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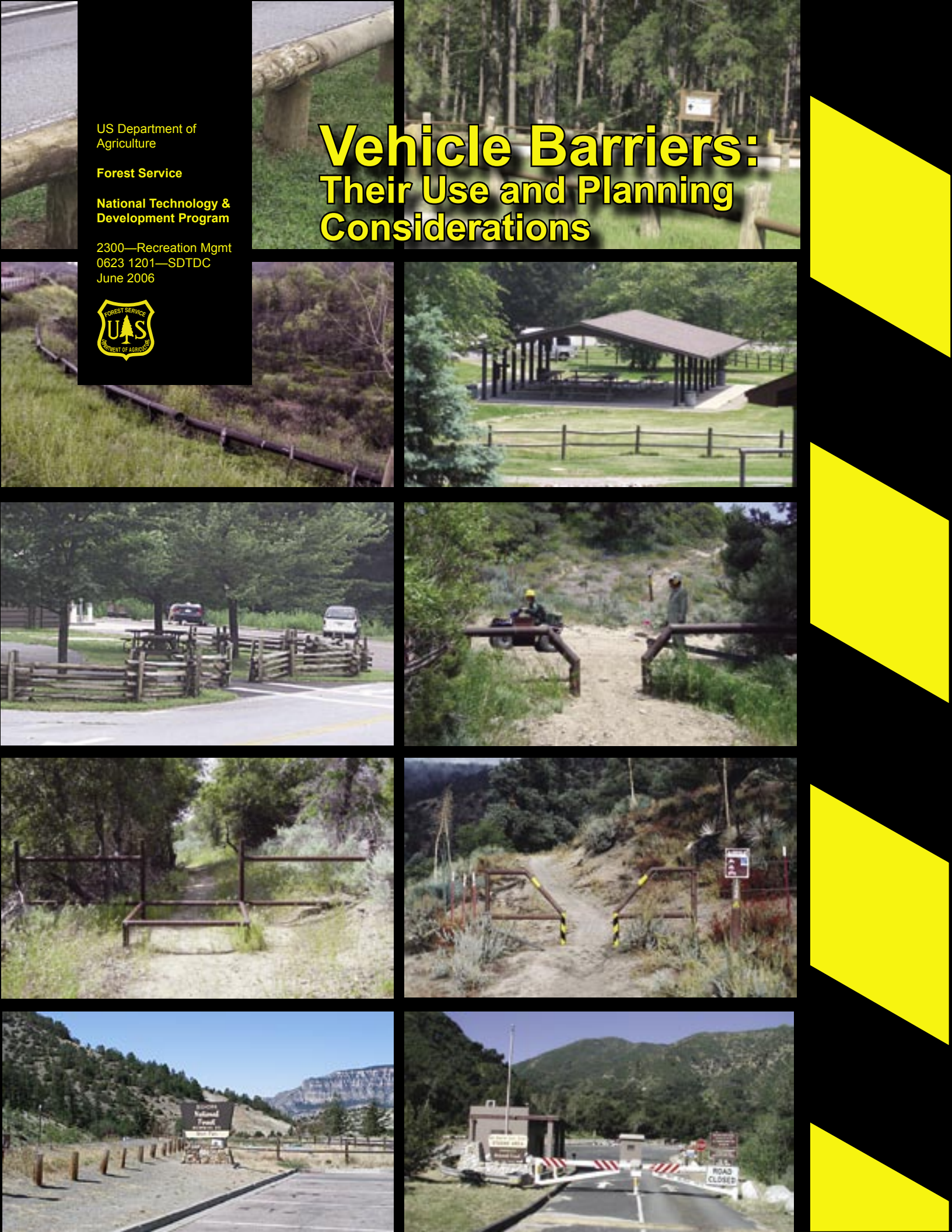
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Vehicle Barriers: Their Use and Planning Considerations



Vehicle Barriers: Their Use and Planning Considerations



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San Dimas Technology and Development Center
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June 2006

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Table of Contents

FORWARD	1
INTRODUCTION	1
GENERAL DISCUSSION	2
Barrier Types	
Bollards	3
Fences.....	4
Gates.....	6
Large Rocks	9
Wooden Guardrails	9
Construction Drawings	
Bollards	11
Fences.....	17
Gates.....	23
Guardrails.....	49
Large Rocks	65
DEFINITIONS... ..	68
WEB SITES	69
Acknowledgements	69
APPENDIX A	
Trail OHV-Width Limiter Gate and Nonmotorizd Trail Barriers.....	70
APPENDIX B	
Object and Barrier Markers on OHV routes	73

FORWARD

This publication discusses vehicle barrier types, appropriate uses, and planning considerations. All barrier construction drawings are in the document, other full sized drawings are on the U.S. Department of Agriculture (USDA) Forest Service, San Dimas Technology and Development Center (SDTDC) Intranet site:

<http://fsweb.sdtcd.wo.fs.fed.us/>.

These barriers do not take the place of highway vehicle barriers or safety barriers on roads.

Use the vehicle barriers described in this publication at forest and grassland trailheads, picnic areas, and campgrounds, and at other facilities where vehicle control is needed to protect natural resources and amenities. This publication is written for designers, managers, recreation and engineering staffs, trail maintenance crews, and organized volunteer trail crews.

During the planning stage—and before installing a barrier—consult the Manual on Uniform Traffic Devices; FSH 7709.59, Chapter 10, Transportation System Operations Handbook, the off-highway vehicle (OHV) policy; and EM-7100-15, Sign and Poster Guidelines for the Forest Service for proper signing (travel management signs) and safety requirements for barriers. (See appendix B.) Also, use these USDA Forest Service and U.S. Department of Transportation, Federal Highway Administration Web sites:

<http://mutcd.fhwa.dot.gov/>,

<http://fsweb.wo.fs.fed.us/eng/programs/signs.htm>

(see pages 11 through 15 for specifics on using “Road Closed” signs),

http://fsweb.mtdc.wo.fs.fed.us/php/library_card.php?p_num=0371%202812,
and

http://fsweb.r1.fs.fed.us/e/access_and_travel_mgmt/atm_index.shtml.

(Scroll down to Field Implementation, click on ATM Signing.)

INTRODUCTION

Each year a greater number of visitors in vehicles use the national forests and grasslands, which increases the need for vehicle barriers. Barriers are one way to define vehicle access and to restrict vehicle encroachment. The degree to which barriers block vehicles varies (figures 1 and 2).



Figure 1. Telephone pole guardrail.



Figure 2. Steel framed width-limiter gate. This gate allows certain width vehicles through.

GENERAL DISCUSSION

GENERAL DISCUSSION

Barrier design depends on an area's intended use (for example, OHV use or day use for picnicking); the area's native materials; the Recreation Opportunity Spectrum (ROS) classification; and the Built Environment Image Guide (BEIG) character type (see Definitions on page 76). Designers and site managers decide appropriate materials and placement of barriers.

Consider vandalism as a factor in barrier planning. Generally, wooden barriers are more at risk because wood is used for campfires or carving projects. Concrete barriers, although more durable, easily succumb to vehicle ramming or chipping from sledge hammers. Often metal is used as the rail portion of a barrier and is at risk from vehicle ramming, too.

Some barriers keep vehicles within defined spaces such as on a road, within a spur, or in a specific parking area. (See figure 3.) Others are meant to deter access to a road or trail. Most visitors recognize and respond to clues and design features such as a simple curb. Use curbs to deter the majority of visitors from driving off-road. Curbs made of concrete or asphalt fit urban or rural ROS classifications while logs, native rock and stones, or mounded dirt act as curbs in less developed ROS classifications. (See figures 4 and 5.)



Figure 3. These 4- by 4-inch timbers are wheel stops that indicate parking spaces.



Figure 4. An extruded curb in a highly developed recreation site.



Figure 5. This rustic curb outlines a road.

Plan for the strongest barriers in areas where there have been vehicle control problems and, in some cases, fabricate specialized barriers for the vehicle type one is trying to control. (See figures 6 through 8.) In general, the larger the vehicle and the more aggressive the driver, the stronger the barrier needs to be. To make barriers more difficult to remove, use:

- Steel instead of wood.
- Small boulders.
- Larger diameter posts.
- Posts buried deeper.
- Posts set in concrete.
- Posts anchored with rebar spikes.

Barrier Types



Figure 6. This wood post and rail fence surrounds a picnic area.



Figure 7. This width-limiter gate not only establishes the vehicle size that can be on the trail, it also marks the forest boundary.



Figure 8. This wood post and steel pipe rail fence keeps motorcycles and ATVs on the road and off the grass. Note the trail entrance in the background.

To anchor a 3- to 6-inch-diameter post, insert a rebar spike (longer than the post is wide) through the post near its bottom edge and set the post in concrete. If an area has small-diameter trees, use two or three posts together to form a stronger post rather than one large post that is out of scale for the area.

Barrier Types

Generally, barriers are divided into five types: bollards, fences, gates, large rocks, and wooden guard-rails. The barrier size and its material(s) vary depending on the problem's severity and the proper scale to fit with the site's resources. Combine materials. For example, use a wooden post and a steel rail or plastic lumber made of recycled plastic. The U.S. Department of the Interior's Yosemite National Park uses plastic lumber posts with wooden rails.

Bollards

A bollard is a large post with no stringer or rail, commonly 1- to 4-feet tall, and used singly or grouped. (See figures 9 through 11.)



Figure 9. Bollards define the site's edge and separate the road and the parking lot.

Barrier Types



Figure 10. Bollards outline the roadway, spurs, and campsite areas.



Figure 11. Bollards keep vehicles away from the restroom.

Purpose: Bollards block vehicle entry.

How to use: Use bollards to define edges such as the edge of a campground road, parking lot, or pedestrian entrance. When bollards define a pedestrian entrance, space them 32 inches apart to allow pedestrian and wheelchair passage; when they define a boundary, space close together.

Where to use: Use at developed sites with urban and rural ROS classifications.

Materials: Make bollards out of wood, concrete, steel, or plastic lumber posts.

Construction techniques: Follow instructions for a fence post.

Fences

A fence is a structure functioning as a boundary or barrier, usually made of posts, boards, wire, or rails.

Purpose: Fences keep people and stock in or out of an area. Fences are not designed to withstand vehicular impact.

How to use: Combine fences with a curb, bumper stop, wheel stop, or shrubbery to prevent vehicle intrusion.

Where to use: Use fences for developed sites with urban, rural, and roaded natural ROS classifications. In wide-open spaces, use fences to line roads and trails to protect pastures and natural resources.

Materials: Use wood, metal, or plastic lumber in developed sites. On range lands, a wooden post or steel t-post and wire fence is common. Openings between the wire strands of the fence allow small animals to go through the fence. A fieldstone wall—or rock fence—is appropriate in all ROS classifications, if the rock is local.

Construction techniques: Pound steel t-posts into the ground or dig in a wooden post. String with wire or barbed wire (depending on animal type) and use a come-along to tighten the wire strands. See figures 12 through 15. The following Web site has wire-fence details:

http://www.de.nrcs.usda.gov/technical/technical_references/engineering/eng_drawings.html

This Web site has information on fieldstone fences

http://www.dswa.org.uk/Publication_frames_page.htm.

Note: If the fence spans a stream or dry wash, use a three-strand wire fence to ensure passage of floodwater and debris.



Figure 12. Wooden and steel t-post wire fence.



Figure 14. Double post stacked rail fence.



Figure 13. Wooden fence with two strands of barbed wire.



Figure 15. This low wall is held together with mortar; it is similar to using fieldstones to build a rock fence

Barrier Types

Gates

Gates allow passage; they may or may not swing open. (See figure 16.) Secure gates to a fence or a substantial natural feature to prevent people from driving around them.

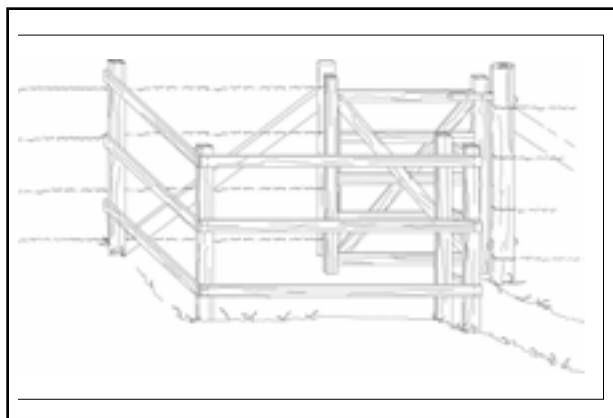


Figure 16. Schematic of kissing gate—designed to allow wheelchair access while blocking ATV access.

Accessible Kissing Gates

Purpose: The accessible kissing gate has two openings: a swing gate secures one opening while a person passes through the other. This gate allows wheelchair access and blocks all motor vehicle access, including all-terrain vehicles (ATVs).

How to use: Use for pedestrian and wheelchair access, while blocking stock, motorcycle, and ATV access.

Where to use: Use at an accessible site. This gate requires flat ground, an area at least 7-1/2-feet square for the gate, and an additional area for entry and exit paths.

Materials: Build the kissing gate out of wood or steel.

Construction techniques: See construction drawings and the USDA Forest Service Missoula Technology and Development Center's 2006 publication *Accessible Gates for Trails and Roads* by James "Scott" Groenier.

Right-angle Gates

Purpose: A right-angle gate creates a passageway for pedestrians and stock. (See figures 17 and 18.)



Figure 17. This wooden fence includes two right angle turns. The width of the opening is a maximum of 32 inches (nonaccessible).



Figure 18. This gate has a single right angle turn and may not be as effective at keeping motorcycles out of an area (nonaccessible).

How to use:

- Use a u-turn opening with two right-angle turns, which prevent motorized vehicle entry. A vehicle is blocked because the vehicle is either too wide or too long to make the right-angle turns required for passage. This is not an accessible gate.
- Use a one right-angle turn opening to keep out vehicles. This is not as effective as a u-turn pattern.

Where to use: Use where motorized vehicles are prohibited.

Materials: Use wood, steel, or a combination of both.

Construction techniques: Use wooden or steel posts with wooden or pipe rails. See construction drawings.

Steel Road Gates

Purpose: Steel road gates prevent vehicle entry to roads, trails, and other closed areas, such as administrative roads and campgrounds. (See figures 19 and 20.)



Figure 19. Standard Angeles National Forest road gate. Note that large rocks and berms have been placed to block entry around the gate.



Figure 20. This double gate is used at an OHV area.

How to use: Close and lock the gate.

Where to use: Use at the entrance to a road or facility.

Materials: Use steel pipe to form posts and steel guardrail material or pipe to form the rails. Attach a travel management sign.

Construction techniques: See construction drawings.

Steel Trail Gates

1. Width-Limiter Gate

Purpose: This gate prevents certain width vehicles from entering. (See figure 21.)



Figure 21. This width-limiter gate is used at trailheads to block certain vehicle types and to allow access by other types. A cross-bar is in place to close the trail to all uses.

Barrier Types

How to use: Use this gate to limit the access of four-wheel drive vehicles and ATVs while allowing motorcycle access. (The 27-inch gate is not accessible.)

Where to use: Use at the entrance to a trail or facility. This gate needs to be visible at the trailhead and as one approaches while riding. For safety reasons, do not let the gate completely blend in or disappear into the landscape. On the other hand, do not let it be a focal point from a distance.

Materials: Use steel pipes.

Construction techniques: See written fabrication instructions, and construction drawings.



Figure 23. This nonmotorized trail barrier gate is shown with the upper bar closed, closing the trail to all traffic. A wire fence is attached to the gate to prevent people from skirting the gate.

2. Nonmotorized Trail Barrier (Stock) Gate

Purpose: This gate allows stock and pedestrians on trails. (See figures 22 through 25.) This gate is not accessible.



Figure 22. This nonmotorized trail barrier gate allows pedestrians and stock to pass through. The gate is flanked by a steel rail fence to prevent people from skirting the gate.



Figures 24 and 25. A barbed wire fence is strung through the holes on the flange on the side of the post. This prevents people from skirting the gate.

How to use: Use at trail entry. Motorized vehicle entry is impossible without heavy weight lifting (vehicle) or destruction of property (government).

Where to use: Use at the entrance to a trail or facility and where trail use designation changes. Tie gates to a fence or a substantial natural feature to prevent people from driving around them.

Materials: Use steel pipes that will withstand vehicle and equestrian bumps.

Construction techniques: See photographs, construction drawings, and narrative in appendix A.

Large Rocks

Rocks are difficult to drive over in a standard automobile and most drivers would not try. However, OHV users may view the rocks as a challenge. (See figure 26.)



Figure 26. These grouped rocks were placed to protect a fire hydrant.

Purpose: Large rocks prevent people from parking off the pavement and keep drivers within designated parking areas. Rocks block entry to decommissioned roads and trails.

How to use: Mimic nature by planting rocks in clusters of one to five and varying space between the rocks and the clusters. End a cluster of rocks where there is sufficient vegetation to prohibit vehicle entry.

Where to use: Use where large rocks occur naturally. If large rocks are not common, do not use them; they will appear out of place.

Materials: Use barrier rocks that weigh 200 to 400 pounds each.

Construction techniques: Bury one-third of the rock for stability, anchoring, and a more natural look. See drawings.

Wooden Guardrails

Wooden guardrails are a series of low posts tied together by wooden rails.

Purpose: Guardrails block and control vehicular access. (See figures 27 and 28.)



Figure 27. This guardrail delineates a parking lot.



Figure 28. Close up view.

How to use: Combine guardrails with a curb, bumper stop, wheel stop, or shrubbery to increase effectiveness against vehicle intrusion.

Where to use: Use them to line roads or areas, such as trailheads or turnouts, in urban and rural ROS classifications, and in limited areas in a roaded natural ROS classification.

Materials: Combine materials, such as concrete posts and wooden rails.

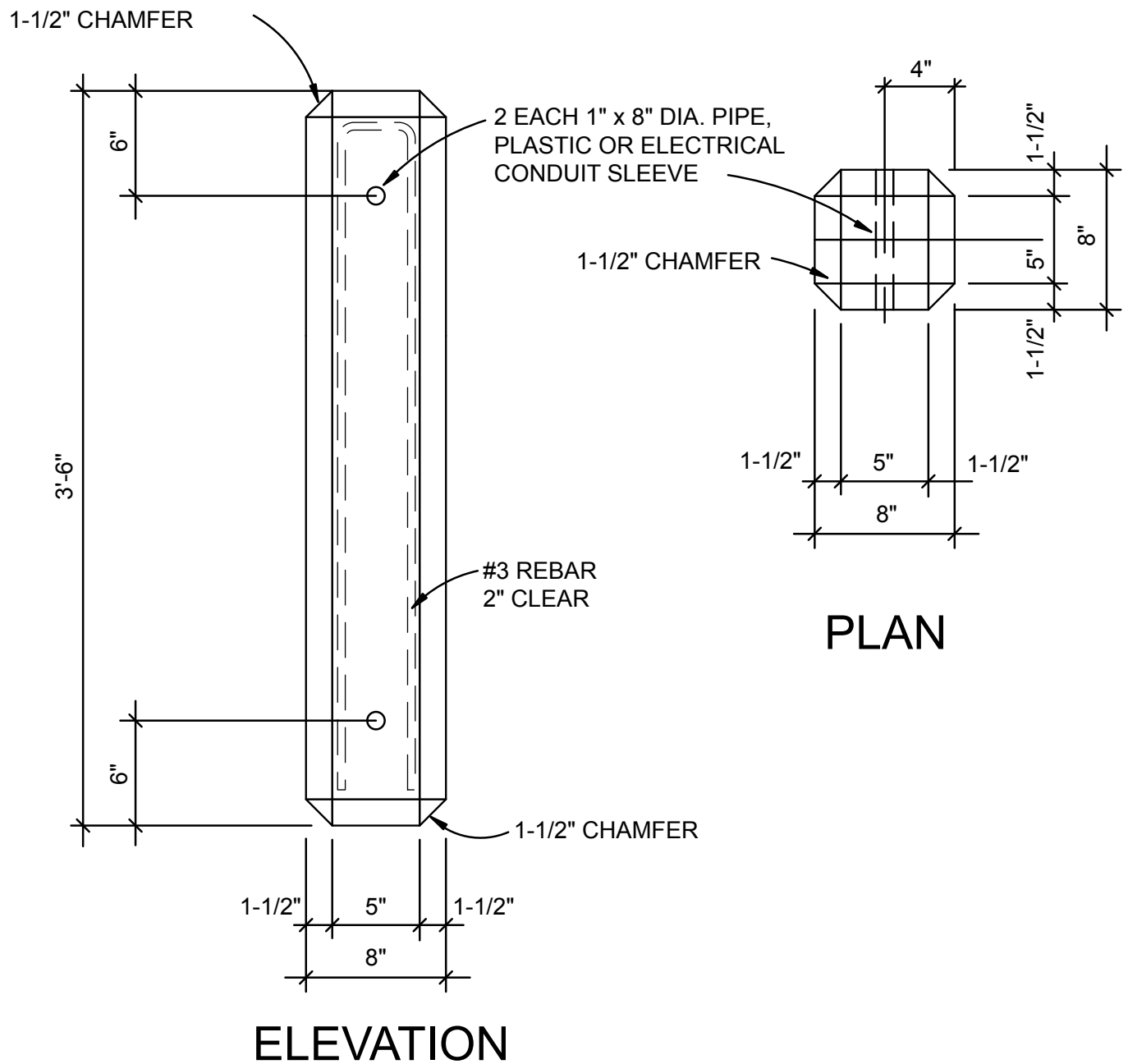
Construction techniques: See photographs and construction drawings, which include a no-dig barrier.

Construction Drawings

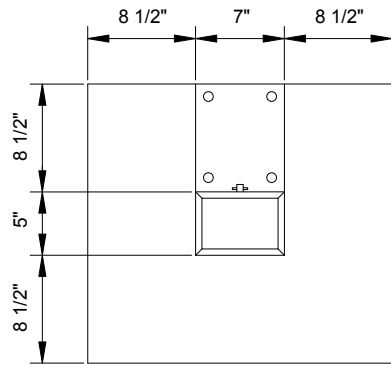
Construction Drawings

The following drawings show many different barriers. Some were described previously, others were not. The drawings are divided into five types: bollards, fences, gates, large rocks, and wooden guardrails.

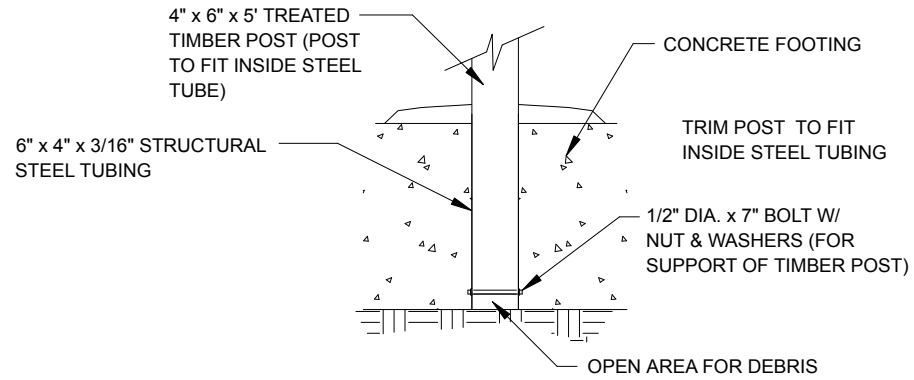
BOLLARDS



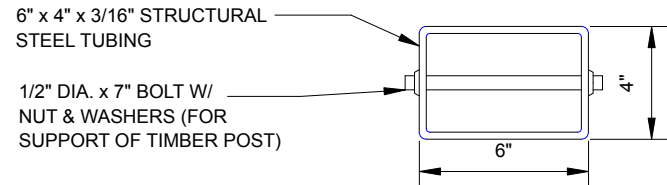
PRECAST CONCRETE POST



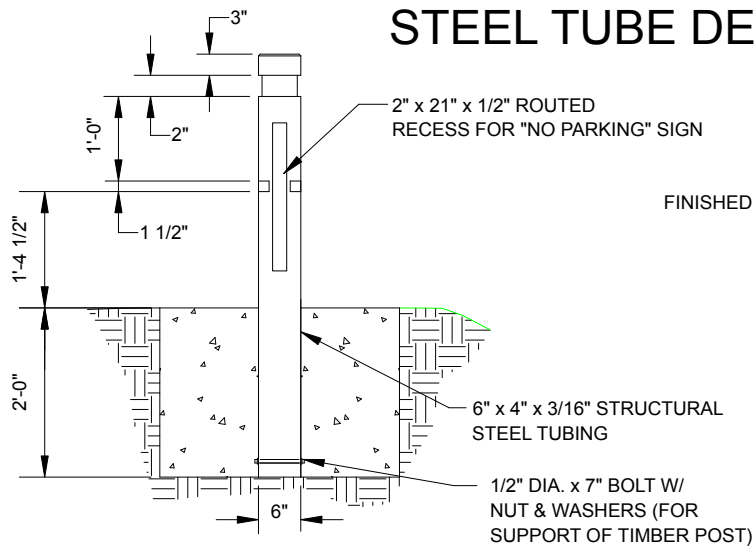
PLAN



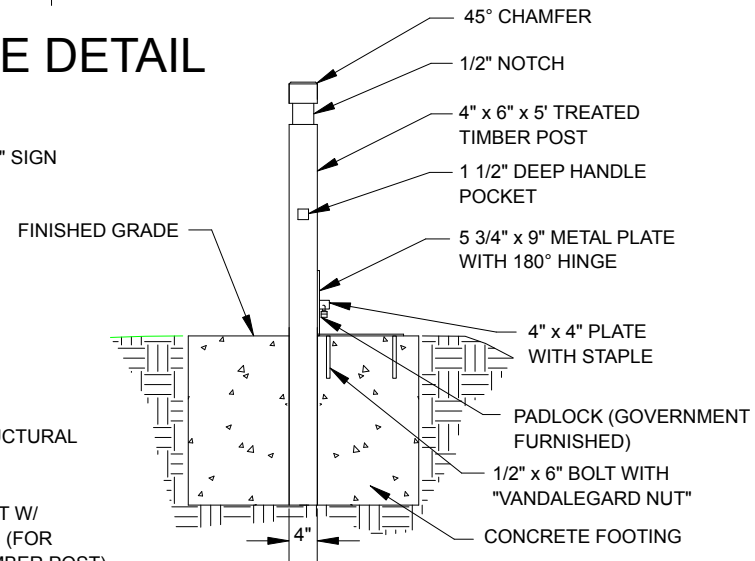
STEEL SLEEVE DETAIL



STEEL TUBE DETAIL



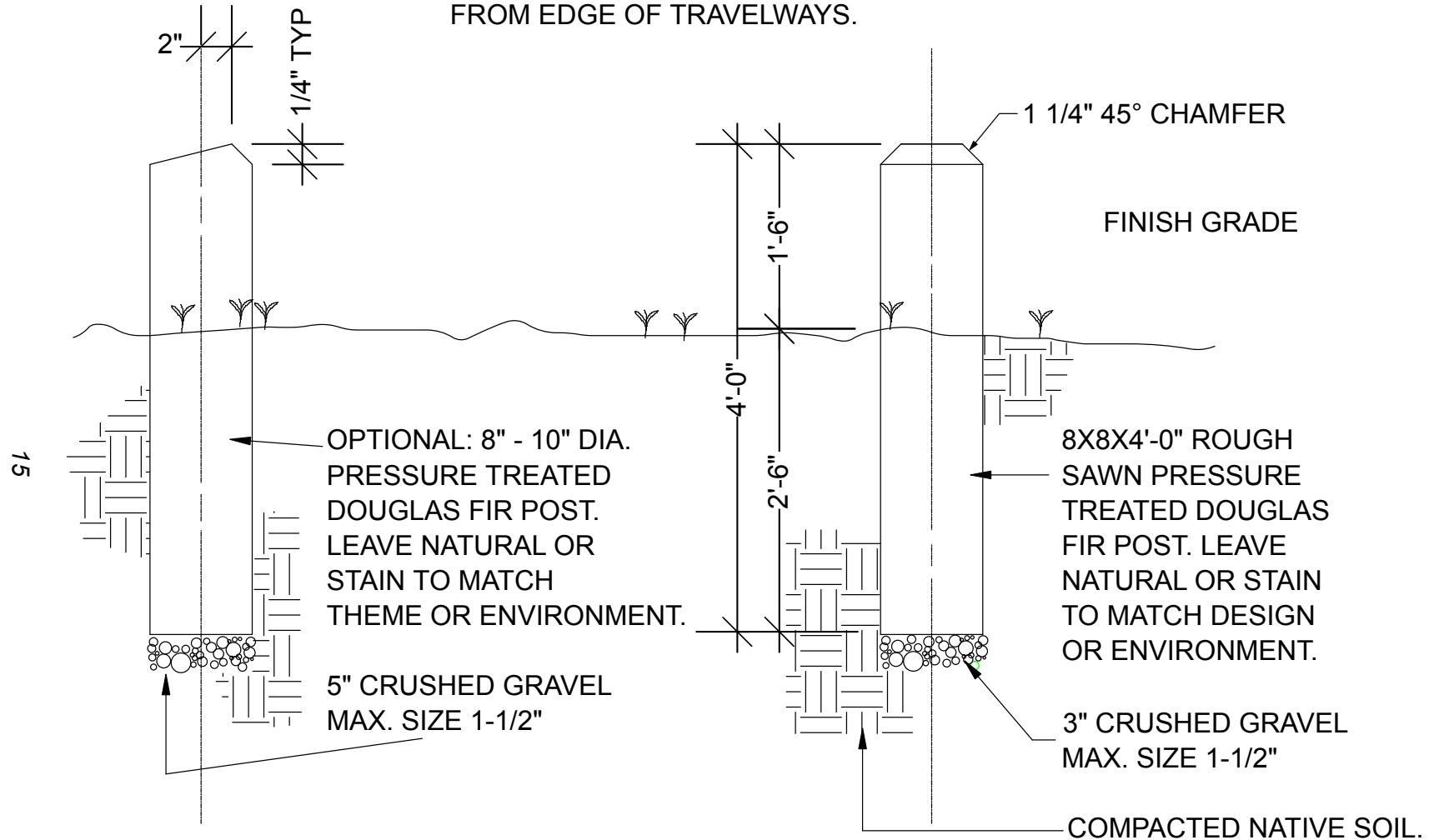
FRONT ELEVATION



SIDE ELEVATION

NOTES:

1. PLACE POST BARRIERS 2'-0" MINIMUM FROM EDGE OF TRAVELWAYS.



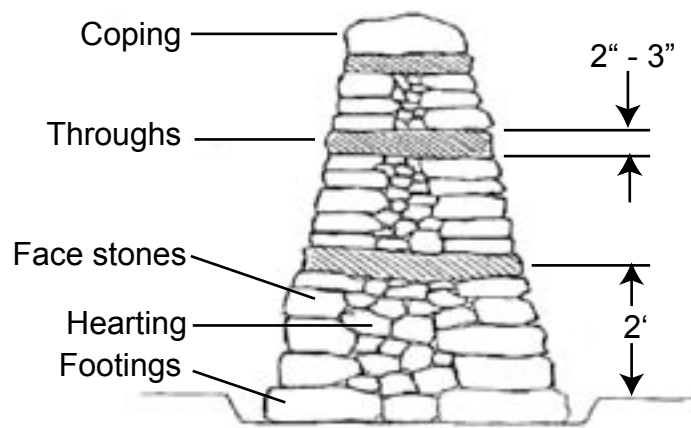
WOOD POST OR BOLLARD

FENZUS

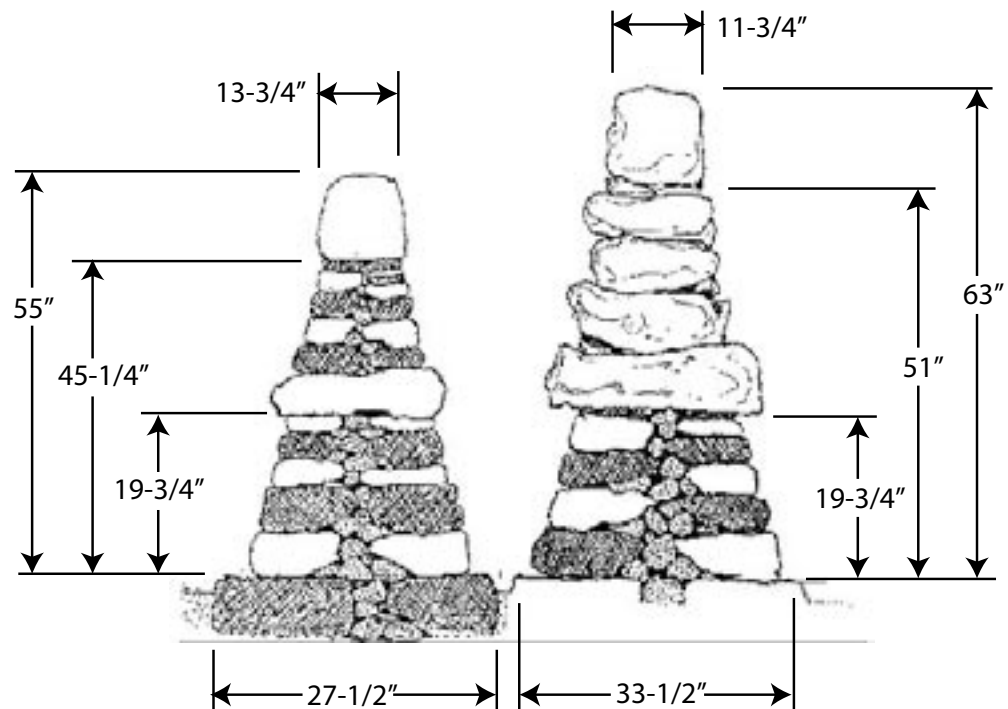


Fieldstone Fence Examples

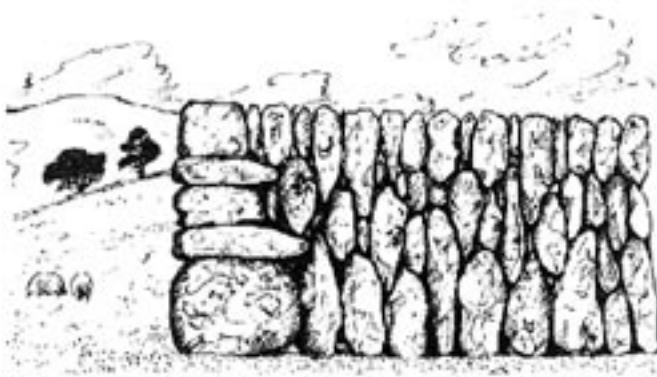
These drawings were made available by the Drystone Conservancy. Specifications for these walls are available in leaflets at: http://www.dswa.org.uk/Publication_frames_page.htm. In the United States these types of walls are referred to as fieldstone fences.



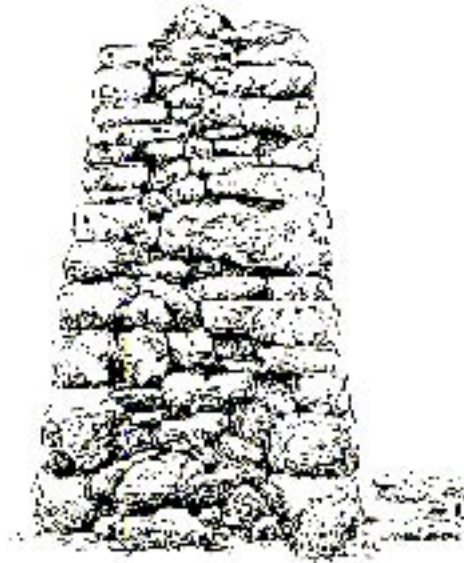
Bottom width 1'-8" to 3"
depending on type of stone.



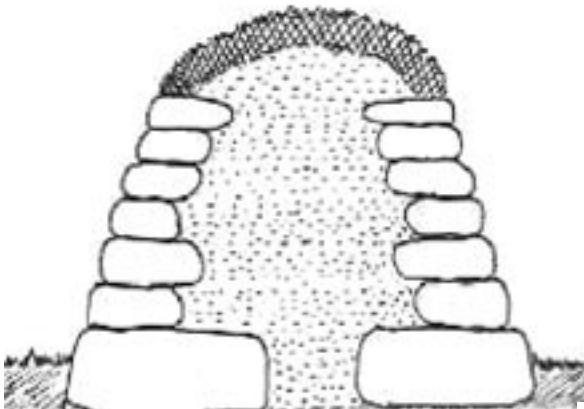
Standard Walls



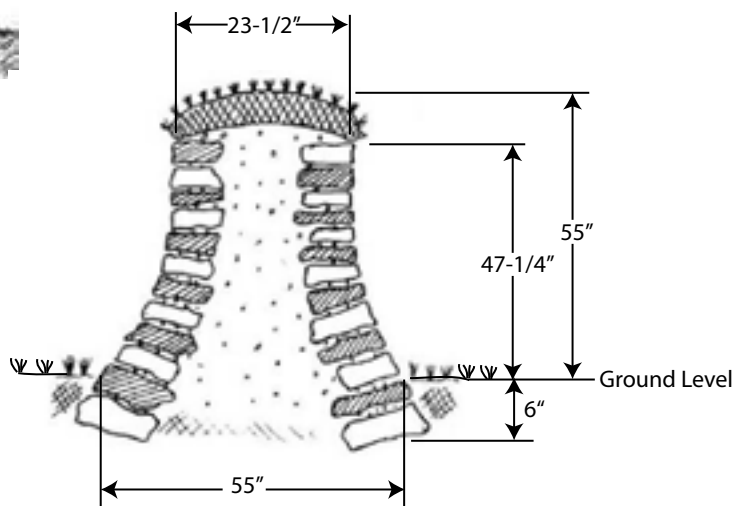
Single Wall



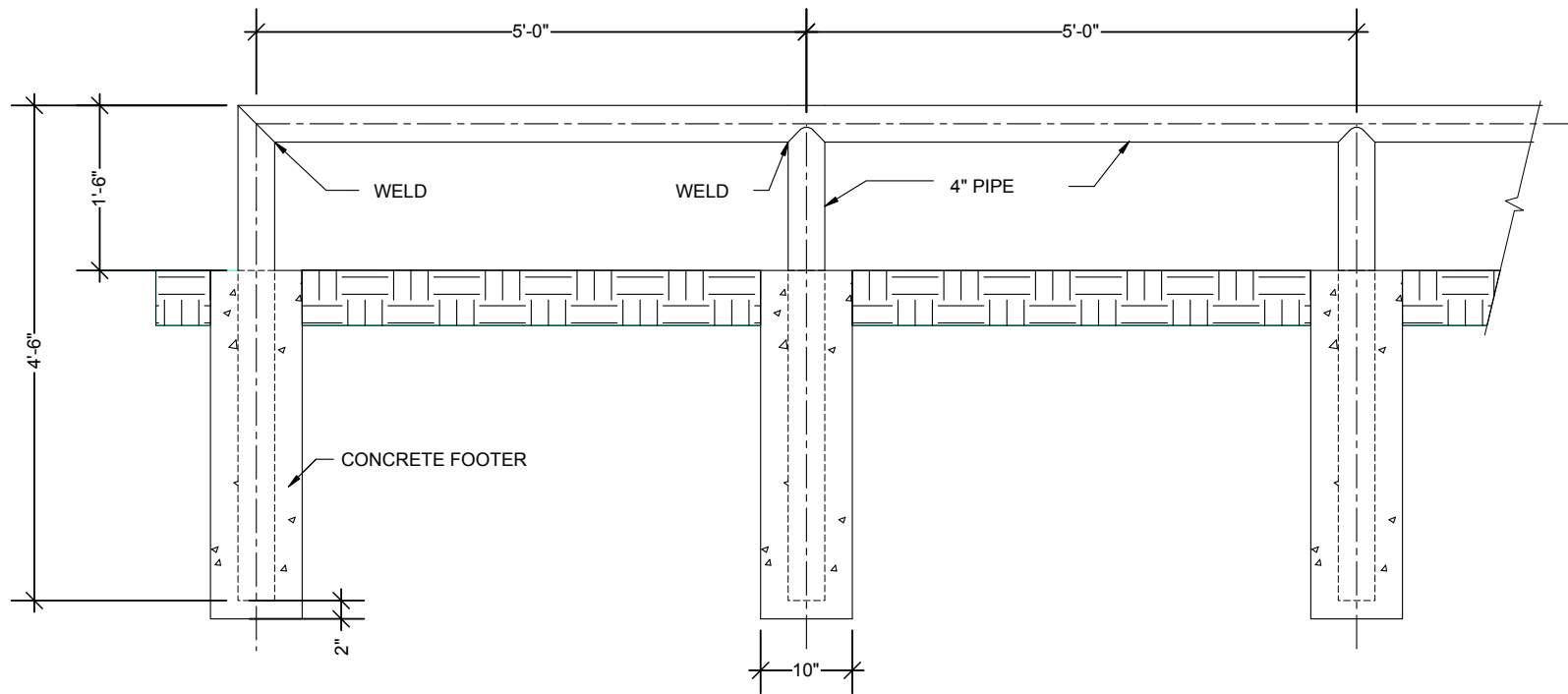
Cotswold Wall



Clawdd Wall



Cornish Hedge



PIPE RAIL

The right side of the image features a vertical band of alternating yellow and black diagonal stripes, running from the top to the bottom. The stripes are approximately 45 degrees to the horizontal.

**G
A
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S**

The diagram illustrates a gate assembly with two concrete footings. The left footing is labeled "CONCRETE FOOTING" and has a diameter of 32" DIA. The right footing is also labeled "CONCRETE FOOTING" and has a diameter of 24" DIA. The distance between the inner edges of the footings is labeled "TRAVEL WAY". The total distance between the outer edges of the footings is labeled "GATE WIDTH". The distance from the center of the left footing to the inner edge of the travel way is 24". The distance from the center of the right footing to the inner edge of the travel way is 24".

1 PLAN VIEW
Not to Scale

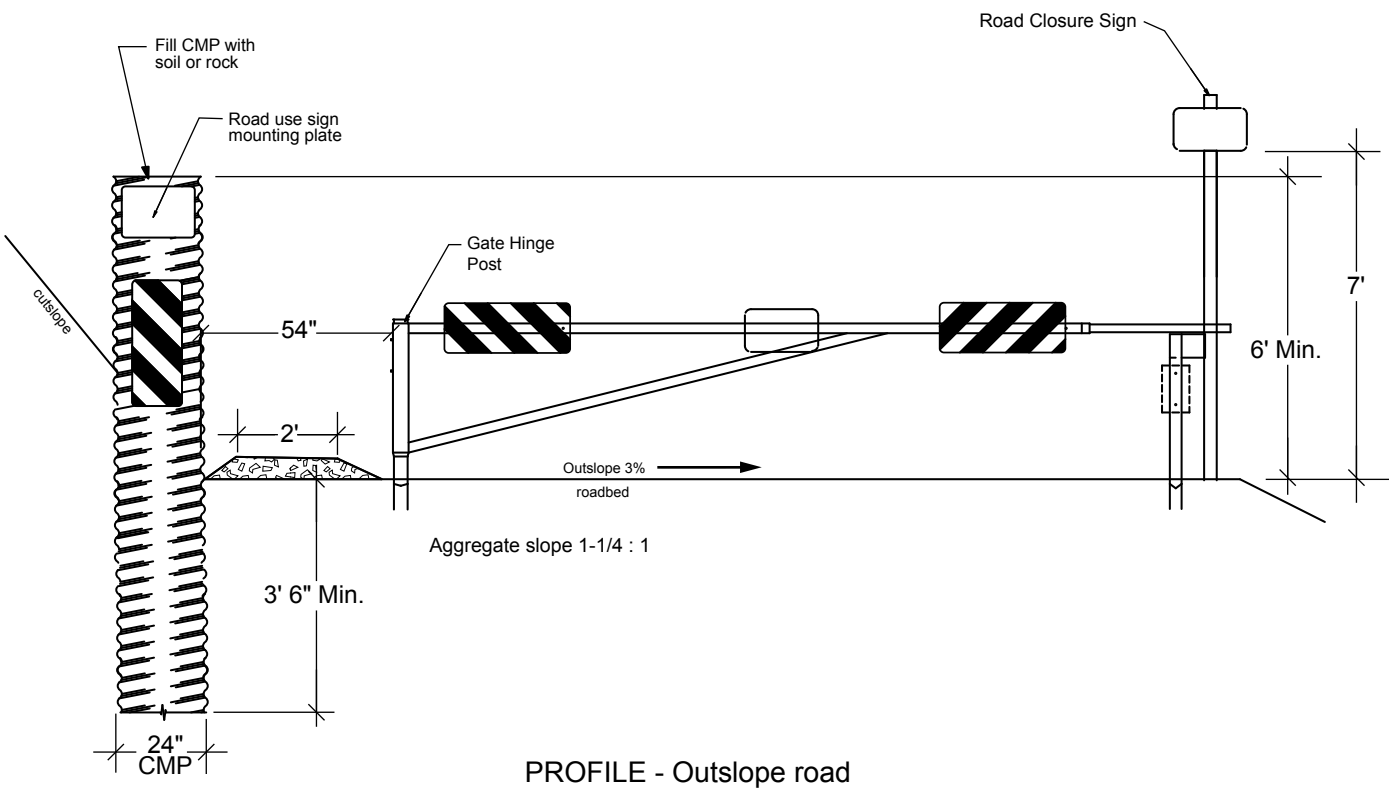
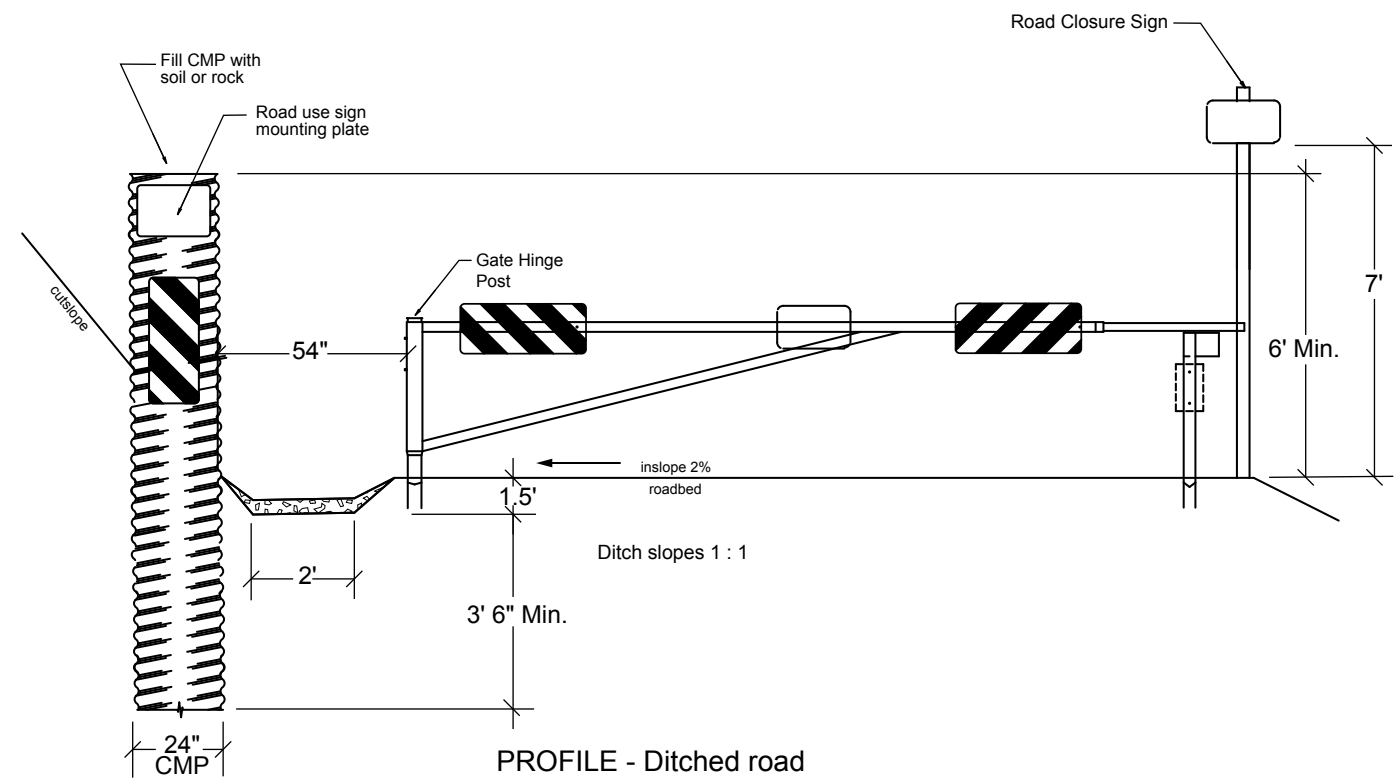


- CONTROL NO.
REV. DATE _____
- SHEET **67** OF _____

Gate Installation Typical

GENERAL NOTES:

- Surface bypass 20 feet each side of barrier with 6-inch crushed aggregate.
- Remove any burrs or sharp edges on top end of culvert.
- Place type 3 object markers on both sides of culvert facing traffic.
- Fill culvert and overfill for future settlement with material from excavation or adjacent cutbank.
- Install road use mounting plate facing closure.

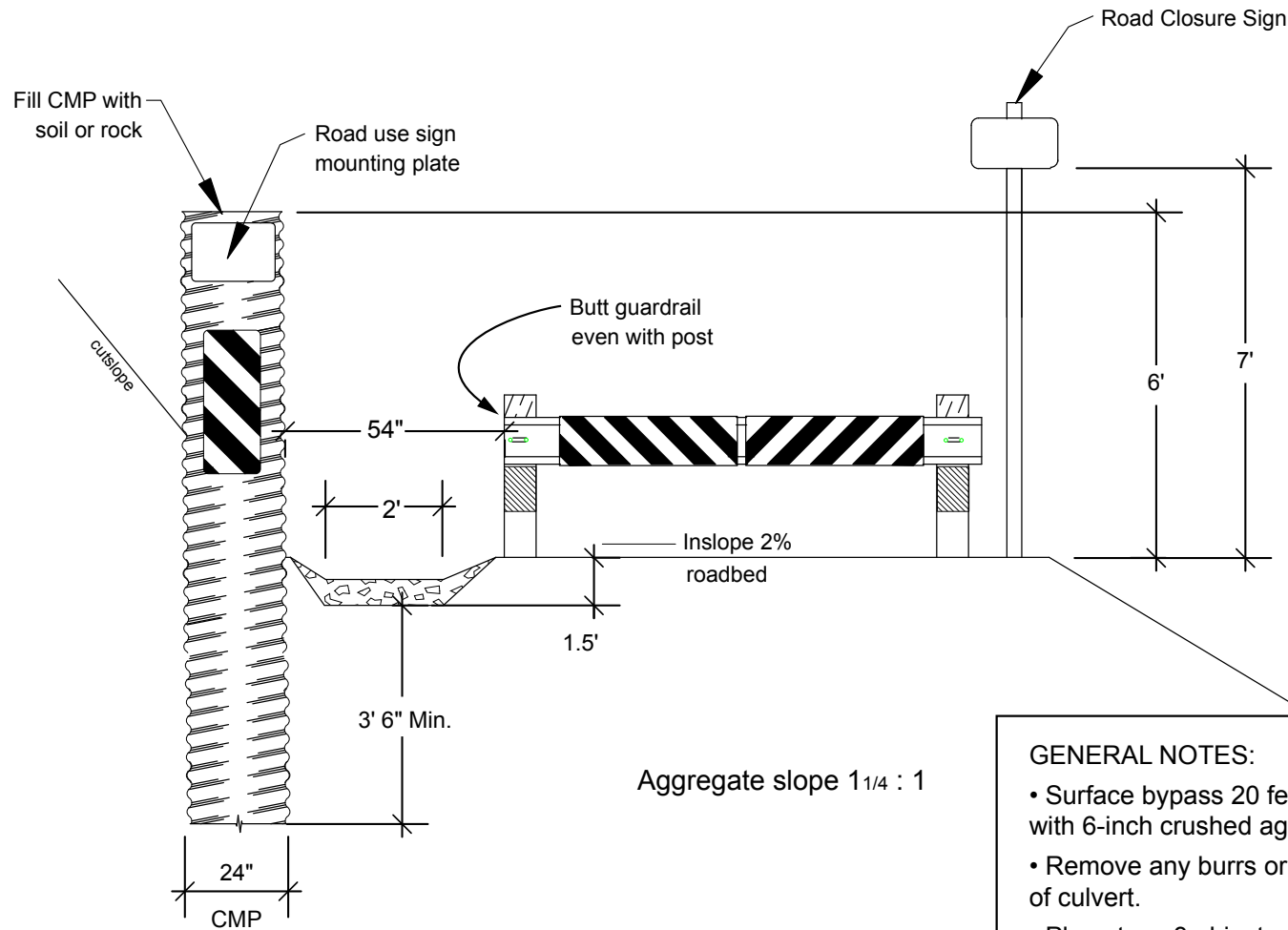


No Scale

GATE BYPASS

SHT IA

Guardrail Installation Typical



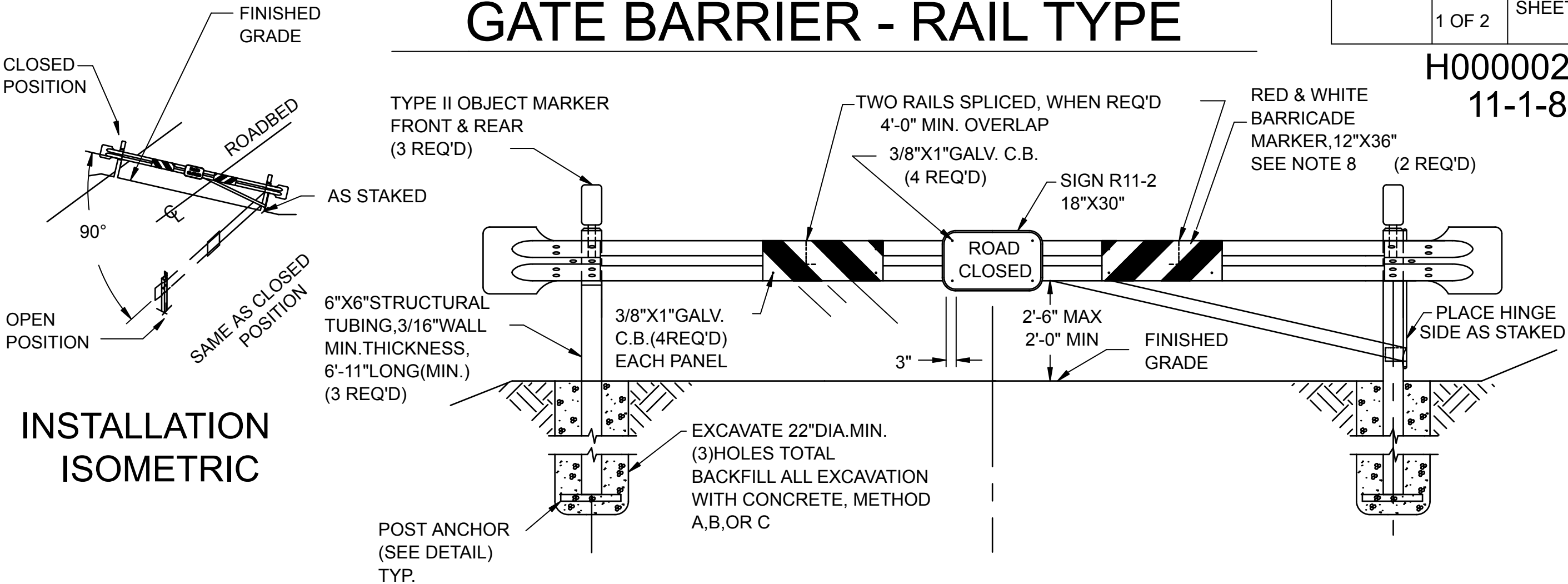
GENERAL NOTES:

- Surface bypass 20 feet each side of barrier with 6-inch crushed aggregate.
- Remove any burrs or sharp edges on top end of culvert.
- Place type 3 object markers on both sides of culvert facing traffic.
- Fill culvert and overfill for future settlement with material from excavation or adjacent cutbank.
- Install road use mounting plate facing closure.

GATE BARRIER - RAIL TYPE

SHEET	PROJECT	TOTAL SHEETS
		1 OF 2

H0000028
11-1-89



INSTALLATION ISOMETRIC

ELEVATION VIEW

NOTES:

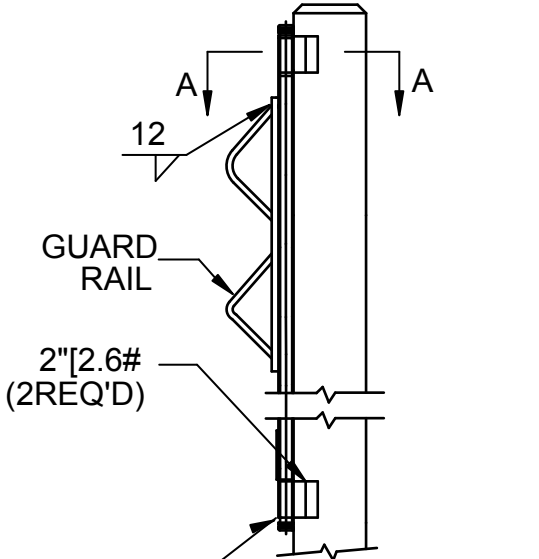
1. ALL STEEL COMPONENTS EXCEPT GUARDRAIL, END SECTIONS, PIPE & BOLTS PER A.S.T.M. DESIGNATION A36.
2. ALL WELDS 3/16" EXCEPT AS SHOWN. WELDING TO BE PER STRUCTURAL WELDING CODE-AWS.
3. GATE SECTION TO BE "ECONO-BEAM" GUARDRAIL AS MANUFACTURED BY ARMCO STEEL FABRICATORS OF EQUAL. END SECTIONS TO BE OF LIKE MATERIAL & CROSS SECTION USED FOR GATE SECTION.
4. TYPE II OBJECT MARKERS & R11-2 SIGN TO BE PER M.U.T.C.D. STANDARDS & CURRENT REVISIONS.
5. PEEN ALL BOLT ENDS TO PREVENT REMOVAL. BOLTS ON BRACE MUST BE CAPABLE OF BEING LOOSENED FOR ADJUSTING GATE.
6. FIELD VERIFY GROUND ELEVATIONS BEFORE CUTTING POSTS FOR LENGTH. ENTIRE STRUCTURE TO BE SHOP FABRICATED EXCEPT

- MINOR FIELD ADJUSTMENTS ARE PERMITTED IN LOCKING DEVICE & RECEIVING SLOTS.
7. ENTIRE STRUCTURE EXCEPT SIGN & OBJECT MARKER TO BE THOROUGHLY CLEANED OF RUST, SLAG, & OTHER FOREIGN MATTER & PRINED WITH ONE COAT OF WHITE MACHINE FAINT IN ACCORDANCE WITH SECTION 708.
 8. BARRICADE MARKER PANELS TO BE ALUMINUM OVERLAIN WITH "3M" REFLECTIVE SHEETING, WIDE ANGLE, FLAT-TOP, PRESSURE SENSITIVE, NO. 3280, IMPERIAL WHITE, TO WHICH TRANSPARENT "STOP SIGN RED", SPRAYING TO PRODUCE STRIPING. EQUAL PRODUCTS & PROCESSES MAY BE APPROVED.
 9. LUBRICATE HINGE ASSEMBLY FULL LENGTH WITH MULTIPURPOSE MARINE A-LUBE OR EQUAL.

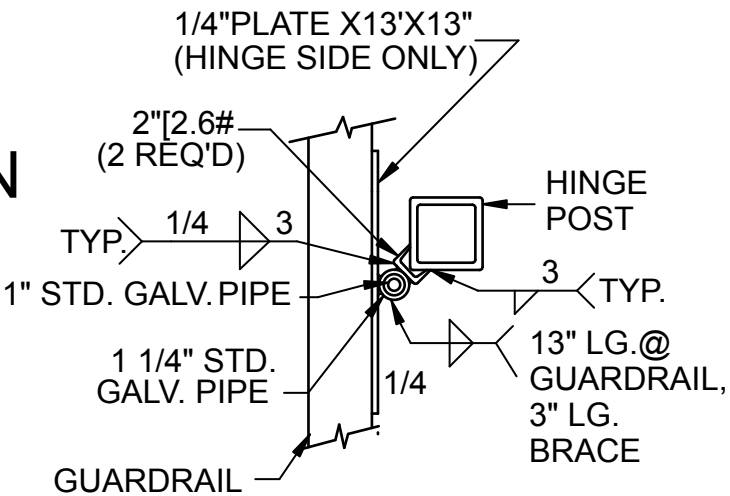
GATE BARRIER RAIL TYPE

SHEET	TOTAL SHEETS
2 of 2	

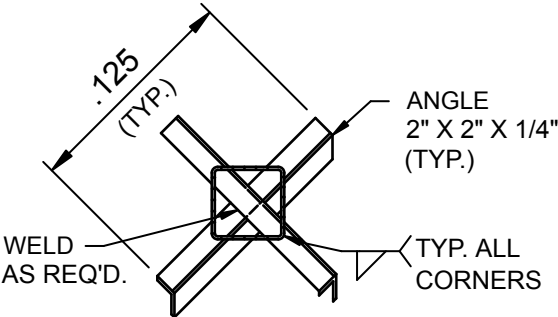
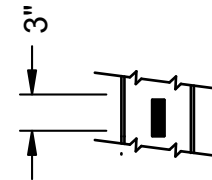
HINGE DETAIL



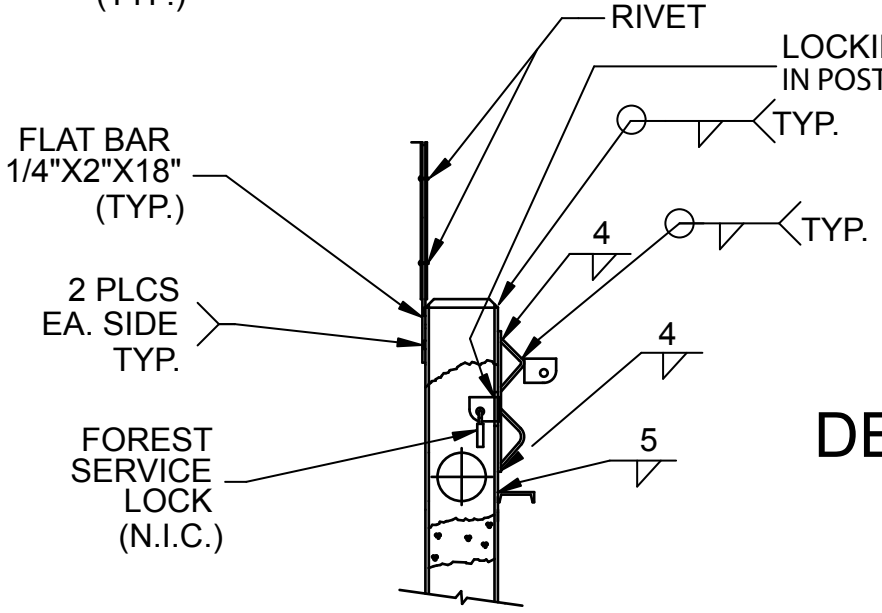
SECTION A-A



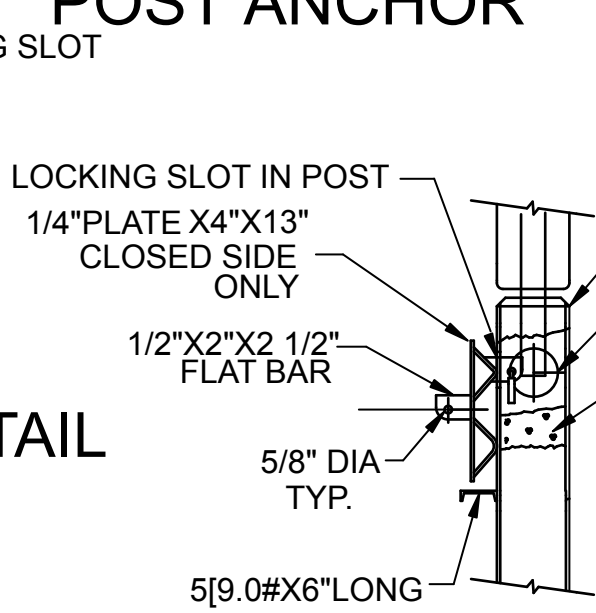
1 1/4"STD.GALV.PIPE CAP BOTH ENDS, 1/4" DRILL THUR PIPE & CAP INSTALL MALEABLE RIVET (TYP.)



POST ANCHOR

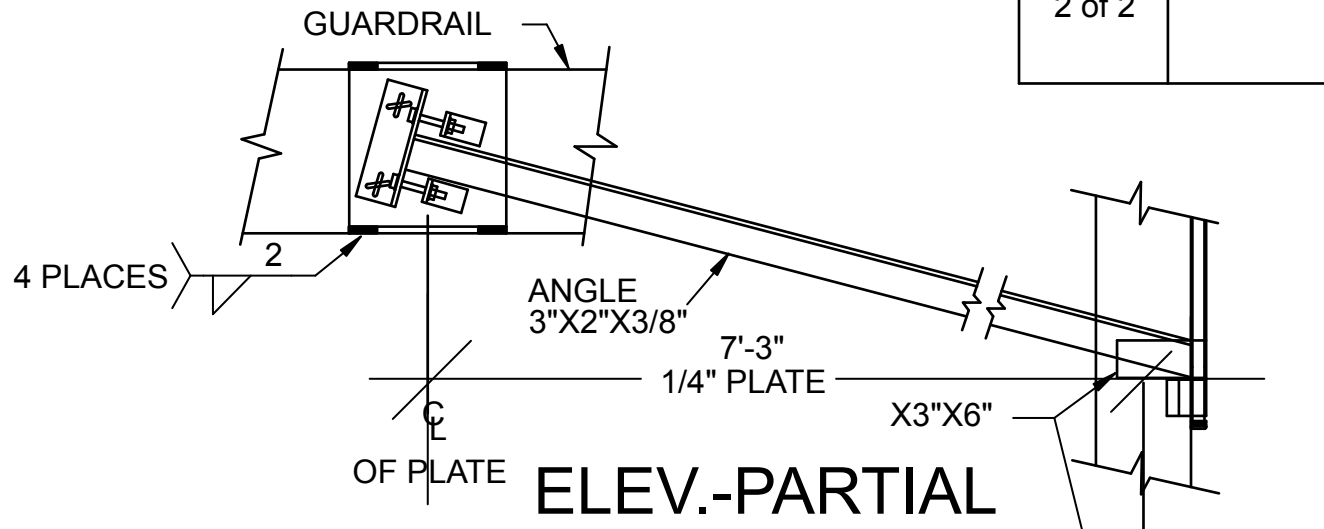


CLOSED POSITION LOCKING POST & GATE

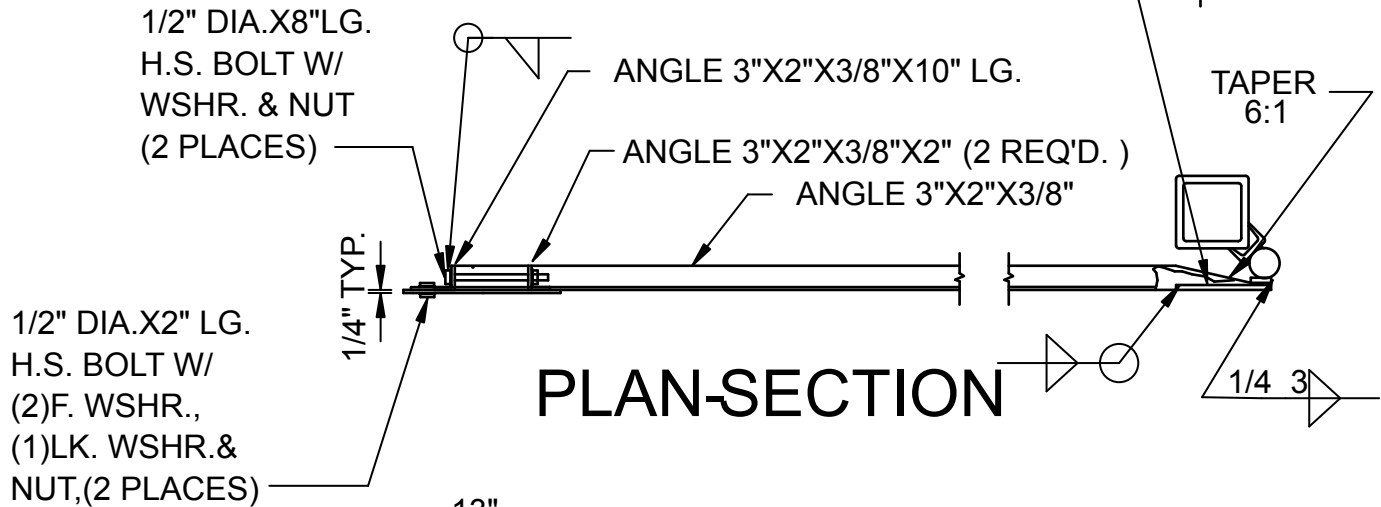


OPEN POSITION LOCKING POST & GATE

H0000029 9/11/88



ELEV.-PARTIAL



PLAN-SECTION

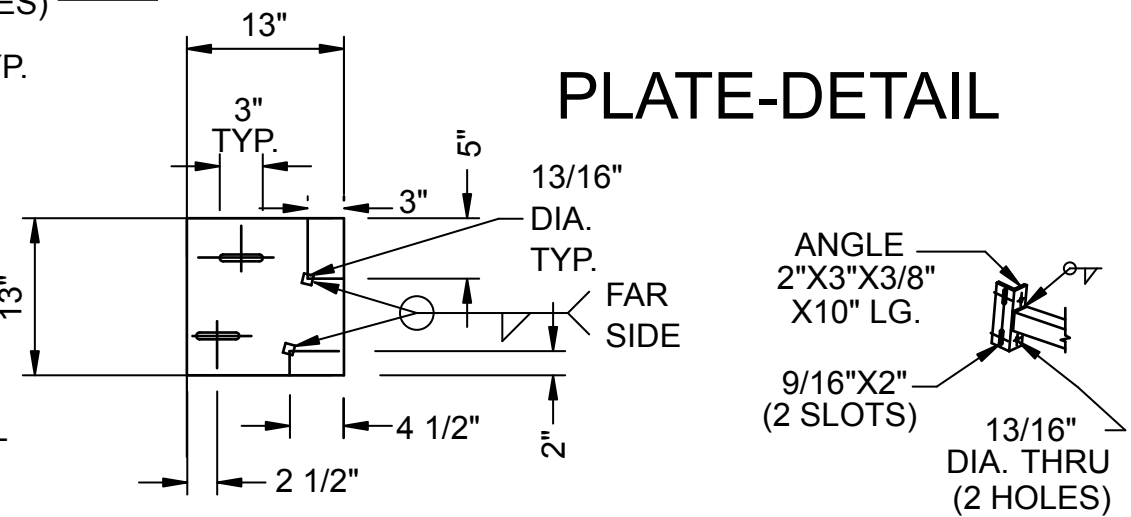
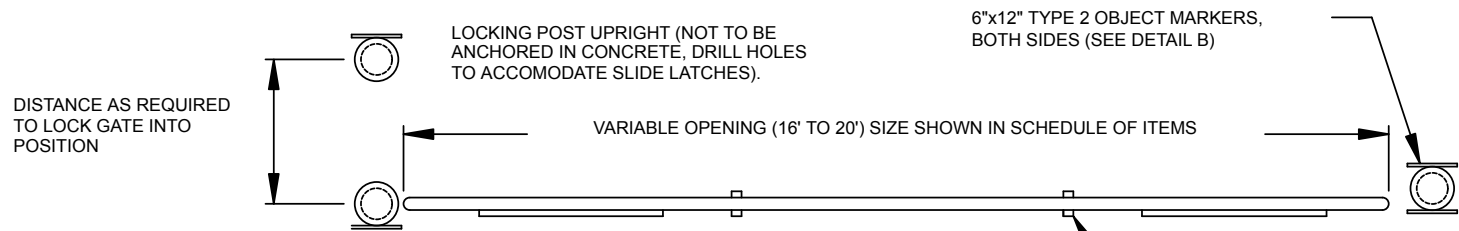
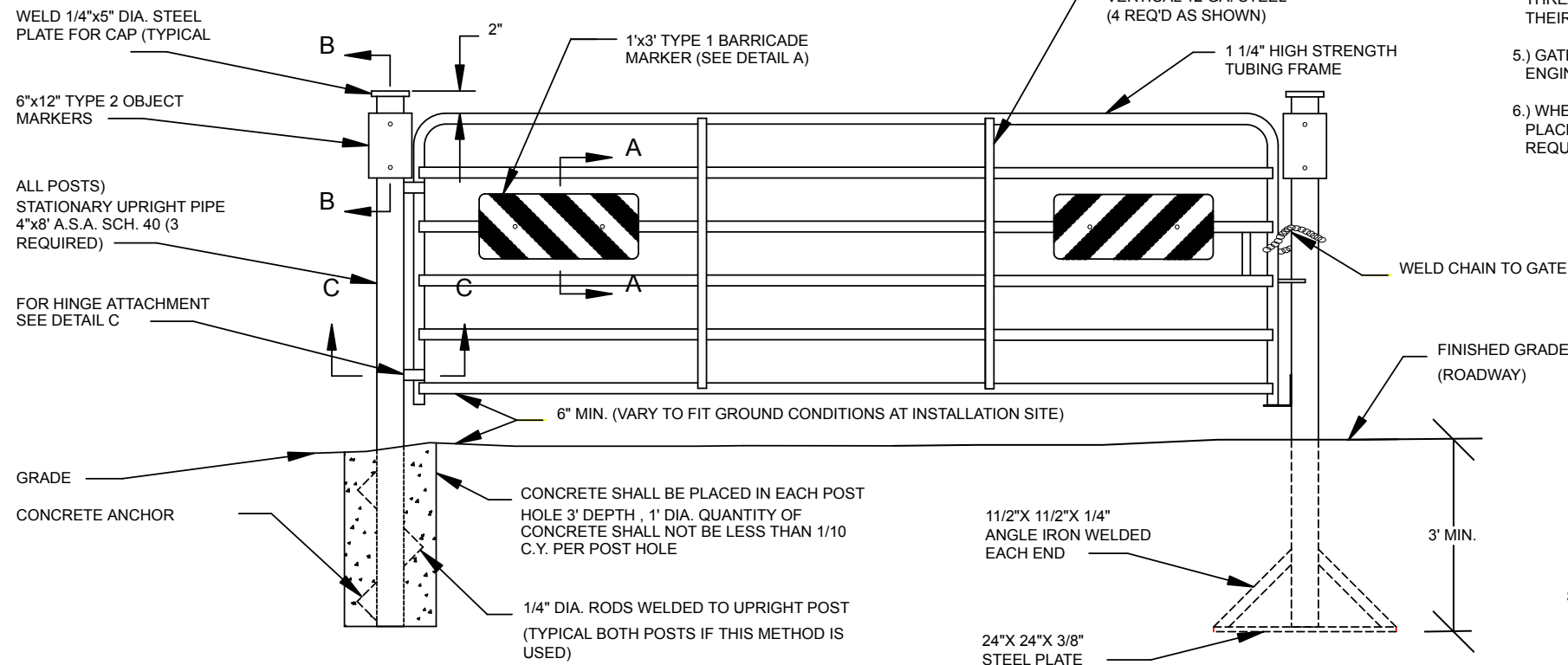


PLATE-DETAIL

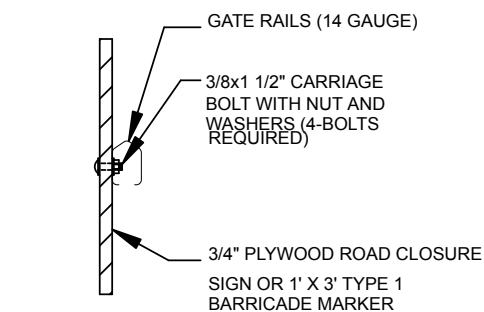
ADJUSTABLE BRACE DETAILS



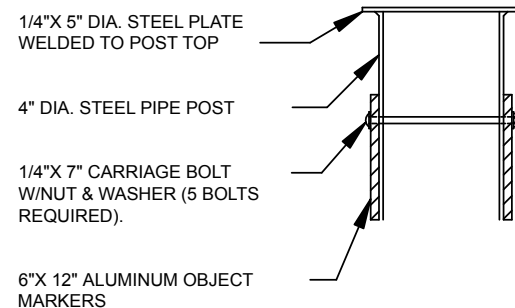
PLAN VIEW



ELEVATION VIEW



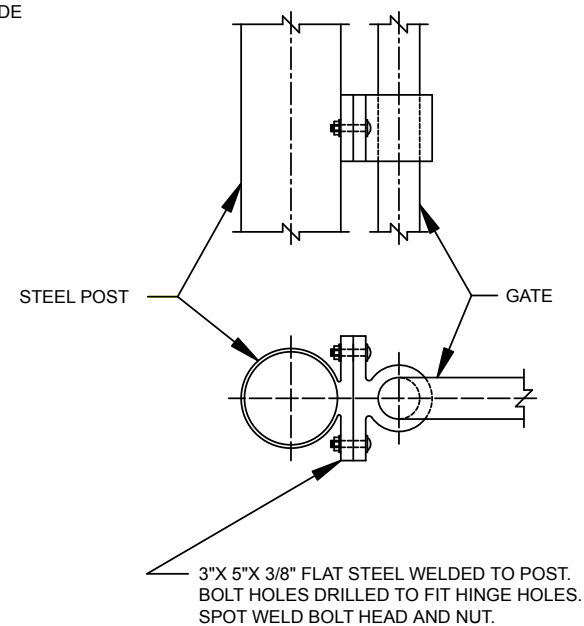
DETAIL "A"



DETAIL "B"

NOTES:

- 1.) GATE, ALL HARDWARE, SIGNS AND SIGN PLACEMENT, ETC. TYPICAL WITH ELEVATION VIEW AS SHOWN ABOVE. HEAVY DUTY GATE MANUFACTURED BY POWDER RIVER CO. OR EQUAL IS ACCEPTABLE.
- 2.) ALL STEEL SURFACES SHALL RECIEVE ONE COAT OF PAINT AFTER FABRICATION AND ONE COAT AFTER INSTALLATION. PAINT SHALL MEET THE REQUIRMENTS OF SECTION 708.
- 3.) ALL SIGNS AND MARKERS FOR THE GATE WILL BE FURNISHED BY THE FOREST SERVICE AND INSTALLED BY THE CONTRACTOR. IN ACCORDANCE WITH THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES".
- 4.) AFTER THE GATE IS INSTALLED AND ADJUSTED, ALL BOLT THREADS SHALL BE PEENED OR SPOT WELDED TO PREVENT THEIR REMOVAL.
- 5.) GATES SHALL BE INSTALLED IN THE LOCATIONS MARKED BY THE ENGINEER.
- 6.) WHEN USING CONCRETE FOR SETTING POST, CONCRETE SHALL BE PLACED AGAINST UNDISTURBED SOIL AND SHALL MEET THE REQUIREMENTS OF SECTION 602.



DETAIL "C"

LIGHTWEIGHT METAL GATE

REC42-01

POURED CONCRETE
16" DIA MIN x 20" DEEP
8 PLACES

11
9
12

3
3'-4"
5

6

PLAN VIEW

9

12"

2'-0"

1'-6"

1'-6"

6'-0"

3- 5/8"DIA x 13" LG
TYPICAL

8

5'-0"

1/8" TYP

1/4" TYP

2

4

6

11

16"DIA

7

4'-6"

1" RAD

A

A

2'-6"

8 SP @ 6" = 4'-0"

3

9

5

5'-0"

1 1/2"

3/16

7

12

SOIL

20"

10

4

4

1/2"

9

5

3/16 TYP

3/16 TYP

11

3/16 TYP

7

12

3

9

11

10

1

ASSEMBLY

6

1"

1/2"

9

5

3/16 TYP

3/16 TYP

11

3/16 TYP

7

12

3

9

11

10

1

ASSEMBLY

5

FENCE TIE IN

5

3/16 TYP

3/16 TYP

11

3/16 TYP

7

12

3

9

11

10

1

ASSEMBLY

4

1/2"

1"

9

5

3/16 TYP

3/16 TYP

11

3/16 TYP

7

12

3

9

11

10

1

ASSEMBLY

4

SECTION A-A

7

12

3

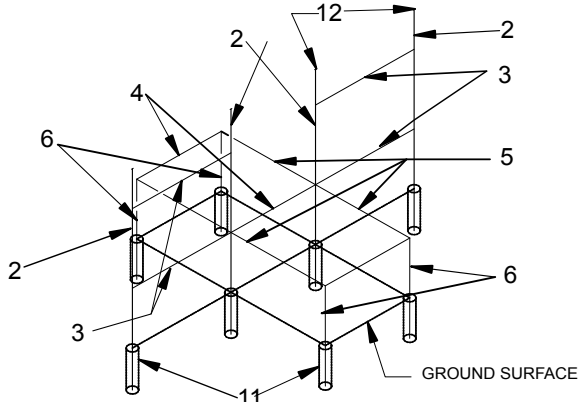
9

11

10

1


MATERIAL LIST					ZONE
ITEM NO.	EDC STOCK NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	
1	REC42-011	ASSEMBLY	1	CONSIST OF ITEMS 2 THRU 12	6A
2	REC42-012	VERTICAL FRAME	4	BI PIPE, 5"DIA, SCH 80 x 72" LG	6B
3		HORIZONTAL FRAME	4	BI PIPE, 3 1/2"DIA, SCH 80 x 60" LG	3B
4		HORIZONTAL FRAME	3	BI PIPE, 3 1/2"DIA, SCH 80 x 54" LG	6D
5		HORIZONTAL FRAME	4	BI PIPE, 3 1/3"DIA, SCH 80 x 40" LG	4D
6		VERTICAL LEG	4	BI PIPE, 3 1/2"DIA, SCH 80 x 36" LG	7C
7		SIGN	1	HRMS, 3/16" PL x 11" x 14" LG	3C
8		SIGN SUPPORT	4	L2 x 1 x 1/8 x 1 3/4" LG	3B
9		FENCE TIE IN	20	CUT FROM CHAIN LINK 3/8"DIA ROD	4D/3B
10		ANCHORS	24	CRS, 5/8" DIA x 13" LG	4A
11		FOUNDATION	8 BAGS	PORTLAND, 50# READY MIX CONCRETE	6A/3C
12		COVER	4	HRMS, 1/4" PL x 5 1/2"DIA	3B



ISOMETRIC VIEW

NOTES:

- ALL WELDED CONSTRUCTION.
- USE SCHEDULE 40 BLACK PIPE MINIMUM, AND SCHEDULE 80 IN HIGH VANDALISM AREA.
- WRAP DIAGONALLY A CAUTION YELLOW AND BLACK ADHESIVE TAPE ON PIPE ABOVE GROUND.
- CONSTRUCT ON FLAT AND LEVEL GROUND.
- PROVIDE FOR SUFFICIENT SIGHT DISTANCE.
- PROVIDE A TURN AROUND ON ONE SIDE OF BARRIER.
- DETERMINE TRAIL MANAGEMENT OBJECTIVE FOR CONFIGURATION OF BARRIER.
- TRAIL DESIGNATION SIGN ON RIGHT SIDE OF BARRIER.
- USE CORTEN STEEL, DO NOT PAINT AS IT ADDS MAINTENANCE COSTS. ESPECIALLY DO NOT PAINT A COLOR THAT BLENDS WITH THE BACKGROUND SINCE IT MAKES HARD FOR THE THE HORSE TO DISTINGUISH.
- WELD TABS OR HALF CHAIN LINKS TO OUTSIDE OF BARRIER TO ATTACH FENCING.
- VARIOUS CONFIGURATIONS FOR BARRIER, COMPONENTS CAN BE PREFABRICATED FOR EASE OF GETTING TO SITE.

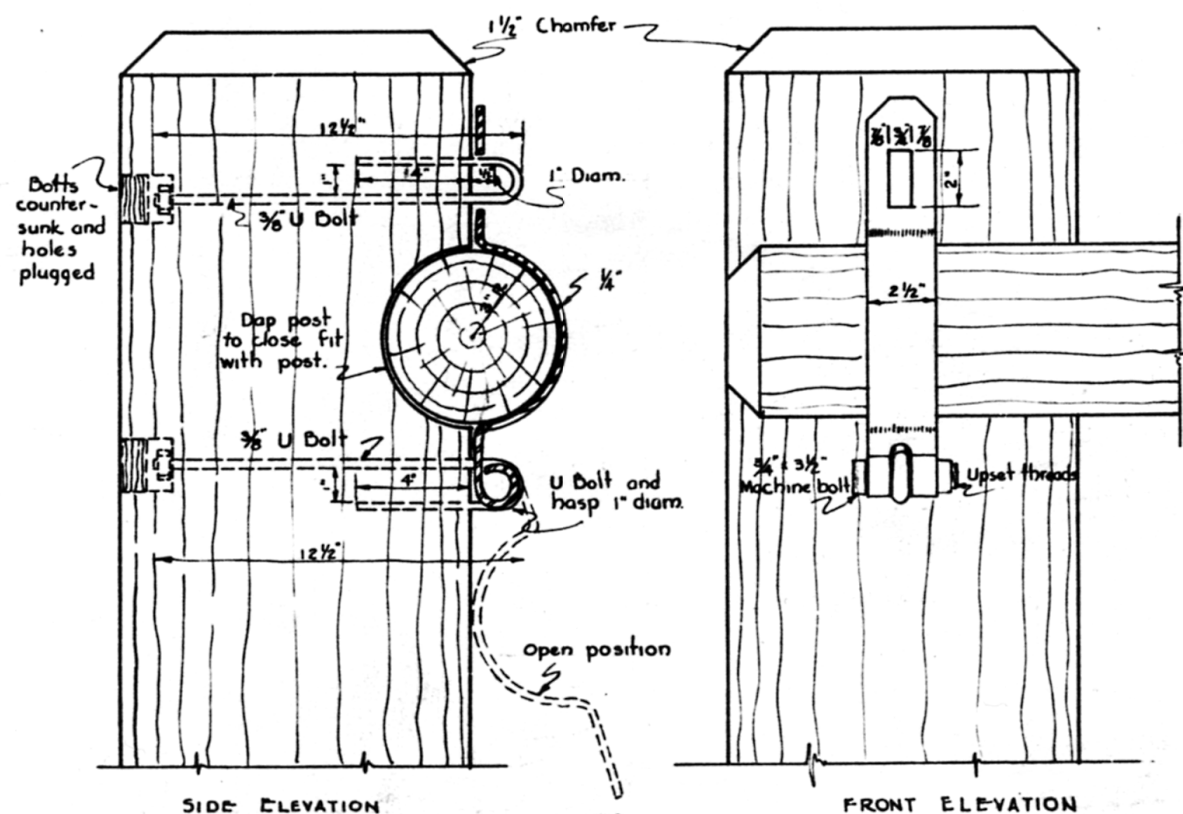
GENERAL NOTES				U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE TECHNOLOGY & DEVELOPMENT CENTER SAN DIMAS, CALIFORNIA 91773				
1. UNLESS OTHERWISE SPECIFIED TOLERANCES ON DIMENSIONS ARE TO BE AS FOLLOWS: DECIMAL ± .010 FRACTIONAL ± 1/16 ANGLES ± 1/2				NON-MOTORIZED TRAIL BARRIERS ASSEMBLY AND DETAILS				
2. REMOVE ALL BURRS AND SHARP CORNERS.								
3. DO NOT SCALE DRAWING.								
4. MAKE NO SUBSTITUTION OF MATERIALS OR ALTERATION OF DIMENSIONS WITHOUT PRIOR WRITTEN APPROVAL BY THE TECHNOLOGY AND DEVELOPMENT CENTER.								
				DRAWN BY M.M.Damole_CHKD. BY DT DATE 9-29-04		DWG NUMBER REC42-01		REV 1
				REVIEWED BY Cam Lockwood DATE 9-29-04				
				APPROVED D. Meadows DATE 9-29-04				
				SCALE Full DATE 9-29-04		SHEET 1 OF 1		

FY 03



1 THESE DIMENSIONS ARE MINIMUM CLEAR DISTANCES REQUIRED TO MEET ACCESSIBILITY STANDARDS.

DATE <input checked="" type="checkbox"/> RECEIVED <input type="checkbox"/> BY TELEPHONE <input checked="" type="checkbox"/> MAIL <input checked="" type="checkbox"/> AIRMAIL <input checked="" type="checkbox"/> SPECIAL DELIVERY <input type="checkbox"/> OTHER <input type="checkbox"/>	U. S. DEPT. OF AGRICULTURE FOREST SERVICE TECHNOLOGY & DEVELOPMENT CENTER MISSOULA, MONTANA
FROM: BANGOR FOREST # <input checked="" type="checkbox"/> DISTRICT OFFICE <input checked="" type="checkbox"/> ATTACHED LABORATORY <input type="checkbox"/> SCALE 1/2 & 3/4 DATE NOV 20/1978	TITLE TIMBER KISSING GATE FOR WHEELCHAIR ACCESSIBILITY SHEET <input checked="" type="checkbox"/> OF <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> MTDC - <input checked="" type="checkbox"/>

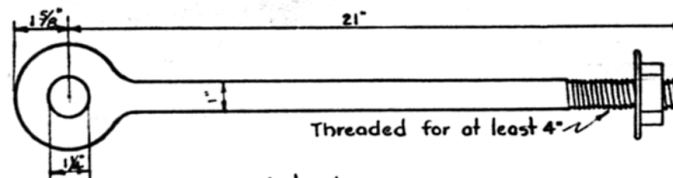
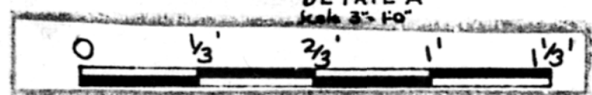


SIDE ELEVATION

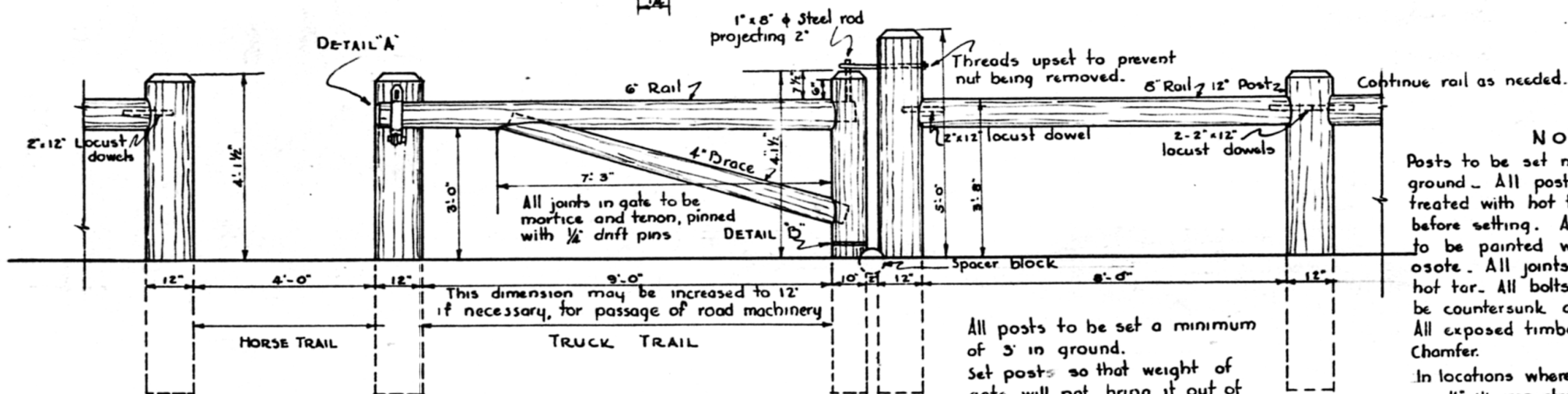
FRONT ELEVATION

DETAIL 'A'

Scale 3" = 1'-0"

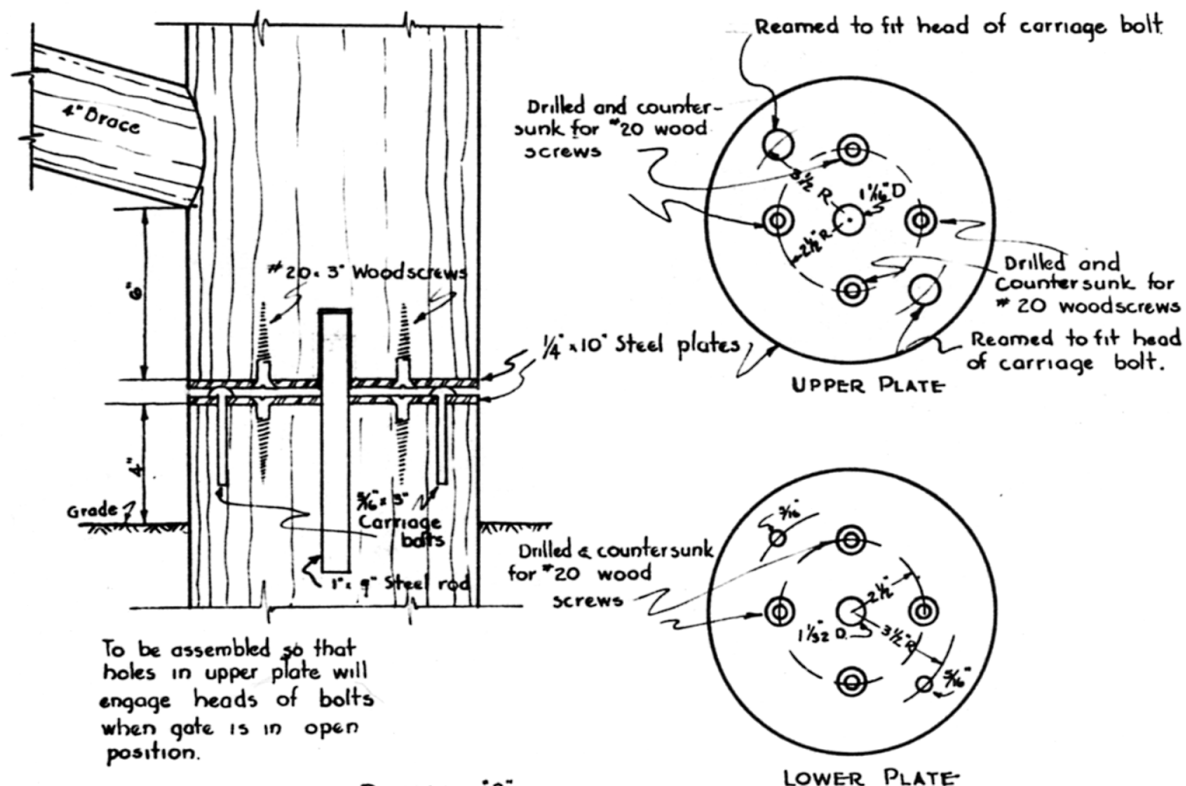


Threaded for at least 4"



ELEVATION

Scale - 1/2" = 1'-0"



DETAIL 'D'

Scale - 3" = 1'-0"

BILL OF MATERIALS

- 1 1/4" x 2 1/2" x 21" Strap iron.
- 2 1/4" x 10" Circular steel plates.
- 1 1" x 22 3/8" Eye bar, threaded, with nut and washer.
- 1 1" x 8" φ Steel Rods
- 2 3/8" x 18" φ Steel Rods, Threaded one end, with nut and washer.
- 1 3/4" x 3 1/2" Machine bolt.
- 8 #20 - 3" Wood screws.
- 2 3/8" x 3" Carriage bolts.

NOTES

Posts to be set not less than 3' in ground. All posts to be thoroughly treated with hot tar to 4" above grade before setting. All exposed wood to be painted with colorless creosote. All joints to be sealed with hot tar. All bolts and drift pins to be countersunk and holes plugged. All exposed timber ends to have 1 1/2" Chamfer.

In locations where extra protection is needed, run 1/2" x 1 1/2" iron straps on upper and lower side of gate lag and sides of posts. Iron collars may be used to further increase strength of gate post at ends.

All posts to be set a minimum of 3' in ground. Set posts so that weight of gate will not bring it out of line.

5-18-37 ORIGINAL DRAWING NPGSM 3029

CHECKED

DRAWN BY

HDS DTP

U. S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
BRANCH OF PLANS AND DESIGN

TRUCK TRAIL BARRIER
GREAT SMOKY MOUNTAINS NATIONAL PARK

RECOMMENDED
CLEARED FOR ENGINEERING
CONCURRED
APPROVED

5/25/37
6/27/37
5/27/37
6/29/37

DRAWING NO.
ND-GSM
2052
SHEET 1
1 SHEETS

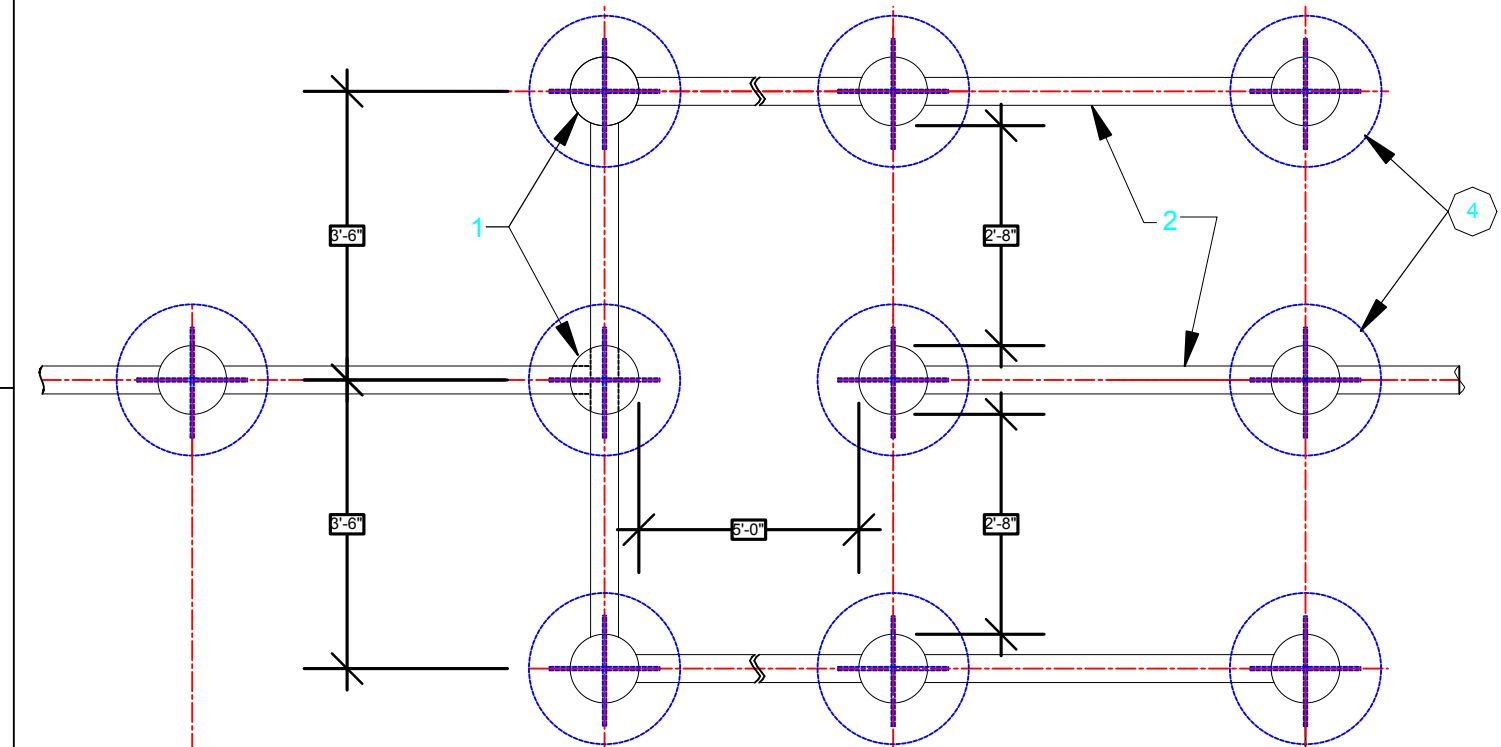
HALF-SIZE REPRODUCTION

133/2052

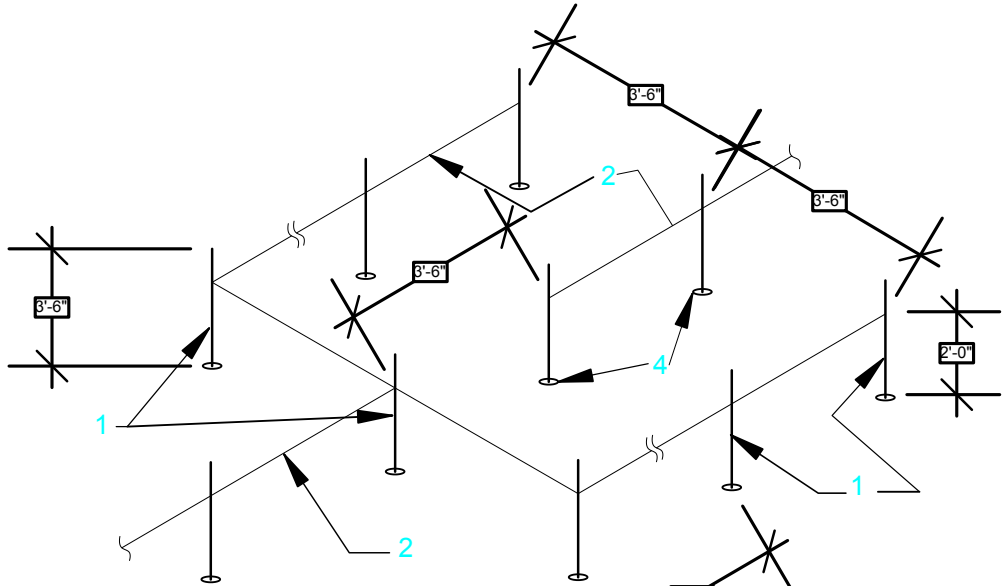
REC48-01

MATERIAL LIST

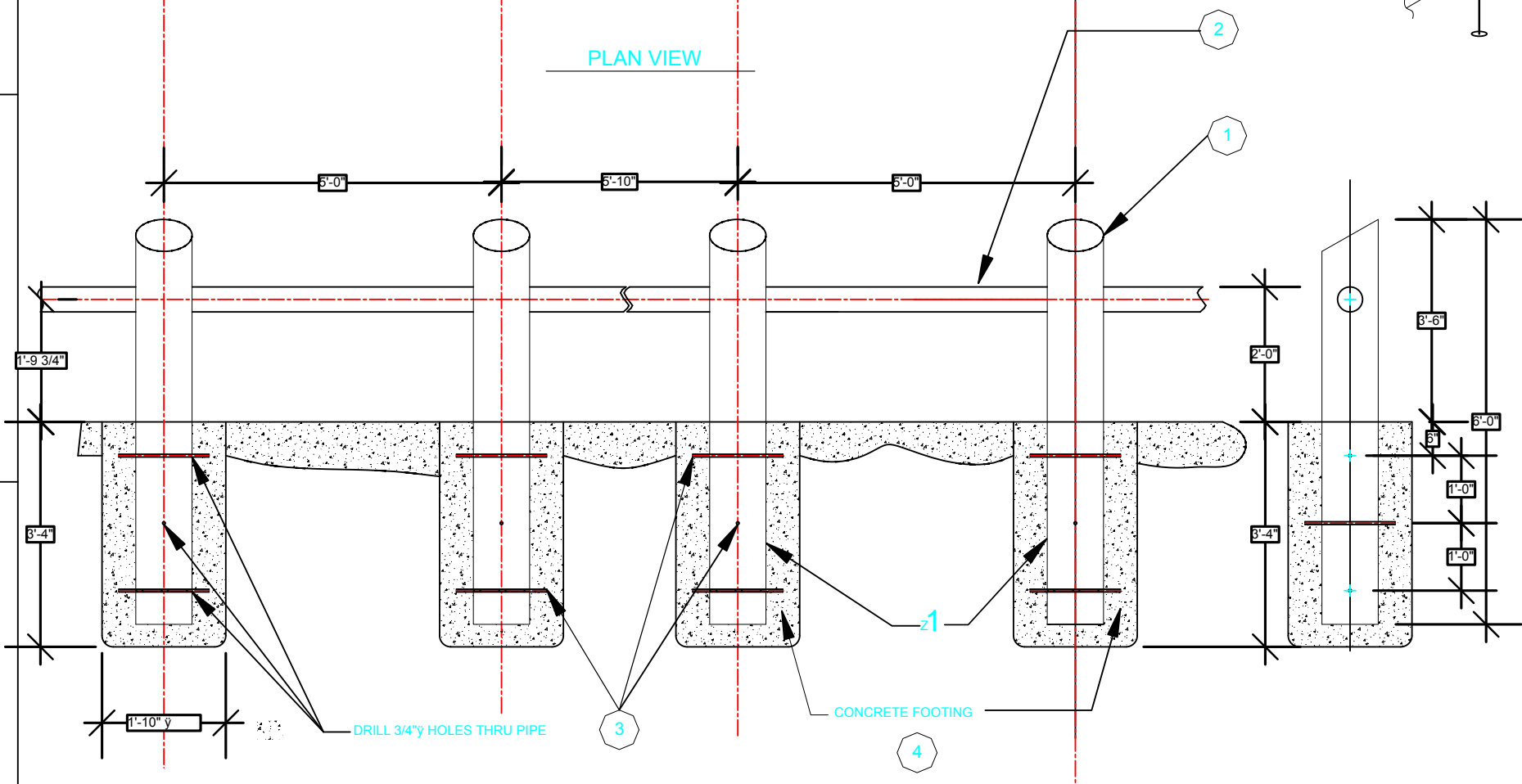
ITEM NO.	EDC STOCK NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	ZONE
1	REC46-011	POST	10	TREATED PINE 10" DIA X 6'-0" LG	4B
2	REC46-012	PIPE RAIL	2	GALV PIPE, 4" DIA X 20'-0" LG	4C
3		ANCHORS	30	STEEL ROD, 5/8" DIA X 18" LG	6A
4		FOOTINGS	25	MIXED CONCRETE BAGS X 100 #	4A/4D
5					
6					



PLAN VIEW



ISOMETRIC VIEW



U-TURN BARRIER ASSEMBLY

NOTES:

- THE DRAWING SHOWS GALVANIZED PIPE RAILS OF 4 7/8" DIAMETER. IF SALVAGED DRILL STEM OIL WELL PIPE IS AVAILABLE USE IT. THE COST IS LOW. ADJUST THE HOLE IN THE POSTS TO 3 7/8" DIAMETER. AN OUTFITTING COMPANY MAY HAVE INFORMATION ON SALVAGED PIPE.
- TO MAKE A TALLER BARRIER WITH TWO RAILS MAKE THE POSTS 4'-4" TALL WITH RAILS AT 1'-4" AND AT 2'-0".

GENERAL NOTES

- UNLESS OTHERWISE SPECIFIED TOLERANCES ON DIMENSIONS ARE TO BE AS FOLLOWS:
DECIMAL ± .010
FRACTIONAL ± 1/16
ANGLES ± 1/2
- REMOVE ALL BURRS AND SHARP CORNERS.
- DO NOT SCALE DRAWING.
- MAKE NO SUBSTITUTION OF MATERIALS OR ALTERATION OF DIMENSIONS WITHOUT PRIOR WRITTEN APPROVAL BY THE TECHNOLOGY AND DEVELOPMENT CENTER.

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
TECHNOLOGY & DEVELOPMENT CENTER
SAN DIMAS, CALIFORNIA 91773

U-TURN BARRIER
KISATCHIE NATIONAL FOREST

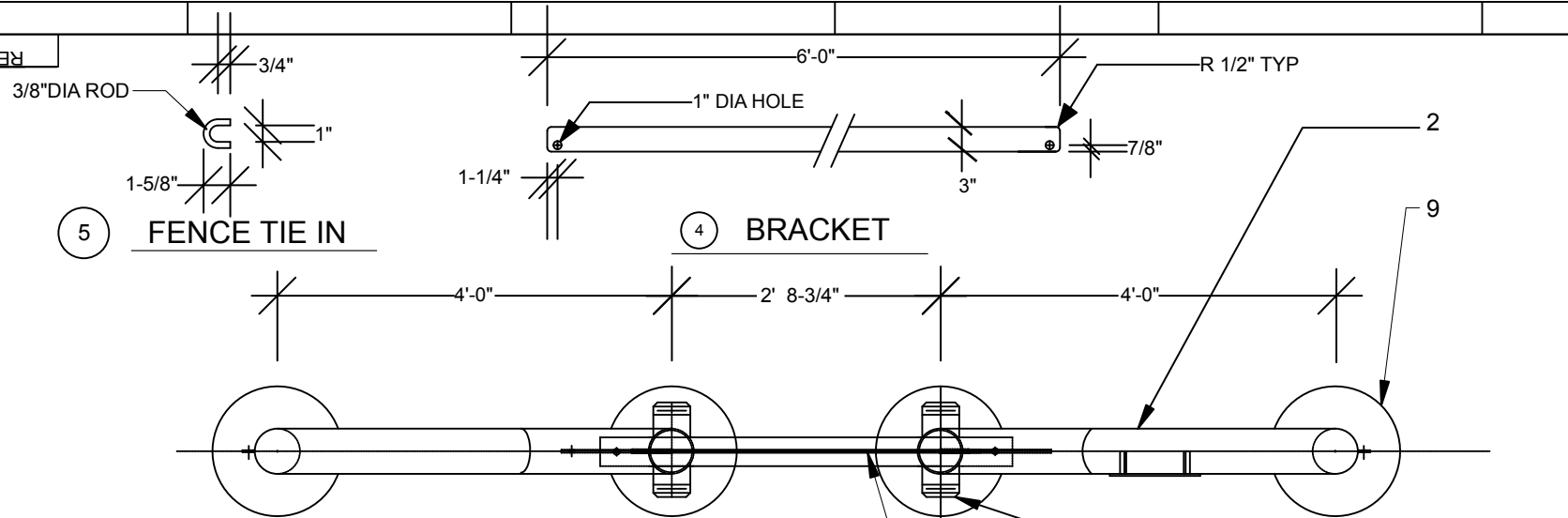


DRAWN BY M.M. Damschke, BY DATE EU 9-9-05
REVIEWED BY EILEEN EUBANKS 9-9-05
APPROVED D. Meadows DATE 9-9-05
SCALE FULL DATE 9-9-05

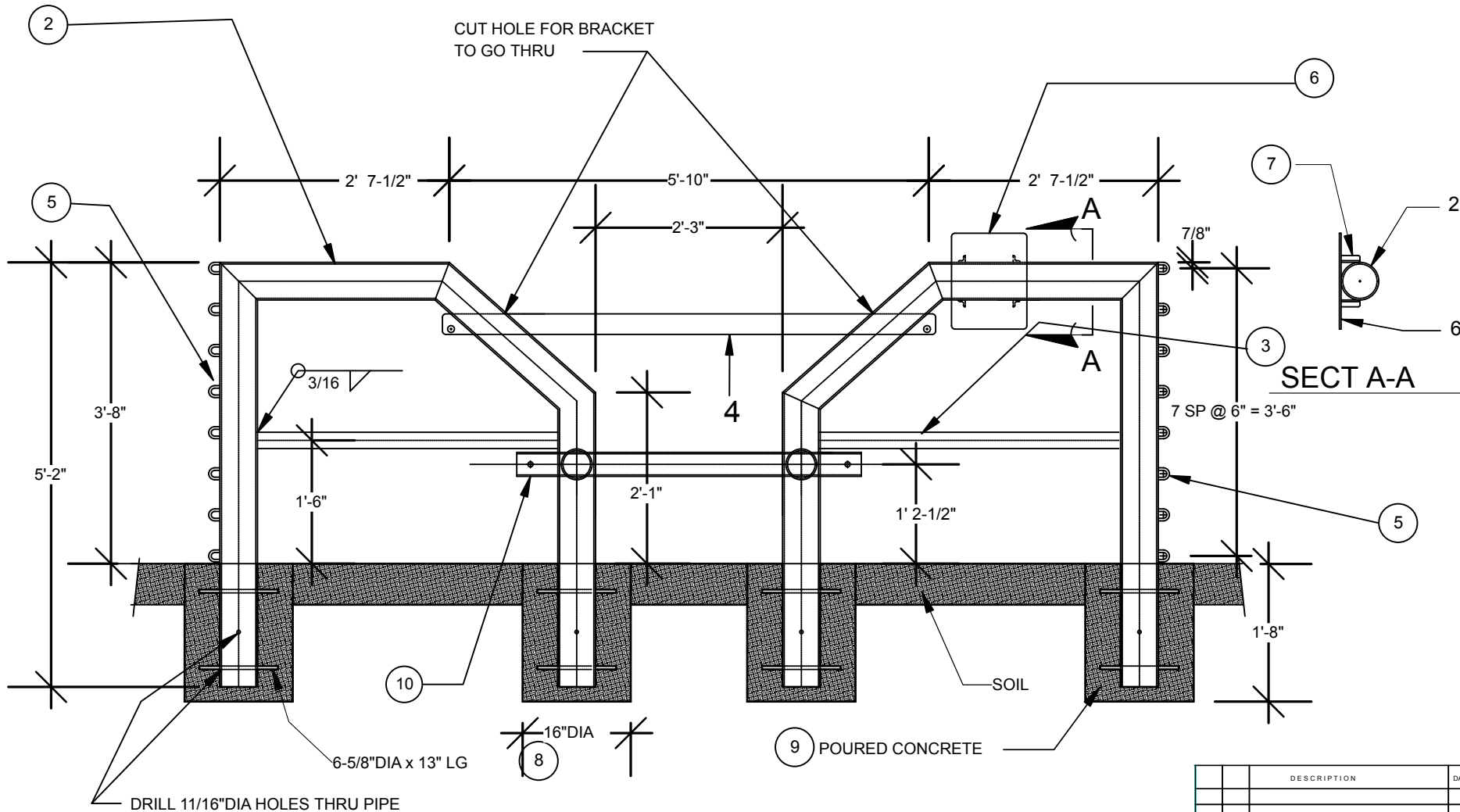
DWG NUMBER REC48-01
REV 0
SHEET 1 OF 1

FY 05

REC40-02



PLAN VIEW



SECT A-A

1 BARRIER ASSEMBLY

MATERIAL LIST

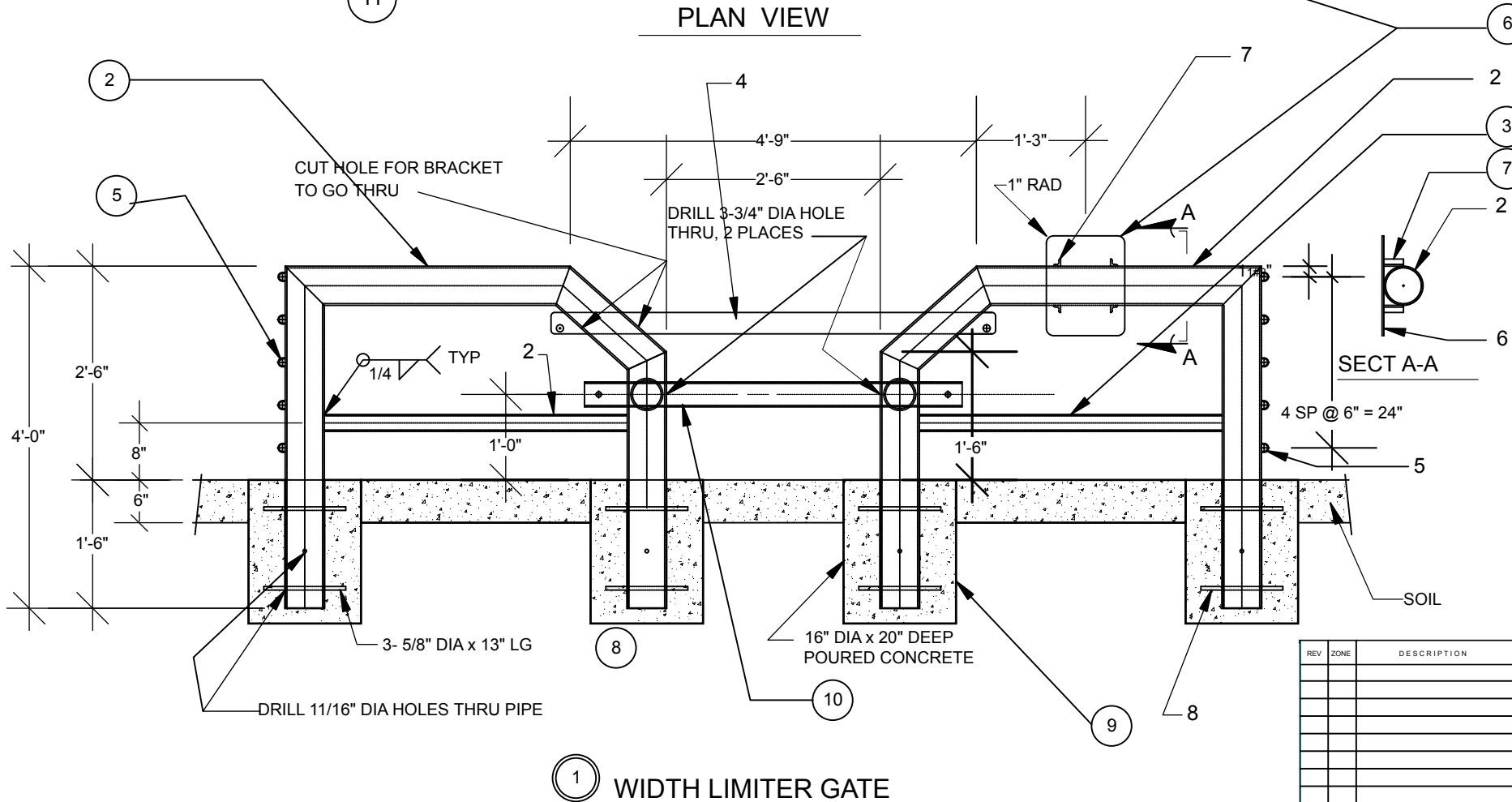
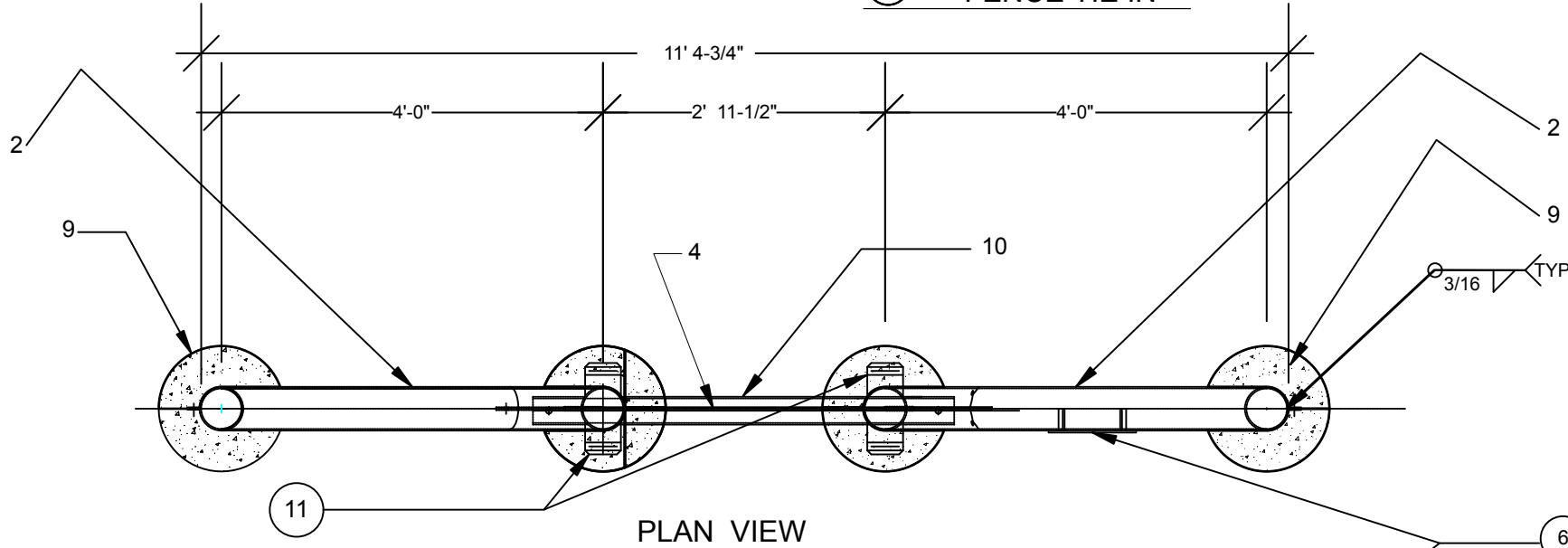
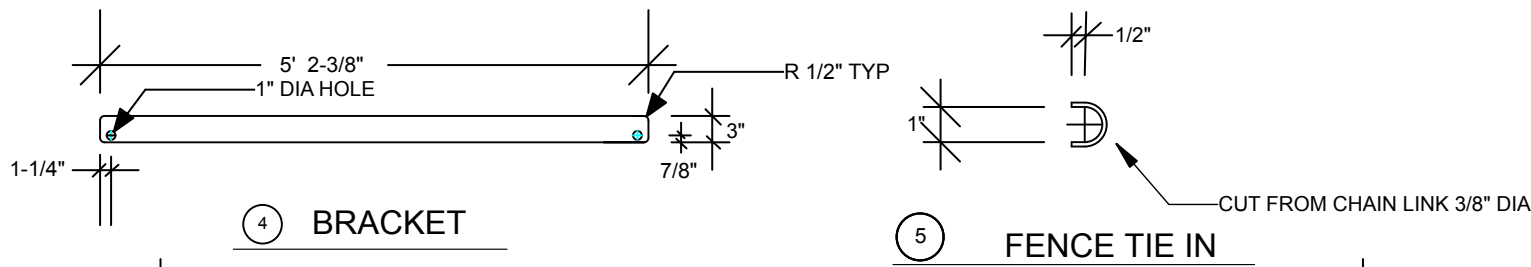
ITEM NO.	EDC STOCK NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	ZONE
1	REC40-021	ASSEMBLY	1	CONSIST OF ITEMS 2 THRU 11	6A
2	REC40-022	MAIN FRAME	2	PIPE, BI SCH 40, 5"DIA x 168" LG	8C
3		LATERAL SUPPORT	2	PIPE, BI SCH 40 2"DIA x 43" LG	3B
4		LOCKING BAR	1	HRMS, 1/2" PL x 3" x 72" LG	6D
5		FENCE TIE IN	16	CUT FROM CHAIN LINK 3/8"DIA	2A/3A
6		SIGN SUPPORT	1	HRMS, 1/4" PL x 11 x 14" LG	3C
7		ANGLE	4	L1 x 2 x 1/8 x 3" LG	3C
8		ANCHORS	12	CRMS, 5/8"DIA x 13" LG	6A
9		FOUNDATION	4 BAGS	PORTLAND, READY MIX CONCRETE	5A
10		PIPE INSERT	1	PIPE, BI SCH 40 3"DIA x 52" LG	5A
11		PIPE STUD	4	PIPE NIPPLE 4"DIA x 5" LG	3C
12					

NOTES:

- ALL WELDED CONSTRUCTION.
- USE SCHEDULE 40 BLACK PIPE MINIMUM, AND SCHEDULE 80 IN HIGH VANDALISM AREA.
- WRAP DIAGONALLY A CAUTION YELLOW AND BLACK ADHESIVE TAPE ON PIPE ABOVE GROUND.
- CONSTRUCT ON FLAT GROUND AND LEVEL GROUND.
- PROVIDE FOR SUFFICIENT SIGHT DISTANCE.
- PROVIDE A TURN AROUND ON ONE SIDE OF BARRIER.
- DETERMINE TRAIL MANAGEMENT OBJECTIVE FOR CONFIGURATION OF BARRIER.
- TRAIL DESIGNATION SIGNING ON RIGHT SIDE OF BARRIER.
- USE CORTEN STEEL, DO NOT PAINT AS IT ADDS MAINTENANCE COSTS. ESPECIALLY DO NOT PAINT A COLOR THAT BLENDS WITH THE BACKGROUND SINCE IT MAKES HARD FOR THE HORSE TO DISTINGUISH.
- SLIDE THRU CLOSURE BAR, EITHER LOCKABLE IN BOOTH OPEN AND CLOSED POSITION OR REMOVABLE.
- WELD TABS OR HALF CHAIN LINKS TO OUTSIDE OF BARRIER TO ATTACH FENCING.
- USE SMALLER DIAMETER PIPE WELDED ON EACH BARRIER HALF TO ATTACH HORSE BARRIER.
- LOWER HORSE BAR SLIPS THRU HOLES CUT IN SIDE HALF TO ATTACH HORSE BARRIER.
- VARIOUS CONFIGURATIONS FOR BARRIER, COMPONENTS CAN BE PREFABRICATED FOR EASE OF GETTING TO SITE.
- HORSE BACK COULD BE SINGLE BENT TUBE WITH ONE SUPPORT LEG OR WELDED 3- SIDED BOX WITH TWO SUPPORT LEGS, BOTH WOULD SLIP OVER SMALL DIAMETER PIPE STUBS WELDED ON SIDE BARRIERS.
- RECOMMEND A MINIMUM OF 3" PIPE, LARGER SIZES CAN BE USED IF APPROPRIATE OR NEEDED.

DESCRIPTION					DATE		BY		CHK		GENERAL NOTES		U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE TECHNOLOGY & DEVELOPMENT CENTER SAN DIMAS, CALIFORNIA 91773	
											1. UNLESS OTHERWISE SPECIFIED TOLERANCES ON DIMENSIONS ARE TO BE AS FOLLOWS: DECIMAL ± .010 FRACTIONAL ± 1/16 ANGLES ± 1/2 2. REMOVE ALL BURRS AND SHARP CORNERS. 3. DO NOT SCALE DRAWING. 4. MAKE NO SUBSTITUTION OF MATERIALS OR ALTERATION OF DIMENSIONS WITHOUT PRIOR WRITTEN APPROVAL BY THE TECHNOLOGY AND DEVELOPMENT CENTER.		DRAWN BY: M.M.Damole_CHKD BY: mmd DATE: 6-9-03 REVIEWED BY: Cam Lockwood DATE: 9-03 APPROVED: D. Meadows DATE: 9-03 SCALE: Full DATE: 6-03	
											DWG NUMBER REC40-02		REV 0	
											SHEET 2 OF 2			

REC40-01



1 WIDTH LIMITER GATE

MATERIAL LIST

ITEM NO.	EDC STOCK NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	ZONE
1	REC40-011	ASSEMBLY	1	CONSIST OF ITEMS 2 THRU 11	7A
2	REC40-012	MAIN FRAME	2	PIPE, BI SCH 40, 5"DIA X 144" LG (OR SCH 80)	4D
3		DIAGONAL SUPPORT	2	PIPE, BI SCH 40 2"DIA X 48" LG	5D
4		BRACKET	1	HRMS, 1/2" PL X 3" X 63" LG	4C
5		FENCE TIE IN	10	CUT FROM CHAIN LINK 3/8" ROD	7D
6		SIGN SUPPORT	1	HRMS, 1/4" PL X 11 X 14 LG	4B
7		ANGLE	4	L2 X 1 X 1/8 X 4" LG	1A
8		ANCHORS	12	CRMS, 5/8" DIA X 13" LG	4C
9		FOUNDATION	4 BAGS	PORTLAND, READY MIX CONCRETE	3B
10		PIPE INSERT	1	PIPE, BI SCH 40 3"DIA X 52" LG	5A
11		PIPE STUD	4	PIPE NIPPLE 4"DIA X 5" LG	7C
12					

NOTES:

5. ALL WELDED CONSTRUCTION.
6. USE SCHEDULE 40 BLACK PIPE MINIMUM, AND SCHEDULE 80 IN HIGH VANDALISM AREA.
7. WRAP DIAGONALLY A CAUTION YELLOW AND BLACK ADHESIVE TAPE ON PIPE ABOVE GROUND.
8. CONSTRUCT ON FLAT GROUND AND LEVEL GROUND.
9. PROVIDE FOR SUFFICIENT SIGHT DISTANCE.
10. PROVIDE A TURN AROUND ON ONE SIDE OF BARRIER.
11. DETERMINE TRAIL MANAGEMENT OBJECTIVE FOR CONFIGURATION OF BARRIER.
12. TRAIL DESIGNATION SIGNING ON RIGHT SIDE OF BARRIER.
13. USE CORTEN STEEL, DO NOT PAINT AS IT ADDS MAINTENANCE COSTS. ESPECIALLY DO NOT PAINT A COLOR THAT BLENDS WITH THE BACKGROUND SINCE IT MAKES HARD FOR THE THE HORSE TO DISTINGUISH.
14. SLIDE THRU CLOSURE BAR, EITHER LOCKABLE IN BOOTH OPEN AND CLOSED POSITION OR REMOVABLE.
15. WELD TABS OR HALF CHAIN LINKS TO OUTSIDE OF BARRIER TO ATTACH FENCING.
16. USE SMALLER DIAMETER PIPE WELDED ON EACH BARRIER HALF TO ATTACH HORSE BARRIER.
17. LOWER HORSE BAR SLIPS THRU HOLES CUT IN SIDE HALF TO ATTACH HORSE BARRIER.
18. VARIOUS CONFIGURATIONS FOR BARRIER, COMPONENTS CAN BE PREFABRICATED FOR EASE OF GETTING TO SITE.
19. HORSE BACK COULD BE SINGLE BENT TUBE WITH ONE SUPPORT LEG OR WELDED 3- SIDED BOX WITH TWO SUPPORT LEGS, BOTH WOULD SLIP OVER SMALL DIAMETER PIPE STUBS WELDED ON SIDE BARRIERS.
20. RECOMMEND A MINIMUM OF 3" PIPE, LARGER SIZES CAN BE USED IF APPROPRIATE OR NEEDED.

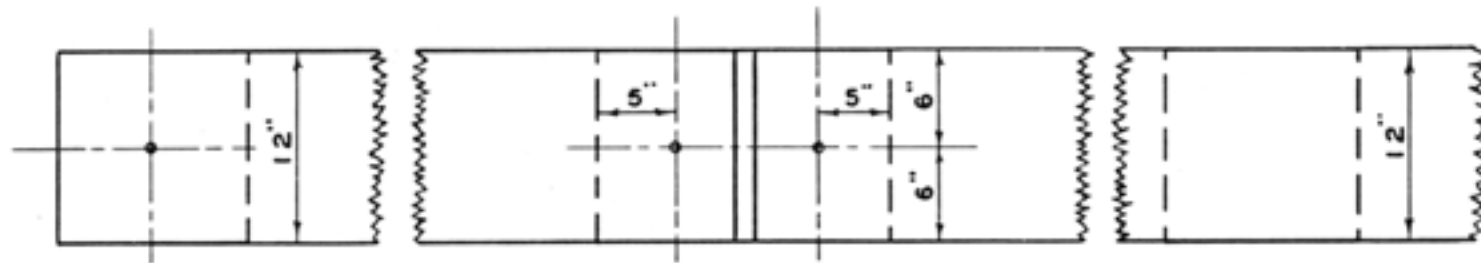
REV	ZONE	DESCRIPTION	DATE	BY	CHK

GENERAL NOTES	
1. UNLESS OTHERWISE SPECIFIED TOLERANCES OR DIMENSIONS ARE TO BE AS FOLLOWS: DECIMAL ± .010 FRACTIONAL ± 1/16 ANGLES ± 1/2	
2. REMOVE ALL BURRS AND SHARP CORNERS.	
3. DO NOT SCALE DRAWING.	
4. MAKE NO SUBSTITUTION OF MATERIALS OR ALTERATION OF DIMENSIONS WITHOUT PRIOR WRITTEN APPROVAL BY THE TECHNOLOGY AND DEVELOPMENT CENTER.	

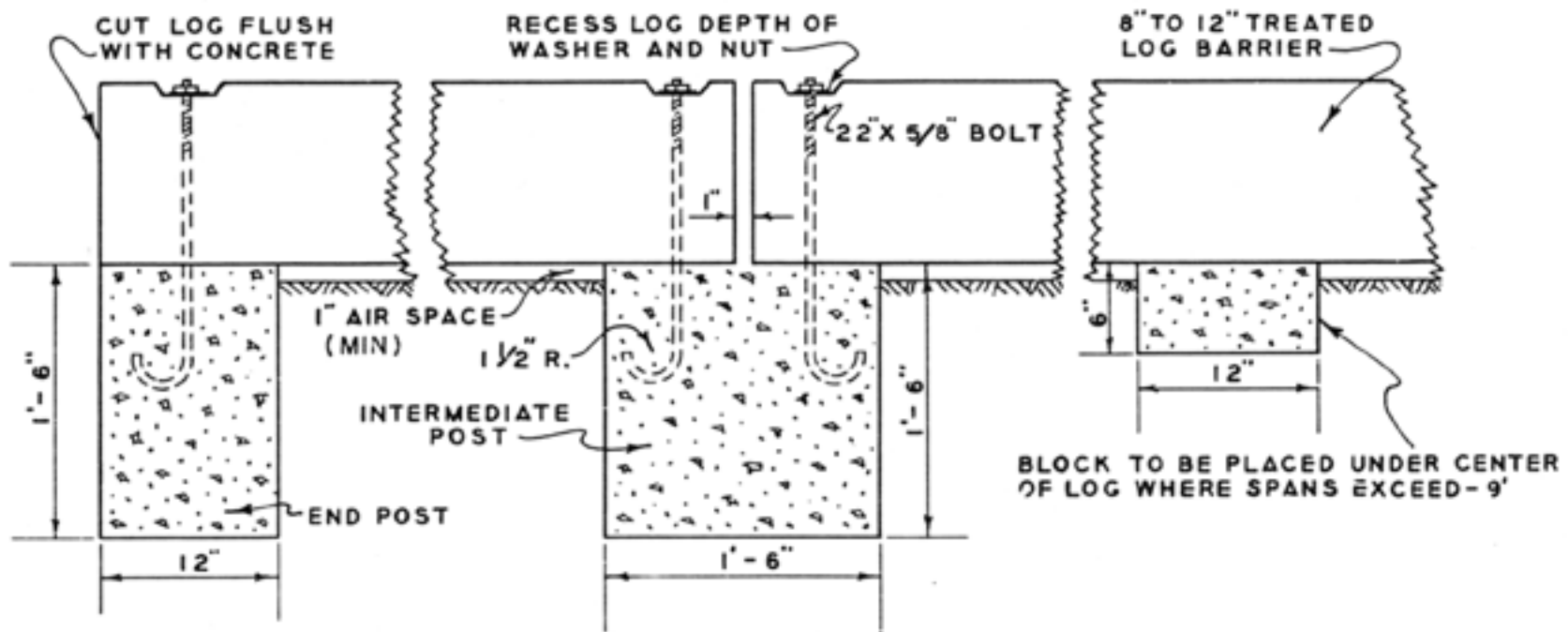
U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE TECHNOLOGY & DEVELOPMENT CENTER SAN DIMAS, CALIFORNIA 91773	
TRAIL OHV WIDTH LIMITER GATE 30"W ASSEMBLY AND DETAILS	
DRAWN BY M.M. Demole ,CHKD. BY DT DATE 6-9-03 REVIEWED BY Cam Lockwood DATE 8-03 APPROVED D. Meadows DATE 8-03 SCALE Full DATE 6-03	DWG NUMBER REC40-01 REV 0
SHEET 1 OF 2	



GUARDRAILS



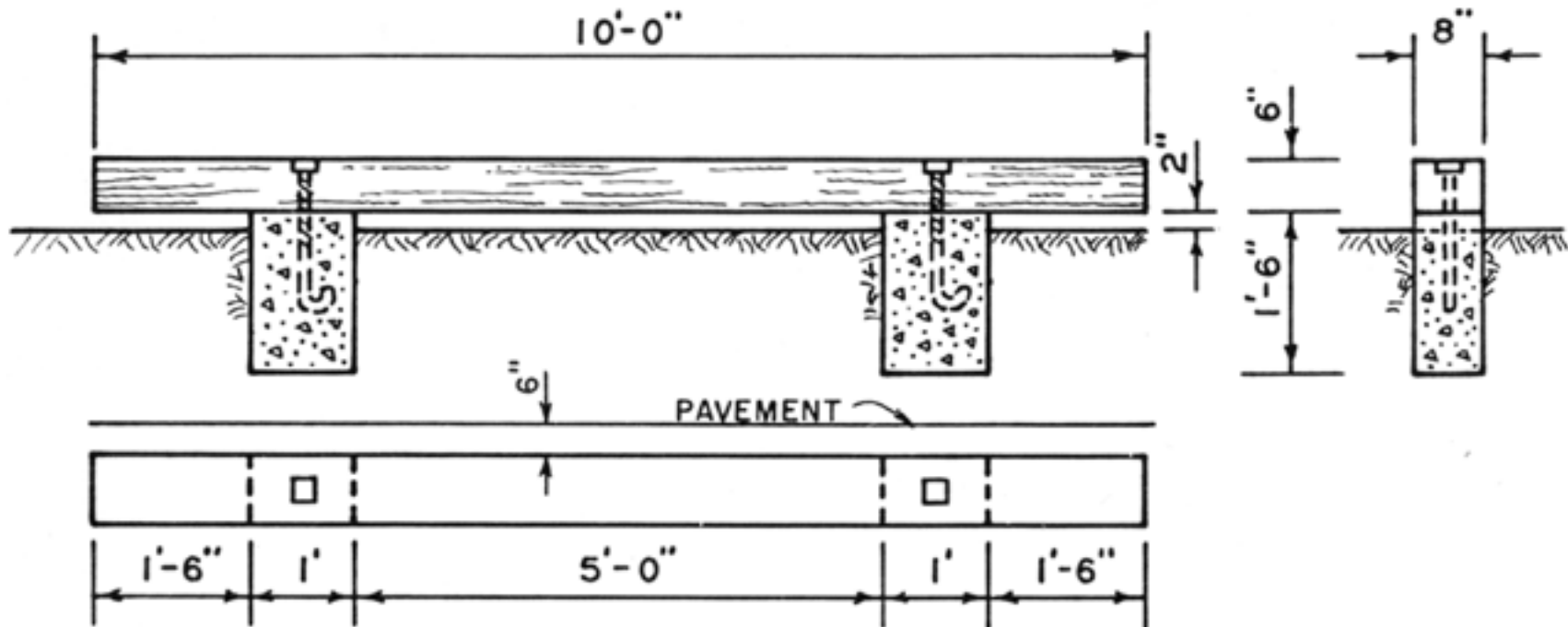
PLAN



ELEVATION

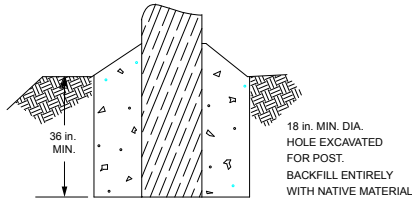
CONCRETE ANCHOR POSTS & BARRIER LOGS

PRESSURE TREATED ROUGH SAWED 6" X 8" TIMBER
BOLTED W/THREADED 3/4" REINF. RODS
W/WASHERS TO CONCRETE BASE.

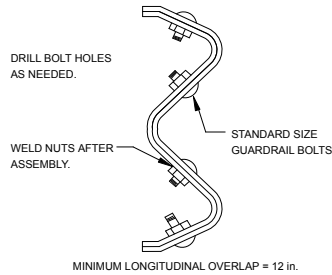


TIMBER BARRIER W/CONCRETE ANCHOR POST

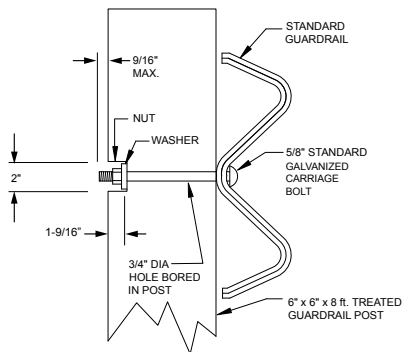
Guardrail Barrier Detail



POST BACKFILL DETAIL



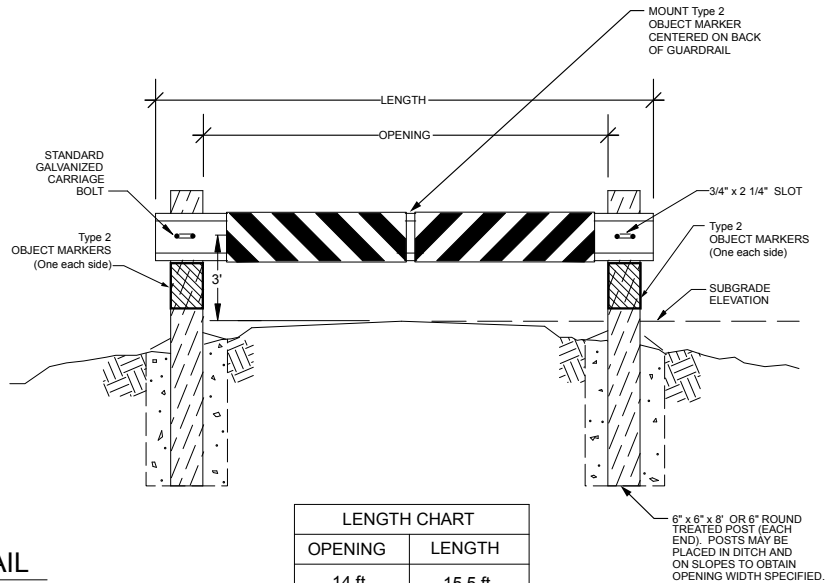
SPLICE DETAIL



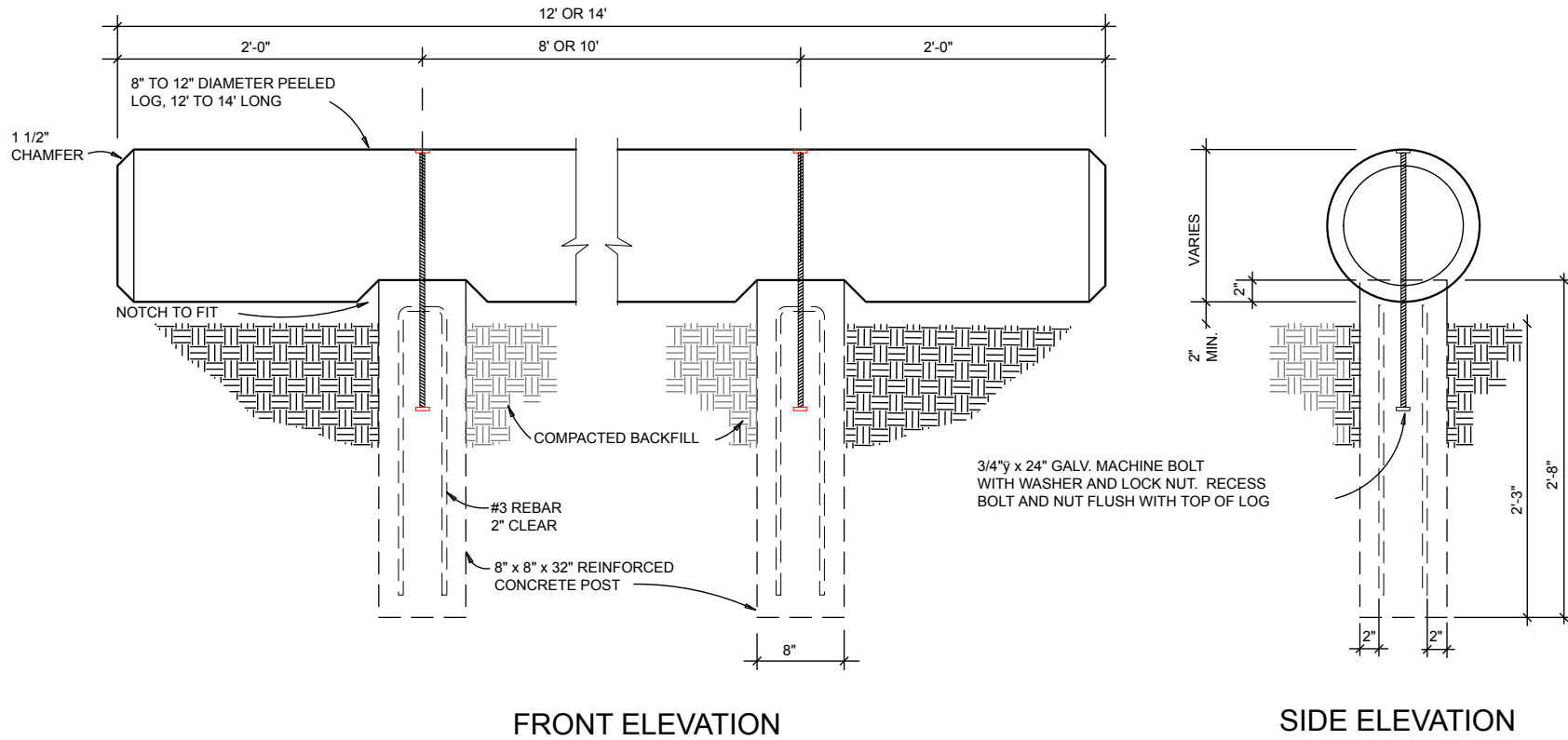
GUARDRAIL ATTACHMENT DETAIL

GENERAL NOTES:

- Posts shall be dressed, rough, or worked lumber, conforming to the requirements of AASHTO designation M-168-84. Post shall be structural grade No. 2 or better, when graded according to current rules of either the West Coast Lumber Inspection Bureau or Western Wood Products Association. Posts shall be treated in accordance with AWP C-2 using one of the following:
 - Water born preservatives per AWP Standard P5 to a retention of 6 kg/m³.
 - Pentachlorophenol meeting AWP P-8 using an AWP P-9 Type A solvent to a retention of 6 kg/m³.
 - Creosote meeting AWP P1/P13 to a retention of 130 kg/m³.
- Drawings not to scale.
- Barriers shall be located as shown in C5.419#.
- Guardrail shall be galvanized beam-type guardrail, Class A, Type 2, meeting the requirements of Section 710 of Forest Service Specifications for Construction of Roads and Bridges, 1996. Two Type 3 Object Markers shall be bolted on guardrail with nuts welded to prevent loosening.
- Type 3 Object Markers, 1'-0"X3'-0" panels, white with 3" wide reflective red stripes.
- Type 2 Object Markers, 6"X12" panels, reflective yellow.



TYPE 3 OBJECT MARKERS



LOG BARRIER

NO-DIG BARRIERS

Jeff Applegate, Mendocino National Forest
(William Applegate/R5/USDAFS)

The no-dig barrier is a guardrail type barrier that is prefabricated, set into place, and then secured with rebar. The barrier is simple to build and simple to install, and save time and therefore money. Inmate labor has built up to 100 units in a day and has installed up to 120 units in one day. This type barrier is especially good when working around or in archeological sites due to the minimum ground disturbance. There has been very little vandalism or removal of this type barrier. (See figure 29.)



Figure 29.

Materials:

Standard railroad ties - relay grade
Pressure treated 8-inch by 8-inch
Hemlock fir or Douglas fir 8- or 10-foot lengths
5/8" steel rebar 20-foot lengths

Tools:

Chain Saw
Cutting torch
Heavy duty drill (1/2 horse)
5/8-inch bell hangers drill bit
Sledge hammers

Prefabrication of no-dig barriers

- Cut 8-inch by 8-inch into 1-foot lengths using chainsaw yielding 8-10 support blocks per unit
- Cut rebar into 30-inch lengths yielding 8 units per 20-foot length
- Using a simple template, set the railroad ties on top of the 8x8x12 inch blocks. The blocks are placed lengthwise in the template with the outside edge
- 12 inches from the end of the tie (12.6") on center of the 1-foot long blocks.
- Drill through the railroad tie and the pressure treated blocks with the 5/8" drill bit
- Pound a 30-inch length of rebar through the tie and block with a sledge hammer until flush with the bottom on the block. This will leave about 12 to 14 inches sticking out of the lumber (See figure 30.)



Figure 30.

At this point the barriers are ready to transport on a trailer to the job site.

Installation

Use an 8-20 lb. sledgehammer to pound the 12- to 14-inch length of rebar into the ground until the rebar is flush with the top of the railroad tie. A string line can be used to line up the barriers, but is usually not necessary. Simple eyeballing and a little leveling with a McLeod can yield a good finished product. (See figures 31 and 32.)

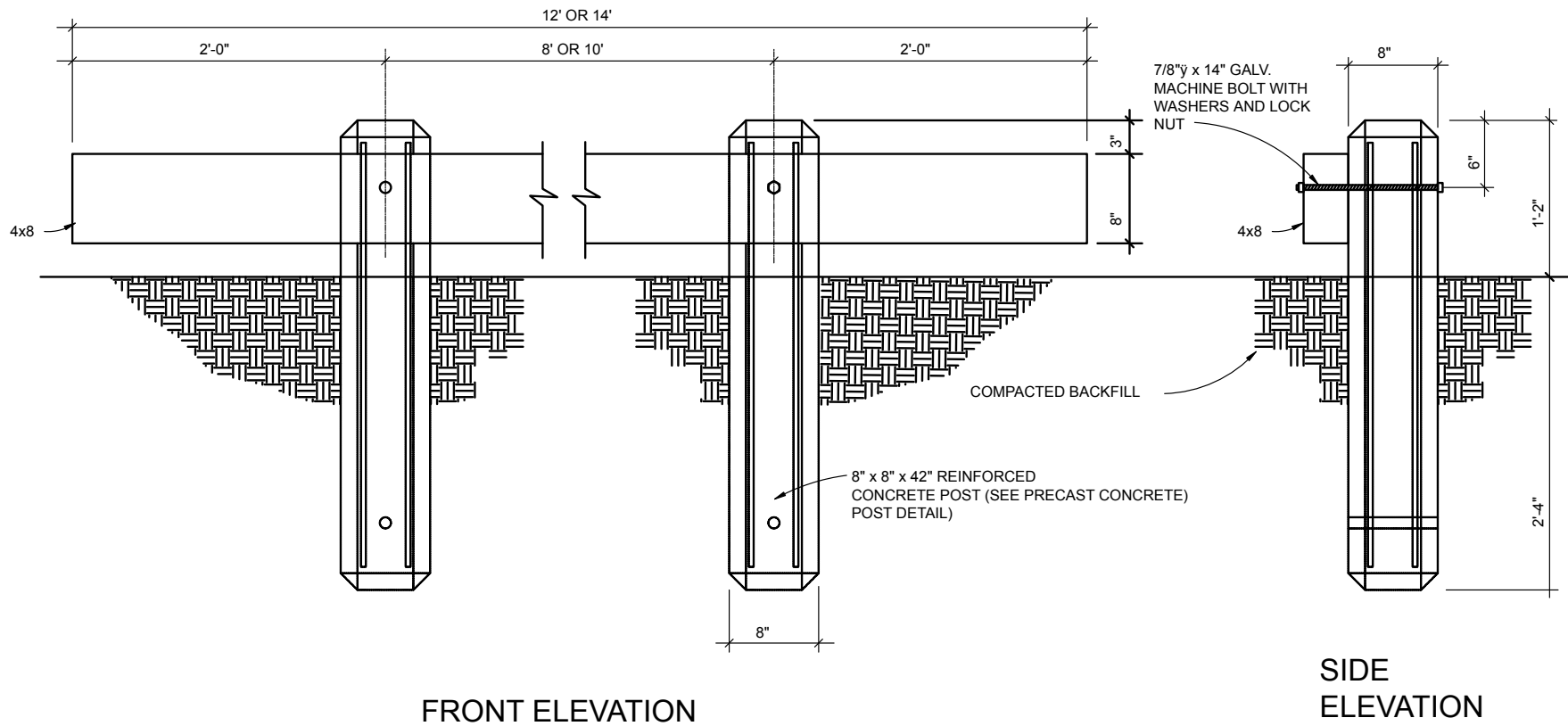


Figure 31.



Figure 32.

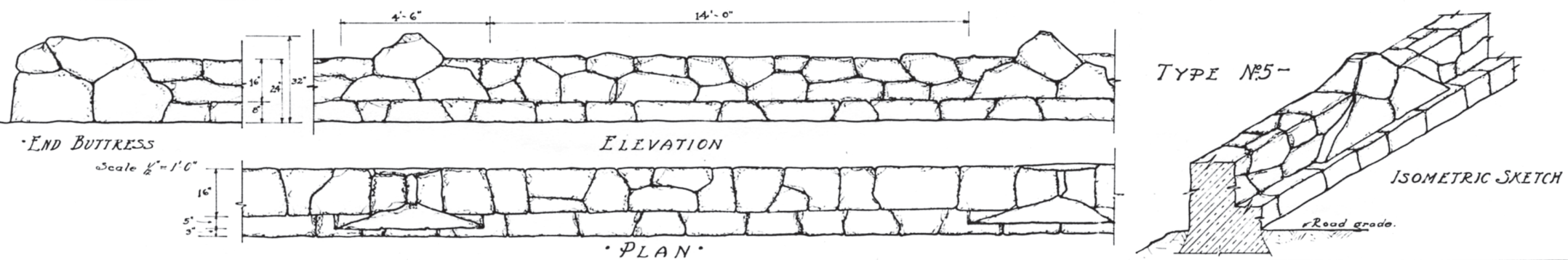
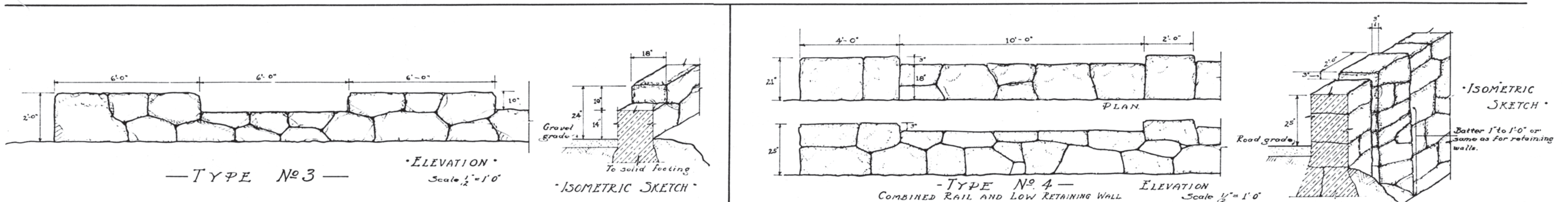
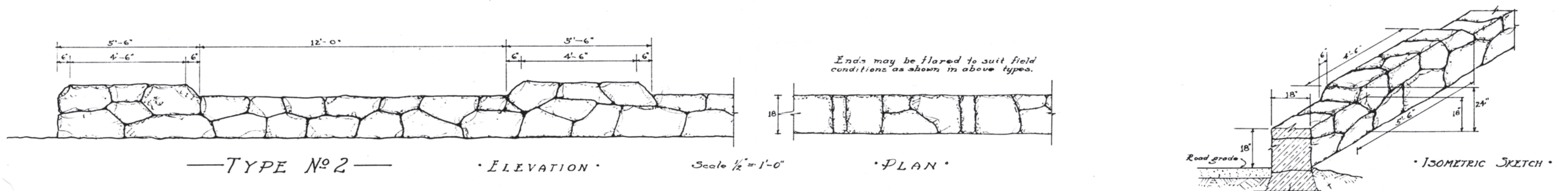
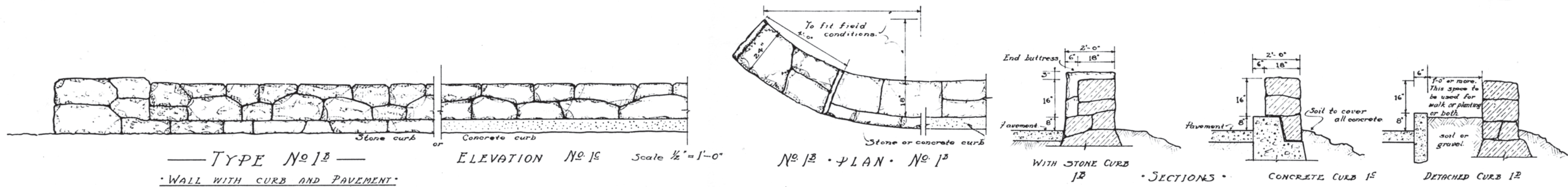
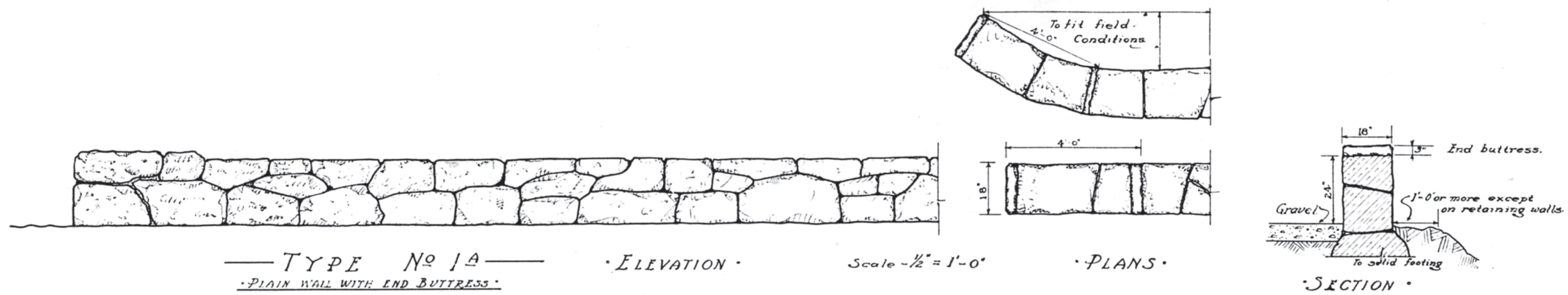
Should the barrier get backed over, it can be easily restored by using a digging bar as a lever. No-dig barriers can be taken out using a jack, but unless the rebar is badly bent, they can be easily reinstalled.



FRONT ELEVATION

SIDE
ELEVATION

SAWED TIMBER GUARD - RAIL TYPE BARRIER



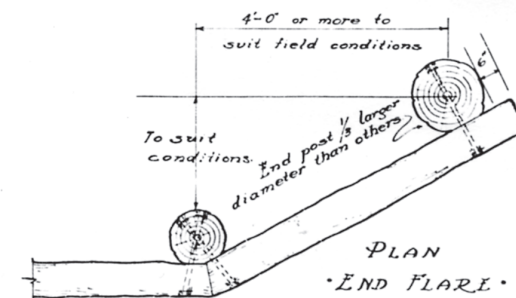
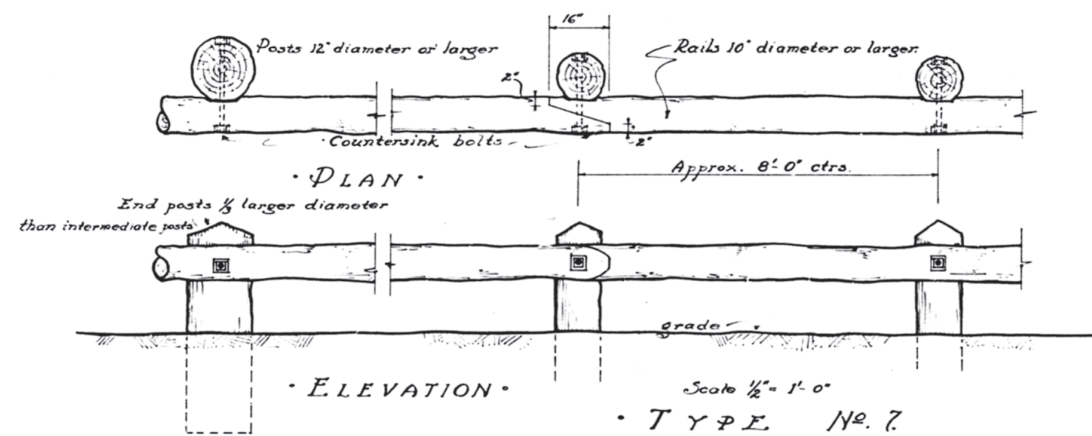
HALF-SIZE REPRODUCTION PG-20

This is a reference sheet superseding all of previous date. Guardrail type for any road will be selected and authorized for use by letter referring to above type and section numbers.

Sho. C. Vint
Date Dec 16, 1929 Chief Landscape Architect.

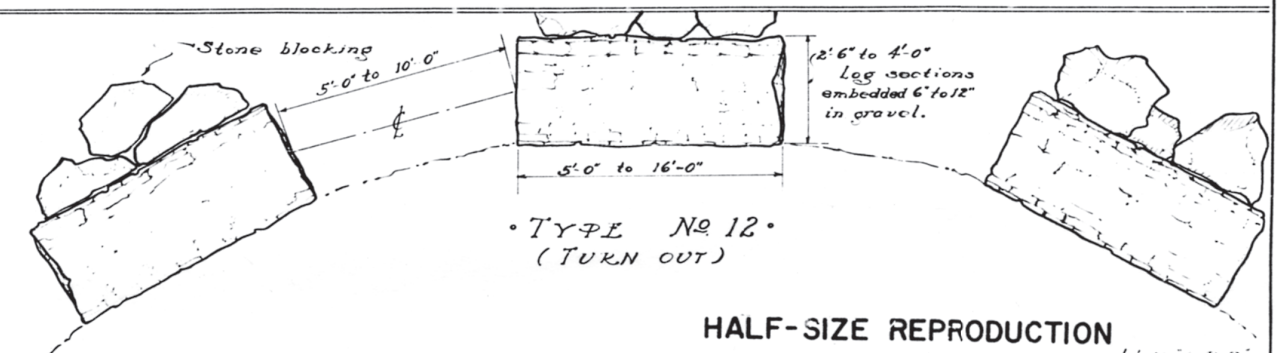
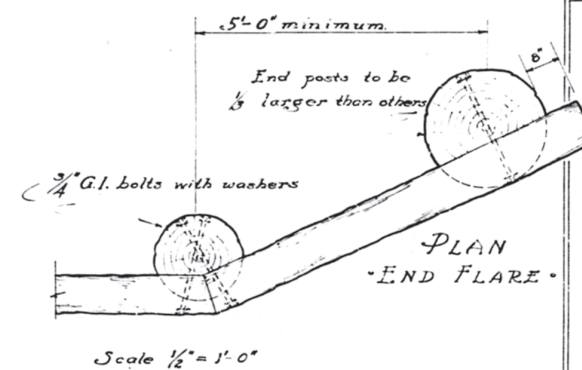
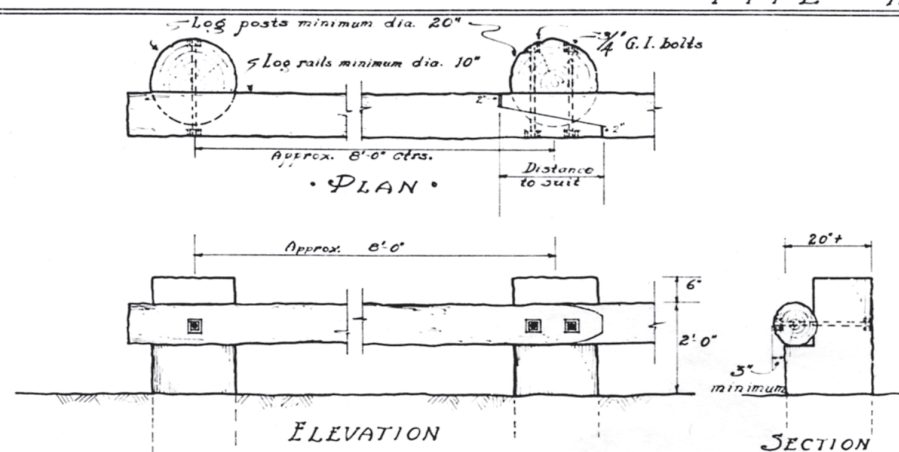
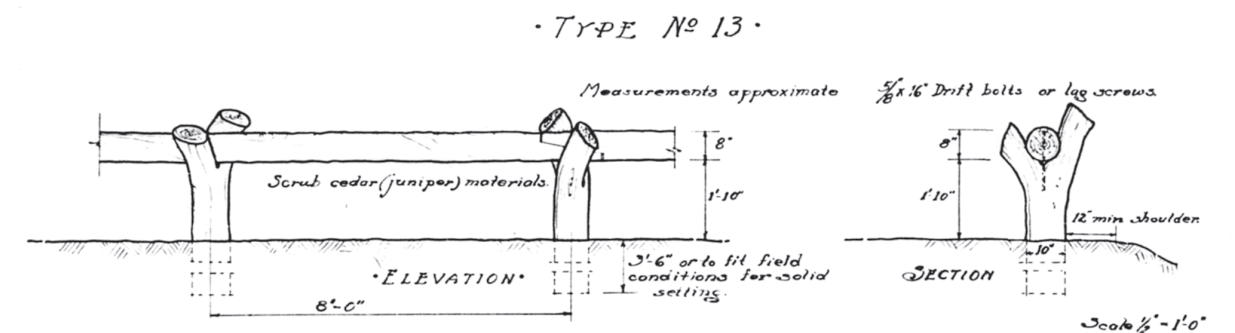
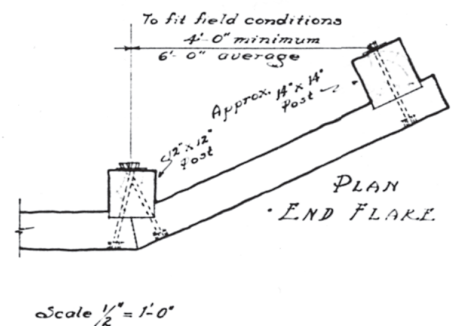
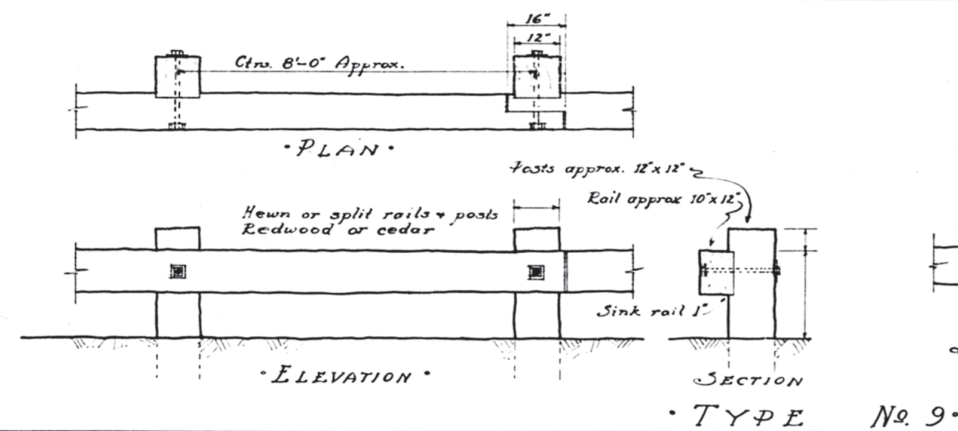
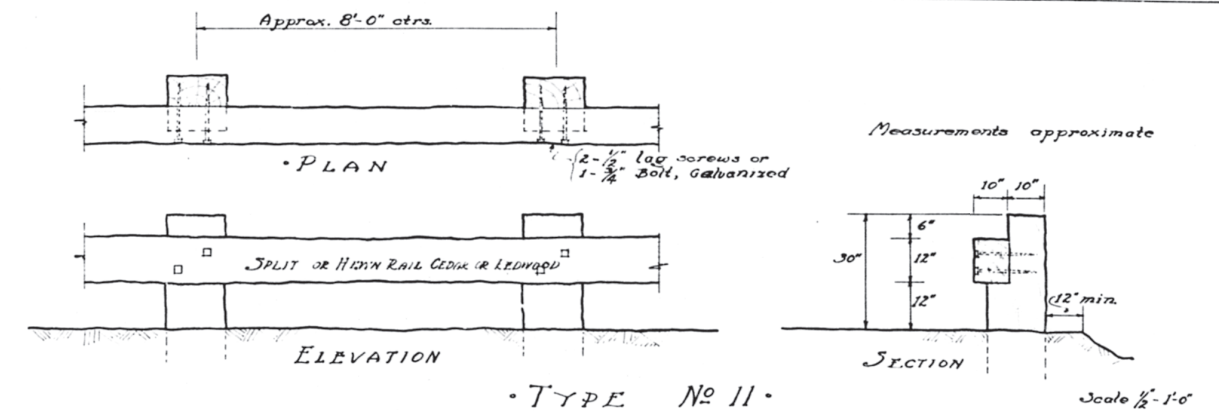
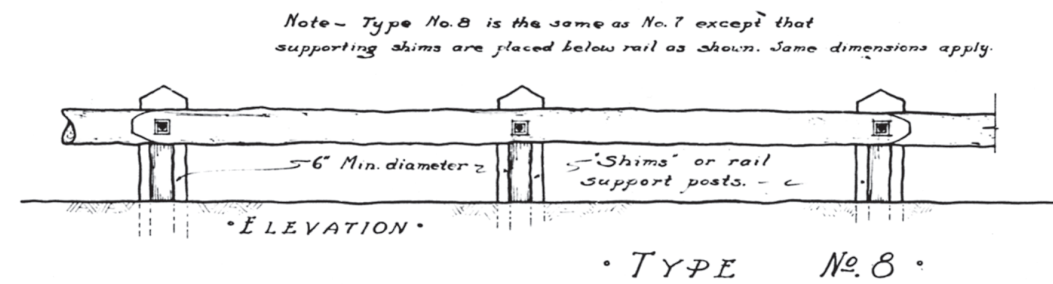
DEPARTMENT OF THE INTERIOR - NATIONAL PARK SERVICE
STONE GUARDRAIL TYPES
• NATIONAL PARK ROAD PROJECTS •
Designed by Landscape Division

Date 7/20/29
Dn. by E.A.D.
Tr. by W.E.M.
Ck. by



Note: All hardware to be galvanized. Depth of posts in ground to be as required to fit field conditions.

All scales 1/2" = 1'-0"



HALF-SIZE REPRODUCTION

This is a reference sheet superseding all of previous data. Guardrail type for any road will be selected and authorized for use by letter referring to above type and section numbers.

Date Dec 14, 1939 Chief Landscape Architect

DEPARTMENT OF THE INTERIOR. NATIONAL PARK SERVICE

WOOD GUARDRAIL TYPES

NATIONAL PARK ROAD PROJECTS

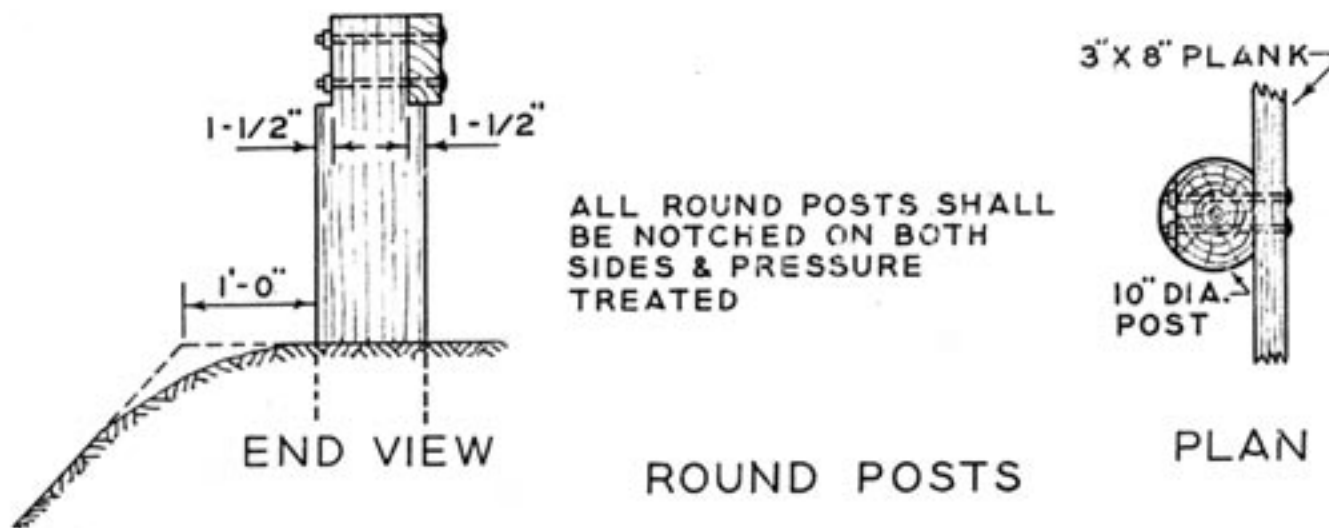
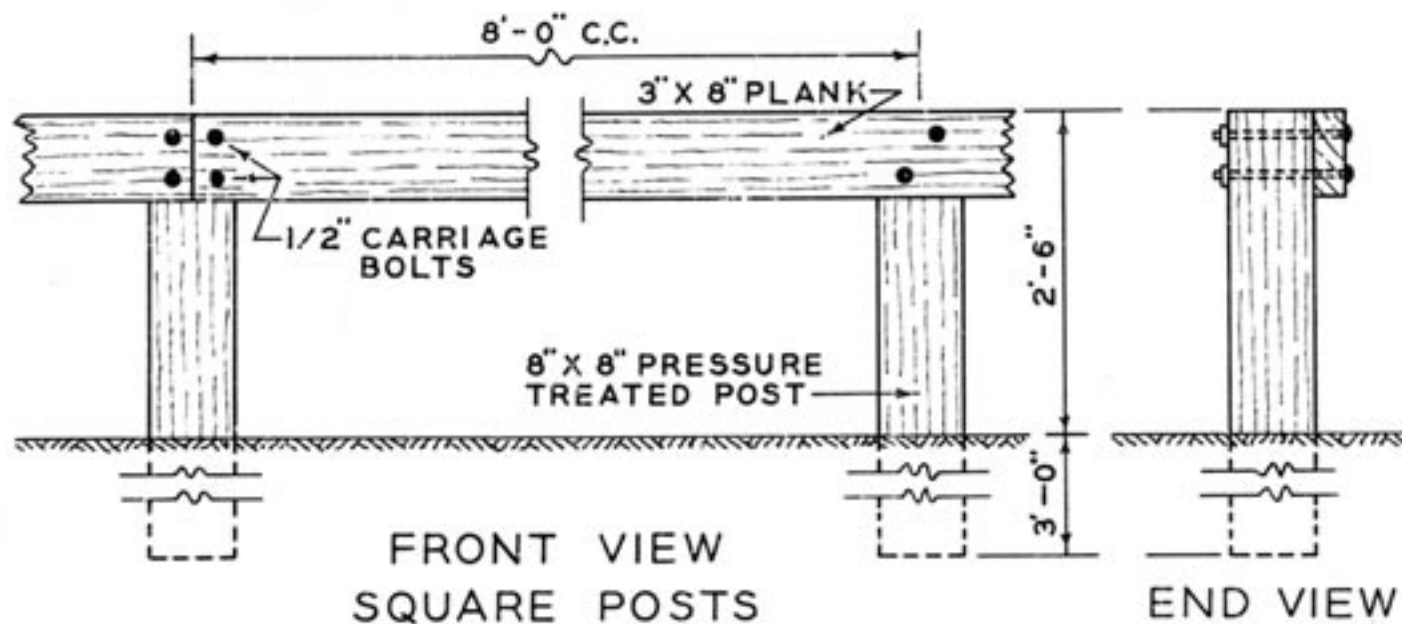
Designed by Landscape Division

Date 10/2/39

Dr. by E.A.D.

Tr. by H.E.M.

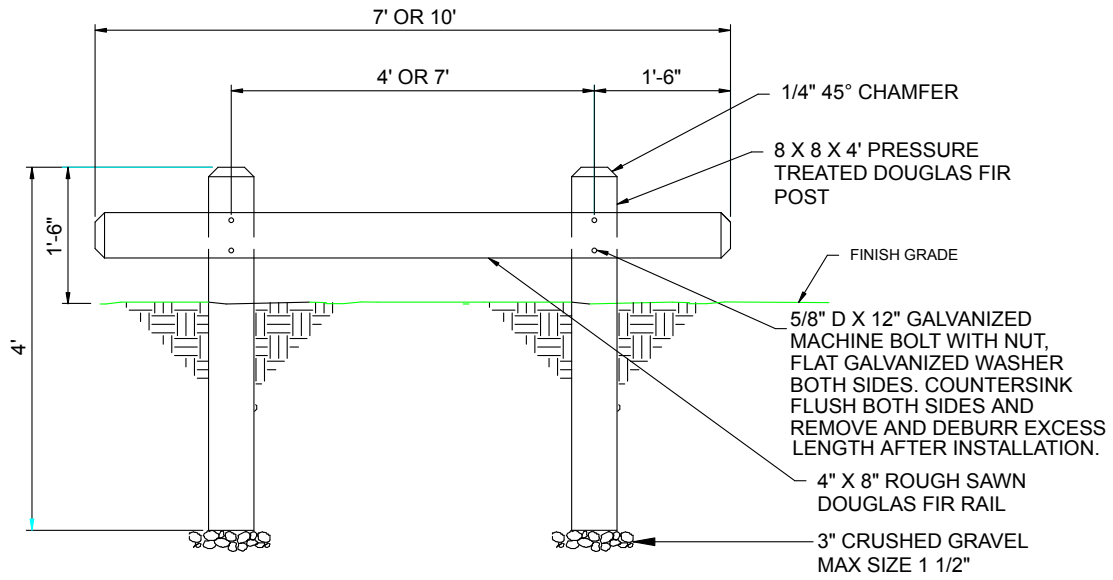
Sheet 1 of 2 sheets



WOOD GUARD RAIL

SIZE 8 X 10%

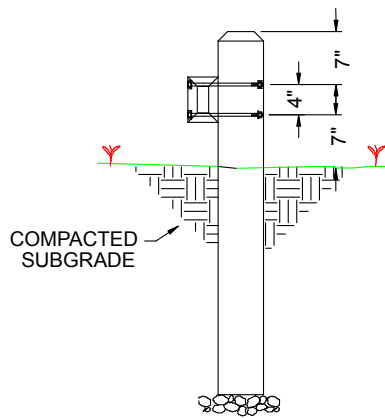
971/R-151



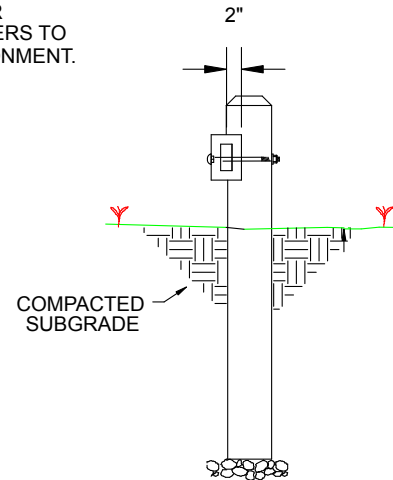
FRONT ELEVATION

NOTES:

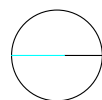
OPTIONAL 8"-10" POLE. NOTCH POLE 3" TO FIT POST. 1 1/4" 45° CHAMFER ON ENDS. STAIN ALL WOOD MEMBERS TO MATCH DESIGN THEME OR ENVIRONMENT.



RIGHT ELEVATION



OPTIONAL ATTACHMENT



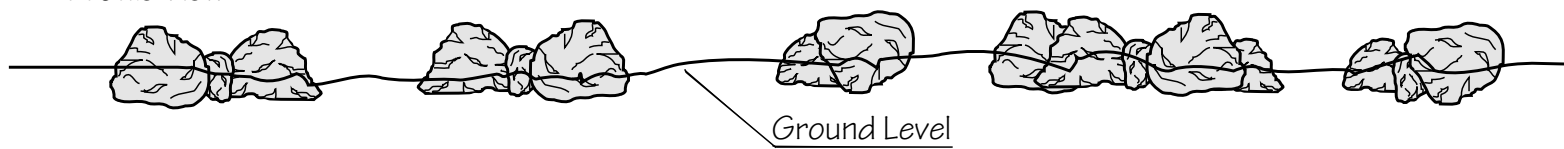
WOOD RAIL BARRIER



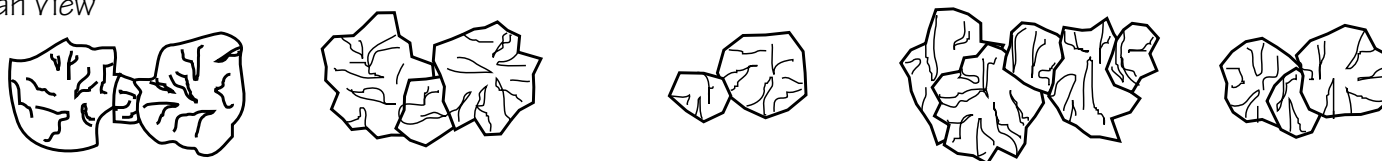
LARGE

ROCKS

Profile View



Plan View



Rock Barriers

DEFINITIONS

DEFINITIONS

Recreation Opportunity Spectrum (ROS) classification

The USDA Forest Service uses the Recreation Opportunity Spectrum (ROS) to inventory and classify National Forest System lands. The range of recreational experiences, opportunities, and settings available on a given area of land is classified through the ROS. Classifications include: Primitive, Semiprimitive-Nonmotorized, Semiprimitive-Motorized, Roaded Natural, Rural, and Urban. The USDA Forest Service typically plans and manages for recreational experiences through the application of the ROS. The ROS is a framework for inventorying, planning, and managing the recreational experience and setting.

The public perceives recreation as more than just camping, fishing, and hiking. Research has shown that people choose a specific setting for each of these activities in order to realize a desired set of experiences. For example, hiking on a natural-surfaced trail in a remote setting with few facilities may offer some visitors a sense of solitude, challenge, and self-reliance. In contrast, a hard-surfaced, interpretive, loop trail in an area with facilities and amenities may offer more comfort, security, and social opportunities for other visitors. Maintaining a spectrum of these classes is very important to provide people with choices. See

<http://216.239.63.104/search?q=cache:RxHC6Zilu8YJ:www.fs.fed.us/mntp/plan/LRMP-D.pdf+recreation+opportunity+spectrum&hl=en>.

Built Environment Image Guide (BEIG)

The built environment, as used in this publication, refers to the administrative and recreation buildings, landscape structures, site furnishings, structures on roads and trails, and signs installed or operated by the USDA Forest Service, its cooperators, and permittees.

The elements of the built environment constructed on national forest lands and grasslands, or those used for administrative purposes in rural areas, towns, and cities, shall—to the extent practicable—incorporate the principles of sustainability, reflect their place within the natural and cultural landscape, and provide optimal service to our customers and cooperators. These elements will:

- Be located, planned, and designed with respect for the natural systems in which they reside
- Aesthetically integrate their natural, cultural, and experiential context
- Contain design elements, including appropriate signs that reinforce a national agency identity
- Emphasize efficiency of energy and materials consumption in construction and operation
- Serve as premier examples to interpret conservation of natural resources and sustainable development
- Create environments for people to enjoy and gain increased appreciation for the natural environment and in which employees work productively, experiencing the connection to the resources they manage

In so doing, the USDA Forest Service built environment will strengthen and reinforce the image of the agency as an international conservation leader. See

http://fsweb/beig/BEIG_Training/default.htm.

WEB SITES

U.S. Department of Agriculture, Forest Service, Missoula Technology and Development Center. 2003. Sign installation guide.

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(Scroll down to Field Implementation, click on ATM Signing.) (26 May 2006).

U.S. Department of Agriculture, Forest Service. 2002. Midewin national tallgrass prairie.

<http://www.fs.fed.us/mntp/plan/index.htm>.

(Scroll down to Prairie Plan, appendixes, D – Recreation Opportunity Spectrum.) (26 May 2006).

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(See chapter 6 for specifics using the “Road Closed” sign.)

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http://www.de.nrcs.usda.gov/technical/technical_references/engineering/eng_drawings.html.

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<http://mutcd.fhwa.dot.gov/>.

(26 May 2006).

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Southwest Region,
Trails Unlimited Enterprise Unit.

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<http://fsweb.sdtcd.wo.fs.fed.us/>.

APPENDIX A

TRAIL OHV-WIDTH LIMITER GATE AND NONMOTORIZED TRAIL BARRIERS

by Don Trammell, USDA Forest Service
Trails Unlimited Enterprise Unit

Use these barriers to narrow the width of a trail, thus limiting the type of off-highway vehicle (OHV) allowed on the trail (i.e., keep all-terrain vehicles (ATVs) off motorcycle-only trails) or as a barrier to OHVs on hiking and horse trails.

Trail OHV-width limiter and nonmotorized trail barrier structures can be assembled in several configurations to meet many trail management objectives. Prefabricate the components and then transport them to the installation site for assembly. Depending on the chosen structure, there may be no welding to do in the field. Prefabrication and no field welding are distinct advantages in remote locations.

Consider sight distance (particularly important on higher speed OHV trails) when locating a structure. Install barriers on a level or near level section of trail and provide a turn around area for excluded uses. In addition to making it easier to install the structure, level ground will minimize the impacts of braking and acceleration on the trail segments on each side of the structure. Tie barriers and gates to a fence or a substantial natural feature to prevent people from riding around them. Barriers are less likely to be vandalized in easily viewed locations, such as along side roads.

The left and right halves of the structure are identical in design with the exception of a plate attached to the right half (approach side). Attach a trail-use designation sign to the plate. Use reflective, stick-on signs to designate trail use. (See appendix B for sign requirements.)

Materials

Use 3-inch schedule 40 black iron pipe as a minimum. Corten tubing of similar dimensions also may be used to extend the lifespan of the structure. For either esthetics or in areas of high vandalism, use larger diameter pipe, schedule 80 pipe, or a combination of both. Use continuous welds on all joints and, to prevent a safety hazard, grind down all rough or jagged surfaces. Do not paint the gate; painting creates a long-term maintenance commitment. If the structure is painted, ensure that it contrasts with the background colors of the site so the barrier remains visible.

Use a cross-bar to close the trail to all uses (wet weather, fire danger, and so forth.) (See figure A1.) Slot the interior posts to accommodate a 3-inch by 1/2-inch bar approximately 30 inches above the ground line. Slot the exterior post on one side to accommodate the closure bar when the trail is open. The closure bar must be able to be locked in both the open and closed positions for safety reasons.



Figure A1. This width-limiter gate is closed to all traffic. The sides of the gate are attached to a wire fence.

Weld loops to the exterior posts (furthest from the trail centerline) and attach a wire fence to prevent users from going around the barrier. Chain links cut in half and welded to the post make excellent loops. Space loops every 4 inches to accommodate various fencing needs. Ensure that these loops do not have square edges so they do not cut the wire.

Anchoring posts makes them more difficult for vandals to remove. Drill 3/4-inch holes through the interior and exterior posts at 3 inches and at 6 inches from the bottom of the posts. The holes should go completely through the posts and be offset 90 degrees from each other. Insert pieces of rebar through holes for post anchors.

Nonmotorized Trail Barrier (Stock Gate)

There are four variations that change this gate from a width limiter gate to an OHV barrier. The base structure can be a width-limiter gate or a simple steel rail fence, as shown in the photographs. The variations allow pedestrians and stock to pass over a barrier. Contrast is especially important for visibility if the barrier is used as an OHV barrier and livestock will have to step over the cross-barrier. Place Type 3 object markers or reflective warning tape (red and white stripes) on the structure to warn vehicle users of the barrier's presence. To promote safe passage, post an informational sign that suggests leading (rather than riding) livestock through the structure.

Variation One

Insert a pipe cross-barrier approximately 16 inches above the ground to create a single

horizontal barrier. (An OHV must be lifted over the bar to gain access.) To create this barrier, cut a hole through interior (closest to the trail centerline) posts and insert the next smaller diameter pipe, forming a cross-barrier. This cross-barrier should fit snugly and not be able to be removed once the structure is buried or cemented in the ground. Ensure that the cross-barrier pipe is long enough to span the trail width and still fit securely into the barrier's side pieces. Done properly, no welding of the cross piece is necessary.

Variation Two

The second variation adds a U-shaped barrier on both sides of the structure to form a horizontal box. Weld nipples to each side of the interior post parallel to the trail, approximately 16 inches above the ground. Each nipple should have an outside diameter sized to fit snugly into the pipe being used for the barrier portion. Fit the whole structure together before the side pieces are buried or cemented in the ground. No welding is necessary if a U-shaped barrier is used on both sides of the structure and the pieces are fitted together properly before being buried or cemented in the ground. If bolts are used to secure the U-shaped barrier pieces to the side pieces for additional strength, vertically insert the bolts to avoid creating a scraping hazard for users.

Construct a U-shaped barrier using a single bent tube for each side with one support leg, or using a welded 3-sided box with 2 support legs. The legs on the U-shaped barrier also should have rebar anchors.

APPENDIX A

Variation Three

The third variation adds one U-shaped barrier piece along with the cross barrier to crate a shorter box, however, welding is recommended when using this configuration to prevent the structure from being wiggled apart. This addition is to the front of the gate. (See figure A2.)



Figure A2.

Variation Four

The fourth variation adds the cross-barrier piece to the two U-shaped barrier pieces to form three horizontal barriers.

See drawings: Width-Limiter Gate 27 inches, Width-Limiter Gate 30 inches, and Nonmotorized Trail Barrier Gate.

OBJECT AND BARRIER MARKERS ON OHV ROUTES

By Don Trammell, USDA Forest Service
Trails Unlimited Enterprise Unit

If the route is a National Forest System (NFS) road, refer to EM-7100-15 Sign and Poster Guidelines for the Forest Service, Chapter 3A, Section 3A.8 – Markings. This section provides all necessary information to properly mark gates or other constructed features that are across, in, or adjacent to roads, and should be followed. (See figures B1 and B2.) Similar guidance for marking objects or barricades within or adjacent to motorized trails is contained in Chapter 5, Section 5.2.2 – Warning Signs and Markers. Mark both sides of all constructed features so they are visible to traffic from both directions. The minimum marking is subject to determination by a recreation study or review.



Figure B1. Striping points down toward the center of the road.



Figure B2. Shows striping on the back side of a double gate.

The following are the suggested minimum markings for constructed features or hazards on motorized NFS trails that intrude into the roadway, trailway, or a combination of both. Constructed features include width limiter gates, cattle guards, and gate posts that are within or immediately adjacent to the trail.

Mark objects with retroreflective yellow and black striped Type 3 object markers or with sheeting applied directly to the object or posts. Type 3 object markers and sheeting come in left and right applications. The stripes should slope down toward the side of the obstruction that traffic is to pass. Whenever possible, install markers approximately 4 feet above the ground. However, if the object is lower than 4 feet, priority should be given to marking the edge of the object closest to the center of the trail regardless of height. A retroreflective area approximately 3-inches wide and 18-inches long is the suggested minimum marking. If

APPENDIX B

the closest portion of the object is too low to be effectively marked, a flexible post with retroreflective markers should be installed in line with the obstacle. (See figure B3.)



Figure B3. Wrap the yellow and black sheeting around the pipe pointing to the center of the trail.

If a trail is restricted by a gate or a closure bar, mark the prominent horizontal barrier closest to 4 feet above the ground with retroreflective red and white striped barricade markers or sheeting. At a minimum, two barricade markers, a left-hand and a right-hand marker, should be used on the restriction device with the stripes pointing toward the center of the barrier. The suggested minimum marking area is approximately 3-inches wide by 3-feet long. Mark the horizontal barricades of an off-highway vehicle barrier in the same manner. (See figures B4 and B5.)



Figure B4. Use retroreflective red and white sheeting to highlight closure bar across trail.



Figure B5. OHV barricade at equestrian gate. (There is no trail in this area.)

Mark gate posts, culvert ends, cattle guard ends, drop offs, and other objects or obstacles located off the trail to warn users a potential hazard. Use retroreflective yellow Type 2 object markers or sheeting. The suggested minimum marking area is approximately 3-inches wide and 6-inches long. (See figure B6.)



Figure B6. Post marked with 6-inch-long yellow sheeting.

Wherever a restriction device is installed, in addition to the standard barrier and object markings, a sign clarifying the restriction also is recommended. The appropriate access travel management sign should be used. (See EM-7100-15, Chapter 6, Travel Management Signing, at

http://fsweb.wo.fs.fed.us/eng/roads_trails/signs_os/index.htm.

Figures B7 through B11 show the process for applying the sheeting to existing steel structures.



Figure B9. Measure and cut sheeting to correct size to assure proper fit.



Figure B7. Sand the metal surface to remove rust and prepare a clean and smooth surface.



Figure B10. Note, remove backing slowly while pressing sheeting into place to avoid wrinkles.



Figure B8. Clean residue off the surface using a quick drying degreaser/cleaner such as brake parts cleaner. Follow manufacturer's directions for use.



Figure B11. Apply sheeting to both sides of the barricade.

