

## Describing engineering processes

Understanding the application of engineering processes including:

- **Marking** includes applying a marking out medium such as engineer's blue to the material and using a scribe to mark lines for cutting or forming. Dividers and calipers may also be used for marking out. Common tools also used would be engineers square and a steel rule.
- **Cutting** can occur using a hand tool like a hacksaw, sheers or snips saw or fretsaw, or using machinery such as a metal bandsaw.
- **Finishing** applications can include oil bluing, lacquer applications, paint, dip coating etc.
- **Shaping** can involve the removal of materials using saws, files or grinding equipment. It is usually applied to change the form/ shape of stock material.
- **Drilling** is a process whereby a hole is required in a material. Drilling can be done using a hand drill, or drill press/pillar drill, and use a variety of different drill types.
- **Milling** uses a milling machine to cut accurate features such as; open slots, steps and enclosed slots. It can also be used to face off edges and produce holes.
- **Brazing** typically involves a brazing hearth to braze metals together to form a permanent joint. The brazing hearth can also be used to heat treat metals by annealing, normalizing, tempering or hardening a range of metals.
- **Turning** uses a machine called a lathe that can be used to turn a piece of metal to create differently shaped round pieces. It can also be used to create threads and to apply different knurled finishes, as well as to apply chamfers or rebates to material.
- **Joining** metals can be done permanently using welding, brazing, epoxy resin adhesives and soldering. Temporary methods include nuts and bolts, hinges, screws and rivets.
- **Soldering** is used to heat join softer metals such as silver in jewelry (silver solder) or to attach electronic components to printed circuit boards.
- **Forming** is a process used to change the shape of the material, for example by bending, compressing or extruding. Additional tools such as vices and clamps are often used in this process. Heat is often used to assist forming processes.
- **Preparing** materials includes cutting materials to rough sizes (slightly larger than required) from stock material (the material as purchased from the supplier). Preparation can also consider ensuring that all of the tools and equipment identified in the planning stages is available and ready to use. This can also include undertaking appropriate risk assessment measures to ensure safe working practice is undertaken.

## Risk assessments and safe working practices

Risk assessments are performed prior to manufacture to ensure that operations can be undertaken safely.

They can include the following:

### Identifying potential hazards

- Visual inspection of the workplace to ensure that no obstructions or hazards are present.
- Visual inspection of equipment, which includes guards and safety features.
- Checking of tools to ensure there are no defects or missing parts.

### Undertaking a risk assessment

Risk assessments aim to identify potential risks based on the work which will be undertaken during manufacture. The risk assessment will classify the risk according to severity of harm. Once the areas are identified, the likelihood and the control measures are put into place to reduce and minimize the risks from becoming potential accidents to the machinist or operator.

### Personal protective equipment (PPE)

The risk assessment document should also identify appropriate PPE, which should be used for key equipment and processes. For example:

- ear defenders
- safety goggles
- protective aprons
- heat resistant gloves
- face shields.