FTC
FIRST® Tech Challenge

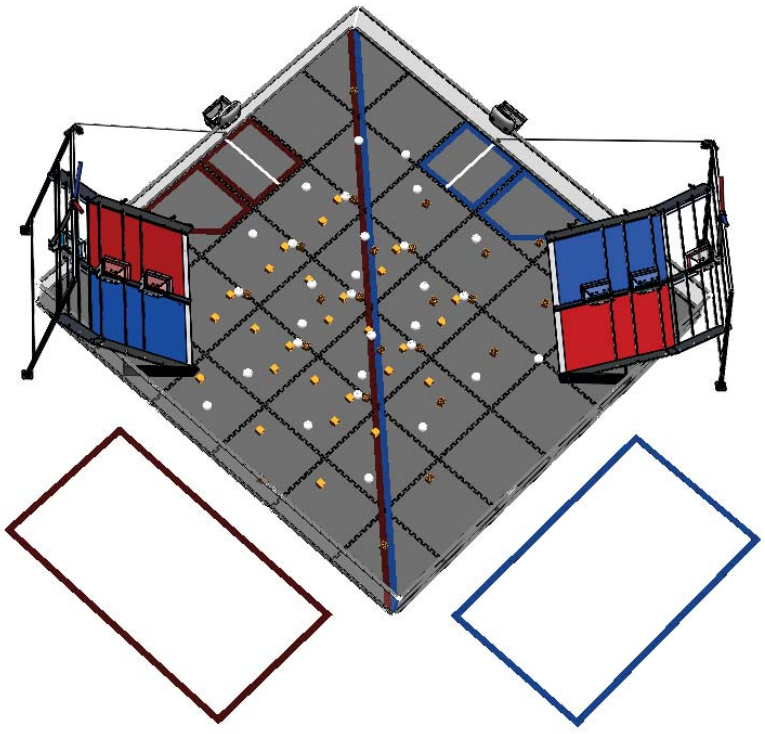
AndyMark®

FIRST® RES-Q℠

Field Setup Guide

Rev 1.0

AndyMark Field Layout and Finishing Guide for 2015-2016 FIRST® Tech Challenge



Read through all the instructions and take a parts inventory before you begin to assemble and setup the game elements!

This guide contains instructions for setting up the Field Elements for the 2015-2016 *FIRST*® Tech Challenge Game *FIRST*® *RES-Q*℠.

REVISION HISTORY		
Rev.	**Date**	**Description**
1.0	9-8-15	Initial Release

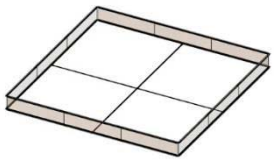
CAUTION!

Edges of field parts may be sharp. File or deburr sharp corners or edges as needed.

TOOLS NEEDED

Component	QTY	Part Photo
Safety Equipment		
1/2" Wrench or ratchet	1	
7/16" Wrench or ratchet	1	
3/8" Wrench, or ratchet	1	
Scissors	1	
Pliers	1	
Adjustable Wrench	1	
Utility Knife	1	
3/16 Hex Key Driver	1	
File	1	
Tape Measure	1	

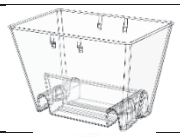
FULL FIELD REQUIREMENTS

Component	Part #	QTY	Part Photo
FTC Field Perimeter	1	AndyMark.com/am-481a OR Other	
5/8" Gray Soft Tiles	36	AndyMark.com/Softtiles	

Competition Field Mountain

Component	Part #	QTY	Part Photo
RED Mountain Assembly	am-3222 See "Part 3" below for instructions on reassembly. See Field Assembly Guide for full assembly instructions.	1	
BLUE Mountain Assembly	am-3222 See "Part 3" below for instructions on reassembly. See Field Assembly Guide for full assembly instructions.	1	
Beam Clamp	am-3177	4	
1/4-20 x 1.250" Thumb Screw	am-1376	2	
¼-20 x 1.25" Eye Bolt	am-1373	4	
¼-20 Nylock Nut	am-1102	2	
Spring	am-3176	2	
Zip Line Lower Anchor	am-3125_anchor	2	
Zip Line	am-3125_line	2	 **approximately 96"**
Zip Line Figurine	am-3023	6	
Cable Tie (white or black)	am-1067	10	

Competition Field Rescue Beacon

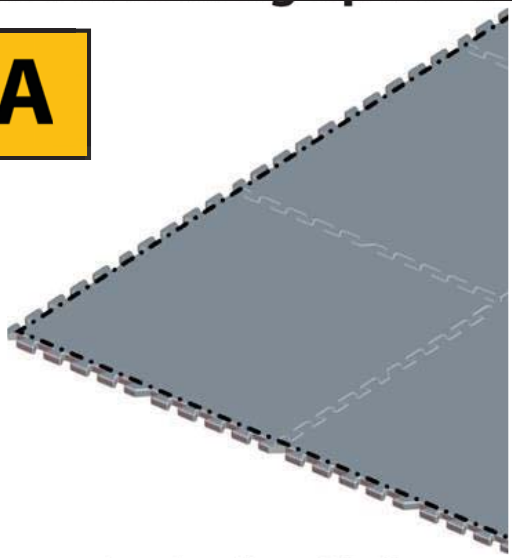
Component	Part #	QTY	Part Photo
RED Rescue Beacon	am-3011 See Field Assembly Guide for setup instructions.	1	
BLUE Rescue Beacon	am- 3011 See Field Assembly Guide for setup instructions.	1	
Battery Holder	am-3011_batt	2	
AA Batteries *Not Included*	Batteries must be purchased separately.	16	
1/4-20 x 1.50" SHCS	am-1131	4	
¼-20 x 1.25 BHCS	am-1183	4	
¼-20 Nylock Nut	am-1102	8	
Goal Baskets/ Shelter Baskets	am-3015	8	
Large Ball	AndyMark.com/am-2968full	30	
Cube		50	
Figurines		8	
2" "Red" Gaffers Tape	AndyMark.com/am-2967	as needed	
2" "White" Gaffers Tape		as needed	
2" "Electric Blue" Gaffers Tape		as needed	
1" "White" Gaffers Tape		as needed	

BHCS=Button Head Cap Screw SHCS=Socket Head Cap Screw

All Official Field Elements can be found on http://www.andymark.com/FTC.

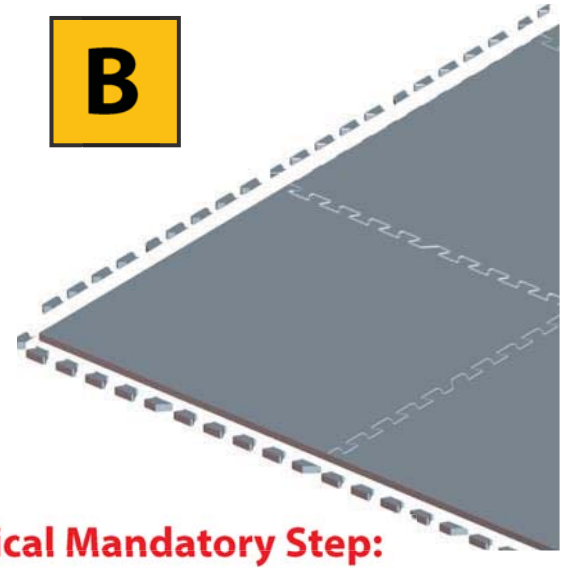
Part 1: Setting up the Floor and Field Perimeter

A



A. Lay the tiles with the ***smooth*** surface facing up in a 6x6 grid pattern.

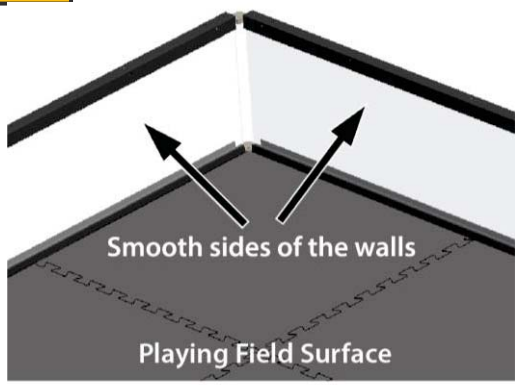
B



B. Critical Mandatory Step:
Trim all outer tabs from the 20 Soft Tiles on the outside edges of the field.

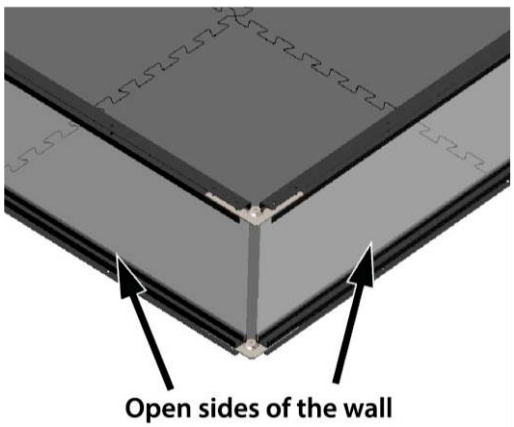
***NOTE**: Lay the tiles out and mark the outer edge to be cut. Use a sharp utility knife and a straight edge or a band saw (if available) to get a smooth clean edge*

C



C. Note that there are several FTC Playing Field wall designs. The wall designs fall into two categories:

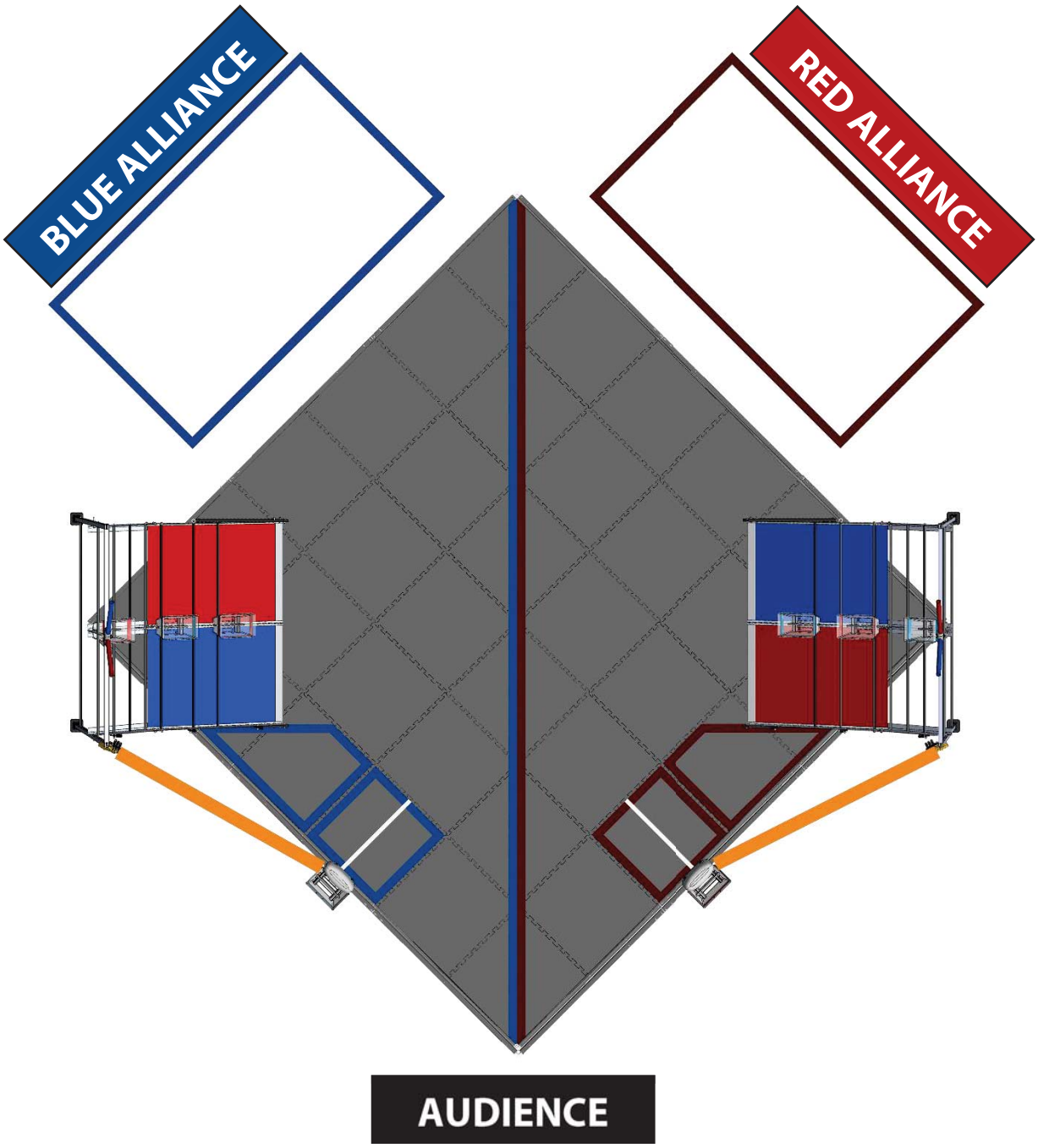
1) Symmetrical inside and outside surfaces; and
2) Smooth on one side and an open cavity on the other side.



The smooth/non-cavity sides should face towards the inside of the Playing Field as shown in the illustration. If the wall has a cavity, it should be oriented so that it faces outside the Playing Field.

***NOTE**: If using the AndyMark Field Perimeter, ensure that straps are installed to keep walls in place during game play.*

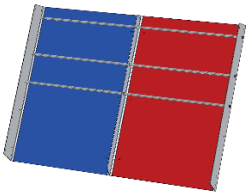
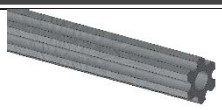
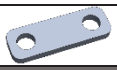
Part 2: General Layout and Orientation



NOTE: Additional protection area may needed outside of the field perimeter and under the Mountain Arch Feet. The Mountain may move during game play and has the potential to scratch floors. Robots or other parts may fall from the height of the mountain to the floor.

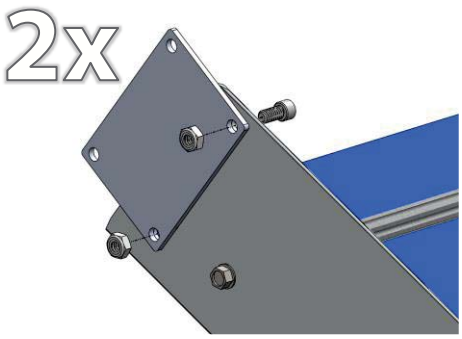
Part 3: Mountain Reassembly

The mountain components can partially disassemble for transportation. If your mountains are fully assembled, skip to Part 4.

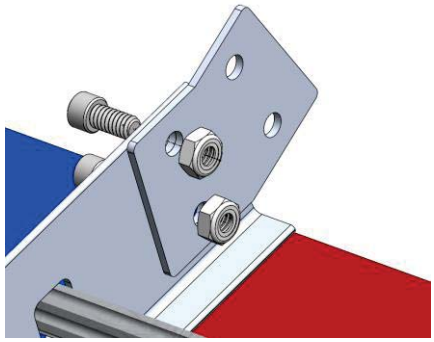
Parts Needed for Mountain Reassembly (per mountain)			
Component	**Part Number**	**Quantity**	**Part Photo**
Upper Mountain Assembly	See Field Assembly Guide for full assembly instructions.	1	
Lower Mountain Assembly	See Field Assembly Guide for full assembly instructions.	1	
RED or BLUE Mountain Arch Assembly	See Field Assembly Guide for full assembly instructions.	1	
Outside Connector Plate	am-3094_outside	2	
Inside Connector Plate	am-3094_center	1	
Arch Foot	am-3063	2	
Fence	am-3096	2	
Churro	am-3022	1	
1/4-20 x 0.50" SHCS	am-1370	14	
1/4-20 x 1.50" SHCS	am-1131	3	
1/4-20 x 1.25" Eye Bolt	am-1373	1	
1/4-20 x 1.00" SHCS	am-1374	9	
1/4-20 x 1.75" TFS	am-1372	10	
1/4-20 Nylock Nut	am-1102	21	
¼" Washer	am-1027	6	
Trigger	am-3036	3	
Trigger 1 Line	am-3125_line	1	**approximately 81"**
Trigger 2 Line		1	**approximately 63"**
Trigger 3 Line		1	**approximately 40"**
Line Runner	am-3125_runner	3	

NOTE: TFS = Thread Forming Screws SHCS=Socket Head Cap Screw

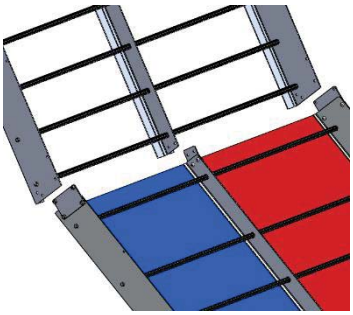
Step 3-1: Attach an *Outside Connector Plate* to the top of each *Lower Mountain Side* with two *¼-20 x 0.50"* screws and *¼-20 Nylock Nuts*. The plate should be on the outside of the *Mountain*.



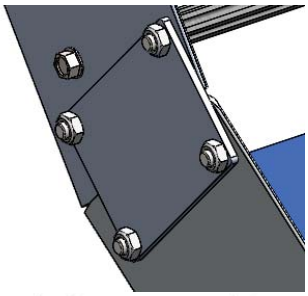
Step 3-2: Attach the *Inside Connector Plate* to the top of *the Lower Center Fence* with two *¼-20 x 0.500"* screws and *¼-20 Nylock Nuts*. The plate should sit on the red panel side of the *Lower Mountain Center*.



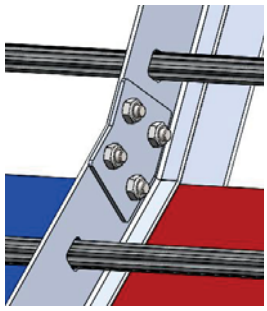
Step 3-3: Align the *Upper Mountain* with the *Connector Plates*. Verify that the *Upper Mountain Center* is on the correct side of the *Inside Connector Plate*.



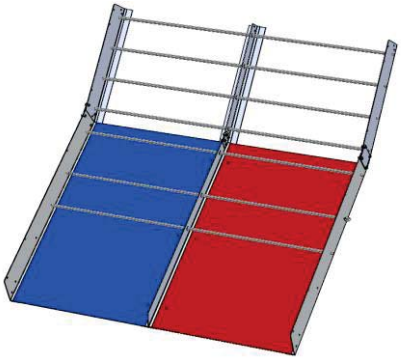
Step 3-4: Attach the *Outside Connector Plates* to the *Upper Mountain Side* using four *¼-20 x 0.50" screws* and *¼-20 Nylock Nuts*.



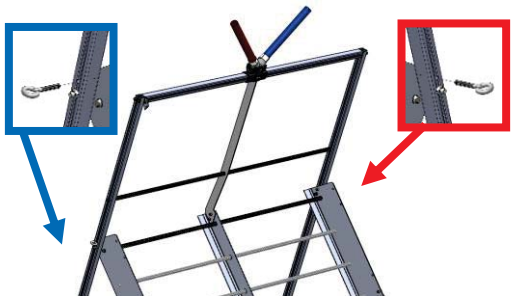
Step 3-5: Attach the *Inside Connector Plate* to the *Upper Mountain Center* using two *¼-20 x 0.50" screws* and *¼-20 Nylock Nuts*.



Step 3-6: The *Mountain Ramp* is complete and can now be added to the *Mountain Arch*.

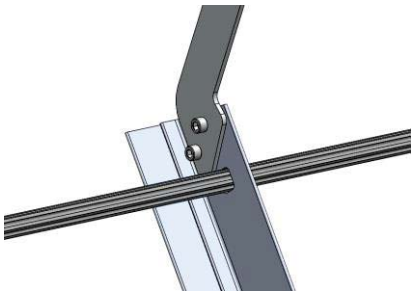


Step 3-7: Using three *¼-20 x 1.50"*, the *Eye Bolt*, and four *Nylock Nuts* join the *Pull-Up Bar* to the *Mountain Ramps*. The *Eye Bolt* goes in the upper hole near the *Blue Panel* on the *Blue Mountain* and the *Red Panel* on the *Red Mountain*.



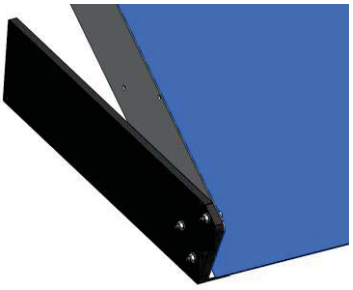
Step 3-8: Attach the *Arch Center Divider* to the *Upper Mountain Center* with two *¼-20 x 0.500"* screws and *¼-20 x Nylock Nuts*.

You can now tighten all the screws in the assembly.

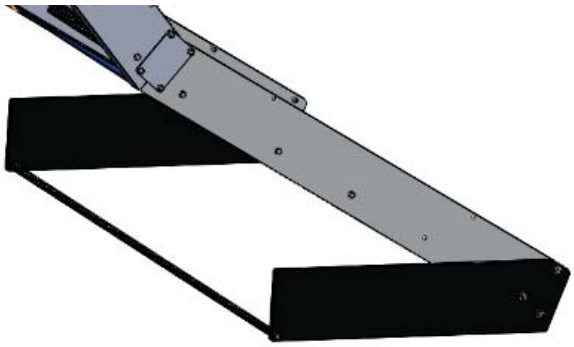


Step 3-9: Press the *Arch Feet* onto the bottoms of the *Arch Support Legs*. Be sure the bottoms of the feet sit flat against the floor.

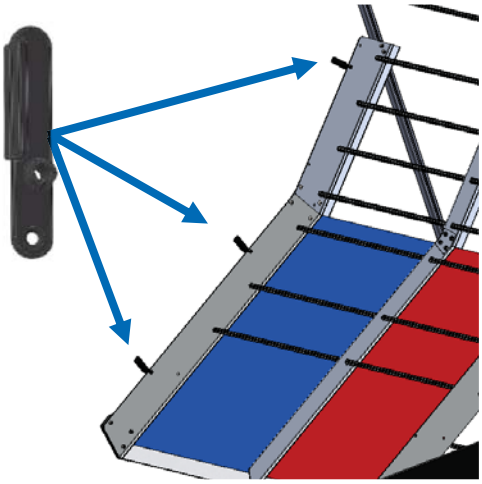
Step 3-10: Add the two *Fences* with three *¼-20 x 1.00"* screws, *¼" washers* and *¼-20 Nylock Nuts* per *Fence*. Be sure to place the *washers* on the outside of the *Fences*.



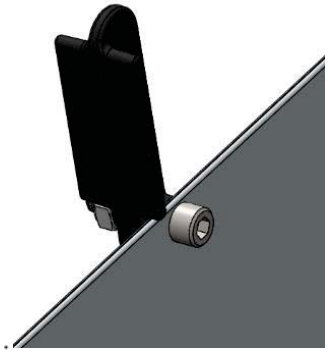
Step 3-11: Add the last *Churro* to the bottom hole on the *Fences* with two *¼-20 x 1.75" TFS*. Use a ½" wrench to keep the *Churro* from twisting.



Step 3-12: Attach *Triggers* to the three holes closest to the edge on the *Mountain Side*. The *Blue Mountain* will have triggers on the blue side of the *Mountain*.



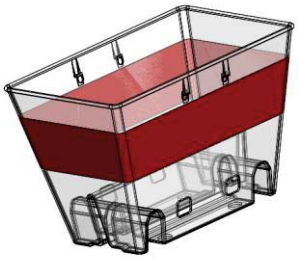
Step 3-13: Use a *¼-20 x 1.00" SHCS* and *¼-20 x Nylock Nut* as a pivot axle for the *Zip Line Triggers*. Bolt them on so that the large target pad faces the bottom of the *Mountain*. The screw should be tightened so that there is no gap between the parts. The *Triggers* should move freely.



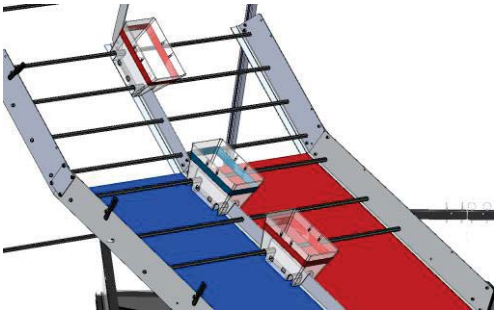
Step 3-14: The *Mountain Assembly* is now complete!

Part 4: Basket Setup and Placement

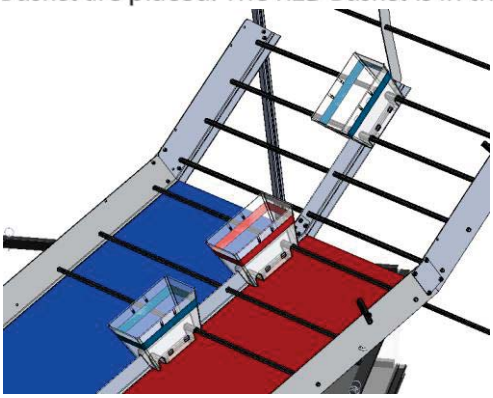
Step 4-1: Mark each *Goal Basket and each Shelter Basket* with a single 2" line of Gaffers tape. There are 3 *Goal Baskets* and 1 *Shelter Basket* marked with red tape and 3 *Goal Baskets and 1 Shelter Basket* marked with blue tape on each field.



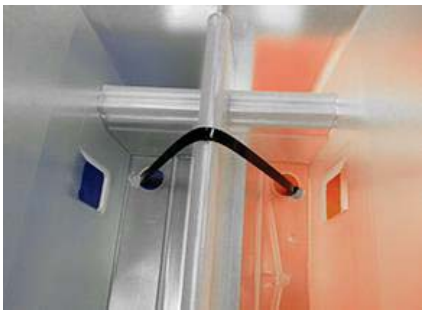
Step 4-2: On the *Blue Mountain*, 2 RED *Goal Baskets* and 1 BLUE are placed. The *Blue Basket* is in the center.



Step 4-3: On the *Red Mountain*, 2 BLUE *Goal Baskets* and 1 RED *Goal Basket* are placed. The RED *Basket* is in the center.

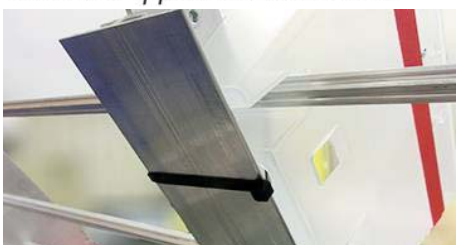


Step 4-4: The 2 lower *Goal Baskets* are each secured with one *Zip Tie*. Pass the *Zip Tie* through the bottom of the *Mountain* panel up through one hole on the bottom of the *Goal Basket* and back down through the adjacent hole as shown.



Step 4-5: The *Zip Ties* for the lower *Baskets* should be tightened down and secured on the underside of the *Mountain* as shown.

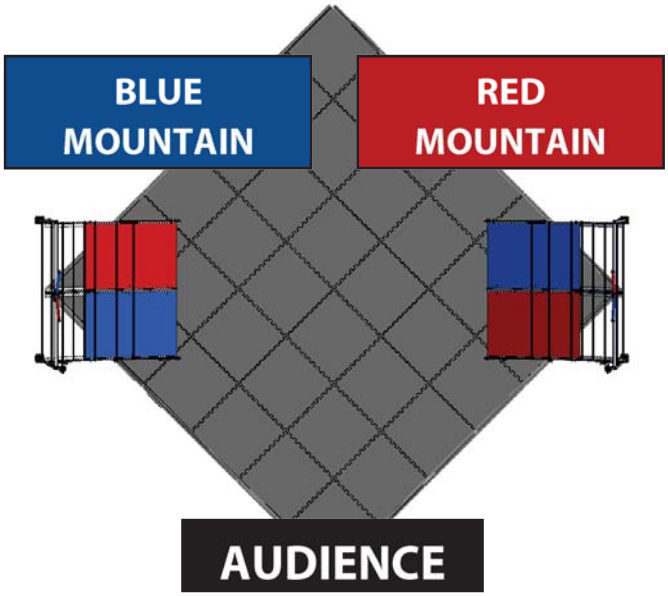
Step 4-6: The upper *Goal Basket* on each mountain should be secured with one *Zip Tie* through the top most hole set wrapped around the *Upper Mountain Center*.



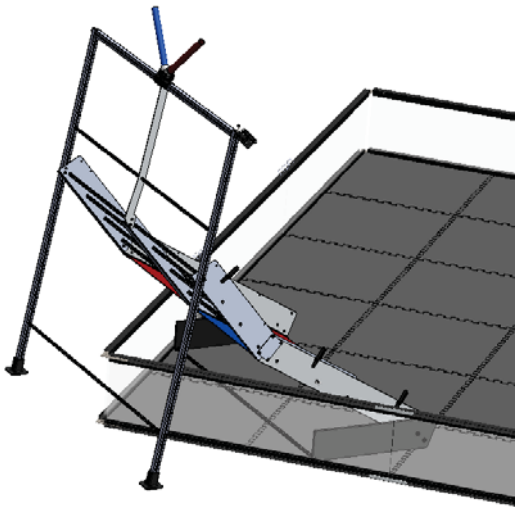
Step 4-7: Snap the remaining *Shelter Baskets* into the slots on the *Rescue Beacons* and align the holes with those in the *Housing*. The side with one button should face towards the *Basket*. The tape on the *Shelter Basket* should match the tape on the *Rescue Beacon*.

Part 5: Mountain Placement and Attachment

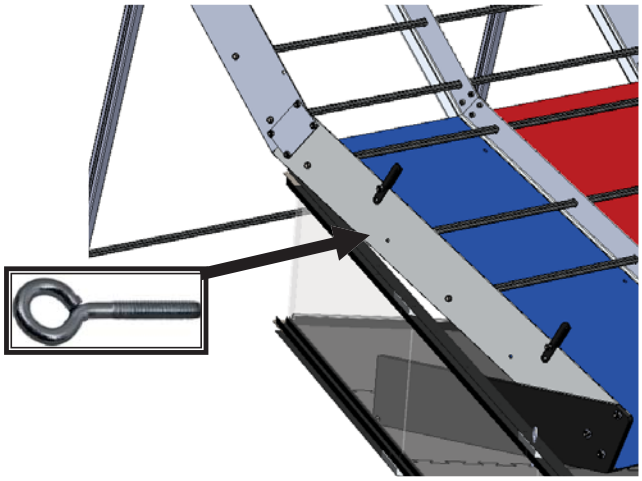
Step 5-1: For competition, the field should be in a diamond orientation with the *Blue Mountain* on the left and the *Red Mountain* on the right from the audience perspective.



Step 5-2: The *Mountains* should sit with the *Arch* outside the field perimeter and the back edge of the *Fences* against inside of the field perimeter. The *Mountain* should sit at a 45 degree angle to the field perimeter. Additional floor protection under the *Mountain* may be used.



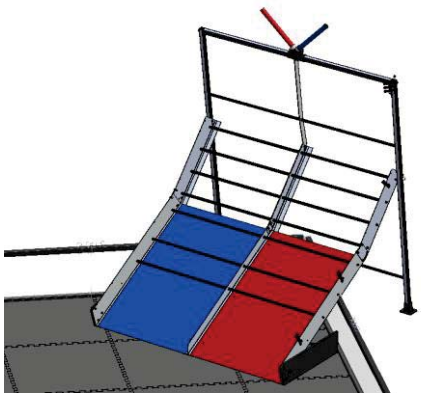
Step 5-3: For competition, the *Mountain* MUST be secured to the field perimeter. Replace the screws holding the second *Churro* on both sides of the *Mountain* with an *Eye Bolt*.



Step 5-4: Attach a *Beam Clamp* to the field perimeter against the edge of the *Mountain* on both sides using an adjustable wrench.

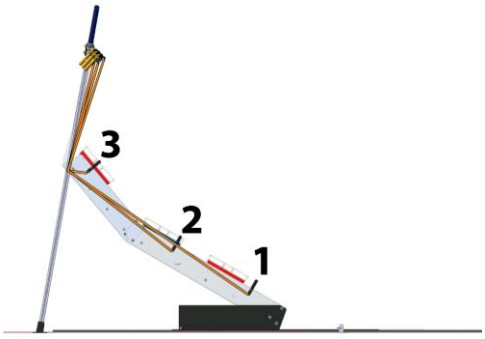
Step 5-5: Connect the *Beam Clamp* to the *Eye Bolt* on the *Mountain* using a *Zip Tie*.

Step 5-6: Repeat the steps in "Part 4" for the other *Mountain*.



Part 6: Zip Line Setup

Step 6-1: The *Trigger Lines* are tied from each *Release* to each *Trigger*. Each cord is a different length. The longest cord is used for the *Zip Line*. The other 3 cords are used for the *Trigger Lines*.



Step 6-2: Tie each *Trigger Line* to each *Release*. The shortest cord goes on the *Release* closest to the *Bracket* (3).

Step 6-3: Run each of the *Trigger Lines* from *Releases* through the *Eye Bolt* on the *Arch Support Leg* to each of the *Triggers*.

Step 6-4: Run the end of a *Trigger Line* through a *Line Runner* as shown.

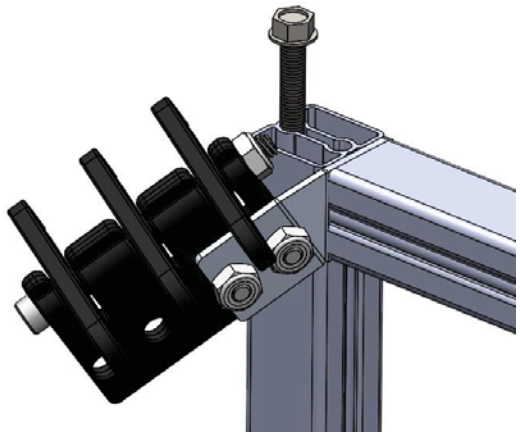
Step 6-5: Run the end of the *Line* through the hole on the *Trigger* as shown.

Step 6-6: Run the end of the *Line* between the cord and the *Line Runner* as shown.

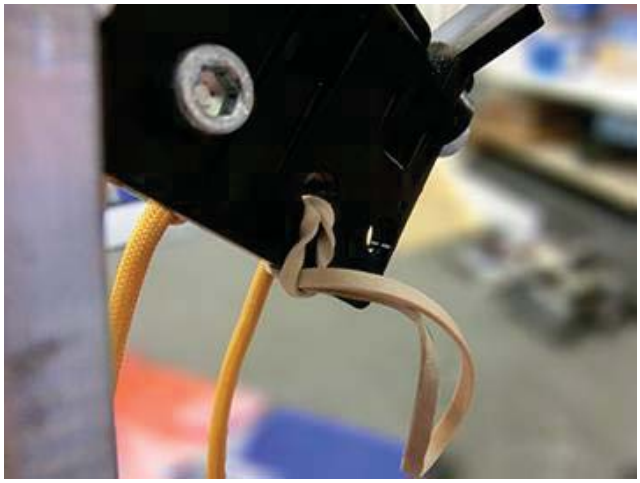
Step 6-7: Wrap the *Line* around and underneath the *Trigger Line* as shown.

Step 6-8: Pull the *Line* tight to form a knot. Repeat steps 5-12 to 5-16 for the other *Triggers*.

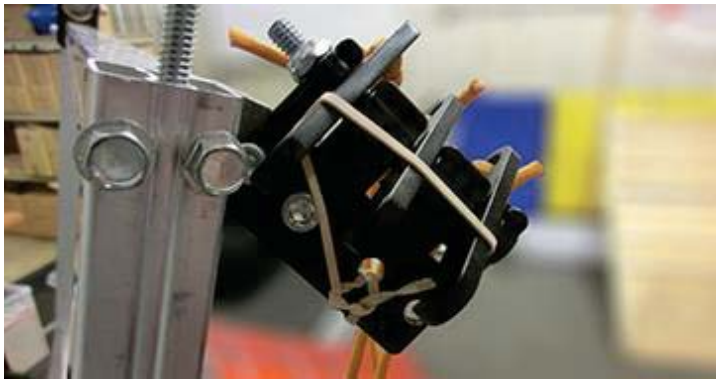
Step 6-9: Ensure the MRM assembly is attached to the top of the arch. Detailed instructions for mounting are located in the Field Assembly Guide.



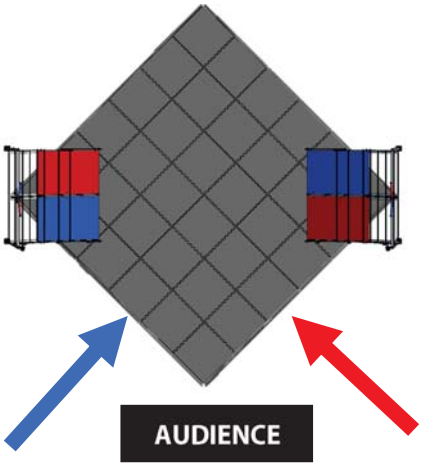
Step 6-10: Add the *Rubber Band* by looping through the hole on the *MRM*.



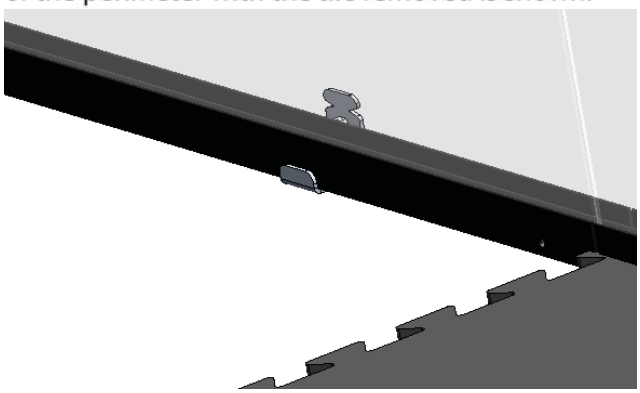
Step 6-11: The *Rubber Band* sits on top of the *Triggers* to hold them securely in place.



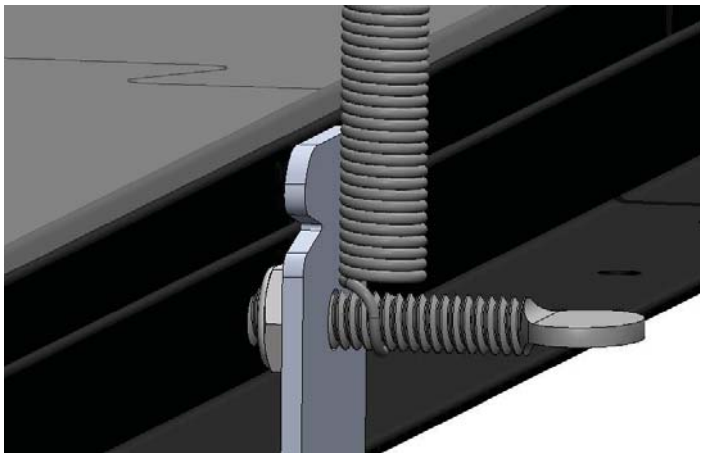
Step 6-12: Each *Anchor* is centered on the 4th tile from the *Mountain*'s corner on the audience side of the field.



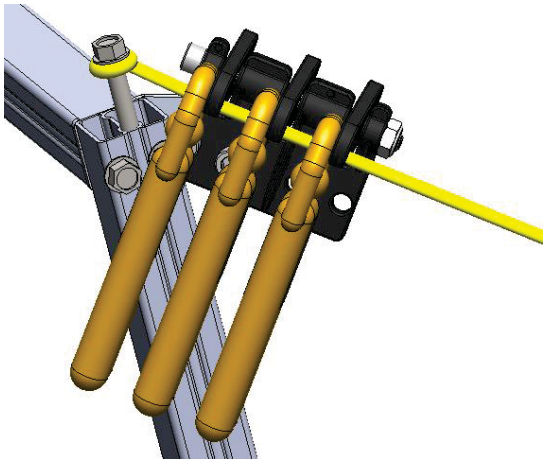
Step 6-13: The *Zip Line Lower Anchor* hooks to the bottom field perimeter rail centered on the 4th tile from the *Mountain's* corner. The long end of the *Anchor* goes on the outside of the perimeter. The view from the inside of the perimeter with the tile removed is shown.



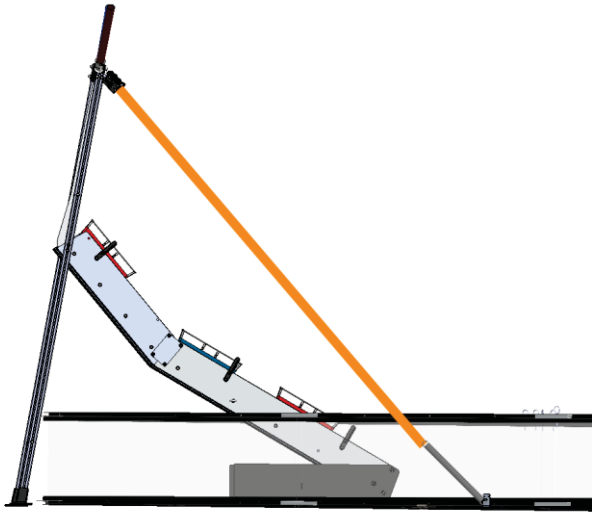
Step 6-14: Secure the *Zip Line Lower Anchor and Spring* to the bottom field perimeter rail in the location shown below, with a *Thumb Screw* and *Nylock nut*. The *Thumb Screw* should be tightened down to securely hold the *Anchor* in place.



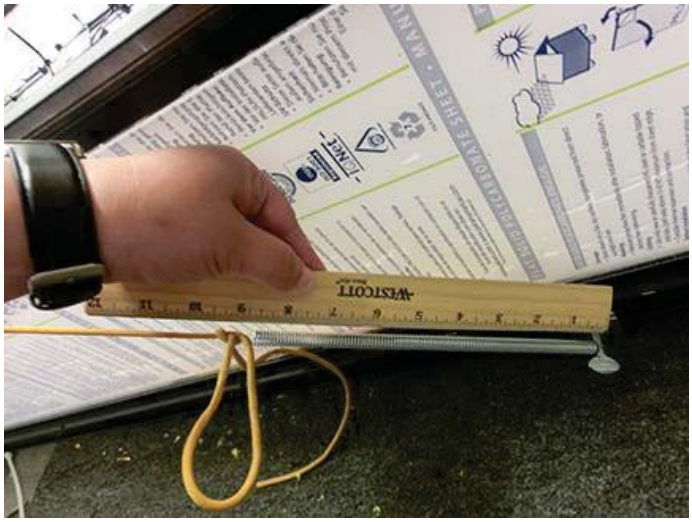
Step 6-15: Tie the *Zip Line* cord to the top screw. Add three *Figurines* to the cord as shown. Note: *Rubber Band* not shown in picture.



Step 6-16: Run the main *Zip Line* cord from the top screw and down through the end of the *Spring*.



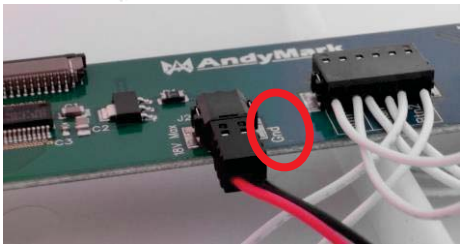
Step 6-17: Pull the *Zip Line* so the *Spring* extends to approximately 8.5" inches and tie with cord end with a secure knot. This will allow the *Zip Line* to have proper tension during game play.



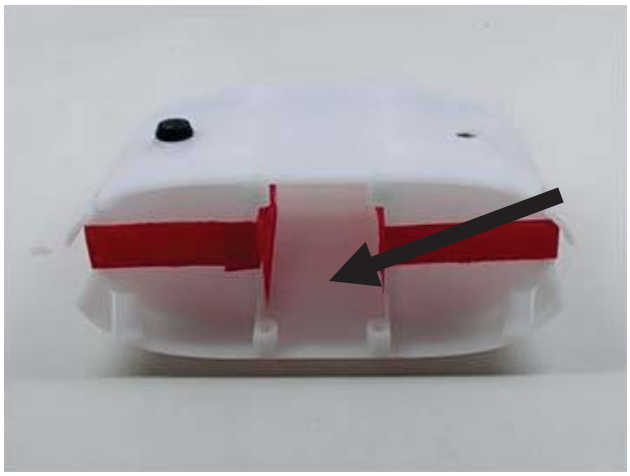
Part 7: Rescue Beacon Testing and Placement

Step 7-1: Put 8 AA batteries (not included with field) into the *Battery Holder*.

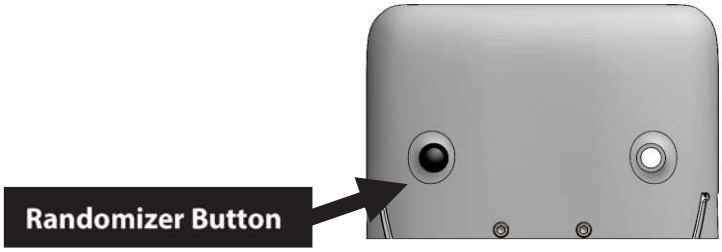
Step 7-2: Take the connector from the *Battery Holder* and press it into the terminal in the middle of the *Circuit Board*. This is how you turn the *Rescue Beacon* on and off. Ensure the black wire lines up with the GND label.

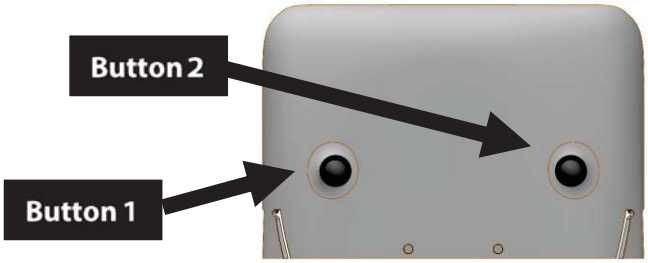


Step 7-3: Stow the *Battery Holder* in the main cavity of the *Rescue Beacon*. You may need to tape the holder with Gaffers Tape. Ensure that the *Battery Holder* sits in a way that does not block the lights shining through the front (2-button) face.

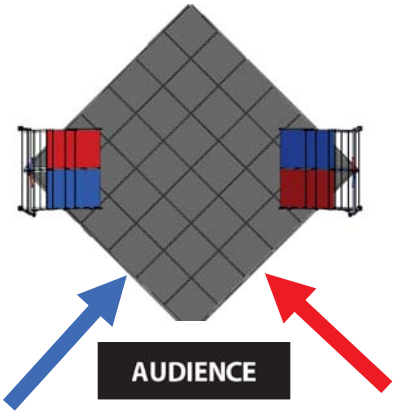


Step 7-4: Test the *Rescue Beacon* to ensure proper operation. When the *Rescue Beacon* powers on, it will cycle the LEDs and then run the randomizer. After this, check that *Button 1 and Button 2* each activate the LEDs on its' side, and that the Randomizer *Button* on the back activates the randomizer.

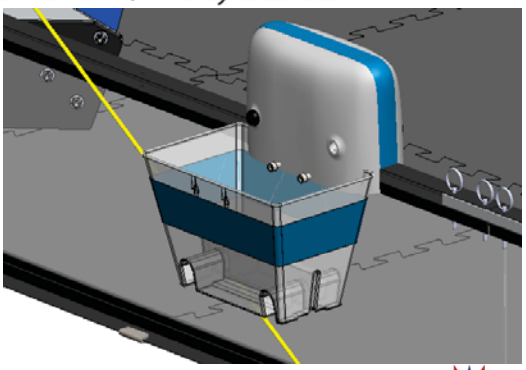




Step 7-5: The Red *Rescue Beacon* sits on the field perimeter next to the Red Mountain. The Blue Rescue Beacon sits near the blue mountain. The Position the *Rescue Beacon* on the field perimeter so that it is centered on the 4th tile from the *Mountain* corner.



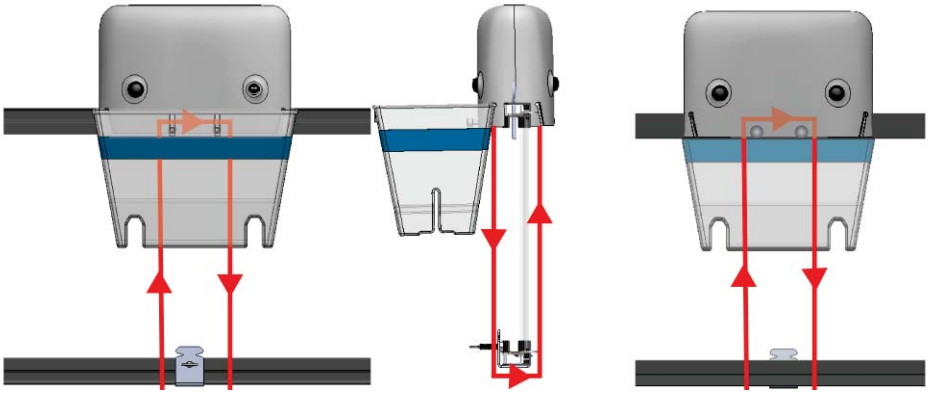
Step 7-6: Place the *Rescue Beacon* on the field perimeter with the basket on the outside of the field perimeter. Secure the *Rescue Beacon* on the infield side with two *1/4-20 x 1.25" BHCS* and *1/4-20 Nylock Nuts* and on the outfield side with two *1/4-20 x 1.50" SHCS* and *1/4-20 Nylock Nuts*.



Step 7-7: To further secure the *Rescue Beacon* to the field perimeter, create a *Zip Tie* Chain by connecting the ends of 5 *Zip Ties* together without fully tightening them down.

Step 7-8: Pass the *Zip Tie* Chain around the screws as shown.

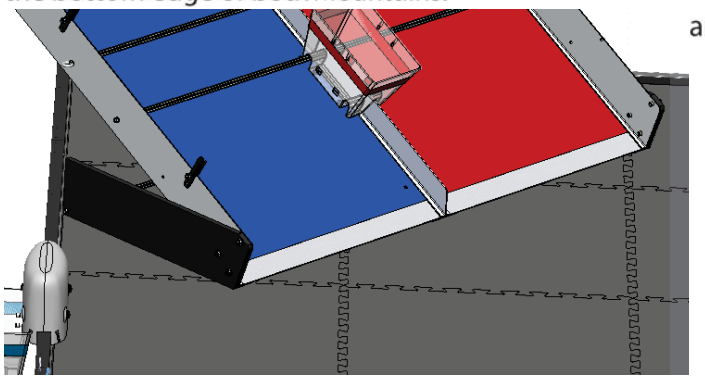
Step 7-9: Wrap the *Zip Tie* Chain around the bottom of the field perimeter and back up over the screws on the back side of the *Rescue Beacon* as shown. Complete the loop, tighten the *Zip Ties*, and trim the ends as needed.



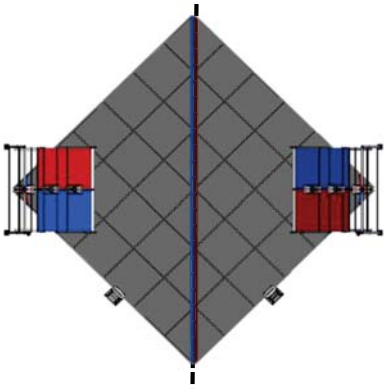
Step 7-10: Ensure the *Zip Tie* Chain is as close to the inside field perimeter wall as possible to avoid getting damaged by robots on the playing field.

Part 8: Taping Diagrams

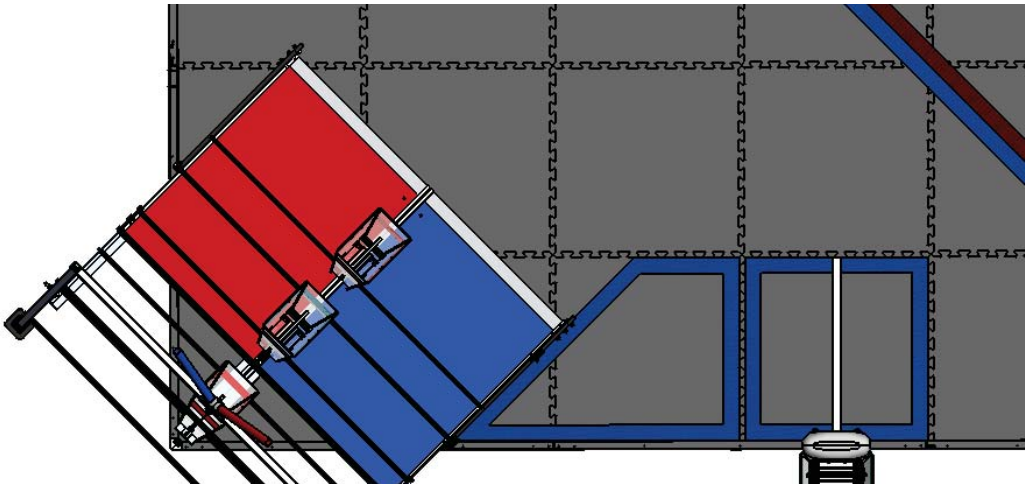
Step 8-1: Place a 2" Strip of white Gaffers Tape along the bottom edge of both *Mountains*.



Step 8-2: Use 2" red and blue Gaffers Tape to diagonally bisect the field. The red tape line should be closest to the red *Mountain* and the blue tape line should be closet to the blue *Mountain*.



Step 8-3: Use 2" red or blue Gaffers Tape to mark out the Rescue Beacon Repair Zone, and the Low Goal. The edges of the Tiles and the edge of the Mountain can be used as a guide. Use 1" white Gaffers Tape to mark the *Rescue Beacon* Tracking Line.



Step 8-4: Use 2" red and blue Gaffers Tape to mark the edges of the Alliance Stations on the floor outside the playing field as shown below. The red alliance station should be on the right side when viewed from the audience and next to the red *Mountain*. The blue alliance station should be on the left side when viewed from the audience and next to the blue *Mountain*.