SECTION X – SCIENCE, ENGINEERING, & TECHNOLOGY

GENERAL INFORMATION

A. 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 exhibit may be identified if the entry tag is separated from the exhibit.
B. Each individual is limited to one exhibit per class for the State Fair. All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.
C. Several classes require a display board which should be a height of 24 inches and not to exceed ¼" in thickness. A height of 23 7/8" is acceptable to allow for the saw kerf (width) if two 24 inch boards are cut from one end of a 4'x 8' sheet of plywood. Nothing should be mounted within ¾" of the top or bottom of the board. (Example: Woodworking and Electricity)
D. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
E. Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit.
F. Demonstration boards should include an overall title for the display, plus other necessary labeling.
G. 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.
H. Premier 4-H Science Award is available in this area. Please see General Rules for more details.

Dept. H – Entomology

General Information:

- The Entomology project levels 1-3 increase in difficulty. A youth should advance to the next level within three years. **Youth should not enroll in more than one level at a time.** When enrolling, choose **one** appropriate level.
- Specimens in display collections should be mounted properly and labeled with location, the date and location of collection, name of collector, and Order name. Follow mounting and labeling instructions in the Nebraska 4-H Entomology Manual.
- Boxes to be not more than 12" high X 18" wide, and landscape orientation so they fit in display racks. Purchase of commercially-made boxes is allowed. All specimens must be from the collector.

Division 800 – Entomology

sf Class 1 **Entomology Display, First-Year Project** – Collection to consist of 25 or more different kinds (species) of insects representing at least 6 orders. Limit of one box.

sf Class 2 **Entomology Display, Second Year Project –** Collection to consist of a minimum of 50 kinds (species) of insects representing at least 8 orders. Replace damaged or poorly mounted specimens. About 25 species should be from after July 1 of previous year. Limit 2 boxes.

sf Class 3 **Entomology Display, Third –Year or More Project –** Collection to consist of a minimum of 75 kinds (species) of insects representing at least 10 orders. Replace damaged or poorly mounted specimens. About 25 species should be from after July 1 of previous year. Limit of 3 boxes.

sf Class 4 **Special Interest Display –** Educational display developed according to individual interests and abilities. Ex: a collection from a specific insect group (butterflies, grasshoppers, etc.) or subject (pests of corn, aquatic insects, insect mimicry, etc.). Other displays include a research project with a report, a journal of an entomological activity, a poster display, an insect scrapbook, or artwork. Research project reports should discuss methods, results, and what was learned. Poster displays should be no larger than 22" x 28". Three-dimensional displays such as artwork, models, and dioramas are restricted to a base area no larger than 22”x28” and a height of no more than 24”. Artwork should include brief information about the work.

sf Class 5 **Insect Habitats** – Habitats consist of any hand-crafted objects, made of natural or artificial materials, placed outdoors, which promote or conserve insects in the environment. Insects may include bee pollinators, butterflies, beneficial insects, etc. A one-page report must accompany the exhibit.

sf Class 6 **Macrophotography** – Subjects should be insects, spiders, or other arthropods, or any nests, webs or constructions they make. All exhibits prints should be 8 ½ “x 11” and mounted on rigid, black 11” x 14” poster or matt board. Either orientation is acceptable. No frames please. A short caption explaining the subject, printed on white paper, should be glued below the print.

Dept. H – Veterinary Science

The purpose of the Veterinary Science display is to inform the public regarding a common health problem of animals or a veterinary principle. Do not confuse veterinary science exhibit topics with animal husbandry or production topics.

- A Veterinary Science exhibit may consist of a poster, notebook or a display. The exhibit may represent material from any of the Veterinary Science projects including entry level exhibits from Unit I.

- If photographs are to be part of the exhibit, remember that they will be viewed by the public. Make sure that the photographs are in good taste and will not be offensive to anyone. Graphic photographs of excessive bleeding, trauma or painful procedures are not appropriate. For exhibits related to veterinary surgical procedures, aseptic techniques need to be shown, for example, use of drapes, use of sterile procedures, wearing of gloves, and other appropriate veterinary medical practices.
- All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair.
- Premier 4-H Science Award is available in this area. Please see General Rules for more details.
- **Veterinary Science Posters:** This exhibit presents the viewer with a design that is simple and direct, unlike a display that usually presents more information. A poster should not exceed 22" x 28" and may be either vertical or horizontal.
- **Veterinary Science Displays:** A display may include but is not limited to: a 3-dimensional exhibit, a scale model, the actual product (for example: skeleton; teeth; samples of leather, fur, or dried skin damaged by disease or parasites) or a notebook. A display is not a poster. A display may be mounted on poster board not to exceed 22" x 28" or on $^{1}/_{4}$" plywood or equivalent that does not exceed 24" high or 32" wide or in a three ring binder or another bound notebook format.
- **Appropriate Veterinary Science Topics:**
    - Maintaining health
    - Specific disease information
    - Photographic display of normal and abnormal characteristics of animals
    - Animal health or safety
    - Public health or safety
    - Proper animal management to ensure food safety & quality
    - Efficient and safe livestock working facilities
    - Or a topic of the exhibitors choosing related to veterinary medicine or veterinary science

**Remember, since these are science displays, all references and information needs to be properly cited. Proper sources include but are not limited to: Professional journals and publications, professional AVMA accredited websites, interviews with Veterinarians and excerpts from Veterinary Educational Literature

Division 840 – Veterinary Science

sf Class 1 **Veterinary Science Large Animal Poster of Display**

sf Class 2 **Veterinary Science Small Animal/Pet Poster or Display**

Class 3 **Other Veterinary Science Exhibit –** can be a notebook, multi-media presentation or video detailing your experience raising an animal.

Class 4 **First Aid Kit for Animals –** put together the supplies needed for the first aid of a specific animal species (ex. dog, horse), container should be sized appropriately and protect contents, include a list of the supplies in the box, be prepared to discuss the correct use of the supplies.

<u>The following will be automatically disqualified:</u>

1. Veterinary prescribed medications. (If the kit's purpose is to provide medication for an animal with special needs, explain in the written description and inventory, but remove the medication.)
2. Materials with expiration dates on or before the judging date. (This includes sterile items, non-prescription medications, ointments, salves, etc. Articles dated month and year only, expire on the last day of the month.)
3. Any controlled substance.

Dept. H – Engineering

General Information:

- 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 exhibit may be identified if the entry tag is separated from the exhibit.
- Several classes require a display board which should be a height of 24" and not to exceed ¼"in thickness. A height of 23 $^{7}/_{8}$" is acceptable to allow for the saw kerf (width) if two 24" boards are cut from one end of 4'x8' sheet plywood. Nothing should be mounted within ¾" to the top or bottom of the board (Woodworking & Electricity)
- Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.
- Demonstration boards should include on overall title for the display, plus other necessary labeling.

- All reports should be clearly written or typed and enclosed in a clear, plastic cover. The reports should be attached securely to the display.

AEROSPACE

General Information:

A. Aerospace 1 is suitable for 5-8 year olds. The Aerospace project levels 1-4 increase in difficulty. A youth should advance to the next level within three years. **Youth should not enroll in more than one level at a time.** When enrolling, choose **one** appropriate level.

Dept. H – Aerospace

Division 850 – Aerospace

- **Rockets** must be supported substantially to protect the rocket from breakage. Rockets are to be mounted on a base that has dimensions equal or less than 12" x 12" and the base should be $^3/_4$" thick. No metal bases. If the rocket fins extend beyond the edges of the required base (12" x 12"), then construct a base that is large enough to protect the fins. The base size is dictated by the size of the rocket fins. The rockets must be mounted vertically. Please do not attach sideboards or backdrops to the displays. In addition, a used engine or length of dowel pin is to be glued and/or screwed into the board and extended up into the rockets engine mount to give added stability. Rockets must be equipped as prepared for launching, with wadding and parachute or other recovery system. Rockets entered with live engines, wrong base size or sideboards will be disqualified.
- **The report** must include:
  1.Rocket specification
  2.A flight record for each launching (weather, distance, flight, and height)
  3.Number of launchings
  4.Flight pictures.
- The flight record should describe engine used, what the rocket did in flight and recovery success. Points will not be deducted for launching, flight or recovery failures described. This includes any damage that may show on the rocket. Judging is based upon display appearance, rocket appearance, workmanship, design or capabilities for flight, and number of times launched.
- Three launches are required to earn the 25 launch points given on the score sheets. Only actual launches count, misfires will not count towards one of the required three launches.
- Complete factory assembled rockets (i.e., plastic fins) will not be accepted.
- For self-designed rockets only, please include digital recorded copy of one flight. In the documentation, please include a description of stability testing before the rocket was flown.

Aerospace 1 – Pre-Flight

Class 1 **Rocket –** Any Skill Level 1 Rocket with wooden fins

Class 2 **Space Station –** Draw a design of a Space Station of the future. Describe how scientists would use the station. Notebook or poster (14"x22").

Class 3 **Display –** Educational notebook, display, collection of materials that relate to aerospace. Include 8 1/2"x11" page describing exhibit and a summary of what you learned. Maximum size 28" x 22".

Class 4 **Poster –** 14"x 22"

Division 850 - Aerospace

Aerospace 2 - Lift Off

sf Class 1 **Rocket –** Any Skill Level 2 Rocket with wooden fins painted by hand or air brush.

sf Class 2 **Display –** Display exemplifying one of the principles learned in the Lift Off project. Examples include, display of rocket parts and purpose, interview of someone in the aerospace field, or kite terminology. Display can be any size up to 28" by 22".

sf Class 3 **Rocket –** Any Skill Level 2 Rocket with wooden fins painted using commercial application, example: commercial spray paint

Aerospace 3 - Reaching New Heights

sf Class 4 **Rocket –** Any Skill Level 3 Rocket with wooden fins painted by hand or air brush.

sf Class 5 **Display –** Highlight one principle learned in Reaching New Heights. ex. airplane instrumentation, kite flying, or radio-controlled planes. Display can be any size up to 28" by 22".

sf **Class 6 Rocket** – Any Skill Level 3 Rocket with wooden fins painted using commercial application, example: commercial spray paint

Aerospace 4 - Pilot in Command

sf Class 7 **Rocket –** Any Skill Level 4 Rocket with wooden fins or any self-designed rocket

sf Class 8 **Display –** Display exemplifying one of the principles learned in the Pilot in Command Project. Examples: flying lessons or careers in aerospace. Display can be any size up to 28" by 22".

sf Class 20 **Careers Interview –** Interview someone who is working in the field of aerospace 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.

Dept. H – Computers

- The Computer project levels 1-3 increase in difficulty. A youth should advance to the next level within three years. **Youth should not enroll in more than one level at a time.** When enrolling, choose **one** appropriate level.

Division 860 – Computers

Computer Mysteries Unit 1

Class 13 **Commercial Software Utilization –** Exhibit will be a notebook of the documentation and printouts using each section of the commercial program. (i.e. Microsoft Works; Word Processor, database; spreadsheet). The notebook will consist of the following areas: 1) cover page, 2) print outs of each of the sections offered by the software and 3) a paragraph explaining how each section can be used.

Class 14 **Computer Art Poster (Black & White) –** Exhibit should be created on at least an 8.5"x11" page using a commercially available graphics software package and color printer/plotter. No theme required.

Class 15 **Computer Art Poster (Color) –** Exhibit should be created on at least 8.5"x11" page using a commercially available graphics software package and color printer/plotter. No theme required.

Class 16 **Computer Designed Greeting Cards –** Exhibit will consist of six (6) greeting cards each for a different occasion/holiday. Cards should be created on an 8.5"x11" page using commercially available graphics program and either single color or color printer/plotter. The cards should vary in folds and design. Tell which software program was used. Pre-fabricated cards from commercially available card programs will NOT be accepted. No theme required. Put cards in some type of protective cover.

Class 17 **4-H Promotional Flier –** Create on 8.5"x11" page using commercially available software. Flier can be color or black and white. Fliers can be a whole page or folded. Put in protective cover.

Class 18 **Utilizing the Internet –** Exhibit will be a notebook of web sites used to plan a real or fictitious vacation. Notebook will consist of at least (4) different web sites illustrating the following: 1) airfare and/or directions to drive to destination 2) hotels/motels in the area 3) things to do (i.e. baseball game, Disney Word, amusement park) and 4) a maximum one-page text telling the steps taken to plan the vacation. List web sites for each site and tell how you may be able to use the web to plan or research other things in the future.

Computer Mysteries Unit 2

sf Class 1 **Computer Application–** 4-H exhibitor should use computer application to create a graphic notebook utilizing computer technology. 4-H'er may create any of the following: greeting card (3 different cards should as a birthday, wedding, anniversary, sympathy get well or other); a business card (2 cards for 2 difference individuals and businesses); menu (minimum of 2 pages including short description of foods and pricing); cd cover (front and back0; book layout (1 book); promotional flyer A(2 flyers promoting 2 different events); newsletter (minimum 2 pages); or other: examples such as precision farming or family business logo etc.; This exhibit consists of a notebook (8.5x11") which should include:

1. A detailed report describing:
   (a) The task to be completed

   (b) The computer application software required to complete the task

   (c) Specific features of the computer application software necessary for completing the task

2. A print out of your project. Project may be in color or black and white.

sf Class 2 **Produce a Computer Slideshow Presentation –** Using presentation software. All county fair projects with a printout should be saved on a CD Rom to be submitted for county fair. Slideshow should include a minimum of 10 slides and no more than 25. Incorporate appropriate slide layouts, graphics and animations. Each slide should include notes for a presenter. All slideshows must be up loaded.

Class 3 **Teach an Adult –** The 4-H exhibitor writes a report between1 and 3 pages describing a situation in which he or she has taught an adult(s) a computer skill. The report should include pictures of the 4-H'er working with the adult(s). The report should be in a clear plastic cover.

Computer Mysteries Unit 3

sf Class 4 **Produce an Audio/Video Computer Presentation** – Using presentation software to design a multimedia computer presentation on one topic related to youth. The presentation should be 2 to 5 minutes, use appropriate graphics, sound and either a video clip, animation or voice over and/or original video clip. The presentation must be able to be played and viewed on a PC using Windows Media Player, Real Player, iTunes or QuickTime Player.

sf Class 5 **Know How Know Now Computer Presentation** – design a fully automated 2 - 5 minute 4-H "how to" video. Submissions should incorporate a picture or video of the 4-Her, as well as their name (first name only), age(as of January 1 of the current year), years in 4-H, and their personal interests or hobbies. Videos should be designed for web viewing. Any of the following formats will be accepted: .mpeg, .rm, .wmv, .mp4, .ov, .ppt, or .avi.

sf Class 6 **Build, Create a Website/Blog or App –** Design a simple Web site/blog or app for providing information about a topic related to youth using either software programs such as an HTML editor like Microsoft's FrontPage or Macromedia's Dreamweaver, and image editor like IrfanView or GIMP OR online using a WIKI such as Google Sites. If the Web site/Blog or App isn't live include all files comprising the Web site/Blog or App should be submitted on a CD-ROM in a plastic case along with the explanation of why the site was created. If developed using a WIKI or other online tool include a link to the website in the explanation of why the site was created.

Sf Class 7 3D Printing – 3D printing uses plastic or other materials to build a e dimensional object from a digital design. Youth may use original designs or someone else's they have re-designed in a unique way. Exhibits will be judged based on the complexity of the design and shape. 3D printing will include a notebook with the following:

a. Software used to create 3D design.
b. Design or, if using a re-design, the original design and the youth's design with changes.
c. Orientation on how the object was printed.

Suggested ideas: 1) 3D PROTOTYPES: 3D objects printed as part of the design process for robot or other engineering project or cookie cutter, be creative. Must include statement of what design question the prototype was supposed to answer and what was learned from the prototype. 2) 3D UNIQUE OBJECT: 3D objects printed for their own sake. May be an art design, tool, or other object.

sf Class 10 **Careers Interview –** Interview someone who is working in the field of computers 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.

Class 11 **Build Your Own Computer Notebook –** (one component only) - Exhibit will be a notebook (8.5x11") that includes:

(1) a cover page,

(2) detailed report (2-3 pages) describing a specific computer component,

(a) describe the component's purpose

(b) how it is used,

(c) the location

(d) why components were chosen

(e) cost comparison of component from more than one source, and

(3) pictures and supporting materials.

Dept. H – Robotics

General Information:

Youth enrolled in Virtual Robotics, Junk Drawer Robotics (Levels 1,2, or 3). Robotics Platforms or GEAR TECH 21 may exhibit in any class within this division.

Team Entries: To qualify for entry at the Nebraska State Fair team materials entered in robotics classes that are clearly the work of a team instead of an individual must have at least 505 of all team members enrolled in 4-H. Additionally all enrolled 4-H members on the team should complete and attach an entry tag to the materials. A supplemental page documenting the individual contributions to the project should be included. The entry will be judged as a team, with all team members receiving the same ribbon placing.

Creating a video of your robot in action would be helpful for the judges but is not mandatory present as a CD Rom with your robot entry.

Division 861 – Robotics

Robotics Explorer Unit 1

sf Class 1 **Robotics Poster –** Create a poster (14" X 22") communicating a robotics theme such as "Robot or Not", "Pseudocode", "Real World Robots", "Careers in Robots" or "Autonomous Robotics", "Precision Agriculture" or a robotic topic of interest to the 4-H'er.

sf Class 2 **Robotics Notebook –** Explore a robotics topic in-depth and present your findings in a notebook. Documentation should include any designs, research, notes, pseudocode, data tables or other evidence of the 4-H'ers learning experience. The notebook should contain at least three pages. Topics could include a programming challenge, a programming skill, calibration, sensor exploration, or any of the topics suggested in Class 1.

sf Class 3 **Robotics Video –** This class should be displayed in a notebook. The notebook should include a video clip on a CD/DVD that demonstrates the robot performing the programmed function. Include your pseudo code and screenshots of the actual code with a written description of the icon/command functions.

sf Class 4 **Robotics/Careers Interview –** Interview someone who is working in the field of robotics and research the career in robotics. 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.

Robotics –Robotic Probe-Unit 2

sf Class 5 **Robotics Sensor Notebook** – Write pseudo code which includes at least one sensor activity. Include the code written and explain the code function.

[sf] Class 6 **Build a Robot** (may use kit) – Include a robot and notebook including the pseudo codes for at least one program you have written for the robot, the robots purpose, and any challenges or changes you would make in the robot design or programming.

[sf] Class 7 **Kit Labeled Robot** (cannot be programmed) – This class is intended for explorations of robotic components such as arms or vehicles OR educational kits marketed as robots that do not have the ability to be programmed to "sense, plan and act." The exhibit should include a project the youth has constructed, a description of what it does and an explanation of how it is similar to and different from a robot.

Class 8 **Life Skills Notebook –** Using the Life Skills Model (available through your local extension office), develop a notebook that explains which life skills you developed while enrolled in the robotics project and how they will influence you in the future.

Dept. H – Electricity

- The Electricity project levels 1-4 increase in difficulty. A youth should advance to the next level within three years. **Youth should not enroll in more than one level at a time.** When enrolling, choose **one** appropriate level.

Division 870 - Electricity

Magic of Electricity Unit 1

Class 11 **Demonstration Board –** Exhibit is to be prepared on a board that is 1/4" thick and 24" high x32" wide. Exhibit may include a simple switch, simple fuse, and/or conductors/non-conductors. Be sure to include the appropriate labeling.

Class 12 **A Poster –** that describes and explains any one of these concepts related to electricity: electrical materials, appreciation of electricity, open and closed switches, and conductivity of materials.

(change to: should exemplify one of the lessons learned in the Magic of Electricity project. Poster can be any size up to 28" x 22")

Class 13 **Design a Project –** that demonstrates the capacity for conductivity of materials.

Investigating Electricity Unit 2

Class 14 **Build a Circuit Board –** Exhibit should be a series or parallel circuit.

Class 15 **Build a Burglar Alarm**

Class 16 **Build a Rocket Launcher**

Class 17 **Telegraph Station –** exhibit must include one telegraph key and one telegraph sounder. The telegraph must be attached to a wooden base and wired to a battery to demonstrate its operation. Label the display and the major components.

Class 18 **Electric Toy Motors –** working model of an electric motor. The motor is to be of the 4-H'ers designed should have the major parts labeled. A short, written description of how the motor works is to be included in a clear protective cover. No pre-manufactured electric motors will be accepted.

Class 19 **Toy Electric Motor Converted to DC or AC Generator –** exhibit is to consist of a toy electric motor shown in Unit II, converted to use as a DC or AC generator. Generator should be exhibited on base including a battery and a light bulb or Galvanism to demonstrate its operation. Title the exhibit and label the major parts.

Class 20 **A Poster –** describe and explain the purpose of the National Electrical Code.

Class 21 **A Poster –** illustrate how an electrical usage meter or a main service panel for a building works.

(Only have one poster & change to should exemplify one of the lessons learned in the Investigating Electricity project)

Wired for Power-Unit 3

sf Class 1 **Electrical Tool/Supply Kit –** Create an electrical supply kit to be used for basic electrical repair around the house. Include a brief description of each item and its use. Container should be appropriate to hold items.

sf Class 2 **Lighting Comparison –** Display studying the efficiency of various lighting (incandescent, fluorescent, halogen, Light Emitting Diodes, etc.). Exhibit could be a poster, display or an actual item.

sf Class 3 **Electrical Display/Item –** Show an application of one of the concepts learned in the Wired for Power project. Examples include: re-wiring or building a lamp, re-wiring or making a heavy duty extension cord or developing an electrical diagram of a house. Exhibit could be a poster display, or an actual item.

sf Class 4 **Poster –** should exemplify one of the lessons learned in the Wired for Power Project. Posters can be any size up to 28" by 22".

<u>Entering Electronics-Unit 4</u>

sf Class 5 **Electrical/Electronic Part Identification –** Display different parts used for electrical/ electronic work. Exhibit should show the part (either picture or actual item) and give a brief description, including symbol of each part and its function. Display should include a minimum of 10 different parts.

sf Class 6 **Electronic Display –** Show an application of one of the concepts learned in Unit 4. Examples: components of an electronic device (refer to p. 35 of the Electronic manual).

sf Class 7 **Electronic Project –** Exhibit an electronic item designed by the 4-H'er or from a manufactured kit that shows the electronic expertise of the 4-H'er. Examples include: a radio, a computer or a volt meter.

sf Class 8 **Poster –** should exemplify one of the lessons learned in Unit 4. Posters can be any size up to 28" by 22".

Class 9 **Electric Fencing System –** this display may show different components such as grounding, insulator, wire, wire splices, lightning protection, how an energizer works, complete system, etc. Use needed labeling, short written description or explanations, drawings, etc. to explain what you are showing, mount on ¼ thick, 24" high, and 32" wide (22" wide if extra space is not required)

sf Class 10 **Careers Interview –** Interview someone who is working in the field of electricity 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.

Dept. H – GPS

Division 880 – Geospatial

General Information:

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

sf Class 1 **Poster-** (not to exceed 14" x 22") communicating a GPS theme ex. 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.

sf Class 2 **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".

sf Class 3 **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.

sf Class 4 **Geocache –** Assemble a themed geocache. Each geocache should be a water-tight container. It should include a log book 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.

[sf] Class 5 **GIS Map –** Create a GIS map with at least three data layers. The GIS should include both vector and roster data. Data may be obtained by using a GPS-enabled device, downloading data from a reputable web site or digitizing. The GIS should have a theme/purpose and include a title, north arrow, legend, labels, scale bar and source. Maps may be of any subject of interest to the 4-H'ers. Include a 1-3 page report on why you chose the subject and maps(s), how you created the maps(s) and the source of your data (use reliable sources such as the US Center for Disease Control or the US Census Bureau). This project could include hurricane tracking maps. The map should appear similar to the National Oceanic and Atmospheric Administration (NOAA) (http://www.nhc.noaa.gov/). Poster size should not exceed 22" x 30". Place report in plastic cover or notebook attached to the poster.

[sf] Class 6 **GIS Thematic Map** – Using any GIS software, create a thematic map. Thematic maps can utilize any subject of interest to the 4-Her. Ex. Amelia Earhart's journey, Sir Francis Drake's voyage, population density, water usage, or 4-H projects in Nebraska. Create a GIS Map using data from books and/or internet. Use reliable date, ex. U.S. Center for Disease Control or U.S. Census Bureau. Map any size 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.

[sf] Class 7 **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 to http://4hhistorypreservation.com/History_Map/. For a step by step video on nominating a point, please go to this link: http://tinyurl.nominate4h. Write a brief description of historical significance of 4-H place or person. (a minimum of one paragraph)

[sf] Class 10 **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.

Dept. H – Small Engines

Division 890 – Small Engines

Crank It Up Unit 1 (No State Fair)

Class 1 **Poster –** of external parts of engines.

Class 2 **Poster –** of tools for maintaining and repairing small engines.

Class 3 **Poster –** describing a cooling system.

Class 4 **Poster –** of Safety Rules for small engines.

Warm It Up Unit 2 (No State Fair)

Class 5 **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.

Class 6 **Complete Small Engines –** are to have been reconditioned, repaired or overhauled during a 4-H Small Engine project. A report-listing source of engine, use of engine, repair parts list and cost is to be included in a notebook. Gas tanks are to be EMPTY when entered at the fair. Engines will be fueled and started as part of the judging criteria.

All engines with cast iron flywheels should be mounted on a solid wood base. These engines will run smoothly without attachments on the PTO shaft.

Complete lawn mower exhibits are recommended where the engine is equipped with an aluminum flywheel because the blade is important to the smooth operation of the engine. Engines must be equipped with a throttle control.

Class 7 **Small Engine Display –** show parts or systems of a small engine, cutaways of engine or systems, worn or broken parts, step by step procedure of how to perform repairs or maintenance, etc. Use needed labeling, short written description or explanations, drawings, etc., to explain what you are showing. Mount on $^{1}/_{4}$" thick board, 24"x 32" wide.

Tune It Up Unit 3 (No State Fair)

Class 8 **Complete Small Engines –** that have been reconditioned, repaired or overhauled in 4-H Small Engine project. A report-listing source of engine, use of engine, repair parts list and cost is to be included and protected in a notebook type of cover. Gas tanks are to be EMPTY when entered at the fair. Engines may be fueled and started as part of the judging criteria. All engines should be mounted on a base at least $^{3}/_{4}$" plywood. Complete lawn mower exhibits are recommended where the engine is equipped with an aluminum flywheel because the blade is important to the smooth operation of the engine. Engines must be equipped with a throttle control.

Class 9 **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. Must include a report detailing: the process of building/rebuilding engine and how/where engine will be utilized (i.e. lawn mower, weed eater, snow blower, etc.)

Division 891 – Restored Vehicle

General Information:

- Not State Fair Eligible
- Include an item description on your Fair Entry Form.
- Large vehicles will be displayed outside.

Class 1 **Restored Vehicle** – scoring: 30pts-General Appearance, 25pts-Written Report, 25pts-Operation, 20pts-Innovation in restoring. A notebook should include:

1. vehicle background and source
2. repairs and parts needed
3. expenses
4. time involved
5. descriptions of special processes used
6. photographs of the item at different stages and youth in action.

Class 2 **Restoration Display** – detailing a specific process used to restore a vehicle. Examples: painting process, fiberglass repair, window replacement, etc.

Class 3 **Bicycle Demonstration Display--** to be exhibited by an individual. Exhibit may include: parts of a bicycle system, worn or broken parts, a step by step procedure of how some repair or service is performed. A notebook describing what was done and what was learned including photographs should be included. Actual parts or cut-a ways of parts are recommended. The exhibit is to be prepared on a 24" high x32" wide x 1/4" thick board.

Class 4 **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 x$^1/_4$" thick board.

Dept. H – 4 Wheelin'

Division 895 – 4 Wheelin' (No State Fair)

Class 1 **Poster** –Poster to show something learned about physics or safety from the 4 Wheelin' activities.

Class 2 **Toolbox** – put together using guidelines from the 4 Wheelin' manual. Include a description of the kit's purpose and a list of individual contents.

Class 3 **4 Wheelin' Vehicle** – The vehicle needs to be mounted on a base that is equal to or less than 12" by 12" and the base should be ¾" thick. Please make your vehicle stable. Please do not attach sideboards or backdrops to the display. A report, protected with a clear, plastic cover, needs to be included with the following information: 1) vehicle specification, 2) results of driving, pulling and climbing tests, 3) track diagram, 4) pictures.

Class 4 **Track or Course Design Drawing** – Scale drawing to actual track or course design. Indicate the direction the course is used with arrows. Display on a 14" x 22" poster.

Dept. H – Power of Wind

Division 900 – Power of Wind

sf Class 1 **Engineering Notebook –** your engineering notebook may include sketches of designs, notes of engineering questions you have, or answers to questions posed within the project manual, pictures as you complete exercises within this project, or big ideas you have while participating in this project. The notebook submitted in this class should be a working engineering notebook, **not a scrapbook.** Please include your name, county, and age on the front cover.

sf Class 2 **Wind Poster –** Poster should exemplify one of the lessons learned in the Power of Wind project. Posters can be any size up to 14" by 22".

sf Class 3 **Mini Turbine Blade Energy Display –** Develop a pinwheel display that demonstrates the working power of wind. Follow guidelines on page 18 and 19 of your manual. Display should include a notebook description of the effectiveness of at least three different designs or materials. Please do not include pennies with your display.

sf Class 4 **Wind Art or Literature Written Piece –** Item should illustrate or represent wind turbines, wind power, or something from the power of wind curriculum (example: a pinwheel) or item may be original story or poem written by the exhibitor about wind

sf Class 5 **Wind as Energy Display –** Item should be the original design of the 4-H'er. 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.

sf Class 6 **Careers Interview –** Interview someone who is working in the field of wind and research the career in wind. 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.

Dept. H – Woodworking

General Information:

- The Woodworking project levels 1-4 increase in difficulty. A youth should advance to the next level within three years. **Youth should not enroll in more than one level at a time.** When enrolling, choose **one** appropriate age level.
- The ability to build objects as designed by another person is an important life skill. Professional woodworkers are often hired to build objects to exacting specifications as laid out in a written plan.
- Requirements: All articles exhibited must include a plan (with drawings or sketch or blueprint) 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. Part of the score depends on how well the project matches the plans. If 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.

Division 911 – Woodworking

MEASURING UP –UNIT 1 (No State Fair)

Class 5 **Build a Flower Box –** include your plan

Class 6 **Build a Letter Holder –** include your plan

Class 7 **Build a Picture Frame –** include your plan

MAKING THE CUT –UNIT 2 (No State Fair)

Class 8 **Display of Wood Samples –** display at least 6 different wood samples, attach securely to a ¼" or 3/8" board, label each sample with tree species and type of wood (hard or soft),

Class 9 **Woodworking Tools Poster –** Create a poster showing at least 6 tools used in woodworking. Label each tools with its name and general use.

Class 11 **Build a Napkin Holder –** include your plan

Class 12 **Build a Birdhouse –** include your plan

Class 13 **Build a Foot Stool –** include your plan

Class 14 **Build a Tool Box or a Sawhorse –** include your plan

Class 15 **Build an Article –** using at least 2 different **hand** tools, include your plan and what tools you used.

NAILING IT TOGETHER-UNIT 3

sf Class 1 **Woodworking Article –** Item made using skills learned in the Nailing it Together manual. Examples include: bookcase, coffee table or end table.

sf Class 2 **Woodworking Display –** Display exemplifying one of the principles learned in the Nailing it Together Project. Examples include: measuring angles, wood lamination and joint types.

sf Class 3 **Recycled Woodworking Display** – Article made from recycled, reclaimed or composite wood. Article must be sanded and sealed and utilize one or more woodworking techniques from pg 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) Evaluate (How does your item solve the original need?)
6) Present results (How would you do this better next time?)

FINISHING UP-UNIT 4

sf Class 4 **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.

sf Class 5 **Woodworking –** Display exemplifying one of the principles learned in the Finishing It Up Project. Examples include: career opportunities, types of finishes, or dovetailing.

sf Class 6 **Recycled Woodworking Display** – Article made from recycled, reclaimed or composite wood. Article must be sanded and sealed and utilize one or more woodworking techniques from pg 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) Evaluate (How does your item solve the original need?)
6) Present results (How would you do this better next time?)

sf Class 10 **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.

Dept. H – Welding

General Information:

- 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 the display board so it can be hung like a picture frame.

Division 920

ARCS & SPARKS

sf Class 1 **Welding Joints –** a display of one butt, one lap and one fillet weld.

sf Class 2 **Position Welds –** a display showing three beads welded in the vertical down, horizontal and overhead positions.

sf Class 3 **Welding Article –** any shop article or piece of furniture where welding is used in the construction. All plans and bill of materials must be attached to the article. Protect plans with a cover.

sf Class 4 **Careers Interview** – Interview someone who is working in the field of welding 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.

4-H Welding Project Tips and Suggestions

Class 1

1. All welds should be made with the same electrode/wire/rod size and number.
2. Welds should be made only on one side of metal so penetration can be judged.
3. 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.
4. It is suggested that all welds be of 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.
5. <u>Stick welding -</u> Suggested coupon thickness- ¼" if using $^{1}/_{8}$" rod, Suggested rod-AC and DC straight or reverse polarity- first E-7014, second E-6013

6. MIG welding - Suggested coupon thickness--¼" if using .035 wire and $^{1}/_{8}$" if using .023 wire
7. Oxy-Acetylene - Suggested coupon thickness– $^{1}/_{8}$". Suggested rod– $^{1}/_{8}$" mild steel rod

Class 2

1. 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" 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.
2. 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**.**

Class 3

1. 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 including steel, electrodes, paint, wheels, etc.

Dept. H – Rope

General Information:

- Each rope exhibit must be mounted on a board $^{3}/_{8}$" thick x 24" high x 32" wide.
- For items on demo-boards use instructions found in the 4-H Rope Manual, EC70179.
- Mount the knots in the same position as shown in the 4-H Rope Manual.
- Either manila or synthetic rope may be used.
- When halters are exhibited, the tie rope, plus a required second piece of rope must show any three of the following items:
    1. End whipping
    2. Eye splice
    3. Crown splice,
    4. Rosebud knot
    5. Matthew Walker knot
    6. Diamond knot
- Not State Eligible

Division 990 – Rope

Class 1 **Rope Display –** at least 10 and not more than 12 knots, hitches and splices (include two splices) made of 3/8" rope.

Class 2 **Single Loop or Double Loop Halter –** cattle and horse use 5/8" or ¾" rope. See above requirements for halter exhibits.

Class 3 **Single Loop or Double Loop Halter –** sheep and goats use 3/8" rope. See above requirements for halter exhibits.

Dept. H – Leather

General Rules

- Leather garments(chaps/chinks/vest) can be entered under Clothing – STEAM 3 Class 11 Fashion Show – STEAM 3 Show Class 40.
- Not State Eligible

Division 991 – Leather

Class 1 **Tooled**

Class 2 **Stamped**

Class 3 **Non-Tooled**

Class 4 **Tooled & Stamped**

Class 5 **Other**