

STEM General

Information

General Information for the following projects: Aerospace, Physics/Power of Wind, SET Careers, Robotics, Computers, Electricity, Geospatial, Small Engines, Woodworking and Welding.

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. ALL static exhibits must have received a purple ribbon at the county fair to advance to the Nebraska State Fair.

C. Several classes require a display board which should be a height of 24" and not to exceed 1/4" in thickness. A height of 24 7/8" is acceptable to allow for the saw kerf (width) if two 24 inch boards are cut from one end of a 4'x8' sheet of plywood. Nothing should be mounted within 3/4" of the top or bottom of the board. (Example: Woodworking, 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. Posters can be any size up to 28"x22" when ready for display. Example: tri fold poster boards are NOT 28"x22" when fully open for display.

STEM ROCKETS

Purple-2.25, Blue 2.00, Red 1.50, White 1.00

See "General Information" at the beginning of the Science, Engineering and Technology Section for information on completing exhibits. The general information lists requirements for all classes in this section.

This category gives 4-H'ers a chance to display the rockets and drones they have created. Through participation in this category 4-H'ers will show judges what they learned about and how they adapted their exhibit throughout this project. Involvement in SET Aerospace gives participants a first-hand experience in modern technology.

Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4haerospace>.

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. 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.

3. 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.

4. 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.

5. A report, protected in a clear plastic cover, must include: 1) rocket specification (include original or photo of manufacture packaging stating rocket skill level), 2) a flight record for each launching (weather, distance, flight height), 3) number of launchings, 4) flight pictures 5) Safety (how did you choose your launch site? Document safe launch, preparations, and precautions)_6 objectives learned and 7) conclusions.

6. 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. Complete factory assembled rockets will not be accepted at the State Fair.

7. 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 the score sheets. For scoring for the State Fair, only actual launches count, misfires will not count towards one of the required three launches.

- 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.

- 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.

8. High power rockets (HPR) ARE 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.

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

Eligibility: All static exhibits must have received a purple ribbon at the county fair to advance to the State Fair. Entry level rockets, made with PLASTIC FINS and PLASTIC BODY TUBES, are COUNTY ONLY projects.

Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4haerospace>.

Aerospace/Rockets

Any youth enrolled in Aerospace 2, 3 or 4 may exhibit in any class within the divisions.

Class H850001 - ROCKET (SF92) - Any Skill Level 2 Rocket with wooden fins and cardboard body tubes painted by hand or air brush.

Class H850002 - AEROSPACE DISPLAY (SF93): Poster or display board that displays or exemplifies one of the principles learned in the **Lift Off** project. Examples include: display of rocket parts and purpose, explaining the parts of a NASA rocket or shuttle, interview of someone in the aerospace field, or kite terminology. Include notebook containing terminology (definition) and what was learned. Display can be any size up to 28"x22".

Class H850003 - ROCKET(SF92): Any Skill Level Rocket with wooden fins and cardboard body tubes painted using commercial application: example commercial spray paint.

Self-Designed Rocket

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

Class H850004 - ROCKET (SF92) - Any self-designed rocket with wooden fins and cardboard body tubes.

Drones

It is suggested that you visit with your city or village office for any rulings on drones operated within city limits before flying.

H850005- Drone Poster—SF93 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 needed to operate drones, and the laws and regulations users must follow. Posters can be any size up to 28” by 22”.

H850006-Drone Video-SF93 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, and drones used for structural engineering. Video should not exceed 5 minutes. Videos should be submitted to Phelps/Gosper 4-H Educator Calvin DeVries (calvin.devries@unl.edu) by July 5, 2024 or 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.

COUNTY ONLY PROJECTS

Units 2,3,4: Class +H850901-Rocket any size/any skill level - Plastic fins are acceptable in this class. Rocket in this class is not eligible for State Fair.

Units 2,3,4: Class +H850902 Second Rocket any size/any skill level - Wooden fins are acceptable in this class. Rocket in this class is not eligible for State Fair.

MODEL ROCKET LAUNCH CLASS +H850903 -- 4-H Rocket Launch judged on knowledge of project rocket, engine, equipment, and flight expectations, plus safety of the launch, the flight and recovery. Catching a descending rocket while in flight is a safety hazard and will be considered a penalty at the discretion of the judge. Rocket launch will be a scheduled contest. Rocket launched must be a rocket built during current year. Complete, factory built rockets are not allowed in the rocket launch. Large engines, size E, F, G are **not** to be used for the Model Rocket Launch Class. *Pre-registration is required.*

Phelps County Model Rocket Launch Junior Division ages 11 and under; Senior Division ages 12 and up.

Gosper County Model Rocket Launch has no age division.

STEM **COMPUTERS**

Purple-2.25, Blue 2.00, Red 1.50, White 1.00

See "General Information" at the beginning of the Science, Engineering and Technology Section for information on completing exhibits. The general information lists requirements for all classes in this section.

This category gives 4-H'ers a chance to display their knowledge of computers. Through participation in this category 4-H'ers will develop presentations that show judges their knowledge in the different aspects of computer science. Involvement in SET Computers gives participants a first-hand experience in modern technology.

Scoresheets, forms, contest study materials, and additional resources can be found at <http://go.unl.edu/ne4hcomputers>

Resources: Computer Mysteries 1, Computer Mysteries 2, Computer Mysteries 3.

-----COMPUTERS - Unit 1 County Only

+Class H860901-BEGINNING FLYER BRO-CHURE Computer Exhibit - 4-H'ers demonstrate their beginning skills in producing a flyer or brochure on topic relating to 4-H. This project is for those in their first and/or second year of the computer project only. Using existing software is acceptable.

+Class H860902: GREETING CARD EXHIBIT- Demonstrate your skills by making three different greeting cards. This project is for those in their first and/or second year of the computer project. Using existing software is acceptable.

+Class H860903: WORD DOCUMENT COMPUTER EXHIBIT - 4-H'ers demonstrate their skills in producing a word document on a topic relating to 4-H. Using existing software is acceptable.

-----COMPUTER MYSTERIES - Unit 2

Class H860001: COMPUTER APPLICATION NOTEBOOK (SF277)- 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 should be as a 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 2 pages); or other: examples such as precision farming or family business logo etc. This exhibit consists of a notebook (8.5x11 inches) which should include a (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.

Class H860002: PRODUCE A COMPUTER SLIDESHOW PRESENTATION (SF276)- 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. All slide shows for Phelps or Gosper County Fair should be emailed to Calvin DeVries (calvin.devries@unl.edu) before July 5. OR the slideshow may be shared through a share link or QR code which is included in the notebook.

Or entries can be uploaded to a cloud sharing 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.

-----COMPUTER MYSTERIES - Unit 3

Class H860003: PRODUCE AN AUDIO/VISUAL COMPUTER PRESENTATION (SF276)- 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.

The presentation should be emailed to Calvin DeVries (calvin.devries@unl.edu) before July 5 OR the presentation can also 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.

Class H860004: How to STEM (Science, Technology, Engineering and Math) Presentation (SF276): Youth design a fully automated 2 to 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 or may 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.

Class H860005 Virtual Platform Presentation - (SF276)

Youth design a fully automated educational presentation using any 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 link to the virtual presentation. Entries should be submitted to Calvin DeVries (calvin.devries@unl.edu) by July 5. Entries can also be uploaded to a cloud sharing service. Exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions for public viewing.

Class H860006 CREATE A WEB SITE/BLOG OR APP (SF275) – 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. Entries should be submitted to Calvin DeVries at calvin.devries@unl.edu before July 5. Entries can be uploaded to a cloud sharing service. Exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to test their codes or links on several devices to check for appropriate permissions for public viewing.

Class H860007 3D PRINTING: (SF 1050) 3D printing uses plastic or other materials to build a three-dimensional (3D) object from a digital design (including 3D Pen Creation). Youth may use original designs or someone else's they have redesigned 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 (you 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. Its design 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 walls, or to have a 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.

Class H860008—MAKER SPACE/DIGITAL FABRICATION (SF 1050) This project is a computer generated projected created using a laser cutter, vinyl cutter, heat press or CNC router. Vector or 3D based software such as 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: A.What motivated you to create this project; B)Software and equipment used; C)Directions on how to create the project; D)Prototype of plans; E)Cost of creating project; F)Iterations or modifications made to original plans; G)Changes you would make if you remade the project.

Team Entry Option: To qualify for entry at the Nebraska State Fair team materials entered in H860008 – 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.

STEM **ELECTRICITY**

Purple: 2.50, Blue 2.25, Red 1.75, White 1.25

See “General Information” at the beginning of the Science, Engineering and Technology Section for information on completing exhibits. The general information lists requirements for all classes in this section.

In this category 4-H'ers have the opportunity to create informational exhibits about the different aspects of electricity. Through involvement in this category 4-H'ers will be better educated about electricity and be able to present their knowledge to others.

***Scoresheets, forms, and additional resources can be found at <https://go.unl.edu/ne4electricity>.**

Resources: *Electric Excitement 1, Electric Excitement 2, Electric Excitement 3, Electric Excitement 4*

ELECTRICITY-UNIT 1 & 2—County Only entries

+Class H870901 ELECTRIC SAFETY POSTER - Must deal with a specific topic. Examples are: “Overhead Powerline Safety”, “Electrical Safety in the Home”, “On the Farm Safety”.

+Class H870902 ELECTRIC ENERGY CONSERVATION- Must show useful methods of efficient use of electrical energy and conservation.

ELECTRICITY-WIRED FOR POWER - UNIT 3

Class H870001 (SF224) 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.

Class H870002 (SF225) 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.

Class H870003 (SF226) 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, rewiring 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.

Class H870004 (SF227) POSTER - Poster should exemplify one of the lessons learned in the Wired for Power Project. Posters can be any size up to 28"x22".

ELECTRONICS - UNIT 4

Class H870005 (SF228) ELECTRICAL/ELECTRONIC PART IDENTIFICATION: - Display different parts used for electrical/electronic work. Exhibit should show the part (either the 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.

Class H870006 (SF 229) 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 p. 35 of the Electronic manual).

Class H870007 (SF230) ELECTRONIC PROJECT: Exhibit an electronic item designed by the 4-Her 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.

Class H870008 (SF231) POSTER- Poster should exemplify one of the lessons learned in the Entering Electronics Project. Posters can be any size up to 28" by 22".

STEM ENERGY

Purple-2.25, Blue 2.00, Red 1.50, White 1.00

See "**General Information**" at the beginning of the Science, Engineering and Technology Section for information on completing exhibits. The general information lists requirements for all classes in this section.

This category provides 4-H'ers a way to present their ideas about renewable energy resources and learn more about physics, friction, energy and elasticity.

RESOURCES: 4-Wheelin' Physics Fun, The Power of Wind.

Scoresheets, forms, contest study materials, and additional resources can be found at <https://go.unl.edu/ne4hphysics-powerofwind>

Class H900001. Create and Compare Energy Resources Poster– Poster should explore 2 alternative/renewable energy resources. Compare and contrast the 2 resources including two of the following information: amount of energy created, costs of production, usability of the energy, pros/cons of environmental impacts, etc. Posters can be any size up to 28" by 22". Tri fold poster boards are not 28"x22" when fully open for display.

Class H900002 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.

Class H900003 Solar as Energy Display/Poster– Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2'x2'. 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.

Class H900004 Water as Energy Display/Poster– Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2'x2'. Include a notebook of why the item was designed and how it harnesses the power of water.

Class H900005 Wind as Energy Display/Poster (WF308)– Item should be the original design of the 4-Her. Include the item, or a picture if item is in excess of 6' tall or 2'x2'. Include a notebook of why the item was designed and how it harnesses the power of wind.

Class H900006 Other Nebraska Alternative Energy Notebook should explore Nebraska an alternative energy source besides wind, water and solar power.

Include information on type of power chosen, infrastructure for distribution, what resources are needed to create this alternative resource, cost of production, and potential uses of bio-products. Examples include geothermal, biomass, ethanol, bio-diesel, methan reactors, etc.

+Class H900901 (County Only Exhibit) WIND ART - (SF304) Item should represent wind turbines, wind power, or other alternate energy. For example, a pinwheel or item about wind.

STEM GEOSPATIAL

Premiums: P-2.50, B-2.25, R-1.75, W-1.25

See "**General Information**" at the beginning of the STEM Section for information on completing exhibits. The general information lists requirements for all classes in this section.

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

Resources: Learn about Geography,, Learn about Geographic Information Systems (GIS); Learn about Global Positioning Systems (GPS).

Scoresheets: Scoresheets, forms and additional resources can be found at <https://go.unl.edu/ne4hgeo>.

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

Class H880001. POSTER– (SF299) Create a poster (not to exceed 14”x22”) 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.

Class H880002. 4-H FAVORITE PLACES OR HISTORICAL SITE POSTER–(SF299) 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”x22”.

Class H880003. GPS NOTEBOOK–(SF300) 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.

Class H880004 GEOCACHE–(SF301) Assemble a themed geocache. Each geocache should be a water-tight container. It should include a logbook and pencil for finders to log their visits and may include small trinket, 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, include a print-out of its registry. The entry may include a photograph of the cache in its intended hiding place.

Class H880005. AGRICULTURE PRECISION MAPPING –(SF302) 4-Hers will assemble a notebook that will include a minimum of 2 digital copies of various data layers that can be used in precision agriculture to identify spatial patterns and/or correlations (printed copies of websites 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.

H880006 - 4-H History Map/Preserve 4-H History (SF 300) – 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://www.4-hhistorypreservation.com/History_Map. For a step by step video on nominating a point, please go to this link: <http://tinyurl.com/nominate4h>. Write a brief description of the historical significance of 4-H place or person. (a minimum of one paragraph)

Class H880007 GIS THEMATIC MAP. – (SF302) Using any GIS software, create a thematic. Thematic maps can utilize any subject of interest to the 4-H'er. Example map would be Amelia Earhart's or Sir Francis Drake's voyage, population density maps, water usage maps or 4-H project in Nebraska. Create GIS Map using data from books, and or internet. Use reliable data, (U.S. Center or U.S. Census Bureau, etc.) Map any size from 8.5”x11” up to 36”x24”, should include Title, Base Map, Neat Line, North Arrow and Legend. Identify the source of your information on the back of the map.

H880008 - Virtual Geocache (SF300) - Keep a log of at least 5 places visited using a virtual geocache 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.

STEM ROBOTICS

Premiums: P-2.50, B-2.25, R-1.75, W-1.25

See “General Information” at the beginning of the STEM Section for information on completing exhibits. The general information lists requirements for all classes in this section.

Participants will learn more about how robots are designed and developed as well as the mechanical and electronic elements of robots. Involvements in SeT Robotics gives participants a first-hand experience in modern technology.

Scoresheets, forms, contest study materials, and additional resources can be found at <http://go.unl.edu/ne4hrobotics>.

RULES:

1. 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 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 the team members receiving the same ribbon placing.

2. Creating a video of your robot in action would be helpful for the judges but is not mandatory. Videos should be uploaded to a video streaming application and exhibitors should provide a hard copy QR code for viewing. Videos should be submitted to calvin.devries@unl.edu by July 5, 2024. Or videos can be uploaded to a video streaming application and exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to should test their codes or links on several devices to check for appropriate permissions for public viewing.

- **Class H861001 - ROBOTICS POSTER (SF236)** Create a poster (28x22") 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.

- **Class H861002 -ROBOTICS NOTEBOOK (SF237):** 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 Class1.

- **Class H861004- ROBOTICS CAREERS INTERVIEW (SF239):** Interview someone who is working in the field robotics and research the career in robotics. Interviews can either be written or in a multimedia format such as a short video uploaded to a cloud sharing service. Include a QR code with your project to allow for judging access. (CD/DVD). Videos should be submitted to Calvin DeVries by July 5 to calvin.devries@unl.edu. Or videos can be uploaded to a video streaming application and exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to 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.

- **Class H861005 - ROBOTICS SENSOR NOTEBOOK (SF241):** Write pseudocode 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. Multitmedia presentations should be 3 to 5 minutes in length. VState Fair qualified videos should be submitted to calvin.devries@unl.edu by July 5, 2024. Or videos can also be uploaded to a video streaming application and exhibitors MUST provide a hard copy QR code for viewing. Exhibitors are encouraged to should test their codes or links on several devices to check for appropriate permissions for public viewing.

- **Class H861007 - (SF243) KIT LABELED ROBOT (cannot be free 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 recommended. If robot is more than 15" wide and 20" tall they may not be displayed in locked cases at the County or State Fair.

- **Class H861008 - (SF244) 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 used of the product and the modifications made to the item.

STEM WELDING

Purple 2.50, Blue 2.25, Red 1.75, White 1.25

See "General Information" at the beginning of the STEM Section for information on completing exhibits. The general information lists requirements for all classes in this section. (All metal welding processes accepted.)

Scoresheets, forms, contest study materials, and additional resources can be found at <http://go.unl.edu/ne4hwelding>.

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 1 or 2 must be mounted on a 12" high x 15" long display board of thickness not to exceed 3/8". Attach each weld on a wire loop hinge or equivalent, so the judge can look at the bottom side of the weld when necessary. Each weld should be labeled with information stated 1) type of welding process (stick, MIG, TIG, Oxy-Acetylene, etc.) 2) kind of weld, 3) welder setting, 4) electrode/wire/rod size, and 5) electrode/wire/rod ID numbers. **Attach a wire to display board so it can be hung like a picture frame. No picture frame hangers accepted.**

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 include 4-H'er name and county, 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 art, 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.

Class H920001 WELDING JOINTS (SF281) Display of one butt, one lap, one fillet weld.

Class H920002 POSITION WELDS (SF281) A display showing 3 beads welded in vertical down, horizontal and overhead positions.

Class H920003 – WELDING ART – (SF283) – any art created using tack welds to hold the metal pieces together (examples include horseshoe projects). Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish.

Class H920004 WELDING ARTICLE (SF281) Any shop article or piece of furniture where welding is used 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 alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

Class H920005 WELDING FURNITURE (SF282). 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 alternations, and a bill for material must be attached to the article. Project 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.

Class H920005 PLASMA CUTTER/WELDER DESIGN. Plasma cutters/welders allowed for detailed design(s) to butt cut into metal. 4H'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 & 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.

H920006 - COMPOSITE WELD PROJECT - (SF280) - 60% of the project must be welded and 40% made from other materials such as wood, rubber, etc. Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

H920007 - Composite Weld Project - (SF280) - 60% of the project must be welded and 40% made from other materials such as wood, rubber, etc. **Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article.** Protect plans with a cover. If project is designed to be outside, it is required to have an appropriate outdoor finish because project may be displayed outside.

CLASS 1: 4-H WELDING PROJECT Tips and Suggestions

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.

Stick welding: Suggested coupon thickness- 1/4" if using 1/8" rod. Suggested rod-AC and CD 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

CLASS 2: 4-H Welding Project Tips and Suggestions

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"x4" or on individual coupons that are about 2"x4" 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.

Class 3 & 4 4-H Welding Project Tips and Suggestions: 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.

STEM

WOODWORKING

Purple 2.50, Blue 2.25, Red 1.75, White 1.25

See "General Information" at the beginning of the Science, Engineering and Technology Section for information on completing exhibits. The general information lists requirements for all classes in this section.

In this category 4-H'ers have the opportunity to create exhibits about varying levels of woodworking. In addition, participants can also create informational exhibits about their woodworking projects. Through involvement in this category 4-H'ers will be better educated about the topic and better their woodworking skills. For more resources and materials in this category refer to the resource section at the bottom of the page.

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. **Requirements:** All articles exhibited must include a plan (with drawings or sketch or blueprints) stating dimensions and other critical instructions a builder would need to know how to build the project. Plans may include narrative instructions in addition to the dimension drawings and include any alternations to the original plan. Part of the score depends on how well the project matches the plans. If the plans are modified, the changes from the original need to be noted on the plans. All plans used for making the article must be securely attached and protected by a clear plastic cover.

3. 4-H'ers must be in Unit 3 or Unit 4 for the exhibit to be considered for State Fair. All projects must have appropriate finish.

4. If the project (i.e. picnic tables, wishing wells, swings, chairs, bridges, doghouses, etc.) is designed to be used outside, it will be displayed outside.

5. **All outside projects MUST have entry tag and supporting information placed in a protective bag to prevent damage from weather events such as rain and be ATTACHED to projects with string, zip ties, etc.**

Scoresheets, forms, contest study materials, and additional resources can be found at <https://unl.box.com/s/leyyacbdu3ktky0i58id6mvgya1tvcc5>

Manuals used for project: Woodworking Wonders 1, 2, 3, and 4.

To be eligible for State Fair, the project must be selected by a judge and receive a purple ribbon.

-----**COUNTY ONLY PROJECTS**

Class +H911901 ARTICLE MADE WITH HAND TOOLS (SF91) Select from **Level 1** or use comparable plans from other sources. Project examples: letter holder, stilts, note holder, picture frame, or other listed in manual.

Class +H911902 2nd ARTICLE MADE WITH HAND TOOLS (SF91) Select from **Level 1** or use comparable plans from other sources. Project examples: letter holder, stilts, note holder, picture frame, or other listed in manual.

Class +H911905 - UNIT 3 SECOND ARTICLE

Class +H911908 SECOND ARTICLE (SF91) Unit 3- Large power tools are used. This is to include cabinet construction and/or other advanced skills. (Score Sheet SF 91)

-----**Making the Cut - UNIT 2**

(county only project)

Class +H911903 ARTICLE (SF91) as Shown in Level 2 or comparable items using power hand tools, electric jig saw, power drill, and/or oscillating sander. Project examples: bird house, foot stool, sawhorse, tool box, other item from manual.

Class +H911904 SECOND ARTICLE (SF91) as Shown in Level 2 or comparable. Project examples: bird house, foot stool, sawhorse, tool box, other item from manual.

-----**Nailing It Together - UNIT 3**

Class H911001 WOODWORKING ARTICLE (SF91): Item should be made using either joints, hinges, dowels, or a dado joining made using skills learned in the Nailing It Together manual. Item is required to be appropriately finished. Examples include: bookcase, coffee table or end table.

Class H911003. RECYCLED WOODWORKING DISPLAY (SF91) – Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 3 manual. Exhibit must include the woodworking plan and a minimum one page report of how the design and engineering process was used to develop the woodworking plan.

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

H911004 - COMPOSITE WOOD PROJECT - (SF96) - 60% of the project must be wood and 40% made from other materials such as metal, rubber, resin, etc. All plans and plan alternations must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside.

H911005 - OUTDOOR WOOD PROJECT made with Treated Wood - (SF97) - Treated wood projects DO NOT have to have a finished coating. All plans and plan alternations must be attached to the article. Protect plans with a cover. If project is designed to be outside. Examples include: picnic tables, planters, outdoor furniture, etc.

H911006 – Wood Projects created on a Turning Lathe - (SF) – 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.

-----**Finishing Up: Unit 4**

H911007 - Woodworking Article - (SF91) Item made using skills learned in the Finishing It Up Project. Examples include: dovetailing, making a pen using lathe, overlays, using a router, etc. Item is required to be appropriately finished.

H911008 - Recycled Woodworking Display - (SF91) Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 4 manual.

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