



Course **Advanced Manufacturing**  
Section: **Robotics Engineering**



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# Welding Joints

## What You Will Do

Build crane arms with different types of joints and test them to determine which joint type is the strongest.

## Materials You Will Need

- Cardboard box you can cut into strips
- Glue or tape
- Small objects for weight
- String
- Ruler
- Pencil
- Scissors

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## Welding Joints

Welders join peices of metal together in a way that makes those two peices act like one solid piece. To do this, you have to understand the best way to create a joint that will withstand the stress that might be applied to it. Think of a crane lifting a few thousand pounds a hundred feet in the air. The welds holding those parts together have to be very strong.

## Flexural Strength

Flexural strength is how much load (weight) a material can hold before it gets deformed or breaks. Cardboard usually has very little flexural strength. Let's see how welders join materials together to strength them.

## Tensile Strength

Tensile strength is the maximum stress a material can withstand while being stretched or pulled before breaking

## Step 1: Create Slats

Use the scissors to cut the box into sheets of cardboard. Then use the ruler, pencil, and scissors to cut the sheets into several slats that each measure 2 inches wide by 6 inches long.

## Step 2: Build a Crane Arm

Use glue or tape to join three slats together into a crane arm that is little over a foot long. Steel is heavy and expensive. Keep in mind that it is the goal of every welder to build the strongest structure possible without using too much material.

Build three crane arms. Each one will use a different joint type to connect the slats:

- **Butt joint** (end-to-end)
- **Lap joint** (overlapping pieces)
- **T-joint** (one piece attached perpendicularly)

If using glue, let it dry before moving to the next step.

## Step 3: Attach the Load

Cut a length of string about as long as your arm. Tie one end of the string around your weight.

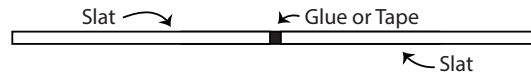
Attach the other end of the string to the first crane arm.

## Step 4: Lift the Weight

Hold the end of the crane arm opposite the weight and slowly lift the weight. How high were you able to lift it before the arm bent or twisted? If it lifted without any problem, add more weights until it does.

You won't know which joint type is the strongest until you test each one until the arm fails. Repeat this test with each joint type and compare how each performs.

### Butt Joint



### Lap Joint



### T-Joint

