

**Title:** Cutting a Keyway for a Sprocket

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**Externship Business:** [Nercon](#)

**Overview / Description:**

This will be a 2-3 day lesson where a student will learn how to cut a slot for a keyway in a pulley, sprocket, or wheel.

**Subject(s):**

Technology Education - General Metals

**Grade Level(s):**

Grades 9-12

**Learning goals/objectives:**

*After completing this activity, students should be able to:*

- Identify what a keyway is, and how to cut one using the proper tools.
- Students should also be able to identify all tools, and what they are used for.
- Students should be able to measure distance to the thousands of an inch.
- The Machinery Handbook will also be introduced.

**Type of Activity:**

- Individual
- Whole Class

**Teaching Strategies:**

- Discussion
- Use of Technology
- Simulation
- Performance Assessment

**Content Standards**

Wisconsin Standards for Technology and Engineering

Content Area: Technology and Engineering

BB/Broad Based

- **BB1.b:** Analyze and use tools and materials.

- **BB1.b.6.h:** Choose and perform the material operations of forming, cutting, etc...

MNF/Manufacturing:

- **MNF1:** Students will be able to select and use manufacturing technologies.
- **MNF1.a:** Identify, select and safely use tools, machines, products and systems for specific tasks.
- **MNF1.a.2.e:** Recognize tools, machines and materials along with their applications and failures.
- **MNF1.a.3.e:** Recognize the characteristics of length.
- **MNF1.a.5.m:** Use tools, materials and machines safely, adjust and repair systems.
- **MNF1.a.9.h:** Select and apply the appropriate units and scales for situations involving measurement.

**Model Academic Standards for School Counseling**

Career Development Domain

**Content Standard G:** Students will acquire the self-knowledge necessary to make informed career decisions.

- Core Performance Standard 1: Develop the ability to make informed career decisions based on self-knowledge.
- Core Performance Standard 2: Develop positive interpersonal skills necessary to be effective in the world of work.

**Length of Time and length of class periods:**

Two to three 50-minute class periods.

**Materials List:**

- Sprocket, pulley, part to be broached
- Broach set
- Arbor press or Hydraulic Press
- Machinery Handbook
- Caliper
- Cutting Oil
- [Student Directions for Cutting a Keyway for a Sprocket](#)

**Directions (Step-by-Step):**

- Teacher will begin by giving an oral and visual demonstration of the equipment needed for cutting a keyway for a sprocket and what it is used for.
- A step-by-step teacher demonstration of cutting a keyway for a sprocket will be done. At the conclusion of the demonstration, teacher should check for understanding by

stopping at different points in the process and asking students to indicate what the next step should be.

- Once students have indicated comfortability with the process, students will then be given a thick walled pipe section to represent the pulley. Each student will then be given an opportunity to broach a keyway into the pipe.

### **Wrap-Up:**

Upon completion, students will have to measure keyway depth and make sure their part fits using a sample key and shaft.

### **Formative/Summative Assessment:**

- Formative assessment - During the demonstration, teacher will check for understanding by stopping at different points in the process and asking students to indicate what the next step should be.
- Summative assessment - Upon completion, students will have to measure keyway depth and make sure their part fits using a sample key and shaft.

### **Extension Activity for differentiation:**

- Students can undertake various measuring activities using calipers.
- A machinist could visit from local manufacturing company to discuss typical processes connected with the position.
- Students could next undertake punching a square hole using an Ironworker.

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## Student Directions for Cutting a Keyway for a Sprocket

- Identify all needed parts:



Pulley



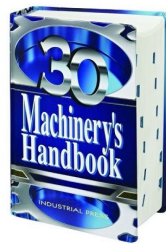
Broach set



Arbor Press



Caliper



Machinery Handbook



Cutting Oil

### Step 2

- Set Up:
  - Measure the inside diameter of the pulley.
  - Use the bushing and shims from the broach set that are necessary to fit in the hole you just measured. Place the bushing and shims in the hole.
  - Select the correct size broach to match up with the keyway hole you will need.
  - If necessary, rotate the bushing to the spot in the pulley where you want the keyway.
  - Lube the cutting area liberally with oil.

### Step 3

- Cutting the Keyway:
  - Align the part in the arbor press (hydraulic press for larger parts) so the broach can be pressed all of the way through without hitting anything.

- Place the broach in the bushing and bring down the press until it touches the broach, and make sure the broach is straight up and down.
- When everything is aligned, press the entire broach down through the bushing and pulley. When it is through, you should see a square hole cut through the edge of the pulley.
- If the keyway needs to be deeper, add a shim and repeat the 3 steps above.
- Continue until you reach the depth you need.

#### **Step 4**

- Fitting with keyway:
  - Align the pulley with the motor or shaft with the keyway and make sure you have a snug fit.
  - If more of the keyway needs to be cut, repeat step 3.