Queen City HiRailers
Module Standards/Construction Methods
Updated June, 2012

General

All modules will be built following the Midwest Independent Hi-Railers Standards for module height, track spacing and electrical plugs:

1) 36" (+1"/-1" adjustment) module height from floor to top of railhead;
2) A 3 track mainline spaced at exactly 4 ¼" on center with first track centerline exactly 3 ¾" from the module front edge;
3) Electrical plug model with 6 pin configuration per Electrical section below;
4) 14 gauge bus wiring and plug wiring per the Electrical section below;
5) 16 gauge wire for track drops per the Electrical section below

This enables use of QCHR modules with other club's modules that follow the Independent Hi-Railer Standard. Note: For QCHR layouts, a 4" leg leveler is used to get to QCHR 39" table height; for connection to other club's layouts a carriage bolt is used for the leg leveler to get the 36" railhead height. Track centerlines may deviate within a multiple module scenery set, as long as each end of the module set follows the Standard.

Modules will not have a specific order of placement in an assembled layout, except for member's multiple module scene sets and for specific purpose modules such as yards and crossovers. This allows for maximum flexibility of layout size and configuration.

Multiple module sets shall be in multiples of 4'. If a module set is not a multiple of 4', the owner shall provide filler sections to make the set a multiple of 4'.

Realism and scale-like will be the approach for scenery versus toy-like. Module scenery of all modules should be such that adjacent modules visually "flow" together.

The standards in the following pages will be used for all modules that will be stored and transported as an entity by general club membership.

Although undesirable, members may build their own modules using other construction methods; however, when non-standard modules are used for a show its owner must transport and must be present at setup and teardown for the show; additionally, the owner must maintain the modules. If any problems occur with setup or operation when using the non-standard modules, it may be decided to remove those modules from the show. On a case by case basis, the Board may agree to store and/or transport non-standard modules of a member.

Members are responsible to maintain their own modules – both standard and non-standard.

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Module Construction

1. Module size for straight modules will be 32" wide x 48" long.

2. Module framing will be nominal 1" x 4" poplar wood although good quality pine is acceptable. On the 48" length, the 1 x 4 shall be the full 48" so as to hide the wood grain of the end framing board. The module top will be trade size ½" plywood of such grade to provide smooth top surface and low risk of long term warping. Install a 1 x 4 brace centered on the 48" length. Assemble framing using 2" minimum deck screws. Use 1 $\frac{5}{8}$ "drywall or deck screws to attach top to frame. Predrill and countersink all screws. Module top to be flush with framing on both ends and along front edge. **Modules shall be square at all corners. Take care to cut the top square and to assemble the framing square. Almost square is not good enough**.

3. Module height from floor to top of railhead will be 36" with height adjustment of +1"/-1".

4. Legs will be milled poplar wood 1 ½" x 1 ½" cut 33 ¾" long. Legs will be provided for all four corners. Install a $^{5}/_{16}$"-18 hex drive threaded insert - Rockler #31880 - in the bottom of each leg for module height adjustment. Drill the threaded insert hole, using a $^{7}/_{16}$" drill size. Hole depth to be minimum 2 ¼".

5. Leg levelers will be wood block dual leveler style made from 1 ½" x 1 ½" milled poplar, cut 4" long. Install a $^{5}/_{16}$"-18 hex drive threaded insert -Rockler #31880- in one end. Install a $^{5}/_{16}$" x 3" all thread stud in the insert. The all thread stud shall be "glued" into the insert using Locktite (Red), leaving 2" exposed. Refer to the Figure 1 for detail of the leg leveler.

6. Leg attachment will be with hinges, using Rockler #39505 hinges. Cut a 45 degree angle on the leg ¾ " from the leg end at the hinge end. Install trade size 1" x 2" cut 3" long for bracing blocks on each side of the leg at the hinge. See Figure 4.

   Leg pockets shall be avoided, except for special circumstances. If leg pockets are used, install a ¼"-20 hex head threaded insert and a thumbscrew or bolt to keep the legs from unintentionally falling out. See Figures 2 & 2a or Figure 3 for leg pocket construction detail.

7. A public barrier will be installed on each module using $^{3}/_{16}$" Plexi-glass. For straight modules, cut 4 $^{7}/_{8}$" wide x 47 $^{15}/_{16}$ " long. (The 4 $^{7}/_{8}$" width will give an even number of barriers from a 4' x 8' sheet) Attachment will allow any piece to fit any module (of the same size). On the Plexi-glass, drill two $^{7}/_{16}$ " holes 1" up from bottom and 36" apart, centered along the barrier. On the module, drill two holes sized for ¼"-20 hex head threaded inserts centered along the 48" public side of the module. **Each member is responsible to provide 2 bolts per module owned for barrier attachment to his/her module(s).**

8. Paint the module sides, ends and legs semi-gloss or gloss black, color matched to the black of the LOTS layout; a choice can be Behr semi-gloss Deep Base 3300, with color custom tinted, purchased from Home Depot. Top surface will be painted a color suitable for the scenery to

be installed; flat black best if scenery is a removable overlay. The underside does not need to be painted.

9. Module skirting will be dark blue similar to the old LOTS layout

10. End boards will be used for transporting modules and are built such that any end board can be used with any module:
    a. The end boards will be made of trade size ½ " plywood, cut to 11" wide by 32" long. Two skids of nominal trade size 2" x 2" wood are cut 11" long and attached with countersunk $1\frac{5}{8}$ " deck or drywall screws at the 11" width on each end of the end board. Drill 4 holes $\frac{3}{8}$ " diameter; 2" up from the 32" edge and 6" in from each 11" end.
    b. Drill 2 holes in the module framing board on each module end. The holes will be 2 inches up from the bottom and 6 inches in from each of the front and rear edges of the module. Install ¼"-20 hex head threaded inserts -Rockler #31872- into each drilled hole.
    c. ¼"-20 x 1 ½" hex head bolts with ¼" washer will be used to attach the end boards to the modules. **Each member is responsible to provide 4 bolts per module owned for attaching the end board to his/her module(s).**

11. Module to module connection for the assembled modular layout will be with C clamps or quick grip clamps; clamps must tighten and not slip. **Each member is responsible for providing 2 clamps for each of his/her module(s).**

Curve Module

Refer to Figures 5, 5a, 5b. Note that both a Right Hand and a Left Hand module are needed for a 90 degree curve. Build one per Figure 5 and the second as a mirror image of that Figure. A cardboard template has been made to these dimensions to simplify layout and cutting of the top; contact the Module Standards Chairperson for location/use of this template.

Curve modules are generally constructed as described in **Module Construction** above, with the following specific differences:

1) Legs: Three legs are cut 33 ¾"; one leg is cut 29 ¾". Legs are installed with hinges as shown in Figure 5a.

2) Leg Levelers: 3 are cut 4" long and are identical to straight module levelers; 1 is cut 8" long. The 8" leveler is not drilled all the way through, but only to a depth of 1 ½ " for the 3" all thread stud. This leveler has two additional ¼"-20 hex head threaded inserts installed in one side of the leveler – Refer to Figure 5. For these inserts two holes are drilled 3 ¾" apart centered on the length and width of the leveler. In Figure 5 the leveler is shown in its transport position on the cross member at the pointed end of the module. Drill two $^3/_8$" holes in the cross member to match the leveler inserts. Standard end board bolts are used to attach the 8" leveler as shown.

3) End Boards: The 32 $\frac{13}{32}$ " end of the curve module uses the same 11" x 32" end board as straight modules. On the module end, measuring from the longer side, measure 6", then 20", and up 2" from the bottom; note that the distance remaining to the other side will be about 6 $\frac{13}{32}$ ".

   The end board for the 16" end of the module is cut 11" x 15 ½". Holes are drilled 3" in from the 11" side and 2" up from the 15 ½" side. On the module ¼"-20 inserts are installed 3" in from the point and 2" up from the bottom. Note that this leaves 3 ½" from the second insert to the 29 $\frac{13}{16}$ " side of the module. **This end board does not have skids on it.**

4) Plexi-glass barriers for curves are cut for a greater height than straight modules for better train protection. Overall size and mounting hole locations are dependent on the style of the curve module. For straight sided curve modules, cut the Plexi-glass 7 ¾ " wide x 29 $\frac{5}{8}$ " long – refer to those currently in use for the club. Likewise, drill two $\frac{7}{16}$" holes in the Plexi-glass, and drill two $\frac{11}{32}$ " holes in each of the two shorter modules sides for ¼-20 hex head inserts, using the same placement dimensions as the existing straight sided curve modules.

5) Large or Small Wedgies can be built for use as curve fillers in a show setup. These shall be built following the design and dimensions of the existing club Wedgies.

Track

1. Track will be Gargraves, using track pins. Roadbed will be O gauge cork.

2. Track attachment will be by screws. Atlas track screws are preferred. If other types are used, the screw heads shall be as invisible as possible and the heads shall be black or painted black.

3. Turnouts will be Ross and generally will be 11 degree with exceptions for certain circumstances. Electrically operated turnouts will use DZ1000 switch motors. Manually operated turnouts will use Caboose Industries ground throws.

4. Track spacing for the triple track main line will be according to the Independent Hi-Railers Standards. This spacing is exactly 4 ¼" on center with Track 1 Outer Main centerline exactly 3 ¾" from module front edge. The track shall be installed using a straight edge to ensure that is straight. Within a multiple module set, the track centerlines may be different and may have curvature as long as the track centerlines at each end of the module set are as stated. Any curvature must be similar to mainline curve modules if curved tracks remain parallel or O72 or greater if tracks separate. **There should be no "back to back" curved trackage on the modules.**

5. Track connections between modules of the assembled layout will be with standard Gargraves track pins.

6. Mainline curves will be wide radius to provide adequate clearances for large scale engines and scale sized passenger cars. Minimum curves sizes will be as follows. With these, each 90 degree curve is effectively 6 feet wide and 6 feet long.

   Track 1: 68.25" radius (O-136.5)
   Track 2: 64.00" radius (O-128)
   Track 3: 59.75" radius (O-119.5

7. Ballast will be roofing shingle granules sourced in Cincinnati. These granules are approximately O scale. Ballast will be a mixture of 4 parts light gray and 1 part black.

Electrical

1. Bus wiring on the module shall be 14 gauge and wire colors as follows: Track 1 (Outer Main)-Blue; Track 2 (Center Main)-Black; Track 3 (Inner Main)-Red; Common-White; Accessory Voltage #1 (14 volts for turnout power) -Orange; Accessory voltage #2-Yellow. Track 1 is nearest module front edge on public side.

2. Bus wire termination shall be at terminal strips at each end. Terminal strips shall be mounted on the module center wood frame member on the track side.

   Terminal Strips: 4 position Dual row – Radio Shack 274-658
   6 position Dual row – Radio Shack 274-659
   8 position Dual row – Radio Shack 274-670

   Use spade lugs (Buchanan 70033 #16-14AWG or equivalent) crimped and soldered to the bus wires. Use non-metallic wire supports to hold bus wiring and track drops in place on the module underside.

3. Track drops for connections from the bus wiring to each track shall be 16 gauge. Wire colors that match the bus wire color for each track are preferred, although black and white drops are acceptable with black to the center rail and white to the outer rails. Each track drop shall have a wire triplet of equal wire length for its center rail power and its outer rail commons; both outer rails are connected together via the two outer rail commons. The drops shall be fluxed and soldered to the bus wire and at the underside or bottom edge of track. At the solder connection to the center rail, rail blackening shall be removed (suggest using Dremel tool wire wheel) to ensure good solder joint.

4. Electrical plugs for module to module electrical connections shall be 6 pin Radio Shack #274-226 for the male plug and #274-236 for the female plug. Provide approximately 12" pig tail length, and terminate at the module terminal strip using crimped and soldered spade lugs. The female plug shall be on the right as viewed from inside layout looking toward public. Remember "the female is always right".

   On modules with 4 tracks and separate 2 wire bus wiring for the 4th track, use Radio Shack #274-222 for the plug.

5. Electrical plug 6 pin wiring is with 14 gauge wire to make a 12" pigtail. Pin wiring configuration is per the Independent Hi-Railers Standard and is as follows: Pin 1: Track 1-Blue; Pin 2: Track 2-Black; Pin 3: Track 3-Red; Pin 4: Common-White; Pin 5: 14v Accessory-Orange; Pin 6: 2nd Accessory voltage-Yellow. Pin numbers are embossed (very small) on the plug at pin positions.

6. Turnout switch motors & related switch controllers are to be terminated on terminal strips. The supplied pigtail wire is small and will need to terminate without spade lugs. Tin the stripped wire ends before attaching to terminal strip.

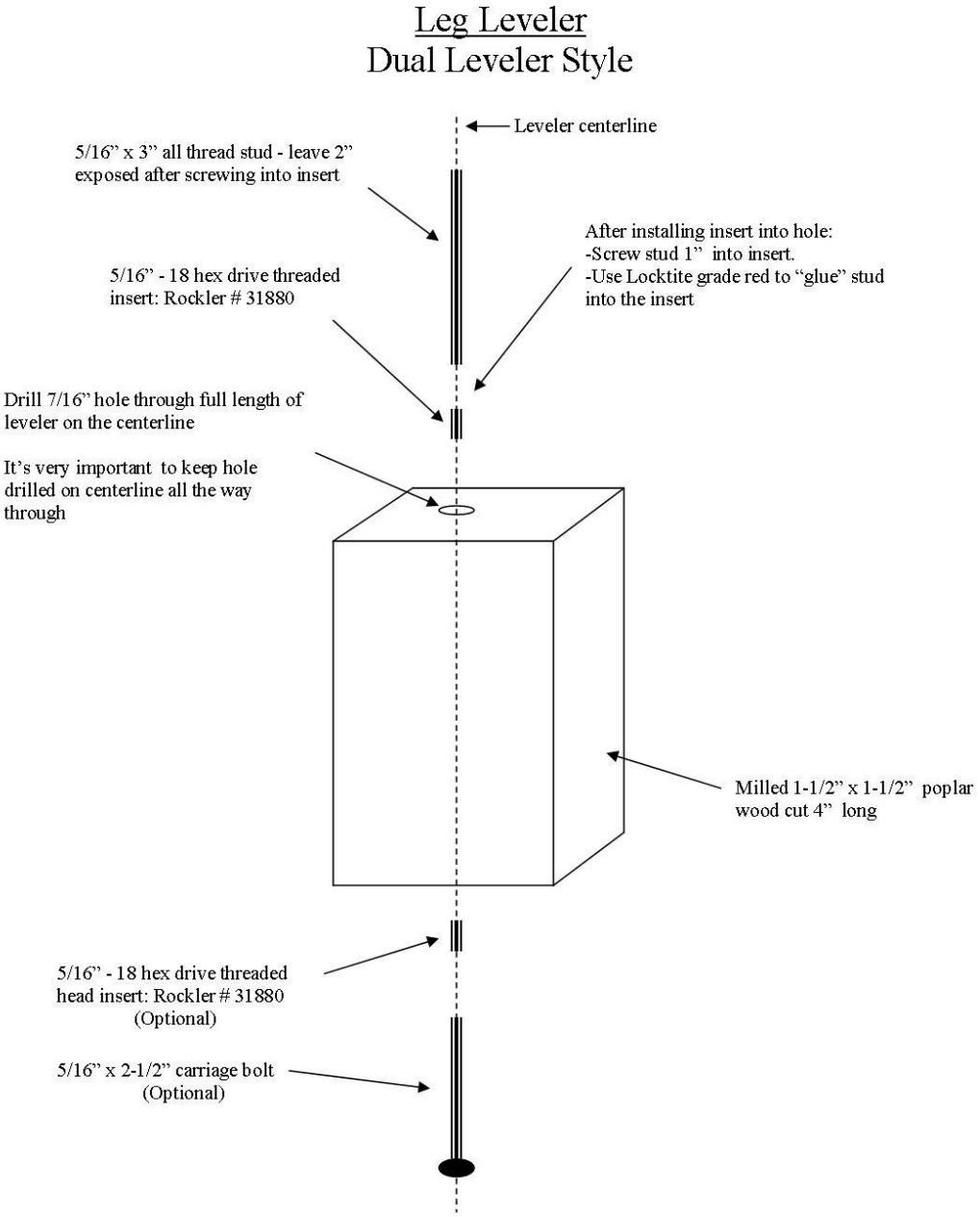
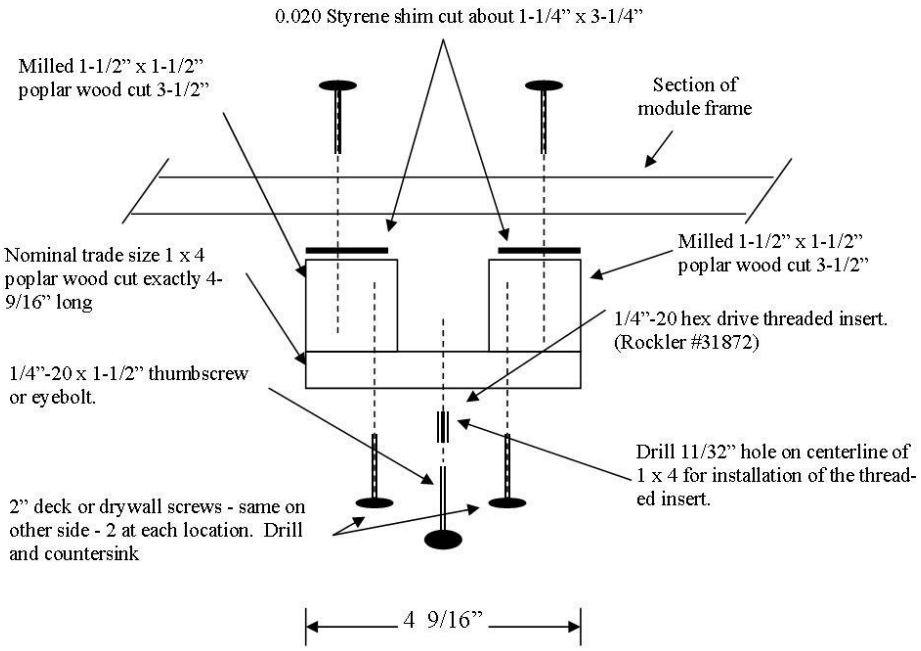

Leg Leveler
Dual Leveler Style
Leveler centerline
5/16" x 3" all thread stud - leave 2" exposed after screwing into insert
After installing insert into hole:
-Screw stud 1" into insert.
-Use Locktite grade red to "glue" stud into the insert
5/16" - 18 hex drive threaded insert: Rockler # 31880
Drill 7/16" hole through full length of leveler on the centerline
It's very important to keep hole drilled on centerline all the way through
Milled 1-1/2" x 1-1/2" poplar wood cut 4" long
5/16" - 18 hex drive threaded head insert: Rockler # 31880 (Optional)
5/16" x 2-1/2" carriage bolt (Optional)

Figure 1

Leg Pocket
for Anywhere Installation

Top View



Notes:

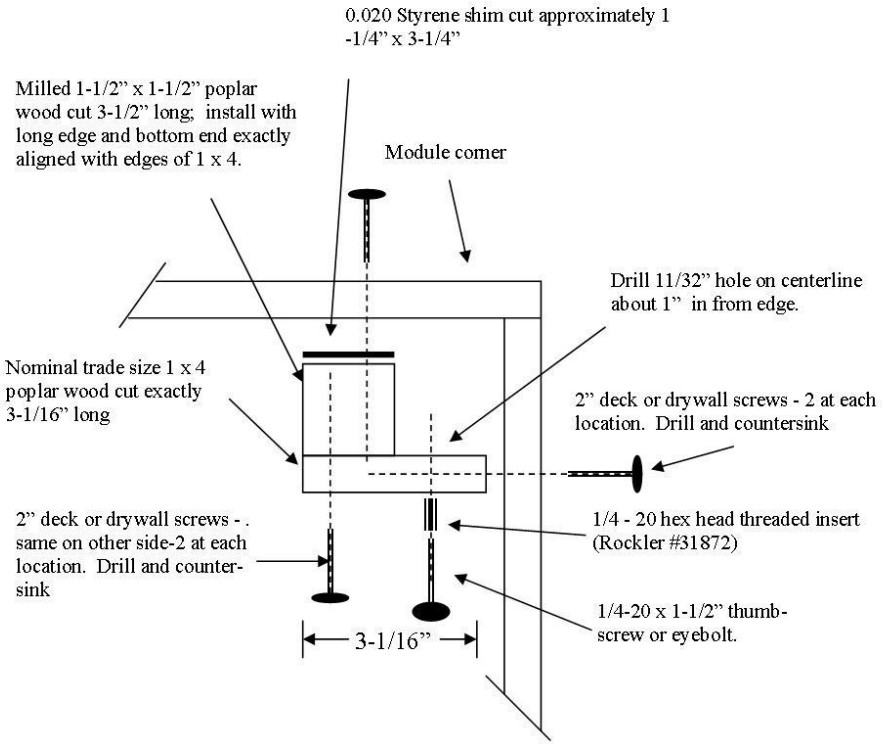
1) Install threaded insert first, then form pocket, then screw to module side.
2) To form pocket: Align one of 1-1/2 x 1-1/2 exactly with one edge and bottom edge of 1 x 4 and screw in place. Place an extra 1-1/2 x 1-1/2 with an extra 0.020 styrene shim aside of this block; then clamp the other 1-1/2 x 1-1/2 in place, aligned with bottom edge of 1 x 4 and screw in place. Remove the extra 1-1/2 x 1-1/2 and shim. This assembly plus the permanently installed shims determine the leg fit. The formed pocket will be 1-1/2 + 0.020 x 1-1/2 + 0.020. Make adjustments of these if needed.
3) Do not glue the leg pocket in place.

Figure 2

Figure 2a

Leg Pocket for Straight Module Corner Installation

Top View



Notes:
1) Length of 1 x 4, placement of 1-1/2 x1-1/2 on the 1 x 4 and the styrene shim determine fit of leg into pocket; may be adjusted as desired for leg fit.
2) Do not glue leg pocket to module.

Figure 3

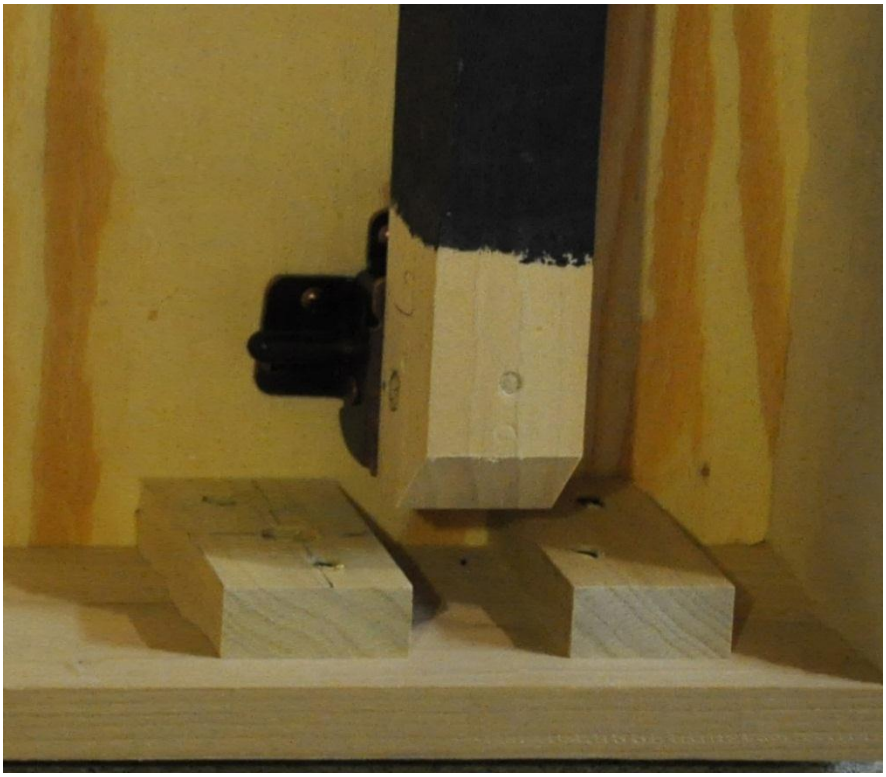
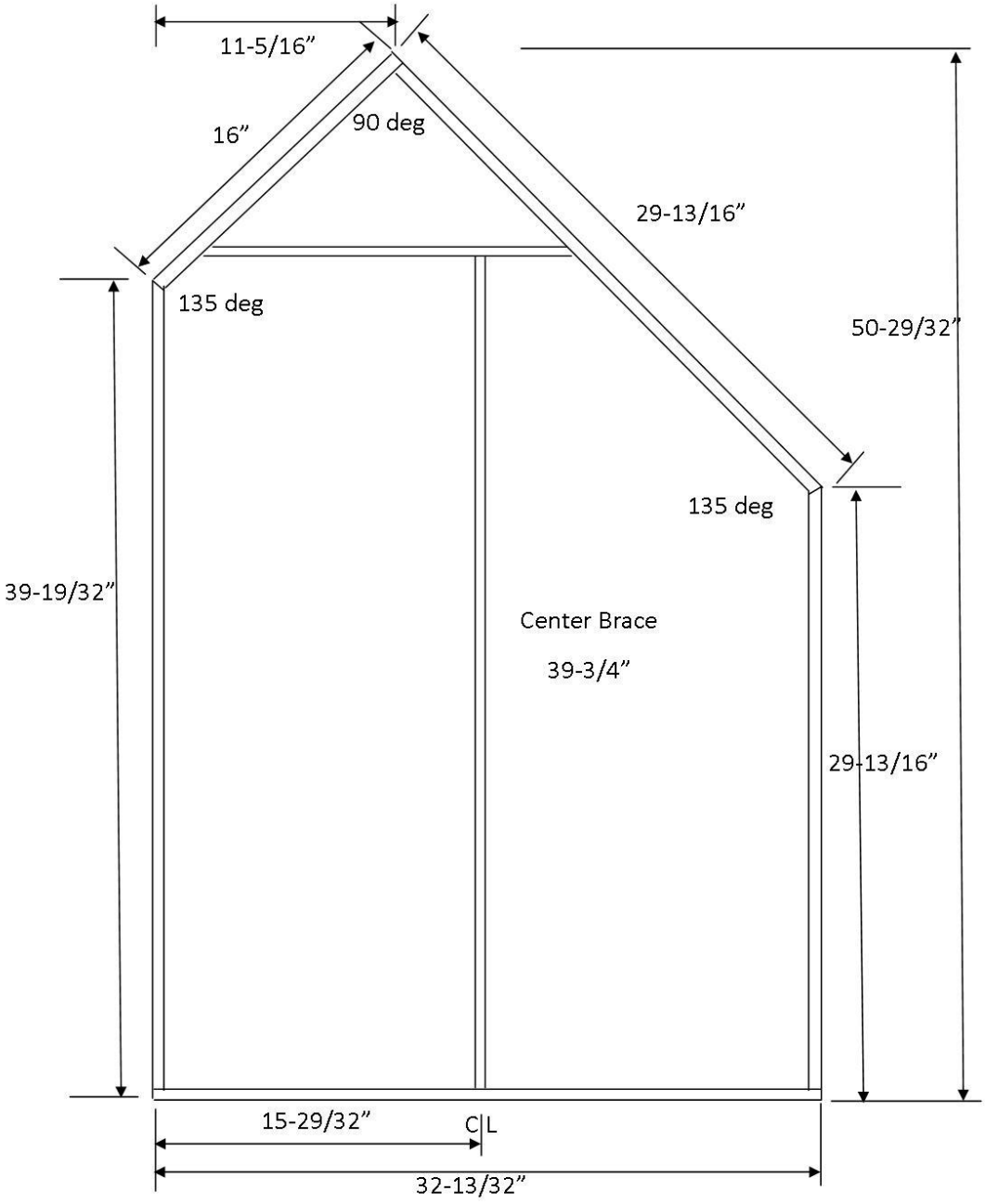


Figure 4



Wide Radius Curve

Figure 5

Diagram 5a

Curve at narrow end with 8" leveler in transport location on cross brace and leg installation detail

Diagram 5b