

# **Handicap Ramp Design and Construction Guidelines**

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**Rockwell Collins Retiree Volunteers  
RCRV**

**and**

**Wheelchair Ramp Assistance Program  
WRAP**

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## Handicap Ramp Design and Construction Guidelines

Rockwell Collins Retiree Volunteers (RCRV) builds handicap ramps for various service agencies in the Cedar Rapids, Iowa area. The service agency identifies the need and pays for the materials. RCRV provides the free labor. Each ramp design must be completed on an individual basis to accommodate home owner, site and individual needs. As a result, a generic process can be defined which is then applied on an individual basis. This process flow includes the following steps:

- Handicap ramp need identified to WRAP
- Identify ramp designer
- Survey site
- Design ramp including material list and cost
- Funding request
- Funding available
- Obtain building permit (if required)
- Ramp build scheduled
- Materials ordered and Delivered
- Construction crew arranged
- Construction of ramp
- Notify building department of ramp completion

The project requires a considerable amount of coordination and communication. The steps which usually take the longest calendar time to complete are: Site survey, ramp design, funding arrangement, and scheduling the materials and construction crews. Completion of a ramp project will typically be 4-6 weeks long even though the actual construction is only 1-2 days.

The requirements that must be accommodated in the design of a handicapped-access ramp include:

Consideration	Explanation
Home entry	The choice of door to which to run a ramp is influenced by the ease of access within the home to the various doorways, the widths of the doorways, and whether any platforms, stairs or porches already exist to which a ramp could be connected.
Space limitations and obstacles	Many aspects of the design of a ramp are limited by the space available and obstacles (such as trees, buildings, and walkways) that affect where it can be run. Also, where is the lower end of the ramp to be terminated?
Building codes	Explicit and implicit code requirements imposed by the city or county. Some cities require a signed permission slip from the owner stating that they want WRAP to build handicap ramp on their property.
Standard practices	Design standards that are commonly applied in the area. Also, although they are not legal requirements for homeowners, the ADA Standards for Accessible Design [ <a href="http://www.usdoj.gov/crt/ada/adastd94.pdf">http://www.usdoj.gov/crt/ada/adastd94.pdf</a> ] establish practices for commercial ramps that may be applicable or expected in home construction. We also follow the guidelines established by the Cedar Rapids Building Department (attached).

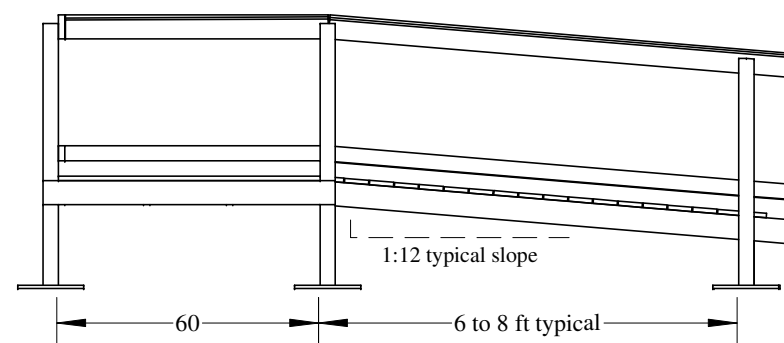
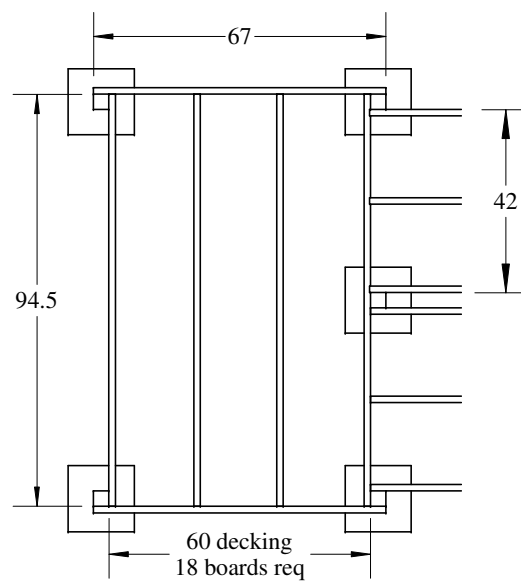
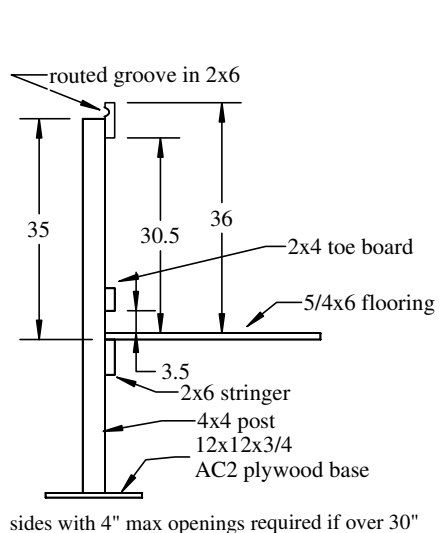
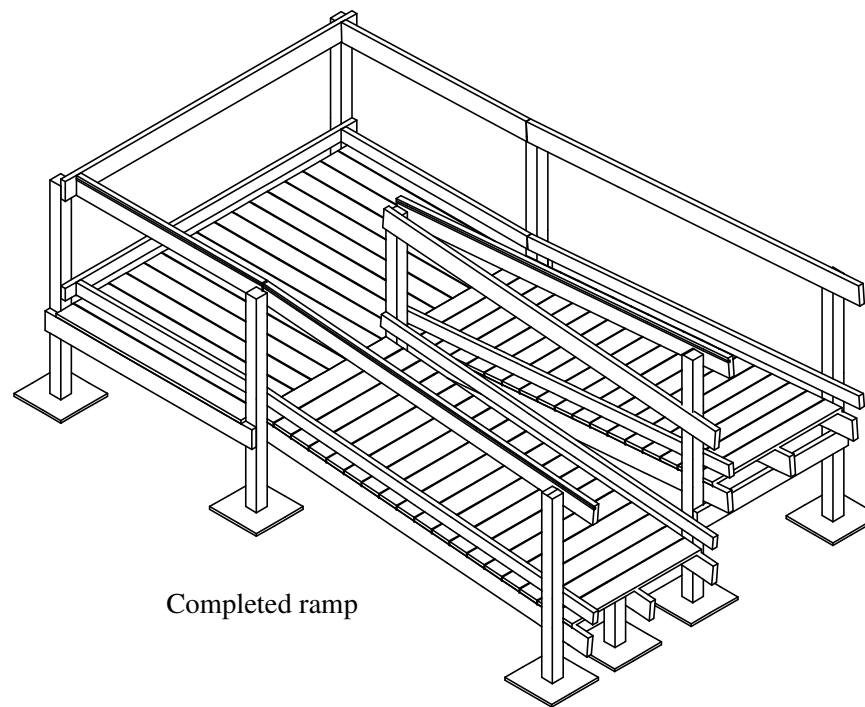
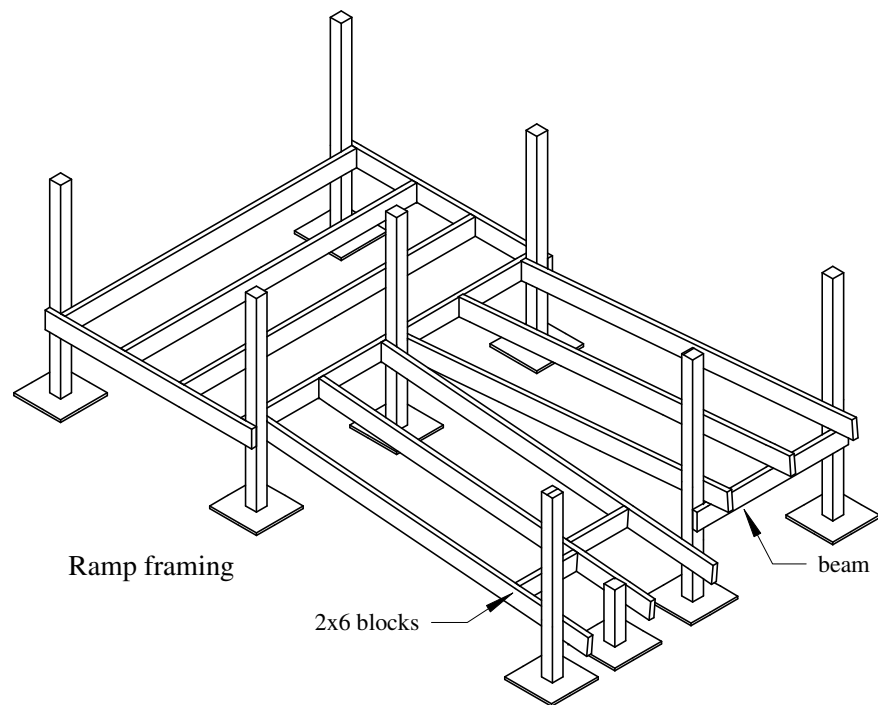
Specifics of the disability and means of movement	<p>Although “standard” designs work well for many people, the specifics of how the ramp will be used MAY affect the design. Examples include:</p> <ul style="list-style-type: none"> <li>• If the disabled person can only be move with his/her legs extended, wider turning platforms are needed than can be accommodated by someone who can move in a wheel chair with the feet lowered.</li> <li>• If the disabled person uses a walker but is unstable on slopes, shallow steps are probably preferable to a ramp.</li> <li>• If the caretaker for the disabled person is weak, the ramp will need to be less steep than normal. Conversely, a powered chair or scooter can make a steeper-than-standard ramp quite acceptable.</li> <li>• A design standard slope is 1:12; however several ramps have been built with 1:10 slope due to space limitations. 1:8 slope is an absolute maximum.</li> </ul>
Landing attached to the house	<p>If the house is not setting on frost footing, such a mobile home, the landing next to the house is not attached to the house and is not on frost footings either. If the house is set on frost footings, as all permanent homes, the landing next to the house must be built on frost footings. If the front stoop is set on frost footing, then the landing may be set on top of the stoop. Otherwise the landing next to the house must be set on posts set on frost footings. These landings should be attached to the house. Always allow for frost movement.</p>
Expected useful life of the ramp	<p>A ramp with a longer expected useful life (more than 5 years?) or a tall structure may need to be solidly attached to the home and built on frost footings. Ramps expected to be used for five years or less will be built without frost footings. Some jurisdictions may not allow frost free footings. The justification for frost free footings is that they are temporary structures.</p>
Neighborhood covenants	<p>Restrictions, especially affecting the aesthetic qualities of a ramp, may be imposed by non-governmental agencies. For example, many mobile-home parks require that skirting be installed to hide the space underneath a ramp.</p>
Aesthetic compatibility with the neighborhood	<p>The appearance of the ramp, especially the type of railing treatment (balusters, rails, etc.), should be chosen to ensure that a functional ramp is not viewed as an eyesore by neighbors.</p>
Homeowner preferences	<p>If a ramp is needed in a home owned by someone other than the family of the disabled person, the requirements of the owner may trump all other considerations. Also, the home owner may desire to match some existing decking or railing design.</p>
Client preferences	<p>When designing a ramp that is not financed by the client or homeowner, trade-offs must be made between functionality and cost. Some client preferences can be accommodated with little impact on cost; others cannot. The ramp designer must deal with these tradeoffs to meet the client’s real needs while ensuring that an agency intending to provide home access does not end up footing the bill for a great party deck.</p>
Access limitations	<p>It may be appropriate, particularly when designing a long ramp, to include steps or other means for non-disabled people (such as mail carriers and delivery people) to reach the doorway without navigating the ramp.</p>

Some standards design practices have been developed which provide simplified, low cost construction to take place. These standards are the starting point of each design, and although variations can and sometimes must be made to these standards, adherence to them is desired. These Standards of Ramp Design include:

- Construction with treated lumber
- Assemble with screws (no bolts or nails except for joist hangers)
- Standard width 42" clearance between posts (allows 39" clearance between railings)
- Use three 2x6" stringers (see 90° and 180° Landing Detail drawings for ramp framing)
- Posts 4x4" and spacing not more than 8 feet (6' nominal)
- Posts to rest on 12"X12" piece of treated ¾" plywood for ground support
- Assure lateral stability of posts (cross bracing at least one place in each direction as needed)
- Stringers are attached to the posts with 3.5" screws where possible. Also use a high shear strength screw such as Spax, Torx or lag screw, 1/4 inch by 4 inch, at sill to home (not mobile homes) and at least one at every load joint, typically 2x6's attached to 4x4s.
- Use of joist hangers required on all free stringers (not attached to 4x4) and use of hanger nails 1 5/8 required, not screws.
- Use 2x6 beams 49" long or as required under stringers at every 4x4 connecting post unless the stringer is resting on or very close to the ground. One beam is used if the stringer continues beyond the post. A beam is used on each side of the post if stringers join at the post. A center post is not needed if a beam is used unless two stringers are joined.
- In places where a free standing post does not have a beam cross member, 18.75" 2x6 blocks should be placed between the stringers to stabilize lateral movement of the post.
- Tall landings or ramps should have diagonal bracing between the posts to stabilize the structure.
- Use 5/4 x 6" decking boards on ramp surface and attach with 2.5" screws. (Shank on 2.5" gives relief for decking, more than 2 inch.)
- Recommend hand rail with finger hold routed out of 2x6. Ready-made vertical hand rails may be purchased in only 8 ft length at lumber yards. Vertical hand rails routed from a raw 2x6 can be obtained with any desired length. (Prior design using a 5/4x6 and 2x4 rail raised some concern with some building inspectors due to the long reach for a finger hold.)
- Railing height 36" above floor
- Railing should extend 12" beyond end of ramp. This may be waived if it interferes with ramp access.
- Enclosed sides are required for sections of the ramp over 30" above the ground or other lower surface. The sides must be enclosed with 4" max openings.
  - If ramp over 30" high, use two horizontal 5/4x6" deck boards or balusters (must be enclosed with 4" max openings)
  - Some building inspectors object to a "ladder" type of enclosed side that consists of horizontal boards. Four balusters can be ripped from 5/4 decking for less than the ready-made baluster cost at stores.
- Toe Board – use 2x4 mounted 3 ½" above decking
- Use 5x8' landing for 180 degree turnaround (see Figure 1, 180° Landing Detail drawing)
- Use 5x5' landing (inside offset) for 90 degree turn (see Figure 2, 90° Landing Detail drawing)
- A landing is required after each 30' of ramp length. Landing should be 5' long.
- Vary joint locations of stringers, railing members and toe boards for improved stability
- An End Post Bracket is used to support the two end posts. This is fabricated from steel angle iron and plates as shown in the drawing.
- A Ramp End Assembly is constructed from wood as shown in the drawings. This may either be fabricated in advance or on site. The structure is screwed together from the bottom and attached to the end posts with screws through the 2x4 toe board. A ¾" plywood base may be required under the End Post Bracket and Ramp End Assembly to stabilize it on the ground. (see Figures 3 and 4, Handicap Ramp Termination drawings) When terminating on uneven concrete, consider fastening the end board down with a Tapcon screw into the concrete.

- The building codes of the City of CR are followed (see Figure 5, Cedar Rapids building code handout)
- Each installation requires site assessment and a design developed
- A great deal of time may be saved on the construction site by developing a very accurate bill of materials in advance. The bill of materials should identify where each item is to be used.

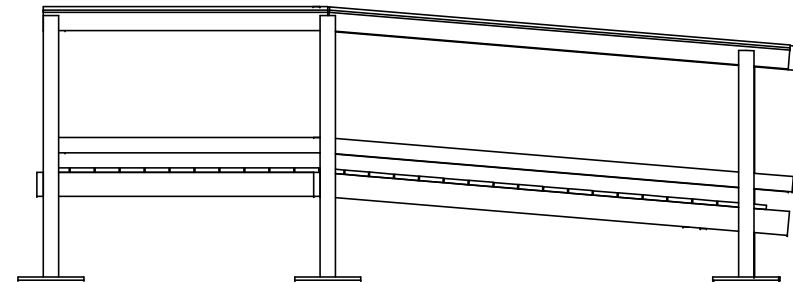
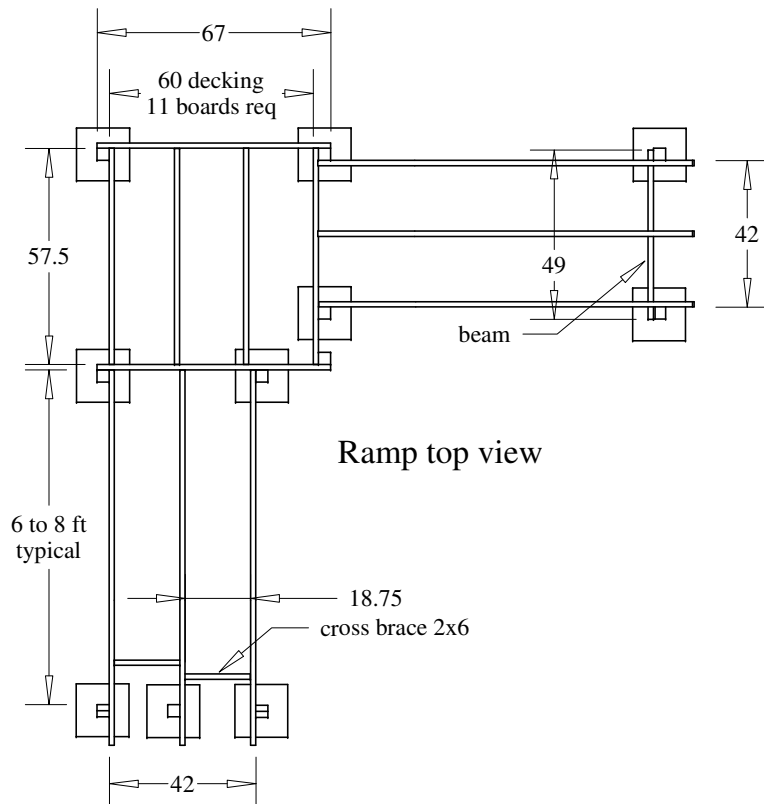
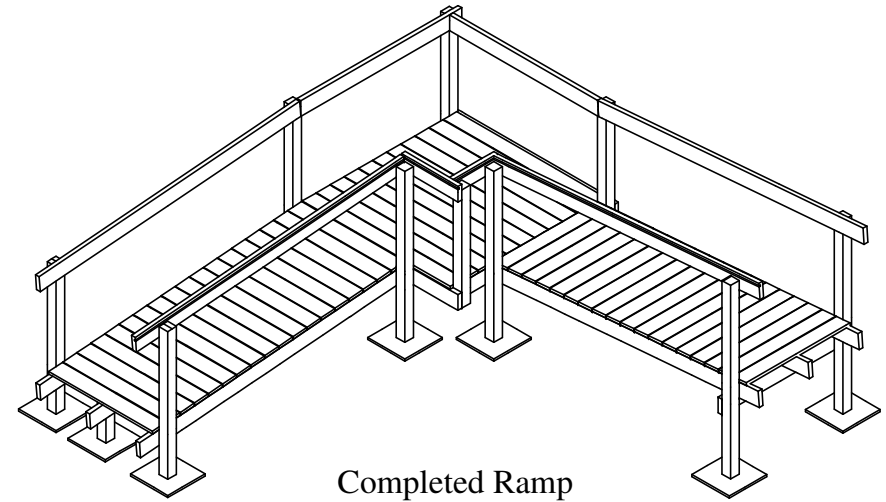
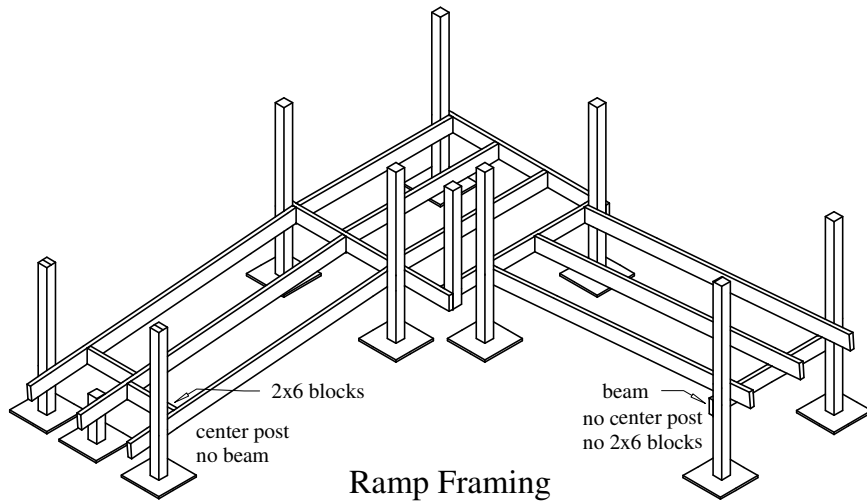
Figures 6 through 13 are photos of a typical ramp constructed using the design standards described above. The ramp is 33 feet long with a 180° landing.



RCRV

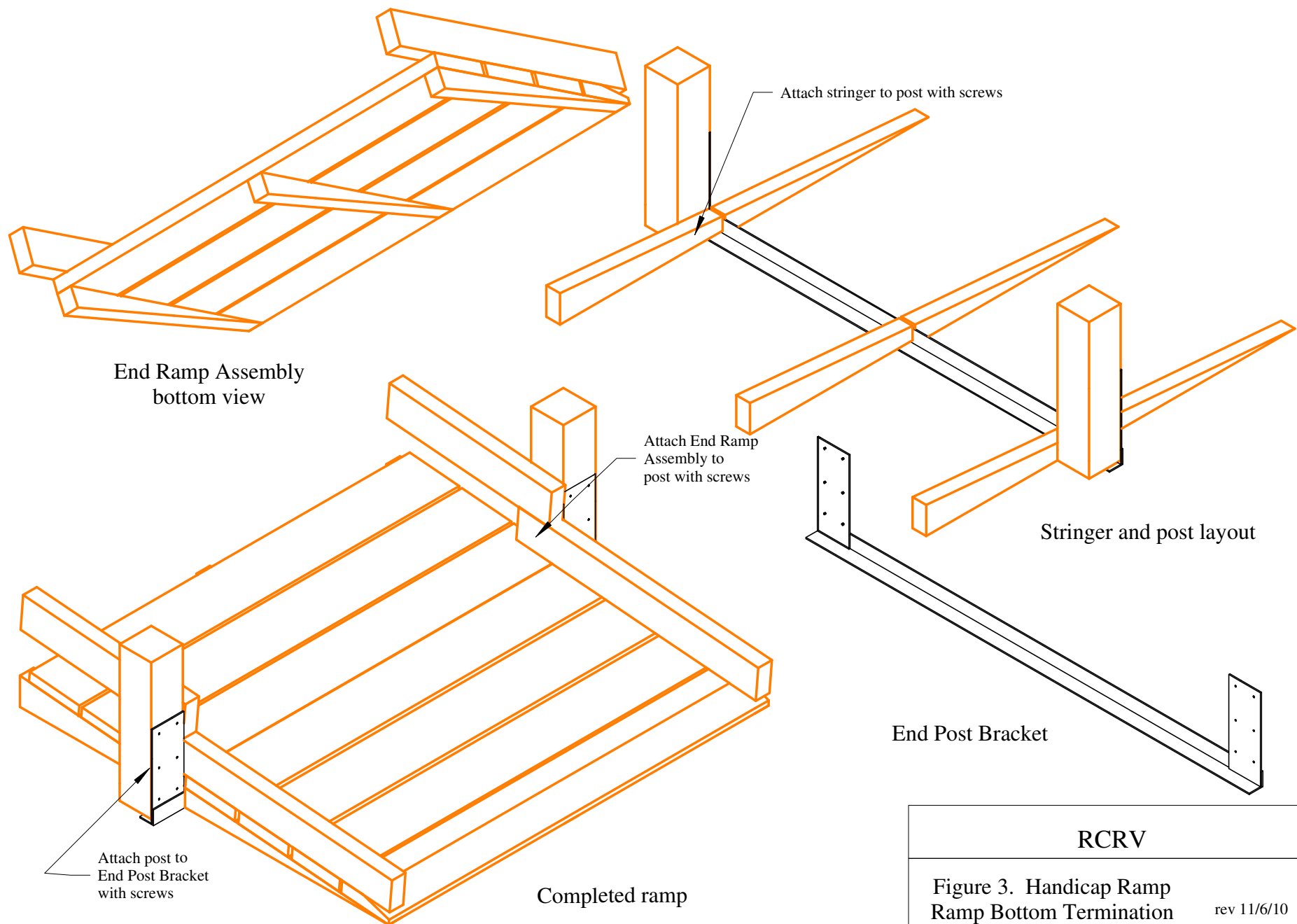
Figure 1. Handicap Ramp  
180° Landing Detail

rev 10/30/07  
rev 11/6/10  
rev 4/7/12



RCRV

**Figure 2. Handicap Ramp** rev 10/30/07  
90° Landing Detail rev 11/6/10  
rev 4/7/12

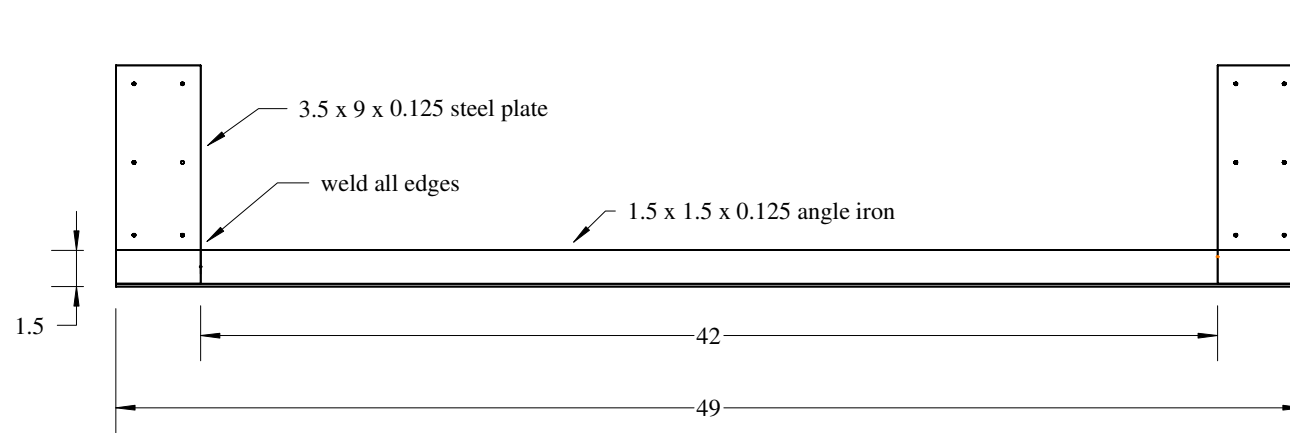


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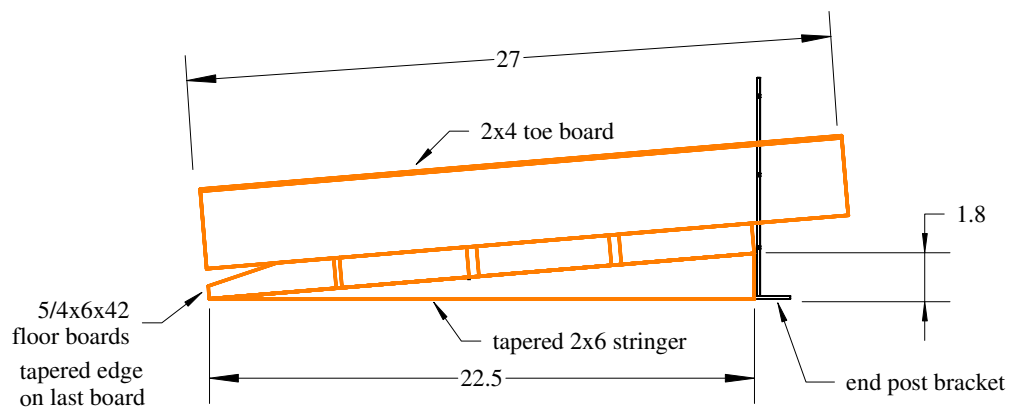
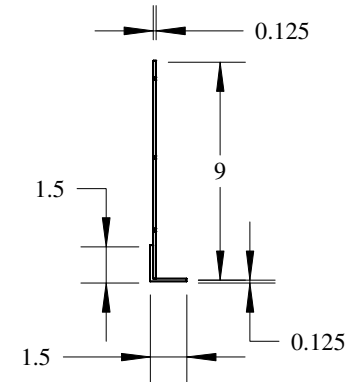
Figure 3. Handicap Ramp  
Ramp Bottom Termination

rev 11/6/10

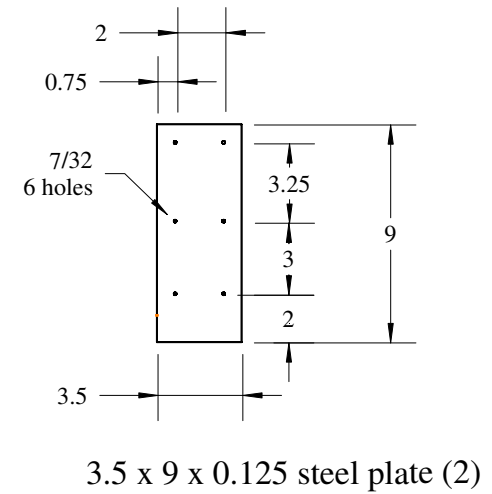




End post bracket



End Ramp Assembly



RCRV

Figure 4. Handicap Ramp  
Ramp Bottom Termination rev 11/6/10

Figure 5. Cedar Rapids building code handout

## STRAIGHT RUN RAMP FOR THE DISABLED

1. RAMPs SHALL HAVE NON-SLIP SURFACES SUCH AS BROOM FINISH OR CARBORUNDUM GRIT
2. HANDRAILS SHALL EXTEND 12" BEYOND TOP & BOTTOM OF RAMP.

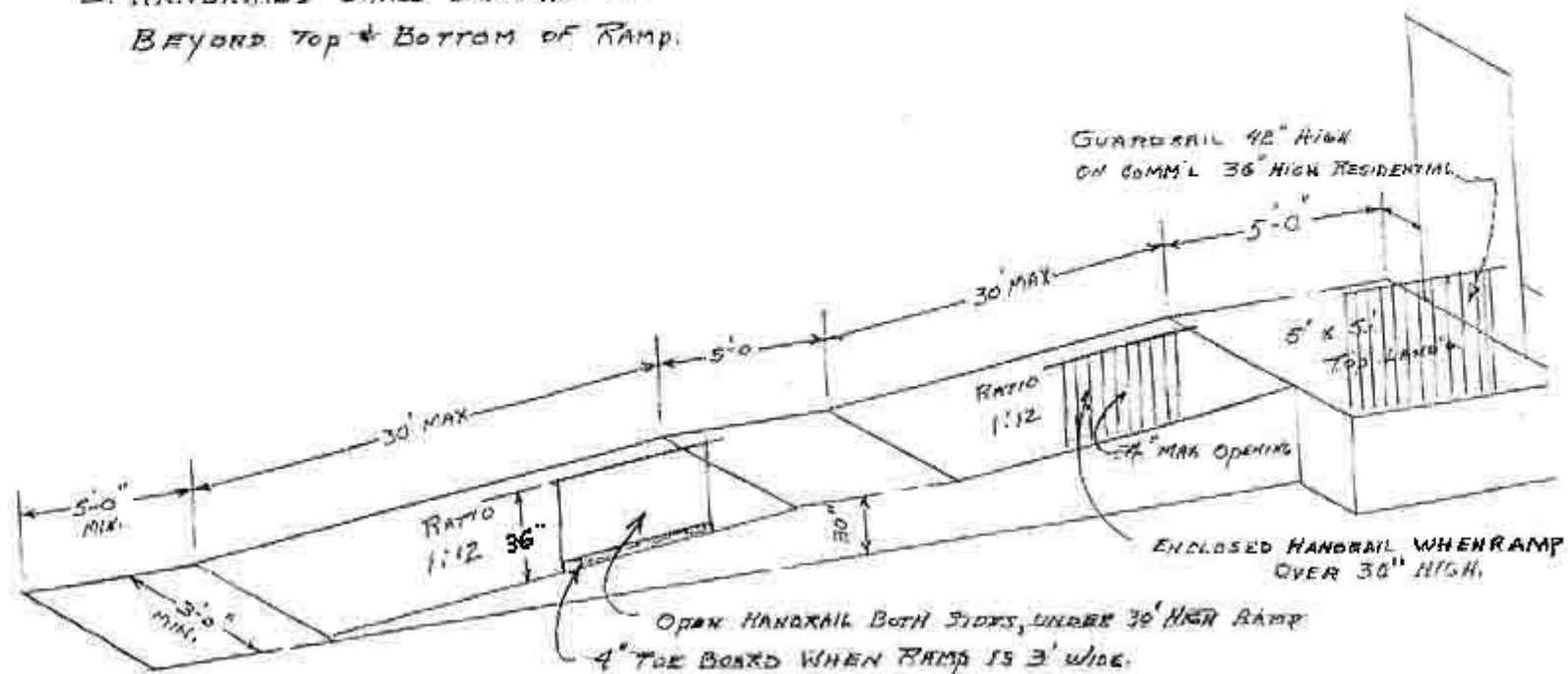




Figure 6. End post bracket



Figure 7. Ramp end assembly, bottom view



Figure 8. Ramp end assembly inserted into end post bracket



Figure 9. Ramp frame with 180° landing. Notice cross bracing



Figure 10. Ramp frame



Figure 11. Stringers into Ramp end post assembly. Notice cross braces.



Figure 12. Ramp frame. Notice cross braces.



Figure 13. Completed ramp