

AGRI-SCIENCE IV

Agricultural Mechanics

Overview

Agri-Science IV students will focus on those areas of interest they have developed over the previous three years and concentrate on developing skills more specific to those areas of interest. All Agri-Science curricula are aligned with the national Agriculture, Food, and Natural Resources (AFNR) standards.

Agribusiness Systems (ABS)—the study of business principles, including management, marketing and finance, and their application to enterprises engaged in Agriculture, Food and Natural Resources

Agricultural Mechanics/Power, Structural and Technical Systems (PST)—the study of agricultural equipment, power systems, alternative fuel sources and precision technology, as well as woodworking, metalworking, welding and project planning for agricultural structures

Animal Science/Animal Systems (AS)—the study of animal systems, including life processes, health, nutrition, genetics, management and processing, through the study of small animals, aquaculture, livestock, dairy, horses and/or poultry

Environmental Service Systems (ESS)—the study of systems, instruments and technology used in waste management and their influence on the environment

Food Products and Processing Systems (FPP)—the study of product development, quality assurance, food safety, production, sales and service, regulation and compliance, and food service within the food science industry

Natural Resource Systems (NRS)—the study of the management of soil, water, wildlife, forests and air as natural resources

Horticulture/Plant Systems (PS)—the study of plant life cycles, classifications, functions, structures, reproduction, media and nutrients, as well as growth and cultural practices, through the study of crops, turf grass, trees and shrubs and/or ornamental plants

Students are expected to complete the specific course of study related to their career interests and goals that they began in Agri-Science II that will define students as “completers”. An Agri-Science completer is an Agri-Science IV student who has successfully completed three or four years of study in agriculture, math, and English. Course selection is developed with the assistance of the SAE advisors and classroom teachers.

Agri-Science IV students will continue to have opportunities to further develop leadership skills through participation the in the FFA. Students at this stage are encouraged to participate in FFA Career Development Events (CDEs) in order to further develop skills. Although participation in Agri-Science is limited to those who complete applications, when space allows, ECE classes may be open to other juniors and seniors within Ledyard High School. Course enrollment opportunities by other LHS students will change from year to year based on space availability. Interested students should contact the Agri-Science Instructional Leader or their School Counselor for further information.

Agri-Science IV Agricultural Mechanics students will further develop abilities and competencies relative to technically related careers in support of agriculture, whereby the student receives not only theory but actual practice. There will be ample opportunities for practical work where students will apply classroom instruction to real-world situations in the shop in livestock and plant growth facilities.

The culmination of Agri-Science IV is the Senior Projects unit. All Agri-Science IV students will have the opportunity to research, design, and conduct an independent project. For those students in Levels 1 & 2 there exists an option to take a more traditional unit in Agricultural Products.

Units Levels 1 & 2

Farmstead Maintenance
Agricultural Structures
Equipment Design
Senior Projects or Agricultural Products

Title: Agri-Science IV Supervised Agricultural Experience (SAE)

Unit Overview: SAE is a vital aspect of agricultural education. As part of Agri-Science I & II students have explored their options and developed work experience programs suitable for young students exploring agriculture as a career. Students have learned how to keep records and the best methods for documenting their day to day work as well as their progress. By the end of Agri-Science III students have developed and implemented plans for supervised work experience relating to their interests and career goals and have shown growth over the previous years.

Agri-Science IV students are expected to continue to demonstrate increased responsibility and new learning relative to their SAEs. Through advanced SAE work, students may be more involved in starting and operating their own businesses or taking employment in agriculturally-related enterprises. It is strongly recommended that students apply for local and state FFA proficiency awards as well as the FFA State Degree.

SAE advisors work with individual students, parents, work-site mentors, and employers to ensure student activities are appropriate, meet student needs, and are in compliance with state labor laws. All students work with their SAE advisors to complete the Universal Structured Work-Based Learning Plan. In addition, some students must complete the Connecticut Department of Labor forms LED 75-1 (Workplace Learning Experiences for Minor Students in Hazardous Occupations).

Suggested Time: On-going

Ledyard High School Expectations for Student Learning:

- Read and write critically and effectively for a variety of purposes
- Speak clearly and communicate ideas accurately in a variety of settings
- Demonstrate critical thinking skills

Agriculture, Food, and Natural Resources Standards:

- CS.01.01.07.c** Evaluate actions taken and make appropriate modifications to personal goals.
- CS.01.03.02.c.** Create a plan of action to complete a task based on a conceptualized idea
- CS.01.06.03.c** Use problem solving strategies to solve a professional or personal issue
- CS.01.06.05.c** Implement a plan to develop new knowledge and skills related to professional and personal aspirations
- CS.02.03.03.c.** Demonstrate employability skills for a specific career
- CS.03.01.01.b.** Select the appropriate form of technical and business writing or communication for a specific situation.
- CS.03.02.03.b.** Practice ethical behaviors.
- CS.07.04.01.c.** Apply general workplace safety precautions/procedures.
- CS.08.01.01.c.** Use tools and equipment appropriately to complete a specific task.
- ABS.03.01.01.a** Maintain production and agri-business records

Common Core State Standards

- RST.11-12.4** Determine the meaning of words and phrases as they are used in text, including analyzing how an author uses and refines the meaning of a key term over the course of a text
- WHST.11-12.1.e** Provide a concluding statement or section that follows from or supports the argument presented.
- WHST.11-12.2a** Introduce a topic and organize complex ideas, concepts, and information so that each new element builds on that which precedes it to create a unified whole; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension
- WHST.11-12.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience
- MP 6** Attend to precision

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Implement planned improvements to enhance or improve work experience program	<ul style="list-style-type: none"> • Develop and expand work experience activities/projects in line with career goals • Write SMART goals for SAE improvement over the year 	CS.01.01.07.c CS.01.03.02.c CS.01.06.03.c CS.01.06.05.c CS.02.03.03.c. ABS.03.01.01.a RST.11-12.4 WHST.11-12.4
Accurately (or independently) complete appropriate work experience forms utilizing AFNR standards	<ul style="list-style-type: none"> • Identify key skills necessary to complete the Structured Work-Based Learning Form using AFNR standards • Complete appropriate CT Departments of Labor and Education forms for student work experience independently 	CS.01.06.05.c CS.02.03.03.b. CS.03.01.01.b. WHST.9-10.4
Demonstrate effective and appropriate work skills	<ul style="list-style-type: none"> • Work safely and effectively • Document safe handling of equipment, plants, and animals • Demonstrate appropriate workplace skills such as time management, interpersonal skills, organization, communication, technology and tool use, and problem solving 	CS.01.06.03.c CS.02.03.03.c. CS.01.06.05.c CS.03.02.03.b. CS.07.04.01.c. CS.08.01.01.c. ABS.03.01.01.a RST.11-12.4 WHST.11-12.4

Develop and maintain clear records	<ul style="list-style-type: none"> • Document time spent in activities, skills learned, income, and expenses • Keep all SAE records in a well-organized binder • Provide evidence of work using photographs, videos, and journals • Meet with SAE advisor weekly during the school year and at least once during the summer • Set up/organize appointments with SAE advisor and employer/supervisor/parent 	CS.02.03.03.c. CS.03.01.01.b. ABS.03.01.01.a RST.11-12.4 WHST.11-12.1.e WHST.11-12.2a WHST.11-12.4
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Italicized items indicate technology use

Vocabulary

501(c)(3)

Entrepreneurship

Hazardous Occupations

Liability

Non-Profit Entity

Paid Placement

Structured Work-Based Learning Plan

Worker's Compensation Insurance

Work-site Mentor

Assessments:

- Weekly record checks
- Monthly and annual summaries
- On-site visits by advisor in coordination with parent/supervisor/employer
- SAE rubrics

Resources/Materials:

- AFNR Standards
- Binder and record sheets
- SDE/SDOL employment forms

Title: Farmstead Maintenance

Unit Overview: Students enrolled in Farmstead Maintenance explore the interactions between the mechanical and technical principles they have studied in previous units and the practical and biological aspects which impact the planning and maintenance of agricultural facilities. Students learn land survey skills and apply them to land planning and erosion control problems. Management of farmstead waste products as either a potential problem or resource are explored. Biosecurity concepts are applied to the evaluation and maintenance of livestock facilities.

Suggested Time: One quarter

Ledyard High School Expectations for Student Learning:

- Read and write critically and effectively for a variety of purposes
- Speak clearly and communicate ideas accurately in a variety of settings
- Demonstrate critical thinking skills

Agriculture, Food, and Natural Resources Standards:

- AS.03.02.01.a. Explain the importance of biosecurity to the animal industry.
- CS.02.04.01.c. Demonstrate critical and creative thinking skills while completing a task
- CS.02.04.02.c. Implement effective problem solving strategies
- CS.07.04.01.c. Apply general workplace safety precautions/procedures.
- CS.08.01.01.c. Use tools and equipment appropriately to complete a specific task
- ESS.03.02.03.a. Explain how the physical qualities of the soil influence the infiltration and percolation of water.
- ESS.03.02.04.b. Use a soil survey to determine the land capability classes for different parcels of land in an area.
- ESS.03.02.04.c. Design a master land-use management plan for a given area
- ESS.04.02.01.b. Evaluate environmental hazards created by different types of solid waste, solid waste accumulation and solid waste disposal.
- ESS.04.02.02.a. Discuss practical management options for treating solid waste.
- ESS.04.02.04.b. Explain scientific principles related to composting.
- ESS.06.01.01.c. Demonstrate surveying and cartographic skills to make site measurements and map facility accesses and infrastructure.
- PST.01.03.01.a. Identify and demonstrate safe use and maintenance of measurement and layout tools.
- PST.04.01.01.a. Identify symbols and drawing techniques used to develop plans and sketches.
- PST.04.04.01.a. Construct and/or repair with wood and metal.
- PST.04.04.05.b. Construct and/or repair with concrete, brick, stone or masonry units.
- PST.04.04.06.b. Construct and/or repair fencing, including wood, static wire, electrical wire and other fencing materials.
- PST.05.03.01.a. Identify geospatial technologies, including global positioning, geographical information and remote sensing.
- PST.05.03.03.b. Describe principles of precision agriculture for map- and sensor-based systems.

Common Core State Standards

- RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- RST.11-12.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
- WHST.11-12.2.d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- WHST.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

- MP 4 Model with mathematics
- MP 6 Attend to precision

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Perform land measurements.	<ul style="list-style-type: none"> • Perform measurements to calculate the area, slope and slope length of a piece of property. • Make a clinometer and use it to determine the slope of a hill. • Use GPS to measure distances and area of a piece of property. 	CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. ESS.06.01.01.c PST.01.03.01.a PST.04.01.01.a. PST.05.03.01.a. RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d

		MP 4 MP 6
Evaluate a piece of property for different agricultural or environmental services applications.	<ul style="list-style-type: none"> • Use a soil survey to determine the dominant soil types of a parcel of land and their characteristics for agricultural uses. • Use the Universal Soil Loss Equation to evaluate land uses and management practices for a parcel of land. • Perform a percolation test on a parcel of land and use it to evaluate the land for agricultural or environmental services use. 	CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. ESS.03.02.03.a. ESS.03.02.04.b. RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d MP 4 MP 6
Determine how management practices and structures can be used to minimize soil loss in agriculture.	<ul style="list-style-type: none"> • Use the USLE or RUSLE2 to evaluate alternative management practices for a parcel of land. • Lay out or construct a grassed waterway, drainage channel, or terrace. • Research and report on the use of practices such as strip cropping and terracing on soil losses in agriculture. 	CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. ESS.03.02.03.a. ESS.03.02.04.b. RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d SL.11-12.4 MP 4 MP 6
Manage agricultural wastes in environmentally sound ways that preserve them as a resource and minimize negative impacts.	<ul style="list-style-type: none"> • Determine the value and risks associated with using farm wastes as a soil amendment. • Use C:N ratios and tools such as Pearson's square to determine optimum mixtures of mixtures of ingredients for a compost pile. • Maintain a compost pile to process farm wastes. • Compare and contrast an aerobic process such as a compost 	CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. ESS.04.02.01.b. ESS.04.02.02.a. ESS.04.02.04.b.

	<p>pile to an anaerobic process such as a manure lagoon.</p> <ul style="list-style-type: none"> • Operate a biogas digester to generate methane gas from farm waste. • Visit a commercial composting facility. 	RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d MP 4 MP 6
Maintain physical structures for livestock health and biosecurity.	<ul style="list-style-type: none"> • Maintain agricultural facilities to improve biosecurity through such practices as excluding pests, improving sanitation or containing livestock. 	AS.03.02.01.a. CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. PST.01.03.01.a PST 04.04.01.a PST.04.04.05.b. PST.04.04.06.b. RST.11-12.3 RST.11-12. RST.11-12.7 RST.11-12.9 MP 4 MP 6

Level 1

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Evaluate a piece of property for different agricultural applications.	<ul style="list-style-type: none"> • Use online resources such as the RUSLE2 and NRCS GIS databases to map and evaluate potential uses of a parcel of land. • Develop and present a plan for using a parcel of land that incorporates NRCS land use data. • Report on the use of precision agriculture to enhance farm production and reduce costs. 	ESS.03.02.04.c. PST.05.03.03.b. SL.11-12.4
Manage agricultural wastes in environmentally sound ways that preserve	<ul style="list-style-type: none"> • Determine the financial value of using farm wastes as a soil amendment. 	CS.02.04.01.c. CS.02.04.02.c.

<p>them as a resource and minimize negative impacts.</p>	<ul style="list-style-type: none"> • Develop a spreadsheet or computer program to determine optimum mixtures of ingredients for a compost pile. • Investigate and report on the impact of compost enhancement additives or techniques. • Create a biogas digester to generate methane gas from farm waste. • Report on the use of composting toilets as alternatives to conventional toilets for processing solid wastes. 	<p>CS.07.04.01.c. CS.08.01.01.c. ESS.04.02.01.b. ESS.04.02.02.a. ESS.04.02.04.b. RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d WHST 11-12.4 MP 4 MP 6</p>
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Italicized items indicate technology use

Assessed Vocabulary:

aerobic
anaerobic
barrier strip
bunker silo
contour plow
cover crop
fermentation

hardware disease
hay
manure lagoon
minimum till
no-till
percolate
putrefaction

respiration
sedimentation
silage
slope
slope length
straw
terrace

Classroom Use Vocabulary:

activator
biosecurity
break chain
clinometer

GPS
grass waterway
hand level
RUSLE2

soil survey
USLE
windrow

Assessments:

- Quizzes
- Unit test
- Written assignments
- Construction Project Assessments

Resources/Materials:

- Soil Survey of New London County Connecticut, National Resource Conservation Service (text or online)
- Survey tools to include cloth tapes, plumb bobs, string, stakes, hand levels, clinometers and builders' level or transit level
- Universal Soil Loss Equation (USLE) documentation from online sources
- Online **RUSLE2 software**
- NRCS online **databases** and resources

Title: Agricultural Structures

Unit Overview: The Agricultural Structures unit introduces students to the concepts and skills used in planning, lay out and construction of agricultural structures. Emphasis is placed on wood-framed and concrete structures.

Suggested Time: One quarter

Ledyard High School Expectations for Student Learning:

- Read and write critically and effectively for a variety of purposes
- Speak clearly and communicate ideas accurately in a variety of settings
- Demonstrate critical thinking skills

Agriculture, Food, and Natural Resources Standards:

- CS.02.04.01.c. Demonstrate critical and creative thinking skills while completing a task
- CS.02.04.02.c. Implement effective problem solving strategies
- CS.07.04.01.c. Apply general workplace safety precautions/procedures.
- CS.08.01.01.c. Use tools and equipment appropriately to complete a specific task
- PST.01.03.01.a. Identify and demonstrate safe use and maintenance of measurement and layout tools.
- PST.04.01.01.a. Identify symbols and drawing techniques used to develop plans and sketches.
- PST.04.01.01.b. Develop plans and sketches using drafting equipment and computer programs.
- PST.04.01.02.a. Prepare bills of materials to accompany plans and sketches.
- PST.04.01.02.b. Use scale measurement and dimension to develop plans and sketches.
- PST.04.02.01.b. Identify and interpret different views of a construction drawing
- PST.04.03.01.b. Select types of materials, determine quantities and estimate their costs and other costs associated with a specified project plan.
- PST.04.04.01.a. Construct and/or repair with wood and metal.
- PST.04.04.03.a. Calculate areas and volumes for coatings.
- PST.04.04.03.b. Paint or protect with coatings.
- PST.04.04.05.b. Construct and/or repair with concrete, brick, stone or masonry units.
- PST.04.04.06.b. Construct and/or repair fencing, including wood, static wire, electrical wire and other fencing materials.

Common Core State Standards

- RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- WHST.11-12.2.d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- WHST.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.

- MP 4 Model with mathematics
- MP 6 Attend to precision

Industry Standards

ASTM International Construction Standards
 NFPA 5000: Building Construction and Safety Code

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Apply knowledge of project planning principles to agricultural structures.	<ul style="list-style-type: none"> • Interpret floor plans and technical drawings to lay out wooden wall frames. • Develop a bill of materials and cost estimate for a building component such as a wall or roof frame from technical drawings. • Develop a bill of materials and cost estimate for a fenced enclosure. • Draw a sketch showing the details and dimensions of a building component such as a flight of stairs or wall frame. • Draw a to-scale floor plan of a simple structure with doors and windows. 	PST.01.03.01.a. PST.04.01.01.a. PST.04.01.01.b. PST.04.01.02.a. PST.04.01.02.b. PST.04.02.01.b. PST.04.03.01.b. PST.04.04.01.a. PST.04.04.06.b. SL.11-12.4 RST.11-12.3

		RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d MP 4 MP 6
Lay out agricultural structures in the landscape.	<ul style="list-style-type: none"> • Use the 3-4-5 triangle method to stake out a rectangular structure or fence line. • Lay out batter boards for a structure, using a water level or builder's level to establish reference lines for excavation. 	CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. PST.01.03.01.a.
Construct and repair agricultural structures with wood	<ul style="list-style-type: none"> • Lay out and mark sole and top plates of a wooden wall frame. • Construct a wooden wall frame. • Construct rafters for a specified pitch, span and overhang. • Install fascia, soffit and flashing on an agricultural structure. • Roof a small structure using asphalt shingles or roll roofing. • Describe and discuss the characteristics of different types and grades of sheet goods, to include plywood, OSB and T-111, and their implications for the use of these materials in constructing agricultural structures. • Plan stringers, risers and treads of a flight of stairs to meet construction standards. • Construct a flight of stairs. • Evaluate a structure for strength, durability and conformity to standards, identifying strengths, weaknesses and actions to be taken to improve the structure. • Use published data to select rafter systems and trusses to meet requirements for specified dead and live loads, span and spacing. 	CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. PST.01.03.01.a. PST.04.03.01.b. PST.04.04.01.a. SL.11-12.4 RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d WHST 11-12.4 MP 4 MP 6
Construct and repair agricultural structures with concrete and masonry units.	<ul style="list-style-type: none"> • Use manufacturer's data to estimate the amount of prepared concrete mix needed to pour a concrete slab. • Calculate the amount of sand, coarse aggregate, cement and water required to mix the concrete needed to pour a concrete slab. • Compare the cost of premix and ready-mixed concrete to the 	CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. PST.01.03.01.a. PST.04.01.02.a.

	<p>cost of mixing concrete from raw materials.</p> <ul style="list-style-type: none"> • Describe the chemical curing process that occurs in concrete. • Compare the characteristics of different cementitious materials used in concrete. • Discuss the use of additives to modify the working properties and performance of concrete. • Describe the use of reinforcing rod and mesh in concrete construction. • Evaluate a structure for strength, durability and conformity to standards, identifying strengths, weaknesses and actions to be taken to improve the structure. • Calculate the number of masonry units and amount of mortar needed to complete a structure. • Construct a story pole based on the floor plan for a structure. • Cut concrete block using hand tools. • Lay out and construct a small structure using concrete block. 	<p>PST.04.03.01.b. PST.04.04.05.b. SL.11-12.4 RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d MP 4 MP 6</p>
Construct and maintain fencing	<ul style="list-style-type: none"> • Inspect electrical fences for proper operation. • Maintain electrical fencing. • Install or maintain wood and vinyl fencing. • Install fence posts with concrete footings. 	<p>CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. PST.01.03.01.a PST.04.04.06.b MP 4 MP 6</p>
Paint or protect with coatings.	<ul style="list-style-type: none"> • Identify and describe the differences among various types of finishes and solvents. • Use manufacturer's information to estimate the amount of a coating required to cover a structure. • Apply stain, paint or varnish to an agricultural structure. • Clean equipment used to apply paint or varnish. • Describe procedures for working with structures and equipment that may have finishes with lead content. • Test paint for lead content. 	<p>CS.02.04.01.c CS.02.04.02.c CS.07.04.01.c CS.08.01.01.c PST.04.04.03.a. PST.04.04.03.b. SL.11-12.4 RST.11-12.3 RST.11-12.4 RST.11-12.7 RST.11-12.9 WHST 11-12.2.d</p>

		MP 4 MP 6
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Level 1

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Apply knowledge of project planning principles to agricultural structures.	<ul style="list-style-type: none"> Develop a complete plan for a small agricultural structure, to include floor plan, elevations, bill of materials and costing. Estimate the labor requirements to construct an agricultural structure. 	PST.04.01.01.b. PST.04.01.02.a. PST.04.01.02.b. WHST 11-12.4
Construct and repair agricultural structures with wood	<ul style="list-style-type: none"> Evaluate the impact of different types and grades of lumber on the performance of a wooden structure. Research and construct engineered beams or trusses and compare their cost and performance to rafters or solid beams. 	PST.04.03.01.b. PST.04.04.01.a. SL.11-12.4 MP 4 MP 6
Construct and repair agricultural structures with concrete and masonry units.	<ul style="list-style-type: none"> Research and produce a special-purpose concrete. Evaluate its performance. Compare its cost and performance to that of conventional concrete. Construct reinforced concrete beams and compare their performance to unreinforced beams. Measure and evaluate the compressive strength of concrete cured with various amounts of available moisture. 	PST.04.03.01.b. PST.04.04.05.b. SL.11-12.4

Italicized items indicate technology use

Assessed Vocabulary:

A-Frame	Gambrel	Rafter	Square
Aggregate	Hardware disease	Ridge	Stringer
Beam	Header	Riser	Stud
Birds mouth	Level	Rough	Tail
Cripple	Mortar	Sheathing	Top Plate
Cure	Plumb	Shed Roof	Tread
Drip edge	Plumb bob	Sill	Trimmer
Fascia	Portland cement	Soffit	
Float	Pozzolana cement	Sole Plate	
Gable	Purlin	Span	

Classroom Use Vocabulary:

Batter boards

Dry-in

Elevation (drawing)

Flashing

Floor plan

Footing

Foundation

Frost line

Hydration

Joist

Mason's lime

Oriented strand board

Plywood

Pointing

Sonotube

Trowel

Truss

Webbing

Assessments:

- Quizzes
- Unit test
- Written assignments
- Construction Project Assessments

Resources/Materials:

- Text: Modern Carpentry, Wagner
- Lumber, plywood, fasteners
- Concrete block, sand, mason's lime, Portland cement, builder's sand, coarse aggregate
- Layout tools to include cloth tapes, plumb bobs, string, stakes and water or builder's levels
- Masonry tools to include trowels, pointing tools, string blocks, brick sets and brick hammers

Title: Equipment Design

Unit Overview: The Equipment Design unit provides students with the opportunity to apply skills from previous units in the design and construction of a working device to solve a real-world problem. The use of analog and digital sensors and indicators in conjunction with microcontrollers is introduced in order to give students tools they may use in their designs.

Suggested Time: One quarter

Ledyard High School Expectations for Student Learning:

- Read and write critically and effectively for a variety of purposes
- Speak clearly and communicate ideas accurately in a variety of settings
- Demonstrate critical thinking skills

Agriculture, Food, and Natural Resources Standards:

- CS.01.01.01.c. Work independently and in group settings to accomplish a task.
- CS.01.01.02.b. Create measurable objectives for a given situation.
- CS.01.01.03.a. Exhibit good planning skills for a specific task or situation.
- CS.01.01.04.b. Use appropriate and reliable resources to complete an action or project.
- CS.02.04.01.c. Demonstrate critical and creative thinking skills while completing a task
- CS.02.04.02.c. Implement effective problem solving strategies
- CS.07.04.01.c. Apply general workplace safety precautions/procedures.
- CS.08.01.01.c. Use tools and equipment appropriately to complete a specific task
- PST.01.03.01.a. Identify and demonstrate safe use and maintenance of measurement and layout tools.
- PST.02.01.01.c. Test and service electrical systems.
- PST.03.02.01.a. Identify and describe applications of simple machines in power systems.
- PST.03.02.02.a. Calculate mechanical advantage in mechanical systems.
- PST.04.01.01.a. Identify symbols and drawing techniques used to develop plans and sketches.
- PST.04.01.01.b. Develop plans and sketches using drafting equipment and computer programs.
- PST.04.01.02.a. Prepare bills of materials to accompany plans and sketches.
- PST.04.04.01.a. Construct and/or repair with wood and metal.
- PST.05.02.01.b. Read and design schematic drawings for an electrical control system.
- PST.05.02.01.c. Identify and use electrical control system components, including transistors, relays, HVAC and logic controllers.
- PST.05.02.02.a. Identify uses of electrical sensors and controls
- PST.05.02.02.c. Troubleshoot electrical system performance problems.

Common Core State Standards

- RST.11-12.3 Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks; analyze the specific results based on explanations in the text.
- RST.11-12.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- RST.11-12.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- WHST.11-12.2.d Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- WHST.11-12.4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- SL.11-12.4 Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
- MP 4 Model with mathematics
MP 6 Attend to precision

Other Standards:

Arduino Language Specification (or others as appropriate)

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Employ basic electronic controls and indicators.	<ul style="list-style-type: none"> • Wire a potentiometer as a position sensor and plot a calibration curve. • Wire a conventional relay and a solid state relay to control a load such as a light. • Use switches to construct an h-bridge to control the direction of a DC motor. 	CS.01.01.01.c. CS.01.01.02.b. PST.02.01.01.c PST.05.02.01.c. PST.05.02.02.a. PST.05.02.02.c.
Employ microcontrollers to process sensor inputs and control devices.	<ul style="list-style-type: none"> • Program a microcontroller such as the Arduino to control an LED based on time and switch inputs. • Wire a microcontroller to control the direction of a DC motor using an h-bridge 	PST.02.01.01.c PST.05.02.01.b PST.05.02.01.c. PST.05.02.02.a PST.05.02.02.c. RST.11-12.3

		RST.11-12.4 RST.11-12.7 WHST.11-12.2.d WHST.11-12.4.
Demonstrate an understanding of the role electronic components play in the control and monitoring of agricultural equipment.	<ul style="list-style-type: none"> • Us the wiring diagram of a piece of equipment such as a lawn tractor or small utility vehicle to trace the circuit. Identify key electronic components and their functions. 	PST.02.01.01.c PST.05.02.01.b PST.05.02.01.c. PST.05.02.02.a PST.05.02.02.c. RST.11-12.3 RST.11-12.4 RST.11-12.7 WHST.11-12.2.d WHST.11-12.4.
Apply understanding of electronic and mechanical principles in the design of a working device.	<ul style="list-style-type: none"> • Design and construct a device that solves a real-world problem. Document your design with schematics, mechanical drawings, bill of materials and costing. 	CS.01.01.01.c. CS.01.01.02.b. CS.01.01.03.a. CS.01.01.04.b. CS.02.04.01.c. CS.02.04.02.c. CS.07.04.01.c. CS.08.01.01.c. PST.01.03.01.a. PST.02.01.01.c. PST.03.02.01.a. PST.03.02.02.a. PST.04.01.01.a. PST.04.01.01.b. PST.04.01.02. PST.04.04.01.a. PST.05.02.01.b. PST.05.02.01.c. I PST.05.02.02.a. PST.05.02.02.c. RST.11-12.3 RST.11-12.4

		RST.11-12.7 WHST.11-12.2.d WHST.11-12.4. SL.11-12.4 MP 4 MP 6
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Level 1

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Demonstrate an understanding of the role electronic components play in the control and monitoring of agricultural equipment.	<ul style="list-style-type: none"> • Us the wiring diagram of a piece of equipment, such as a lawn tractor or small utility vehicle, to trace the circuit with a multimeter and identify circuit faults. • Develop a troubleshooting guide for a piece of equipment that includes some electronic controls or indicators. 	PST.05.02.01.b. PST.05.02.01.c. PST.05.02.02.a PST.05.02.02.c. WHST.11-12.4.
Apply understanding of electronic and mechanical principles in the design of a working device.	<ul style="list-style-type: none"> • Design and construct a device that solves a real-world problem. Create a web page documenting the device with schematics, mechanical drawings, bill of materials and costing and a video detailing its function. 	SL.11-12.4

Italicized items indicate technology use

Assessed Vocabulary:

Actuator
Comparator
Control
Gear ratio

Hydraulic
Load Cell
Pneumatic
Potentiometer

Relay
Strain Gauge
Thermostat

Classroom/Shop Use Vocabulary:

Safety Guard
Ergonomic
H-Bridge

Integrated Development Environment

Jumper
LED

Microcontroller
Multimeter
Prototype
Vee Belt

Assessments:

- Written assignments
- Assigned activities
- Design Project Assessments

Resources/Materials:

- Make Magazine and makezine.com website
- Instructables.com website
- **Microcontrollers** such as Arduino Uno, prototyping boards, auxiliary components
- Manuals for selected pieces of agricultural equipment
- Resources appropriate to the **microcontroller** such as the online manuals and activities on the Arduino Playground
- lumber, plywood, fasteners
- Construction materials appropriate to chosen projects

Title: Senior Project

Unit Overview: Most Agri-Science IV students will develop and complete a culminating project at the end of the school year. This project will give students the opportunity to demonstrate the application of critical skills learned over the course of their high school careers through a comprehensive project selected with the assistance of their Agri-Science teachers. Although this option is available to all students there are some who may select an alternative unit as a replacement. "Agricultural Products" (see Ag Sci IV, Animal Science curriculum) will be available to all students with the exception of those who are enrolled in ECE Horticulture classes.

Suggested Time: One quarter

Ledyard High School Expectations for Student Learning:

- Read and write critically and effectively for a variety of purposes
- Speak clearly and communicate ideas accurately in a variety of settings
- Employ problem-solving skills effectively
- Demonstrate critical thinking skills
- Employ effective research and study skills

Agriculture, Food, and Natural Resources Standards:

- CS.01.01.01.c** Work independently and in group settings to accomplish a goal
- CS.01.01.02.c** Assess outcomes to determine success for a task
- CS.01.01.03.c** Implement an effective project plan
- CS.01.01.04.b.** Use appropriate and reliable resources to complete an action or project
- CS.01.01.05.c.** Implement a plan that minimizes physical, financial, and professional risks and analyze results
- CS.01.01.07.c.** Evaluate actions taken and make appropriate modifications to personal goals
- CS.01.03.02.c.** Create a plan of action to complete a task based on a conceptualized idea
- CS.01.02.02.c.** Engage others in conversations to respond to an obstacle when completing a task
- CS.01.04.06.c.** Analyze one's level of self-discipline and causes for lack of self-discipline
- CS.01.06.05.c.** Implement a plan to develop new knowledge and skills related to professional and person aspirations.
- CS.02.04.01.c** Demonstrate critical and creative thinking skills while completing a task
- CS.02.04.02.c** Implement effective problem solving strategies
- CS.03.03.03.c.** Respond to feedback to improve a situation, skill or performance
- CS.06.02.01.a** Use proper safety practices/personal protective equipment
- CS.07.04.01.c** Apply general workplace safety precautions/procedures.
- CS.08.01.01.c** Use tools and equipment appropriately to complete a specific task

Common Core State Standards

- RST.11-12.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics
- RST.11-12.7** Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem
- WHST. 11-12.1e.** Provide a concluding statement or section that follows from or supports the argument presented.
- WHST. 11-12.4.** Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes
- SL.11.-12.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
- SL.11-12.5** Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence to add interest.
- SL.11-12.6** Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Develop a plan for an independent, agriculturally-related project	<ul style="list-style-type: none"> • With assistance from advisors, identify a suitable topic to meet the established requirements for the senior project • Submit a formal project proposal delineating goals, activities, procedures, and materials • Conduct necessary background research to develop a plan 	CS.01.01.04.b. CS.01.03.02.c. CS.02.04.01.c RST.11-12.4 WHST. 11-12.4.
Execute a project plan in order to meet established goals	<ul style="list-style-type: none"> • Establish clear project objectives • Create a weekly plan for research and work • Identify procedures to effectively complete the project • Create a time-line to complete work • Work safely and efficiently • Conduct research as needed to identify and solve problems • Work safely in a shop / lab situation 	CS.01.01.01.c CS.01.01.03.c CS.01.01.04.b. CS.01.01.05.c. CS.01.03.02.c. CS.01.06.05.c. CS.02.04.01.c CS.02.04.02.c CS.06.02.01.a CS.07.04.01.c CS.08.01.01.c RST.11-12.4 RST.11-12.7

		WHST. 11-12.4.
Assess progress and modify plans as needed	<ul style="list-style-type: none"> • Use journal to record successes and problems • Discuss issues with advisor and peers in order to solve problems • Make adjustments to plan as needed • Conduct research as needed to identify and solve problems 	CS.01.01.02.c CS.01.01.04.b. CS.01.01.05.c. CS.01.01.07.c. CS.02.04.01.c CS.02.04.02.c RST.11-12.4 RST.11-12.7 WHST. 11-12.4.
Journal accomplishments, problems, and propose solutions	<ul style="list-style-type: none"> • Record progress in a journal including weekly assessments of work 	CS.01.01.02.c CS.01.01.07.c. CS.02.04.02.c WHST. 11-12.4.
Present a summary of project	<ul style="list-style-type: none"> • Make a presentation to class of project work • Evaluate work and final project 	CS.01.01.02.c CS.01.01.07.c. CS.02.04.01.c WHST. 11-12.1e WHST. 11-12.4. SL.11.-12.4 SL.11-12.5 SL.11-12.6

Level 1

Develop a plan for an independent, agriculturally-related project	<ul style="list-style-type: none"> • Select AFNR standards applicable to project 	CS.01.01.01.c
Assess progress and modify plans as needed	<ul style="list-style-type: none"> • Initiate discussions with advisors and peers in order to identify and solve problems 	CS.01.02.02.c CS.01.04.06.c.

ECE Students

Develop a plan for an independent, agriculturally-related project	<ul style="list-style-type: none">• Work independently to develop an appropriate topic to meet established criteria	CS.01.01.01.c
Assist students with project tasks	<ul style="list-style-type: none">• Provide assistance to other students as needed	CS.02.04.02.c
Assess progress and modify plans as needed	<ul style="list-style-type: none">• Reflect in journal and through discussions	CS.01.04.06.c. CS.01.02.02.c CS.03.03.03.c.
Present a summary of project	<ul style="list-style-type: none">• Create a presentation for peers utilizing digital media	SL.11-12.5

Italicized items indicate technology use

Vocabulary:

Vocabulary is dependent upon topic and will be identified by each student

Assessments:

- Weekly plan
- Weekly journal
- Weekly work/participation evaluation
- Completed project
- Presentation

Resources/Materials:

- Resources are dependent on topic and will be identified by each student

Title: Agricultural Products

Unit Overview: This unit will look at the food delivery system. After a quick review of human digestion and food nutrients, the course will look at the production and safe handling of agricultural products from production to consumer. Included will be food borne illnesses, preservation, and handling. Further students will consider the implications of a vegetarian and vegan diet, as well as conventional versus small scale, locally grown agricultural products.

Suggested Time: One Quarter

Ledyard High School Expectations for Student Learning:

- Read and write critically and effectively for a variety of purposes
- Speak clearly and communicate ideas accurately in a variety of settings
- Demonstrate critical thinking skills

Agriculture, Food, and Natural Resources Standards:

ABS.01.01.01.a. Recognize principles of capitalism as related to AFNR businesses.

ABS.05.01.02.a Name and explain the impact of external economic factors on an AFNR Business.

ABS.05.01.04.a Calculate percentages, ratios, and related business applications

CS.02.04.01.c Demonstrate critical and creative thinking skills while completing a task

CS.02.04.02.c Implement effective problem solving strategies

CS.06.02.01.a Use proper safety practices/personal protective equipment

CS.07.04.01.c Apply general workplace safety precautions/procedures.

CS.08.01.01.c Use tools and equipment appropriately to complete a specific task

FPP.01.01.01.b. Evaluate changes and trends in the food products and processing industry.

FPP.01.01.02.b. Discuss the issues of safety and environmental concerns about foods and food processing (e.g., Genetically Modified Organisms, microorganisms, contamination, irradiation).

FPP.01.02.01.b. Evaluate the changes in the food products and processing industry brought about by industry organizations or regulatory agencies.

FPP.02.03.01.a. Explain techniques and procedures for the safe handling of food products.

FPP.02.03.03.a. Describe the effects food-borne pathogens have on food products and humans.

FPP.03.01.03.a. Explain the Food Guide Pyramid in relation to essential nutrients for the human diet.

PP.03.01.04.a. Discuss common food constituents (e.g., proteins, carbohydrates, fats, vitamins, minerals).

FPP.03.01.05.b. Describe the purpose of common food additives.

FPP.04.01.01.b. Discuss factors that affect quality and yield grades of food products.

FPP.04.01.03.a. Identify and describe accepted animal treatment and harvesting techniques.

FPP.04.02.01.b. Discuss desirable qualities of processed meat, egg, poultry, fish and dairy products.

- FPP.04.03.05.a.** Explain materials and methods of food packaging and presentation.
- FPP.04.03.06.a.** Identify and explain storage conditions to preserve product quality.
- FPP.04.03.06.b.** Select methods and conditions for storing raw and processed food products
- PS.03.05.03.b.** Explain the proper conditions to maintain the quality of plants and plant products held in storage

Common Core State Standards:

- WHST.11-12.2d** Use precise language, domain-specific vocabulary and techniques such as metaphor, simile, and analogy to manage the complexity of the topic; convey a knowledgeable stance in a style that responds to the discipline and context as well as to the expertise of likely readers.
- WHST 11-12.4** Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose and audience
- RST 11-12.4** Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
- SL.11.-12.4** Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.

- MP1** Make sense of problems and persevere in solving them
- MP 4** Model with mathematics
- MP 6** Attend to precision

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Identify and describe the function of the organs of the human digestive tract.	<ul style="list-style-type: none"> • Label a diagram of the human digestive tract, identifying the organs and giving the function of each. 	FPP.03.01.03.a. SL.11.-12.4
Outline the role each of the six food nutrients provide in the human diet.	<ul style="list-style-type: none"> • Name the six food nutrients and explain what they provide for normal human health and physiology. 	FPP.03.01.04.a.
Outline the guidelines for safe handling of food and raw materials.	<ul style="list-style-type: none"> • Summarize the Ledge Light Health District guidelines for safe handling of food. 	ABS.05.01.02.a FPP.02.02.01.b. FPP.02.03.01.a FPP.02.03.03.a. FPP.04.01.01.b FPP.04.01.03.a FPP.04.02.01.b. RST 11-12.4

Identify food spoilage and differences in food poisoning (contrast food borne infection and intoxication).	<ul style="list-style-type: none"> • Categorize food borne pathogens as causing food infection or food intoxication. 	FPP.02.03.03.a PS.03.05.03.b.
List common food additives and how they enhance foods.	<ul style="list-style-type: none"> • Create a chart of food additives and how they alter foods. 	FPP.03.01.05.b
Apply methods of food preservation (i.e. - freezing, drying, fermenting, pickling, etc.)	<ul style="list-style-type: none"> • Make butter • Make yogurt • Make ice cream • Make mozzarella • Dehydrate fruit • Make (dried meat) jerky • Make pickles 	ABS.05.01.04.a CS.02.04.01.c CS.02.04.02.c CS.06.02.01.a CS.07.04.01.c CS.08.01.01.c FPP.04.03.05.a FPP.04.03.06.a. FPP.04.03.06.b.
Recognize principles of capitalism as relates to food and food distribution.	<ul style="list-style-type: none"> • Create a flow chart of various foods and their path from farm to consumer. • Compare specific diets (vegetarian, vegan, etc.) 	ABS.01.01.01.a. FPP.01.01.01.b. FPP.01.02.01.b

Level 1

Objectives	Required Activities/ Suggested Activities	AFNR Standards/CCSS
Apply methods of food preservation (i.e. - freezing, drying, fermenting, pickling, etc.)	<ul style="list-style-type: none"> • Compare and contrast various preservation methods on raw foods 	ABS.05.01.04.a CS.02.04.01.c CS.02.04.02.c CS.06.02.01.a CS.07.04.01.c CS.08.01.01.c FPP.04.03.05.a FPP.04.03.06.a. FPP.04.03.06.b.

Analyze the feasibility of personal independence and sustainability with regard to food in New England.	<ul style="list-style-type: none"> Outline an annual, month by month schedule of home grown and produced food. Compare availability of New England produced foods to that of foods for sale from other parts of the U. S. and other countries 	ABS.05.01.04.a CS.02.04.01.c CS.02.04.02.c CS.06.02.01.a CS.07.04.01.c CS.08.01.01.c FPP.04.03.05.a FPP.04.03.06.a. FPP.04.03.06.b. WHST.11-12.2d RST 11-12.4 SL.11.-12.4
Discuss the issues of safety and environmental concerns about foods and food processing (e.g., Genetically Modified Organisms, microorganisms, contamination, irradiation).	<ul style="list-style-type: none"> Prepare and give a Power Point presentation on a safety or environmental issue in the food delivery system. 	FPP.01.01.02.b.

Italicized items indicate technology use

Assessed Vocabulary:

Absorption

C. botulinum

Casein

Clostridium perfringens

Colloid

Digestion

Escherichia coli

Food infection

Food Intoxication

Food Nutrient

Homogenization

Metabolism

Myoglobin

Pasteurization

Salmonella

Staphylococcus aureus

Sterilization

Value-added

Assessments:

- Lab activities
- Class assignments
- Tests
- Quizzes
- Guest presentation/field trip reflections

Resources/Materials:

- Introduction to Food Science, Rick Parker, Delmar, 2003.
- Food Science and Safety, George J. Seperich, Interstate, 1998.
- Ledge Light Health District Guide For Food Handling.