



# Model Design and Building

## Merit Badge Workbook



This workbook can help you but you still need to read the merit badge pamphlet.

This Workbook can help you organize your thoughts as you prepare to meet with your merit badge counselor.

You still must satisfy your counselor that you can demonstrate each skill and have learned the information.

You should use the work space provided for each requirement to keep track of which requirements have been completed, and to make notes for discussing the item with your counselor, not for providing full and complete answers.

If a requirement says that you must take an action using words such as "discuss", "show", "tell", "explain", "demonstrate", "identify", etc, that is what you must do.

**Merit Badge Counselors may not require the use of this or any similar workbooks.**

No one may add or subtract from the official requirements found in Scouts BSA Requirements (Pub. 33216 – SKU 653801).

The requirements were last issued or revised in 2020 • This workbook was updated in June 2020.

Scout's Name: \_\_\_\_\_ Unit: \_\_\_\_\_

Counselor's Name: \_\_\_\_\_ Phone No.: \_\_\_\_\_ Email: \_\_\_\_\_

<http://www.USScouts.Org> • <http://www.MeritBadge.Org>

Please submit errors, omissions, comments or suggestions about this **workbook** to: [Workbooks@USScouts.Org](mailto:Workbooks@USScouts.Org)  
 Comments or suggestions for changes to the **requirements** for the **merit badge** should be sent to: [Merit.Badge@Scouting.Org](mailto:Merit.Badge@Scouting.Org)

1. Study and understand the requirements for personal safety when using such modelmaker hand tools as knives, handsaws, vises, files, hammers, screwdrivers, hand drills and drill bits, pliers, and portable power tools, and when to use proper protective equipment such as goggles when grinding or drilling.

Knives:


Handsaws:


Vises:


Files:


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Hammers:


Screwdrivers:


Hand drills  
and drill bits:


Pliers,


Portable  
power tools:


When to use proper protective equipment such as goggles when grinding or drilling:


Know what precautions to take when using flammable or hazardous products such as glue, epoxy, paint, and thinners.


Discuss these with your counselor before you begin your modelmaking project and tell why they are important.


2. Explain the uses for each of the following types of models: architectural, structural, process, mechanical, and industrial.

Architectural:


Structural:


Process:


Mechanical:


Industrial:


Do research into the different types of materials that could be used in making these models.


3. With your counselor's advice, select a subject from requirement 4 for your model project. Kits may not be used.

Subject: \_\_\_\_\_

Prepare the necessary plans to the proper scale.

Tell your counselor why you selected this project.


4. Do ONE of the following: *(Use a separate sheet of paper for your notes.)*

- a. Make an architectural model. Build a model of a house to a scale of  $\frac{1}{4}'' = 10'$  (1:50 scale) After completing the model, present it to your counselor for approval. Review with your counselor the materials you used and the details of your model.
- b. Build a structural model. Construct a model showing corner construction of a wood-frame building to a scale of  $1\frac{1}{2}'' = 1'0''$  (1:8 scale). All structures shown must be to scale. Cardboard or flat sheet wood stock may be used for sheeting or flooring on the model. Review with your counselor the problems you encountered in gathering the materials and supporting the structure. Be able to name the parts of the floor and wall frames, such as intermediate girder, joist, bridging, subfloor, sill, sole plate, stud, and rafter.
- c. Make a process model. Build a model showing the plumbing system in your house. Show hot and cold water supply, all waste returns, and venting to a scale of  $\frac{3}{4}'' = 1'0''$  (1:15 scale). After completion, present the model to your counselor. Discuss the scale, the materials used, and any problems you encountered in building the model.
- d. Complete a mechanical model. Build a model of a mechanical device that Uses at least two of the six simple machines. After completing the model, present it to your counselor. Be prepared to discuss materials used, the machine's function, and any particular difficulty you might have encountered.
- e. Make an industrial model. Build a model of an actual passenger-carrying vehicle to a scale of  $1'' = 1'0''$  or  $\frac{1}{2}'' = 1'0''$  (1:10 or 1:25 scale). Take the dimensions of the vehicle and record the important dimensions. Draw the top, front, rear, and sides of the vehicle to scale. From your plans, build a model of the vehicle. Discuss with your counselor the most difficult part of completing the model.

- 5. Build a special-effects model of a fantasy spacecraft or a hand-held prop that might appear in a Hollywood science-fiction movie. Determine an appropriate scale for your design - one that makes practical sense. Include a cockpit or control area, living space, storage unit, engineering spaces, and propulsion systems. As you plan and build your model, do the following:
  - a. Study existing designs of vehicles and hand-held devices.
  - b. Arrange and assemble the parts.
  - c. Sketch your completed model.
  - d. Discuss your design, scale, and materials choices with your counselor. Describe how you engineered your model and discuss any difficulties you encountered and what you learned.
- 6. List at least six occupations in which modelmaking is used and discuss with your counselor some career opportunities in this field.

	Occupation	Career Opportunities
1.		
2.		
3.		
4.		
5.		
6.		

**When working on merit badges, Scouts and Scouters should be aware of some vital information in the current edition of the *Guide to Advancement* (BSA publication 33088). Important excerpts from that publication can be downloaded from <http://usscouts.org/advance/docs/GTA-Excerpts-meritbadges.pdf>. You can download a complete copy of the *Guide to Advancement* from <http://www.scouting.org/filestore/pdf/33088.pdf>.**