Colorado CTE

Power, Structure, and Technical Systems (2015): Grades 9, 10, 11, 12, Higher Education

Adopted 2015

Understand the agriculture mechanical and technical system and its relationship to the industry of agriculture PSTS.01

01. Understand the history and global significance of agricultural mechanical and technical systems PSTS.01.01

- a. Define major components of ag mechanical and technical systems (engineers, producers, fabricators, retailers) PSTS.01.01.A
- b. Define the major historical events and trends and in agriculture mechanics and technology to global agriculture production PSTS.01.01.B
- c. Compare industrialized nations to non-industrialized nations and their ability to produce food) PSTS.01.01.C

02. Relate the efficiency of the agriculture industry to the advances of agriculture technology and mechanization PSTS.01.02

- a. Describe how mechanical and technical systems have improved agriculture industry segments (producers, processors, consumers, etc.) and distribution channels PSTS.01.02.A
- b. Explain the local, regional, national and global agriculture production and the role of ag technology at each level PSTS.01.02.B
- c. Describe the movement of agriculture products through industry segments and the mechanical systems found at each level PSTS.01.02.C

Understand and apply safety procedures in the work environment PSTS.02

01. Understand and use established OSHA workplace safety standards PSTS.02.01

- a. Students will understand safety rules and expectations for workplace and school settings PSTS.02.01.A
- b. Pass safety tests with 100% accuracy and have zero safety violations PSTS.02.01.B
- c. Maintain safe environment in school laboratory setting in an on-going fashion & follow all policies, procedures, rules and guidelines PSTS.02.01.C

02. **Organize and maintain a clean, orderly work environment** PSTS.02.02

- a. Identify factors of a clean and orderly work environment PSTS.02.02.A
- b. Distinguish safe and unsafe work environments PSTS.02.02.B
- c. Students will assess work environments for cleanliness and orderliness PSTS.02.02.C
- d. Student will assess a work environment and make recommendations to improve it PSTS.02.02.D

03. **Use appropriate personal safety equipment** PSTS.02.03

- a. Identify personal protective equipment and attire PSTS.02.03.A
- b. Demonstrate safety in personal equipment and attire by wearing safety glasses and coveralls at all times PSTS.02.03.B

04. **Identify and locate emergency equipment (fire extinguishers, eye wash, etc.)** PSTS.02.04

- a. Identify and locate the emergency equipment in the shop; distinguish different types of safety equipment (types of fire extinguishers) PSTS.02.04.A
- b. Demonstrate use of emergency equipment PSTS.02.04.B

05. **Interpret and comply with Material Safety Data Sheets** PSTS.02.05

- a. Read MSDS and understand purposes of MSDS PSTS.02.05.A
- b. Apply all content of a MSDS PSTS.02.05.B

06. **Interpret information on labels and signs** PSTS.02.06

- a. Read labels, signs and understand common safety symbols PSTS.02.06.A
- b. Interpret equipment manuals to determine proper operation, safety, maintenance, troubleshooting & repair PSTS.02.06.B

Identify, use and store/maintain tools and materials PSTS.03

01. **Identify and use hand tools** PSTS.03.01

- a. Identify tools and their uses PSTS.03.01.A
- b. Demonstrate proper and safe operation of tool PSTS.03.01.B
- c. Maintain and store tools appropriately PSTS.03.01.C

02. **Identify and use power tools** PSTS.03.02

- a. Identify tools and their uses PSTS.03.02.A
- b. Demonstrate proper and safe operation of tool PSTS.03.02.B
- c. Maintain and store tools appropriately PSTS.03.02.C

03. **Identify and use specialty tools** PSTS.03.03

- a. Identify specialty tools (engines, cabinetmaking, hard surfacing, plumbing, electrical) PSTS.03.03.A
- b. Demonstrate proper and safe operation of specialty tools PSTS.03.03.B
- c. Maintain and store tools appropriately PSTS.03.03.C

04. **Identify proper tools for the job requirement** PSTS.03.04

- a. Students will identify the tools necessary to complete their project/job PSTS.03.04.A

Demonstrate skills in project completion on individual and group projects PSTS.04

01. **Utilize blueprints in completing an agricultural mechanics project** PSTS.04.01

- a. Student will identify blueprints, their components and describe their purpose PSTS.04.01.A
- b. Read blueprints with accuracy PSTS.04.01.B
- c. Draw their own blueprints and use blueprints to build a project PSTS.04.01.C

02. **Develop working drawings** PSTS.04.02

- a. Identify and describe different views, scales, and tools necessary for a working drawing PSTS.04.02.A
- b. Use a drawing to complete a project PSTS.04.02.B
- c. Complete a drawing for a personal agricultural mechanics project PSTS.04.02.C

03. **Utilize computer aided design programs in designing a project** PSTS.04.03

- a. Learn the basic functions of CAD PSTS.04.03.A
- b. Understand and design simple projects using CAD PSTS.04.03.B
- c. Understand and design a small structure using CAD PSTS.04.03.C
- d. Understand, design and build a structure PSTS.04.03.D

04. **Utilize a bill of materials to complete an agricultural mechanics project** PSTS.04.04

- a. Describe a bill of materials and the purpose for having a bill of materials PSTS.04.04.A
- b. Complete a bill of materials including prices and quantities PSTS.04.04.B

05. **Develop a procedure list and an order of fabrication** PSTS.04.05

- a. Describe the importance of a procedure list and order of fabrication PSTS.04.05.A
- b. Student will develop a list of procedures and a timeline for project completion PSTS.04.05.B

06. **Accurately measure building materials (i.e. steel, wood, concrete, etc.)** PSTS.04.06

- a. Identify increments on a tape measure PSTS.04.06.A
- b. Students will measure materials using the correct methods based on the material being measured PSTS.04.06.B

07. **Demonstrate effective work habits individually and in group work** PSTS.04.07

- a. Identify effective work habits PSTS.04.07.A
- b. Demonstrate habits that increase efficiency and craftsmanship PSTS.04.07.B
- c. Demonstrate habits that increase efficiency and craftsmanship PSTS.04.07.C

Utilize construction principles in building an agricultural mechanics construction project PSTS.05

01. **Define construction terminology** PSTS.05.01

- a. Define basic terms used in construction PSTS.05.01.A
- b. Define and utilize appropriate construction terminology PSTS.05.01.B

02. **Select construction materials** PSTS.05.02

- a. Identify different construction materials PSTS.05.02.A
- b. Identify construction materials and their common dimensions PSTS.05.02.B
- c. Select materials for specific situations PSTS.05.02.C

03. **Identify local building permit requirements** PSTS.05.03

- a. Read local permit requirements PSTS.05.03.A
- b. Read and understand the different aspects of building requirements PSTS.05.03.B
- c. Prepare and apply for a construction permit PSTS.05.03.C
- d. Build and be inspected by local authorities PSTS.05.03.D

04. **Operate a transit/level for surveying and layout purposes** PSTS.05.04

- a. Learn the different types and parts of levels and transits PSTS.05.04.A
- b. set up and level the transit for use PSTS.05.04.B
- c. Measure elevation using differential survey, lay out a contour line PSTS.05.04.C
- d. Lay out a foundation, lay out a ditch to grade PSTS.05.04.D

05. **Pour concrete for floors or foundations** PSTS.05.05

- a. set and reinforce forms for concrete PSTS.05.05.A
- b. calculate concrete needed for specific job PSTS.05.05.B
- c. pour, finish and cure concrete PSTS.05.05.C
- d. evaluate concrete mixtures for specific applications PSTS.05.05.D

06. **Construct masonry walls and lay pavers for building purposes** PSTS.05.06

- a. Identify types and applications of concrete blocks & paving stones PSTS.05.06.A
- b. Calculate amount of materials needed for given scenario PSTS.05.06.B
- c. select supporting and reinforcing necessary for laying concrete block & pavers PSTS.05.06.C
- 06d. Layout and construct block wall or paved area PSTS.05.06D

07. **Select, identify, and use lumber** PSTS.05.07

- a. Learn the different types of lumber and characteristics of each PSTS.05.07.A
- b. Learn what types of lumber to use for different applications PSTS.05.07.B
- c. Select a project and type of lumber needed PSTS.05.07.C
- d. Construct project PSTS.05.07.D

08. **Identify, select, and use fasteners and hardware** PSTS.05.08

- a. Identify the different types of hardware fasteners and their uses PSTS.05.08.A
- b. Select and utilize appropriate hardware for in agricultural mechanics situations PSTS.05.08.B

09. **Frame structures** PSTS.05.09

- a. Identify correct spacing for joists, studs and rafters PSTS.05.09.A
- b. Define and describe procedures for framing a floor, wall and rafters PSTS.05.09.B
- c. Frame a floor and wall with doors and windows PSTS.05.09.C
- d. Layout and cut rafters PSTS.05.09.D

10. **Select appropriate insulation materials** PSTS.05.10

- a. Identify the different types of insulation PSTS.05.10.A
- b. Describe safety precautions used while installing insulation PSTS.05.10.B
- c. Distinguish the different "R" ratings for insulation PSTS.05.10.C
- d. Install insulation PSTS.05.10.D

11. **Select appropriate and apply appropriate roofing materials** PSTS.05.11

- a. Identify different types of roofing materials PSTS.05.11.A
- b. Calculate and figure square feet for roofing (100 square feet = 1 square) PSTS.05.11.B
- c. Describe proper procedures install shingles and steel roofing materials PSTS.05.11.C
- d. Install shingles and steel roofing PSTS.05.11.D

12. Select and apply siding and sheathing PSTS.05.12

- a. Identify procedures for applying siding and sheathing PSTS.05.12.A
- b. Describe procedures for installing siding and sheathing PSTS.05.12.B
- c. Calculate amount of material needed to install siding and sheathing PSTS.05.12.C
- d. Install siding and sheathing PSTS.05.12.D

13. Install doors and windows PSTS.05.13

- a. Identify the different types of doors and windows PSTS.05.13.A
- b. Install windows and doors PSTS.05.13.B

14. Select and apply wood finishes PSTS.05.14

- a. Learn the different types and uses of paint PSTS.05.14.A
- b. Calculate quantity of paint needed to trim and paint a building PSTS.05.14.B
- c. Apply paint/finish with brushes and rollers building PSTS.05.14.C
- d. Apply paint/finish with low and high pressure sprayers PSTS.05.14.D

Understand electrical principals, circuit theory and apply them in practical settings PSTS.06

01. Understand and practice electrical safety PSTS.06.01

- a. Identify the dangers of working with electricity PSTS.06.01.A
- b. Relate shock amperage levels to body damage PSTS.06.01.B
- c. Explain circuit and equipment grounding PSTS.06.01.C
- d. Relate GFCI operation to electrical user safety PSTS.06.01.D

02. Electrical terminology and calculations PSTS.06.02

- a. Define electrical terms (current, conductor, volt, watt, amp, alternating vs. direct current) PSTS.06.02.A
- b. Calculate the cost of electrical power PSTS.06.02.B
- c. Perform Ohms law calculations for series and parallel circuits PSTS.06.02.C
- d. Analyze circuits for malfunctions including over or under current; understand applications of the National Electric Code PSTS.06.02.D

03. Electrical conductors &devices PSTS.06.03

- a. Identify common electrical conductors, conduit & fittings, devices and their applications PSTS.06.03.A
- b. Compare and contrast conductor and insulating materials PSTS.06.03.B
- c. Select appropriate conductor size based on current load and length of run PSTS.06.03.C
- d. Understand conductor terminology and designations PSTS.06.03.D

04. Wiring alternating current electrical circuits (see also ag power electric motors) PSTS.06.04

- a. Diagram a common electrical circuit for outlets, lights and switches PSTS.06.04.A
- b. Wire simple circuits (single-pole switch to light, source to receptacle, etc.) PSTS.06.04.B
- c. Wire various single pole and double pole switch circuits utilizing switch loops PSTS.06.04.C
- d. Wire a wall according to code PSTS.06.04.D

05. Wiring direct current electrical circuits PSTS.06.05

- a. Diagram a common direct current electrical circuit PSTS.06.05.A
- b. Wire simple direct current circuit (battery to light) PSTS.06.05.B
- c. Install vehicle or implement lighting and brake system PSTS.06.05.C

Understanding and utilizing plumbing skills PSTS.07

01. Identify tools and equipment used in plumbing processes PSTS.07.01

- a. Identify tools to be used in plumbing projects PSTS.07.01.A
- b. Identify different plumbing materials (pipe) and joints (i.e. couplings) PSTS.07.01.B
- c. Utilize tools and calculate needed materials to complete a plumbing project PSTS.07.01.C
- d. Identify and design the components of a residential plumbing system PSTS.07.01.D

02. Joining plumbing pipe PSTS.07.02

- a. Determine type of plumbing pipe and identify proper supplies needed for process PSTS.07.02.A
- b. Determine length & cut pieces of pipe to size PSTS.07.02.B
- c. Utilize proper procedures for joining pipe PSTS.07.02.C
- d. Analyze processes for inconsistencies and joining defects PSTS.07.02.D

Understand and operate power and mechanical systems for agriculture use PSTS.08

01. Identify uses of power systems in agriculture PSTS.08.01

- a. Identify electric motors, small gas engines and farm power systems and their application in agriculture PSTS.08.01.A
- b. Select the appropriate the power system given different scenarios PSTS.08.01.B
- c. Determine capability of each type of power system PSTS.08.01.C

02. **Installation, operation and maintenance of electrical motors** PSTS.08.02

- a. Identify types and components of electric motors PSTS.08.02.A
- b. Describe the operation of electric motors and control devices PSTS.08.02.B
- c. Safely install an electric motor and control devices based on procedures in operators manual PSTS.08.02.C
- d. Select the appropriate type of electric motor for given scenario PSTS.08.02.D

03. **Identify and select electric motors based upon needs** PSTS.08.03

- a. Identify applications of use for electric motor PSTS.08.03.A
- b. Describe the specifications of a particular electric motor based upon the motor faceplate PSTS.08.03.B
- c. Determine horsepower and duty cycle requirements for required application PSTS.08.03.C
- d. Select appropriate motor base for required applications PSTS.08.03.D

04. **Apply theory & operation of hydraulic systems** PSTS.08.04

- a. Understand the theory and principle of operation of hydraulic systems PSTS.08.04.A
- b. Identify and explain the purpose of hydraulic system components PSTS.08.04.B
- c. Explain safety rules for working around hydraulic systems PSTS.08.04.C
- d. Design a hydraulic system for specific load and speed criteria PSTS.08.04.D

05. **Disassemble, repair and reassemble a small gas engine** PSTS.08.05

- a. Identify and describe functions of each small gas engine component PSTS.08.05.A
- b. Disassemble and reassemble engine according to accepted procedures and required specifications PSTS.08.05.B
- c. Troubleshoot engine problems PSTS.08.05.C
- d. Replace worn or damaged parts of engine system and return it to proper functioning based on service manual recommendations PSTS.08.05.D

06. **Service power mechanics engine systems (including ignition, exhaust, cooling, lubrication, and fuel systems)** PSTS.08.06

- a. Identify components of the system, engine nomenclature and operating principles of the system (including ignition, exhaust, cooling, lubrication, fuel) for both diesel & gas engines PSTS.08.06.A
- b. Using service manuals determine service intervals and proper maintenance procedure for each system PSTS.08.06.B
- c. Troubleshoot engine problems within each system PSTS.08.06.C
- d. Replace worn or damaged parts of engine system and return it to proper functioning based on service manual recommendations PSTS.08.06.D

07. **Service schedules and the need for regular maintenance on power equipment systems** PSTS.08.07

- a. The student will identify wearable components of a power equipment system (belts, oil, battery, tires, hydraulics, spark plugs, wheel bearings) PSTS.08.07.A
- b. Perform necessary preventative maintenance checks, check fluid levels, ensure safety equipment is in place and operational PSTS.08.07.B
- c. Evaluate systems for wear and future maintenance needs PSTS.08.07.C
- d. Perform necessary repair to identified components of power systems PSTS.08.07.D

08. **Calibrate and operate implements attached to agriculture power equipment** PSTS.08.08

- a. Identify categories of implements and their uses (tillage and seed bed prep, planting, harvesting, transporting) PSTS.08.08.A
- b. Identify parts of implement; understand operation principles of implement including power needs (PTO, Hydraulic) PSTS.08.08.B
- c. Safely hitch (attach) and operate safety equipment PSTS.08.08.C
- d. Calibrate implement for intended use and troubleshoot implement malfunctions PSTS.08.08.D

09. **Demonstrate safe operation of motorized equipment** PSTS.08.09

- a. Identify equipment safety components and symbols PSTS.08.09.A
- b. Understand safety rules for PTO, hydraulic equipment, rollovers and operation on public roadways PSTS.08.09.B
- c. Demonstrate safe operation of motorized equipment PSTS.08.09.C

Understand the welding process and correctly demonstrate welding processes PSTS.09

01. **Follow welding safety protocols** PSTS.09.01

- a. Identify safe welding practices for each welding process PSTS.09.01.A
- b. Demonstrate safe welding practices for each welding process PSTS.09.01.B

02. **Understand welding processes** PSTS.09.02

a. Identify and describe uses of equipment and materials (filler rod) used for each welding process and the situation for each welding process PSTS.09.02.A

b. Describe the reaction that occurs in each welding process both physical and chemical (metallurgic) PSTS.09.02.B

c. Identify quality welds based on knowledge of the welding process and analyze for inconsistencies and defects PSTS.09.02.C

d. Read and interpret welding symbols and blueprints PSTS.09.02.D

03. **Complete allied cutting processes** PSTS.09.03

a. Perform metal cutting operations utilizing an abrasive saw, hydraulic shear and band saw PSTS.09.03.A

b. Perform strait line cuts on mild steel plate utilizing oxyacetylene and plasma cutting processes PSTS.09.03.B

c. Perform beveled edge cuts and hole piercing on mild steel plate utilizing oxyacetylene and plasma cutting processes PSTS.09.03.C

d. Use heating tool (rose bud) utilizing oxyacetylene process and perform various cuts on stainless steel and aluminum utilizing the plasma cutting process PSTS.09.03.D

04. **Demonstrate proficiency in oxyacetylene joining process** PSTS.09.04

a. Demonstrate proper set up and neutral flame setting of the oxyacetylene torch system and perform outside corner and butt joint welds without filler metal in the flat position PSTS.09.04.A

b. Perform fillet welds in lap and tee joints with filler metal in the flat position PSTS.09.04.B

c. Perform open butt joint full penetration in the flat position PSTS.09.04.C

d. Perform all of level 2 competencies in the vertical position PSTS.09.04.D

05. **Demonstrate proficiency in shielded metal arc welding process (SMAW)** PSTS.09.05

a. Run a strait bead on flat plate and pad a plate utilizing 6010 and 7018 electrode PSTS.09.05.A

b. Perform a multi-pass fillet weld in a tee joint utilizing 6010 and 7018 electrodes PSTS.09.05.B

c. Perform a fillet weld in a tee joint utilizing 6010 electrode vertical down and an open butt joint full penetration utilizing 6010 for the root and 7018 for the cover pass in the flat position PSTS.09.05.C

d. Perform all of level 2 competencies in the vertical position PSTS.09.05.D

06. **Demonstrate proficiency in gas metal arc welding process (GMAW)** PSTS.09.06

- a. Demonstrate and explain machine settings for short circuit transfer GMAW welding PSTS.09.06.A
- b. Perform a fillet weld in a tee joint and lap joint in a flat, vertical down, vertical up and over head positions PSTS.09.06.B
- c. Perform an open butt joint full penetration in the flat and vertical positions PSTS.09.06.C
- d. Demonstrate and explain machine settings for spray transfer GMAW welding PSTS.09.06.D

07. **Demonstrate proficiency in gas Tungsten arc welding (GTAW)** PSTS.09.07

- a. Demonstrate proper machine and torch set up PSTS.09.07.A
- b. Perform a fillet weld in a lap joint on stainless steel in the flat position PSTS.09.07.B
- c. Perform a fillet weld in a lap joint on aluminum in the flat position PSTS.09.07.C

08. **Develop a project incorporating all of the welding processes** PSTS.09.08

- a. Prepare a material list and cut list for metal fabrication or repair project and select layout tools required for metal fabrication or repair project Select welding process/es to be used for metal fabrication or repair project PSTS.09.08.A
- b. Demonstrate procedures to control distortion in a welding environment and construct jigs and or templates for metal fabrication or repair PSTS.09.08.B
- c. Cut, layout, weld, and complete fabrication project with craftsmanship quality PSTS.09.08.C
- d. Perform a repair project with craftsmanship quality PSTS.09.08.D