Department H – Science, Engineering & Technology

Only one entry per class. Classes only are State Fair eligible.

All static exhibits must have received a purple ribbon at the county fair to advance to the State 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 (1) 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.)
- 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.
- All 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 binder. The reports should be attached securely to the display.

Small Engines
Division 890

Crank It Up - Unit 1
Class 3 Small Engine Display/Item: Show an application of one of the concepts learned in the unit project. Examples include: identify the parts of a small engine, safety rules for starting a small engine, small engine repair tool identification.

Warm It Up - Unit 2
Class 1 Small Engine Display/Item: Show an application of one of the concepts learned in the Warm It Up project. Examples include: comparison of engine oil types, transmissions, or safety related to engines. Exhibit could be a poster, or an actual item.

Tune It Up - Unit 3
Class 2 Engine Display/Item: Display/item should exemplify one of the lessons learned in the Tune It Up project. Examples include: diagnostic tools, fuel systems, ignition systems. If a complete engine is exhibited it will not be started. However, display needs to report process of building/rebuilding engine and how/where engine will be utilized (i.e. lawn mower, weed eater, snow blower, etc.)

Power of Wind
Division 900

$\text{Class 1 Engineering Notebook} – (SF305) Your engineering notebook may include sketches of designs, notes of engineering questions you have, or answers to questions posed
within the project manual, pictures as you complete exercises within this project, or big ideas you have while participating in this project. The notebook submitted in this class should be a working engineering notebook, not a scrapbook. Please include your name, county, and age on the front cover.

**SF Class 2 Wind Poster** – (SF307) Poster should exemplify one of the lessons learned in the Power of Wind project. Posters can be any size up to 14” x 22”.

**SF Class 3 Mini Turbine Blade Energy Display** – (SF306) Develop a pinwheel display that demonstrates the working power of wind. Follow guidelines on page 18 and 19 of your manual. Display should include a notebook description of the effectiveness of a least three different designs or materials. Please do not include pennies with your display.

**SF Class 4 Wind Art or Literature Written Piece** – (SF304) Item should illustrate or represent wind turbines, wind power, or something from the power of wind curriculum, for example a pinwheel or item may be original story or poem written by the exhibitor about wind.

**SF Class 5 Wind as Energy Display** – (SF308) Item should be the original design of the 4-H’er. Include the item, or a picture if item is in excess of 6’ tall or 2’ x 2’. Include a notebook of why the item was designed and how it harnesses the power of wind.

**SF Class 6 Careers Interview** – (SF239) Interview someone who is working in the field of wind and research the career in wind. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be 3 to 5 pages, double spaced, 12 point font, and 1” margins. Multimedia reports should be between 3 to 5 minutes in length.

**Woodworking Division 911**

The ability to build objects as designed by another person is an important life skill. Professional woodworkers often are hired to build objects to exacting specifications as laid out in a written plan.

Requirements: All articles exhibited must include a plan (with drawings or sketch or blueprint) stating dimensions and other critical instructions a builder would need to know how to build the project. Plans may include narrative instructions in addition to the dimension drawings. Part of the score depends on how well the project matches the plans. If 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.

4-H’ers must be in Unit 3 or Unit 4 for the exhibit to be considered for State Fair.

**MEASURING UP – UNIT 1**

Class 5 **First Woodworking Article**: Item made using skills learned in the Measuring Up project guide. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.

Class 6 **Second Woodworking Article**: Item made using skills learned in the Measuring Up project guide. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.

Class 7 **Third Woodworking Article**: Item made using skills learned in the Measuring Up project guide. Examples include: recipe holder, stilts or other skill level appropriate item. Items should be entered with construction plans.

**MAKING THE CUT – UNIT 2**
Class 8  **First Woodworking Article**: Item made using skills learned in the Making the Cut project guide. Examples include: birdhouse, footstool, napkin or letter holder. Items should be entered with construction plans.

Class 9  **Second Woodworking Article**: Item made using skills learned in the Making the Cut project guide. Examples include: birdhouse, footstool, napkin or letter holder. Items should be entered with construction plans.

Class 10 **Third Woodworking Article**: Item made using skills learned in the Making the Cut project guide. Examples include: birdhouse, footstool, napkin or letter holder. Items should be entered with construction plans.

**NAILING IT TOGETHER – UNIT 3**

F Class 1  **Woodworking Article**: (SF91) - Item made using skills learned in the Nailing it Together manual. Examples include: bookcase, coffee table or end table.

F Class 2  **Woodworking Display**: (SF91) - Display exemplifying one of the principles learned in the Nailing it Together Project. Examples include: measuring angles, wood lamination and joint types.

F Class 5  **Recycled Woodworking Display** (SF91) - Article made from recycled, reclaimed or composite wood. Article must be sanded and 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. Evaluate (How does your item solve the original need?)
6. Present results (How would you do this better next time?)

**FINISHING UP – UNIT 4**

F Class 3  **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.

F Class 4  **Woodworking Display**: (SF91) Display exemplifying one of the principles learned in the Finishing It Up Project. Examples include: career opportunities, types of finishes, or dovetailing.

F Class 6  **Recycled Woodworking Display** – (SF91) Article made from recycled, reclaimed or composite wood. Article must be sanded and 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. Build the item (What was your woodworking plan, and what processes did you use to build your item?)
5. Evaluate (How does your item solve the original need?)
6. Present results (How would you do this better next time?)

**Class 10 Careers Interview** – (SF239) Interview someone who is working in the field of woodworking and research that career. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be 3 to 5 pages, double spaced, 12 point font, and 1” margins. Multimedia reports should be between 3 to 5 minutes in length.

**Welding**
**Division 920**

**ARCS AND SPARKS**

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.

**Class 1** **Welding joints**– (SF281) a display of one butt, one lap and one fillet weld.

**Class 2** **Position welds**– (SF281) a display showing three beads welded in the vertical down, horizontal and overhead positions.

**Class 3** **Welding article**– (SF239) any shop article or piece of furniture where welding is used in the construction. All plans and bill of materials must be attached to the article. Protect plans with a cover.

**Class 4** **Careers Interview** – (SF239) Interview someone who is working in the field of welding and research that career. Interviews can either be written or in a multimedia format (CD/DVD). Written interviews should be in a notebook. Written reports should be 3 to 5 pages, double spaced, 12 point font, and 1” margins. Multimedia reports should be between 3 to 5 minutes in length.

**4-H Welding Project Tips and Suggestions:**

**Class 1**

All welds should be made with the same electrode/wire/rod size and number. Welds should be made only on one side of metal so penetration can be judged. 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. It is suggested that all welds be on the same size and thickness of metal. These pieces, referred to as coupons, should be 1.5 to 2 inches wide and 3.5 to 4 inches long. A good way to get this size is to buy new cold rolled strap iron and cut to length. The extra width is needed to provide enough metal to absorb the heat from the welding process and prevent the coupons from becoming too hot before the bead is completed. Narrower coupons will become very hot, making an average welder setting too cold at the bead start, just about right in the middle, and too hot at the end. The correct way to weld narrow strips is to make short beads and allow time to cool, however this project requires a full length bead.

**Stick welding**
Suggested coupon thickness—½” if using 1/8” rod
Suggested rod—AC and DC straight or reverse polarity- first E-7014, second E-6013

**MIG welding**
Suggested coupon thickness—½” 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
It is suggested that all welds be on same size and thickness of metal. These pieces are referred to as coupons. The welds can be on one coupon that is about 4” x 4” or on individual coupons that are about 2” X 4” inch and -¼” thick. Suggested rods for this class of position welds for AC and DC straight or reverse polarity is, first E-6013, second E-7014 and E-6010 for DC reverse polarity only.
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
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.