



**U. M. ARMY – Texas Conference**

**Wheel Chair Ramp Manual**

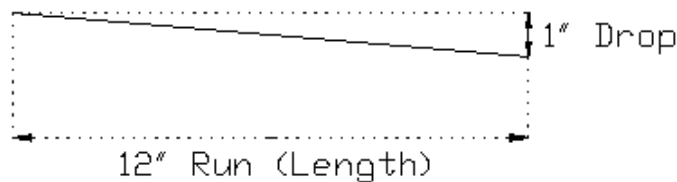
**May 2011**

# U. M. ARMY – Texas Conference Building & Repair Tips

## Wheelchair Ramps

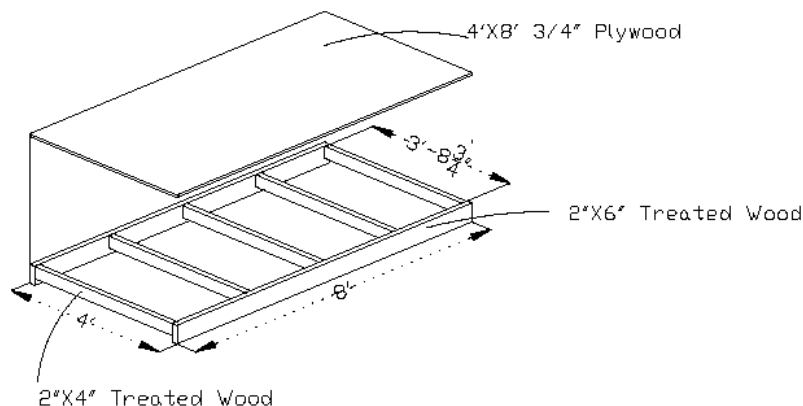
Complete a site survey to determine the design of the ramp. Measure the height of the starting point to determine the length of the ramp (1" of drop (slope) to 1' run (length)).

**Example:** A porch or door that is 16 inches above the ground will require a 16 foot ramp. "Run" is the length of the inclined (sloped) portion of the ramp. Determine if the length can be straight. If the ramp will require turns then landings will be needed at any change of direction. Landings are always level, runs are inclined. Do not include the length of the landings as part of the run.



There are two different types of decking (the surface) that can be used for a wheelchair ramp. Some people choose to use plywood decking because it goes together a little faster and with fewer screws. However,  $\frac{3}{4}$ " treated plywood is very heavy in a full 4' x 8' sheet and it tends to warp and split over time and with exposure to the elements. The other option is to use treated  $\frac{5}{4}$ " deck boards. Deck boards are nominally 1-  $\frac{1}{4}$ " thick, but are actually 1" thick. They are about 5-  $\frac{1}{2}$ " wide. To use this method, you will need to cut lots of deck boards to a 4 ft length and screw each of them down. This takes longer to install, but it results in a final product that will look better and last longer. The choice of methods is up to the work team and color group leader.

Wheelchair ramps will usually be 4 ft. wide so we can use  $\frac{3}{4}$ " plywood (or  $\frac{5}{4}$ " deckboards) without having to trim the sides. The framing construction is based on 4 x 8 sections that will be joined together to form the ramp. The basic 4 x 8 frame is made of 2 x 6's on the sides and 2 x 6's as cross pieces on each end and every 2 ft. inside the frame. If using deckboards, additional support is needed lengthwise down the middle of the frame. A diagram of a frame for plywood deck construction is below. A diagram of a frame for deckboard construction is found in Appendix A.



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Make sure your cross pieces are cut to 45 inches long, not 48 inches. The width of each joist (the long 2x6 support board) is 1- ½" to account for the other 3"!

Landings for a 90° turn are 4 x 4, and for a 180° turn are 4 x 8.

Once the design is complete, construct the necessary frames for the project. Be sure frames are square by using a carpenter's square or speed square. If you do not have a square, measure the frame diagonally across the corners. These measurements should be equal.

**TIP:** If you are using plywood decking, one easy way to make sure the frames are square and 2 x 4's are flush with 2 x 6's is to build the frames on top of a 4 x 8 sheet of plywood using the plywood as a template. Lay a sheet of plywood on saw horses, and place the framing boards on the plywood and screw them together.

*Do not attach decking at this time.*

When the frames are complete, lay them out on the ground in the manner in which the ramp is to be built. This will show you where to place the 4 x 4 posts (every 4 ft.).

**TIP:** To save time, while frames are being constructed the post holes can be dug by other team members. To determine where the holes are to be dug, lay out the sheets of plywood on the ground exactly where and how the ramp will be, starting against the porch or house. Mark post locations every 4 ft.

### **POST HOLES OR DECK BLOCKS**

**Post holes** are the most secure way to set a 4 x 4 post. Holes should be 18-20" deep, and posts set in concrete.

**Deck blocks** are concrete blocks with a 4 x 4 hole in the top into which a 4 x 4 post can be set. These are used instead of digging a post hole. Although not as secure as a post hole, they can be used successfully when it is not possible to dig a hole because of underground utilities, tree roots, rocks, etc.

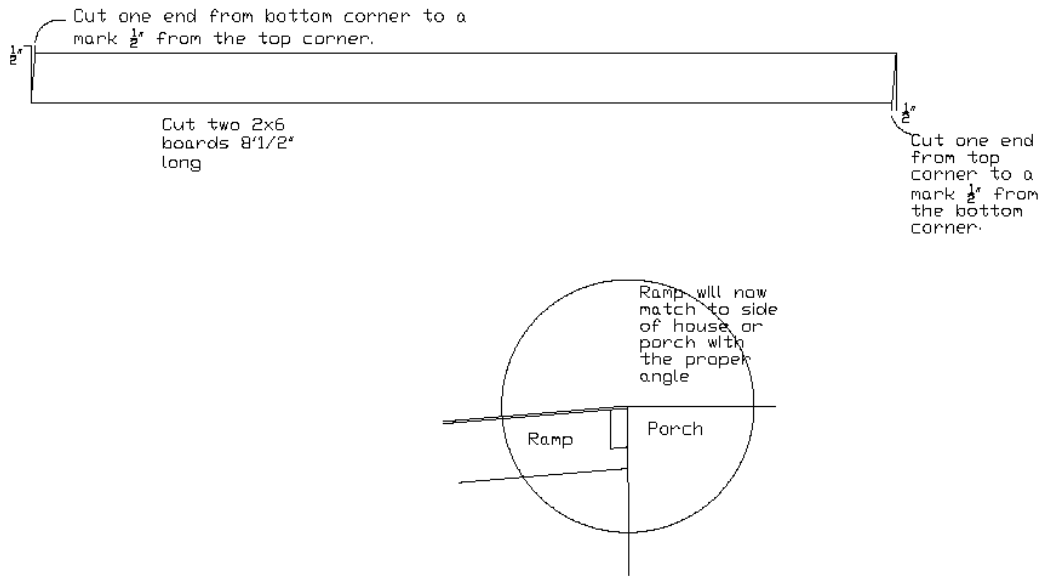
Dig post holes (18-20" deep), or set deck blocks, and insert 4 x 4 posts. If using post holes, **DO NOT** set in concrete until after ramp is attached.

**CAUTION:** *Always check for underground utilities before digging. If unsure, dig slowly.*

Starting at the top of the ramp, attach the first frame to the house or porch (be sure you are attaching it to solid wood, and not soft or rotted wood), and then to the posts at the proper incline of 1 inch to 1 ft. Example, an 8 ft. frame will drop 8 inches.

See the detail below to connect to house or porch with the proper angle which will prevent a gap. Each joist that is running on a grade (slope) must have a 5 deg angle cut to account for the slope. Flat landings do not have the 5 deg angle.

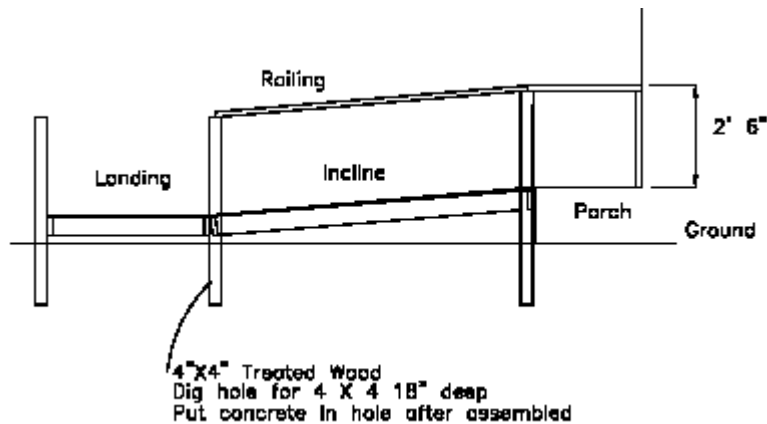
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See Appendix B for a diagram of using the 5 deg angle and the slope of a ramp joist. This diagram also shows the proper way to attach each joist (built as a frame) to the 4x4 posts. Use one galvanized lag screw ( $\frac{5}{16}$ " x 3  $\frac{1}{2}$ " long) in each post.

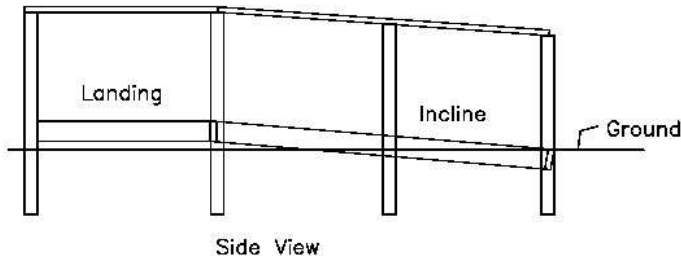
Continue joining the frames together and to the posts to form the ramp. As you do this be sure the posts are plumb (vertical on all sides). Slight changes to the post holes may be necessary to ensure the posts are set properly. Once all joists in a frame section are attached to the posts with lag screws and all posts have been assured to be plumb, then begin adding two galvanized nails (10d or larger) to each joint, one above and one below each lag screw (see Appendix B again).

Repeat this process for each frame section in your ramp design.



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The final frame will need to come level with the ground. This can be achieved either by digging the dirt out to allow the end to come to ground level, or by trimming the bottom of the frame at an angle such that it comes to ground level.



**ONLY NOW are you ready to pour concrete.** Fill post holes in concrete **after** the frames are attached and posts are plumb (vertical on all sides). Pre-mixing concrete with water is not necessary. With post in the hole, fill approximately halfway with water, then pour in dry concrete. Tamp to remove any air pockets. Allow to set up overnight if possible.

TIP: Another option, if you can't allow concrete to set overnight: pour in dry concrete without water. Then attach your decking, build handrails, etc. When you leave for the night, the last thing you do is pour a little water over top of your dry concrete. This will allow you to maximize your working hours.

## **Attach plywood decking or 5/4" deckboards to frames.**

For deck boards, in each board put two screws in each of the three frame joists, for a total of 6 screws per board. Use spacers between each board to ensure drainage of rainwater. Spacers can be nails or paint stir sticks or anything consistent and roughly  $\frac{1}{8}$  inch thick. Use one spacer on each end of the board and between each board to make the decking look uniform. See Appendix C.

For plywood, nail or screw no less than every 6" on all sides and across the middle on the cross pieces. To locate the cross pieces from the top, look on the sides of the frame (2 x 6's) and find the screws or nails holding the cross pieces in place. Snap a chalk line across the top of the deck holding the string at the screws on opposite sides.

Make sure all screws are sunk flush with the deck; don't leave screw heads sticking up to trip your client!

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### Construct the handrails

The standard height for a hand rail is 32" – 40" depending on the height of the principle user. Proper height for 4 x 4 posts must be attained by cutting them off with a reciprocating saw ("sawzall") or a circular saw *after* the frames are attached to the posts. Do not cut posts if concrete in holes is not fully set. The circular saw makes a flatter cut than the recip saw, but it will require two passes to cut through the thickness of a 4x4.

When cutting 4 x 4's for handrails, cut at the appropriate angle so the handrail lies flat on top of the post. This means the same 5 deg angle needs to be cut on the top of many of the 4x4 posts!

For the top rail, use a 5/4 x 6 deck board. This product is sanded smooth and has rounded edges.

A 2 x 4 attached on the side of the uprights just below the top rail provides added strength and firmness when the top rail is attached.

A 2x4 is also used for the bumper rail at the bottom and for added security, an additional 2 x 4 should be attached on the uprights midway between the bumper and the top rail for roll-off protection. See Appendix D and E for the proper design of the handrail.

If the deck is plywood, install roll roofing down the middle of the ramp for slip protection and to give firm footing and traction (nail with roofing nails).

Painting the ramp is not necessary since all of the lumber is treated for outdoor use.

If you decide to paint the ramp for aesthetic reasons, be sure the wood is dry (treated lumber is often stored outside and very wet).

### **PROPER LENGTH NAILS OR SCREWS.**

**SPECIAL NOTE:** *Screws and power drills are preferable to hammers and nails.*

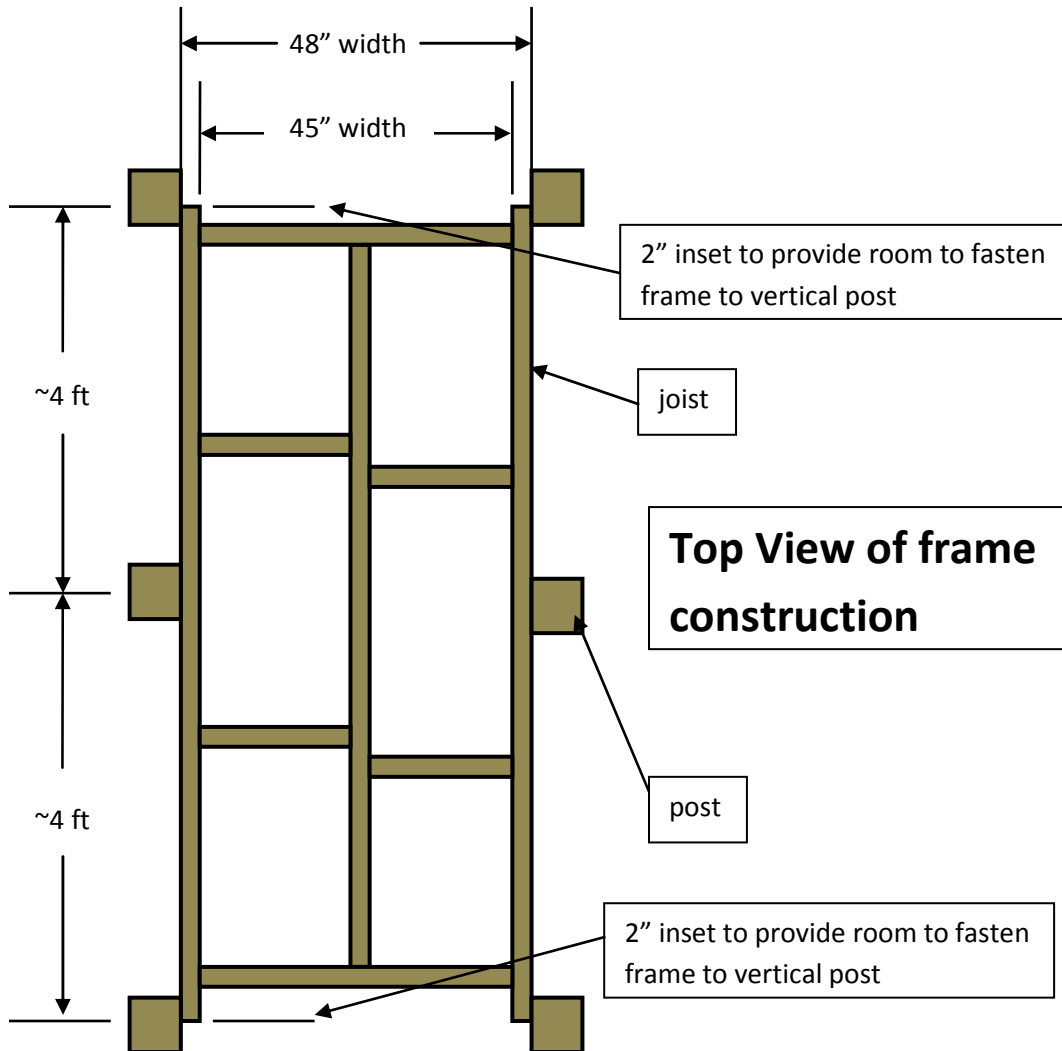
General rule is the nail or screw should be at least 1" longer than the board into which you are nailing. Put another way, it should penetrate at least 1" into the board to which you are joining. Example: A 2 x 4 is 1 ½" thick. A proper nail or screw will be at least 2 ½" long. Longer nails or screws give added strength, but should not protrude out the back of the other side.

Use 3" or 3 ½" length nails or screws when attaching the frame to the 4 x 4 support posts and to the house or porch. This will give added strength to these weight bearing surfaces.

**TIP:** When purchasing wood screws, get exterior deck screws with a combo tip. These tips are both Phillips head & #2 torque drive. Using these with a #2 torque driver bit instead of a Phillips head bit ensures they will not be stripped out.

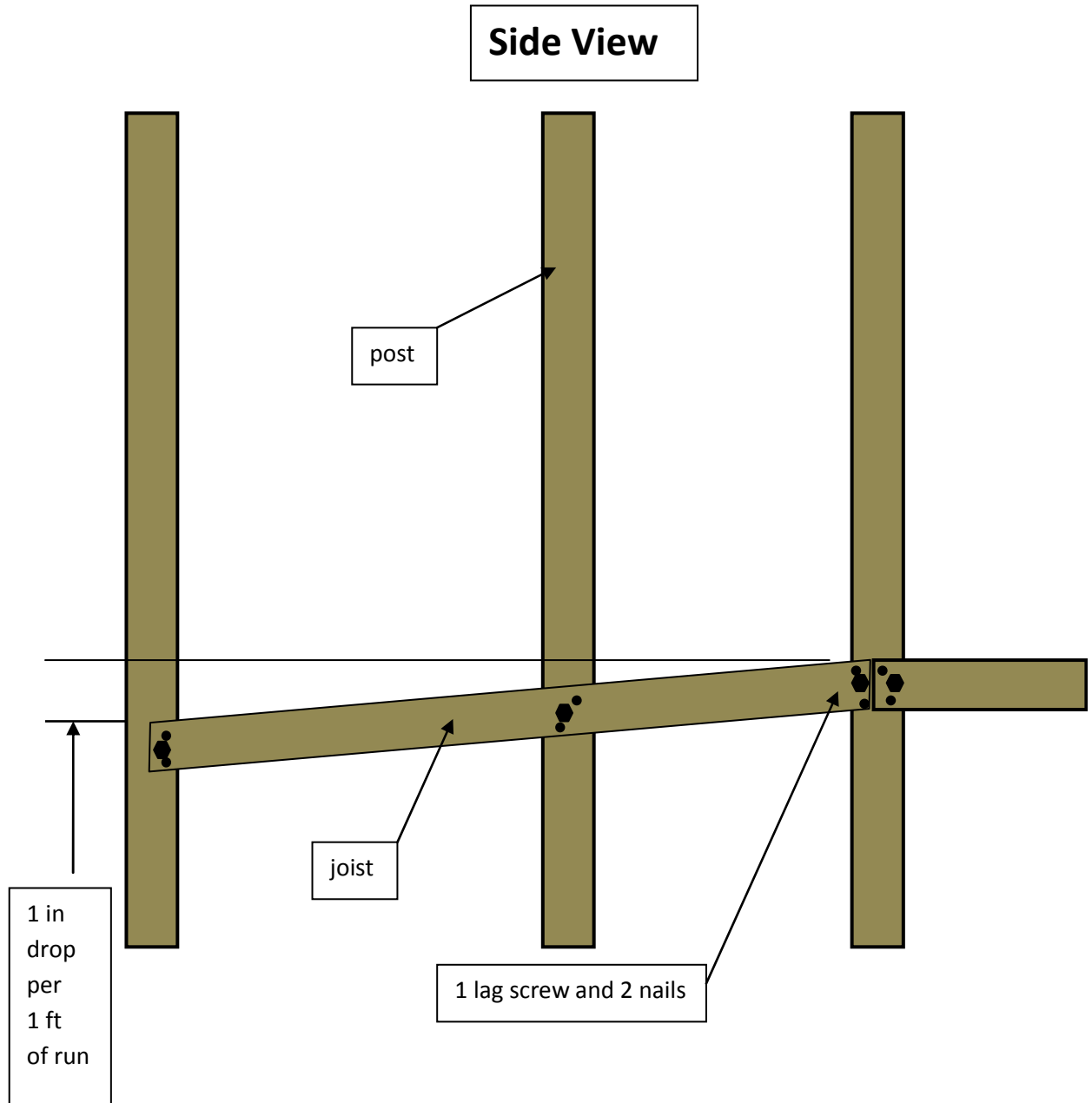
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## Appendix A



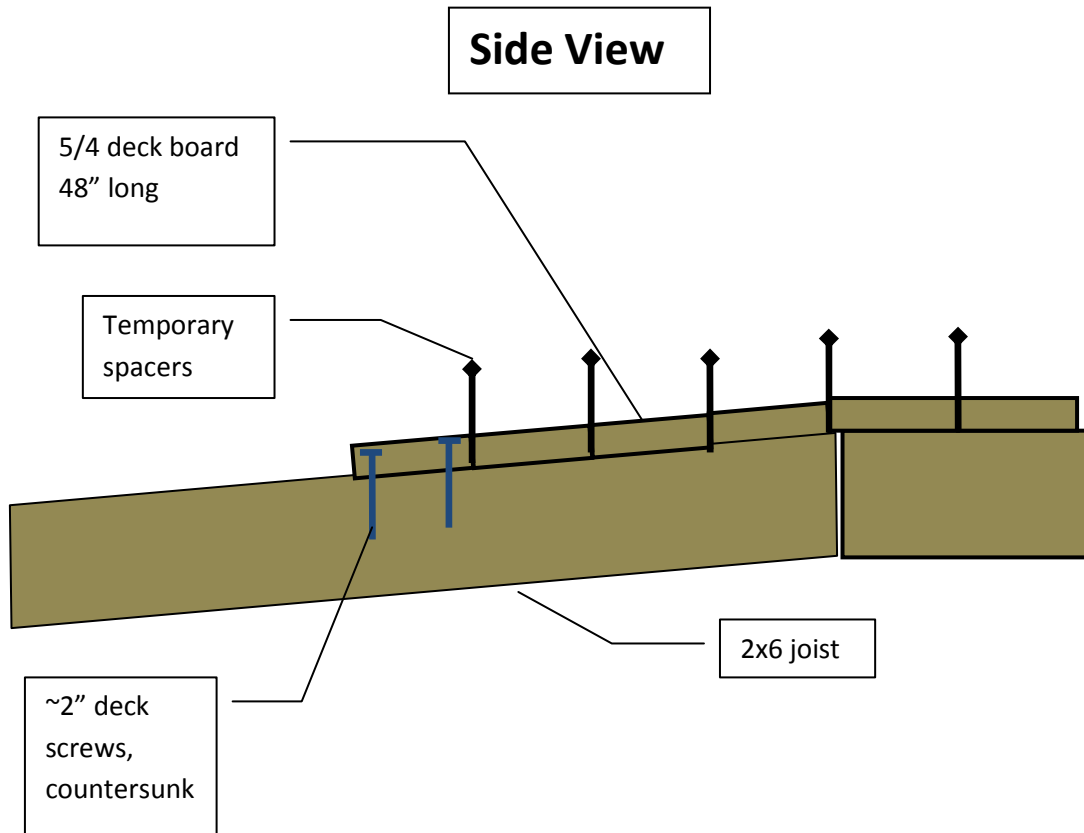
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# Appendix B



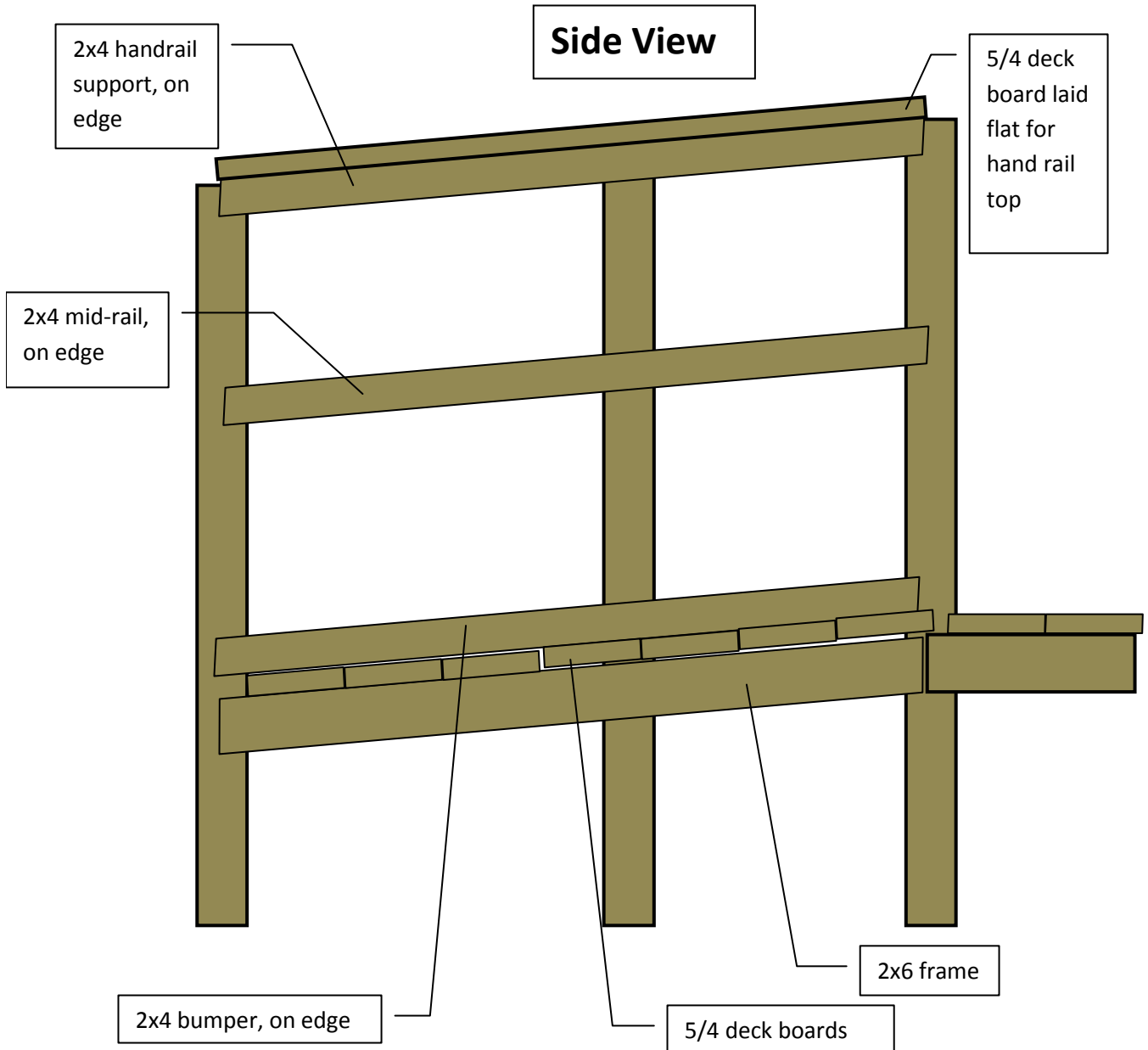
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## Appendix C



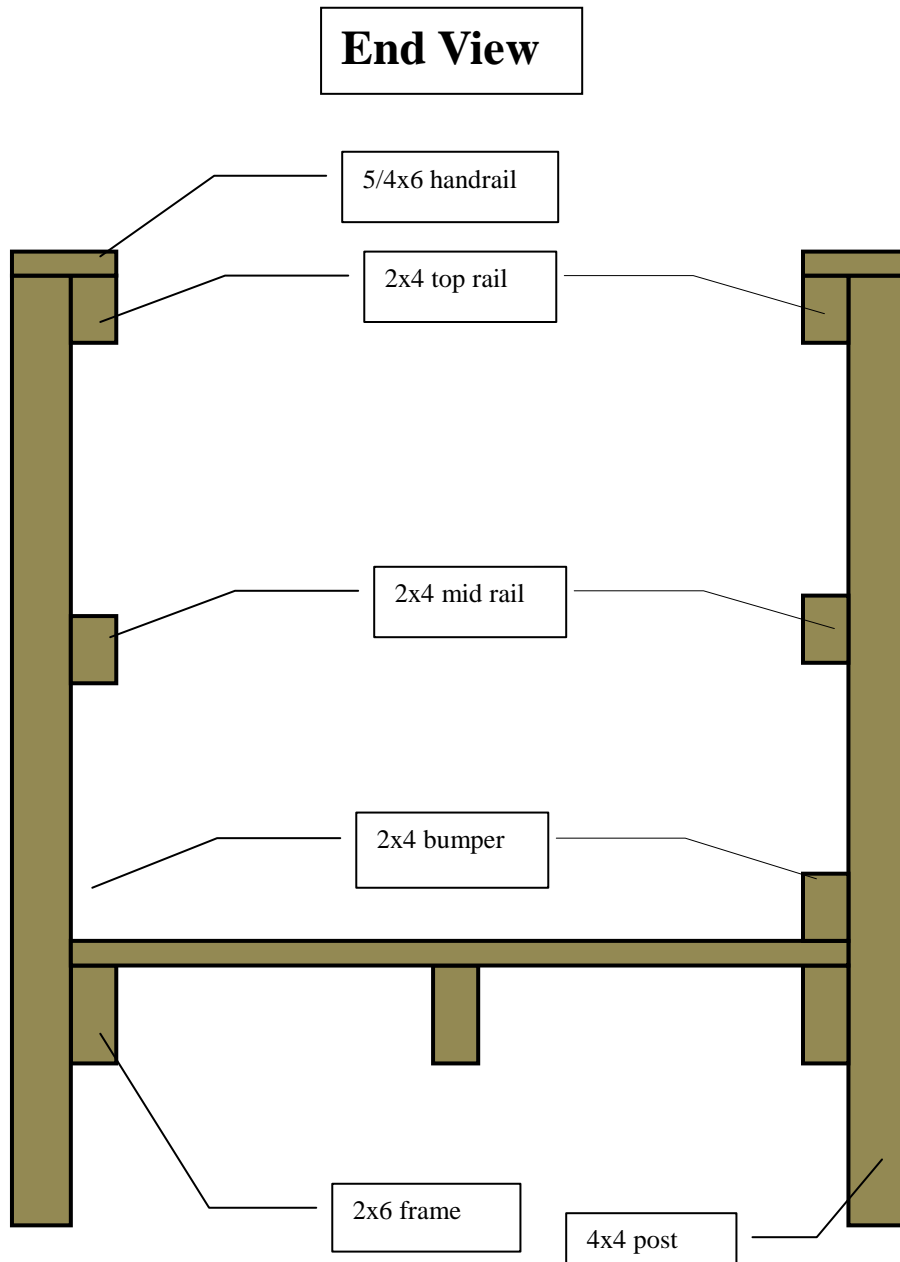
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## Appendix D



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## Appendix E



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## Useful Tools and Hardware for building a wheel chair ramp

Not required to have ALL of these, but they are all useful.



Speed square – about \$4-\$8



Post Level – about \$5-\$10



String level set - \$10



Drain spade or sharpshooter - ~\$20

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Post Hole Digger - ~\$30



Galvanized 3- 1/2 " lag screws



Galvanized 10d 3" nails



2" deck screws

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### Useful Power Tools for building a wheel chair ramp

Each of these tools are available from many brands and stores.



Cordless Impact driver –about \$80-\$200

Great for driving lag screws and deck screws.

Need sockets, adapter and bits



Cordless Drill –about \$80-\$200

Drilling holes and driving deck screws.

Need bits



Circular Saw –about \$50-\$100

Cutting lumber.

Need blades



Reciprocating Saw / Sawzall –about \$50-\$100

Cutting lumber.

Need blades