

2024 SCIENCE, ENGINEERING AND TECHNOLOGY

All exhibits must be labeled. Label each item with the exhibitor name, project division, exhibit class number and years in the project before entering at county fair. 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. 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 State Fair.

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 (width) 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. (Example: Woodworking & Electricity.) For the safety of the models, models must be brought to the fair on a steady surface. Board such as plywood, composition board, or particle-type lumber must be used for demonstration displays and LEGO models.

Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays.

Demonstration boards should be sanded and finished to improve their appearance. The finish on a demonstration board will be judged as a woodworking exhibit. Demonstration boards should include an overall title for the display, plus other necessary labeling.

Reports should be written using the scientific method whenever possible (background, the question or hypothesis, what you plan to do and what you did, method used and observations, results: what you learned. All reports should be computer generated and enclosed in a clear, plastic cover. The reports should be attached securely to the display.

4-H'ers can exhibit in only one level, and once they have progressed to a higher level they cannot exhibit or enroll in a lower project level. This does not apply to Aerospace Model Rockets Levels 3 and 4 and Woodworking Levels 3 and 4.

*H930001. Careers Interview – Interview someone who is working in any field associated with science, engineering and technology and research that career (i.e. computer programmer, architect, engineer, pilot, etc.). 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.

STEM WOODWORKING

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

Requirements: All articles exhibited must include a plan (with drawings or sketch or blueprint) stating dimensions and other critical instructions a builder would need to know to build the project and 4-Her's name and county. Plan may include narrative instructions in addition to the dimension drawings and include any alterations 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, dog houses, etc.) is designed to be used outside, it might be displayed outside. 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.

The name and county of each exhibitor should appear on the back of each board or article and on the front cover of the notebooks so the exhibit may be identified if the entry tag is separated from the exhibit. Each exhibitor is limited to one exhibit per class.

Display boards should be a height of 24 inches and not to exceed ¼ inches in thickness. A height of 24 7/8 inches is acceptable to allow for the saw kerf if two 24-inch boards are cut from one end of a 4-foot by 8-foot sheet of plywood. Nothing should be mounted within ¾ inch of the top or bottom of the board. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays. Demonstration boards

should be sanded and finished to improve their appearance. Demonstration boards should include an overall title for the display, plus other necessary labeling.

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 in observation, 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.

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.

*Denotes State Fair Entry

Purple, \$3; Blue, \$2; Red, \$1.50; White, \$1

The exhibitor's name must be included on all plans and woodworking articles.

Unit I

H911021 Flower Box (from page 33 of manual)

H911022 Napkin or Letter Holder (from page 34 of manual)

H911023 Picture Frame (from page 35 of manual)

H911024 Other Woodworking Article: Item made using skills learned in the Measuring Up manual.

H911025 Woodworking Display: Display exemplifying one of the principles learned in the Measuring Up manual. Examples include: tools and equipment, safety, wood characteristics, measuring, and hand sawing.

Unit II

H911031 Napkin or Letter Holder (from page 32 of manual)

H911032 Birdhouse (from page 33 of manual)

H911033 Foot Stool (from page 34 of manual)

H911034 Woodworking Article: Item made using skills learned in the Making the Cut manual. Examples include: napkin or letter holder, birdhouse, foot stool.

H911035 Woodworking Display: Display exemplifying one of the principles learned in the Making the Cut manual. Examples include: safety, woodworking careers, wood species, screwdrivers and types of screws, squares, sanding, and liquid finisher.

Purple, \$4; Blue, \$3.50; Red, \$3; White, \$2.50

Unit III

*H911001 Woodworking Article: Item should be made using either joints, hinges, dowels, or dado joining made using skills learned in the Nailing It Together manual. Item is required to appropriately finished. 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 laminating and joint types.

*H911003. Recycled Woodworking Display – Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 3 manual. Exhibit must include the woodworking plan and a minimum one-page report of how the engineering design process was used to develop the woodworking plan.

Engineering Design Process

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

*H911004 Composite Wood Project – 60% of the project must be wood and 40% made from other materials such as metal, rubber, resin, etc. All plans and plan alternations must be attached to the article. Protect plans with a cover. If project is designed to be outside, it is required to have appropriate outdoor finish because project may be displayed outside.

*H911005 Outdoor Wood Project made with Treated Wood – Treated wood projects DO NOT have to have a finished coating. All plans and plan alternations must be attached to the article. Protect plans with a cover. If project is designed to be outside, the project may be displayed outside.

*H911006 – 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.

H911041 Learning Tree Jigsaw Puzzle (from page 33 of manual).

H911042 A Box of Many Uses (from page 35 of manual).

Unit IV

*H911007 Woodworking Article — Item made using skills learned in the Finishing Up manual. Examples: dovetailing, making a pen using lathe, overlays, using a router, etc. Item is required to be appropriately finished.

*H911008 Recycled Woodworking Display – Article made from recycled, reclaimed or composite wood. Article must be appropriately finished and/or sealed and utilize one or more woodworking techniques from page 2 of the Unit 4 manual. Exhibit must include the woodworking plan and a minimum one-page report of how the design and engineering process was used to develop the woodworking plan.

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

H911050 Woodworking Display — Display exemplifying one of the principles learned in the Finishing Up project. Examples: career opportunities, types of finishes, or dovetailing.

H911051 Toy Car (from page 26 of manual).

H911052 Table Top Hockey (from page 28 of manual).

H911053 Step Stool/Chair (from page 31 of manual).

H911054 Doggie (from page 33 of manual).

H911055 Woodpecker Door Knocker (from page 34 of manual).

STEM WELDING

Purple, \$3; Blue, \$2; Red, \$1.50; White, \$1

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

The name and county of each exhibitor should appear on the back of each board or article and on the front cover of the notebooks so the exhibit may be identified if the entry tag is separated from the exhibit. Each exhibitor is limited to one exhibit per class.

Display boards should be a height of 24 inches and not to exceed ¼ inches in thickness. A height of 24 7/8 inches is acceptable to allow for the saw kerf if two 24-inch boards are cut from one end of a 4-foot by 8-foot sheet of plywood. Nothing should be mounted within ¾ inch of the top or bottom of the board. Fabricated board such as plywood, composition board, or particle-type lumber may be used for demonstration displays. Demonstration boards should be sanded and finished to improve their appearance. Demonstration boards should include an overall title for the display, plus other necessary labeling.

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 in observation, results: what you learned.) All reports should include 4-Her name and county, be computer generated and enclosed in a clear, plastic cover. The reports should be attached securely to the display.

Welding joints and position: All welds exhibited in class 1 or 2 must be mounted on a 12-inch-high by 15-inch-long display board of thickness not to exceed 3/8 inch. 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 type of welding process (stick, MIG, TIG, oxy-acetylene, etc.), kind of weld, welder setting, electrode/wire/rod size, and electrode/wire/ rod ID numbers. Attach a wire to the display board so it can be hung like a picture frame. No picture frame hangers accepted. If no plans are included with welding article or welding furniture, it will be disqualified. 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.

*H920001 Welding joints — a display of one butt, one lap and one fillet weld.

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 pieces of metal that are the same size and thickness. These pieces, referred to as coupons, should be 1½ to 2 inches wide and 3½ 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 is ¼ inch if using 1/8-inch rod. Suggested rod for AC and DC straight or reverse polarity is first E-7014 and second E-6013.

MIG welding — Suggested coupon thickness is ¼ inch if using .035 wire and 1/8 inch if using .023 wire.

Oxy-acetylene — Suggested coupon thickness is 1/8 inch and suggested rod is 1/8-inch mild steel rod.

*H920002 Position Welds — a display showing three beads welded in the vertical down, horizontal and overhead positions.

1. It is suggested that all welds be of same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4 inches by 4 inches or on individual coupons that are about 2 inches by 4 inches and ¼ inch thick. Suggested rods for this class of position welds for AC and DC straight or reverse polarity is first E-6013 and second E7014, 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.

Purple, \$4; Blue, \$3.50; Red, \$3; White, \$2.50

Description for Classes 3 and 4: All welds should be cleaned and protected from rust with paint or light oil. Plans are to be complete enough that if they were given to a welding shop, the item could be made without further instructions. Bill of materials should include a cost for all items including steel, electrodes, paint, wheels, etc.

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

*H920004 Welding Article — any shop article where welding is used in the construction. 60% of item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. **Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article.** Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project may be displayed outside. 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.

*H920005 Welding Furniture – Any furniture with 75% welding is used in the construction. 60% of the item must be completed by 4-Her and notes regarding laser welding or machine welding must be included. Type of welder, welder settings, all plans, plan alternations, and a bill for material must be attached to the article. Protect plans with a cover. If project is designed to be outside it is required to have appropriate outdoor finish because project maybe displayed outside.

*H920006 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 the metal. In the notebook include:

- a. A photo (front and back) of the finished project. Also include detailed photographs of the project to allow judges to examine cuts.
- b. Instructions on how the design was created, this allows for replication of the project.
- c. Lessons learned or improvements to the project.

*H920007 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 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.

