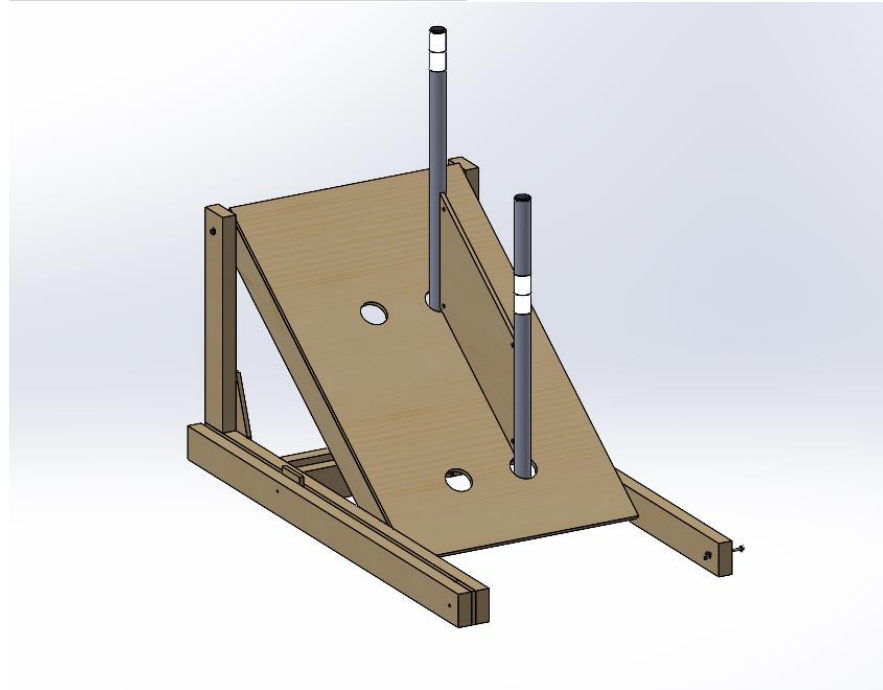


## TE-23002 END CONE RAMP ASSEMBLY



**Description:** This is an End Cone Ramp, designed so that teams can practice without the need for a full GRID. This design allows for a quick modification to be used either as a left end or a right end.

### FILES INCLUDED

In this compressed folder, you will find all of the drawings, CAD Files and STEP Files for this design.

**Drawings:** For your convenience, all drawing files have been exported to

PDF Format. Each major field assembly will have both assembly drawings and component drawings.

**CAD Files:** All SOLIDWORKS files required to build or modify the assembly.

**STEP files:** STEP files of the assembly are included for the convenience of non-SOLIDWORKS users.

### SHOPPING LIST

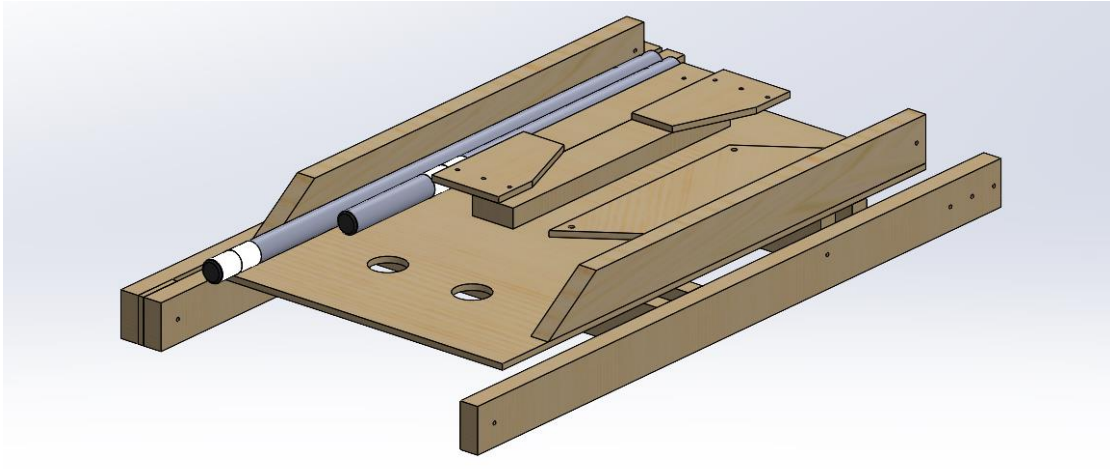
#### Plywood and Lumber (Example Cut List at end of Readme):

- 4' x 8' x 1/2" Thick Plywood – Under Half of a Sheet
- 2" x 4" x 8' Lumber – 5 Pieces

#### Hardware:

- 1/4-20 x 2.5" Long – 6 Pieces
- 1/4-20 x 3.5" Long – 2 Pieces
- 1/4-20 x 4" Long – 2 Pieces
- 1/4-20 x 5" Long – 4 Pieces
- 1/4-20 Wing Nuts – 14 Pieces
- Cable Ties – 4 Pieces
- #8 Wood Screws x 1.5" long – Approximately 16 Pieces
- #8 Wood Screws x 3" Long – Approximately 16 Pieces

**NOTE ON HARDWARE:** All nuts and bolts, except for the 5" long bolts and 4 of the wing nuts (holding the poles), can be replaced with approximately 4x #8 x 1.5" wood screws and 8x #8 x 3" wood screws. The design uses these nuts and bolts to allow itself to be broken down into a much smaller footprint for packing. If this is not a concern for your team, wood screws will make for a sturdier assembly. Below is an image showing how much space you can save using nuts and bolts instead of wood screws.



*An End Cone Ramp can be broken down to be 8.25" tall instead of 26.5" tall (wood frame) and 46" tall (with pole)*

Other:

- 1-1/4" Schedule 40 Aluminum Pipe x 45 11/16" Long – This pipe could be made from Black Iron Pipe from the 2022 Team Element Hangar, or out of PVC if you don't have the resources to cut and drill metal pipes. AndyMark also sells this pipe (without the drilled holes) with a cap installed, part number **am-4942\_back**.
- 1-1/4" Schedule 40 Aluminum Pipe x 33 11/16" Long – This pipe could be made from Black Iron Pipe from the 2022 Team Element Hangar, or also out of PVC if you don't have the resources to cut and drill metal pipes. AndyMark also sells this pipe (without the drilled holes) with a cap installed, part number **am-4942\_front**.
- AndyMark also sells these as a pair of poles, part number **am-4942\_pair**, and a half field's worth of poles, part number **am-4942\_half**. All AndyMark poles do not have the drilled holes in the sides of the poles.
- 2x Pole Caps. The official Pole Caps are **CCF-RT-13-1** from caplugs.com. These caps are also available at AndyMark individually, part number **am-1686**. There is also a CAD file of a similar but not exact model of the caps available, TE-23029, to be 3D printed or otherwise manufactured. If making this cap is a challenge, lengthening your pole by 3/16" and not having a cap is a relatively close alternative to the pole with the cap installed.
- 4x 5.25" long pieces of vision tape, supplied in the Kit of Parts.
- 2-3/4" Spade Bit, Forstner Bit or Hole Saw

**Notes about materials:**

- Plywood and Hardboard Sheets – quality of plywood is up to the user. Plywood of lower qualities may contain voids and may warp more than high quality plywood. All dimensions listed are "nominal". For example, 1/2" plywood is typically 15/32".
- Lumber - quality of lumber is up to the user. Please keep in mind that lumber of lower qualities may warp more than high quality lumber. All dimensions below are the "mill cut" dimensions. For example, 2" x 4" lumber is really 1 1/2" x 3 1/2".

**Example Cut List (All Units are Inches):**

Repetition	Stock dimensions	Panel	Qty
1x	96 x 48	25.75 x 43.875 / TE-23014	1
		9.5 x 5.75 / TE-23012	2
		9.5 x 25.52 / TE-23007	1
		3.5 x 3.5 / TE-23006	2

Repetition	Stock length	Part length / Label	Qty	Waste
2x	96	54.25 / TE-23008	1	Material remnant 2.375
		39.125 / TE-23013	1	Cut 0.25
		54.25 / TE-23008		39.125 / TE-23013

Repetition	Stock length	Part length / Label	Qty	Waste
1x	96	54.25 / TE-23005	1	Material remnant 15.75
		25.75 / TE-23009	1	Cut 0.25
		54.25 / TE-23005		25.75 / TE-23009

Repetition	Stock length	Part length / Label	Qty	Waste
1x	96	25.75 / TE-23009	3	Material remnant 18.375
				Cut 0.375
		25.75 / TE-23009		25.75 / TE-23009

Repetition	Stock length	Part length / Label	Qty	Waste
1x	96	22.5 / TE-23011	2	Material remnant 50.75
				Cut 0.25
		22.5 / TE-23011		22.5 / TE-23011