

Performance Indicators for Plumbing

A Bridge to Selected Instructional Materials



- Missouri Competencies • NCCER Wheels of Learning Competencies
- All Aspects of the Industry Objectives • Pre-Employment/Work Maturity Skills
- SCANS Competencies

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INTRODUCTION

This curriculum project includes two components. The first is an updated plumbing competency profile and this performance indicator “bridge” document. The updated profile contains those skills needed in the field as identified and validated by industry personnel. Also, an asterisk (*) identifies those specific skills that are core or essential, which should be interpreted as “those skills industry identifies as required for the first day on the job.” Task identifications for Missouri’s Vocational Administrative Management System (VAMS) are shown in brackets.

The Performance Indicator Chart connects plumbing skills with leading national organizations and other important, but more general, skills needed by students. This document provides instructors and administrators with links between newly updated plumbing competencies and (1) previous Missouri competencies, (2) competencies from NCCER Wheels of Learning, (3) All Aspects of the Industry objectives, (4) Pre-Employment/Work Maturity Skills, and (5) SCANS competencies (addressed in National VICA’s Total Quality Curriculum), and (6) Missouri’s Show-Me Standards. These set of skills are listed after the Performance Indicator Chart.

To use the Drafting Performance Indicator Chart, consider the following example. Duty bands (umbrella-like categories for competencies) are in **bold** type and shaded.

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Missouri Competency	Previous Mo. Competencies	NCCER Wheels of Learning	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Know. (Content)	Perform.(Goals)
8. Service and Repair of Plumbing, Fixtures, and Appliances							
8.1 Replace water closet wax ring [GO1]	G1	02404.11	D13, D14, E4	F4	3.1-3.3., AII 5	SC2, SC7	1.10, 3.1 -3.8

The second column (Previous Mo. Competencies) is helpful for anyone with curriculum tied to the previous Missouri competency list. Competency 8.1 is a revised competency, as indicated by the competency list in the second column. Competency 8.1 is also related to NCCER (Wheels of Learning) 20404.11; AAOI Objectives D13, D14, E4; and so on. Show in the last two columns are related Show-Me Standards, the academic skills in Missouri K-12 public classrooms.

This document may best be used as an initial step toward more in-depth articulation with national skill standards and Missouri Show-Me Standards. Although every attempt was made to provide a comprehensive crosswalk, local advisory council input should be solicited and used to validate to competencies/core competencies required in any given geographic location.

For more detail, obtain or contact the following resources.

- *Wheels of Learning Standardized Craft Training*. Rosslyn, VA: National Center for Construction Education and Research (formerly Construction Education Foundation), © 1998. Contact: National Center for Construction Education and Research, ATTN: Craft Training, 1300 N. 17th St., Rosslyn, VA 22209, 703/812-2000. (home page: <http://www.nccer.org>)
- *Plumbing Competency Profile (70-3079-C)*, 1998. * Contact: Instructional Materials Laboratory, 2316 Industrial Drive, Columbia, MO 65203, 800/669-2465, FAX 573/882-1992. (home page: <http://www.iml.coe.missouri.edu>)
- *Pre-Employment/Work-Maturity Skills Instructional Resource Guide (30-6000-1)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1998*. Contact: IML (See Above)
- *All Aspects of the Industry (65-9000-I)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1994. Contact: IML (see above)
- *Learning a Living: A Blueprint for High Performance* (A SCANS Report for America 2000). Washington, DC, U.S. Department of Labor, 1992.* (homepage: <http://www.dol.gov>)
- VIMS/VAMS Support Center, 106 Rothwell, UMC, Columbia, MO 65211, 573/882/2951. (Homepage: <http://www.coe.missouri.edu/~vams>)

These resources are available to Missouri educators for free loan from the Missouri Vocational Resource Center (MVRC), University of Missouri-Columbia, 8 London Hall, Columbia, MO 65211 (800/392-7217, Fax 573/882=9935).

Acknowledgments

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Drafting Performance Indicator Chart

Notes: The numbers in brackets represent IDs used in computerized tracking software.

* = Core competencies (essential for the first day on the job)

= Core competencies with #3 (Knowledge Demonstrated) as the highest level of expected achievement.

Show – Me Standards

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
1. Safety							
*1.1 Demonstrate good safety practices [AO1]	A1	02102.1	H 1-9, I3	F3, F4	3.3	HP5, HP7	1.10, 4.7
*1.2 Demonstrate proper techniques for lifting and carrying [AO2]	A2		H7	F4	3.3	HP4	1.10, 4.7
#1.3 Exercise extreme caution when working around electric lines and equipment [AO3]	A3	02101.0	H2, H4	F4	3.3	HP5	1.10, 4.7
*1.4 Maintain work area properly [AO4]	A4		H2	F4	3.3	HP5	1.10, 4.7
*1.5 Adhere to safety signs and color codes [AO5]	A5		H1, H4	F6	3.3	HP5, SS3	1.10, 4.2, 4.7
*1.6 Identify and report potential safety hazards [AO6]	A6		D3, H3	F4	3.1, 3.3	CA1, HP5	1.10, 2.3, 3.1, 3.5, 4.7
*1.7 Practice ladder and scaffold safety [AO7]	A7		H4	F4	3.3	HP5	1.10, 4.7
*1.8 Safely operate hand and power tools [A15]	A10, A11	02102.1	E2, H4	F4	3.3, 5.2	HP5, SC2	1.10, 4.7
#1.9 Properly handle gas cylinders, hoses and regulators [A16]		02102.1	E2, H4	F4	3.3, 5.2	HP5	1.10, 4.7
*1.10 Wear required safety equipment [AO9]	A9	02102.1	H2, H4	F6	3.3	HP5, SS3	1.10, 4.2, 4.7
#1.11 Identify types of fire extinguishers and their proper uses [A12]	A12		H4	F6	3.3	HP5, SS3	1.10, 3.5, 4.7
*1.12 Practice fire safety when operating heating equipment or working with hot materials [A13]	A13	02102.1	H4	F4	3.3, 5.2	HP5	1.10, 4.7
*1.13 Demonstrate safe practices when using flux [A14]	A14	02102.1	H3	F4	3.3, 5.2	HP5	1.10, 4.7
*1.14 Demonstrate safe use of solvents [A17]		02102.1	H3	F4	3.3, 5.2	HP5	1.10, 4.7
#1.15 Read and interpret MSDS sheets [A18]			D3, H3	F6	3.3, 5.2	HP5, SS3, CA3	1.5, 4.2, 4.3, 4.7
*1.16 Demonstrate an awareness of locating and verifying buried utility lines [A19]		02102.1	D3, H4		3.1, 3.3	HP5	1.10, 4.7
#1.17 Shoring and bracing excavation [A20]			H4	F4	3.3	HP5	1.10, 4.7
#1.18 Understand and confined space entry [A21]			H4		3.1, 3.3	HP5	1.10, 4.7

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
#1.19 Identify hazardous materials on site (i.e., leaking gas, asbestos) [A22]			D3, H3	F4, F6	3.1, 3.3	Hp5, SC1, SS3	1.10, 3.5, 4.7
#1.20 Work safely around laser equipment [A23]		02102.1	D3	F4	3.3, 5.2	HP5	1.10, 4.7
*1.21 Demonstrate an awareness of OSHA guidelines [A24]			A5, D3, H1	F6	3.1, 3.3	HP5, SS3	1.10, 4.2, 4.3, 4.7
#1.22 Administer first aid and CPR [A25]			D3, D4, H4		3.2, 3.3	HP7	1.10, 3.1, 4.7
2. Pre-Employment Skills							
*2.1 Identify employment opportunities in the plumbing trade [JO1]	B1	02101.3		A2, B2	3.1	SS4	1.10, 2.6, 4.8
*2.2 Complete a job application thoroughly [JO2]			D3, D15	D1-6	3.2	CA1	2.1, 2.6, 4.8
*2.3 Develop and present a resume [JO3]	I9		D3	C1, C2	3.2, 3.3	CA1, CA4, CA6	2.1, 2.6, 4.8
*2.4 Maintain a professional appearance (neat, clean, groomed, appropriately dressed) [JO4]	I8		I5	F5		SS6	4.3
*2.5 Demonstrate effectiveness in oral and written communications [JO5]	I6	02213.2	D3, D12	G1	3.3	CA1, CA4, CA6	2.1, 2.2
*2.6 Demonstrate good interpersonal skills [JO6]	I4	02213.1	I4, B9	F3, G1, G2	2.6	CA1, CA6, SS6	2.3
*2.7 Demonstrate a polite and respectful attitude [JO7]	I5	02213.1	I4	F3, G1, G2	2.6	CA1, CA6, SS6	2.3, 4.3, 4.4
*2.8 Demonstrate good interviewing skills [JO8]			D3, D4, D5, D12	E1-6	3.3	CA1, CA6	2.1, 2.6, 4.8
3. Basic Skills							
*3.1 Demonstrate basic reading skills [B12]			D3, D15		3.1	CA3	1.5
*3.2 Perform general mathematical calculations [BO4]	B4	02105-ALL	D1, D2		3.1	MA1, MA2	3.1, 3.2
*3.3 Use good time management skills (i.e., efficient use of time on job site) [B13]			D6, D9	F1, F2	1.1		4.5
*3.4 Lay out and plan any given installation [B14]		02106, 02107, 02108, 02109 - ALL	D7, D1, D2, E5	F4	3.1-4, 5.1	MA1, MA2	1.8, 2.1
#3.5 Define plumbing terminology [BO2]	B2	02101.1	D3, E1	F6	3.1, 3.3	CA1	2.1
3.6 Read and interpret Americans with Disabilities Act (ADA) requirements [B15]		02402.10, 11	D3, D5, G1, G6, H1	F6	3.1, 3.3	CA3, SS3, HP5	1.5, 4.2, 4.3, 5.7
*3.7 Read measuring devices [BO3]	B3	02105.1	D1, D2, D3, E2	F4	3.1, 3.3	MA2	1.4, 2.7
3.8 Read and interpret a blueprint [BO5]	B5	02106-ALL	D1-3, D7, D8, D15	F4	3.1, 3.3	CA3, MA1, MA2	1.5, 1.6, 2.7
3.9 Sketch a plumbing layout [BO6]	B6	02106.2, 5	D3, D7, D8, D15	F4	3.1, 3.3, 4.1, 4.3, 5.2	MA1, MA2	2.1, 2.5, 2.7
#3.10 Read and interpret catalog and rough-in information [BO7]	B7	02107.3 02216.3	D3, D15, D16		3.1, 3.3	CA3, MA2	1.5, 1.6

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		02305.1					
3.11 Read and interpret specifications [BO8]	B8	02107.2 02305.5	D3, D15, D16		3.1, 3.3	CA3, MA2	1.5, 1.6
#3.12 Prepare a bill of materials [BO9]	B9	02108.5, 6; 02109.3, 02216.1	C4, C6, D3, D4, D15	F4	1.3, 5.2	CAI, SS4	1.8, 2.1
3.13 Read and interpret applicable codes [B10]	B10	02107.5, 02110.4, 02112-ALL	A5, D3, D15	F6	3.1, 3.3	CA3, SS3	1.5, 4.2, 4.3
3.14 Identify basic structural framing components [B11]	B11	02215.1, 02216.8	D15, E5		3.1, 3.3	MA2	1.10, 3.5
3.15 Use judgment for structural penetrations (i.e., drilling, cutting, notching) [B16]		02215.8, 02216.8	D15, E5		3.1, 3.3	SC2	1.10, 3.2, 3.3, 3.5
*3.16 Solder a 95/5 copper joint [B17]	E19	02202.1-4	D15, E1, E4	F4	5.2	SC2	1.10, 2.5
*3.17 Assemble a soft and rigid lead-free copper joint [B18]	E20	02202.1-4	D15, E1, E4	F4	5.2	SC2	1.10, 2.5
3.18 Silver braze a copper joint [B19]	E21	02202.5-9	D15, E1, E4	F4	5.2	SC2	1.10, 2.5
3.19 Assemble a plastic joint/connection [B20]	D6			F4	5.2	SC2	1.10, 2.5
4. Basic Use of Hand and Power Tools							
*4.1 Identify types of pipe cutters [C14]		02102-All, 02202.1	D15, E2, E4, H4		5.2, 3.1		1.10, 3.5
*4.2 Cut cast-iron pipe with a snap cutter [C15]	D1		D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.3 Cut cast-iron pipe with a ratchet cutter [C16]	D2		D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
#4.4 Cut cast-iron pipe using a hammer and chisel [C17]			D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
*4.5 Cut plastic pipe using hand saw [C18]	D11	02201.3	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.6 Cut plastic pipe using tubing cutter [C19]	D12	02201.3	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.7 Cut plastic pipe using ratchet shear [C20]		02201.3	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
*4.8 Cut copper pipe using tubing cutter [C21]		02202.2, 6	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.9 Cut vitrified clay pipe using a hammer and chisel [C22]	D7	02211.3	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.10 Cut vitrified clay pipe with a snap cutter [C23]	D8	02211.3	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.11 Operate a three-way threader (band hand) [CO3]	C3	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.12 Operate a drop-head ratchet threader (by hand) [CO4]	C4	02102 – All	D15, E2, E4,	F4	5.2	SC2	1.10, 2.5

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
			H4				
4.13 Operate an adjustable 1'-2' ratchet threader (by hand) [CO5]	C5	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
*4.14 Assemble fittings using two pipe wrenches [CO6]	C6	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.15 Operate a power threader with a nipple chuck [CO7]	C7	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.16 Operate a power vise with a three-way threader [CO8]	C8	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.17 Operate a power vise with a drop-head ratchet threader [CO9]	C9	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.18 Operate a power vise with a quick-open threader [C24]	C10	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
#4.19 Operate a right-angle drill/high torque drill [C25]	C12	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
#4.20 Operate a chop saw [C26]		02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
#4.21 Operate a reciprocating saw [C13]	C13	02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
*4.22 Operate a fuel-air torch [C27]	A8	02102 – All 02202.1, 5	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.23 Operate plastic fusion equipment [C28]		02102 – All	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
4.24 Operate laser equipment [C29]		02102 – All 02210.4	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
5. Soil, Waste, and Vent Systems (Rough-In)							
5.1 Construct a cast iron/lead and oakum assembly [DO3]	D3	02217.4	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
5.2 Construct a cast-iron assembly with compression gasket joints [DO4]	D4	02216.5, 6, 7; 02205.1	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
5.3 Construct a no-hub cast-iron pipe assembly [DO5]	D5	02205.1, 02216.5, 6, 7	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
5.4 Assemble a vitrified clay pipe compression joint [D09]	D9	02211.4	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
5.5 Install a clay-to-plastic adapter coupling [D10]	D10	02211.4	D15, E2, E4, H4	F4	5.2	SC2	1.10, 2.5
5.6 Excavate a trench and maintain desired grade [D13]	D13	02209.2, 3; 02210 – All	D15, E2, E4, H4	F4, F6	5.2	SC2, SC5, SS3	1.10, 2.5
5.7 Install a floor drain [D14]	D14	02214.1, 4	B7, D15, E2, E4, H4	F4, F6	5.2	SC2, SS3	1.10, 2.5, 4.2
5.8 Rough-in for a three-fixture bath, including main vent and flashing [D15]	D15	02401.1-6, 02402 – All 02208.1-7, 02216.5, 6, 7	D7, D15, E2, E4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
5.9 Rough-in for a kitchen sink [D16]	D16	02401.3, 02402 – All	D7, D15, E2, E4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
5.10 Rough-in for a washing machine [D17]	D17		D7, D15, E2, E4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
5.11 Rough-in for indirect waste [D19]	D19	02220 – All	D7, D15, E2, E4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
5.12 Install backwater valve [D21]	D21		D7, D15, E2, E4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
#5.13 Perform a standing water test [D22]	D22	02217.4	D7, D15, E2, E4, H4	F4, F6	3.2, 5.2	SC1, SC2, SC5, SS3	1.2, 3.4, 3.5, 4.2
#5.14 Perform an air test to manufacturer's specifications [D23]		02217.3	D7, D15, E2, E4, H4	F4, F6	3.2, 5.2	SC1, SC2, SS3	1.2, 1.5, 3.4, 3.5, 4.2
5.15 Install a sump pump [D24]		02221 – All	D7, D15, E2, E4, H4	F4, F6	5.2	SC2, SS3	1.10, 2.5, 4.2
5.16 Install subsoil drainage system [D25]		02221 – All	D7, D15, E2, E4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
6. Water Distribution (Rough-In)							
6.1 Install a building's water service [E12]	E12	02206 – All 02209 – All 02318- All	D7, D15, E2, F4, H4	F4, F6	5.2	SC2, SS3	1.10, 2.5, 4.2
#6.2 Install a main shut-off valve [E17]	E17	02318.2	D7, D15, E2, F4, H4	F4, F6	5.2	SC2, SS3	1.10, 2.5, 4.2
*6.3 Assemble soft tubing with flare fittings [EO1]	E1	02206 – All	D15, E2, F4, H4	F4	5.2	SC2	1.10, 2.5
*6.4 Assemble soft tubing with compression joints [EO2]	E2	02206 – All	D15, E2, F4, H4	F4	5.2	SC2	1.10, 2.5
*6.5 Construct a soft tubing assembly with solder joints [EO3]	E3	02202 – All	D7, D15, E2, F4, H4	F4	5.2	SC2	1.10, 2.5
6.6 Install a water distribution system of galvanized steel [EO4]	E4	02203 – All	D7, D15, E2, F4, H4	F4	5.2	SC2	1.10, 2.5
6.7 Install a water distribution system of hard-drawn copper [EO5]	E5	02202 – All	D7, D15, E2, F4, H4	F4	5.2	SC2	1.10, 2.5
6.8 Install a water distribution system of CPVC (chlorinated polyvinyl chloride) [EO6]	E6	02317 – All	D7, D15, E2, F4, H4	F4	5.2	SC2	1.10, 2.5
6.9 Rough-in water supply for a laundry box [E25]			D7, D15, E2, F4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
6.10 Rough-in water supply for a laundry tub [E26]		02401.1, 10; 02317 – All	D7, D15, E2, F4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
6.11 Rough-in water supply for a kitchen sink [E10]	E10	2401.1-3, 02317 – All	D7, D15, E2, F4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
6.12 Install a sillcock [E27]		02308.7, 02317 – All	D7, D15, E2, F4, H4	F4	4.1, 5.2	SC2	1.10, 2.5
6.13 Rough-in water supply for a water heater [E15]	E15	02309 – All, 02317	D7, D15, E2, F4, H4	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2
6.14 Rough-in water supply for a three fixture bath [E16]	E16	02317. 1-6,	D7, D15, E2,	F4, F6	4.1, 5.2	SC2, SS3	1.10, 2.5, 4.2

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
		02401 – All	F4, H4				
6.15 Apply a 95/5 solder system [E19]	E19	02202. 1-4	D15, E2, F4, H4	F4	4.1, 5.2	SC2	1.10, 2.5
6.16 Apply a lead-free solder system [E20]	E20	02202. 1-4	D15, E2, F4, H4	F4	4.1, 5.2	SC2	1.10, 2.5
6.17 Apply a silver brazed system [E21]	E21	02202.5-9	D15, E2, F4, H4	F4	4.1, 5.2	SC2	1.10, 2.5
6.18 Install water hammer arrestors [E28]		02311 – All	D7, D15, E2, F4, H4	F4	5.2	SC2	1.10, 2.5
#6.19 Perform an air pressure test [E23]	E23	02217.3	D15, E2, F4, H4	F4, F6	3.1, 3.3, 5.2	SC1, SC2, SC5, SS3	1.2, 3.4, 3.5, 4.2
#6.20 Perform a water pressure test [E24]	E24	02217.4	D15, E2, F4, H4	F4, F6	3.1, 3.3, 5.2	SC1, SC2, SC5, SS3	1.2, 3.4, 3.5, 4.2
6.21 Install a pressure reducing valve [E29]		02303.2	D7, D15, E2, F4, H4	F4, F6	5.2	SC1, SC2, SS3	1.10, 2.5, 4.2
6.22 Install a backflow prevention assembly where required [E30]		02312 – All	D7, D15, E2, F4, H4	F4, F6	3.1, 3.3, 5.2	SC1, SC2, SS3	1.10, 2.5, 4.2
6.23 Install a check valve on a water supply line to a plumbing appliance [E31]		02306.3	D7, D15, E2, F4, H4	F4	5.2	SC2	1.10, 2.5, 4.2
6.24 Install a vacuum breaker on a water supply line to a plumbing appliance		02312. 1-4	D7, D15, E2, F4, H4	F4, F6	5.2	SC2	1.10, 2.5, 4.2
7. Fixtures and Trim							
*7.1 Identify components of fixture hardware [FO1]	F1	02305 – All 02401.1, 3-13	E1	F4	3.1	SC2	1.10, 3.5
#7.2 Install a lavatory (cabinet installation) [FO2]	F2	02401. 1-3 02403 1,3	E1, D7	F4	5.2	SC2	1.10, 2.5
#7.3 Trim out a lavatory [FO3]	F3		E1, D7	F4	5.2	SC2	1.10, 2.5
#7.4 Install a tank-type water closet [FO4]	F4	02401.1, 2, 6; 02403. 1, 5, 6, 8	E1, D7	F4	5.2	SC2	1.10, 2.5
#7.5 Install a kitchen sink [FO5]	F5	02305. 1, 5, 6; 02401. 1, 2, 3; 02403. 1, 3, 8	E1, D7	F4	5.2	SC2	1.10, 2.5
#7.6 Trim out a kitchen [FO6]	F6	02305. 1, 5, 6	E1, D7	F4	5.2	SC2	1.10, 2.5
#7.7 Install a garbage disposal [FO7]	F7	02401. 1, 2, 12	E1, D7	F4	5.2	SC2	1.10, 2.5
7.8 Hook up a dishwasher [FO8]	F8	02401.13	E1, D7	F4	5.2	SC2	1.10, 2.5
#7.9 Install a wall-hung lavatory [FO9]	F9	02305. 1, 5, 6; 02041.1, 2, 3; 02403. 1, 3, 4, 8	E1, D7	F4	5.2	SC2	1.10, 2.5
7.10 Install a gas water heater [F10]	F10	02309 - All	E1, D7	F4, F6	3.1, 3.3, 5.2	SC1, SC2, SS3	1.10, 2.5, 4.2

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
7.11 Install an electric water heater [F11]	F11	02309 – All	E1, D7	F4, F6	3.1, 3.3, 5.2	SC1, SC2, SS3	1.10, 2.5, 4.2
7.12 Install a tub with tub filler [F18]		02401.1 1, 2, 4; 02402.1, 2, 3, 5, 10, 11 02403. 1-2	E1, D7	F4	5.2	SC2	1.10, 2.5
#7.13 Set a shower stall [F14]	F14	02401.1, 2, 5; 02402.2, 3, 10, 11, 02403.1, 2	E1, D7	F4	5.2	SC2	1.10, 2.5
7.14 Install a service sink [F15]	F15	02401.1, 2, 4; 02402.2, 3, 10, 11 02403.1, 2	E1, D7	F4	5.2	SC2	1.10, 2.5
7.15 Install shut-off valves [F16]	F16	02308.2, 4, 5, 7,9	E1, D7	F4	5.2	SC2	1.10, 2.5
7.16 Trim out a three-fixture bath [F-17]	F17	02305.1, 5, 6; 02401. 1-6	E1, D7	F4	5.2	SC2	1.10, 2.5
7.17 Install a water softener [F19]		02314.4	E1, D7	F4	5.2	SC2	1.10, 2.5
8. Service and Repair of Plumbing, Fixtures, and Appliances							
8.1 Replace water closet wax ring [G02]	G1	02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2, SC7	1.10, 3.1-3.8
8.2 Repair or replace water closet ball cock [G02]	G2	02404.6, 11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.3 Repair or replace water closet flush valve [G03]	G3	02404.6, 11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.4 Replace water closet tank gasket [G04]	G4	02404.6, 11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.5 Repair or replace flushometer valves [G32]		02404.6, 11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.6 Clear stoppage using closet auger [G05]	G5	02404.9, 14	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.7 Replace faucet washer and seat [G06]	G6	02404.6, 11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.8 Replace patented overflow (P.O.) plug [G07]	G7	02404.6, 11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.9 Replace lavatory trap [G08]	G8	02401.1, 3; 02403.1, 3, 8	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.10 Repair or replace lavatory faucet, two-handed mixing valve [G09]	G9	02305.6, 25404.6, 11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.11 Repair or replace lavatory faucet, single lever [G10]	G10	02305.6, 25404.6, 11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.12 Replace tub connected waste and overflow [G11]	G11	02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.13 Replace tub diverter [G12]	G12	02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.14 Replace tub shower arm and head [G13]	G13	02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
8.15 Replace kitchen sink [G14]	G14	02305.1, 5, 6 02401.1-3; 02403.1,3,8; 02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.16 Repair or replace kitchen sink faucet, two-handed mixing valve [G15]	G15	02305.1, 5, 6; 02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.17 Repair or replace kitchen sink faucet, single lever [G16]	G16	02305.1, 5, 6; 02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.18 Replace sink waste, basket strainer type [G17]	G17	02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.19 Replace kitchen sink trap [G18]	G18	02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.20 Replace kitchen sink continuous waste [G19]	G19	02404.11	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.21 Remove and replace garbage disposal [G20]	G20	02404.16	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.22 Replace gas water heater [G21]	G21	02309 – ALL	D13, D15, E4	F4, F6	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.23 Replace gas water heater control valve [G22]	G22	02309.3	D13, D15, E4	F4, F6	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.24 Replace gas water heater thermocouple [G23]	G23	02309.3	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.25 Replace electric water heater [G24]	G24	02309 – ALL	D13, D15, E4	F4, F6	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.26 Replace electric water heater elements [G25]	G25	02309.3	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.27 Replace electric water heater thermostats [G26]	G26	02309.3	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.28 Replace T & P relief valve with proper discharge type [G33]		02308.11	D13, D15, E4	F4, F6	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.29 Replace water heater drain valve [G34]		02309.3	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.30 Thaw frozen pipes [G27]	G27	2316 – ALL	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
*8.31 Insulate water lines [G28]	G28		D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.32 Repair solder joint [G29]	G29	02202.1-4	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.33 Install repair coupling [G30]	G30		D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.34 Repair or replace fixture shut-off valve [G35]		02308.15, 16	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
8.35 Clear stoppage using an electric sewer [G36]		02409.9	D13, D15, E4	F4	3.1-3.3, All 5	SC2	1.10, 3.1-3.8
9. Supporting and Hanging Pipe							
9.1 Install expansion anchors [H01]	H1	02215 – ALL	D1, D2, D15, E4	F4	5.2	SC2	1.10, 2.5
9.2 Place inserts [H02]	H2	02215. 1-7	D1, D2, D15, E4	F4	5.2	SC2	1.10, 2.5

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
9.3 Install stub anchors [H03]	H3	02215 – ALL	D1, D2, D15, E4	F4	5.2	SC2	1.10, 2.5
9.4 Hang pipe using wire pipe hooks [H04]	H4	02215.2, 3, 7 (b), (c), (e)	D1, D2, D15, E4	F4, F6	3.1, 3.3, 5.2	SC2, SS3	1.10, 2.5, 4.2
9.5 Hang pipe using clevis hangers [H06]	H6	02215.2, 3, 7 (b), (c), (e)	D1, D2, D15, E4	F4, F6	3.1, 3.3, 5.2	SC2, SS3	1.10, 2.5, 4.2
9.6 Hang pipe using split-ring hangers [H07]	H7	02215.2, 3, 7 (b), (c), (e)	D1, D2, D15, E4	F4, F6	5.2	SC2, SS3	1.10, 2.5, 4.2
9.7 Install beam clamps [H08]	H8	02215.2, 3, 7 (b), (c), (e)	D1, D2, D15, E4	F4	3.1, 3.6, 5.2	SC2	1.10, 2.5
9.8 Support pipe using riser clamps [H09]	H9	02215.2, 3, 7 (a), (d)	D1, D2, D15, E4	F4, F6	5.2	SC2, SS3	1.10, 2.5, 4.2
*9.9 Install backing boards for fixtures [H10]	H10	02215.8; 02402.3, 10, 11	D1, D2, D7 D15, E4	F4	5.2	SC2	1.10, 2.5
*9.10 Install bathtub supports [H11]	H11	02402.1, 3, 5, 10, 11	D1, D2, D7, D15, E4	F4	5.2	SC2	1.10, 2.5
*9.11 Install backing for shower head supports [H12]	H12	02402.1, 3, 5, 10, 11	D1, D2, D7, D15, E4	F4	5.2	SC2	1.10, 2.5
9.12 Install pipe sleeves through concrete or masonry wall [H13]	H13		D1, D2, D7, D15, E4	F4	5.2	SC2	1.10, 2.5
9.13 Install fire caulking [H14]			D1, D2, D7, D15, E4	F4, F6	3.1, 3.3, 5.2	SC2, SS3	1.10, 2.5, 4.2
9.14 Install unistrut supports [H15]		02215.2, 3	D1, D2, D15, E4	F4	5.2	SC2	1.10, 2.5
10. Leadership							
*10.1 Demonstrate an understanding of VICA its structure, and activities [I01]	I1			ALL			1.10
*10.2 Demonstrate an understanding of one's personal values [I01]	I2		I1-6	A1	ALL 2	CA6, SS6	1.10, 2.3, 4.1, 4.3, 4.4
*10.3 Perform tasks related to effective personal management skills [I03]	I3		D6, D9, D11, E3, F1-6	F1-6	1.1	SS6	1.10, 4.5, 4.6
*10.4 Demonstrate good interpersonal skills [I04]	I4		D3-5, D10	G1-2	ALL 2	CA1, CA6, SS6	1.10, 2.3, 4.3, 4.4
*10.5 Demonstrate etiquette and courtesy [I05]	I5		D4, I1-5	F3	ALL 2	CA1, CA6, SS6	1.10, 2.3, 4.3, 4.4
*10.6 Demonstrate effectiveness in oral and written communications	I6		D3, D4, D5	G1	3.3	CA1, CA4, CA6	1.10, 2.1-2.7
*10.7 Develop and maintain a code of professional ethics [I07]	I7		I1-5	F1-6, A1	ALL 2	CA6, SS6	1.10, 4.1, 4.3
*10.8 Maintain a good professional appearance [I08]	I8		I5	F5		SS6	1.10
*10.9 Perform basic tasks related to securing and terminating employment	I9		B2, D11	C, D, E, G	ALL 2	CA6	1.10, 2.1, 2.3, 2.6, 4.1, 4.3, 4.4, 4.5, 4.6, 4.8

Missouri Competency	Previous Mo. Competencies	NCCER Competencies	AAOI Objectives	Pre-Employment/ Work Maturity Skills	SCANS Competencies	Knowledge (Content)	Performance (Goals)
*10.10 Perform basic parliamentary procedures in a group meeting	I10		B15, D3, D12	G1	2.1, 2.4, 2.5	CA6	1.10, 2.3, 2.6

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Core Curricula Competencies

1. The Plumbing Trade (Task Module 02101)

1. Discuss the historical development of the trade.
2. Discuss the functions of water supply and sewage treatment systems.
3. Discuss the importance of plumbers in modern society

2. Basic Plumbing Tools (Task Module 02102)

1. Discuss safety as it applies to plumbing tools.
2. Identify the basic hand and power tools used in the plumbing trade.
3. Discuss the proper maintenance procedures to be used for hand and power tools.

3. Math for Plumbers (Task Module 02105)

1. Measure pipe using the following methods:

2. Identify orthographic, oblique and isometric drawings.
3. Discuss how orthographic views are used to depict information about object
4. Explain how scale and dimensions are used to convey
 - a. End-to-end
 - b. End-to center
 - c. Center-to-center
 - d. End-to-face
 - e. Face-to-face
 - f. Face-to-throat
2. Determine end-to-end dimensions by figuring fitting allowances and make-up
3. Use a framing square to find the center of fittings.
4. Figure 45-degree offsets using the constant method.

5. Figure 45-degree offsets using a framing square and a wooden rule of tape measure.

4. Introduction to Plumbing Blueprint Reading (Task Module 02106)

1. Discuss the various ways in which drawings can be reproduced, including blue lines, black lines, sepias, and CAD. information about objects.
5. Identify the basic symbols used in schematic drawings of pipe assemblies.
6. Discuss the characteristics of isometric drawings.
7. Discuss procedures used to make piping isometric

5. Reading Residential Plumbing Drawings (Task Module 02107)

1. List the types of drawings that may be included in a set of residential plans.
2. Distinguish between plans and specifications
3. Interpret plumbing related information from a set of residential plans.
4. Understand the relationships that exist among the various drawings.
5. Apply the local code requirements to given drawings.

6. Joining Plastic Pipe Fittings (Task Module 02201)

1. State the precautions that must be taken when installing refrigerant piping.
2. Select the right tubing for a job.
3. Cut and bend tubing.
4. Join tubing by using flare and compression fittings.
5. Determine the kinds of hangers and support needed for refrigerant piping.
6. Insulate refrigerant piping.
7. State the basic requirements for pressure-testing a system once it has been installed.

8. Follow basic safety precautions for the installation, operation and maintenance of refrigerating and air conditioning equipment.

7. Soldering and Brazing Copper Tubing and Fittings (Task Module 02202)

1. Assemble and operate the tools used for soldering.
2. Prepare tubing and fittings for soldering.
3. Identify the purposes and use a solder and solder fluxes.
4. Solder copper tubing and fittings.
5. Assemble and operate the tools used for brazing.
6. Prepare tubing and fittings for brazing.
7. Identify the purposes and use of filler metals and fluxes used for brazing.
8. Braze copper tubing and fittings.
9. Identify the inert gases that can safely be used to purge tubing when brazing.

8. Joining Carbon Steel Pipe and Fittings (Task Module 02203)

1. Discuss the weights and sizes in which steel pipe is available.
2. Discuss the American Standard Pipe Thread.

9. Joining Cast-Iron Pipe and Fittings (Task Module 02205)

1. Differentiate between cast iron-hub and spigot pipe and no-Hub pipe and fittings.
2. Identify the labeling system used for cast-iron pipe and fittings.
3. State the sizes, weights, and availability of cast-iron pipe.
4. Identify common fittings used with cast-iron pipe.

10. Making Flare and Compression Joints with Copper Tubes (Task Module 02206)

1. Identify fittings and soft copper tubing.
2. Discuss the advantages of flared and compression joints.

11. Installing Traps and Interceptors (Task Module 02207)

1. Describe the different types of traps and how they work.
2. Explain the local code requirements for trap installation.

3. Identify the critical dimensions in trap installation.

12. Fitting and Cleanout Requirements for DWV Piping (Task Module 02208)

1. Recognize the different types of DWV fittings.
2. Understand the application of the various kinds of DWV fittings used within the plumbing design.
3. Understand the application of the various kinds of DWV fittings in reference to code requirements.
4. Understand the use of cleanouts in the DWV piping system.
5. Become familiar with the code requirements for the size, directions and locations of cleanouts.
6. Understand the placement of cleanouts on stacks, junctions and traps,
7. Understand the requirements for cleanout accessibility and clearance.
8. Understand the code requirements for manholes.

13. Installing Natural Gas Piping Systems (Task Module 02501)

1. Understand how the code affects natural gas piping systems.
2. Recognize the different types of natural gas distribution materials.
3. Interpret plumbing drawings or blueprints to determine natural gas piping layouts.
4. Recognize the parts of a gas system.
5. Know testing and purging procedures.
6. Understand appliance installation.

14. Installing LPG Piping Systems (Task Module 02502)

1. Understand how the code affects LPG piping systems.
2. Recognized the different materials used in LPG piping systems.
3. Recognized different types of storage containers.
4. Interpret plumbing plans to determine layouts.
5. Recognized the parts of a LPG system.
6. Understand testing procedures for LPG systems.
7. Install LPG appliances.

15. Installing Fuel Oil Piping Systems (Task Module 02503)

1. Understand how code affects fuel oil piping systems.
2. Recognize the different types of fuel oil distribution materials
3. Interpret plumbing drawings or blueprints to determine fuel oil system layouts.
4. Recognize the parts of a fuel oil system.
5. Understand testing and bleeding procedures.
6. Understand appliance installation.

16. Reading Commercial Drawings, Part 1 (Task Module 02108)

1. Interpret information from given Site Plans.
2. Verify dimensions shown on drawings and generate a Request for Information (RFI) when discrepancies are found.
3. Locate plumbing entry points, walls and chases.
4. Determine the sizes of drains, lines and other plumbing requirements.
5. Do a material takeoff for DWV and water supply systems from information shown on drawings.
6. Develop a bill of materials.

17. Intermediate Math for Plumbers (Task Module 02113)

1. Calculate 11-1/4, 22-1/2, 60 and 72-degree simple offsets.
2. Calculate 11-1/4, 22-1/2, 60 and 72-degree parallel offsets.
3. Calculate the area of a triangle, circle, and square.
4. Calculate the volume of rectangular solids and cylinders.
5. Calculate the capacity of tank in gallons.
6. Calculate the weights of water in a tank, given the volume.

18. Installing Pipe in Trenches (Task Module 02209)

1. Understand the process of installing pipe in trenches.
2. Recognize the various tools the machines used to layout and dig trenches.
3. Understand the need to follow prescribed safety rules when trenching.
4. Size a trench for a line of pipe.
5. Layout a trench for a line of pipe.

19. Grade for Drain and Waste Piping (Task Module 02210)

1. Interpret grade requirements for plumbing codes.
2. Calculate grade, fall, run and percent of grade.
3. Measure grade using spirit levels.
4. Measure grade using lasers.
5. Measure grade using optical instruments.

20. Joining Clay and Concrete Pipe (Task Module 02211)

1. Understand the applications of clay and concrete piping.
2. Understand how clay and concrete pipe fittings are made.
3. Cut clay and concrete pipe.
4. Join clay and concrete pipe.

21. Connecting the Sewer Main (Task Module 02212)

1. Know where to make connections to sewer mains.
2. Name the agency responsible for making connections.
3. Identify the proper place to tap a sewer main pipe.
4. Know about the ways to cut holes to tap sewer mains.
5. Know the fittings available for sewer main branch joints.
6. List the processes for installing sewer main branch joints.

22. Installing Roof, Floor and Area Drains (Task Module 02214)

1. Obtain the needed information from drawings and specifications to locate drains.
2. Install a roof drain.
3. Install waterproof membranes and flashing.
4. Use a surveyor's level or transit to measure the elevation of a floor drain.

23. Installing Pipe Hanger and Supports (Task Module 02215)

1. Identify basic problems encountered when supporting plastic DWV pipe.
2. Identify the three basic components of supports and hangers.
3. Identify service for different types of pipe attachments and connectors.

4. Identify service for different types of spring hangers and pipe rollers.
5. Construct field-media alignment guides.
6. Protects pipe insulations from being crushed in the hanger or support.
7. Properly support:
 - a. Vertical pipe
 - b. Horizontal pipe
 - c. Closet bends
 - d. Stack bases
 - e. Multiple side by side runs of pipe
8. Discuss the proper use of powder actuated fastening systems to secure common pipe attachments.

24. Installing DWV Piping Systems (Task Module 02216)

1. Develop a material takeoff from a given set of plans.
2. Use plans to determine the route of the plumbing and the locations of the fixtures.
3. Locate plumbing fixtures using roughing-in measurements.
4. Center the stack within the structure.
5. Install a building drain.
6. Install a main stack.
7. Install a secondary stack.
8. Modify structural members without weakening the structure.

25. Testing DWV Piping Systems (Task Module 02217)

1. Understand some of the reasons for testing DWV piping.
2. Understand what the plumber's responsibilities are for testing.
3. Conduct an air test.
4. Conduct a water test.
5. Conduct a smoke test.
6. Conduct an odor test.

26. Connection to the Water Main (Task Module 02301)

1. Make connections to the water main
2. Correctly layout pipes and valves for a water connection to a building.
3. Install a curb box.

27. Testing Water Supply Piping (Task Module 02302)

1. Conduct an air test.
2. Conduct a hydrostatic test.

28. Types of Faucets (Task Module 02305)

1. Identify and install the most commonly used faucets.
2. Identify various applications for utility faucets.
3. Understand basic functions for utility faucets.
4. Install utility faucets.
5. Identify various types of valve assemblies for kitchen and bathroom faucets.
6. Install common bathroom and kitchen faucets.
7. Identify and install various types of combination shower and bath fittings.

29. Types of Valves (Task Module 02306)

1. Understand the difference in pressure rating for valves.
2. Identify basic types of valves.
3. Understand the common service applications for common types of valves.
4. Understand the common service applications for pressure regulator valves, pressure safety valves, and pressure relief valves.
5. Disassemble and assemble valves.

30. Installing and Servicing Valves and Faucets (Task Module 02308)

1. Identify components and tools used in threaded valve and faucet installations.
2. Install threaded valves and faucets.
3. Identify components and tools used in soldered valve and faucet installations.
4. Install soldered faucets and valves.
5. Install CPVC faucets and valves.
6. Identify the components of sink and lavatory facets and shut-off valves.
7. Install freezeproof lawn faucets and shut-off valves.

8. Identify the components of freezeproof lawn faucets, self-piercing and standard needle valves.
9. Install self-piercing and standard needle valves.
10. Identify the potential difficulties and problems associated with valve and faucet installation.
11. Install and test a temperature and pressure relief valve and check valve.
12. Install float valves and flush valves.
13. Adjust float and flush valves for proper functioning.
14. Properly install gas cocks and gas valves.
15. Repair globe valves and compression faucets.
16. Repair gate valves
17. Repair single control mixing faucets.
18. Repair a tank flush valve.

31. Installing Water Heaters (Task Module 02309)

1. Describe the basic operation of water heaters.
2. Identify the common types of water heaters.
3. Identify the basic components of water heaters.
4. Install water heater.

32. Water Meters (Task Module 02310)

1. Identify why water meters are installed.
2. Identify locations for water meter installation
3. Identify the three major types of water meters.
4. Describe the basic working principles of a disk type meter, a tubing meter, and a compound meter.
5. Identify several types of water meter yokes and their applications.

33. Types of Fixtures (Task Module 02401)

1. Identify materials used in the manufacture of plumbing fixtures.
2. Identify dfu ratings for given types of plumbing fixtures.
3. Discuss common types of sinks and lavatories.
4. Discuss common types of bathtubs and both-shower modules.
5. Discuss common types of shower stall and shower baths.
6. Discuss common types of water closets.

7. Discuss common types of urinals.
8. Discuss common types of bidets.
9. Discuss common types of drinking fountains and water coolers.
10. Discuss common types of laundry trays.
11. Discuss common types of service sinks and mop basins.
12. Discuss common types of garbage disposals.
13. Discuss common types of domestic dishwashers.

34. Setting Fixtures (Task Module 02403)

1. The general installation considerations which should be followed before installing any fixture.
2. The general process for installing bathtubs and shower stalls.
3. Describe the basic procedures for installing lavatories and sinks.
4. Differentiate the procedures for installing built-in and wall-hung sink and lavatories.
5. Describe the process for installing water closets.
6. Describe how installed water closets can be protected.
7. Describe the process of installing urinals
8. Relate the installations of urinals to water closets and sinks.

35. Reading Commercial Plumbing Drawings, Part II (Task Module 02109)

1. Interpret information found on mechanical drawings as it related to piping/
2. Interpret information found on mechanical drawings as it related to the HVAC system.
3. Use mechanical drawings and other drawings as needed to perform material takeoffs on plumbing-related components.

36. Introduction to Regional & Local Plumbing Codes (Task Module 02112)

1. Understand the model plumbing codes and their purposes.
2. Understand the local plumbing codes and their purpose.
3. Understand the procedure for modifying plumbing codes.
4. Be familiar with the model code and local code used in their area.
5. Be able to write a proposed code change.

37. Advanced Math for Plumbers (Task Module 02144)

1. Calculate simple and parallel offsets.

38. Types of Vents and Venting Installation (Task Model 02219)

1. Know how air pressure influences DWV Systems.
2. Know several types of problems caused by varying pressures in a DMV system.
3. Know of other problems that can cause loss of trap seal.
4. Know the definitions of back, branch, circuit, common, and continuous vents.
5. Recognize the vents.
6. Know where the vents are used.

39. Indirect and Special Waste (Task module 02220)

1. Discuss the reason for using indirect and special waste systems.
2. State the local code requirements for indirect waste systems.
3. Install an indirect waste system.

40. Sewage Pumps and Sump Pumps (Task module 02221)

1. Identify the differences between sump pumps and sewage pumps.
2. Explain the function of the sump pump and sewage pump and demonstrated how each on works.
3. Identify the major components of the sump pump system and the sewage pump system.

41. Locating Buried Sewer and Water Lines (Task Module 0222)

1. The importance of accurately locating pipe.
2. The use of prints in locating run of pipe.
3. How pipe can be located from known references.
4. How storm and sanitary sewers can be located by calculating grade between manholes.
5. An electronic pipe locator is used.
6. Plastic, clay, and concrete pipe is located.
7. Cameras are used to locate pipe.

8. The importance of accurate as-built drawings.

42. Installing Pressure-Reducing Valves (Task Module 02303)

1. Understand the need for and function of pressure-reducing valves.
2. Install a pressure-reducing valve.
3. Adjust a pressure-reducing valve.
4. Maintain a pressure-reducing valve.

43. Water Pressure Booster Systems (Task Module 02304)

1. Understand the function and purpose of water pressure booster systems.
2. Understand the principles behind the gravity tank system.
3. Understand how hydro-pneumatic systems function.
4. Understand the function and advantages of constant speed and variable capacity systems.
5. Understand the factors involved in the sizing of water pressure booster systems.
6. Understand the factors involved in system efficiency.
7. Understand the importance of economics and energy used in water pressure booster systems.
8. Be aware of the different pumps that can be used on water pressure booster systems.
9. Be aware of the advantages of choosing the correct motor for booster systems.
10. Be aware of maintenance considerations related to booster systems.
11. Be aware of component locations in booster system installations.

44. Installing Shock Arrestors (Task Module 02311)

1. Understand the problems of water hammer and what causes it.
2. Understand the function of a shock arrestor.
3. Understand the term fixture units and know its application to shock arrestor sizing.
4. Be able to identify the different types of shock arrestors.
5. Understand how each of these shock arrestors functions.

6. Understand the procedure used to fabricate an on-site shock arrestor.

45. Backflow Preventers (Task Module 02312)

1. Explain the principle of back-siphonage.
2. Explain the hazards of back-siphonage and demonstrate the importance of backflow preventers.
3. Identify and explain the applications of the five basic backflow prevention devices.
4. Install common types of backflow preventers.
5. Maintain common backflow preventers.
6. Know the testing procedures for backflow preventers.

46. Installing Recirculation Systems (Task Module 02313)

1. Understand the characteristics of the different recirculation systems.
2. Identify and install the basic components of recirculation systems.
3. Identify where various components are located within the system.
4. Know specific installation requirements for recirculation systems.
5. Know local code requirements.

47. Filtering and Softening Water (Task Module 02314)

1. Identify local water problems.
2. Know procedures for solving local water problems.
3. Identify the basic equipment necessary to solve specific water quality problems.
4. Install water conditioning equipment.

48. Cleaning and Disinfecting Potable Water Systems (Task Module 02315)

1. Ask questions of public officials relative to water-borne diseases and plumbing systems.
2. Explain the full procedure for flushing visible and invisible contaminants from plumbing system.

3. Explain the reasons for flushing visible and invisible contaminants from plumbing systems.
4. Flush out visible contaminants from plumbing systems.
5. Disinfect a potable water plumbing system.

49. Thawing Frozen Water Pipes (Task Module 02316)

1. Identifying the Various machines used to thaw frozen water pipe.
2. Demonstrate abilities in the use of the various methods of thawing frozen water pipe.
3. Identify methods of preventing water pipe from freezing.

50. Installing Water Supply Piping (Task Module 02318)

1. Properly install a water service line to a structure.
2. Properly bring a water service line into the structure.
3. Properly request and designate requirements for a water meter.
4. Explain how a water meter and an indirect register operate.

51. Fixture Rough-In (Task Module 02402)

1. Be aware of the extra support necessary for bathtubs in residential installations.
2. Be aware of the problems and concerns of roughing-in fiberglass tubs and showers.
3. Be aware of the many blocking possibilities for mounting fixtures.
4. Understand the reason for using floor-mounted lavatory carriers in commercial buildings.
5. Understand the procedures for mounting fixture carriers to wood-stud, metal stud, and masonry walls.
6. Understand how water closet carriers are installed.
7. Understand how water closet carriers are designed to work.
8. Understand how back-to-back water closet carriers are installed.
9. Be aware of the special typed of fixtures which can be mounted on fixture carriers.
10. Be aware of the requirements for installing plumbing fixtures for handicapped individuals.

11. Be aware of installation procedures for fixtures for the handicapped.

52. Plumbing for Solar Heating Systems (Task Module 02512)

1. Be aware of the various types of solar hot water heating systems.
2. Be able to tell the difference between the various types of solar hot water heating systems and their preferred us.
3. Be aware of the need for heat exchangers and freeze protection and the different methods by which freeze protection can be achieved.
4. Problems of corrosion in solar hot water systems.
5. Function of solar controls in hot water systems.
6. Possibilities for solar hot water space heating of homes, and solar pool and hot tub heating.

53. Sizing, Piping, and Venting Natural Gas Systems (Task Module 02513)

1. Understand the sizing of standard-pressure natural gas piping.
2. Understand the sizing of medium- and high-pressure natural gas piping.
3. Understand the need for pressure regulators, valve-protective sleeves, venting of pipes, and access to hidden valves and regulators.
4. Understand the combustion air requirements for natural gas appliances.
5. Understand the venting requirements for natural gas appliances.
6. Understand the special considerations in reference to venting, such as types of vents and chimney heights.

54. Plumbing Theory (Task Module 02110)

1. Calculate the change in volume of air which results from the application of pressure.
2. Describe the effects of pressure being applied to water.
3. Describe the results of excessive water temperature in a water heater.

4. Identify local plumbing code requirements which are directly related to pressure, temperature, or volume.

55. Sizing Storm Drainage Systems (Task Module 02213)

1. Discuss how a positive attitude contributes to overall job success and productivity.
2. Discuss the importance of effective communications.
3. Discuss how the telephone may be used as an effective communications tool.
4. Describe the relationship between safety and cost of plumbing work.
5. Discuss the proper use of company-owned vehicles.

56. Sizing Vents (Task Module 02224)

1. Explain general requirements for and applications of vents.
2. Explain the reasons for using vents in plumbing systems.
3. Identify and explain the sizing requirements for the special kinds of vents.

57. Sizing Drainage Systems (Task Module 02225)

1. Describe flow in branch lines and stack in drainage systems.
2. Calculate drainage fixture units for a plumbing system.
3. Size branch lines for the drainage of plumbing fixtures and groups of fixtures.

58. Combination Waste and Vent Systems (Task Module 02226)

1. Identify the applications and limitations of combination waste and vent systems.
2. Size combination waste and vent systems.
3. Layout a combination waste and vent system.

59. Servicing Traps and Interceptors (Task Module 02227)

1. Explain the necessary precautions, tools, and equipment that are needed before beginning to service a trap or interceptor.
2. Demonstrate how to clean or disassemble a household trap.
3. Identify the parts and know the procedures necessary in cleaning basin and drum traps.

60. Sizing Water Supply Piping (Task Module 02317)

1. Be aware of the history of indoor plumbing systems.
2. Understand the concepts of density and viscosity as they apply to water supply piping.
3. Understand the factors which cause resistance to the flow of installations.
4. Identify the major events leading up to contemporary plumbing installations.
5. Explain the concepts of density and viscosity.
6. Explain the factors which influence resistance in water supply piping.

61. Servicing Plumbing Fixtures (Task Module 02404)

1. Understand the problems associated with replacing broken or rusted water supply piping.
2. Understand the problems associated with joining dissimilar metal piping.
3. Understand the problems associated with frozen water supply piping.
4. Understand some of the major causes and solutions to water pressure problems.
5. Understand some of the major causes and solutions to water quality problems.
6. Understand some of the major causes and solutions to water flow problems.
7. Cleaning various types of household traps.
8. Servicing plumbing systems through vents and cleanouts.
9. Removing clogs from various building drains and sewer lines.
10. Understand the procedure for servicing or replacing water heaters.
11. Understand the procedure for replacing sinks, lavatories, bathtubs, and water closets.
12. Understand the procedure for servicing or replacing sump pump assemblies.
13. Troubleshoot water supply problems.
14. Troubleshoot water drainage problems.

15. Troubleshoot fixture and appliance problems in plumbing systems.
16. Troubleshoot household plumbing appliances.
17. Troubleshoot lawn sprinkling systems.

62. Installing Swimming Pools and Hot Tubs (Task Module 02506)

1. Understand the swimming pool system and how it functions.
2. Understand the swimming pool component and how each of them functions.
3. Understand the water quality problems associated with swimming pools.
4. Understand the installation procedures for hot tubs.
5. Understand the procedure for plumbing a hot tub.
6. Understand the various components in a hot tub system.

63. Installing Compressed Air Piping Systems (Task Module 02507)

1. Name design considerations when installing a compressed air piping system.
2. Explain how various types of piping are installed in a compressed air piping system.
3. Determine friction loss in a given compressed air piping system.

64. Installing Hydronic Heating Systems (Task Module 02508)

1. Identify the basic types of hydronic heating systems.
2. Identify system components and locate individual components within the system.

65. Installing Medical Gas Systems (Task Module 02509)

1. List at least five corrosive wastes and explain where they are formed.
2. List the three types of materials under waste resistant piping.
3. Explain the steps that should be followed in designing a corrosive resistant waste piping system.

66. Installing Medical Gas Systems (Task Module 02510)

1. List five types of medical gas systems and explain where they are used.
2. List and explain three types of supply systems used with medical gas.
3. Explain where and what types of alarm systems are required for medical gas systems.

67. Plumbing for Mobile Homes and Mobile Home Parks (Task Module 02511)

1. Have an understanding of how mobile homes are located and how they are plumbed.
2. Have and understand of why proper layout of a mobile home park is important.
3. Have and understand of how various water supply systems are connected in a mobile home park.
4. Have and understand of sanitary sewer requirements for mobile home parks.
5. Have and understand of mobile home plumbing requirements.
6. Have and understand of how to connect water and sewer lines to mobile homes.
7. Have and understand of what is meant by a travel trailer park and its plumbing needs.
8. Have and understand of what is meant by a sanitary dump station.

68. Installing Private Waste Disposal Systems (Task Module 02601)

1. Describe several types of private sewage systems.
2. State local code requirements regarding private sewage systems.

69. Installing Private Water Supply Systems (Task Module 02602)

1. Identify the qualities of a good well and point out concerns about a questionable water source.
2. Determine the type of pump necessary for a water well installation.
3. Explain the workings of a shallow well and deep well jet pump.

ALL ASPECTS OF THE INDUSTRY

Recent national legislation requires that vocational education programs provide a strong experience in “all aspects of the industry” (AA01) for industries that students are preparing to enter. AA01’s ultimate goal is to give future workers a sense of the issues involved in the world of work. Such knowledge can empower future workers to make informed decisions about their career paths. This knowledge can also allow workers to make meaningful contributions to the industry, instead of performing mindlessly like another piece of equipment. The main areas of AA01 include:

- Planning Management
- Management
- Finance
- Technical and Production Skills
- Principles of Technology
- Labor and Community Issues
- Health/Safety/Environment
- Personal Conduct

Duty Brands and Objectives

A. Planning

- A1 Describe why industries respond to customer wants and expectations
- A2 List differences in how companies deliver products versus delivering services
- A3 Describe ways a worker can influence company decision-making
- A4 Identify benefits in anticipation technology and market trend changes
- A5 Identify an example of how regulatory laws can impact how a business operates
- A6 Identify an example of how a political organization can impact how a company operates

B. Management

- B1 Identify key components of a company “mission statement
- B2 Identify how a corporate “chain of command” works
- B3 Describe the significance of a company’s “corporate culture”
- B4 Describe how a company organizes its departments
- B5 List typical ways company departments communicate

- B6 Cite examples of why a worker should adjust to different management styles
- B7 Cite an example of how companies are dependent on the national economy
- B8 Cite an example of how a company is dependent upon the local economy
- B9 Describe the importance of achieving internal and external customer satisfaction
- B10 Identify examples of how cultural diversity can affect an industry
- B11 Identify key difference in how private companies and government agencies operate
- B12 List reasons why written policies are used in industry
- B13 Identify resources available from professional organizations
- B14 Identify how roles and responsibilities in a family business are different than in larger companies
- B15 List benefits a worker can get by participation in meetings
- B16 List key differences in how a family farm operates versus how another small business operates

B 17 Describe how a company's marketing affects all its employees

C. Finance

- C1 List typical ways a business obtains capital
- C2 Describe the importance of accounting in a business
- C3 Describe key implications for a company which grants credit
- C4 Describe how a company estimates and bids for a contract
- C5 Describe how paycheck deductions affect a worker
- C6 Describe the importance of cost containment in a company

D. Technical and Production Skills

- D1 Demonstrate a basic math ability
- D2 Demonstrate the capability to measure quickly and accurately
- D3 Demonstrate the ability to speak and write the English language effectively
- D4 Demonstrate the ability to listen effectively
- D5 Demonstrate the ability to use effective negotiation skills
- D6 Demonstrate the ability to manage time effectively
- D7 Demonstrate the ability to read blueprints and drawings
- D8 Demonstrate the ability to perform basic computer operation
- D9 Describe the importance of deadlines and schedules
- D10 Demonstrate the ability to use team player skills
- D11 Demonstrate the ability to use supervisory and delegation skills
- D12 Demonstrate the ability to utilize good public speaking skills
- D13 Describe the importance of using troubleshooting techniques
- D14 Cite one example of a job that is inter-related with another job
- D15 Demonstrate the ability to obtain technical information
- D16 Identify certification requirements for a specific job

E. Principles of Technology

E1 Describe the key characteristics of the technology used
E2 Describe the importance of analyzing new equipment for possible use

- E3 Describe the importance of continuously upgrading one's job skills
- E4 Describe the importance of adaptability and learning from experience
- E5 Describe the importance of acquiring and analyzing information effectively and making sound decisions
- E6 Describe the importance of cross-training

F. Labor and Community Issues

- F1 Describe the importance of a written job description
- F2 Describe the importance of knowing your rights as a worker
- F3 Describe the importance of a written job description
- F4 List advantages/disadvantages of hourly and salaried pay
- F5 List differences between being a self-employed worker and a worker employed by a company
- F6 Describe the importance of participating in quality enhancement programs
- F7 Describe the importance of understanding why a worker is asked to occasionally work longer hours
- F8 Describe the importance of cultural sensitivity

G. Community

- G1 Describe the importance of recognizing a worker should contribute special skills through volunteer work
- G2 Identify key ways a company helps its community
- G3 Identify key ways a community helps a company
- G4 Identify an impact of buying outside the community
- G5 Describe how a company's public perception is important
- G6 Describe the importance of providing for the access needs of the physically challenged

H. Health, Safety and Environment

- H1 Describe the importance of complying with federal agency regulations

- H2 Describe why it is important to avoid job-specific health threats
- H3 Read and comprehend major components of a Material Safety Data Sheet
- H4 Identify basic safety training (tornado, fire, first aid)
- H5 Describe the importance of participating in preventive medicine programs
- H6 Describe the importance of handling stress effectively
- H7 Describe the importance of good workplace ergonomics
- H8 Identify any effects weather could have on an industry
- H9 Describe the importance of management's responsibility for a safe workplace

I. Personal Conduct

- I1 Describe the importance of recognizing the dignity of all work
- I2 Describe the importance of producing quality and effective work
- I3 Describe the importance of being fit for duty (no drugs, no alcohol)
- I4 Describe the importance of exhibiting good attitude, enthusiasm, integrity
- I5 Describe the importance of exhibiting good grooming and appearance
- I6 Describe the importance of good personal financing

Source: *All Aspects of the Industry (65-9000-1)*. University of Missouri-Columbia: Instructional Materials Laboratory, 1994

PRE-EMPLOYMENT/WORK MATURITY SKILLS

The following competencies from *Pre-Employment and Work-Maturity Competencies: A Guide for Practitioners* (Revised 1998) have been endorsed by three agencies: the Missouri Department of Elementary and Secondary Education, the Department of Labor and Industrial Relations, and the Department of Economic Development. The list includes seven core competencies and related employability skills. Locally developed learner outcomes may, of course, be added, and local groups are encouraged to utilize the identified state competencies for development of their own pre-employment and work maturity skills.

A. Making Career Decisions

- A1. Perform self assessment
- A2. Explorer occupational information
- A3. Perform decision-making process

B. Using Labor Market Information

- B1. Identify sources of information
- B2. Use labor market information

C. Preparing a Resume

- C1. Collect resume data
- C2. Develop a resume

D. Completing the Job Application Process

- D1. Prepare letters of inquiry
- D2. Provide accurate educational data
- D3. Provide accurate work history data
- D4. Provide accurate personal data
- D5. Provide accurate reference information
- D6. Fill out job application form

E. Demonstrating Effective Interviewing Skills

- E1. Present proper appearance
- E2. Prepare for interview
- E3. Greet the interviewer
- E4. Participate in the interview
- E5. Respond to interview closure
- E6. Prepare a letter of follow-up

F. Demonstrating Knowledge of the Proper Work Attitudes and Behaviors

- F1. Be dependable
- F2. Be punctual
- F3. Maintain a positive attitude and behavior
- F4. Complete tasks effectively with or without supervision
- F5. Practice good grooming and personal hygiene
- F6. Recognize legal issues in the workplace

G. Demonstrating Knowledge of Effective Interpersonal Skills

- G1. Communicate with others
- G2. Maintain relationships with others

SCANS COMPETENCIES

SCANS *foundation skills* identified by the U.S. Department of Labor describe generic skills needed by nearly everyone. The SCANS *competencies*, however, are more specific in nature and are listed below. (SCANS is the acronym for the Secretary [of Labor]’s Commission on Achieving Necessary Skills.) National VICA’s *Total Quality Curriculum incorporates* SCANS competencies and Total Quality Management (TQM) principles in a 17-module set of activities.

1. Resources

1. Allocates time
2. Allocates money
3. Allocates material and facility resources
4. Allocates human resources

2. Interpersonal

1. Participates as a member of a team
2. Teaches others
3. Serves clients/customers
4. Exercises leadership
5. Negotiates to arrive at a decision
6. Works with cultural diversity

3. Information

1. Acquires and evaluates information
2. Organizes and maintains information
3. Interprets and communicates information
4. Uses computers to process information

4. Systems

1. Understands systems
2. Monitors and corrects performance
3. Improves and designs systems

5. Technology

1. Selects technology
2. Applies technology to task
3. Maintains and troubleshoots equipment

SHOW-ME STANDARDS

The new educational goals and standards are a result of the Outstanding Schools Act of 1993, which calls on Missouri citizens and educators to define appropriate, rigorous expectations for children's learning. Committees of teachers, citizens, parents, lawmakers and state officials have been working on the proposed goals and standards since then. The goals and standards listed below were approved as a final regulation by the Missouri State Board of Education, January 18, 1996, and are available through the Missouri Department of Elementary and Secondary Education's home page. (URL <http://dese.state.mo.us/standards/goal1.html>)

Goal 1: Students in Missouri public schools will acquire the knowledge and skills to *gather, analyze and apply information and ideas*.

Students will demonstrate within and integrate across all content areas the ability to

- 1.1 develop questions and ideas to initiate and refine research
- 1.2 conduct research to answer questions and evaluate information and ideas
- 1.3 design and conduct field and laboratory investigations to study nature and society
- 1.4 use technological tools and other resources to locate, select and organize information
- 1.5 comprehend and evaluate written, visual and oral presentations and works
- 1.6 discover and evaluate patterns and relationships in information, ideas and structures
- 1.7 evaluate the accuracy of information and the reliability of its sources
- 1.8 organize data, information and ideas into useful forms (including charts, graphs, outlines) for analysis or presentation
- 1.9 identify, analyze and compare the institutions, traditions and art forms of past and present societies
- 1.10 apply acquired information, ideas and skills to different contexts as students, workers, citizens and consumers

Goal 2: Students in Missouri public schools will acquire the knowledge and skills to *communicate effectively within and beyond the classroom*.

Students will demonstrate with and integrate across all content areas the ability to

- 2.1 plan and make written, oral and visual presentations for a variety of purposes and audiences
- 2.2 review and revise communications to improve accuracy and clarity
- 2.3 exchange information, questions and ideas while recognizing the perspectives of others
- 2.4 present perceptions and ideas regarding works of the arts, humanities and sciences
- 2.5 perform or produce works in the fine and practical arts
- 2.6 apply communications techniques to the job search and to the workplace
- 2.7 use technological tools to exchange information and ideas

Goal 3: Students in Missouri public schools will acquire the knowledge and skills to *recognize and solve problems*.

Students will demonstrate within and integrate across all content areas the ability to

- 3.1 identify problems and define their scope and elements
- 3.2 develop and apply strategies based on ways others have prevented or solved problems
- 3.3 develop and apply strategies based on one's own experience in preventing or solving problems
- 3.4 evaluate the process used in recognizing and solving problems

- 3.5 reason inductively from a set of specific facts and deductively from general premises
- 3.6 examine problems and proposed solutions from multiple perspectives
- 3.7 evaluate the extent to which a strategy addresses the problem
- 3.8 assess costs, benefits and other consequences of proposed solutions

Goal 4: Student in Missouri public schools will acquire the knowledge and skills to *make decisions and act as responsible members of society.*

Students will demonstrate within and integrate across all content areas the ability to

- 4.1 explain reasoning and identify information used to support decisions
- 4.2 understand and apply the rights and responsibilities of citizenship in Missouri and the United States
- 4.3 analyze the duties and responsibilities of individuals in societies
- 4.4 recognize and practice honesty and integrity in academic work and in the workplace
- 4.5 develop, monitor and revise plans of action to meet deadlines and accomplish goals
- 4.6 identify tasks that require a coordinated effort and work with others to complete those tasks
- 4.7 identify and apply practices that preserve and enhance the safety and health of self and others
- 4.8 explore, prepare for and seek educational and job opportunities

Communication Arts (CA)

In Communications Arts, students in Missouri public schools will acquire a solid foundation which includes knowledge of and proficiency in

- CA1 speaking and writing standard English (including grammar usage, punctuation, spelling, capitalization)
- CA2 reading and evaluating fiction, poetry and drama
- CA3 reading and evaluating nonfiction works and material (such as biographies, newspapers, technical manuals)
- CA4 writing formally (such as reports, narratives, essays) and informally (such as outlines, notes)
- CA5 comprehending and evaluating the content and artistic aspects of oral and visual presentations (such as storytelling, debates, lectures, multi-media productions)
- CA6 participating in formal and informal presentations and discussions of issues and ideas
- CA7 identifying and evaluating relationships between language and culture

Fine Arts (FA)

In Fine Arts, students in Missouri public schools will acquire a solid foundation which includes knowledge of

- FA1 process and techniques for the production, exhibition or performance of one or more of the visual or performed arts
- FA2 the principles and elements of different art forms
- FA3 the vocabulary to explain perceptions about the evaluations of works in dance, music, theater and visual arts
- FA4 interrelationships of visual and performing arts and the relationships of the arts to other disciplines
- FA5 visual and performing arts in historical and cultural contexts

Health/Physical Education (HP)

In Health/Physical Education, students in Missouri public schools will acquire a solid foundation which includes knowledge of

- HP1 structures of, functions of, and relationships among human body systems
- HP2 principles and practices of physical and mental health (such as personal health habits, nutrition, stress management)
- HP3 diseases and methods for prevention, treatment and control

- HP4 principles of movement and physical fitness
- HP5 methods used to assess health, reduce risk factors, and avoid high risk behaviors (such as violence, tobacco, alcohol and other drug use)
- HP6 consumer health issues (such as the effects of mass media and technologies on safety and health)
- HP7 responses to emergency situations

Mathematics (MA)

In Mathematics, students in Missouri public schools will acquire a solid foundation which includes knowledge of

- MA1 addition, subtraction, multiplication and division; other number sense, including numeration and estimation; and the application of these operations and concepts in the workplace and other situations
- MA2 geometric and spatial sense involving measurement (including length, area, volume), trigonometry, and similarity and transformations of shapes
- MA3 data analysis, probability and statistics
- MA4 patterns and relationships within and among functions and algebraic, geometric and trigonometric concepts
- MA5 mathematical systems (including real numbers, whole numbers, integers, fractions), geometry, and number theory (including primes, factors, multiples)
- MA6 discrete mathematics (such as graph theory, counting techniques, matrices)

Science (SC)

In Science, students in Missouri public schools acquire a solid foundation which includes knowledge of

- SC1 properties and principles of matter and energy

- SC2 properties and principles of force and motion
- SC2 properties and principles of force and motion
- SC3 characteristics and interactions of living organisms
- SC4 changes in ecosystems and interactions of organisms with their environments
- SC5 processes (such as plate movement, water cycle, air flow) and interactions of earth’s biosphere, lithosphere and hydrosphere
- SC6 composition and structure of the universe and the motions of the objects within it
- SC7 processes of scientific inquiry (such as formulating and testing hypotheses)
- SC8 impact of science, technology and human activity on resources an the environment

Social Studies (SS)

In Social Studies, students in Missouri public schools will acquire a solid foundation which includes knowledge of

- SS1 principles expressed in the documents shaping constitutional democracy in the United States
- SS2 continuity and change in the history of Missouri, the United States and the world
- SS3 principles and processes of governance systems
- SS4 economic concepts (including productivity and the market system) and principles (including the laws of supply and demand)
- SS5 the major elements of geographical study and analysis (such as location, place, movement, regions) and their relationships to changes in society and environment
- SS6 relationships of the individual and groups to institutions and cultural traditions
- SS7 the use of tools of social science inquiry (such as surveys, statistics, maps, documents)

Source: “The Show-Me Standards.” Jefferson City, Mo: Missouri Department of Elementary and Secondary Education, March 1996