



User Installation Guide
Picket Rails
36-inch height

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Preface

The objective of this report is to simplify the installation process for new and inexperienced aluminum railing installers. The step wise procedure can be applied to all sorts of home installation projects which include stair rail and top handrail. Please refer to the Appendix section to learn about materials and equipment used throughout the installation process.

The step wise procedure may vary depending on each project and may sometimes be modified based on the needs of the customer. These instructions are meant to be guidelines, as proper judgement should always be used. Safety gloves and earmuffs should be worn when using the mitre saw.

Chapter 1 Installation of Flat Handrails

This section presents the stepwise procedure to install standard picket handrails, which is demonstrated in Figure 1.

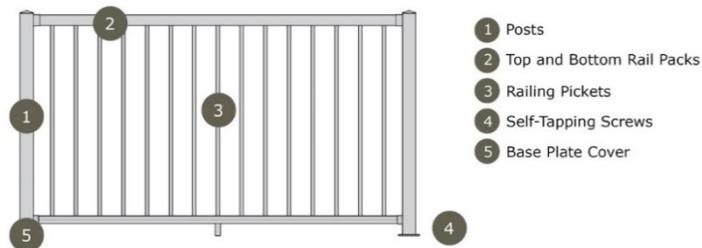


Figure 1 Flat Handrail with Pickets

The following construction steps are presented in order, and all tool and material descriptions are provided in Appendix A and Appendix B. These steps are for a single 6-foot section of rail, however information regarding longer sections is also provided at the end of the procedure.

1. Use the following materials to construct a 6-foot section of flat handrail:
 - a. 2 end posts
 - b. A section of top and bottom rail
 - c. A pack of pickets and spacers
 - d. Top and bottom rail brackets
2. Begin by cutting an end post to 36.5 inches. Then cut the pickets to 30 ¼” inches. Fasten the brackets to the side of stair posts using the 12x3/4 screws. The top rail brackets should be at the very top of the posts, and the bottom bracket should be attached such that the bottom rail will be sitting 3 inches from the base plate.
3. Place the stair post on the edge of the deck or patio, a safe distance such that there is enough support underneath for a lag bolt to go through. Use the square to ensure that the post is at a 90-degree angle with the edge of the deck. Mark the holes using a pencil.
4. Place the level on the edge of the end post to see if the post is perfectly vertical. If not, insert composite shims underneath the post to make it level.
5. Once the shims are in place, remove the post from its location.

6. Use the impact driver with a 3/16 drill bit to drill the holes if it is a wood deck. If it is concrete patio, use the concrete drill with a 5/16 drill bit and insert concrete plugs after the hole is drilled.
7. Return the post to its location and use the 3x14 lags screws to fasten the post into place. (Use 14x2 for concrete). Screw slowly and under control, to avoid scratching the bolts or the post.
8. Next, cut the top and bottom rail using the mitre saw to exactly 6 feet.
9. Slide the top rail into the brackets at the top of the end post. Take the other end post and slide the top rail in at the other side. Repeat for the bottom rail. Careful, the structure may be slightly unstable, make sure to hold the end post in place. Use the measuring tape to ensure that this new end post is 6 feet from the other end post.
10. Use the impact driver to fasten a 12x3/4 screw to connect the bracket to the top rail, as shown in Figure 2. Screw in the bottom rail on the exterior or interior of the post.

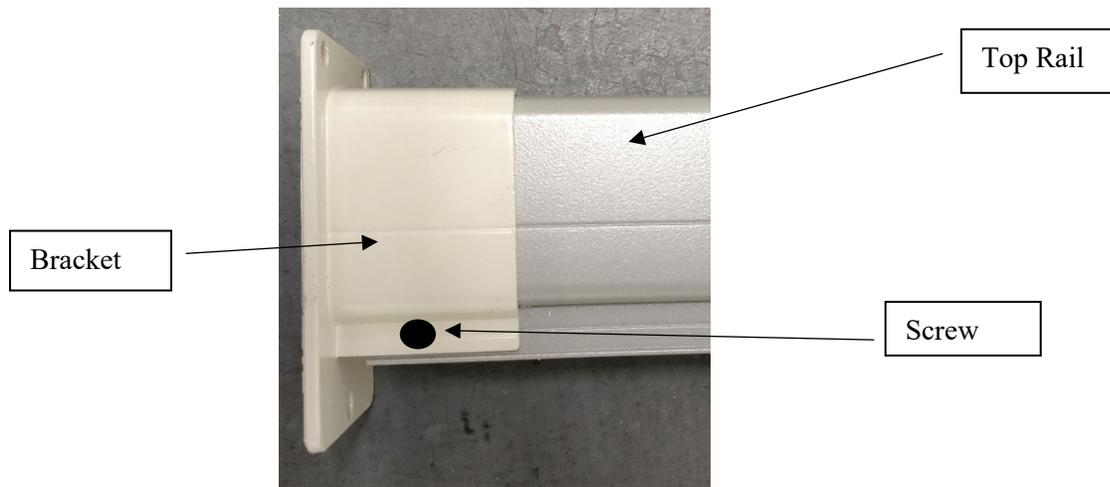


Figure 2 Screw location for top rail and end post

11. Repeat steps 2,3,4, 6,7 for the other end post, then repeat step 10, ensuring that the post is snug when attaching the screw. The project should now look like Figure 3. Screw in the bottom rail from the interior or exterior of the post.



Figure 3 End posts with top and bottom rail

12. Snap the spacers on the bottom rail starting at one end and work across to the other side, beginning with the flat end touching the end post, as shown in Figure 4a. Once you have reached the other end post, and there is no space left for another full spacer, slide the spacers to the middle such that there will be equal picket spacing at each end, which is shown in Figure 4b.

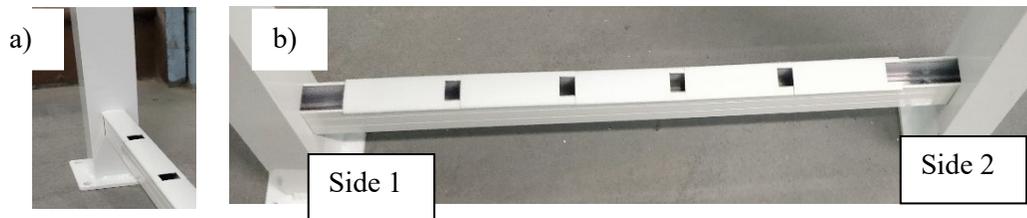


Figure 4 a) Spacers beginning at one end; b) Spacers once they have been slid to the middle

13. If the distance is quite small between the spacer and the end post (Less than 2 inches), remove a spacer, and then slide the group of spacers to the centre once again, and double check that the new spacing is not larger than 3.75 inches.
14. In order to get equal picket spacing at each end, cut 4 spacers according to Figure 5. Finding equal spacing may take some trial and error of sliding the spacers and then measuring. Spacer 1 and 3 will be on the top and bottom rail at Side 1, and Spacer 2 and 4 will be on the top and bottom rail at side 2 (from Figure 4b).



Figure 5 Spacer cuts required for even picket spacing

15. Remove all the spacers from the bottom rail. Snap in the first spacer on the top and bottom rail and snap in the picket. Continue adding spacers and pickets as you go along the rail until you get to end. The final product should look like Figure 6.



Figure 6 Final handrail

Chapter 2 Installation of Stair Rails

This next section will tackle a more challenging installation: Stair railings. With a little bit of practice, they will come easy, however, perseverance is the key. A stair rail is illustrated in Figure 7.



Figure 7 Stair Railing

1. Use the following materials to construct a 3-foot stair rail
 - a. 2 Stair posts
 - b. A section of top and bottom rail
 - c. A pack of pickets and spacers
2. Begin by cutting a stair post to 38.5 inches.
3. Using the mitre saw set to a 35-degree angle (will produce a 55-degree acute angle), cut 2 pickets to 29 inches long. The angles for each cut should be parallel, as shown in Figure 8. Approximate the number of pickets required for the step and cut them in the exact same way.

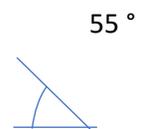
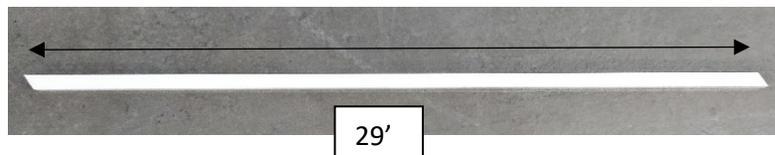


Figure 8 Angled Picket Cuts

4. Take one stair post, and mark 4 inches down from the top using the pencil (This will be the post at the top of the stairs). Then take the other stair post and mark 2.5 inches down from the top (this will be the bottom stair post).
5. Clamp the picket to the side of the stair post and fasten it with 3 fasteners. Their orientation is shown in a side view image in Figure 9

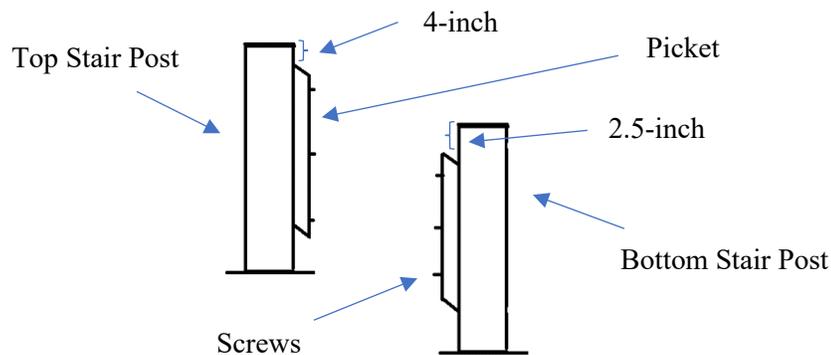


Figure 9 Orientation of pickets fastened to the stair posts (Side view)

6. Place the stair post on the edge of the deck or patio, a safe distance such that there is enough support underneath for a lag bolt to go through. Use the square to ensure that the post is at a 90-degree angle with the edge of the deck. Mark the holes using a pencil.
7. Place the level on the edge of the end post to see if the post is perfectly vertical. If not, insert composite shims underneath the post to make it level.
8. Once the shims are in place, remove the post from its location. Use the impact driver with a 3/16 drill bit or the power drill to drill the holes if it is a wood deck. If it is concrete patio, use the concrete drill with a 5/16 drill bit and insert concrete plugs after the hole is drilled.
9. Repeat this for the other post (both posts should be fully fastened in before moving to the next step)
10. Acquire a piece of top and bottom rail that extend past each end of the post and clamp them to the side of the posts (this is temporary, in order to take measurements). The rail will slip over top of the fastened pickets slightly (about 1 inch), so move the rail down slightly to allow for that.

Use the pencil to mark the edges of where the top and bottom rail intersects the posts, as shown in Figure 10.

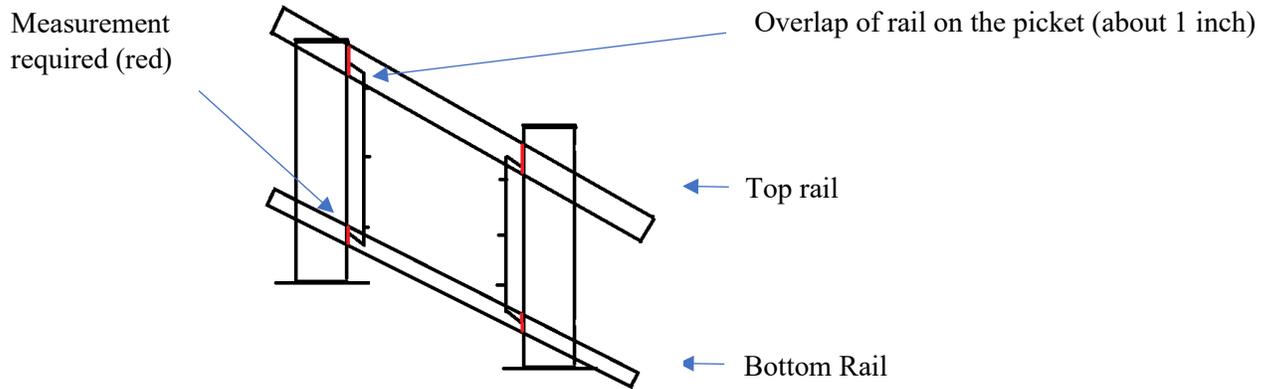


Figure 10 Placement of railing and measurements required (red)

11. Measure the exact angle of the red line marked using a protractor, then adjust the miter saw angle to correspond. Miter saw angle = $90 - x$, where x is the acute angle from the flat edge, which is shown in Figure 11.



Figure 11 Acute angle cut on the top and bottom rail

12. Make the angled cuts using the miter saw, and then fit the top and bottom rail in place. If the cut is not quite flush, remeasure and retry the cut. Once the rails are in place, use a $12 \times 3/4$ screw to fasten in both rails on the exterior side of the rail, as shown in Figure 12.



Figure 12 Exterior rail screw

13. Snap the spacers on the bottom rail starting at one end and work across to the other side, beginning with the flat end touching the end post, as shown in Figure 13a. Once you have reached the other end post, and there is no space left for another full spacer, slide the spacers to the middle such that there will be equal picket spacing at each end, which is shown in Figure 13b.

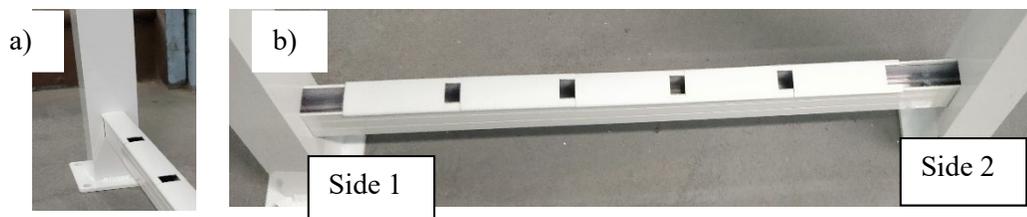


Figure 13 a) Spacers beginning at one end; b) Spacers once they have been slid to the middle

14. If the distance is quite small between the spacer and the end post (Less than 2 inches), remove a spacer, and then slide the group of spacers to the centre once again, and double check that the new spacing is not larger than 3.75 inches.
15. In order to get equal picket spacing at each end, cut 4 spacers according to Figure 14. Finding equal spacing may take some trial and error of sliding the spacers and then measuring. Spacer 1 and 3 will be on the top and bottom rail at Side 1, and Spacer 2 and 4 will be on the top and bottom rail at side 2 (from Figure 4b).



Figure 14 Spacer cuts required for even picket spacing

16. Remove all the spacers from the bottom rail. Snap in the first spacer on the top and bottom rail and snap in the picket. Continue adding spacers and pickets as you go along the rail until you get to end. The final product should look like Figure 15.

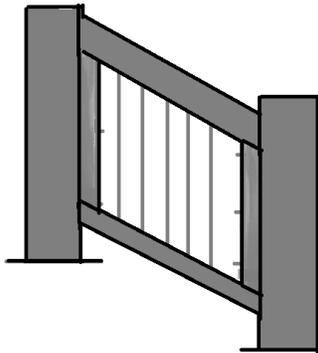
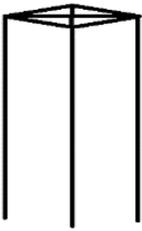
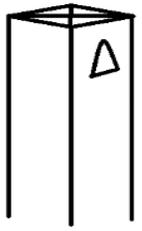
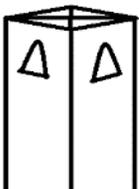
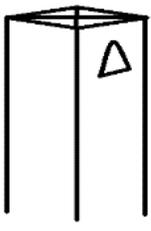


Figure 15 Final handrail

Appendix A Building Materials

Material	Photo	Description
Stair post		Used for stairs, has no holes.
End Post		Used to end a section of railing, has one hole
Corner post		Used to continue railing around a corner, 2 holes on perpendicular edges
Line post		Used to continue railing, 2 holes on parallel edges
Spacer		Used to space out pickets
Picket		Metal rod that sits in between top and bottom rail
14x2 Screw		Used to fasten posts on concrete steps
14x3 Screw		Used to fasten posts on wood decks
12x1 1/2 Screw		Used to fasten pickets on to stair posts

12/3/4 Screw		Used to fasten top and bottom rail to pickets and fasten top rail to posts for flat handrails
Concrete plug		Inserted into concrete hole after drilling
Top Rail		
Bottom Rail		
Handrail Bracket		Secures 36-inch handrail to end posts

Appendix B Tools

Tool	Photo	Description
Impact Driver	 A red and black Milwaukee impact driver, shown from a side profile. It has a hexagonal bit holder at the front and a pistol-grip handle with a trigger.	Used for high torque applications such as fastening lags
Standard Power Drill	 A red and black Milwaukee standard power drill, shown from a side profile. It features a keyless chuck and a pistol-grip handle.	Used for drilling wood, lower torque applications
Concrete Drill	 A blue and black Bosch concrete drill, shown from a side profile. It has a large, heavy-duty motor housing and a pistol-grip handle.	Used to drill into concrete
Mitre Saw (with non-ferrous blade)	 A red and white Skiln mitre saw, shown from a side profile. It has a large circular blade mounted on a sliding table with a red handle for the blade.	Used to make cuts on aluminum (MUST HAVE NON-FERROUS BLADE)

Clamps		Used to clamp rails to posts for measurement
Shims		Used to level posts
Level		Used to determine if posts are level
Measuring tape		Used to measure cuts
Square		Used to ensure the post is square with the edge of the deck

