			Agriculture Building and Construction **Grades 11-12** **Unit #1**
Course/Subject: Ag building and construction	**Grade:** **11-12**	**Agriculture Power and Machinery**	**Suggested Timeline:** 5-6 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Agricultural Power and Machinery
Unit Summary	In this chapter students will look at the type of equipment and machinery that is used to perform work in an agricultural setting. Most machinery is internal combustion engines that require gasoline or diesel fuel. An agricultural mechanic must have an understanding of these principles as well as proper equipment maintenance practices. Due to depletion of fossil fuels, sustainable energy resources are being developed to help agricultural operations for the future.

Unit Essential Questions: 1. Machinery is important during construction; explain in what ways it is.	**Key Understandings:** 1. Work, power, and Torque principles 2. Agricultural equipment maintenance 3. Engines and mobile power equipment 4. Sustainable energy resources

Focus Standards Addressed in the Unit:

Standard Number	*Standard Description*
PST.02.01.02.a	Examine operator's manuals to determine recommendations for servicing filtration systems and maintaining fluid levels on equipment, machinery and power units used in AFNR power, structural and technical systems.
PST.02.02.02.a	Examine and identify safety hazards associated with equipment, machinery and power units used in AFNR power, structural, and technical systems.

Important Standards Addressed in the Unit:

PST.02.01.01.a	Maintain the cleanliness and appearance of equipment, machinery, and power units used in AFNR power, structural and technical systems to assure proper functionality.
PST.02.02.01.c	Perform pre-operation inspections, start-up and shut-down procedures on equipment, machinery and power units as specified in owner's manual.
PST.02.02.02.c	Adjust equipment, machinery and power units for safe and efficient operation in AFNR power, structural and technical systems.

Misconceptions:	**Proper Conceptions:**
1. You can operate equipment on a farm if you are under 16 years of age. 2. Using machinery makes you lazy.	1. You may operate any piece of equipment on your families' owned farm no matter of age. To operate equipment on a different farm you must have a safe tractor certification or your driver's license. 2. Using machinery reduces the amount of workers needed, increases the mechanical advantage, and reduces the amount of time to complete a job. Thus reducing the cost of the job.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Review operating and service manuals, and schedules; and, conduct procedures as needed ● safety inspections in industrial, manufacturing or repair settings ● Identify and describe agricultural equipment and their operations ● Identify renewable and non-renewable natural resources ● the historical development of agricultural power and systems technologies ● various gauges and testers used in agricultural power equipment ● Select, measure, use and calibrate testing devices and the machines ● disassembly and assembly procedures ● correct selection and use of agricultural machinery and equipment systems ● auxiliary systems including hydraulics, pneumatics and electronics ● troubleshooting procedures ● the parts and functions of specific energy systems to include electrical power, solar power, wind power, mechanical power and chemical/carbon-based power systems	● Locate and use a repair manual to diagnose malfunctions of various agricultural equipment ● Test a vehicle to determine installation, service or repair needed. ● Service vehicle with water, fuel or oil ● Conduct training in product use ● Provide customer service needs ● Identify the various types of land uses ● Identify global applications of agricultural power and systems technologies ● Identify emerging technologies and their potential impact ● Identify methods of changing appropriate technology for various applications ● Adjust or set mechanical controls or components ● Move or fit heavy objects ● Select, connect, engage and operate machinery and power units ● Lubricate machinery, equipment or parts ● Test electrical/electronic wiring, equipment, systems or fixtures ● Repair or replace electrical wiring, circuits, fixtures or equipment ● Use computers to enter, access or retrieve data ● Prepare a technical report	● Ethical judgment ● Curiosity

• Identify and investigate emerging technologies and their economic impact on energy systems • appropriate industry standards for energy systems • Maintain accurate business and financial records. • Use telephone communication techniques • sales activities or trends. • hydrologic cycle • Maintain repair records • Agricultural equipment and their operations • the principles of power transmission, heat transfer, evaporation, fluid movement, conductivity, satellite transmission, conservation and regulations	• Prepare a list of prospective customers • Use product knowledge and customer's need to solicit an order from established or new customers • Access media advertising services • Conduct a sales presentation. • Demonstrate goods or services • Use sales techniques based on the customer • Compute financial data. • Identify steps to arrange for trial installations of equipment • Negotiate terms of sale or services with customer • Record details of repairs made and parts used • Calculate bills according to record of repairs made, labor time and parts used • Identify computer applications, remote sensing and automatic controls to manage systems	

Academic Vocabulary:

• Energy • Force • Horsepower • Pressure • Radiation • Torque • Work • Gear • Prime mover • Hydraulic system • Actuator • Pump • Hose • Cylinder • Pneumatic system • Generator • Converter • Solar energy • Photovoltaic system • Pyrolysis	• Lubricant • Bearing • Mechanical drive system • Belt drive • Belt • Slip • Flat belt • V-belt • Standard belt • Timing belt • Chain drive • Gear drive • Sustainable energy resources • Heat pump • Heat sink • Compressor • Wind turbine • Grid-connected wind energy system • Stand-alone wind energy system • Gasification • liquefaction	• Small engine • Gasoline engine • Diesel engine • Four-stroke cycle engine • Two-stroke cycle engine • Air-cooled engine • Liquid-cooled engine • Engine block • Crankshaft • Power take-off (PTO) • Piston • Connecting rod • Valve • Push rod • Camshaft • Turbocharger • Carburetor • Differential • Fermentation • Anaerobic digestion

Assessments:

- Test
- Quizzes
- Participation

- Check points

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit involves the use and maintenance of machinery and equipment in the agricultural setting. Students will learn to care and maintain the equipment and machinery to keep it in good running condition. This mindset and ability to do so will transition over to the way they care for their own personal things. Students will learn to have a respect for property and the property of others. Science will be introduced when talking about the alternative energy sources that are being developed.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #2**
Course/Subject: Agriculture Building and Construction	**Grade:**11 & 12	**Electrical Systems**	**Suggested Timeline:** 4-5 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Electrical Systems
Unit Summary	This unit explores residential wiring and electric motors. It looks into all the components that make up electrical systems such as switches. Students will get a basic understanding of how these components and devices operate, are connected, and are maintained.

Unit Essential Questions: 1. How does knowing electrical systems make you a better mechanic?	**Key Understandings:** 1. Electrical principles 2. Electrical components and equipment 3. Electrical distribution systems 4. Control circuits

Focus Standards Addressed in the Unit:	
Standard Number	*Standard Description*
PST.04.04.01.a	Compare and contrast direct and alternating current
PST.04.04.01.b	Assess and analyze the electrical requirements of an AFNR structure.
PST.04.04.01.c	Install and/or repair fixtures following appropriate codes and standards.
PST.04.04.02.c	Plan and wire electrical circuits.

Important Standards Addressed in the Unit:	

Misconceptions:	Proper Conceptions:

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● emerging technologies and their potential impact ● positive safety attitudes and responsibilities ● safety rules and regulations. ● electrical/electronic wiring, equipment, systems or fixtures ● Matter and its relationship to electricity ● Ohm's law ● Power sources ● Electrical distribution ● Electrical drawings	● Use computers to enter, access or retrieve data ● Prepare a technical report ● Use telephone communication techniques ● Identify methods of changing appropriate technology for various applications ● Describe regulations, safety and consumer protection ● Read blueprints and schematics ● Calculate bills according to record of repairs made, labor time and parts used ● Conduct troubleshooting procedures ● Repair or replace electrical wiring, circuits, fixtures or equipment ● Take measurements using voltmeters, ammeters and multimeters ● Calculate basic electric quantities ● Explain methods of grounding and protecting circuits ● Explain control circuits ● Voltage requirements and limits for branch circuits	● Persistence ● Ethical behavior

Academic Vocabulary:		
● Electricity ● Energy ● Voltage ● DC voltage ● AC voltage ● Polarity ● Current ● Ampere ● Raceway ● Ungrounded conductor	● power ● Ohm's law ● Generator ● Conductor ● Fuse ● Circuit breaker ● Light emitting diode ● Electric motor ● Wire marker ● receptacle	● National Electrical Code ● Thermocouple ● Photovoltaic cell ● Disconnect switch ● Overcurrent protective device ● Thermal overload ● Transformer ● General wiring ● Service entrance ● Feeder conductor ● Branch circuit

Assessments:

- Test
- Quizzes
- Participation
- Check points
- projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- The interdisciplinary connection with the electrical unit links to math and science courses. The unit looks at Ohm's law and the calculations that go along with it. Students will determine the amperage, voltage and power of an electrical system.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #3**
Course/Subject: Agriculture Building and Construction	**Grade:11 & 12**	**Plumbing and Irrigation**	**Suggested Timeline:** 4-5 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Plumbing and Irrigation
Unit Summary	All agricultural environments, whether they are indoors or outdoors, require some type of plumbing system. This unit will look at plumbing in primary residences and also in outbuildings for livestock/poultry. With many agricultural settings, irrigation systems are needed to water fields, water livestock/poultry, or hydroponic systems. Agricultural mechanics must have knowledge of the different types of piping, and related operation principles.

Unit Essential Questions:	**Key Understandings:**
1. How have plumbing systems evolved over the years? In what ways have they improved?	1. Plumbing systems 2. Pipe fitting 3. Irrigation systems

Focus Standards Addressed in the Unit:	
Standard Number	*Standard Description*
PST.04.03.04.a	Compare and contrast the characteristics of materials used in plumbing and water systems.
PST.04.03.04.b	Calculate the cost of a water system in an AFNR structure
PST.04.03.04.c	Install and/or repair pipes and plumbing equipment and fixtures in AFNR structures

Important Standards Addressed in the Unit:

Misconceptions:	**Proper Conceptions:**

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● various plastic and metal components and their functions within water supply, waste and vent systems. ● components in agricultural irrigation systems based on crop, greenhouse or landscaping needs ● requirements of a safe water supply and treatment procedures that may be needed ● emerging technologies and their potential impact ● plumbing equipment and fixtures ● plumbing tools ● well systems, septic systems, gas systems ● water cycle ● irrigation distribution planning ● types of irrigation	● Cut, assemble and pressure test components within various types of water supply systems ● Determine pump and pipe size based on water requirements, head and friction losses for water and irrigation systems. ● Identify, construct and evaluate storage and waste disposal systems and procedures ● Identify methods of changing appropriate technology for various applications (size, social and cultural). ● Maintain pipes and plumbing equipment ● Describe how water pumps are used in irrigation systems ● Rainwater harvesting systems and methods.	● Curiosity ● Adaptability

Academic Vocabulary:

● Plumbing system ● Water main ● Water distribution pipe ● Sanitary drainage system ● Sewage ● Cleanout ● Potable water	● Polyvinyl chloride (PVC) ● Nominal pipe size ● Black pipe ● Galvanized pipe ● Valve ● Well pump ● Pressure tank ● Septic system	● Water cycle ● Soil moisture ● Gourndwater ● Runoff ● Aquifer ● Irrigation ● Soil erosion

Assessments:

- Test
- Quizzes
- Participation
- Check points
- projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit has relations to math when talking about the different angles of the pipe fittings. There is also a connection to science as the different pipes are made from different elements such as copper or brass.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #4**
Course/Subject: Ag building and construction	**Grade:** 11-12	**Structures and Maintenance**	**Suggested Timeline:** 8 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Agricultural Structures and Maintenance
Unit Summary	In this unit students will learn about the many different type of structures made from a variety of materials are used in agricultural settings. The type of building method used and the type of structure depend on the farmstead plan and layout. Common agricultural structures include pole barns, out buildings, poultry barns and greenhouses. Specialized structures include hydroponic structures, which are built to utilize maximum energy efficiency.

Unit Essential Questions: 1. What are the determining factors to consider when you want to put a building or fence up?	**Key Understandings:** 1. Building methods and structures 2. Building and energy efficiency 3. Fencing 4. Surface coating

Focus Standards Addressed in the Unit:	
Standard Number	*Standard Description*
PST.04.03.01.c	Select materials for a project based upon an analysis of the project and the quality of the materials.
PST.04.01.02.c	Evaluate, plan and design functional and efficient facilities for use in AFNR power, structural and technical systems.
PST.04.01.01.b	Apply scale measurement and dimension to develop sketches of agricultural structures.
PST.04.01.02.a	Read and interpret the parts and/or views of plans for agricultural structures.

Important Standards Addressed in the Unit:	
PST.04.02.02.b	Assess and analyze local building code requirements for agricultural structures.
PST.04.02.01.b	Analyze a project plan to prepare a bill of materials and an estimate of material cost
PST.04.02.01.c	Create a project cost estimate, including materials, labor and management for an AFNR structure.

Misconceptions:	**Proper Conceptions:**
1. Buildings can be placed anywhere you need them any time.	1. There are local ordinances that mandate what you can and cannot do on your property.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● blueprints and schematics ● renewable and non-renewable natural resources ● various types of land uses ● building code ● framing systems ● hydroponic systems ● common types of coatings and applications ● Safety precautions when applying surface coatings ● possible types and sources of credit. ● emerging technologies and their potential impact ● energy system maintenance, testing and evaluation. ● operating principles for energy systems ● industry standards for energy systems	● Read work order, instructions, formulas or processing charts ● Design a building for an application in agriculture using new technologies ● Develop short, mid and long-term project plans ● Identify emerging technologies and their potential impact ● Construct different structures ● Determine best structure for land use ● Demonstrate how to paint or protect wood, masonry and metals ● Calculate surface areas to be painted and cost to cover said areas ● Operate woodworking equipment/machinery, as needed in the agricultural sector ● Design a building for an application in agriculture using new technologies ● Identify the parts and functions of specific energy systems to include electrical power, solar power, wind power, mechanical power and chemical/carbon-based power systems. ● Identify and investigate emerging technologies and their economic impact on energy systems ● Identify and evaluate building construction materials, methods and styles ● Calculate ventilation, insulation, heating, cooling, lighting, electrical, water and waste handling needs ● Design and construct wall and roofing systems	● Curiosity ● Ethical behavior

	● Identify and select proper roofing materials ● Identify environmental problems and use equipment and tools needed to measure the problems in livestock, crop handling, processing, nursery and landscaping, aquaculture, forestry and agribusiness industries. ● Use various map types and aerial photos for land use, soil, watershed, wildlife and natural resource management and conservation. ● Develop an itemized bill of materials, determine costs, delivery and storage requirements and construction time. ● Read legal land descriptions and determine land areas using maps and on-site measuring techniques ● Identify, construct and evaluate storage and waste disposal systems and procedures ● Assemble environmental and natural resource systems equipment and structures	

Academic Vocabulary:

● Farmstead plan ● Windbreak ● Footing ● Greenhouse ● Hydroponic structure ● Aquaculture ● Prefabricated building ● Coating ● Volatile organic compound ● Resin ● primer	● Building science ● Heat transfer ● Conduction ● Convection ● Radiation ● Vapor barrier ● Perm rating ● Thermal insulation ● Weather stripping ● Sealer ● substrate	● Fence ● Perimeter fence ● Cross fence ● Wire fence ● Barbed wire ● Electrical fence ● Electric wire ● Wire fabric fence ● Rail fence ● Topcoat ● solvent

Assessments:

- Test
- Quizzes
- Participation
- Check points
- Projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit looks at the building of structures in the agricultural setting. Students will use their math skills to measure and compute numbers.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #5**
Course/Subject: Ag building and construction	**Grade:** 11-12	**Welding, Cutting and Joining Processes**	**Suggested Timeline:** 4-5 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Welding, cutting, and joining processes
Unit Summary	Cutting materials, welding materials, and joining materials together are important processes used in agriculture. These processes are used extensively for fabrication and repair of structures and agriculture equipment. The ability to perform cutting, welding, and other joining processes is required for agricultural mechanics.

Unit Essential Questions:	**Key Understandings:**
1. How does knowing how to weld and use a torch help you when building, even when the building material is not metal?	1. Welding fundamentals 2. Oxyfuel welding and joining 3. Arc welding and plasma arc cutting 4. Weld testing and joining processes

Focus Standards Addressed in the Unit:

Standard Number	*Standard Description*
PST.01.03.01.b	Analyze the situation and determine the best welding and cutting process to be used in metal fabrication.
PST.01.03.02.c	Construct and/or repair metal structures and equipment using metal fabrication procedures.
PST.01.03.01.c	Evaluate the quality of metal fabrication procedures.
PST.01.03.01.a	Compare and contrast the principles and procedures of different welding and cutting processes.

Important Standards Addressed in the Unit:	

Misconceptions:	Proper Conceptions:
1. When welding you touch the metal to metal to bond it.	1. Welding is done through an electric arc between two metals that super heats the metal while adding a filler metal to the bead.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Identify and select various types of metals ● Identify and select various types of welding and cutting equipment including oxyacetylene and plasma arc. ● Adjust or set mechanical controls or components ● Three types of welding processes ● Job-site safety procedures ● Welding terminology ● Oxyfuel cutting process ● Identification of shielded metal arc welding, gas metal arc welding, flux core arc welding, gas tungsten arc welding ● Plasma arc cutting process ● Destructive testing techniques of welds ● Nondestructive examination process of welds ● Resistance welding processes	● Select, adjust, operate and maintain oxy-fuel equipment with and without filler rods ● Identify and weld various joints to include fillet butt joint, vertical tee joint, double bevel joint and fillet tee joint. ● Use soldering equipment ● Fabricate a product by hand ● Repair sheet metal products ● Produce welds using stick and wire style welders. ● Ignite and adjust OAW torch ● Demonstrate safety precautions when handling oxygen and acetylene cylinders ● Assemble OAW equipment ● Explain the various types of electrode transfer used in GMAW	● Critical thinking ● Problem solving

Academic Vocabulary:

● Welding	● Oxyfuel welding	● Shielded metal arc welding
● Fabricate	● Oxyacetylene welding	● Gas metal arc welding
● Oxyfuel welding	● Welding torch	● Short circuit transfer
● Arc welding	● Neutral flame	● Globular transfer
● Resistance welding	● Soldering	● Spray transfer
● Weld bead	● Capillary action	● Flux-cored arc welding
● Crater	● Brazing	● Gas tungsten arc welding
● Weld reinforcement	● Braze welding	● Plasma arc cutting
● Root face	● Weld joint	● Resistance welding
● Weld toe	● Weld type	● Projection welding
● Root bead	● Fillet weld	● Destructive test
● Tack weld	● Groove weld	● Nondestructive examination

• Filler metal	• Handfeed welding • Solvent welding	• Flash welding

Assessments:

- Test
- Quizzes
- Participation
- Check points
- Projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- Students will need to follow step by step procedures in order produce an arc and lay down a bead. In order for the weld to be strong student will use problem solving skills to determine metal type, thickness and type of gas being used. From there they need to determine the wire speed and voltage needed to make a strong weld. From these students will gain problem solving skills and critical thinking when determining the best setup to weld. They will also gain hand eye coordination in order to produce a quality weld.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #6**
Course/Subject: Ag building and construction	**Grade:** 11-12	**Concrete and Masonry**	**Suggested Timeline:** 4-5 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Concrete and Masonry Construction
Unit Summary	Concrete and masonry construction is a necessary task for most agricultural business and facilities. An agricultural mechanic should have a thorough understanding of the chemical, mechanical, and physical properties of concrete and masonry materials. Concrete and masonry construction is used in agricultural applications for both new construction and repair work.

Unit Essential Questions: 1. Thinking of the skills required to be a mason, how does one become a master mason?	**Key Understandings:** 1. Concrete and mortar makeup 2. Concrete principles 3. Concrete calculation formula 4. Bill of materials 5. Concrete and mortar tools 6. Placement and working of concrete and mortar

Focus Standards Addressed in the Unit	
Standard Number	*Standard Description*
PST.04.03.06.b	Calculate volume for concrete projects
PST.04.03.06.a	Summarize the characteristics of the components found in concrete
PST.04.02.01.b	Analyze a project plan to prepare a bill of materials and an estimate of material costs.

Important Standards Addressed in the Unit:

Misconceptions:	**Proper Conceptions:**
1. Concrete is cured once it is hard. 2. Concrete and mortar are the same.	1. Concrete takes 28 days to fully cure. 2. Concrete has aggregate in it and mortar does not.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Concrete calculations ● Composition of concrete and mortar ● Pouring and working concrete ● Cure time for concrete and mortar ● Slump test ● Tools and equipment used for mixing, placing and finishing concrete ● Foundation systems ● Masonry tools ● Masonry building materials ● Ingredients in mortar ● Masonry construction methods.	● Read work order, instructions, formulas or processing charts ● Calculate volume needed for a project ● Lay block and brick ● Finish concrete ● Determine bill of material for project and all materials included ● Identify raw materials used to make concrete ● Construct forms and place concrete ● Floating, troweling, and edging floor slabs ● Temperature and moisture control when curing concrete ● Calculate quantities and amounts of materials needed for masonry construction ● Layout a structure foundation, erect batter boards and frames and/or forms ● Design, form and pour concrete. ● Develop an itemized bill of materials, determine costs, delivery and storage requirements and construction time..	● Persistence

Academic Vocabulary:

● Concrete ● Cement ● Aggregate ● Hydration ● Admixture ● Load-bearing capacity ● Groundwork ● Excavating ● Sloping	● foundation ● screeding ● joint control ● floating ● troweling ● wythe ● Plasticity ● Bond ● Benching ● shoring	● Masonry ● Trowel ● Jointer ● Brick hammer ● Brick set ● Line ● Brick ● Concrete masonry unit (CMU) ● Mortar ● Course

Assessments:

- Test
- Quizzes
- Participation
- Check points
- projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- The masonry and concrete unit requires mathematical calculations to determine amounts and ratios. These calculations involve finding area and volumes. There is also a science connection when it comes to the chemical makeup of concrete and mortar. Students can use their knowledge of other subjects to help them relate the information to real life situations.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #7**
Course/Subject: Ag building and construction	**Grade:** 11-12	**Project Design**	**Suggested Timeline:** 5-6 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Project Design
Unit Summary	This unit will look at what goes into project planning. Project planning requires the ability to read and understand drawings, plans, prints and project specifications. Project planning also involves understanding estimates and bids for materials and processes. When planning for a project whether it is for a building or land conservation, surveying is a necessary step in the process.

Unit Essential Questions:	**Key Understandings:**
1. How does knowing welding, carpentry, plumbing, and electricity affect building plans? Would it make you a better project designer?	1. Project Planning 2. Surveying

Focus Standards Addressed in the Unit:

Standard Number	*Standard Description*
PST.04.01.01.a	Interpret and explain the meaning of symbols used in sketches of agricultural structures.
PST.04.01.02.a	Read and interpret the parts and/or views of plans for agricultural structures.
PST.04.01.01.b	Apply scale measurement and dimension to develop sketches of agricultural structures.
PST.04.02.01.c	Create a project cost estimate, including materials, labor and management for and AFNR structure.

Important Standards Addressed in the Unit:

PST.04.01.01.c	Create sketches of an agricultural structure by applying principles of design

Misconceptions:	Proper Conceptions:

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● short, mid and long-term project plans. ● various types of land uses ● technical sketches ● pictorial drawing ● sectional drawing ● detail drawing ● assembly drawing ● plot plan ● floor plan ● plat of survey ● methods for dimensioning ● Major parts of a print ● Bidding ● Scale drawing ● Geographic divisions ● Safety procedures with lasers ● measurement devices and techniques for calculating measurement including the metric system. ● accurate business and financial records. ● various types of land uses	● Read blueprints and schematics ● Read work order, instructions, formulas or processing charts ● Design and layout agricultural structures ● Design buildings or land for a customer ● Survey land ● Calculate land acreage ● Set up and use different leveling instruments to perform surveying operations ● Taking distance measurements ● Identify possible types and sources of credit ● Use computers to enter, access or retrieve data ● Define soil erosion and its causes ● Explain a site evaluation and determine elevation, slope and cut and fill requirements ● Interpret plans and drawings for structures with consideration to building codes, regulations and inspection requirements. ● Develop an itemized bill of materials, determine costs, delivery and storage requirements and construction time. ● Develop an itemized bill of materials, determine costs, delivery and storage requirements and construction time. ● Read legal land descriptions and determine land areas using maps and on-site measuring techniques	● Critical thinking ● Persistence

Academic Vocabulary:

● Sketch ● Multiview sketch ● Pictorial drawing	● Utility plan ● Print ● Specification	● Surveying ● Public land survey ● Plat of survey

• Detail drawing • Assembly drawings • Sectional drawing • Plot plan • Floor plan • Foundation plan • Structural plan	• Construction specifications institute • General contractor • Subcontractor • Estimating • Building permit • Authority having jurisdiction • Bill of materials • Request for proposal	• Section • Leveling rod • Leveling • Builders level • Transit level • Laser level • Laser target • Global positioning system • Geographic information system

Assessments:

- Test
- Quizzes
- Participation
- Check points
- projects

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit has a strong connection to math and technical drawing. Students will use their math skills to determine things like slope and angles when surveying. They will also need math skills to scale down measurements for their drawings and layout work.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #8**
Course/Subject: Ag building and construction	**Grade:** **11-12**	**Materials and Fasteners**	**Suggested Timeline:** 2 week

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Materials and Fasteners
Unit Summary	Material selection is an important part of component design and repair. Materials and their properties determine size, shape and thickness a component needs for its intended function. Materials commonly used are wood, metal, and plastics. Fasteners are components used for attaching parts in an assembly. Fasteners are available in a variety of material types. Having knowledge about common materials and their associated fasteners aids the agricultural mechanic in fabrication and repair of equipment.

Unit Essential Questions: 1. How can the choice of material or fastener change the integrity of a building?	**Key Understandings:** 1. Lumber selection and application 2. Metal selection and application 3. Fastener identification and application

Focus Standards Addressed in the Unit:	
Standard Number	*Standard Description*
PST.04.03.03.a	Compare and contrast the characteristics of wood and/or metal products used in AFNR structures.
PST.04.03.01.c	Select materials for a project based upon an analysis of the project and the quality of the materials.
PST.04.03.01.a	Examine the criteria in selecting materials for constructing, maintaining, and/or repairing AFNR structures
PST.04.03.01.b	Analyze and assess samples of materials or products for quality and efficiency of workmanship.

Important Standards Addressed in the Unit:	

Misconceptions:	Proper Conceptions:
1. Does not matter if a fastener is designed for wood or metal as long as it holds two things together. 2. Wood is wood and metal is metal.	1. Fasteners have specific strengths and designed for specific uses. 2. Wood comes in different types and also different grain structures. 3. There are a variety of metals with different uses and strengths.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● emerging technologies and their potential impact ● renewable and non-renewable natural resources ● Lumber selection ● Metal selection ● Fastener selection ● Parts of a tree trunk ● Moisture content on lumber ● Methods of sawing, seasoning, planning, and grading lumber ● Lumber defects ● Ferrous and nonferrous metal ● Plastics used in Agricultural applications ● Threaded fasteners ● Nonthreaded fasteners ● Move or fit heavy objects.	● Identify and select various types of metals ● Identify methods of changing appropriate technology for various applications (size, social and cultural) ● Demonstrate the proper installation and application of common hardware items like nails, screws, bolts and rivets. ● Identify imperfections in lumber ● Select the appropriate material for the job application ● Heat treating process ● Identify and select fasteners ● Select lumber for a specific application for an agricultural structure ●	● Curiosity ● Critical thinking

Academic Vocabulary:

● Lumber ● Plain-sawn lumber ● Quarter-sawn lumber ● Warpage ● Crown ● Bow ● Twist ● Cup ● Metal ● Alloy ● Ferrous metal ● Cast iron	● Carbon steel ● Galvanized steel ● Nonferrous metal ● Aluminum ● Copper ● Magnesium ● Tensile strength ● Machinablility ● Plastic ● Thermoplastic ● Thermoset plastic ● Rivet	● Fastener ● Threaded fastener ● External thread ● Internal thread ● United Thread Standard (UTS) ● Wood screw ● Bolt ● Nut ● Washer ● Nonthreaded fastener ● Nail ● Wire brad

● Adhesive bonding	● pin	● staple

Assessments:

- Test
- Quizzes
- Participation
- Check points

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit talks about the differences between material and fasteners. Being able to determine the proper use and strength of the material or fastener being used is important. The ability to choose correctly requires critical thinking and problem solving. Students can use these skills in a variety of different courses when they are faced with a problem and have a plethora of choices to solve it with. They can determine the best solution through critical thinking and problem solving. These are skills that will be vital in life as well.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #9**
Course/Subject: Ag building and construction	**Grade:** **11-12**	**Tools and Equipment**	**Suggested Timeline:** 3-4 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Tools and Equipment
Unit Summary	Most, if not all, tasks in agricultural environments require the use of hand tools, portable power tools, and stationary power tools. Proper use of tools requires that an agricultural mechanic know how the tool is to be used for specific task, how the tool is to be maintained, and how the tool is to be stored. An agricultural mechanic must also have an understanding of protective equipment requirements and when to take a tool out of service and replace it with a new tool.

Unit Essential Questions: 1. Tools have evolved over years. What tool do you use commonly and how has it evolved?	**Key Understandings:** 1. Hand tool and power tool identification 2. Safe use and handling of power tools 3. Safe use of stationary power equipment 4. Proper use of all tools and equipment

Focus Standards Addressed in the Unit:	
Standard Number	*Standard Description*
PST.02.02.02.b	Apply safety principles and applicable regulations to operate equipment, machinery, and power units used in AFNR power, structural and technology systems.
CS.03.04.	Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.
PST.01.02.02.a	Identify the tools, machines and equipment needed to construct and/or fabricate a project in AFNR

Important Standards Addressed in the Unit:	

Misconceptions:	Proper Conceptions:
1. Tools can be used however they see fit, for any job.	1. Tools are designed to perform certain task and can cause serious injury if used improperly.

Knowledge & Concepts	Skills & Competencies	Dispositions & Practices
● Identification of hand tools and power tools and their uses ● various gauges and testers used in agricultural power equipment ● Hand tool safety ● Power tool safety ● Stationary power tools safety ● Power tool and stationary tool setup	● Describe regulations, safety and consumer protection. ● Identify, select, adjust, maintain and safely use common handtools and power tools ● Demonstrate proper and safe use of air operated equipment ● Adjust, maintain and safely use electrical powered shop equipment ● Demonstrate accurate use of measurement devices and techniques for calculating measurement including the metric system ● Properly cut threads using a tap or die ● Identify methods of changing appropriate technology for various applications (size, social and cultural). ● Identify various gauges and testers used in agricultural power equipment	● Curiosity

Academic Vocabulary:		
● Hand tool	● Circular saw	● Radial arm saw
● Level surface	● Jigsaw	● Table saw
● Tap	● Reciprocating saw	● Miter saw
● Die	● Drill bit	● Chop saw
● Jointing	● Hammer drill	● Band saw
● Whetting	● Rotary hammer	● Drill press
● Belt sander	● Impact wrench	● Lathe
● Finish sander	● Power screwdriver	● Grinder
● Pneumatic nailer	● Portable power plane	● Power load
● Powder-actuated tool	● Portable power router	● Center point test

Assessments:

- Test
- Quizzes
- Participation
- Check points

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- After learning all the types of tool, power tools and equipment students can then determine the proper tool for the job at hand. Through this they develop problem solving skills which they can use in all classes and life. They can use the tools to make their job easier. Knowing the operation or the use of the tool is important to do the job properly and keep having an accident.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey

			Agriculture Building and Construction **Grades 11-12** **Unit #10**
Course/Subject: Ag building and construction	**Grade:** 11-12	**Ag Technical Systems and Safety**	**Suggested Timeline:** 3-4 weeks

Grade Level Summary	Combining modern approaches in the construction of Agricultural Building and systems is the basis of this course. Students selecting this course will find hands-on instruction and practice in areas of building site set-up, laser and optics surveying, concrete and masonry and building principles used today in construction.	
Grade Level Units	Unit 1: Agriculture Power and Machinery Unit 2: Electrical Systems Unit 3: Plumbing and Irrigation Unit 4: Structures and Maintenance Unit 5: Welding, Cutting and Joining Processes	Unit 6: Concrete and Masonry Unit 7: Project Design Unit 8: Materials and Fasteners Unit 9: Tools and Equipment Unit 10: Ag Technical Systems and Safety

Unit Title	Agricultural Technical Systems and Safety
Unit Summary	Agricultural mechanics provide important services to the agricultural industry. Agricultural mechanics must have the technical skills, aptitude, and ability to perform technical work using various systems and equipment. Skills are needed in several areas to perform various types of work, including carpentry, plumbing, electrical, and welding work and work on hydraulic and pneumatic systems, motorized power equipment, and sustainable energy systems. Before performing any type of work, agricultural mechanics must have a thorough understanding and the ability to successfully apply all safety procedures. Practicing proper safety procedures protects individuals from harm and properly and equipment from damage.

Unit Essential Questions:	**Key understandings:**
1. What agricultural career do you want? 2. What are the safety precautions and tools needed to perform that career?	1. Safety and Health 2. Career opportunities 3. Agricultural student leadership organizations 4. Skills for employability

Focus Standards Addressed in the Unit:	
Standard Number	*Standard Description*
CPR.10.01.02.a	Examine career clusters and identify potential career opportunities based on personal interests, talents, goals, and preferences.

PST.02.02.02.b	Apply safety principles and applicable regulations to operate equipment, machinery, and power units used in AFNR power, structural and technology systems.
CPR.10.04.01.a	Identify and explain the purpose of fundamental tools used to pursue a career path as well as the common components of each.
CPR.10.04.02.b	Examine and practice the skills needed to complete common processes for pursuing a career.

Important Standards Addressed in the Unit:	
CRP.10.02.02.a	Identify methods for setting goals for personal improvement and continuous growth in a career area.
CPR.10.04.01.b	Organize personal information to prepare and continuously update a set of tools to aid in the pursuit of a career path

Misconceptions:	**Proper Conceptions:**
1. All careers need a 4 year college degree. 2. Safety is only a concern for those performing the work.	1. Jobs come with many different levels of education requirements. Many only need on the job training or a technical degree. 2. Agricultural accidents can affect all that are nearby whether they be chemical, fire, or mechanical.

Knowledge & Concepts	**Skills & Competencies**	**Dispositions & Practices**
● Dangers in an agricultural mechanics shop and work place. ● safety colors used on signs and icons in the agriculture industry ● Identify and use proper firefighting equipment ● Career opportunities ● Education and training requirements for careers in agriculture ● Employability skills ● Industry and standard organizations ● historical significance of agriculture to US and global economic strength ● the historical development of agricultural power and systems technologies ● global applications of agricultural power and systems technologies	● List safety procedures that promote avoidance of shop hazards and accident reduction ● Identify and demonstrate wearing of personal protective equipment. ● Demonstrate positive safety attitudes and responsibilities ● Demonstrate safety rules and regulations ● Describe regulations, safety and consumer protection ● Demonstrate first aid methods and procedures using supplies in a first aid kit ● Identify career pathways and education requirements ● Use computers to enter, access or retrieve data ● Fill out business or government forms	● Curiosity ● Learning to learn

Academic Vocabulary:		
● Agriculture ● Portfolio ● Career objective	● Occupational Safety and Health Administration (OSHA)	● carbon monoxide ● hazardous material ● NFPA hazard signal system

• Resume • Networking • Grounding • Ground-fault circuit interrupter (GFCI) • Lockout and tagout	• Environmental Protection Agency (EPA) • Personal protective equipment (PPE) • Chemical hazard • Spontaneous combustion • Bonding • Firstaide • Confined space	• Flammability hazard • Hazardous Material Identification Guide (HMIG) • Asbestos • Blood borne pathogen • Electrical shock

Assessments:

- Test
- Quizzes
- Participation
- Check points

Differentiation:

- Book work
- Lecture
- Demonstrations
- Video clips
- Hands on learning
- IEP accommodations

Interdisciplinary Connections:

- This unit introduces many of the different agricultural systems found in industry. In all of those industries safety is the most important thing. Students can use skills learned in this unit for everyday life in the aspects of safety. Also as they progress through their high school career they will need to make choices about career opportunities.

Additional Resources:

- Video clips
- Articles
- Personal Accounts
- Agricultural Technical Systems and Mechanics Textbook

Created By:
Troy Summey