



Boy Scout Engineering Merit Badge Requirements

1. As a group or singularly, select a manufactured item in your home (such as a toy or an appliance, we suggest using the ear phones provided at the stations for scouts) and, under adult supervision and with the approval of your counselor, investigate how and why it works as it does. Find out what sort of engineering activities were needed to create it. Discuss with your counselor what you learned and how you got the information.
2. Select an engineering achievement that has had a major impact on society (for example: electricity). Using resources such as the Internet (with your counselor's permission), books, magazines, engineers, volunteers and counselors at the expo to find out about the engineer(s) who made this engineering feat possible, the special obstacles he/she/they had to overcome, and how this achievement has influenced the world today. Discuss with your counselor what you've learned.
3. Explain the work of six types of engineers. Pick two of the six and explain how their work is related.
 - 1.)
 - 2.)
 - 3.)
 - 4.)
 - 5.)
 - 6.)
4. Visit with an engineer (who may be your counselor or parent, or here at the expo) and do the following:
 - a. Discuss the work this engineer does and the tools the engineer uses.
 - b. Discuss with the engineer a current project and the engineer's particular role in it.
 - c. Find out how the engineer's work is done and how results are achieved.
 - d. Ask to see the reports that the engineer writes concerning the project.
 - e. Discuss with your counselor what you learned about engineering from this visit.

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5. Do ONE of the following: (one collaborated design for a group of scouts is accepted)
- a. Use the systems engineering approach to make step-by-step plans for your next campout (talk about it). List alternative ideas for such items as program schedule, campsites, transportation, and costs. Talk about why you made the choices you did and what improvements were made with your counselor.
 - b. Make an original design for a piece of patrol equipment. Use the systems engineering approach to help you decide how it should work and look (on the back of this paper). Draw plans for it. Show the plans to your counselor, explain why you designed it the way you did, and explain how you would make it.
6. Do TWO of the following: (Recommended: 6C, and 6F/ There are stations provided to do these)
- a. *Transforming motion.* Using common material or a construction set, make a simple model that will demonstrate motion. Explain how the model uses basic mechanical concepts like levers and inclined planes to demonstrate motion. Describe an example where this mechanism is used in a real product.
 - b. *Using electricity.* Make a list of 10 electrical appliances in your home. Find out approximately how much electricity each uses in one month. Learn how to find out the amount and cost of electricity used in your home during periods of light and heavy use. List five ways to conserve electricity.
 - c. *Understanding electronics.* Using an electronic device such as a mobile telephone or portable digital media player, find out how sound travels from one location to another. Explain how the device was designed for ease of use, function, and durability.
 - d. *Using materials.* *Do experiments to show the differences in strength and heat conductivity in wood, metal, and plastic. Discuss with your counselor what you have learned.*
 - e. *Converting energy.* Do an experiment to show how mechanical, heat, chemical, solar, and/or electrical energy may be converted from one or more types of energy to another. Explain your results. Describe to your counselor what energy is and how energy is converted and used in your surroundings.
 - f. *Moving people.* Find out the different ways people in your community get to work. Make a study of traffic flow (pedestrian traffic flow at the expo, number of people and relative speed). Discuss with your counselor what might be improved to make it easier for people at the expo to get where they need to go.
 - g. *Building an engineering project.* Enter a project in a science or engineering fair or similar competition. (This requirement may be met by participation on an engineering competition project team.) Discuss with your counselor what your project demonstrates, the kinds of questions visitors to the fair asked you about it, and how well were you able to answer their questions.
7. Explain what it means to be a registered Professional Engineer (PE). Name the types of engineering work for which registration is most important? If you have any questions or do not know, feel free to ask any Expo director, or any of the Engineers with the companies, for most would love to help(just be ask politely and be courteous).
8. Study the **Engineer's Code of Ethics (below)**. Explain how it is like the Scout Oath and Scout Law.
Engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

Principles

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- using their knowledge and skill for the enhancement of human welfare;
- being honest and impartial and serving with fidelity the public, their employers and clients;
- striving to increase the competence and prestige of the engineering profession; and
- Supporting the professional and technical societies of their disciplines.

Cannons

- Engineers shall hold paramount the safety, health and welfare of the public in the performance of their professional duties.
- Engineers shall perform services only in areas of their competence.
- Engineers shall issue public statements only in a subjective and truthful manner.
- Engineers shall act in professional matters for each employer or client as faithful agents or trustees, and shall avoid conflicts of interest.
- Engineers shall build their professional reputation on the merit of their services and shall not compete unfairly with others.
- Engineers shall act in such a manner as to uphold and enhance the honor, integrity, and dignity of the engineering profession.
- Engineers shall continue their professional development throughout their careers, and shall provide opportunities for the professional development of those engineers under their supervision.

8. (Above)

9. Find out about three career opportunities in engineering. Pick one and discuss with your counselor the education, training, and experience required for this profession, then explain why this profession might interest you.

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