and/or High School Testing Coordinators	NOCTI	TESTING AGREEMENT	Each institution/ consortium should have a Testing Coordinator who contacts NOCTI to obtain assessment exams, proctoring information, data management needs, and other important functions. Click here for the NOCTI Testing Agreement form: http://www.nocti.org/forms.cfm					

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Manufacturing; Metals Manufacturing	Automated Manufacturing Technology	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA Automated Manufacturing Technology	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for automated manufacturing technology.	Online; Approximate assessment time 1 hour	70%	$10 - SkillsUSA member; $20 non-Member	Computer-driven exam-40 questions

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	SkillsUSA Work Force Ready System	SkillsUSA	SITE COORDINATOR	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: http://www.workforceready system.org/index.shtml					

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Manufacturing	CNC Machining Operator	Academic Assessment	CareerTech	CareerTech Machining Operator	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing CNC careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
	Careertech Testing Information for Consortia Leaders and/or High School Testing Coordinators	Careertech	TESTING AGREEMENT	Each institution/ consortium should have a Testing Coordinator who contacts Careertech to obtain assessment exams, proctoring information, data management needs, and other important functions. Click here for the Careertech Testing Agreement form: http://www.okcareertech.org/educators/assessments-and-testing/testing/study-guides/StudyGuideList_20162017.pdf					

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Computer Integrated Machining	CNC Milling & Turning Technology	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA CNC Milling Turning Technology	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing CNC careers.	Online; Approximate assessment time 1 hour	70%	$10 - SkillsUSA member; $20 non-Member	Computer-driven exam-40 questions
Computer Integrated Machining	Precision Machining	Academic Assessment	NOCTI	NOCTI Precision Machining	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing CNC careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Average for Secondary	$19 for post-test only; $31 for pre-test and post-test.	Job-Ready Assessment - 149 item multiple choice exam

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Computer Integrated Machining	Computer Integrated Manufacturing	Academic Assessment	Project Lead the Way (PLTW)	PLTW CIM	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing CNC careers.	End of Course assessment that verifies student mastery of the knowledge and skills that provide the foundation for engineering careers.		*No Fee	*There is no fee to PLTW Certified high schools.
Computer Integrated Machining	CNC Machining Operator	Academic Assessment	CareerTech	CareerTech Machining Operator	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing CNC careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam

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Welding	Welding	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA Welding	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$10 - SkillsUSA member; $20 non-Member	Computer-driven exam-40 questions
Welding	Welding	Academic Assessment	NOCTI	NOCTI Welding	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	National Average for Secondary	$19 for post-test only; $31 for pre-test and post-test.	Job-Ready Assessment - 138 item multiple choice exam
Welding	Welding	Certification	SENSE	SENSE Welding	Industry certification that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online	Pass/Fail	Must be SENSE Accredited School; 1st Year is complimentary	

State-Approved Technical Skill Assessments

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Welding	Shielded Metal Arc	Academic Assessment	CareerTech	CareerTech Shielded Metal Arc	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
Welding	Gas Metal Arc	Academic Assessment	CareerTech	CareerTech Gas Metal Arc	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
Welding	Flux Core Arc	Academic Assessment	CareerTech	CareerTech Flex Core Arc	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam

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Welding	Gas Tungsten Arc	Academic Assessment	CareerTech	CareerTech Gas Tungsten Arc	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
Welding	Certified Welder	Certification	American Welding Society	http://www.aws.org	Certification for entry-level certified welder.	Performance-based at Official AWS Testing Center	Pass/Fail	$30 registration fee; $200 for exam & seminar; $200 for exam only	Must be renewed on regular basis.

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● For use at POSTSECONDARY	For use at POSTSECONDARY	For use at POSTSECONDARY							
Manufacturing Engineering Technology	Manufacturing Technology	Academic Assessment	NOCTI	NOCTI Manufacturing Technology	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	Criterion-Referenced Cut Score	$19 for post-test only; $31 for pre-test and post-test.	Job-Ready Assessment - 195 item multiple choice exam
	NOCTI Testing Information for Consortia Leaders and/or High School Testing Coordinators	NOCTI	TESTING AGREEMENT	Each institution/ consortium should have a Testing Coordinator who contacts NOCTI to obtain assessment exams, proctoring information, data management needs, and other important functions. Click here for the NOCTI Testing Agreement form: http://www.nocti.org/forms.cfm					

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Manufacturing Engineering Technology	Automated Manufacturing Technology	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA Automated Manufacturing Technology	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing careers.	Online; Approximate assessment time 1 hour	70%	$10 - SkillsUSA member; $20 non-Member	Computer-driven exam-40 questions

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	SkillsUSA Work Force Ready System	SkillsUSA	SITE COORDINATOR	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: http://www.workforceadysystem.org					

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Electronics Technology	Electronics: General Electronics Technician	Academic Assessment	CareerTech	http://www.okcareertech.org/about/state-agency/divisions/testing/skills-standards/manufacturing-skills-standards	Job-specific assessment that verifies student mastery of the knowledge and skills in electronics technology career pathway	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
	Careertech Testing Information for Consortia Leaders and/or High School Testing Coordinators	Careertech	TESTING AGREEMENT	Each institution/ consortium should have a Testing Coordinator who contacts Careertech to obtain assessment exams, proctoring information, data management needs, and other important functions. Click here for the Careertech Testing Agreement form: http://www.okcareertech.org/about/state-agency/divisions/testing					

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Fluid Power	Fluid Power Mechanic	Academic Assessment	International Fluid Power Society Certification	http://www.ifps.org/docs/certification/certifications_offered/default.aspx	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Fluid Power careers.	Testing Centers	Pass/Fail	$90 per assessment	$90 for a Certification Test. Student must be an IFPS member carrying 12 credits.
Fluid Power	Fluid Power Mechanic	Academic Assessment	CareerTech	CareerTech Fluid Power Mechanic	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
Industrial Maintenance and Repair	Industrial Maintenance Service & Repair Level II	Academic Assessment	National Institute for Metalworking Skills (NIMS)	http://neme-s.org/CTHSS/NIMS%20info/ProceduresManualforMachiningCredentials_002.pdf	Entry-level Assessment that verifies student mastery of the NIMS knowledge and skills for Machine Maintenance and Repair careers	Online	NIMS cannot release this information	Registration fee of $40.00 and a $50.00 testing fee	NIMS Accredited Programs receive a discount of $10 per Level II exam.

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Industrial Maintenance and Repair	Machine Building Level II	Academic Assessment	National Institute for Metalworking Skills (NIMS)	http://neme-s.org/CTHSS/NIMS%20info/ProceduresManualforMachiningCredentials_002.pdf	Entry-level Assessment that verifies student mastery of the NIMS knowledge and skills for Machine Building Level II careers	Online	NIMS cannot release this information	Registration fee of $40.00 and a $50.00 testing fee	NIMS Accredited Programs receive a discount of $10 per Level II exam.
Industrial Maintenance and Repair	Industrial Maintenance Technology; Industrial Maintenance Mechanic	Academic Assessment	CareerTech	http://www.okcareertech.org/educators/assessments-and-testing/testing/study-guides/study-guides-ok-works-2015-2016/IndustrialMaintTechSG.pdf	Job-specific assessment that verifies student mastery of the knowledge and skills in industrial maintenance technology career pathway	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
Precision Manufacturing	Precision Manufacturing	Academic Assessment	National Institute for Metalworking Skills (NIMS)	NIMS Precision Manufacturing	Entry-level Assessment that verifies student mastery of the NIMS knowledge and skills for Precision Manufacturing careers.	Online	NIMS cannot release this information	Registration fee of $40.00 and a $50.00 testing fee	NIMS Accredited Programs receive a discount of $10 per Level II exam.

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Mechatronics	Mechatronics	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA Mechatronics	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing careers.	Online; Approximate assessment time 1 hour	70%	$10 - SkillsUSA member; $20 non-Member	Computer-driven exam-40 questions
Mechatronics	Fluid Power Mechanic	Academic Assessment	CareerTech	CareerTech Fluid Power Mechanic	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Manufacturing careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
Welding	Welding	Academic Assessment	SkillsUSA Work Force Ready System	SkillsUSA Welding	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$10 - SkillsUSA member; $20 non-Member	Computer-driven exam-40 questions

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Welding	Welding	Academic Assessment	NOCTI	NOCTI Welding	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Estimated time for assessment: Up to 3 hours; in 1, 2, or 3 sessions	Criterion-Referenced Cut Score	$19 for post-test only; $31 for pre-test and post-test.	Job-Ready Assessment - 138 item multiple choice exam
Welding	Welding	Academic Assessment	SENSE	SENSE Welding	Industry certification that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online	Pass/Fail	Must be SENSE Accredited School; 1st Year is complimentary	
Welding	Shielded Metal Arc	Academic Assessment	CareerTech	CareerTech Shielded Metal Arc	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam

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Welding	Gas Metal Arc	Academic Assessment	CareerTech	CareerTech Gas Metal Arc	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
Welding	Flux Core Arc	Academic Assessment	CareerTech	CareerTech Flex Core Arc	Entry-level assessment that verifies student mastery of the knowledge and skills that provide the foundation for all Welding careers.	Online; Approximate assessment time 1 hour	70%	$12 per exam for pre-test and post-test.	40 item multiple choice exam
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Welding	Certified Welder	Certification	American Welding Society	http://www.aws.org	Certification for entry-level certified welder.	Performance-based at Official AWS Testing Center	Pass/Fail	$30 registration fee; $200 for exam & seminar; $200 for exam only	
Welding	Certified Welder (Sheetmetal Worker)	Certification	American Welding Society	http://www.aws.org	Certification for entry-level certified welder	Performance-based at Official AWS Testing Center	Pass/Fail	$30 registration fee; $200 for exam & seminar; $200 for exam only	Must be renewed on regular basis.
Welding	Certified Welder (Ironworker Union)	Certification	American Welding Society	http://www.aws.org	Certification for entry-level certified welder.	Performance-based at Official AWS Testing Center	Pass/Fail	$30 registration fee; $200 for exam & seminar; $200 for exam only	Must be renewed on regular basis.

Core Competencies

Pathway: Maintenance, Installation and Repair
Cluster: Manufacturing

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 postsecondary education opportunities within the Manufacturing Maintenance, Installation, and Repair career pathway.				
INDICATOR 01.01 Complete required training, education, and certification to prepare for employment in a manufacturing career field.	**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.	**O**	**Y**	
	MEASURE 01.01.03 Pass certification tests to qualify for licensure and/or certification in chosen occupational area.	**O**	**O**	
INDICATOR 01.02 Demonstrate language arts knowledge and skills required to pursue the full range of post-secondary education and career opportunities.	**MEASURE 01.02.01** Understand active listening.	**Y**	**Y**	
	MEASURE 01.02.02 Adapt industrial terminology for audience, purpose, situation. (e.g., diction/structure, style).	**Y**	**Y**	
	MEASURE 01.02.03 Organize and apply oral and written information.	**Y**	**Y**	**Comment from Secondary/Postsecondary:** Focus on written documents and oral presentations. i.e. Field reports, technical terminology, identification of assumptions, purpose, as well as outcomes and solutions.
INDICATOR 01.03 Demonstrate mathematics knowledge and skills required to pursue the full range of post-secondary education and career opportunities.	**MEASURE 01.03.01** Identify whole numbers, decimals, and fractions.	**Y**	**Y**	**Comment from Business/Industry**: Math is very important; routinely working in 1000th inch & fractions.
	MEASURE 01.03.02 Demonstrate knowledge of basic arithmetic operations such as addition, subtraction, multiplication, and division.	**Y**	**Y**	

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		KEY: Y=Essential	N=Not Essential	O=Optional
	MEASURE 01.03.03 Demonstrate use of relational expressions such as equal to, not equal, greater than, less than, etc.	**O**	**Y**	**Comment from Business/Industry**: Measures 01.03.03 to 01.03.07 critical in our industry.
	MEASURE 01.03.04 Apply data and measurements to solve a problem.	**O**	**Y**	**Comment from Business/Industry**: Very important
	MEASURE 01.03.05 Analyze mathematical problem statements for missing and/or irrelevant data.	**O**	**Y**	
	MEASURE 01.03.06 Interpret charts/tables/graphs from functions and data.	**O**	**Y**	**Comment from Business/Industry**: Critical
	MEASURE 01.03.07 Analyze data when interpreting operational documents.	**O**	**Y**	**Comment from Business/Industry**: Critical
INDICATOR 01.04 Demonstrate science knowledge and skills required to pursue the full range of post-secondary and career education opportunities.	**MEASURE 01.04.01** Evaluate scientific constructs such as conclusions, conflicting data, controls, data, inferences, limitations, questions, sources of errors, and variables.	**Y**	**Y**	
	MEASURE 01.04.02 Apply scientific methods in qualitative and quantitative analysis, data gathering, direct and indirect observation, predictions, and problem identification.	**Y**	**Y**	
TOPIC 2: COMMUNICATIONS/ WORKPLACE-BUSINESS COMMUNICATIONS - Use oral and written communication skills in creating, expressing and interpreting information and ideas including technical terminology and information.				
INDICATOR 02.01 Communicate with co-workers and/or external customers to ensure production meets business requirements.	**MEASURE 02.01.01** Communicate safety, training, and job-specific needs using effective speaking and presentation skills.	**Y**	**Y**	
	MEASURE 02.01.02 Communicate material specifications.	**Y**	**Y**	

Core Competencies

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		KEY: Y=Essential	N=Not Essential	O=Optional
	MEASURE 02.01.03 Communicate delivery schedules in a timely & accurate manner.	**Y**	**Y**	
INDICATOR 02.02 Use correct grammar, punctuation and terminology to write and edit documents.	**MEASURE 02.02.01** Compose job-specific documents clearly, succinctly, and accurately.	**Y**	**Y**	
INDICATOR 02.03 Interpret verbal and nonverbal cues/behaviors to enhance communication with co-workers and clients/participants.	**MEASURE 02.03.01** Interpret verbal and nonverbal behaviors when communicating with clients and co-workers.	**Y**	**Y**	
INDICATOR 02.04 Apply active listening skills to obtain and clarify information.	**MEASURE 02.04.01** Respond with restatement and clarification techniques to clarify information.	**Y**	**Y**	
INDICATOR 02.05 Develop and interpret tables, charts, and figures to support written and oral communications.	**MEASURE 02.05.01** Create tables, charts, and figures to support written and oral communications.	**Y**	**Y**	
	MEASURE 02.05.02 Interpret tables, charts, and figures used to support written and oral communication.	**Y**	**Y**	
INDICATOR 02.06 Listen to and speak with diverse individuals to enhance communication skills.	**MEASURE 02.06.01** Demonstrate ability to communicate and resolve conflicts within a diverse workforce.	**Y**	**Y**	
INDICATOR 02.07 Communicate with others regarding maintenance, installation, and repair issues and trends to meet business needs.	**MEASURE 02.07.01** Understand the benefits of predictive and preventive maintenance.	**O**	**O**	*e.g., Use various techniques to clearly communicate the goals and benefits of predictive and preventive maintenance.* *e.g., Include information on operator responsibility for predictive and preventive maintenance in a training program. Communicate with other to set repair and maintenance priorities and schedules.* *e.g., Make sure that education of production schedulers and managers promotes their understanding of the priorities and benefits of predictive and preventive maintenance.*

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		KEY: Y=Essential	N=Not Essential	O=Optional
	MEASURE 02.07.02 Prepare maintenance and repair logs for shift-to-shift communication.	**Y**	**Y**	**Comment from Postsecondary:** Not essential for Instrument Repair *e.g., Complete documentation in a timely way. Prepare maintenance and repair logs from shift to shift as needed.* *e.g., Clearly communicate all important information to the next shift.* *e.g., Submit repair report and preventive maintenance reschedule on time.* *e.g., Make documentation accessible to all appropriate parties.* *e.g., Clearly communicate status reports from shift-to-shift.*
TOPIC 3: PROBLEM-SOLVING AND CRITICAL THINKING - Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.				
INDICATOR 03.01 Employ critical thinking skills independently and in teams to solve problems and make decisions (e.g., analyze, synthesize and evaluate).	**MEASURE 03.01.01** Identify common tasks that require employees to use problem-solving skills.	**Y**	**Y**	*e.g. Create ideas, proposals, and solutions to problems.* *e.g. Evaluate ideas, proposals, and solutions to problems.* *e.g. Use structured problem-solving methods when developing proposals and solutions.* *e.g. Use structured problem-solving methods when developing proposals and solutions.* *e.g. Generate new or creative ideas to solve problems by brainstorming possible solutions.* *e.g. Critically analyze information to determine value to the problem-solving task.* *e.g. Evaluate alternatives using a variety of problem-solving and critical thinking skills.*
	MEASURE 03.01.02 Analyze elements of a problem to develop creative solutions.	**Y**	**Y**	
	MEASURE 03.01.03 Use problem-solving and critical thinking skills to improve a situation or process.	**Y**	**Y**	

Pathway: Maintenance, Installation and Repair
Cluster: Manufacturing

		KEY: Y=Essential	N=Not Essential	O=Optional
INDICATOR 03.02 Employ critical thinking and interpersonal skills to resolve conflicts.	**MEASURE 03.02.01** Analyze situations and behaviors that affect conflict management.	**Y**	**Y**	
	MEASURE 03.02.02 Employ solutions for conflict resolution using critical thinking skills.	**Y**	**Y**	*e.g. Acknowledge feelings, needs, and concerns of others.* *e.g. Implement stress management techniques.* *e.g. Resolve conflicts with/for customers using conflict resolution skills.* *e.g. Implement conflict resolution skills to address staff issues, problems.*
INDICATOR 03.03 Conduct technical research to gather information necessary for decision-making.	**MEASURE 03.03.01** Gather, analyze, and evaluate technical information and data using a variety of resources.	**Y**	**Y**	
TOPIC 4: INFORMATION TECHNOLOGY APPLICATIONS - Use information technology tools specific to the career cluster to access, manage, integrate, and create information.				
INDICATOR 04.01 Operate electronic communication applications to communicate within a workplace.	**MEASURE 04.01.01** Effectively use email to share files and documents.	**Y**	**Y**	**Comment from Business/Industry:** Include texting & other new technical devices; caution as it can be a stumbling block.
INDICATOR 04.02 Operate Internet applications to perform workplace tasks.	**MEASURE 04.02.01** Search for information and resources.	**Y**	**Y**	
TOPIC 5: SYSTEMS - Understand roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. Identify how key organizational systems affect organizational performance and the quality of products and services. Understand global context of industries and careers.				
INDICATOR 05.01 Summarize and explain how businesses operate to demonstrate an understanding of key functions within organizations in the industry.	**MEASURE 05.01.01** Identify the role and major functions of businesses.	**Y**	**Y**	*e.g., Explain the importance of business to society.* *e.g., Identify the mission, major internal functions and structure of businesses.* *e.g., Identify the customers, suppliers, and stakeholders of businesses, their roles, and how they relate.* *e.g., Explain the major competitive challenges faced by the businesses.*

Pathway: Maintenance, Installation and Repair
Cluster: Manufacturing

		KEY: Y=Essential	N=Not Essential	O=Optional
				e.g., Identify and describe types of systems.
				e.g., Analyze current trends in systems.
TOPIC 6: SAFETY, HEALTH AND ENVIRONMENTAL - Understand the importance of health, safety, and environmental management systems in organizations and their importance to organizational performance and regulatory compliance. Follow organizational policies and procedures and contribute to continuous improvement in performance and compliance.				
INDICATOR 06.01 Maintain safe and healthful working conditions and environment to ensure employee safety.	**MEASURE 06.01.01** Identify workplace conditions according to trade-specific safety and health requirements.	**Y**	**Y**	*e.g., Identify the types of risk of injury/illness at work.*
				e.g., Identify those who are susceptible to risk of injury/illness at work.
				e.g., Describe ways to positively impact occupational safety and health.
INDICATOR 06.02 Understand employee rights and responsibilities and employer obligations concerning occupational safety and health.	**MEASURE 06.02.01** Demonstrate knowledge of rules and laws designed to promote safety and health.	**Y**	**Y**	*e.g., Identify key rights of employees related to occupational safety and health.*
				e.g., Identify the responsibilities of employers related to occupational safety and health.
				e.g., Explain the role of government agencies in providing a safe workplace.
INDICATOR 06.03 Assess types and sources of workplace hazards in order to maintain safe working conditions in a manufacturing business environment.	**MEASURE 06.03.01** Demonstrate methods to correct common hazards following appropriate safety procedures.	**Y**	**Y**	*e.g., Identify and describe common hazards in the workplace.*
				e.g., Identify and describe major sources of information about hazards in the workplace (e.g., MSDS, work procedures, exposure control plans, training materials, labels, and signage).
				e.g., Identify sources of combustible/flammable materials, fire and emergencies to establish a fire safe environment.
				e.g., Interpret safety signs and symbols.
INDICATOR 06.04 Control workplace hazards in order to maintain safe working conditions in a business environment.	**MEASURE 06.04.01** Demonstrate safe workplace practices that promote personal and group health.	**Y**	**Y**	*e.g., Identify procedures necessary for maintaining a safe work area.*
				e.g., Identify methods to correct common hazards.
				e.g., Identify methods for disposing of hazardous materials.
				e.g., Demonstrate principals of safe physical movement to avoid slips, trips, and spills.

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		KEY: Y=Essential	N=Not Essential	O=Optional
				e.g., Inspect and use protective equipment (PPE).
INDICATOR 06.05 Summarize safety, health, and environmental management systems to build an understanding of compliance with governmental policies and procedures for businesses.	**MEASURE 06.05.01** Demonstrate workplace activities that comply with safety, health, and environmental policies and procedures.	**Y**	**Y**	*e.g., Promote and maintain knowledge of organizational safety, health, and environmental management policies and procedures.*
				e.g., Follow organizational policies and procedures.
				e.g., Educate and orient other workers.
				e.g., Maintain a safe work area.
				e.g., Identify, describe, and report workplace hazards.
				e.g., Perform and participate in regular audits and inspections.
				e.g., Provide and maintain documentation needed for compliance.
				e.g., Conduct and participate in accident/incident investigations.
INDICATOR 06.06 Demonstrate the knowledge of safe use of maintenance equipment in order to ensure safety in the maintenance, installation, and repair work environment.	**MEASURE 06.06.01** Demonstrate safe working practices on equipment and operator performance according to industry safety standards.	**Y**	**Y**	*e.g., Verify that monitoring is being performed regularly.*
				e.g., Report out-of-compliance or unsafe conditions immediately.
				e.g., Take corrective action when out-of-compliance or unsafe conditions exist.
				e.g., Check equipment to ensure it is operating according to specifications and that tools are checked for compliance with specifications.
				e.g., Forward accident and injury data to appropriate personnel for inclusion in OSHA recordables.
				e.g., Gather information on equipment use from operators to reveal existing or potential problems.
				e.g., Adjust equipment and processes as required.
				e.g., Accurately document all monitored data.
INDICATOR 06.07 Identify how work varies with regard to site, from indoor confined spaces to outdoor areas, including aerial space and a variety of climatic and physical conditions.	**MEASURE 06.07.01** Identify how work varies with regard to site, from indoor confined spaces to outdoor areas, including aerial space and a variety of climatic and physical conditions.	**Y**	**Y**	

Core Competencies

Pathway: Maintenance, Installation and Repair
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		KEY: Y=Essential	N=Not Essential	O=Optional
TOPIC 7: LEADERSHIP AND TEAMWORK - Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.				
INDICATOR 07.01 Employ leadership skills to accomplish organizational goals and objectives.	**MEASURE 07.01.01** Identify 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 traits appropriate to the workplace.	**Y**	**Y**	
INDICATOR 07.02 Foster organizational and staff development skills to foster positive working relationships and accomplish organizational goals.	**MEASURE 07.02.01** Model leadership and teamwork qualities to aid in employee morale.	**Y**	**Y**	*e.g. Exhibit teamwork* *e.g. Demonstrate team player quality.*
INDICATOR 07.03 Interpret and explain written organizational policies and procedures to help employees perform their jobs according to employer rules and expectations.	**MEASURE 07.03.01** Locate information on organizational policies.	**Y**	**Y**	
TOPIC 8: ETHICS AND LEGAL RESPONSIBILITIES - Know and understand the importance of professional ethics and legal responsibilities.				
INDICATOR 08.01 Apply ethical reasoning to a variety of workplace situations in order to make ethical decisions.	**MEASURE 08.01.01** Understand alternative responses to workplace situations based on personal or professional ethical responsibilities.	**Y**	**Y**	
INDICATOR 08.02 Interpret and explain written organizational policies and procedures to help employees perform their jobs according to employer rules and expectations.	**MEASURE 08.02.01** Locate information on organizational policies.	**Y**	**Y**	

Core Competencies

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		KEY: Y=Essential N=Not Essential O=Optional		
TOPIC 9: EMPLOYABILITY AND CAREER DEVELOPMENT - Know and understand the importance of employability skills. Explore, plan, and effectively manage careers. Know and understand the importance of entrepreneurship skills.				
INDICATOR 09.01 Identify and demonstrate positive work behaviors and personal qualities needed to be employable.	**MEASURE 09.01.01** Demonstrate self-discipline, self-worth, positive attitude, and integrity in a work situation.	**Y**	**Y**	
	MEASURE 09.01.02 Demonstrate flexibility and willingness to learn new knowledge and skills.	**Y**	**Y**	
	MEASURE 09.01.03 Identify resources in relation to the position (i.e., budget, supplies, computer, etc.).	**Y**	**Y**	
	MEASURE 09.01.04 Identify positive work-qualities typically desired in each of the career cluster's pathways.	**Y**	**Y**	
INDICATOR 09.02 Develop a personal career plan to meet career goals and objectives.	**MEASURE 09.02.01** Develop career goals and objectives as part of a plan for future career direction.	**Y**	**O**	
INDICATOR 09.03 Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.	**MEASURE 09.03.01** Demonstrate skills related to seeking and applying for employment to find and obtain a desired job.	**Y**	**Y**	*e.g. Prepare a résumé.* *e.g. Prepare a letter of application.* *e.g. Complete an employment application.* *e.g. Interview for employment.* *e.g. List the standards and qualifications that must be met in order to enter a given industry.* *e.g. Read trade magazines and journals, manufacturers' catalogues, industry publications and internet sites to keep current on industry trends.*
INDICATOR 09.04 Maintain a career portfolio to document knowledge, skills and experience in a career field.	**MEASURE 09.04.01** Select educational and work history highlights to include in a career portfolio.	**Y**	**Y**	

Core Competencies

Pathway: Maintenance, Installation and Repair
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INDICATOR 09.05 Identify and exhibit traits for retaining employment to maintain employment once secured.	**MEASURE 09.05.01** Model behaviors that demonstrate reliability and dependability.	**Y**	**Y**	*e.g. Maintain appropriate dress and behavior for the job to contribute to a safe and effective workplace/jobsite.* *e.g. Understand key activities necessary to retain a job in the industry.* *e.g. Identify positive work behaviors and personal qualities necessary to retain employment.*
INDICATOR 09.06 Continue professional development to keep current on relevant trends and information within the industry.	**MEASURE 09.06.01** Read trade magazines and journals, business catalogues, industry publications and Internet sites to keep current on industry trends.	**O**	**O**	**Comment from Business/Industry:** Important. Employees must stay current on the industry.
INDICATOR 09.07 Examine licensing, certification and credentialing requirements at the national, state and local levels to maintain compliance with industry requirements.	**MEASURE 09.07.01** Understand continuing education requirements related to licensing, certification, and credentialing requirements at the local, state and national levels for chosen occupation.	**Y**	**Y**	

Core Competencies

Pathway: Maintenance, Installation and Repair
Cluster: Manufacturing

		KEY: Y=Essential N=Not Essential O=Optional		
TOPIC 10: PATHWAY-SPECIFIC SKILLS - Use the technical knowledge and skills required to pursue the targeted careers in the Manufacturing Maintenance, Installation, and Repair, including knowledge of design, operation, and maintenance of technological systems critical to the career pathway.				
INDICATOR 10.01 Describe and employ technical skills and knowledge required for careers in manufacturing in order to perform basic workplace activities common to manufacturing.	**MEASURE 10.01.01** Demonstrate the planning and layout processes (e.g., designing, print reading, measuring).	**O**	**O**	*e.g., Read prints and use the information to play, lay out, and produce parts or products--occupational comments specific to manufacturing*
	MEASURE 10.01.02 Summarize how materials can be processed using tools and machines.	**Y**	**Y**	*e.g., Use tools and the processes of cutting, shaping, combining, forming, etc. of materials to manufacture a part or product.*
	MEASURE 10.01.03 Describe various types of assembling processes (e.g., mechanical fastening, mechanical force, joining, fusion bonding, adhesive bonding).	**Y**	**Y**	*e.g., Apply appropriate fastening or joining procedure to the design and production of a manufactured part or product.*
	MEASURE 10.01.04 Explain finishing processes (e.g., types of finishing materials, surface preparation, methods of application).	**O**	**O**	*e.g., Select a finishing process for a product appropriate to the job it must perform environment in which it functions, and its aesthetic appeal--occupational comments specific to manufacturing.*
	MEASURE 10.01.05 Demonstrate the processes of inspection.	**O**	**O**	**Comment from Business/Industry:** Very important. Examples are tools, i.e. calipers. *e.g., Perform continuous on line inspections to ensure that parts or products meet design specifications.*
INDICATOR 10.02 Maintain hands-on knowledge of equipment operation to identify maintenance needs and maximize performance.	**MEASURE 10.02.01** Maintain hands-on knowledge of equipment operation to identify maintenance needs and maximize performance.	**Y**	**Y**	*e.g., Perform observations of equipment regularly.* *e.g., Report all unusual behaviors or unsafe conditions immediately to appropriate personnel.* *e.g., Document all aspects of equipment operations.* *e.g., Make sure that all safety requirements are in place during observations.* *e.g., Observe equipment and process operations a number of times for consistency.* *e.g., Analyze equipment and process data regularly.*

Pathway: Maintenance, Installation and Repair
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		KEY: Y=Essential	N=Not Essential	O=Optional
	MEASURE 10.02.02 Understand the importance of maintaining the correct up-to-date knowledge of all documentation related to equipment.	**O**	**Y**	**Comment from Business/Industry:** Critical! *e.g., Make all relevant materials easily available.* *e.g., Use machine identifiers, equipment lists, and process data to locate relevant information.* *e.g., Use all relevant databases in a timely manner.* *e.g., Retrieve relevant information to the requirements of the work to be performed from documents quickly.* *e.g., Use only information that is up-to-date.* *e.g., Discuss interpretations and questions on materials, specifications, and diagnostics.*
INDICATOR 10.03 Identify and diagnose equipment problems in order to effectively repair equipment.	**MEASURE 10.03.01** Identify and diagnose equipment problems in order to effectively repair equipment.	**O**	**Y**	*e.g. Gather information and history that can assist in identifying and diagnosing problems.* *e.g. Isolate system and component failure following diagnostic procedures.* *e.g. Identify root causes of problem using diagnostic procedures.* *e.g. Develop corrective action plans to fix the problem.* *e.g. Document diagnosis, case history plan, and repair outcome according to company protocols.* *e.g. Isolate system and component failure following diagnostic procedures.*
INDICATOR 10.04 Employ installation, customization, or upgrading techniques in order to ensure the proper functioning of equipment.	**MEASURE 10.04.01** Employ installation, customization, or upgrading techniques in order to ensure the proper functioning of equipment.	**O**	**O**	**Comment from Business/Industry:** Not required of entry-level worker. *e.g. Coordinate preparation for the installation, customization, or upgrading of equipment.* *e.g. Obtain machine information from vendors related to proper installation, customization, or upgrade.* *e.g. Install, customize, or upgrade equipment.* *e.g. Equip team with information and resources needed to complete task.* *e.g. Move or remove equipment completely, safely, and according to company and vendor procedures.*

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		KEY: Y=Essential	N=Not Essential	O=Optional
				e.g. Test the equipment to ensure proper function after installation, customization or upgrading.
INDICATOR 10.05 Follow a preventative maintenance schedule to maintain equipment, tools, and workstations.	**MEASURE 10.05.01** Follow a preventative maintenance schedule.	**O**	**Y**	*e.g. Conduct a pre-job consultation with the person/people who requested the maintenance or repair.*
				e.g., Verify supplies are available to perform preventive maintenance and routine repairs.
				e.g. Monitor equipment indicators to ensure it is operating correctly.
				e.g. Document training of maintenance activities according to company maintenance regulations.
				e.g. Maintain production schedules by completing daily housekeeping activities.

Technical Skill Assessment Blueprint

Pathway: Maintenance, Installation, and Repair

Cluster: Manufacturing

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 Career Pathway teams 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 postsecondary opportunities within the Maintenance, Installation, and Repair.	8%	6%	6%
TOPIC 2	**COMMUNICATION -** Use oral and written communication skills in creating, expressing, and interpreting information and ideas including technical terminology and information.	5%	6%	7%
TOPIC 3	**PROBLEM-SOLVING AND CRITICAL THINKING -** Solve problems using critical thinking skills (analyze, synthesize, and evaluate) independently and in teams. Solve problems using creativity and innovation.	14%	14%	16%
TOPIC 4	**INFORMATION TECHNOLOGY APPLICATIONS -** Use information technology tools specific to business, administration, and management to access, manage, integrate, and create information.	6%	5%	4%
TOPIC 5	**SYSTEMS -** Understand roles within teams, work units, departments, organizations, inter-organizational systems, and the larger environment. Identify how key organizational systems affect organizational performance and the quality of products and services. Understand global context of industries and careers.	5%	7%	4%
TOPIC 6	**SAFETY, HEALTH AND ENVIRONMENTAL -** Understand the importance of health, safety, and environmental management systems in organization.	8%	5%	5%
TOPIC 7	**LEADERSHIP AND TEAMWORK -** Use leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.	4%	4%	6%
TOPIC 8	**ETHICS AND LEGAL RESPONSIBILITY -** Know and understand the importance of professional ethics and legal responsibilities.	4%	4%	3%
TOPIC 9	**EMPLOYABILITY AND CAREER DEVELOPMENT -** Know and understand the importance of employability skills. Explore, plan, and effectively manage careers. Know and understand the importance of entrepreneurship skills.	6%	4%	3%
TOPIC 10	**TECHNICAL SKILLS -** Use of technical knowledge and skills required to pursue careers in the specific area or pathway, including knowledge of design, operation, and maintenance of technological systems critical to the Maintenance, Installation, and Repair career pathway.	40%	45%	46%
		100%	100%	100%

Manufacturing: Maintenance, Installation, & Repair Career 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, Installation, & Repair Career Pathway) 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 Maintenance, Installation, and Repair 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. Certain local student organization activities such as SkillsUSA or FFA are also important.	• Robotics I • Metals/ Welding I	**Occupations Requiring Postsecondary Education** ►Automation Mechanic ►Biomedical Equipment Technician ►Building Engineer ►Communication System Installer/Repairer ►Computer Maintenance Technician ►Electrical Equipment Installer/Repairer ►Facility Mechanic ►Forklift Mechanic ►Industrial Electronic Installer/ Repairer ►Industrial Machinery Mechanic ►Industrial Maintenance Electrician ►Industrial Maintenance Technician ►Instrument Calibration & Repairer ►Instrument Control Technician ►Job/Fixture Designer ►Laser Systems Technician ►Maintenance Repairer ►Meter Installer ►Millwright ►Music/ Instrument Repair Technician ►Plumber ►Security System Installer/ Repairer ►Welder
	10	English/ Language Arts II	Algebra II	Biology	U.S. History		• Robotics II • Metals/ Welding II	
	11	English/ Language Arts III	Probability and Statistics	Chemistry or Physics or CTE Science Equivalent	World History		• Computer Integrated Manufacturing • Any Technical Education course focusing on engineering, welding, electronics, or robotics	
	College Placement Assessments-Academic/Career Advisement Provided							
	12	English/ Language Arts IV	Math Elective (i.e. CTE Math Equivalent)	Science Elective	Economics		• Computer Integrated Manufacturing • Any Technical Education course focusing on engineering, welding, electronics, or robotics	
	Articulation/Dual Credit Transcripted-Postsecondary courses may be taken/moved to the secondary level for articulation/dual credit purposes.							
POSTSECONDARY	College Year 1	Required Goals Determined by Local College Program in College Year 1 and Year 2 - **Goal 1:** Communication; **Goal 2:** Critical Thinking/Problem-Solving; **Goal 3:** Natural Science; **Goal 4:** Mathematical/Logical Reasoning; **Goal 5:** History and the Social and Behavior Sciences **Varies by colleges and by programs				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 Maintenance, Installation, & Repair Pathway Specific to Program	
	College Year 2						• Advanced Classes In Maintenance, Installation, & Repair Pathway Specific to Program	
	Year 3	Continue courses in the area of specialization.					• Continue Courses in the Area of Specialization	
	Year 4						• Complete Manufacturing Major (4-year degree program)	