

# Locking Clamp Build Guide

**6627A**

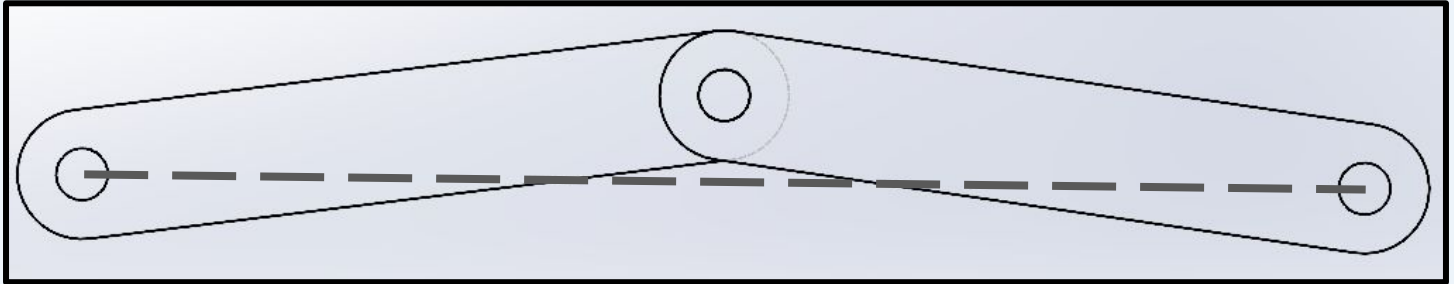
**Aidan  
Cian  
Iza  
Lily  
Zack**

**Foothill High School**  
**Video Walkthrough**

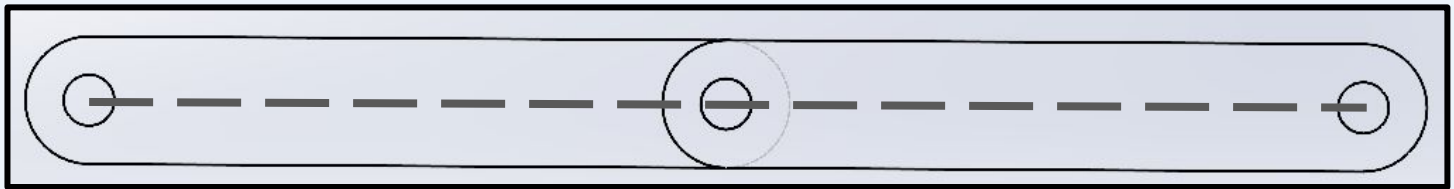
# Over-Centered Linkage

## What is an over-centered linkage?

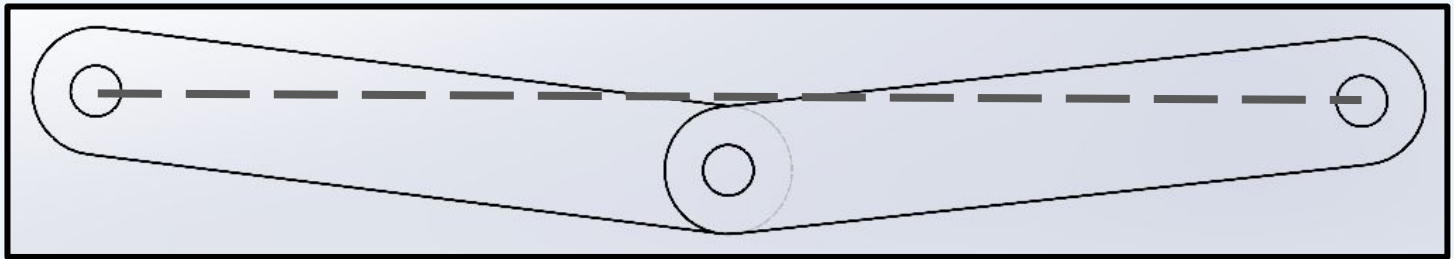
Simply put, an over-centered linkage is any linkage where the connection is rotated past the center. With two rotating pieces, this occurs once the center passes the illustrated line.



**Under-centered**



**Centered**



**Over-centered**

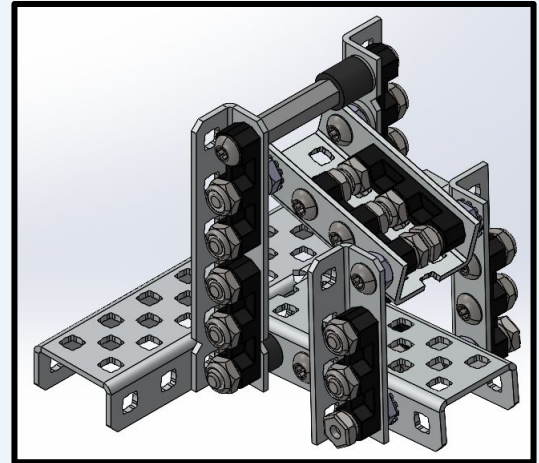
## What are the advantages

When force is applied compressing the two outsides together, the linkage will pivot in a specified direction (moving upward for the under-centered example, and downward for the over-centered example). Using this unique property of these linkages, a clamp can be created that forces the pieces into a hard stop, causing the clamp to lock.

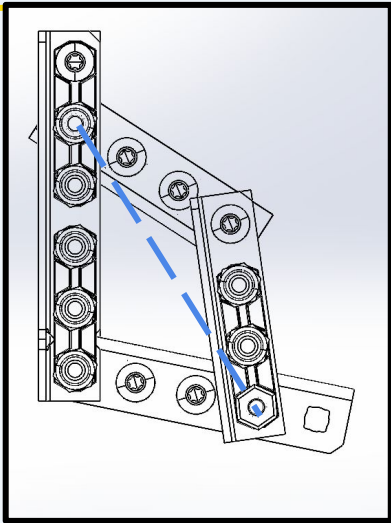
# Example - Overview

## Example

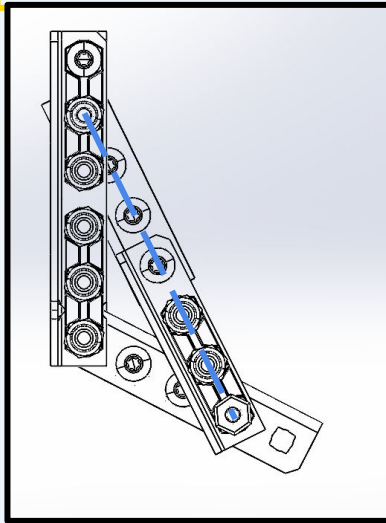
Over-centered locking mechanisms can be configured in a variety of ways, with limitless combination of lengths, materials, and mountings. For a simplified example, this will cover the construction of a small and stable clamp, versatile for any application.



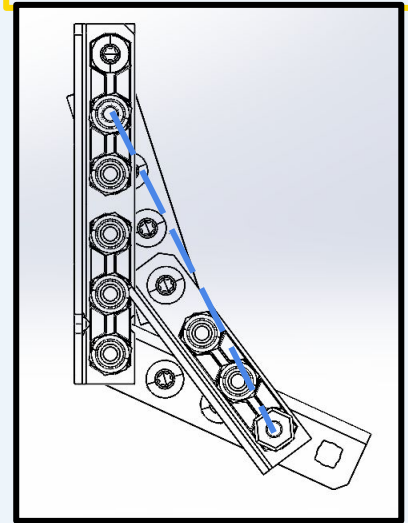
## Under-centered



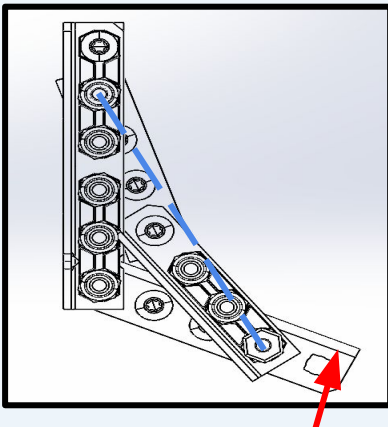
## Centered



## Over-Centered



Despite the seemingly complicated construction, the fundamental concepts still apply, and there are many parallels to the diagram on the slide prior.



## Why this works

When the clamp is engaged in the over-centered position, any force pushing up on the clamping bar will translate into force inward, where it stops against the internal stop.

# Example - Materials

## Required Tools

In addition to the parts (listed below) a screwdriver and wrench is required to assemble the subsystem.

## Bill of Materials

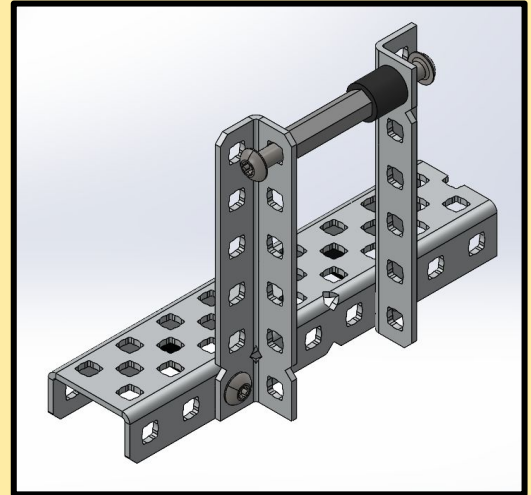
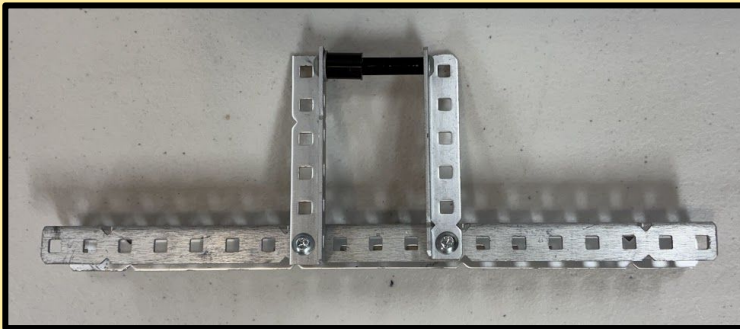
Part	Quantity
4 Hole C-Channel	1
5 Hole C-Channel	2
6 Hole Half C-Channel	2
4 Hole Half C-Channel	2
Bearing Flat	10
0.875" Standoff	3
0.5" Screw	18
0.75" Screw	6
2.5" Screw	1
Low Profile Nylock Nut	25
Keps Nut	7

## Not Listed

Assorted spacing - nylon spacers and nylon washers - and a mounting back (any c-channel of a length 5 holes or longer)

# Example - Construction

## Frame

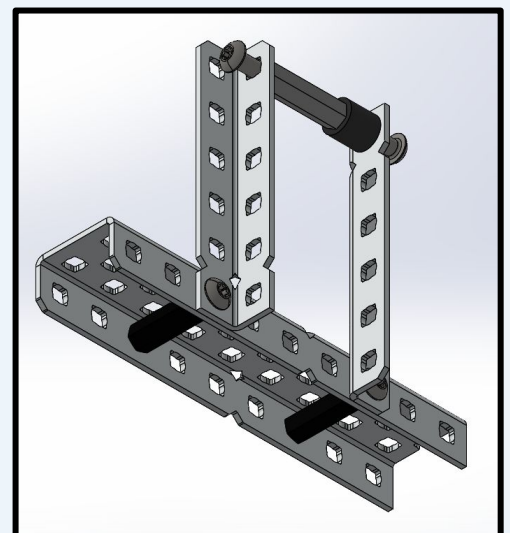


### Instructions

Attach the two 6 Hole Half-C Channels to the back mounting piece using screws and standoffs. It is important to place a standoff between the two pieces to ensure that they remain square and rigid after constant force.

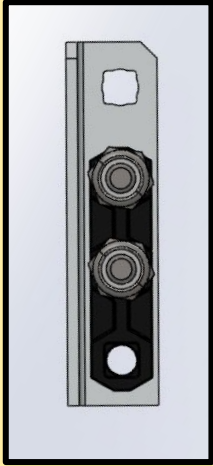
### Build Tip!

Using the 0.875" standoffs between the flanges of the mount prevents the c-channel from bending and to maintain the rigidity. These are the exact width of the interior spacing of the c-channel and fortify the shape. Alternatively, these specialty standoffs can be replaced with a 0.5" and a 0.375" spacer.

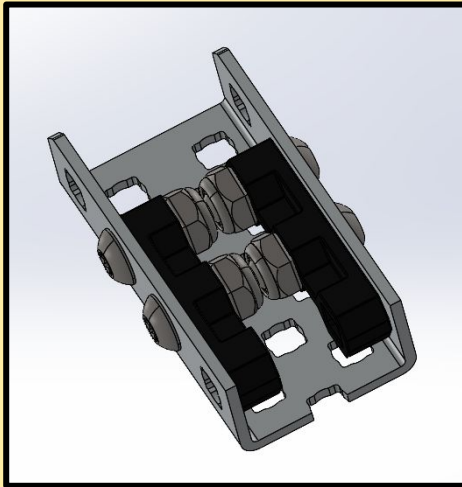


# Example - Construction

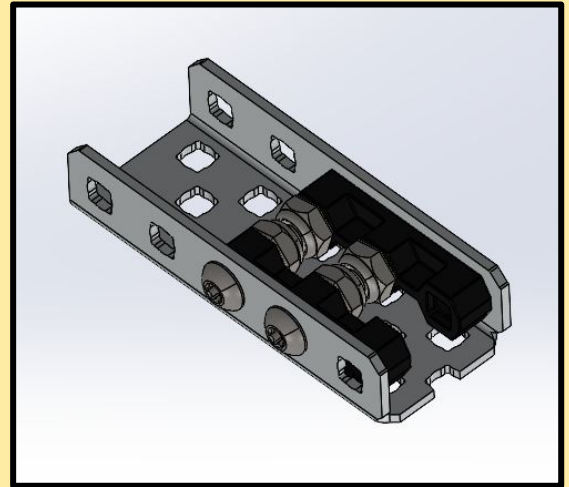
## Prep the Pivots



(2x)



(1x)



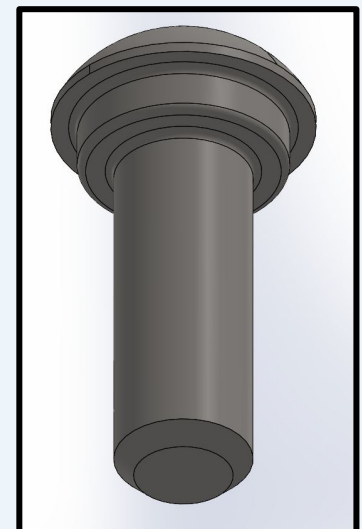
(1x)

### Instructions

Prep the pivoting components by attaching the 6 bearing flats, using 12 screws and thin nylock nuts. This will allow for the final assembly of the screw joints to be seamless and efficient.

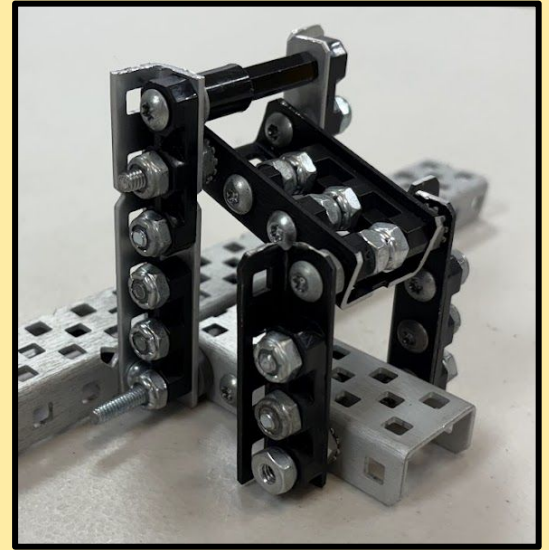
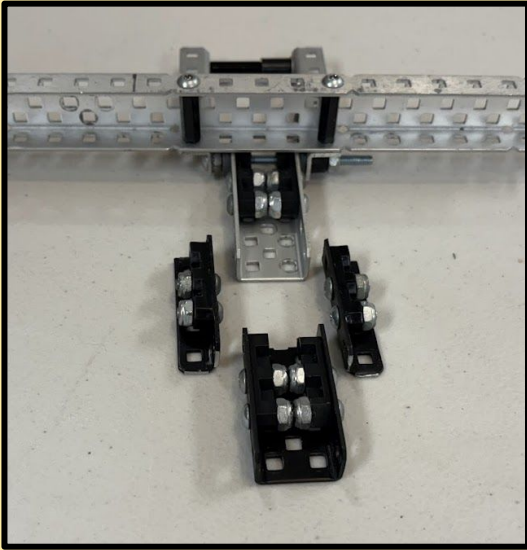
### Build Tip!

Shoulder screws have an additional larger outer profile of material near the head. This wider diameter allows for it to fit snugly within the c-channel. By removing any excess space within the screw to the metal, it allows for all of the construction to be perfectly aligned and remain rigid through constant usage.



# Example - Construction

## Attach the Pivots



### Instructions

Finally attach the pivots by tightening the c-channel to the screw head to ensure it cannot move. Attach adequate nylon spacing using washers and spacers to reduce friction (always strive to avoid metal on metal connections). Connect the screw through the bearing flat and attach a nylock nut.

### Build Tip!

Making a screw joint and the screw isn't quite long enough? Never fear! Simply reverse the orientation of the nylock nut, requiring less thread length to still maintain a tight fit. Make sure to often maintain these connections however as they are more prone to unscrewing from movement and vibrations than the traditional method of attaching.

