DIXON COUNTY FAIRBOOK 2023
DEPARTMENT H2
Science, Engineering, Technology (SET) Part 2 of 2
Geospatial, Physic/Wind Energy, Small Engines, Tractors, Welding, Woodworking

SET GENERAL RULES

1. The name and county of each exhibitor should appear separately on the back of each board, poster or article and on the front cover of the notebooks so owner of the exhibit may be identified if the entry tag is separated from the exhibit.
2. Each individual is limited to one exhibit per class.
3. Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: what you learned. All reports should be computer generated and enclosed in a clear plastic cover. The reports should be attached securely to the display.
4. 3. Posters can be any size up to 28" by 22" when ready for display. Example: tri fold poster boards are not 28" by 22" when fully open for display.
5. Please refer to the General Rules for the policy regarding firearms, items with a blade, and other related items.
6. Please refer to the General Rules for the policy regarding use of copywritten images.

GEOSPATIAL

SET Geospatial is a diverse category that includes a variety of exhibits 4-H'ers can get involved in. Through participation in this category 4-H'ers will gain more knowledge about Nebraska's rich history and diverse geography. Take close note of the rules to ensure your exhibit qualifies.

Resources:
Geospatial - Learn about Geography; Learn about Geographic Information Systems (GIS); Learn about Global Positioning Systems (GPS).
URL: https://4hcurriculum.unl.edu/index.php/main/program_project/132

Refer to **SET GENERAL RULES** for more information, at the top of page 1.

Rules:
1. Youth enrolled in Geospatial or GEAR TECH 21 may exhibit in any class within this division.

H 880 001 POSTER Create a poster (not to exceed14" x 22") communicating a GPS theme such as How GPS or GIS works; Careers that use GPS or GIS; How to use GPS; What is GIS, GPS or GIS in Agriculture, Precision Agriculture; or a geospatial topic of interest.

H 880 002 4-H FAVORITE PLACES OR HISTORICAL SITE POSTER The 4-H exhibitor identifies a favorite place or historical site (including grave sites) in Nebraska. Exhibit should include latitude and longitude, digital picture, and local area map. Poster size should not exceed 14" X 22".

H 880 003 GPS NOTEBOOK Keep a log of at least 5 places visited using a GPS enabled device. At least one site should be from a community other than where you live. For each site, record the latitude, longitude and elevation. Also include a description of the site, a paragraph

explaining what was interesting about the site or finding it. Photos of each site and/or cache are optional but encouraged.

H 880 004 GEOCACHE Assemble a themed geocache. Each geocache should be a water-tight container. It should include a logbook and pencil for finders to log their visits and may include small trinket, geo-coins, etc. for the finders to trade. Documentation should include a title, teaser description and the geographic coordinates of intended placement. Register the site at geocaching.com, include a print-out of its registry. The entry may include a photograph of the cache in its intended hiding place.

H 880 005 AGRICULTURE PRECISION MAPPING 4-Hers will assemble a notebook that will include a minimum of 2 digital copies of various data layers that can be used in precision agriculture to identify spatial patterns and/or correlations (printed copies of websites were applications can be purchased is acceptable) A report of how the analysis of the various data will be used to make a management decision.

H 880 006 4-H HISTORY MAP / PRESERVE 4-H HISTORY Nominate a Point of Interest for the 4-H History Map Project include copy of submitted form in folder or notebook. To nominate a site for the 4-H history map please go to http://arcg.is/1bvGogV For more information about 4-H history go tohttp://www.4-hhistorypreservation.com/History_Map/For a step by step video on nominating a point, please go to this link: http://tinyurl.com/nominate4h. Write a brief description of the historical significance of 4-H place or person. (Minimum of one paragraph)

H 880 007 GIS THEMATIC MAP Using any GIS software, create a thematic. Thematic maps can utilize any subject of interest to the 4-H'er. Example map would be Amelia Earhart's or Sir Francis Drake's voyage population density maps, water usage maps or 4-H project in Nebraska. Create GIS Map using data from books, and or internet. Use reliable data, (U.S. Center or U.S. Census Bureau etc.) Map any size from 8.5" x 11" up to 36" x 24", should include Title, Base Map, Neat Line, North Arrow, and Legend. Identify the source of your information on the back of the map.

H 880 008 VIRTUAL GEOCACHE Keep a log of at least 5 places visited using a virtual geocach platform. At least one site should be from a community other than where you live. For each site, record the latitude, longitude and elevation. Also include a description of the site, a paragraph explaining what was interesting about the site or finding it. Photos of each site and/or cache are optional, but highly encouraged.

***H 880 010 CAREERS INTERVIEW** Interview someone who is working in a Geospatial field and include research that career. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be 3 to 5 pages, double-spaced, 12-point font, and 1" margins. Multimedia reports should be between 3 to 5 minutes in length. *Not State Fair eligible.

PREMIUMS: Purple $2.50; Blue $2.20; Red $1.75; White $1.40

PHYSICS / WIND ENERGY

This category provides 4-H'ers a way to present their ideas about renewable energy resources. Through participation in this category 4-H'ers will learn more about physics, friction, energy, and elasticity. In addition, participants will make a display to go along with their findings. For more resources and materials in this category refer to the resource section at the bottom of the page.

Resources:

4-Wheelin' Physics Fun - Learn basic principles of physics, such as friction, energy, elasticity; Do experiments with a radio-controlled pickup.
URL: https://4hcurriculum.unl.edu/index.php/main/program_project/133

The Power of Wind - Learn about wind and its uses; Design, create, build and test a wind-powered device; Explore wind as a potential energy source in the community.
URL: https://4hcurriculum.unl.edu/index.php/main/program_project/134

4-H NYSD 2011: Wired for Wind - Explores how to engineer renewable energy technologies, and the positive impact that they can have in communities across the country and the world.
https://4-h.org/parents/national-youth-science-day/wired-for-wind/

4-H HYSD 2009: Biofuel Blast - Explores the production of biofuel ethanol.
https://4-h.org/parents/national-youth-science-day/biofuel-blast/

Renewable Energy Resources:

United States Department of Energy: https://www.energy.gov/clean-energy
U.S. Energy Information Administration: https://www.eia.gov/energyexplained/renewable-sources/
Natural Resources Defense Council: https://www.nrdc.org/stories/renewable-energy-clean-facts

Refer to **SET GENERAL RULES** for more information, at the top of page 1.

H 900 001 CREATE AND COMPARE ENERGY RESOURCES POSTER Poster should explore 2 alternative/renewable energy resources. Compare and contrast the 2 resources including two of the following information: amount of energy created, costs of production, usability of the energy, pros/cons of environmental impacts, etc. Posters can be any size up to 28” by 22.”

H 900 002 EXPERIMENT NOTEBOOK Notebook will explore the scientific method involving alternative/renewable energy sources. Information required. 1.) Hypothesis 2.) Research 3.) Experiment 4.) Measure 5.) Report or Redefine Hypothesis.

H900 003 SOLAR AS ENERGY DISPLAY / POSTER Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6’ tall or 2’ X 2’. Include a notebook of why the item was designed and how it harnesses the power of the sun. Examples include solar ovens, solar panels, etc.

H 900 004 WATER AS ENERGY DISPLAY / POSTER Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of water.

H 900 005 WIND AS ENERGY DISPLAY / POSTER Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2' X 2'. Include a notebook of why the item was designed and how it harnesses the power of wind.

H 900 006 OTHER NEBRASKA ALTERNATIVE ENERGY Notebook should explore Nebraskan alternative energy source besides wind, water, and solar power. Include information on type of power chosen, infrastructure for distribution, what resources are needed to create this alternative resource, cost of production, and potential uses of bio-products.

PREMIUMS: Purple $2.50; Blue $2.20; Red $1.75; White $1.40

SMALL ENGINES

*This is a County Only project area. Not State Fair eligible.
Refer to **SET GENERAL RULES** for more information, at the top of page 1.

CRANK IT UP - UNIT 1

***H 890 901 DISPLAY ITEM** Exhibit demonstrating the skills learned in the Crank It Up project. Examples include parts of an engine, types of engines and uses, engine maintenance, or safety) Exhibit can be a poster display or an item. Include a report on what you did to the engine.

***H 890 902 INTERVIEW OR PRICE COMPARISON** Mount on an 8 ½ by 11 cardstock what you learned by doing an interview or price comparison. See pages 3033 for examples of what to include. May include a photo of person or item.

WARM IT UP – UNIT 2

***H 890 903 SMALL ENGINE DISPLAY/ITEM** Show an application of one of the concepts learned in the Warm It Up project. Examples include: comparison of engine oil types, transmissions, or safety related to engines. Exhibit could be a poster display, or an actual item. Include a report on what you did to the engine.

***H 890 904 INTERVIEW OR PRICE COMPARISON** Mount on an 8 ½ by 11 cardstock what you learned by doing an interview or price comparison. See pages 3033 for examples of what to include. May include a photo of person or item.

TUNE IT UP – UNIT 3

***H 890 905 ENGINE DISPLAY/ITEM** Display/Item should exemplify one of the lessons learned in the Tune It Up Project. Examples include: diagnostic tools, fuel systems, ignition systems. If a complete engine is exhibited it will not be started. However, display needs to report process of building/rebuilding engine and how/where engine will be utilized (i.e. lawn mower, weed eater, snow blower, etc.). Include a report on what you did to the engine.

***H 890 906 INTERVIEW OR PRICE COMPARISON** Mount on an 8 ½ by 11 cardstock what you learned by doing an interview or price comparison. See pages 3033 for examples of what to include. May include a photo of person or item.

PREMIUM: Purple $1.60; Blue $1.25; Red $1.00; White $.75

TRACTOR OR FARM MACHINERY

*This is a County Only project area. Not State Fair eligible.

Refer to **SET GENERAL RULES** for more information, at the top of page 1.

***H 775 901 INDIVIDUAL TRACTOR SERVICES** - Record as outlined in Tractor Project Unit III or adapt service record in Unit IV.

***H 775 902 TRACTOR DEMONSTRATION DISPLAY** - To be exhibited by an individual only. Exhibit should show some part or system of a tractor. Include a brief description of how the part or system functions. Prepare the display on a 24" high x 32" wide board not to exceed 3/8" in thickness.

***H 775 903 ANY PIECE OF MACHINERY THAT HAS BEEN REFURBISH AND /OR REFINED**

***H 775 904 EQUIPMENT SAFETY** Video or Poster presentation on safety with farm equipment

PREMIUM: Purple $5.00; Blue $4.00; Red $3.00; White $1.85

WELDING

This category helps 4-H'ers learn the basics of welding. In addition, 4-H'ers get the opportunity to present their knowledge on the topic and display what they have made. Involvement in SET Welding gives participants a first-hand experience in a skill that can be used for a lifetime.

Resources:

ARC Welding - Learn to cut metal with an arc solder; Weld high carbon, spring steel and alloy steels; Weld horizontal, vertical and overhead positions.
URL: https://4hcurriculum.unl.edu/index.php/main/program_project/143

Refer to **SET GENERAL RULES** for more information, at the top of page 1.

Rules:

1. All welds exhibited in class 1 or 2 must be mounted on a 12" high x 15" long display board of thickness not to exceed 3/8". Attach each weld on a wire loop hinge or equivalent, so the judge can look at the bottom side of the weld when necessary. Each weld should be labeled with information stated: 1) type of welding process (stick, MIG, TIG, Oxy-Acetylene, etc.); 2)

kind of weld; 3) welder setting; 4) electrode/wire/rod size; and 5) electrode/wire/rod ID numbers. **Attach a wire to display board so it can be hung like a picture frame. No picture frame hangers accepted.** If no plans are included with welding article or welding furniture, item will be disqualified.

2. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
3. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
4. Reports should be written using the scientific method whenever possible (Background, the Question or hypothesis, what you plan to do and what you did, Method used and observations, Results: what you learned. All reports should be computer generated and enclosed in a clear plastic cover. The reports should be attached securely to the display.
5. If no plans are included with welding art, welding article, welding furniture or composite weld project item will be disqualified.
6. All outside projects MUST have entry tag and supporting information placed in a protective bag to prevent damage from weather events such as rain and be ATTACHED to projects with string, zip ties, etc.
7. **4-H WELDING PROJECT TIPS AND SUGGESTIONS: CLASS 1**
    a) All welds should be made with the same electrode/wire/rod size and number.
    b) Welds should be made only on one side of metal so penetration can be judged.
    c) Welds should be cleaned with chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.
    d) It is suggested that all welds be on the same size and thickness of metal. These pieces, referred to as coupons, should be 1.5 to 2 inches wide and 3.5 to 4 inches long. A good way to get this size is to buy new cold rolled strap iron and cut to length. The extra width is needed to provide enough metal to absorb the heat from the welding process and prevent the coupons from becoming too hot before the bead is completed. Narrower coupons will become very hot, making an average welder setting too cold at the bead start, just about right in the middle, and too hot at the end. The correct way to weld narrow strips is to make short beads and allow time to cool, however this project requires a full length bead.
    e) STICK WELDING: Suggested coupon thickness - 1/4” if using 1/8” rod. Suggested rod- AC and DC straight or reverse polarity- first E-7014, second E-6013.
    f) MIG WELDING: Suggested coupon thickness - 1/4" if using .035 wire and 1/8" if using .023 wire.
    g) OXY-ACETYLENE: Suggested coupon thickness - 1/8". Suggested rod– 1/8" mild steel rod
8. **4-H WELDING PROJECT TIPS AND SUGGESTIONS: CLASS 2**
    a) It is suggested that all welds be on same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4” x 4” or on individual coupons that are about 2" x 4" inch and ¼” thick. Suggested rods for this class of position welds for AC and DC straight or reverse polarity is, first E-6013, second E-7014 and E-6010 for DC reverse polarity only.
    b) Welds should be cleaned with a chipping hammer and wire brush. Apply a coat of light oil (penetrating oil) to the metal to prevent rusting. Wipe off excess oil.

c) 4-H WELDING PROJECT TIPS AND SUGGESTIONS: CLASS 3 & 4. All welds should be cleaned and protected from rust with paint or light oil. Plans are to be complete enough that if they were given to a welding shop, the item could be made without further instructions. Bill of materials should include a cost for all items used including steel, electrodes, paint, wheels, etc.

All metal welding processes accepted.

ARCS AND SPARKS

H 920 001 WELDING JOINTS A display of one butt, one lap and one fillet weld.

H 920 002 POSITION WELDS A display showing three beads welded in the vertical down, horizontal and overhead positions.

H 920 003 WELDING ART – any art created using tack welds to hold the metal pieces together (examples include horseshoe projects). Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.

H 920 004 WELDING ARTICLE - (SF281) - any shop article where welding is used in the construction. 60% of item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. **Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article.** Protect plans with a

cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

H 920 005 WELDING FURNITURE Any furniture with 75% welding is used in the construction. 60% of item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. **Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article**.? . Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

H 920 006 PLASMA CUTTER/WELDER DESIGN Plasma cutters/welders allowed for detailed design(s) to butt cut into metal. 4-H members will create a notebook describing the design process to create the "artwork" to butt cut into metal. In the notebook include:

1) A photo (front and back) of the finished project;
2) Include detailed photographs of the project to allow judges to examine cuts;
3) Instructions on how the design was created (include software used) - this allows for replication of the project;
4) Lessons learned or improvements to the project.
5) Steps to finish the project.

H 920 007 COMPOSITE WELD PROJECT - (SF280) - 60% of the project must be welded and 40% made from other materials such as wood, rubber, etc. **Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article.** Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

PREMIUMS: Purple $2.00; Blue $1.50; Red $1.20; White $0.85

WOODWORKING

In this category 4-H'ers have the opportunity to create exhibits about varying levels of woodworking. In addition, participants can also create informational exhibits about their woodworking projects. Through involvement in this category 4-H'ers will be better educated about the topic and better their woodworking skills.

Resources:

Woodworking Wonders 1 - Develop skills such as measuring, squaring and cutting a board, driving nails, and using clamps and screws; Build a picture frame, a letter holder, a box, or an airplane.
URL: https://4hcurriculum.unl.edu/index.php/main/program_project/144

Woodworking Wonders 2 - Measure , cut, sand, drill, and use advanced hand and power tools; Apply paint and use bolts and staples; Build a sawhorse, birdhouse, tool box, or a stool.
URL: https://4hcurriculum.unl.edu/index.php/main/program_project/145

Woodworking Wonders 3 - Practice measuring angles, cutting dado and rabbet joints; Use a circular saw, a table saw, and a radial arm saw; Sand and stain wood.
URL: https://4hcurriculum.unl.edu/index.php/main/program_project/146

Woodworking Wonders 4 –
URL: https://4hcurriculum.unl.edu/index.php/main/program_project/205

Refer to **SET GENERAL RULES** for more information, at the top of page 1.

Rules:

1) The ability to build objects as designed by another person is an important life skill. Professional woodworkers often are hired to build objects to exacting specifications as laid out in a written plan.
2) Requirements: All articles exhibited must include a plan (with drawings or sketch or blueprints) stating dimensions and other critical instructions a builder would need to know how to build the project. Plans may include narrative instructions in addition to the dimension drawings and include any alternations to the original plan. Part of the score depends on how well the project matches the plans. If the plans are modified, the changes from the original

need to be noted on the plans. All plans used for making the article must be securely attached and protected by a clear plastic cover.

3) 4-H'ers must be in Unit 3 or Unit 4 for the exhibit to be considered for State Fair. All projects must have appropriate finish.
4) If the project (i.e. picnic tables, wishing wells, swings, chairs, bridges, doghouses, etc.) is designed to be used outside, it will be displayed outside.
5) **All outside projects MUST have entry tag and supporting information placed in a protective bag to prevent damage from weather events such as rain and be ATTACHED to projects with string, zip ties, etc.**

Only one exhibit allowed per 4-H member per class.

MEASURING UP - UNIT 1
***Not eligible for State Fair**

***H 911 901 ARTICLE MADE WITH HAND TOOLS**. Select from Unit I or use comparable plans from other sources.

***H 911 902 SECOND ARTICLE WITH HAND TOOLS**. Select from Unit 1 or use comparable plans from other sources.

MAKING THE CUT - UNIT 2
***Not eligible for State Fair**

***H 911 903 WOODWORKING ARTICLE** selected from Unit II or use comparable plans from other sources, such as a bird house, foot stool, saw horse OR similar item.

***H 911 904 SECOND ARTICLE**

NAILING IT TOGETHER - UNIT 3

H 911 001 WOODWORKING ARTICLE Item should be made using either joints, hinges, dowels, or a dado joining made using skills learned in the Nailing It Together manual. Item is required to be appropriately finished. Examples include: bookcase, coffee table or end table.

H 911 003 RECYCLED WOODWORKING DISPLAY Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 3 manual. Exhibit must include the woodworking plan and a minimum one-page report of how the engineering design process was used to develop the woodworking plan. Engineering Design Process

1. State the problem (Why did you need this item?)
2. Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)
3. Select a solution (How does your solution compare on the basis of cost, availability, and functionality?)

4. Build the item (What was your woodworking plan, and what processes did you use to build your item?)
5. Reason for article finish (What type of finish, how did you finish or why you chose this finish?)
6. Evaluate (How does your item solve the original need?)
7. Present results (How would you do this better next time?)

H 911 004 COMPOSITE WOOD PROJECT 60% of the project must be wood and 40% made from other materials such as metal, rubber, resin, etc. All plans and plan alternations must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

H 911 005 OUTDOOR WOOD PROJECT MADE WITH TREATED WOOD Treated wood projects DO NOT have to have a finished coating. All plans and plan alternations must be attached to the article. Protect plans with a cover. If project is designed to be outside. Examples include: picnic tables, planters, outdoor furniture, etc.

FINISHING UP - UNIT 4

H 911 006 WOODWORKING ARTICLE Item made using skills learned in the Finishing It Up Project. Examples include: dovetailing, making a pen using lathe, overlays, using a router, etc. Item is required to be appropriately finished.

H 911 008 RECYCLED WOODWORKING DISPLAY Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 4 manual. Exhibit must include the woodworking plan and a minimum one-page report of how the design and engineering process was used to develop the woodworking plan.

1. State the problem (Why did you need this item?)
2. Generate possible solutions (How have others solved the problem? What other alternatives or designs were considered?)
3. Select a solution (How does your solution compare on the basis of cost, availability, and functionality?)
4. Build the item (What was your woodworking plan, and what processes did you use to build your item?)
5. Reason for article finish (What type of finish, how did you finish, or why you chose this finish?)
6. Evaluate (How does your item solve the original need?)
7. Present results (How would you do this better next time?)

***H 911 010 CAREERS INTERVIEW** Interview someone who is working in the field of woodworking and research that career. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be 3 to 5

pages, double spaced, 12-point font, and 1" margins. Multimedia reports should be between 3 to 5 minutes in length.
PREMIUMS: Purple $2.00; Blue $1.50; Red $1.20; White $0.85