

Engineering Science & Technology Department H

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General Information

- A. The name and county of each exhibitor should appear separately on the back of each board, poster or articles 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.
- C. Several classes require a display board which should be a height of 24 inches and not to exceed 1/4" in thickness. A height of 23 7/8" is acceptable to allow for the saw kerf if two 24 inch boards are cut from one end of a 4' X 8' sheet of plywood. Nothing should be mounted within 3/4" of the top or bottom of the board.
- 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. All reports should be clearly written or typed and enclosed in a clear, plastic cover. The reports should be attached securely to the display.

Division H860, Computers

Limit of four (4) exhibits per exhibitor.

Computer Mysteries - Unit 1

H860004 Computer Level 1. You may choose from any of the following exhibits: Cards for All Occasions, Graphic Illustration, Computer Presentation, Photograph Series, Scrapbook/Poster or Storybook. You need to follow the directions listed in the Computer Level I-Booting Up: Interacting with computers listed on page 50.

Computer Mysteries - Unit 2

H860001* **Computer Application Demonstration.** 4-H exhibitor demonstrates how to accomplish a task using a computer application software such as a spreadsheet, database, publishing, graphic design, accounting or precision farming program. This exhibit consists of a notebook (8.5 x 11 inches) which should include a (1) cover page (2) a detailed report describing: (a) the task to be completed (b) the computer application software required to complete the task and (c) specific features of the computer application software necessary for completing the task and (d) other tasks that can be accomplished using the computer application software and (3) print out of your project. Examples: design a logo for your school; enhance a digital image for a newspaper story; manage a checking account; create a poster to publicize an event; or to design scrapbook pages, or other.

H860002* **Produce a Computer Slideshow Presentation** – Using presentation software like Microsoft PowerPoint and following the *Checklist for Creating Your Next PowerPoint Presentation* located at <http://cit.information.unl.edu/info0806.htm> the 4-H exhibitor develops a slideshow about a topic related to youth. The 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. The exhibit includes a copy of the presentation saved to a CD-ROM along with a printout of the notes pages in a clear plastic cover. Slide presentation should relate to one topic.

H860003* **Teach an Adult** – The 4-H exhibitor writes a report between 1 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-Her working with an adult(s) The report should be in a clear plastic cover.

Computer Mysteries - Unit 3

H860005* **Produce an Audio/Video Computer Presentation** – Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. The presentation should contain a minimum of 10 computer screens and no more than 25 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.

H860006* **Build a Web Site** – Design a simple Web site for providing information about a topic related to youth using multiple computer application software programs such as an HTML editor like Microsoft's FrontPage or Macromedia's Dreamweaver, and image editor like IrfanView or GIMP. All files comprising the Web site should be included on a CD-ROM and able to be viewed using both Internet Explorer and Mozilla. Exhibit CD in a plastic case.

H860007* **Build Your Own Computer (one component only)** – Exhibit will be a notebook (8.5 x 11 inches) that includes a (1) 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 of component from more than one source, and (3) pictures and supporting materials.

H860008* **Mapping a Historical Site Within Nebraska** - Using a global positioning system (GPS) device and a geographic information system (GIS) computer software application program like Arcview create an 8.5 x 11 inch map and pinpoint a historical site within Nebraska. Map should include title, base map, neat line, north arrow, and legend. Add 1-3 digital images of the historical site to the map and a text box that includes a brief explanation of the image and surrounding area, brief explanation of how photo was taken, camera, etc. Latitude and Longitude of the site, map datum used, position format used and a brief explanation of why you chose this site. Exhibit will include: two page report on map creation and the map itself enclosed in a clear plastic cover.

H860009* **Hurricane Tracking Map** – Exhibit will consist of a poster presentation using approved National Oceanic and Atmospheric Administration (NOAA) hurricane tracking maps. The maps can be of the Atlantic Ocean, the Pacific Ocean or the Gulf of Mexico. The tracking maps must have at least 1-3 hurricanes from the same hurricane season plotted on the map using different colors and different plotting shapes for each hurricane. The plotting point must be identified with a shape (dot, square, triangle, etc.) and must be connected by a line showing the progression of the storm. The plotting point will be every 12 or 24 hours with the date located to the right of the plot point. Hurricane data can be located at:

<http://www.underground.com/tropical/>. Poster size will be 14" x22" and include: (1) a title (include year of the hurricane season) (2) the name of the hurricane and (3) listed below the name of the hurricane in column format: the dates of the storm in sequential order, the plotted latitude and longitude at 12-24 hour intervals, the highest hurricane category, and the highest sustained winds. Please include the Title, Base map, Neat Line, North arrow and Legend.

H860010* **Hurricane Tracking Poster** - Hurricane Tracking Poster – Exhibit will consist of a poster presentation using the approved National Oceanic and Atmospheric Administration (NOAA) hurricane tracking maps. Go to the National Hurricane Center to print a hurricane tracking map at <http://2www.nhc.noaa.gov/>. Poster can be of the Eastern Atlantic, the Full Pacific or the Western Atlantic using different colors and different plotting shapes for each hurricane. The plotting point must be identified with a shape (dot, square, triangle, etc) and must be connected by a line showing the progression of the storm. Plot points every 12 – 24 hours. Hurricane data can be located at: <http://www.wunderground.com/tropical/>. Include title, name of hurricane, date hurricanes begins and ends, distance traveled, minimum and maximum wind speeds, types

of categories and latitude and longitude, etc.

H860011* **4-H Youth Favorite Places** – The 4-H exhibitor visits his or her favorite place in Nebraska. Using a Global Positioning Systems (GPS) receiver he/she records the latitude and longitude of his/her favorite place. The exhibitor also takes a digital picture of the favorite place. The exhibitor then uploads the data and picture to the 4-H Youth Favorite Places Web site at <http://www.youthfavoriteplaces.org/index.php>. Up to three sites can be included in the state fair exhibit which is to consist of a folder/notebook explaining the steps involved in entering the data to the 4-H Youth Favorite Places Web site. Fair exhibit will include: A folder/notebook including a report for each site visited and at least one and no more than five digital photos and captions of each site visited. The reports should explain how the 4-H'er participated in the national 4-H Youth Favorite Places project, recording the information and then uploading it to the Web site. Each report should include (1) the nearest city or town, (2) the county where the site is located, (3) the latitude and longitude of the favorite place, (4) an explanation of why this is their favorite place and why other people should visit the place and (5) list the steps for entering the data on the Web site for the national project. A printed copy of the Web site posting of each favorite place uploaded should also be included with the report in the folder. **NOTE:** 4-H exhibitor should choose a public location that others can visit; not their personal residence.

H860012* **GIS Thematic "Poster"Map** – Using any GIS software, create a thematic map. Thematic maps can utilize any subject of interest to the 4-Her. Maps could be of Amelia Earhart's journey, Sir Francis Drake's voyage, population density maps, water usage maps, or 4-H projects in Nebraska (examples). 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. Poster – 14"X 22", should include Title, Base map, Neat Line, North Arrow, and Legend. Identify the source of your information on the back of the poster.

H860013* **Write a Software Program** – This project allows a 4-Her to demonstrate his or her skills in writing a computer program using a common programming language. The program must demonstrate the use of data files and subroutines. It should demonstrate a high degree of organization and quality suitable for distribution to the general public. This exhibit consists of a notebook (8.5x11 inches) which should include these parts: (1) a cover page, (2) a report including: (a) what the software can do, (b) why you wrote the software, (c) what features are included in the software, (d) how you will use the program in the future. (3) a flow chart in block diagram form and (4) an example of input and output.

ELECTRICITY

General Rules

- A. Limit of four (4) exhibits per exhibitor per project in this Division
- B. 4-H electricity related posters (Classes H870001 and H870002) are to be entered in the engineering Division for exhibiting and judging. Refer to Division B152. Posters for general requirements.
- C. You must be in your third year of an electricity project to exhibit in electricity classes at state fair.

Division H870, Electricity

Electricity Unit 1 - For classes H870100- H870103 please refer to 4-H manual Unit 1-"Magic of Electricity".

- H870100 Unit 1 Bright Lights: Create your own flash light using items found around your house. Flash lights should be made out of items that could be recycled or reused. No kits please
- H870101 Unit 1 Control the Flow: Make a switch. Use the following items: D cell battery, battery holder, insulated wire, 2 or 2.5 volt light bulb, bulb holder, paper clip, cardboard, and two brass paper fasteners to create a circuit that you can open and close.
- H870102 Unit 1 Conducting things: Make a circuit with a switch and a light bulb that can be used to test different household items for their ability to act as an insulator or conductor. You must find five

items that are conductors and five items that are insulators. Create a table that illustrates your results.

- H870103 Unit 1 Is There a Fork in the Road? Use the following items to construct a parallel and a series circuit display board. Items: D cell battery, battery holder, insulated wire, bulb holder and a 2 or 2.5 volt light bulb.

Electricity Unit 2 - For classes H870104- H870106 please refer to 4-H manual Unit 2 "Investigating Electricity"

- H870104 Unit 2 Case of the Switching Circuit: Use the following items: two D cell batteries, two battery holders, light bulb, bulb holder, a 3" x 6" piece of cardboard, six brass paper fasteners and approx. two feet of 24 gauge insulated wire to build a three way switch. Write a short essay or create a poster that illustrates how three way switches functions.
- H870105 Unit 2 Rocket Launcher: Construct a rocket launcher out of the following materials: a plastic pencil box that is at least 4" x 8", single pole switch, single throw switch, normally-open push button switch, 40 feet of 18 or 22 gauge stranded wire, 4 alligator clips, 2x 6 board 6" long, 1/8 inch diameter metal rod, rosin core solder, soldering iron or gun, wire stripper, small crescent wrench, pliers, small Phillips and straight blade screwdrivers, drill, 1/8 inch and 1/4 inch drill bits, rocket engine igniters, additional drill bits matched to holes for two switches. You must successfully build a rocket launcher and light two rocket igniters with your launcher. You DO NOT have to actually fire a rocket off of the launcher. Create a poster using photographs to show the "step by step process" you used to build your launcher
- H870106 Unit 2 Stop the Crime: Build an ALARM using the following materials: On-off push button switch, mercury switch, buzzer-vibrating or piezoelectric, 9-volt battery, 9-volt battery holder, 4" x4" x 1/8 inch Plexiglas board to mount circuit on; rosin core solder, soldering gun/iron, two feet of 22 gauge wire, wire strippers, hot glue sticks, hot glue gun and plastic box with a lid to mount your alarm circuit on. Create a poster using photographs to show the "step by Step process" you used to build your alarm.

Electricity Unit 3 – Wired for Power

- H870001* 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.
- H870002* 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.
- H870003* 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.
- H870004* Poster should exemplify one of the lessons learned in the Wired for Power Project. Posters can be any size up to 28" by 22".

Electronics Unit 4

- H870005* Electrical/Electronic Part Identification: Display different parts used for electrical/electronics 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.
- H870006* Electronic Display: Show an application of one of the concepts learned in the Electronics project. Examples include: components of a electronic device

- H870007* Electronic Project: Exhibit an electronic item designed by the 4-Her or form a manufactured kit that shows the electronic expertise of the 4-Her. Examples include: a radio, a computer, or a volt meter.
- H870008* Poster should exemplify one of the lessons learned in the Entering Electronics Project. Posters can be any size up to 28" by 22".
- H870099 Other Electric Exhibit- Not eligible for State Fair or County Fair Division Awards. Must meet guidelines stated in Project Manual.

Small Engines

Division H890, Small Engines

Limit one (1) exhibit per project

Crank It Up – Unit 1

H890003 Small Engine Display/Item: Show an application of one of the concepts learned in the unit one project. Examples include: identify parts of a small engine, safety rules for starting a small engine or small engine repair tool identification.

Warm it Up – Unit 2

H890001* 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.

Tune it Up – Unit 3

H890002* 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.).

Restored Vehicle

Division H891 – Restored Vehicle

H8910001* In lieu of bringing a tractor, etc. to the County or State Fair, the 4-Her can submit a detailed report explaining the process used to restore or overhaul. Also include a VHS tape or digital recorded copy of the item and the process used.

Woodworking

Division H911, Woodworking

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.

Requirements: All articles exhibited must include a plan stating dimensions and other critical instructions a builder would need to know 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. 4-Hers must be in advanced woodworking projects for the exhibit to be considered for State Fair.

Measuring Up – Unit 1

H911555 Woodworking article made using skills learned in the Measuring Up Unit I Woodworking Manual. Examples include: recipe holder, stilts or other skill appropriate items. Items should be entered with construction plans.

Making the Cut – Unit 2

- H911666 Woodworking article made using skills learned in the Making the Cut Unit II Woodworking Manual. Examples include: birdhouse, foot stool, napkin or letter holder. Items should be entered with construction plans.
- H911667 Woodworking Display: Display exemplifying one of the principles learned in the Making the Cut Manual. Examples include: measuring angles, wood lamination and joint types.

Nailing it Together – Unit 3

- H911001* Woodworking Article: Item made using skills learned in the Nailing it Together manual. Examples include: bookcase, coffee table or end table.
- H911002* Woodworking Display: Display exemplifying one of the principles learned in the Nailing it Together Project. Examples include: measuring angles, wood lamination and joint types.

Finishing Up – Unit 4

- H911003* 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.
- H911004* Woodworking Display: Display exemplifying one of the principles learned in the Finishing It Up Project. Examples include: career opportunities, types of finishes, or dovetailing.
- H911099 Other Woodworking Exhibit- Not eligible for State Fair or for County Fair Division Awards. Must meet guidelines stated in Project Manual.

Welding

Division H920, Welding

All metal welding process accepted. All welds exhibited in class 920001 or 920002 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. NOTE: You must be in your third year of a welding project to exhibit welding at the State Fair.

- H920001* Welding Joints-a display of one butt, one lap and one fillet weld.
- H920002* Position welds-a display showing three beads welded in the vertical down, horizontal and overhead positions.
- H920003* Welding article - any shop article where welding is used in the construction. All plans and bill of materials must be attached to the article. Protect plans with a cover.
- H920099 Other Welding Exhibit- Not eligible for State Fair or for County Fair Division Awards. Must meet guidelines stated in Project Manual.

4-H Welding Project Tips and Suggestions

H920001

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 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.

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

MIG welding

Suggested coupon thickness - 1/4" if using .035 wire and 1/8" if using .023 wire

Oxy-Acetylene

Suggested coupon thickness - 1/8"

Suggested rod - 1/8" mild steel rod

H920002

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" inch and 1/4" 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.

H920003

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

Division H861, Robotics

Robotic Explorer – Unit 1

- H861001* Robot or Not Poster: Create a poster (14" X 22") demonstrating how to determine whether an object is a machine, a computer or a robot. Poster should include at least 2 - 4 objects.
- H861002* Pseudocode Display Poster – Poster (14" X 22") should display the pseudocode written for the robot to perform at least four functions and utilize at least two modifiers. Include the pseudocode, and a written description of the icon functions.
- H861003* Robotics Explorer 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 pseudocode and a written description of the icon functions.
- H861004* Robotics Explorer Interview – Interview someone who is working in the field of 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.
- H861005* Careers in Robotics – Research a career in robotics. Your report can be either written or in a multimedia CD/DVD format. Written reports 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.

Robotic Probe - Unit 2

- H861006* Rotation Sensor Notebook – Write pseudocode which includes at least one rotational sensor activity. Include the code written and explain what the code function is and how you would change it to improve either the function or the code.
- H861007* Robotics Probe Notebook – Youth should follow one of the following activities in the project manual: Go the Distance, Tighten Your Belts, or Do the Time. Based upon the activity you select, replicate and complete the chart. Your notebook should include the chart and the answer to the following questions: 1. What did you learn about gears and gear ratios? 2. What are the benefits of using belts and pulleys? 3. What is the relationship between gear ratio and speed?
- H861008* Build a Robot (may use kit) – Include a robot and a notebook which includes any code/pseudocode that you have written for the robot, the robots purpose, and any challenges or changes you would make in the robot design or programming.
- H861009* 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.

ROPE

County only project

General Rules

- B. 4-Hers are limited to three (3) exhibits per project in this project.
- C. No rope exhibits are eligible for State Fair.
- D. Each rope exhibit must be mounted on a board that 1/4" thick x 24" high x 32" wide.
- E. All items on demo-boards in classes 925001 - 925003 must be made according to instructions found in the 4-H Rope Manual, EC 7-01-79.
- F. Mount the knots in the same position as shown in the 4-H Rope Manual.
- G. Either manila or synthetic rope may be used.
- H. 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

Division H925, Rope

- H925001 Rope Display, at least 10 and not more than 12 knots, hitches and splices (include two splices) made of 3/8" rope. See above requirements for halter exhibits.
- H925002 Single Loop or Double Loop Halter - cattle and horse use 5/8" or 3/4" rope. See above requirements for halter exhibits.
- H925003 Single Loop or Double Loop Halter - sheep and goats use 3/8" rope. See above requirements for halter exhibits.

LEATHER

County only project

General Rules

- A. 4-Hers are limited to one entry per class, and three items total in this project.
- B. No leather exhibits are eligible for State Fair.

Division H930, Leather

- H930001 Tooled
- H930002 Stamped
- H930003 Non-Tooled
- H930004 Tooled and Stamped
- H930005 Other