

Pool Courses – Build Guide

2022 SeaPerch Season

www.seaperch.org

This build guide includes instructions for building the obstacle course and mission course for the *International Space Station (ISS) Extra Vehicular Activity (EVA) Mission* within the 2022 International SeaPerch Challenge. Please check with your local regional coordinator for information related to your local regional competition.

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This guide and associated parts list is divided by course component. The full obstacle course and mission course task frames are identical to the components used in 2019 – 2021. A mini course modification is included for practice or use in smaller pools; however only the full size course will be utilized during the 2022 International SeaPerch Challenge.

Obstacle Course Build Guide

This obstacle course is the standard SeaPerch 5-hoop course with 4-foot hoop spacing. For the International SeaPerch Challenge, the hoops may be oriented differently than shown and the obstacle course will be suspended from the lane dividers, if possible. Detailed drawings can be found on the SeaPerch website in the Build Guide instructions for the 2020 competition at:

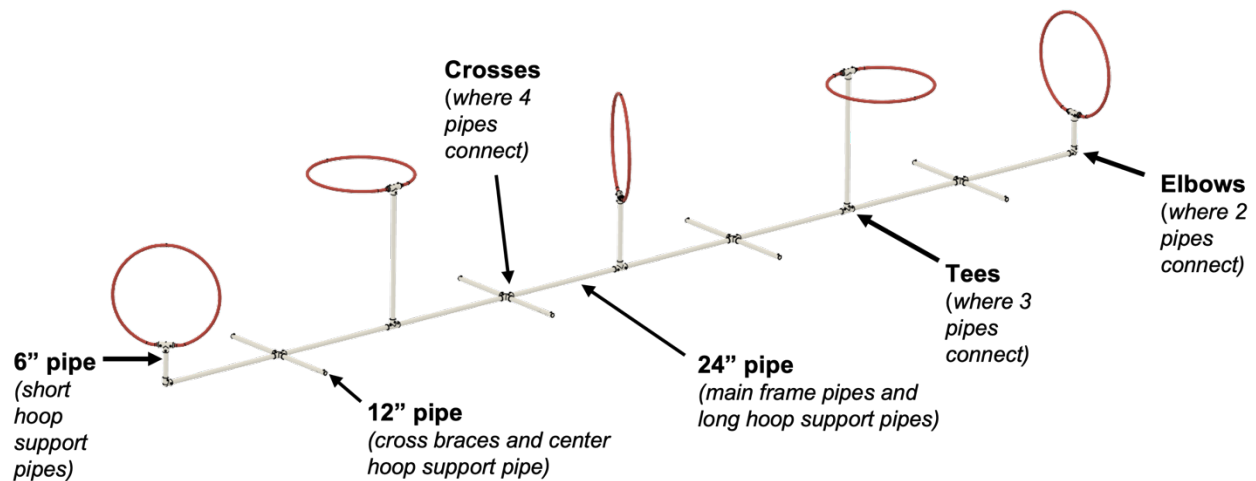
<https://seaperch.org/resources/library/#competition>

Parts Lists

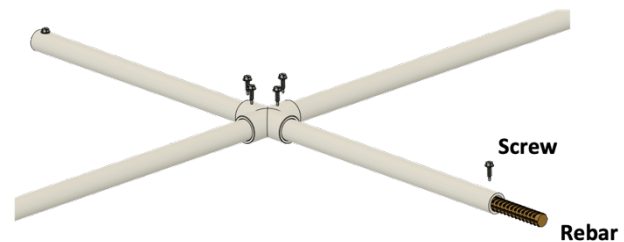
Obstacle Course Frame & Hoop Supports (5 hoops, 4-foot hoop spacing)		
Item	Unit	Qty.
1/2" Sch 40 PVC Elbow	Each	2
1/2" Sch 40 PVC Cross	Each	4
1/2" Sch 40 PVC Tee	Each	3
1/2" Sch 40 PVC Pipe X 6" Lg	Each	2
1/2" Sch 40 PVC Pipe X 24" Lg	Each	10
1/2" Sch 40 PVC Pipe X 12" Lg	Each	9
#4 Rebar (1/2" Dia.) X 24" Lg	Each	4

Obstacle Course Hoops (5 Hoops)		
Item	Unit	Qty.
1/2" Sch 40 PVC Tee	Each	5
1/2" Sch 40 PVC Pipe X 1" Lg (if using pipe for PEX connector)	Each	10
1/2" PEX Tubing (Red) X 57" Lg	Each	5
#8 X 5/8" Stainless Steel Flanged Head Self-Drilling Screw	Each	10
1/2" in. CPVC to PVC Bushing (alternative for PEX connection)	Each	10

Frame and Hoop Supports: The suggested hoop support pipe lengths (24", 12", 6") are suitable for pool depths of 4' – 7' and may need to be adjusted for pools that are shallower or deeper. It is recommended that all pipe joints be secured with self-drilling screws from the parts list.

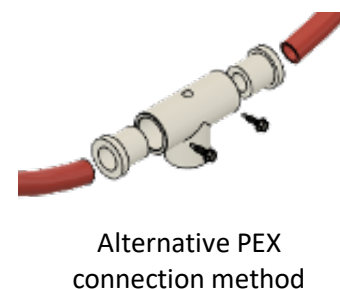
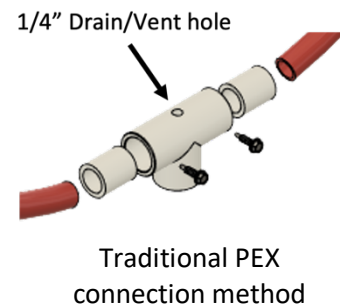


For the base of the obstacle course frame, insert rebar into cross braces (12" long pipes). Secure the rebar with screws in the end of pipes and secure cross brace pipes to tee after inserting rebar.



Obstacle Course Hoops: Assure that the PEX pipe is fully inserted into the pipes or bushing before securing with screws. Drain/vent holes (1/4") must be drilled in the hoops and pipe tees to allow air to escape when submerging and water to escape when removing from the pool.

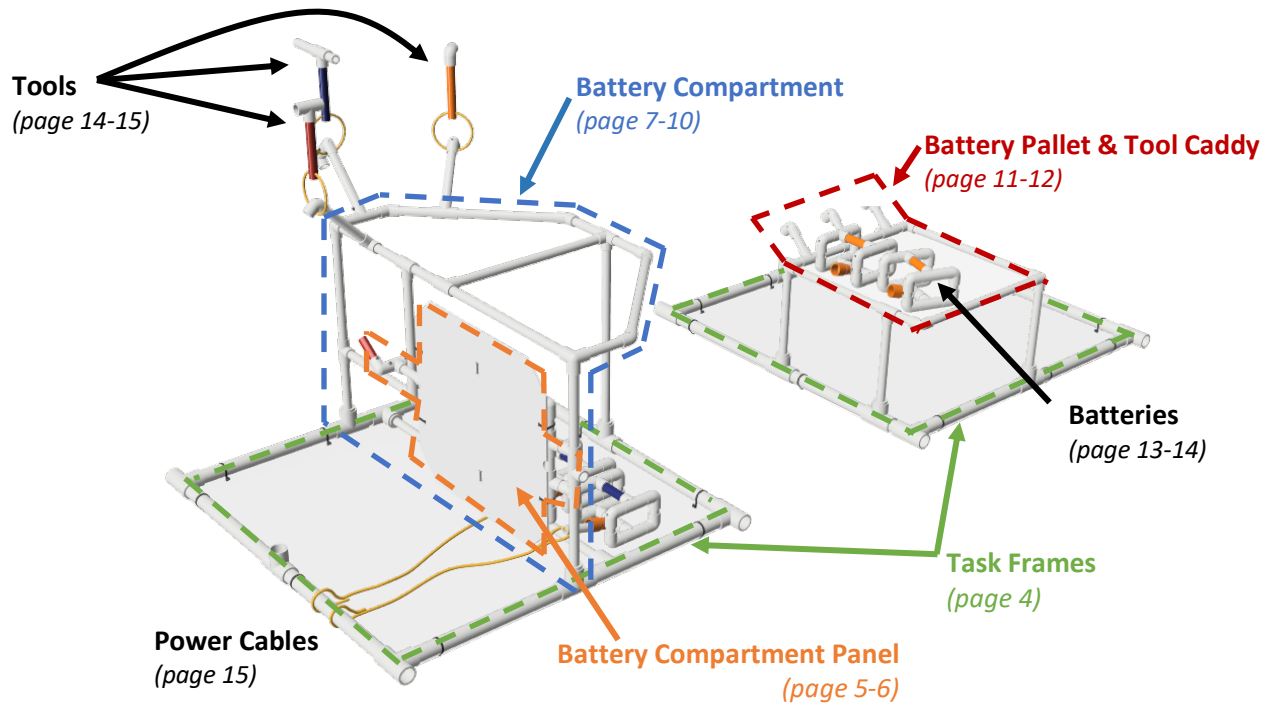
The outside diameter of the PEX pipe may be slightly larger than the inside diameter of the PVC pipe, making it extremely hard to push the PEX pipe into the PVC pipe. The 1/2" CPVC to PVC Bushing provides an easier to assemble solution.



Mission Course Build Guide

The mission course is built upon two standard SeaPerch Challenge task frames. The course can be constructed without the task frames if desired. Detailed drawings for these task frames can be found on the SeaPerch website in the Build Guide instructions for the 2020 competition at:

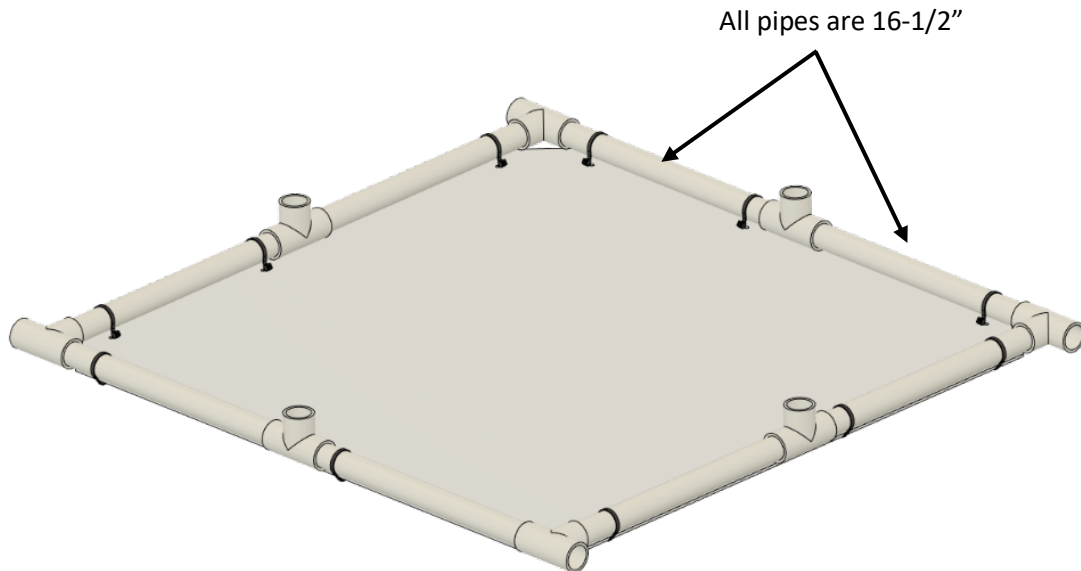
<https://seaperch.org/resources/library/#competition>



Task Frames

These two frames will form the base of the two platforms. The polypropylene plate is optional for courses used on the pool floor. Use cable ties to secure the polypropylene plate to the frame. It is recommended that all pipe joints be secured with self-drilling screws from the parts list.

Task Frame <i>(Quantities are for 2 frames)</i>		
Item	Unit	Qty.
1" Sch 40 PVC Tee (DURA)	Each	16
1" Sch 40 PVC Pipe X 16.5" Lg	Each	16
#8 X 5/8" Stainless Steel Flanged Head Self-Drilling Screw	Each	32
Polypropylene Corrugated Sheet, .157 Thick, 36" X 36" <i>(Optional for pool floor course)</i>	Each	2
8" Cable Tie <i>(Only needed if using Polypropylene sheet)</i>	Each	12

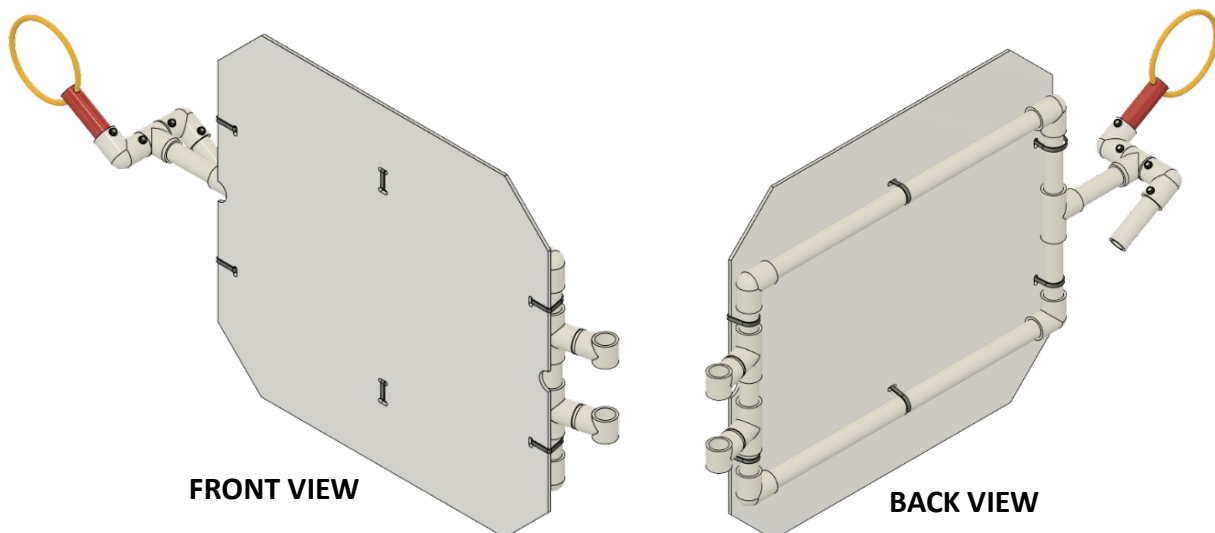


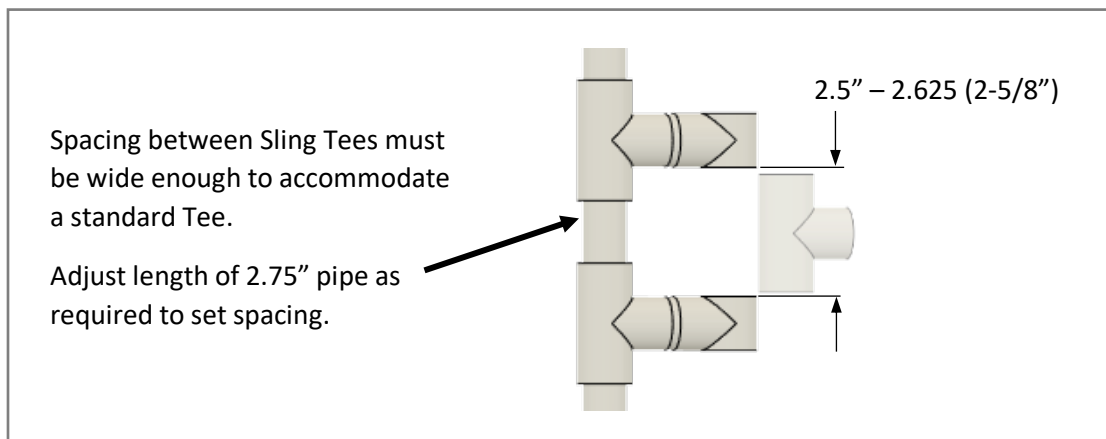
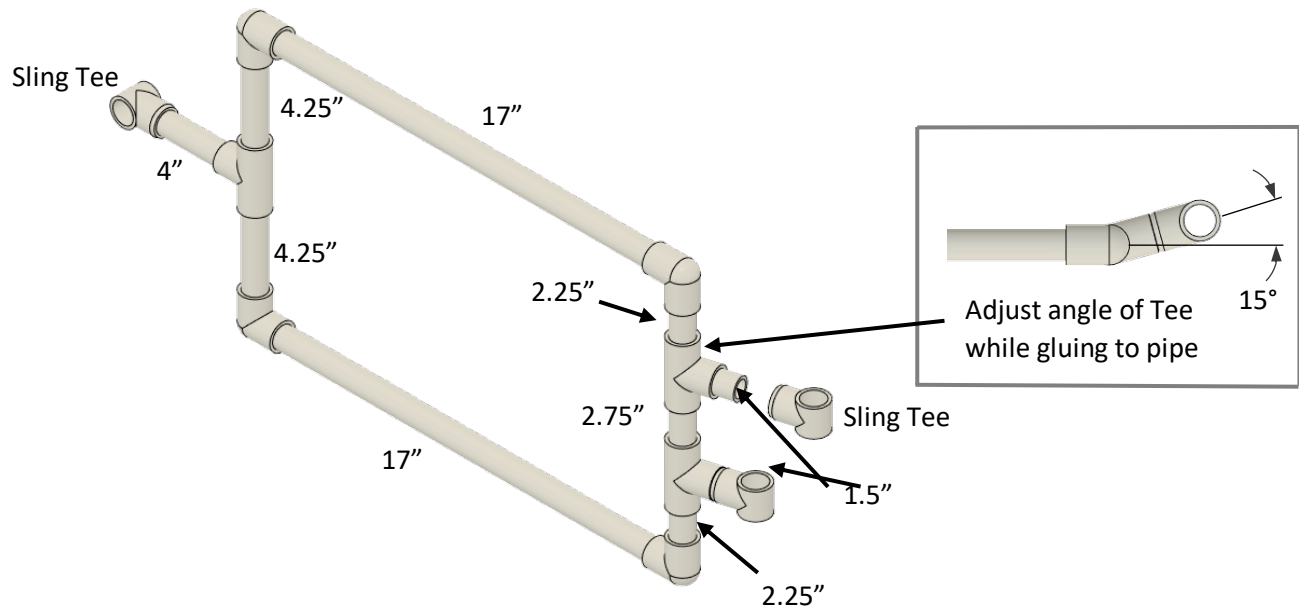
Battery Compartment Panel Assembly

The battery compartment panel reuses the Vault Gate from the 2020 and 2021 International SeaPerch Challenges. To reuse the Vault Gate, the coupler connected to the latch, the vault hoop, and the closing arm must be removed. The closing arm can be reused as one of the tool tray hooks.

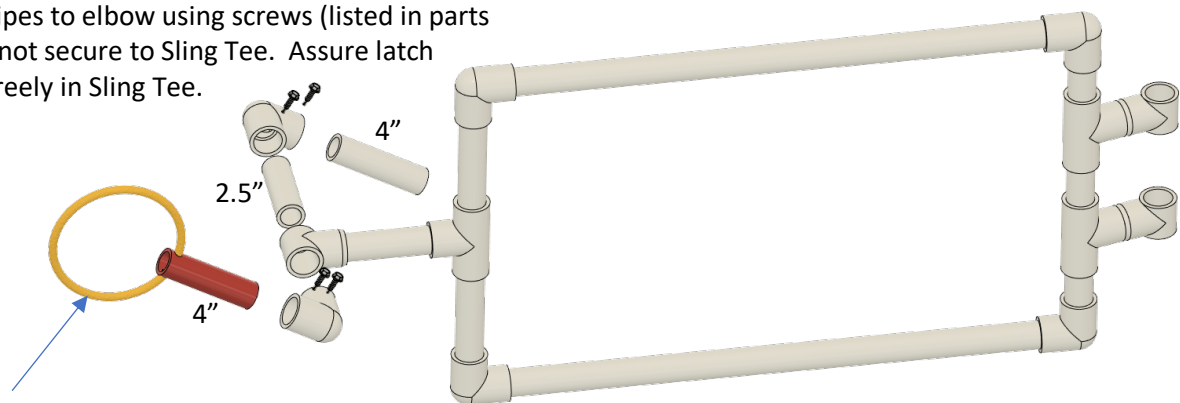
It is recommended that the frame be glued using PVC solvent cement following the manufacturer's safety and usage instructions. Gluing the frame will make it positively buoyant.

Battery Compartment Panel		
Item	Unit	Qty.
1/2" Sch 40 PVC Elbow	Each	6
1/2" Sch 40 PVC Tee	Each	3
1/2" PVC Furniture Grade Sling Tee	Each	3
1/2" Sch 40 PVC Pipe X 1.5" Lg	Each	2
1/2" Sch 40 PVC Pipe X 2.5" Lg	Each	3
1/2" Sch 40 PVC Pipe X 2.75" Lg	Each	1
1/2" Sch 40 PVC Pipe X 3" Lg	Each	1
1/2" Sch 40 PVC Pipe X 4" Lg	Each	1
1/2" Sch 40 PVC Pipe X 4.25" Lg	Each	2
1/2" Sch 40 PVC Pipe X 17" Lg	Each	2
1/2" Sch 40 PVC Pipe X 3" Lg (Red) (or use plain pipe and paint or tape)	Each	1
#8 X 5/8" Stainless Steel Flanged Head Self-Drilling Screw	Each	4
Polypropylene Sheet, .157 Thick, 18.0" X 19.0" (can use 18" x 18")	Each	1
8" Cable Tie (may be substituted with other sizes)	Each	6
#8 X 5/8" Stainless Steel Flanged Head Self-Drilling Screw (Only needed for latch)	Each	4





Secure pipes to elbow using screws (listed in parts list). Do not secure to Sling Tee. Assure latch rotates freely in Sling Tee.



Polypropylene rope.
Fasten ends using cable ties or suitable means.

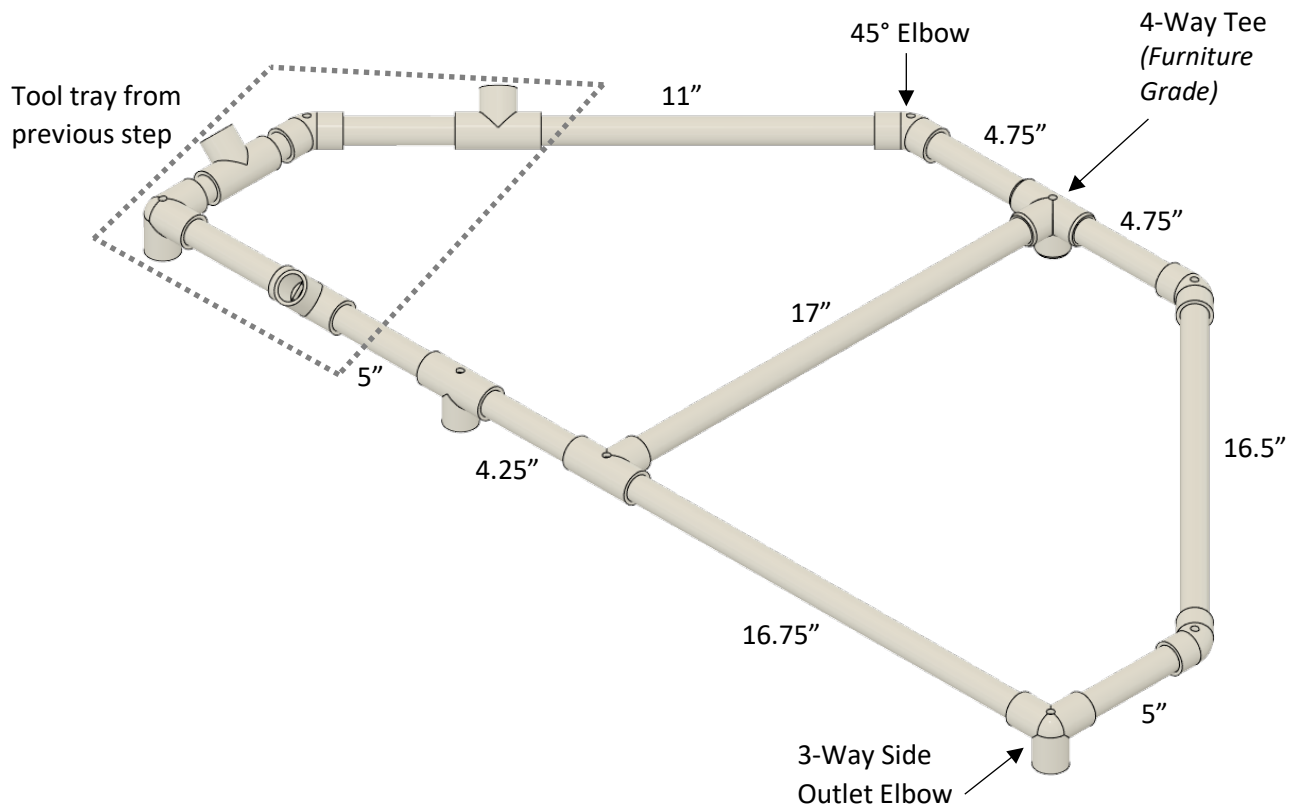
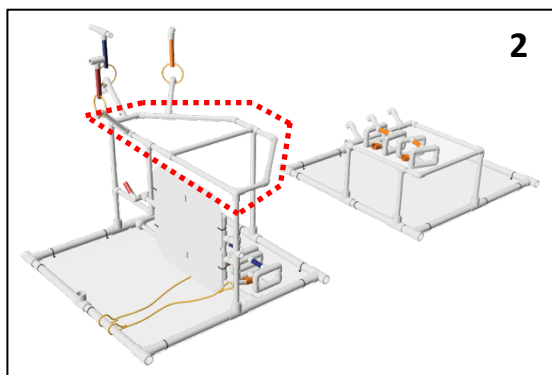
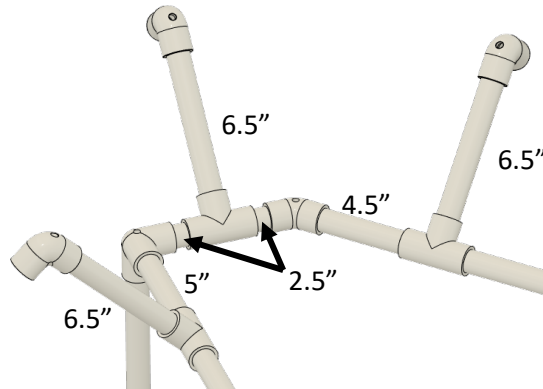
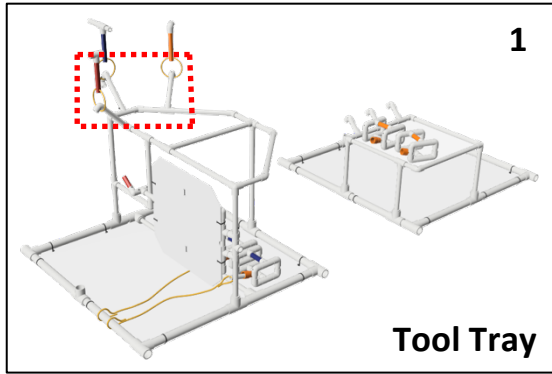
Battery Compartment

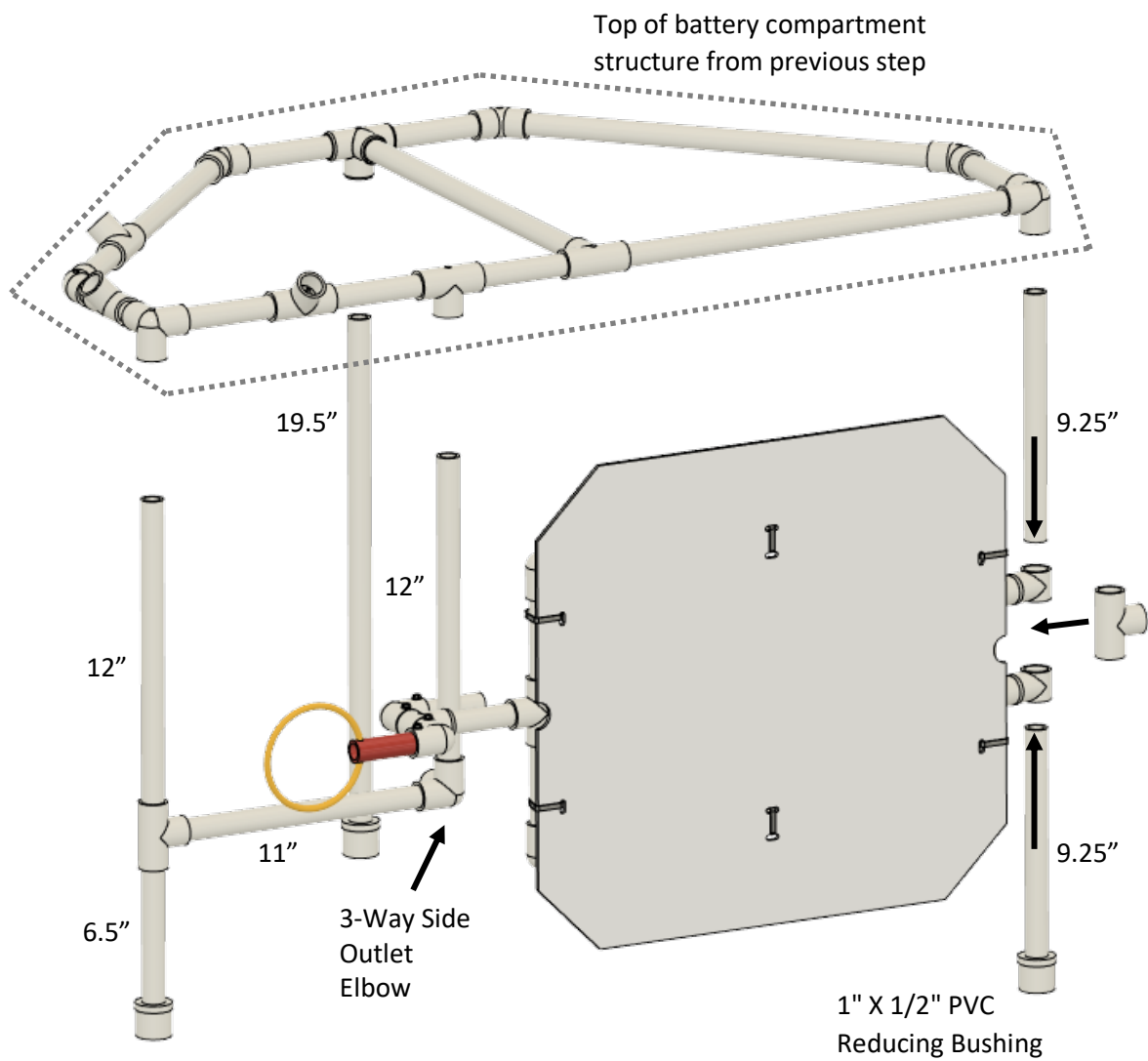
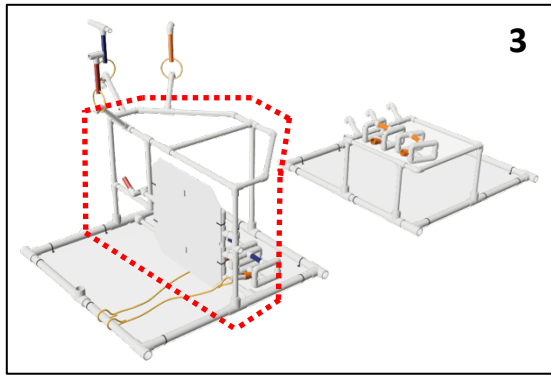
This structure is the primary structure on the front platform. The battery panel will be attached to the front of this structure and tool tray protrudes from the top of the structure.

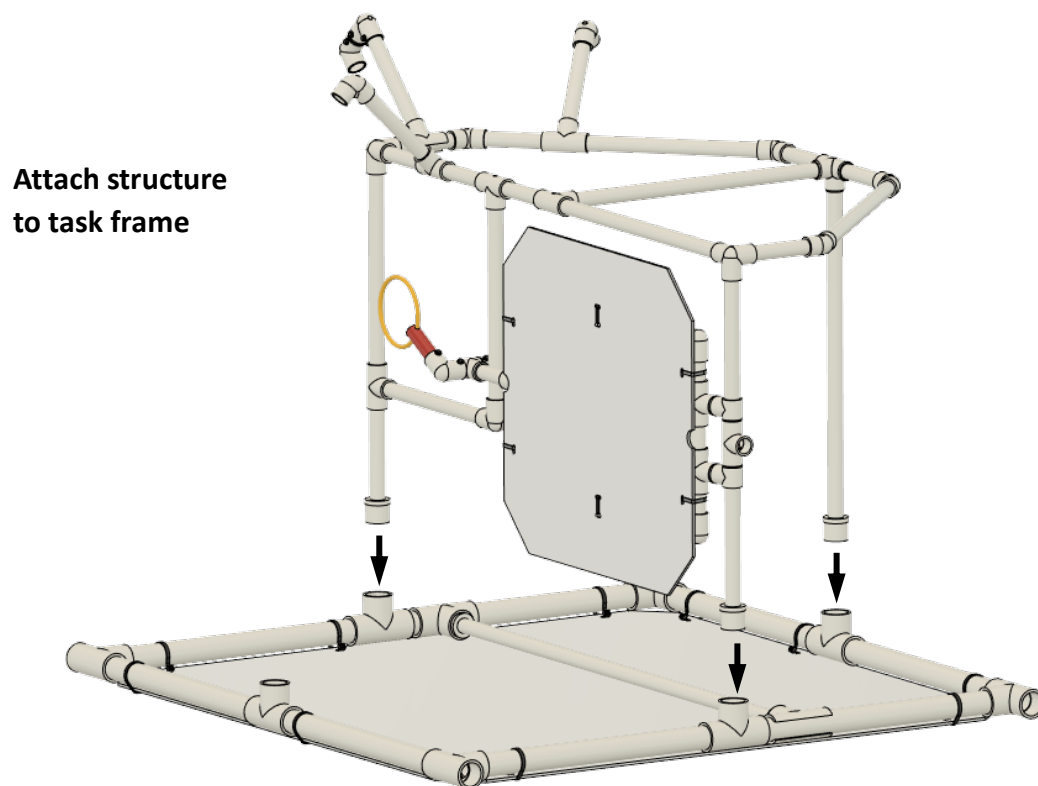
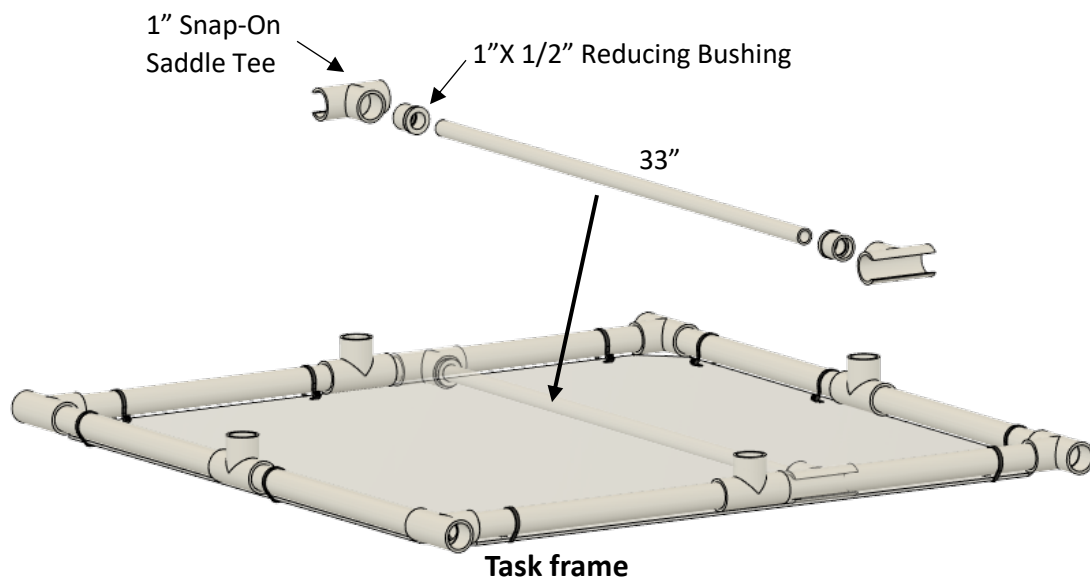
The battery compartment structure is shown as an assembly separate from the task frame; however, it can be built on the task frames to keep the legs aligned with the tees on the frame. Please note that pipe lengths may need to be adjusted since tees and elbows from different manufacturers can have different lengths and socket depths.

It is recommended that all pipe joints be secured with self-drilling screws from the parts list. Tees and elbows on the upper section of the structure should be drilled with 1/4" drain/vent holes.

Battery Compartment		
Item	Unit	Qty.
1/2" Sch 40 PVC 3-Way Side Outlet Elbow (standard plumbing grade)	Each	2
1/2" Sch 40 PVC Elbow	Each	4
1/2" Sch 40 PVC 45° Elbow	Each	4
1/2" Sch 40 PVC Tee	Each	7
1/2" 4-Way Tee (Furniture Grade)	Each	1
1" X 1/2" Sch 40 Reducing Bushing	Each	5
1" PVC Snap-On Saddle Tee	Each	2
1/2" Sch 40 PVC Pipe X 2.5" Lg	Each	2
1/2" Sch 40 PVC Pipe X 4.25" Lg	Each	1
1/2" Sch 40 PVC Pipe X 4.5" Lg	Each	1
1/2" Sch 40 PVC Pipe X 4.75" Lg	Each	2
1/2" Sch 40 PVC Pipe X 5" Lg	Each	4
1/2" Sch 40 PVC Pipe X 6.5" Lg	Each	4
1/2" Sch 40 PVC Pipe X 9.25" Lg	Each	2
1/2" Sch 40 PVC Pipe X 11" Lg	Each	2
1/2" Sch 40 PVC Pipe X 12" Lg	Each	2
1/2" Sch 40 PVC Pipe X 16.5" Lg	Each	1
1/2" Sch 40 PVC Pipe X 16.75" Lg	Each	1
1/2" Sch 40 PVC Pipe X 17" Lg	Each	1
1/2" Sch 40 PVC Pipe X 19.5" Lg	Each	1
1/2" Sch 40 PVC Pipe X 33" Lg	Each	1
#8 X 5/8" Stainless Steel Flanged Head Self-Drilling Screw	Each	53



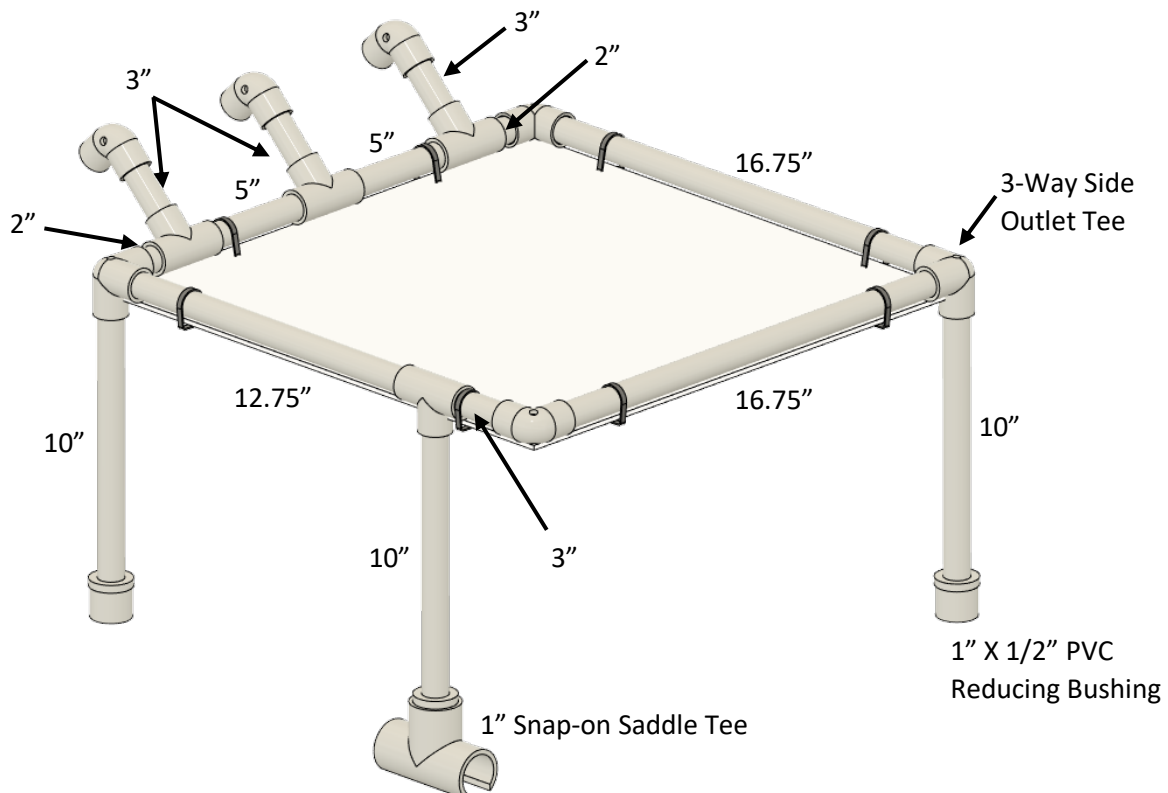


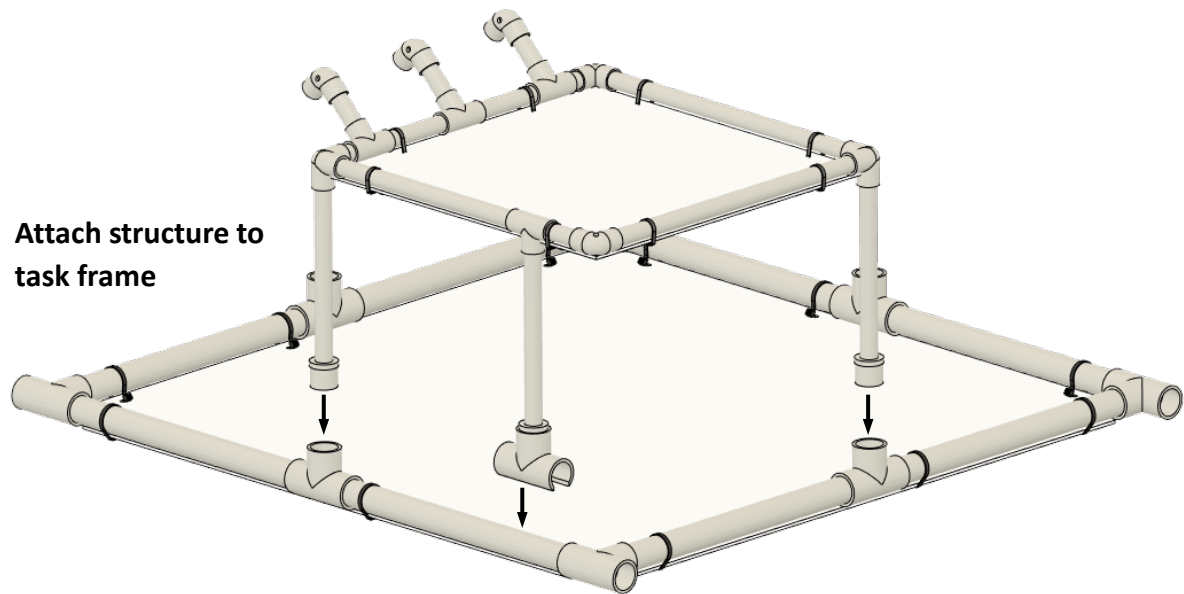


Battery Pallet & Tool Caddy (or Battery Drop Off Platform)

This structure is the primary structure on the back platform. It is recommended that all pipe joints be secured with screws (listed in the parts list). Use screws to secure 1" x 1/2" reducing bushings and 1" snap-on saddle tee after attaching to the task frame. Tees and elbows should be drilled with 1/4" drain/vent holes.

Battery Pallet & Tool Caddy (or Battery Drop Off Platform)		
Item	Unit	Qty.
1/2" Sch 40 PVC Elbow	Each	5
1/2" Sch 40 PVC 3-Way Side Outlet Elbow (standard plumbing grade)	Each	2
1/2" Sch 40 PVC Tee	Each	4
1" X 1/2" Sch 40 Reducing Bushing	Each	5
1" PVC Snap-On Saddle Tee	Each	2
1/2" Sch 40 PVC Pipe X 2" Lg	Each	2
1/2" Sch 40 PVC Pipe X 3" Lg	Each	4
1/2" Sch 40 PVC Pipe X 5" Lg	Each	2
1/2" Sch 40 PVC Pipe X 10" Lg	Each	3
1/2" Sch 40 PVC Pipe X 12.75" Lg	Each	1
1/2" Sch 40 PVC Pipe X 16.75" Lg	Each	2
Polypropylene Corrugated Sheet, .157 Thick, 18" X 18"	Each	1
8" Lg Cable Ties (may be substituted with other sizes)	Each	8
#8 X 5/8" Stainless Steel Flanged Head Self-Drilling Screw	Each	30



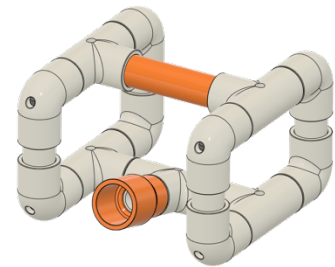


Batteries

The course will include four (4) batteries; two simulating new batteries and two simulating old batteries. Parts of the new and old batteries should be painted or taped with different high visibility colors to distinguish the old and new batteries. Screws are not required for the pipe joints.

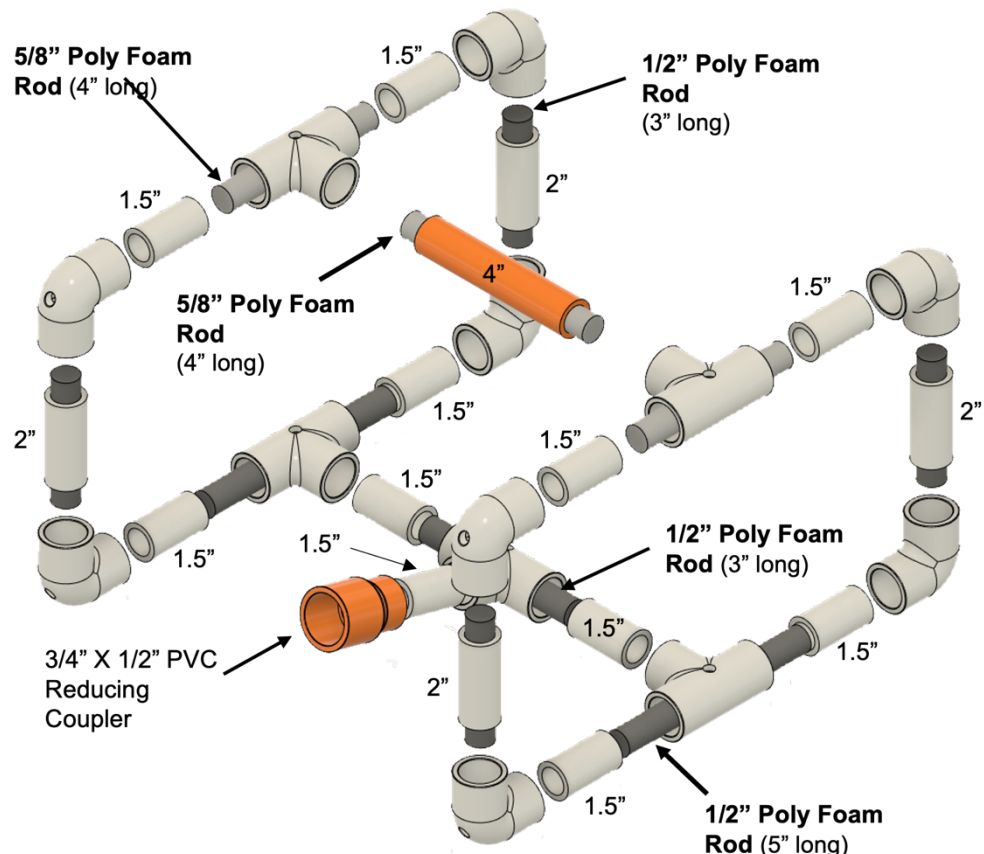
The batteries are designed to have a buoyancy that will mimic an object in micro gravity. The batteries are designed to be neutrally buoyant at a depth of approximately 2' – 3' in chlorinated pool water at approximately 78° F. The batteries will be slightly negatively buoyant at a depth of 5'. The batteries will float upright with the colored pipe designating the top side. The foam rods will need to be adjusted in each pool to accomplish neutral buoyancy. It is recommended that the pipe joints be loosely fitted while testing buoyancy. After adjusting the buoyancy, the pipes should be fully seated into the fitting.

Batteries (Quantities are for 4 batteries)		
Item	Unit	Qty.
1/2" Sch 40 PVC Elbow	Each	24
1/2" Sch 40 PVC Tee	Each	20
1/2" Sch 40 PVC Pipe X 1.5" Lg	Each	44
1/2" Sch 40 PVC Pipe X 2" Lg	Each	16
1/2" Sch 40 PVC Pipe X 4" Lg	Each	4
3/4" x 1/2" PVC Reducing Coupler	Each	4
Magnet	Each	4
1/2" Poly Foam Rod X 3" Lg	Each	20
1/2" Poly Foam Rod x 5" Lg	Each	8
5/8" Poly Foam Rod x 4" Lg	Each	4



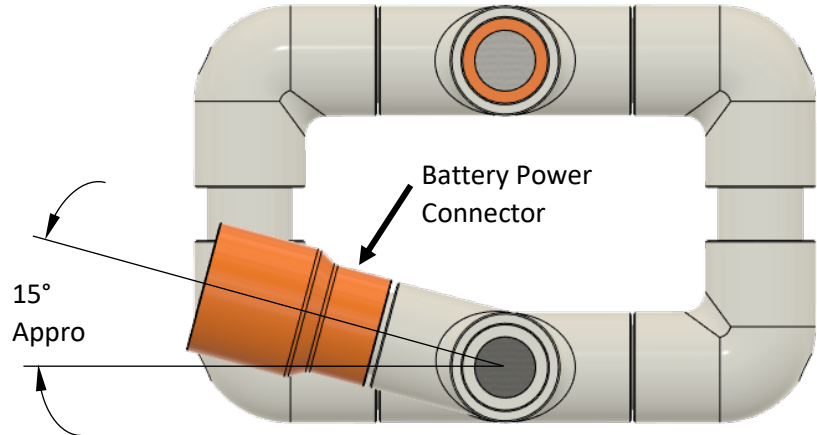
All pipe elbows and tees require 1/4" drain/vent holes.

Each time the batteries are placed in the water they should be held below the surface and manipulated to allow all the air to escape from the pipes. Tapping on the battery while holding it underwater will help air escape.



The battery power connector will include a magnet to hold the power cable connector in place.

The battery power connector should be angled upward approximately 15°.



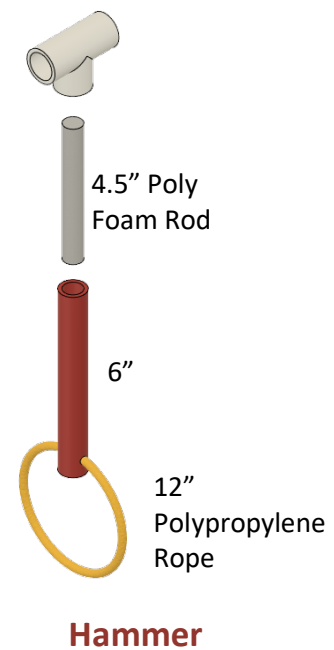
Tools

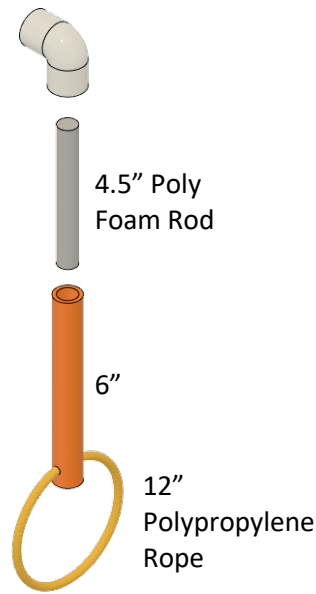
Three different tools are simulated in this course: a hammer, a torque wrench, and a pistol grip tool. When fully constructed, these tools should be slightly positively buoyant at the depth of the Tool Caddy. The length of the foam rod may need to be adjusted for the desired buoyancy.

Tools (Quantities are for 1 of each tool)		
Item	Unit	Qty.
1/2" Sch 40 PVC Elbow	Each	1
1/2" Sch 40 PVC Tee	Each	2
1/2" Sch 40 PVC Pipe X 2" Lg	Each	1
1/2" Sch 40 PVC Pipe X 4" Lg	Each	1
1/2" Sch 40 PVC Pipe X 6" Lg	Each	3
1/2" Poly Foam Rod X 4.5" Lg	Each	2
1/2" Poly Foam Rod x 5.5" Lg	Each	1
1/4" Polypropylene Rope x 12" Lg	Each	3

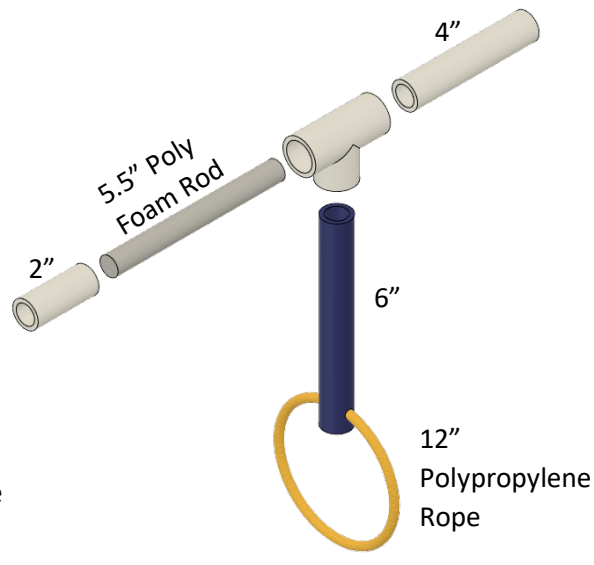
The main pipe piece of each tool should be painted or taped with a different high visibility color.

Screws are not required for the pipe joints. The pipes should be fully inserted into the fittings and may be secured using screws or tape if the pipe joints are loose.





Torque Wrench

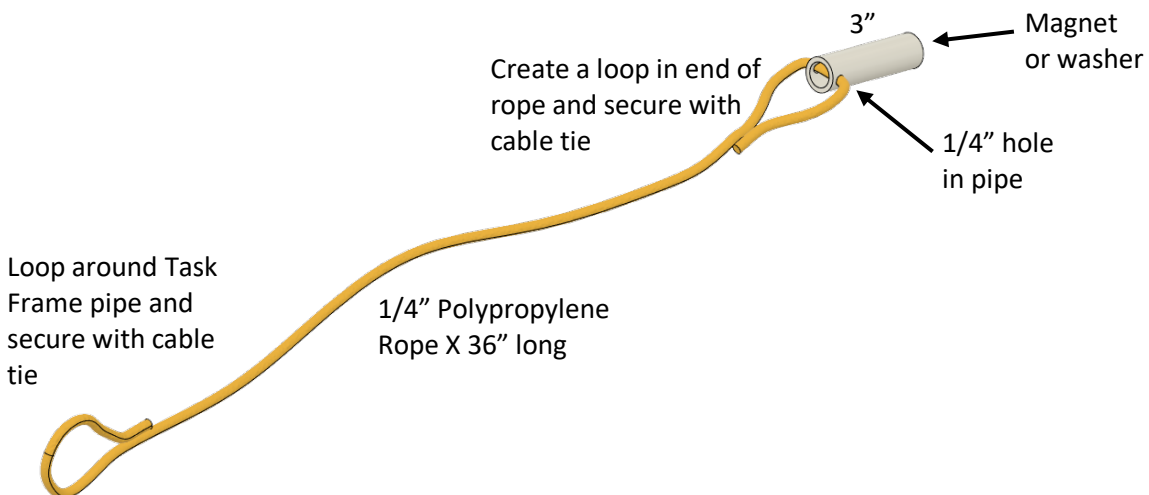


Pistol Grip Tool

Power Cables

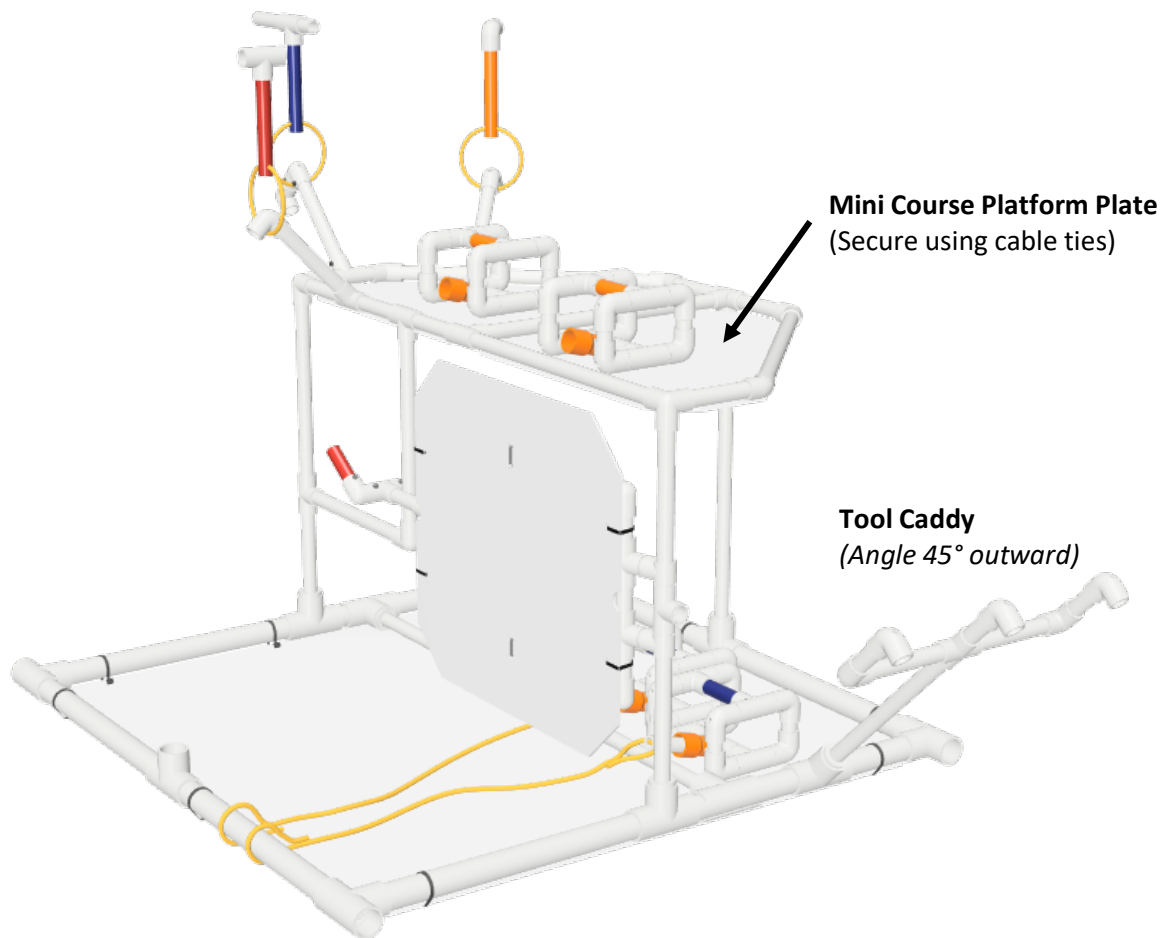
Power cables will have a steel washer or magnet epoxied or glued to the free end of the connector pipe. This will allow the connector to more securely attach to the battery.

Power Cables		
Item	Unit	Qty.
1/2" Sch 40 PVC Pipe X 3" Lg	Each	2
1/4" Polypropylene Rope X 36" Lg	Each	2
Steel Washer or Magnet	Each	2
8" Cable Tie (<i>may be substituted with other sizes</i>)	Each	8



Mini Course (Modified Mission Course)

For pools sizes that prohibit the use of the two standard task frames, the tasks can be combined into a single frame. A mini course can easily be configured by adding a polypropylene sheet to the top of the Battery Compartment and building and attaching a Tool Caddy to the Battery Compartment Task Frame.



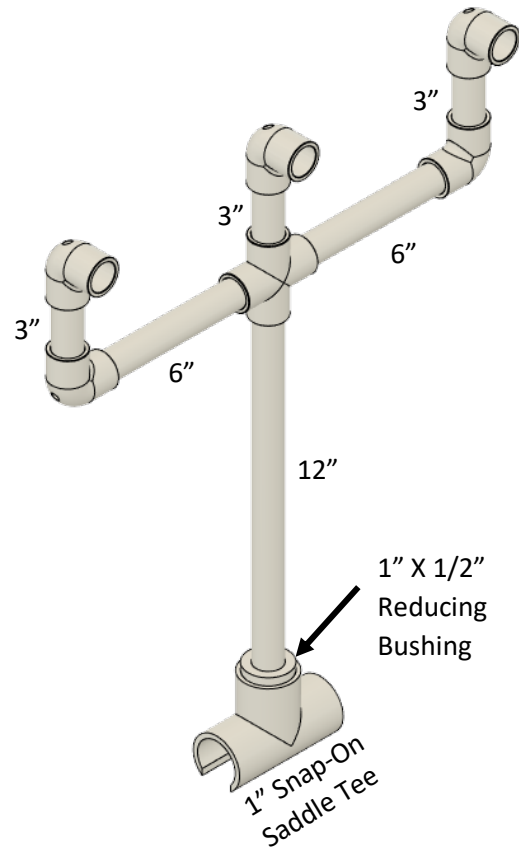
Additional Materials for Mini Course (Tool Caddy & Platform Plate)		
Item	Unit	Qty.
1/2" Sch 40 PVC Elbow	Each	5
1/2" Sch 40 PVC Cross	Each	1
1" X 1/2" Sch 40 Reducing Bushing	Each	1
1" PVC Snap-On Saddle Tee	Each	1
1/2" Sch 40 PVC Pipe X 3" Lg	Each	3
1/2" Sch 40 PVC Pipe X 6" Lg	Each	2
1/2" Sch 40 PVC Pipe X 12" Lg	Each	1
Polypropylene Corrugated Sheet, .157 Thick, 18" X 36"	Each	1
8" Lg Cable Ties (<i>may be substituted with other sizes</i>)	Each	8
#8 X 5/8" Stainless Steel Flanged Head Self-Drilling Screw	Each	14

Mini Course Tool Caddy

It is recommended that all pipe joints be secured with screws (listed in the parts list).

Secure (with screws) 1" x 1/2" Reducing Bushing and 1" Snap-On Saddle Tee after attaching to the Task Frame.

Elbows should have 1/4" drain/vent holes.



Mini Course Platform Plate

Attach this platform plate to the top of the battery compartment (front task frame).

