



# Composite Materials

Scouts BSA · STEM

Name

Started

Completed

Composites are combinations of materials that make things stronger and lighter, from bikes and boats to airplanes. This badge shows you how they're made and lets you build two projects yourself. It's a hands-on badge for future engineers and builders.

## Requirements

Every official requirement, in plain language. Check the official wording when you sign off ([scouting.org/merit-badges/composite-materials/](https://scouting.org/merit-badges/composite-materials/)). Tips and examples are ideas, not extra requirements.

### 1 Safety

**Tips for this section:** Read a safety data sheet for a resin or adhesive with an adult. Wear gloves, eye protection, and work in a well-ventilated area.

**Example for this section:** Pull up the safety data sheet for an epoxy resin and point to the sections on health hazards, protective gear, and first aid. Then explain your setup: nitrile gloves, safety glasses, good ventilation, and no eating at the workbench.

- ☐ **1a** Explain to your counselor the hazards you're most likely to meet when working with composites and how to anticipate, prevent, mitigate, and respond to them; describe the right safety gear and clothing to wear

- ☐ **1b** Explain what precautions to take when you handle, store, or throw away resins, reinforcements, and other composite supplies, and why health, safety, and care for the environment matter

- ☐ **1c** Describe a safety data sheet (SDS) and explain why it's used

## 2 What composites are

**Tips for this section:** Find composite items around you, like a hockey stick or fishing rod, and compare them to wood or metal versions.

**Example for this section:** Compare a fiberglass canoe paddle with a wooden one: weight, stiffness, how each handles water and sun, and cost. Explain that the glass fibers carry the load while the resin holds them in shape.

- ☐ **2a** Explain what composite materials are, with a short history of how they developed

- ☐ **2b** Compare composites with wood, aluminum, copper, and steel, describing their physical, electrical, mechanical, corrosion, flammability, cost, and other properties; for each of those four materials, give one example of shaping and using it for a specific purpose

- ☐ **3** Describe how composite materials are made, then do 3a-3c

**Tip:** Look up how fibers and resins are combined. Draw a simple diagram showing the layers.

**Example:** Draw a cross-section of a surfboard or kayak hull: foam or wood core, layers of fiberglass cloth, and resin soaking through it. Explain how laying fibers in different directions makes a part strong in more than one direction.

- ☐ **3a** Discuss three composite reinforcement materials, their good and bad traits, and their uses; get the SDS for each and discuss its toxicity, disposal, and safe-handling sections

- ☐ **3b** Discuss three resins used in composites, including both thermoset and thermoplastic resins, their good and bad traits, and their uses; get the SDS for each and discuss its toxicity, disposal, and safe-handling sections

- ☐ **3c** For each of the three resins you picked in 3b, come up with a new use that might be worth developing

#### 4 Learning from industry: Choose 1 of 2

**Tips for this section:** If a visit isn't possible, explore company websites to see what they make and how.

- ☐ **4a** With a parent's or guardian's permission and your counselor's approval, visit a company that builds or repairs products made from composites, then talk over what you learned with your counselor

- ☐ **4b** With a parent's or guardian's permission and your counselor's approval, find three websites related to composites, then talk over what you learned with your counselor

## 5 Composite projects

**Tips for this section:** Work with an adult and follow safety rules. Start with a simple project to learn how the materials behave.

**Example for this section:** Pick at least one project from the Composite Materials pamphlet. The second can be another from the pamphlet or your own idea, like a fiberglass patch on a scrap of wood, once your counselor approves it. Do them with your counselor or an adult they approve who has worked with resin.

- ☐ **5a** Complete two composite projects: at least one from the Composite Materials pamphlet, and the second either from the pamphlet or your own idea that your counselor approves in advance

- ☐ **5b** With your counselor's help, find a suitable site to do the projects safely under the supervision of your counselor or a knowledgeable adult your counselor approves

- ☐ **5c** Decide with your counselor how the finished projects will be judged, then use those guidelines to evaluate them together

## 6 Careers and hobbies: Choose 1 of 2

**Tips for this section:** Look into jobs like materials engineer or technician, or hobbies like model building or boat repair.

- ☐ **6a** Research one composites-related career: training and education, costs, job outlook, salary, duties, and advancement (with permission, use internet or library research, an interview, or a workplace visit); discuss with your counselor what you found and why it might interest you

- ☐ **6b** Explore how composites knowledge and skills could become a hobby or interest; research training, costs, and organizations that support it, and discuss with your counselor the short- and long-term goals you might set