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## SCIENCE, ENGINEERING & TECHNOLOGY (SET)

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Each individual is limited to one exhibit per class. 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. 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.

### AEROSPACE

Rockets must be supported substantially to protect the rocket from breakage. Rockets are to be mounted on base that has dimensions equal or less than 12 inches x 12 inches and the base should be 3/4 inch thick. No metal bases. If the rocket fins extend beyond the edges of the required base (12 inches x 12 inches), then construct a base that is large enough to protect the fins. The base size is dictated by the size of the rocket fins. Rockets must be mounted vertically. Please do not attach sideboards or back drops 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. A report, protected by clear plastic cover, must include 1) rocket specification, 2) a flight record for each launching; weather, distance, flight height, 3) number of launchings, 4) flight pictures, 5) statistics, 6) objectives learned and 7) conclusions. The flight record may describe engine used, what 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. Complete factory assembled rockets will not be accepted. Judging is based upon display appearance, rocket appearance, workmanship, design or capabilities for flight, number of times launched and report. Three launches are required to earn the maximum launch points given on score sheet. For scoring, only actual launches count, misfires will not count towards one of the required three launches. For self-designed rockets only, please include a digital recorded copy of one flight. In the documentation, please include a description of stability testing before the rocket was flown. Skill level of project is not determined by number of years in project. Skill level is determined by the level listed on the manufacturing packaging. 4-H Rocket project levels are not intended to correspond to National Association of Rocketry model rocket difficulty ratings or levels. High powered rockets (HPR) is similar to model rocketry with differences that include the propulsion power and weight increase of the model. They use motors in ranges over "G" power and/or weigh more than laws and regulations allow for unrestricted model rockets. These rockets are NOT appropriate for 4-H projects and will be disqualified.

Posters can be any size up to 28 inches by 22 inches when ready for display. Example: Tri-fold poster boards are not 28 inches by 22 inches when fully open for display.

Premium: Purple \$4.00; Blue \$3.50; Red \$3.00; White \$2.50  
PRE-FLIGHT - UNIT 1 (County Fair Only)

**Class No.**

**X 850 99** ROCKET - (non-Clover Kid) Any Skill Level 1 rocket with wooden fins or plastic fins.

Premium: Purple \$4.50; Blue \$4.00; Red \$3.50; White \$3.00

**Youth enrolled in Aerospace 2, 3 or 4 may exhibit in any class within this division. State Fair Eligible**

**Class No.**

**H 850 1** ROCKET - Any skill level rocket with wooden fins and cardboard body tubes painted by hand or air brush.

**H 850 2** AEROSPACE DISPLAY - Poster or display board that displays or exemplifies one of the principles learned in the Lift Off project. Examples include: display or rocket parts and purpose, explaining the parts of NASA rocket or shuttle, interview of someone in the aerospace field, or kite terminology. Display can be any size up to 28 inches x 22 inches.

**H 850 3** ROCKET - Any skill level rocket with wooden fins and cardboard body tubes painted using commercial application example commercial spray paint.

**H 850 4** ROCKET - Any self-designed rocket with wooden fins and cardboard body tubes.

**H 850 5** DRONE POSTER - Exhibit must be designed to educate yourself and others on one or more of the following topics: drone technologies, uses of drones, the different types of drones, types of training need to operate drones, and the laws and regulations users must follow. Posters can be any size up to 28 inches x 22 inches.

**H 850 6** DRONE VIDEO - Exhibit must demonstrate how the drone interacts with the outside world. Examples include field scouting, surveying damage from natural disasters, drones used in commercial applications and settings, drones used for structural engineering. Video should not exceed 5 minutes. Videos should also be uploaded to a video streaming application and exhibitors **must** provide a hard copy QR code for viewing. Exhibitors should test their codes or links on several devices to check for appropriate permissions for public viewing.

### COMPUTER

TEAM ENTRIES: To qualify for entry at the Nebraska State Fair team materials entered in H860007 – Maker Space/Digital Fabrication must clearly be the work of a team instead of an individual and must have at least 50% 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.

Premium: Purple \$3.50; Blue \$3.00; Red \$2.50; White \$2.00

**Class No.**

**BOOTING UP - Unit 1** (County Fair Only)

**X 860 1 REFLECT REPORT** - Enter a typed report answering the Reflect Questions (found under Store Your Data section at the end of each chapter) from one chapter in the manual. Retype the set of questions using word processing software and answer the questions. Reports not to be longer than 5 pages and displayed in a clear plastic cover.

Premium: Purple \$4.00; Blue \$3.50; Red \$3.00; White \$2.50

**COMPUTER MYSTERIES - Unit 2** (State Fair Eligible)

**H 860 1 COMPUTER APPLICATION NOTEBOOK** - 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 (5 different cards such as birthday, wedding, anniversary, sympathy, get well or other); a business card (3 cards for 3 different individuals and businesses); menu (minimum of 2 pages including short description of foods and pricing); book layout (I-book); promotional flyer (3 flyers promoting 3 different events); newsletter (minimum of 2 pages); or other (examples such as a precision farming of family business logo, etc.). This exhibit consists of a notebook (8.5x11 inches) 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) print out of your project. Project may be in color or black and white.

**H 860 2 PRODUCE A COMPUTER SLIDESHOW PRESENTATION** - Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth. A notebook with a printout of all the slides should be submitted. Slideshow should include a minimum of 10 slides and not more than 25. Incorporate appropriate slide layouts, graphics, animations, and audio (music or voice and transition sounds do not count). Each slide should include notes for a presentation. All slideshows must be uploaded to a thumb drive, or entries can be uploaded to a cloud streaming service and exhibitors **MUST** provide a hard copy QR code for viewing. Exhibitors should test their codes or links on several devices to check for appropriate permissions for public viewing.

Premium: Purple \$5.00; Blue \$4.50; Red \$4.00; White \$3.50

**COMPUTER MYSTERIES - Unit 3** (State Fair Eligible)

**H 860 3 PRODUCE AN AUDIO/VIDEO COMPUTER PRESENTATION** - Using presentation software a 4-H exhibitor designs a multimedia computer presentation on one topic related to youth, including audio and/or video elements. A notebook with a printout of all the slides should be submitted. The presentation should be at least 2 minutes in length and no more than 5 minutes in length, appropriate graphics, sound and either a video clip, animation, or voice over and/or original video clip. All presentations must be uploaded to a thumb drive or entries can be uploaded to a cloud streaming service and exhibitors **MUST** provide a hard copy QR code for viewing. Exhibitors should test their codes or links on several devices to check for appropriate permissions for public viewing.

**H 860 4 HOW TO STEM (SCIENCE, TECHNOLOGY, ENGINEERING, MATH) PRESENTATION** - Youth design a fully automated 2 to 5 minute 4-H "how to" video. Submissions should incorporate a picture or video of the 4-H'er, 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. All presentations must be uploaded to a thumb drive or video can be uploaded to a cloud streaming service and exhibitors **MUST** provide a hard copy QR code for viewing. Exhibitors should test their codes or links on several devices to check for appropriate permissions for public viewing.

**H 860 5 VIRTUAL PLATFORM PRESENTATION** - Youth design a fully automated education presentation using multimedia platform such as Tik Tok, YouTube, Canva, Canvas, etc. Submissions may include a notebook, poster, etc., explaining the process, experience and/or presentation. All submissions must include a link to the virtual presentation. All presentations must be uploaded to a thumb drive or entries can be uploaded to a video streaming service and exhibitors **MUST** provide a hard copy QR code for viewing. Exhibitors should test their codes or links on several devices to check for permissions for public viewing.

**H 860 6 CREATE A WEB SITE, BLOG OR APP** - Design a simple web-site, blog or app for providing information about a topic related to youth. Include an explanation of why the entry was created. Any current website, blog, or app development platform is accepted such as Google Sites, iBuildApp, Wix, etc. If the website, blog or app isn't live, include all files on a flash drive in a plastic case. All entries must be uploaded to a thumb drive or entries can be uploaded to a cloud streaming service and exhibitors **MUST** provide a hard copy QR code for viewing. Exhibitors should test their codes or links on several devices to check for permissions for public viewing.

**H 860 7 3D PRINTING** - 3D printing uses plastic or other materials to build a three-dimensional object (3D) object for a digital design (including 3D Pen Creation). Youth may use original designs or someone else's they have re-designed in a unique way. Exhibits will be judged based on the motivation and/or problem identified. For example, 3D objects printed as part of the design process for robot or other engineering project. Must include design notebook that addresses the following questions: 1) What was the motivation for your design or the problem you were solving with your design? i.e. Is your item a functional or decorative piece; 2) Please include a picture of original design, citation of designer/website OR if design is completely original (your created it using CAD software), then state that it's original. If item was not completely original, indicate what you did to the original design to modify it to better meet the design problem stated in #1 above. If item was modified multiple times, please indicate what change was made with each modification, and what prompted the need for the change. i.e. I printed it and the design was too fragile, so I resliced the print to make thicker external wall, or to have denser infill; 3) Define your process for designing/printing. What software and/or hardware was used (indicate type of 3D printer or if item was created with 3D pen); 4) What materials were selected for your project; 5) If your final design has any moving parts, define how you determined appropriate allowance in your design; 6) Identify any changes that you would make to improve your design.

**H 860 8 MAKER SPACE/DIGITAL FABRICATION** - This project is a computer-generated project created using a laser cutter, vinyl cutter, heat press or CNC router. Vector or 3D based software such Corel Draw or Fusion 360 would be an example of an appropriate software used to create your finished project. Project should include a notebook with the following: 1) What motivated you to create this project; 2) Software and equipment used; 3) Directions on how to create the project; 4) Prototype of plans; 5) Cost of creating project; 6) Iterations or modifications made to original plans; 7) Changes you would make if you remade the project.

## **ELECTRICITY**

Premium: Purple \$3.50; Blue \$3.00; Red \$2.50; White \$2.00

**Class No.**

**MAGIC OF ELECTRICITY - UNIT 1** (County Fair Only)

**X 870 1 PROJECT** - Demonstrating the skills learned in Magic of Electricity Project. For example: making a test switch or flashlight.

## INVESTIGATING ELECTRICITY - UNIT 2 (County Fair Only)

**X 870 2 PROJECT** - Demonstrating the skills learned in Investigating Electricity Project. For example: building a series circuit, parallel circuit or a momentary switch.

Premium: Purple \$4.00; Blue \$3.50; Red \$3.00; White \$2.50

## WIRED FOR POWER - UNIT 3 (State Fair Eligible)

**H 870 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.

**H 870 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.

**H 870 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.

**H 870 4 POSTER** - Exemplifying one of the lessons learned in the Wire for Power Project. Posters can be any size up to 28 inches x 22 inches.

Premium: Purple \$5.00; Blue \$4.50; Red \$4.00; White \$3.50

## ENTERING ELECTRONICS - UNIT 4 (State Fair Eligible)

**H 870 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.

**H 870 6 ELECTRONIC DISPLAY** - Show an application of one of the concepts learned in the Entering Electronics Project. Examples include: components of an electronic device (refer to page 35 of the manual).

**H 870 7 ELECTRONIC PROJECT** - Exhibit an electronic item designed by the 4-H'er or form a manufactured kit that shows the electronic expertise of the 4-H'er. Examples include: a radio, a computer, or a voltmeter.

**H 870 8 POSTER** - Exemplifying one of the lessons learned in the Entering Electronics Project. Posters can be any size up to 28 inches x 22 inches.

## GEOSPATIAL

State Fair Eligible. Youth enrolled in Geospatial may exhibit in any class within this division.

Premium: Purple \$3.50; Blue \$3.00; Red \$2.50; White \$2.00

### **Class No.**

**H 880 1 POSTER** - Create a poster (not to exceed 14 inches x 22 inches) 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 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 inches x 22 inches.

**H 880 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.

**H 880 4 GEOCACHE** - Assemble a themed geocache (physical geocache is REQUIRED with exhibit). 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, Geocoins, 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](http://geocaching.com), include a printout of its registry.** The entry may include a photograph of the cache in its intended hiding place.

**H 880 5 AGRICULTURE PRECISION MAPPING** - 4-H'ers 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 where 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 6 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 a 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://4-hhistorypreservation.com/History\\_Map](http://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 historical significance of 4-H place or person (a minimum of one paragraph).

**H 880 7 GIS THEMATIC MAP** - Using any GIS software, create a thematic. Thematic maps can utilized any subject of interest to the 4-H'er. Example map would be Amelia Earhart's or Sire 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 intent, Use reliable data (U.S. Center or U.S. Census Bureau etc.) Map any size from 8.5 inches x 11 inches up to 36 inches x 24 inches, should include Title, Base Map, Neat Line, North Arrow and Legend. Identify source of your information on the back of the map.

**H 880 8 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.

## MODELS

County Fair Only. One entry per class per exhibitor. Must include your model building instruction sheet for all classes. If you do a test flight, etc., keep a record of date, weather, distance traveled, description of flight and pictures of events and include with fair exhibit. For

self-designed models, include a list of supplies used and directions of how assembled. **NOTE: All Lego projects must be displayed on a sturdy board or in a low sided box of appropriate size to protect the model from breakage when moving it.**

Premium: Purple \$3.50; Blue \$3.00; Red \$2.50; White \$2.00

**Class No.**

**X 885 1** BEGINNING SELF-DESIGNED MODEL utilizing preformed building materials (i.e. LEGOS). Do NOT use kits.

**X 885 2** BEGINNING LEVEL MODEL KIT - plastic, paper, etc. (NOT LEGOS)

Premium: Purple \$4.00; Blue \$3.50; Red \$3.00; White \$2.50

**X 885 3** MORE ADVANCED LEVEL MODEL KIT - i.e. plastic, wood, paper or combination of materials. (NOT LEGOS)

**X 885 4** ADVANCED SELF-DESIGNED MODEL. DO NOT USE KIT.

## ENERGY

State Fair Eligible.

**RULES:** The name and county of each exhibitor should appear separately on the back of each poster or article and on the front cover of the notebooks so the owner of the exhibit may be identified if the entry tag is separated from the exhibit. 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. Posters can be any size up to 28 inches by 22 inches when ready for display. Example: tri-fold poster boards are not 28 inches by 22 inches when fully open for display.

Premium: Purple \$3.50; Blue \$3.00; Red \$2.50; White \$2.00

**Class No.**

**H 900 1** 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 inches x 22 inches.

**H 900 2** 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.

**H 900 3** SOLAR AS ENERGY DISPLAY/POSTER - Item should be the original design of the 4-H'er. Include the item, or a picture if item is in excess of 6 feet tall or 2 feet x 2 feet. 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 4** WATER AS ENERGY DISPLAY/POSTER - Item should be the original design of the 4-H'er. Include the item, or a picture if item is in excess of 6 feet tall or 2 feet x 2 feet. Include a notebook of why the item was designed and how it harnesses the power of water.

**H 900 5** WIND AS ENERGY DISPLAY/POSTER - Item should be the original design of the 4-H'er. Include the item, or a picture if item is in excess of 6 feet tall or 2 feet x 2 feet. Include a notebook of why the item was designed and how it harnesses the power of wind. Examples include geothermal, biomass, ethanol, bio-diesel, methane reactors, etc.

Premium: Purple \$5.00; Blue \$4.00; Red \$3.00; White \$2.00

**H 900 6** 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 productions, and potential use of bio-products.

## ROBOTICS

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

**RULES:** The name and county of each exhibitor should appear separately on the back of each poster or article and on the front cover of the notebooks so the owner of the exhibit may be identified if the entry tag is separated from the exhibit. 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. Posters can be any size up to 28 inches by 22 inches when ready for display. Example: tri-fold poster boards are not 28 inches by 22 inches when fully open for display.

**TEAM ENTRIES:** To qualify for entry at 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 50% of all team members enrolled in 4-H. Additionally all enrolled in 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.

Premium: Purple \$3.50; Blue \$3.00; Red \$2.50; White \$2.00

**Class**

**H 861 1** ROBOTICS POSTER - Create a poster (28 inches X 22 inches) 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.

**H 861 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.

**H 861 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 such as a short video. All videos can be uploaded to a video streaming application and exhibitors MUST provide a hard copy QR code for judging access. Exhibitors should test their codes or links on several devices to check for appropriate permissions for public viewing. Written interviews should be in a notebook. Written reports

should be 3 to 5 pages, double-spaced, 12-point font, and 1-inch margins. Multimedia reports should be between 3 to 5 minutes in length.

**H 861 5 ROBOTICS SENSOR NOTEBOOK** - Write pseudo code which includes at least three sensor activity. Include the code written and explain the code function. Codes can be submitted as a multimedia format uploaded to a cloud sharing service. Include a QR code with your project to allow judging access. Multimedia presentations should be 3 to 5 minutes in length. Videos can also be uploaded to a video streaming application and exhibitors **MUST** provide a hard copy QR code for viewing. Exhibitors should test their codes and links on several devices to check for appropriate permissions for public viewing.

**H 861 7 KIT LABELED ROBOT (cannot be programmed) AND NOTEBOOK** - 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 notebook with the robot the youth has constructed. Included in the notebook should be (1) a description of what the robot does; (2) pictures of programs the robot can perform; (3) why they chose to build this particular form; and (4) how they problem-solved any issues they might have had during building and programming. A picture story of assembly is required. If robot is more than 15 inches wide and 20 inches tall they may not be displayed in locked cases.

**H 861 8 3D PRINTED ROBOTICS PARTS** - This class is intended for youth to create parts, through 3D printing, to help create their robot or aid the robot in completing a coded function. Project should include notebook describing the process used to create the project, describe the success of your designed piece (did it work), intended use of the product and the modifications made to the item.

## WELDING

State Fair Eligible. All metal welding processes accepted. Call the Extension office for a list of welding project tips and suggestions.

### 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 as 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. Stick welding: Suggested coupon thickness - 1/4 inch if using 1/8 inch rod. Suggested rod-AC and DC straight or reverse polarity-first E-7014, second E-6013
6. MIG welding: Suggested coupon thickness - 1/4 inch if using .035 wire and 1/8 inch if using .023 wire
7. Oxy-Acetylene: Suggested coupon thickness - 1/8 inch. Suggested rod - 1/8 inch mild steel rod

### 4-H Welding Project Tips and Suggestions: Class 2

1. It is suggested that all welds be of the same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4 inch x 4 inch or on individual coupons that are about 2 inch x 4 inch and 1/4 inch 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.
3. 4-H Welding Project Tips and Suggestions: Class 4 & 5. 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.

**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) All welds exhibited in class H9201 and H9202 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 judge can look at bottom side of 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. (3) Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays. (4) Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit. (5) 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. (6) If no plans are included with welding article, welding furniture or composite weld project item will be disqualified. (7) 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.

Premium: Purple \$5.00; Blue \$4.50; Red \$4.00; White \$3.50

### **Class No.**

#### ARCS AND SPARKS

**H 920 1 WELDING JOINTS** - A display of one butt, one lap and one fillet weld.

**H 920 2 POSITION WELDS** - A display showing three beads welded in the vertical down, horizontal and overhead positions.

Premium: Purple \$11.00; Blue \$9.00; Red \$7.00; White \$5.00

**H 920 3 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 alterations, 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 4 WELDING ARTICLE** - Any shop article where welding is used in the construction. 60% of items must be completed by 4-H'er and notes regarding laser welding or machine welding must be included. Type of welder, welder settings, all plans, plan alterations, and a bill for material must be attached to the article. Protect plans with a clear cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside at State Fair.

**H 920 5 WELDING FURNITURE** - Any furniture with 75% welding is used in the construction. 60% of item must be completed by 4-H'er and notes regarding laser welding or machine welding must be included. Type of welder, welder settings, all plans, plan alterations, 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 at State Fair.

Premium: Purple \$5.00; Blue \$4.00; Red \$3.00; White \$2.00

**H 920 6 PLASMA CUTTER/WELDER DESIGN** - Plasma cutters/welders allowed for detailed design(s) to butt cut into metal. 4-H'ers will create a notebook describing the design process to create the "artwork" to butt cut into the metal. In the notebook include: a) A photo (front and back) of the finished project. b) Instructions on how the design was created (include software used), this allows for replication of the project. c) Lessons learned or improvements to the project. d) Steps to finish the project.

**H 920 7 COMPOSITE WELD PROJECT** - 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 alterations, 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.

## **WOODWORKING**

### **GENERAL RULES:**

- 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.
- 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.
- All projects must have appropriate finish.
- 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 at State Fair. 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.

Premium: Purple \$4.50; Blue \$4.00; Red \$3.50; White \$3.00

### **Class No.**

**MEASURING UP - UNIT 1** (County Fair Only)

**X 911 1 WOODWORKING ARTICLE** - Item made using skills learned in the Measuring Up manual. Examples include: flower box, letter or napkin holder, picture frame.

**X 911 2 WOODWORKING DISPLAY** - Display exemplifying one of the principles learned in the Measuring Up manual. Examples include: butt joint, measuring, sanding.

**MAKING THE CUT - UNIT 2** (County Fair Only)

**X 911 3 WOODWORKING ARTICLE** - Item made using skills learned in the Making The Cut manual. Examples include: letter or napkin holder, birdhouse, footstool.

**X 911 4 WOODWORKING DISPLAY** - Display exemplifying one of the principles learned in Making The Cut manual. Examples include: wood types, angle cutting, liquid finisher.

Premium: Purple \$7.00; Blue \$6.00; Red \$5.00; White \$4.00

**NAILING IT TOGETHER - UNIT 3** (State Fair Eligible)

**H 911 1 WOODWORKING ARTICLE** - Item should be made using either joints, hinges, dowels, or a dado joining 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 3 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 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 choose 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 4 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 alterations 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 5 OUTDOOR WOOD PROJECT MADE WITH TREATED WOOD** - Treated wood projects DO NOT have to have a finished coating. All plans and plan alterations 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.

**H 911 6 WOOD PROJECTS CREATED ON A TURNING LATHE** - Article is the object created from spinning wood on a turning lathe. Article must be appropriately finished and/or sealed. Exhibit must include plans detailing design and process of completion, any

changes made to the design, details of finishing techniques, and other relevant information about the article. Must include a description of tools used.

Premium: Purple \$11.00; Blue \$9.00; Red \$7.00; White \$5.00

FINISHING UP - UNIT 4 (State Fair Eligible)

**H 911 7 WOODWORKING ARTICLE** - Item made using skills learned in the Finishing It Up manual. Examples include: dovetailing, making a pen using lathes, overlays, using a router, etc. Item is required to be appropriately finished.

**H 911 8 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 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 choose this finish?)
- 6) Evaluate (How does your item solve the original need?)
- 7) Present results (How would you do this better next time?)