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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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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.sdtc.wo.fs.fed.us/>.

These barriers do not take the place of high-way 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.

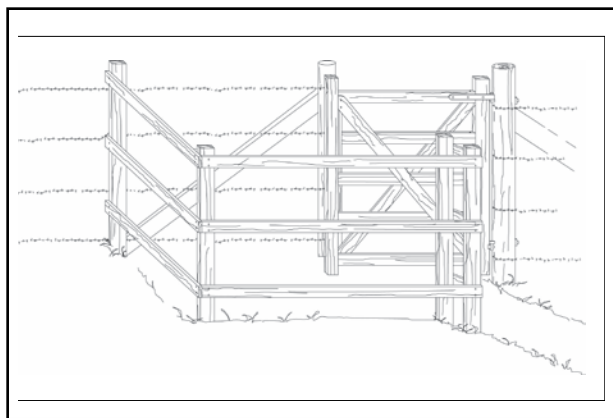


Figure 16. Schematic of kissing gate—designed to allow wheelchair access while blocking ATV access.

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 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-foot 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.

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

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.

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 or used steel well casings.

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

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.



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.



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.

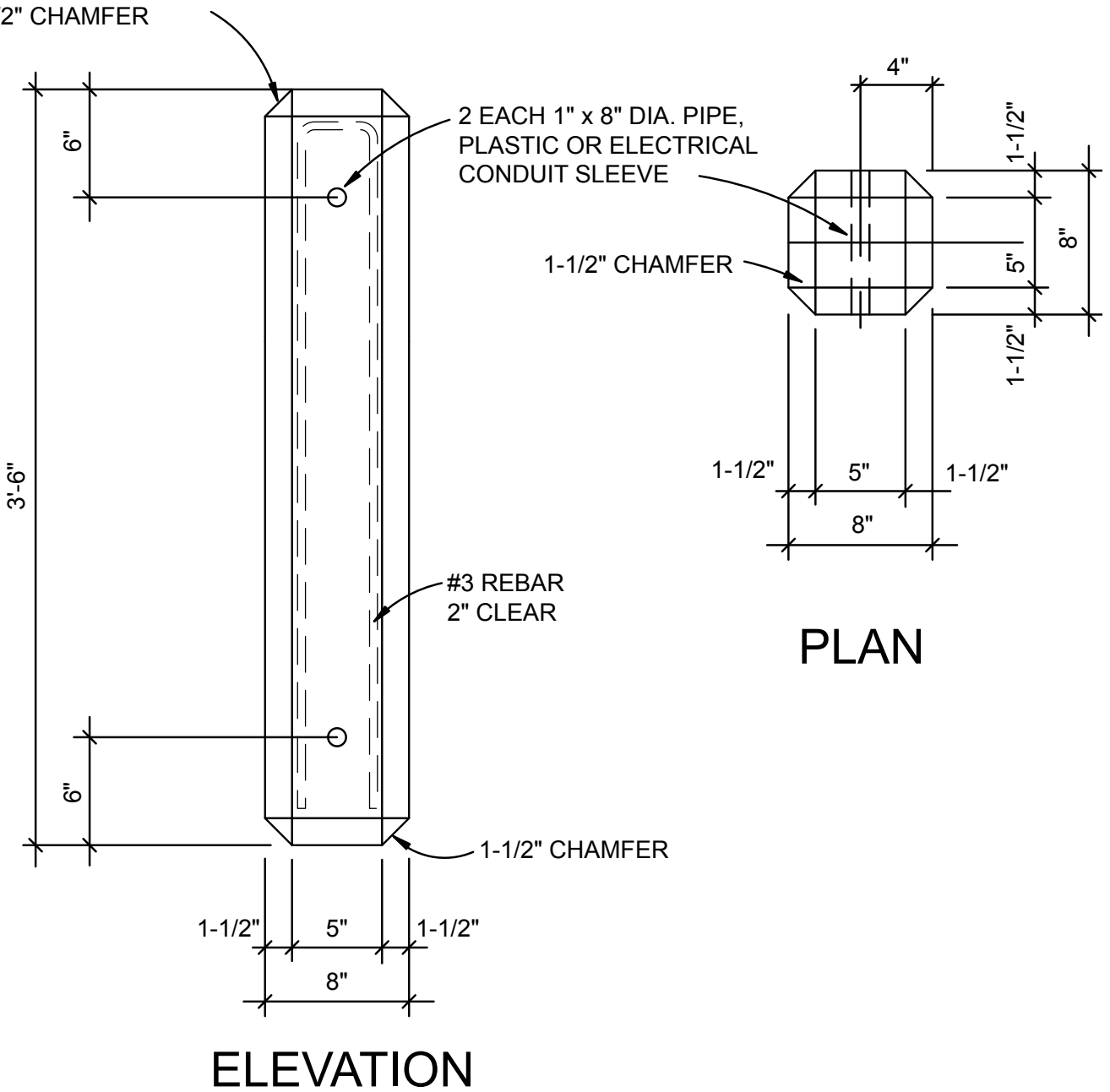
Construction Drawings

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

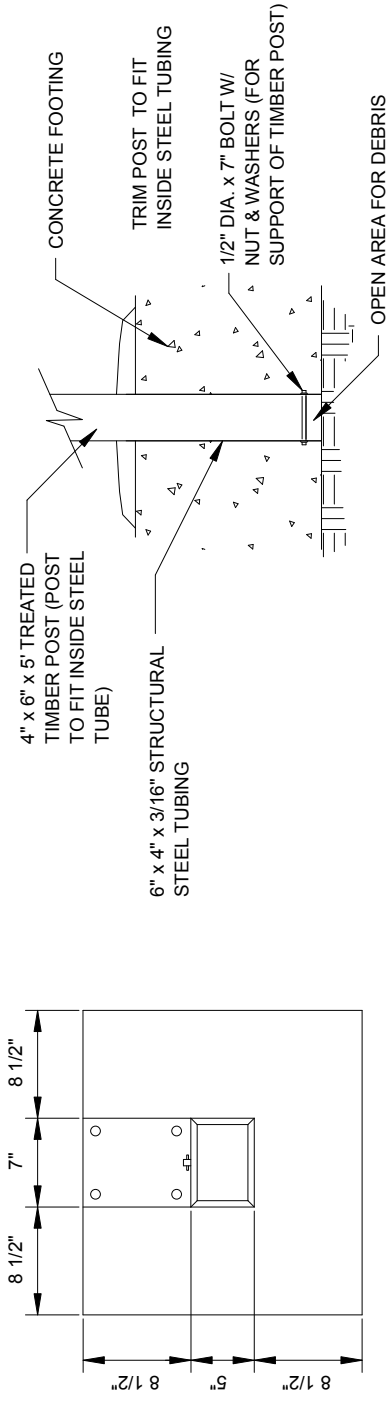
1-1/2" CHAMFER



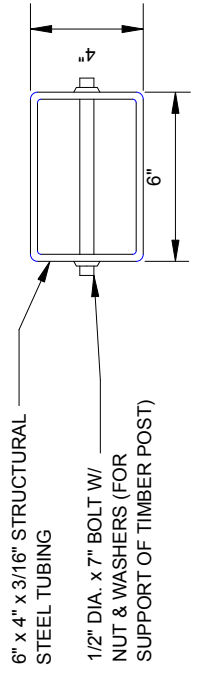
ELEVATION

PLAN

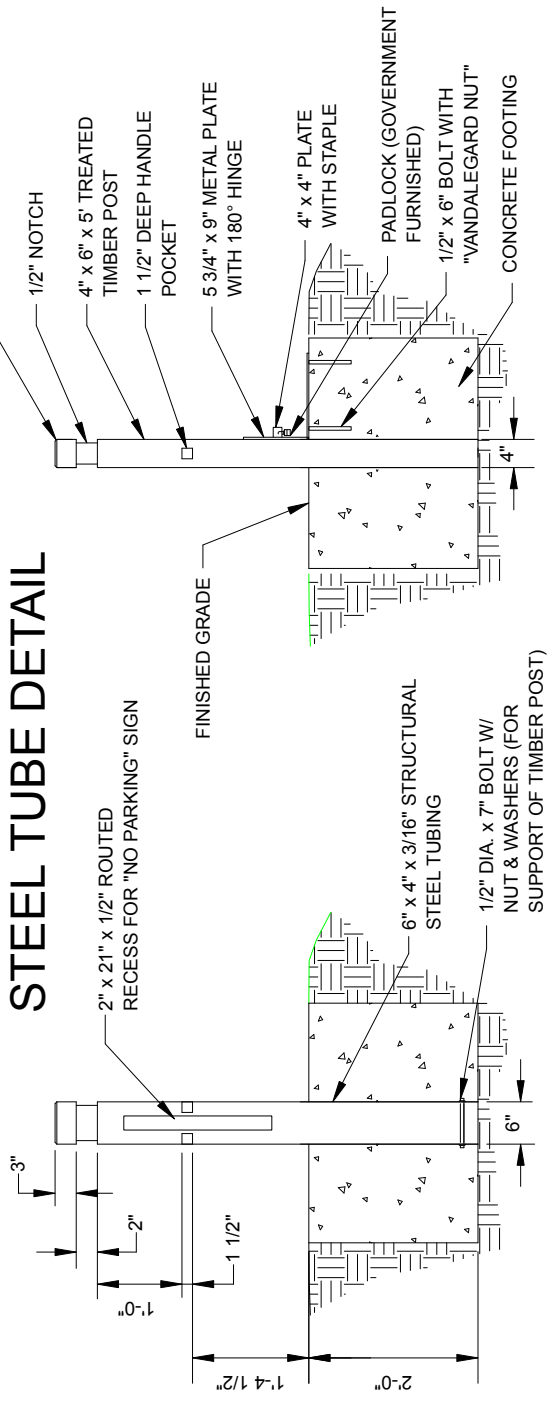
PRECAST CONCRETE POST



STEEL SLEEVE DETAIL

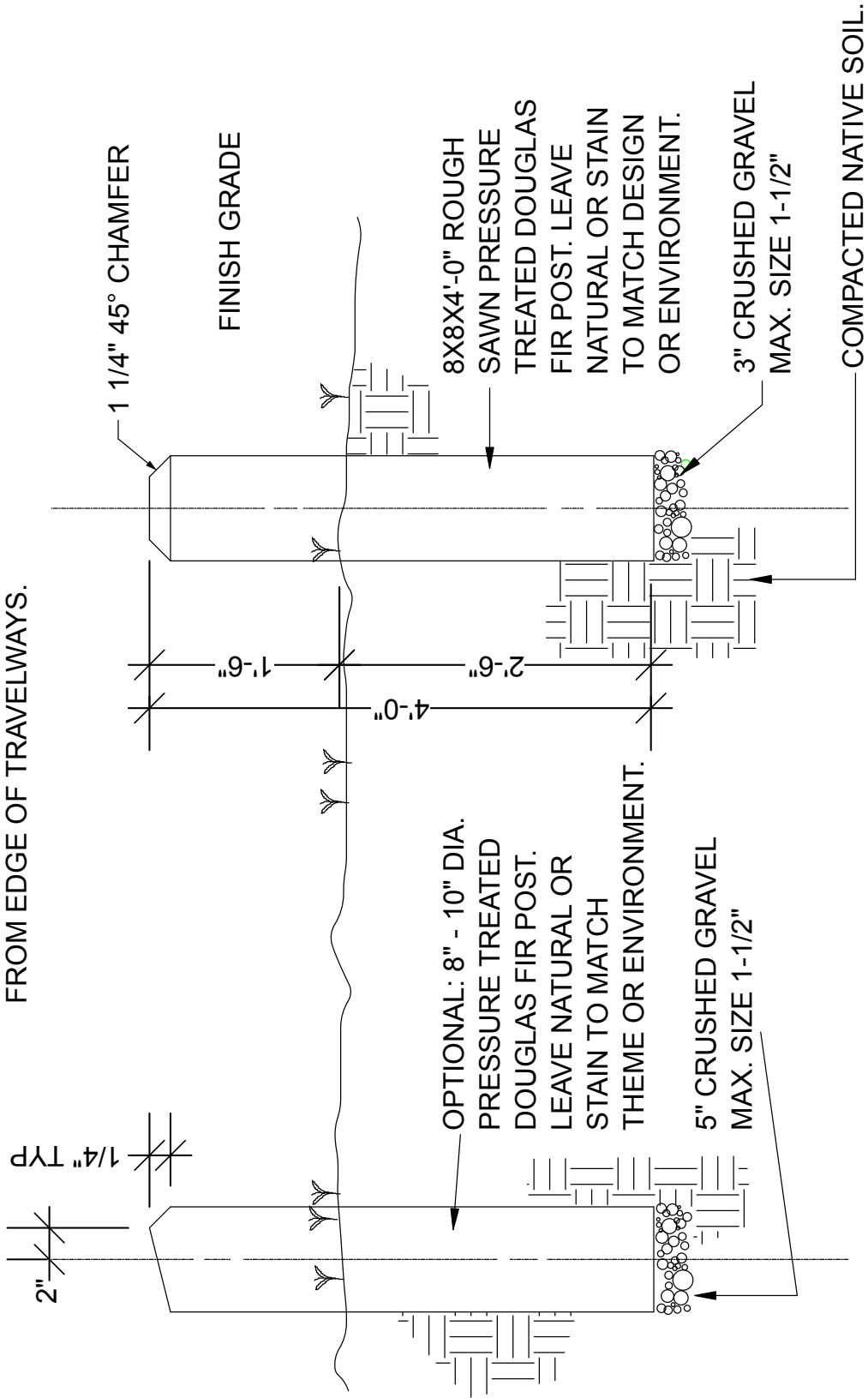


STEEL TUBE DETAIL



NOTES:

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

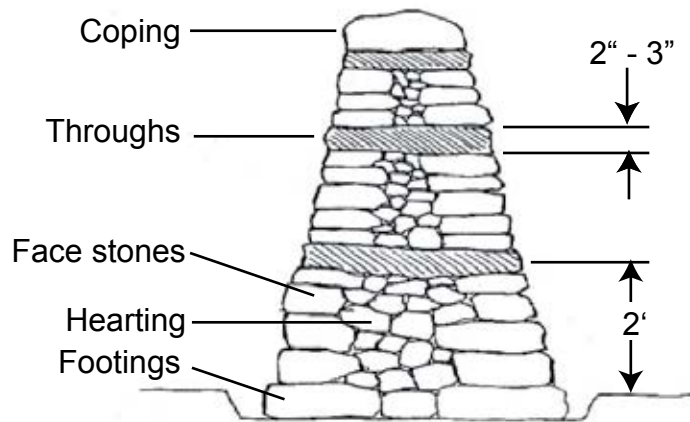


WOOD POST OR BOLLARD

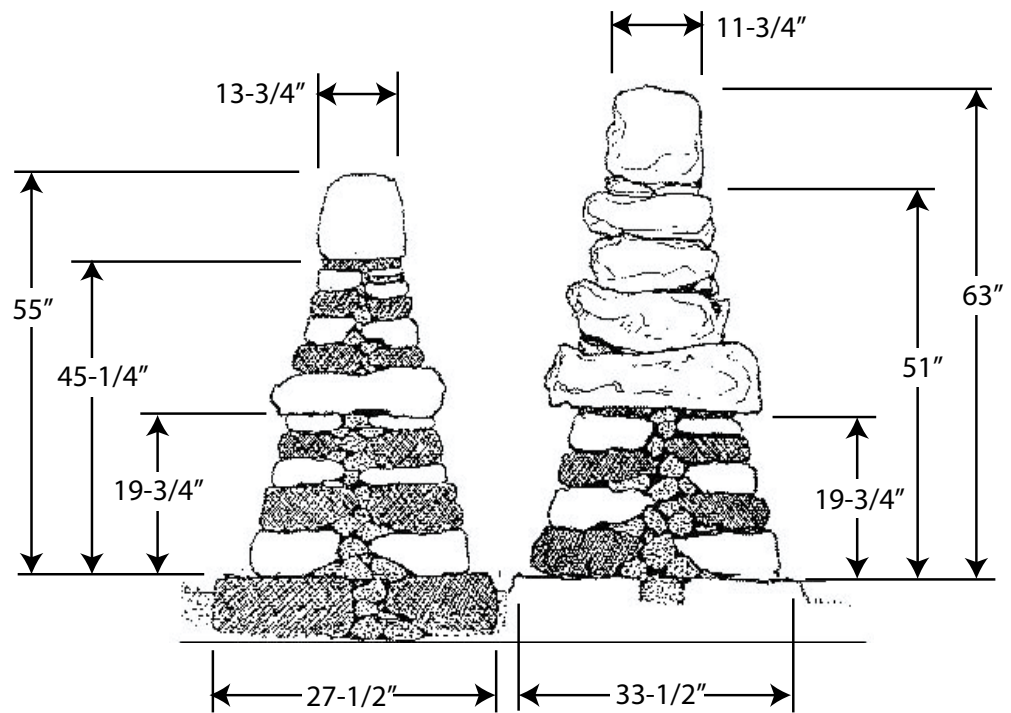
SMCZMF

Fieldstone Fence Examples

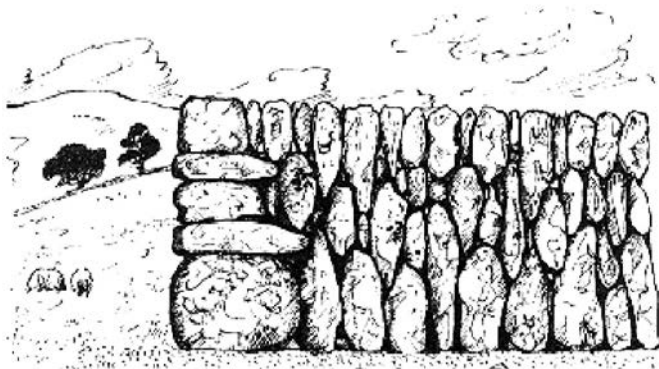
These drawings were made available by the Drystone Conservancy. Specifications for these walls are available in leaflets at: http://www.dswa.org.uk/Publication_frames_page.htm. In the United States these types of walls are referred to as fieldstone fences.



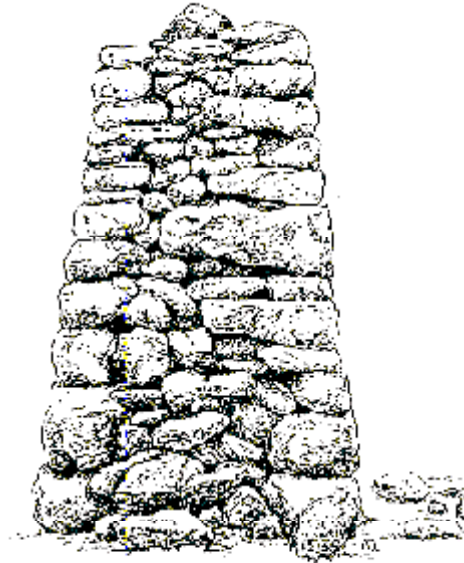
Bottom width 1'-8" to 3"
depending on type of stone.



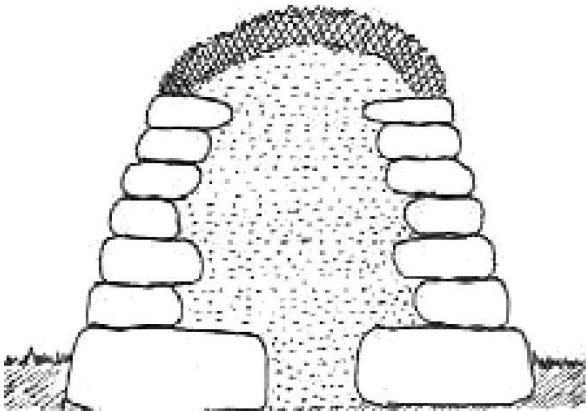
Standard Walls



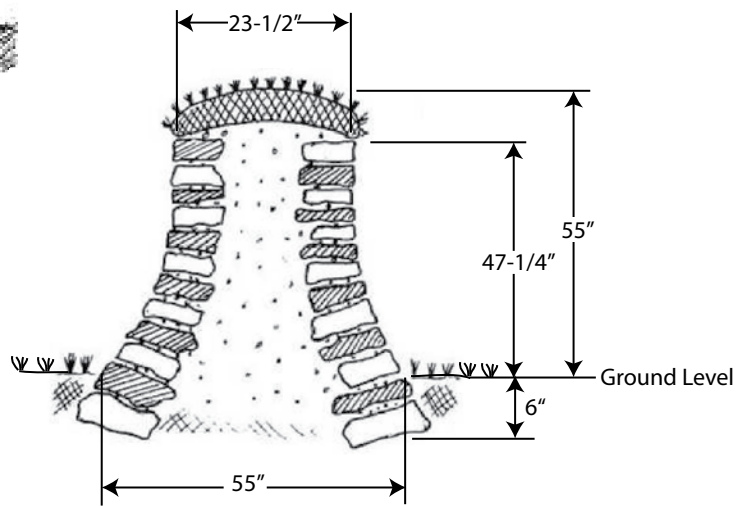
Single Wall



Cotswold Wall



Clawdd Wall

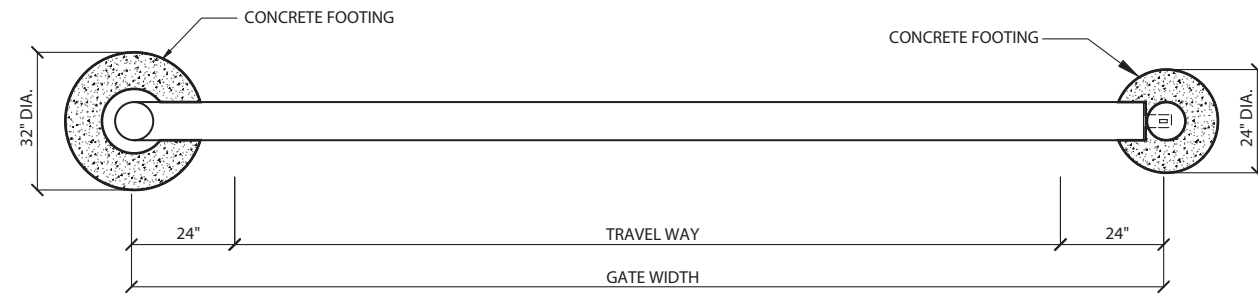


Cornish Hedge

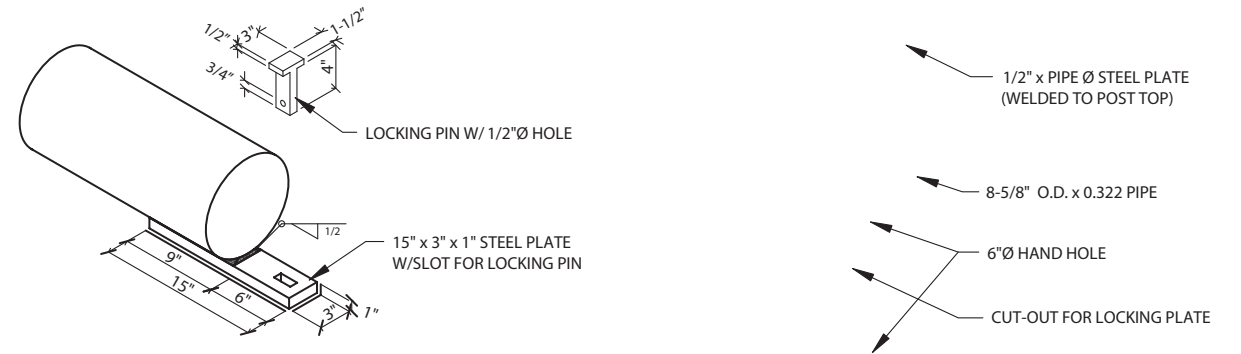
A vertical decorative border on the right side of the page, consisting of alternating diagonal stripes of yellow and black.

**G
A
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S**

NOTE: LOCKING POSTS, ONE EACH, WILL BE REQUIRED AT THE OPEN AND CLOSED POSITIONS OF THE GATE

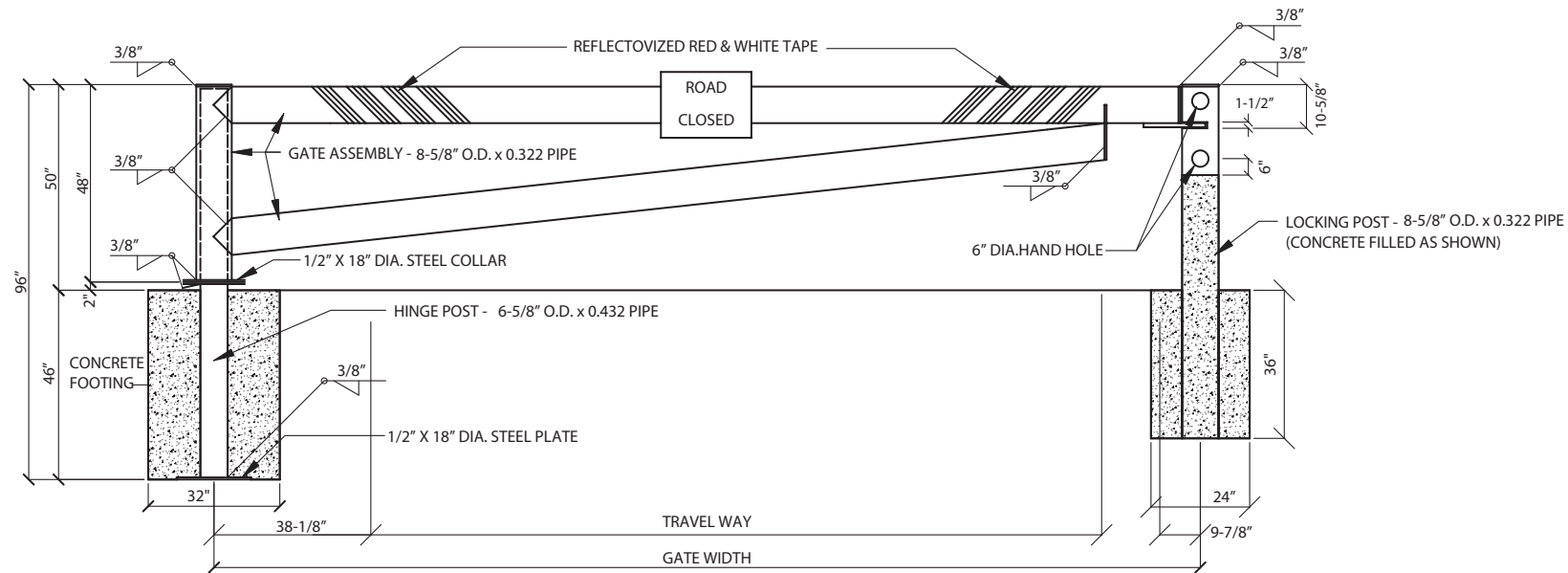


1 PLAN VIEW
Not to Scale

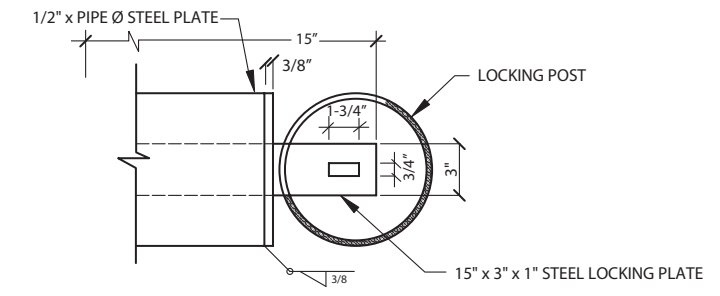


4 ISOMETRIC-LOCKING SYSTEM
Not to Scale

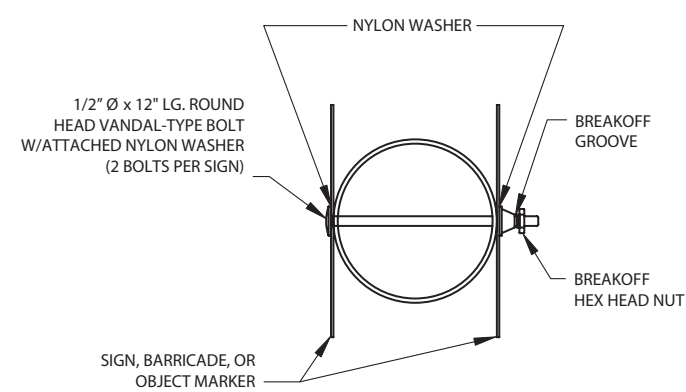
8 ISOMETRIC-LOCKING POST
Not to Scale



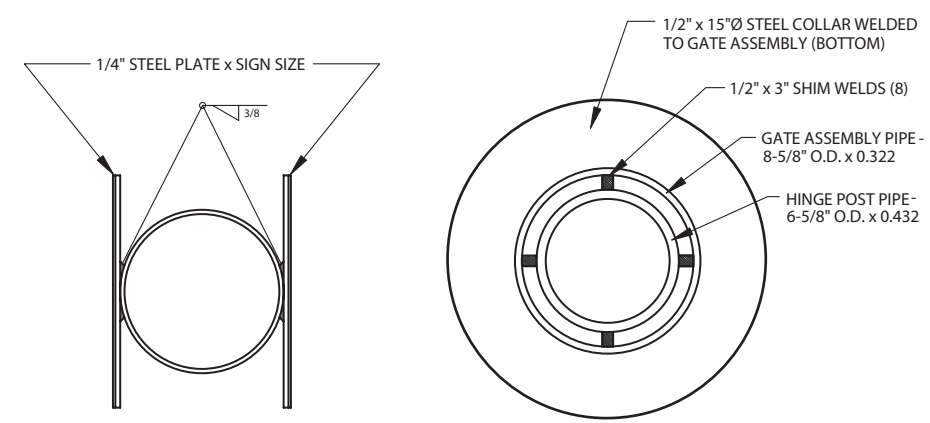
2 ELEVATION
Not to Scale



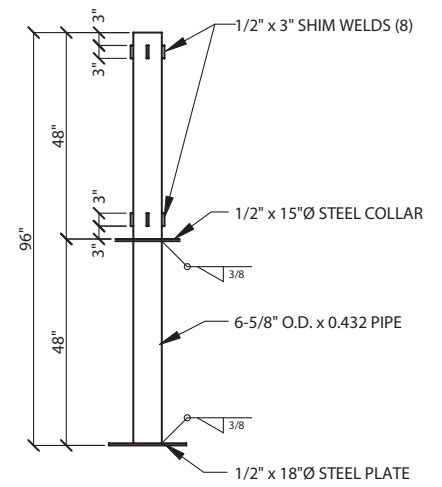
5 SECTION THRU LOCKING POST
Not to Scale



3 DETAILS-GATE ATTACHMENTS
Not to Scale



6 SECTION @ HINGE POST
Not to Scale



7 DETAIL-HINGE POST
Not to Scale

- NOTES:
- PIPE SHALL MEET THE REQUIREMENTS OF ASTM A 53, GRADE B. PIPE SIZE SHALL BE AS SHOWN ON THE DRAWINGS
 - CONCRETE SHALL BE IN ACCORDANCE WITH THE REQUIREMENTS OF SPECIFICATION SECTION 601.
 - GATE AND LOCKING POSTS SHALL BE PRIMED (1 COAT) AND PAINTED (2 COATS), COLOR WHITE, IN ACCORDANCE WITH SECTION 708-PAINT AFTER FABRICATION.

U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE
ANGELES NATIONAL FOREST

DESIGNED	TITLE	DATE
DRAWN	CHECKED	DATE
TECHNICAL APPROVAL		
BY	TITLE	DATE
BY	TITLE	DATE

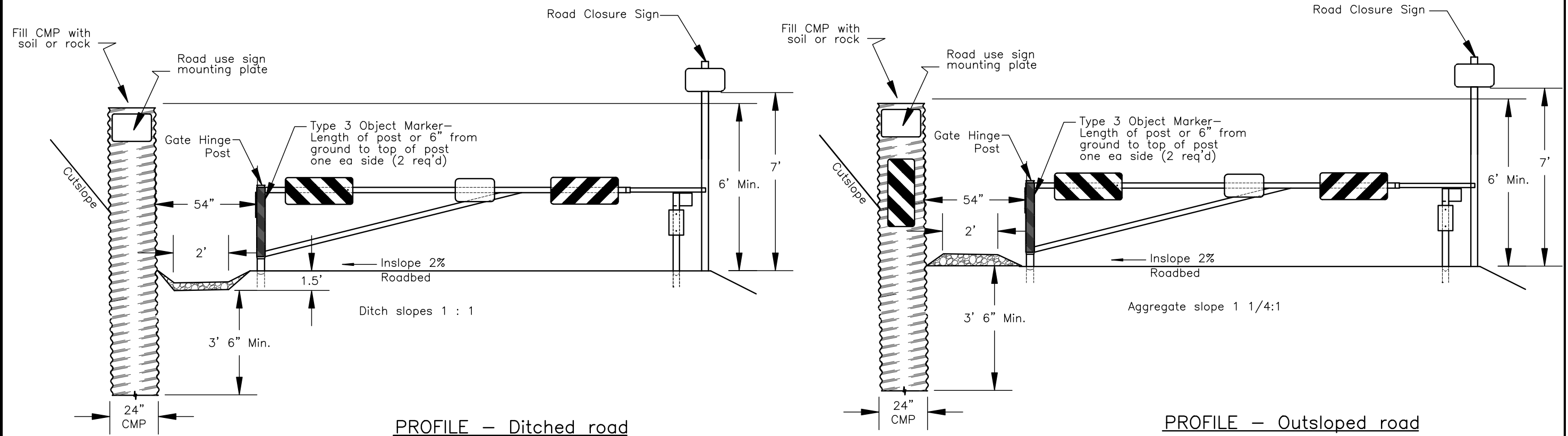
CROWN COMPLEX ROAD REHABILITATION
ROAD CLOSURE GATE DETAILS

CONTROL NO.	REV.	DATE
SHEET	6.7	

Gate Installation Typical

GENERAL NOTES:

1. Surface bypass 20' each side of barrier with 6" crushed aggregate.
2. Remove any burrs or sharp edges on top end of culvert.
3. Place type 3 object markers on both sides of gate hinge post. Apply according to MUTCD, FS EM7100-15.
4. Fill culvert and overfill for future settlement with material from excavation or adjacent cutbank.
5. Install road use mounting plate facing closure.



No Scale

GATE BYPASS SHT 1A

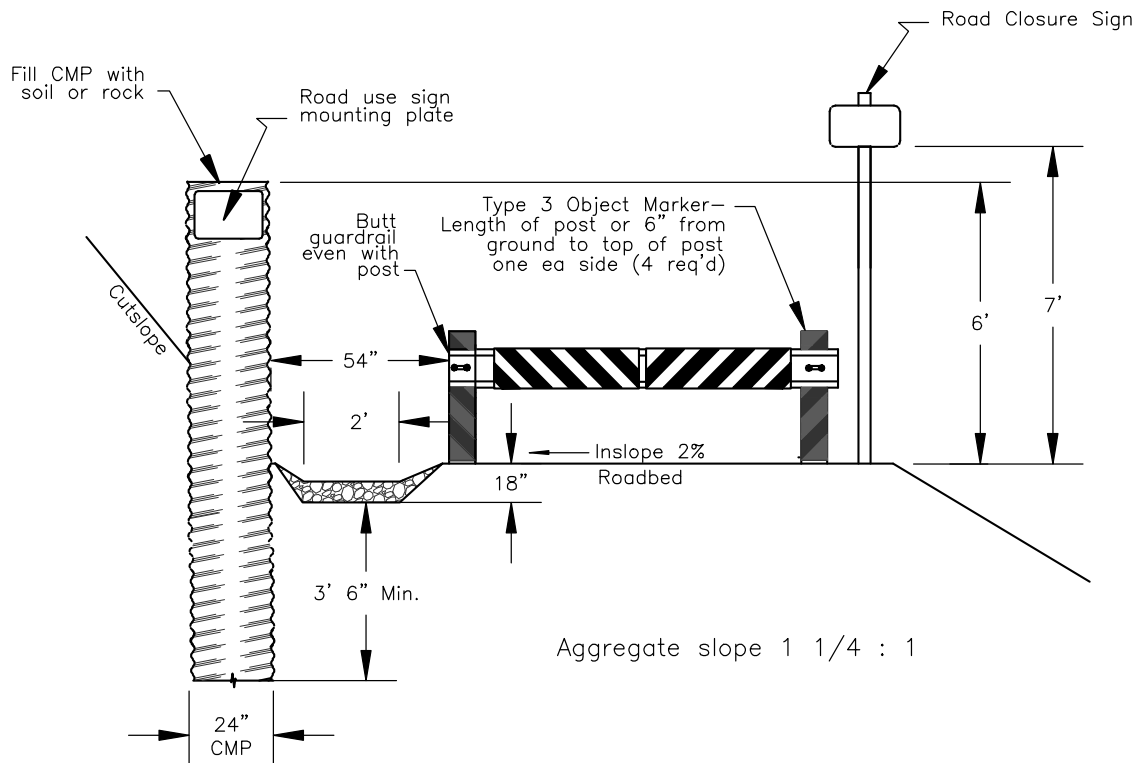
Guardrail Installation Typical

Timber Sale

Closure to Use By Others, C5.419#

GENERAL NOTES:

1. Surface bypass 20' each side of barrier with 6" crushed aggregate.
2. Remove any burrs or sharp edges on top end of culvert.
3. Place type 3 object markers on both sides of gate hinge post. Apply according to MUTCD, FS EM7100-15.
4. Fill culvert and overfill for future settlement with material from excavation or adjacent cutbank.
5. Install road use mounting plate facing closure.



PROFILE — Ditched road

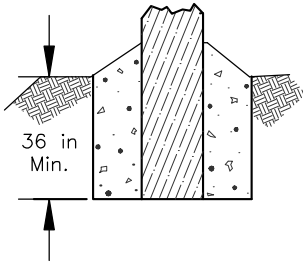
No Scale

Gate Bypass Sht 1B

Guardrail Barrier Detail

Timber Sale

Closure to Use By Others, C5.419#

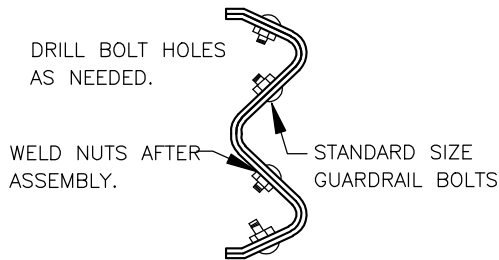


18 in. MIN. DIA.
HOLE EXCAVATED
FOR POST.
BACKFILL ENTIRELY
WITH NATIVE MATERIAL

GENERAL NOTES:

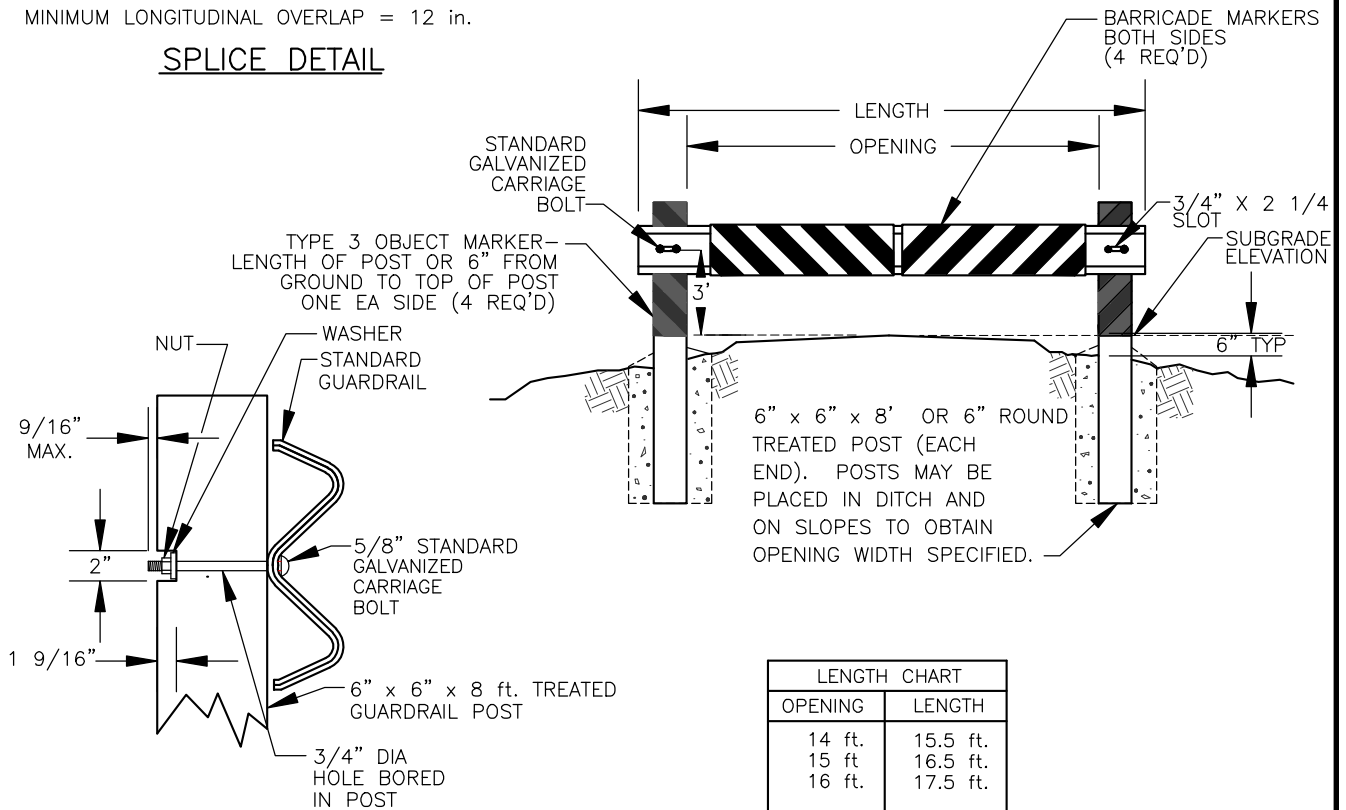
1. Posts shall be dressed, rough or worked lumber, conforming to the requirements of AASHTO designation M-168-84. Post shall be structural grade No. 2 or better, when graded according to current rules of either the West Coast Lumber Inspection Bureau or Western Wood Products Association. Posts shall be treated in accordance with AWPA C-2 using one of the following:
 - A. Water born preservatives per AWPA Standard P5 to a retention of 6 kg/m³.
 - B. Pentachlorophenol meeting AWPA P-8 using an AWPA P-9 type A solvent to a retention of 6 kg/m³.
 - C. Cresote meeting AWPA P1/P13 to a retention of 130 kg/m³.
2. Drawings not to scale.
3. Barriers shall be located as shown in C5.419#.
4. Guardrail shall 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. Barricade Markers shall be bolted on guardrail with nuts welded to prevent loosening.
5. Type 3 Object Markers & Barricade Markers shall be according to MUTCD, FS EM7100-15.

POST BACKFILL DETAIL



MINIMUM LONGITUDINAL OVERLAP = 12 in.

SPLICE DETAIL



LENGTH CHART	
OPENING	LENGTH
14 ft.	15.5 ft.
15 ft.	16.5 ft.
16 ft.	17.5 ft.

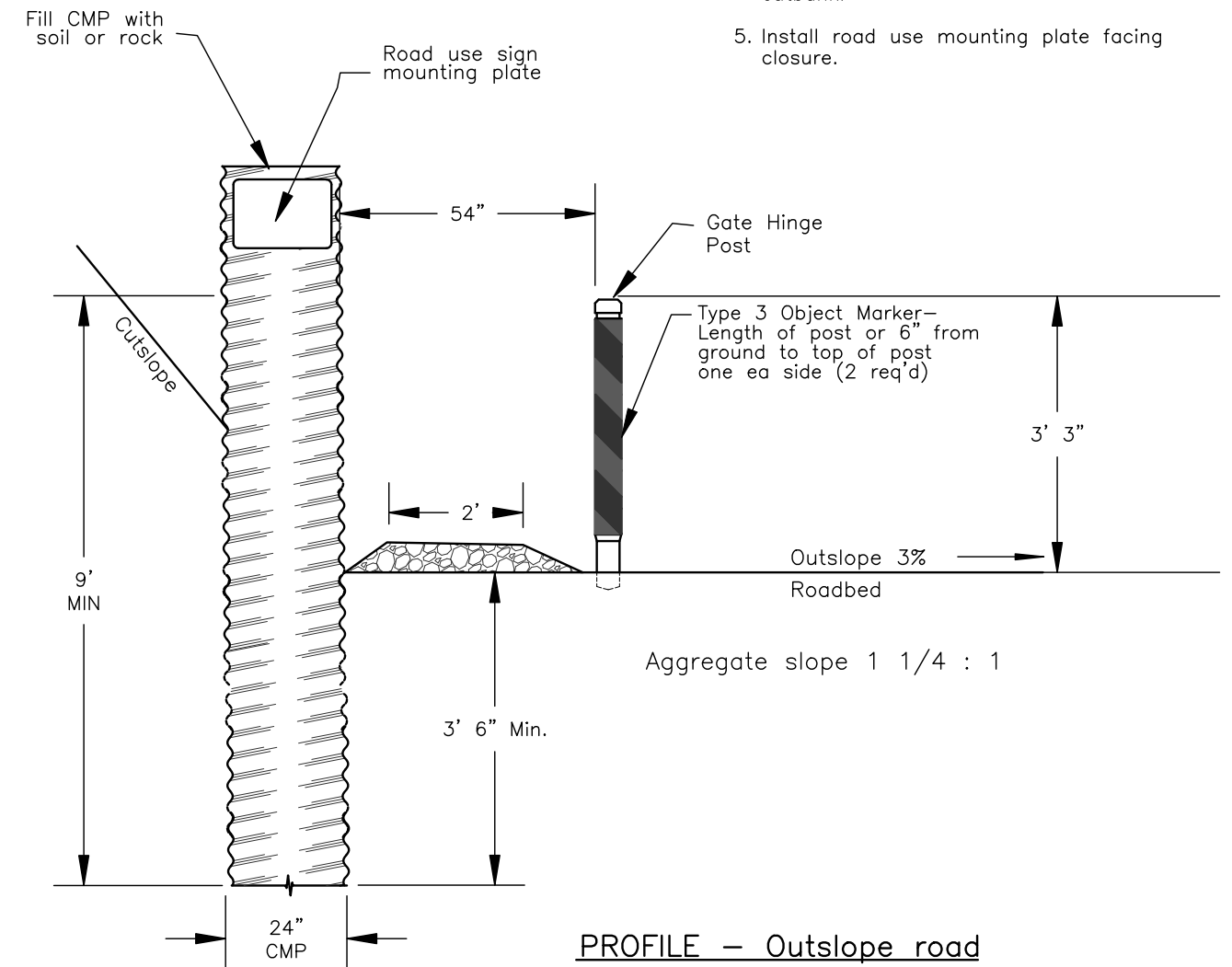
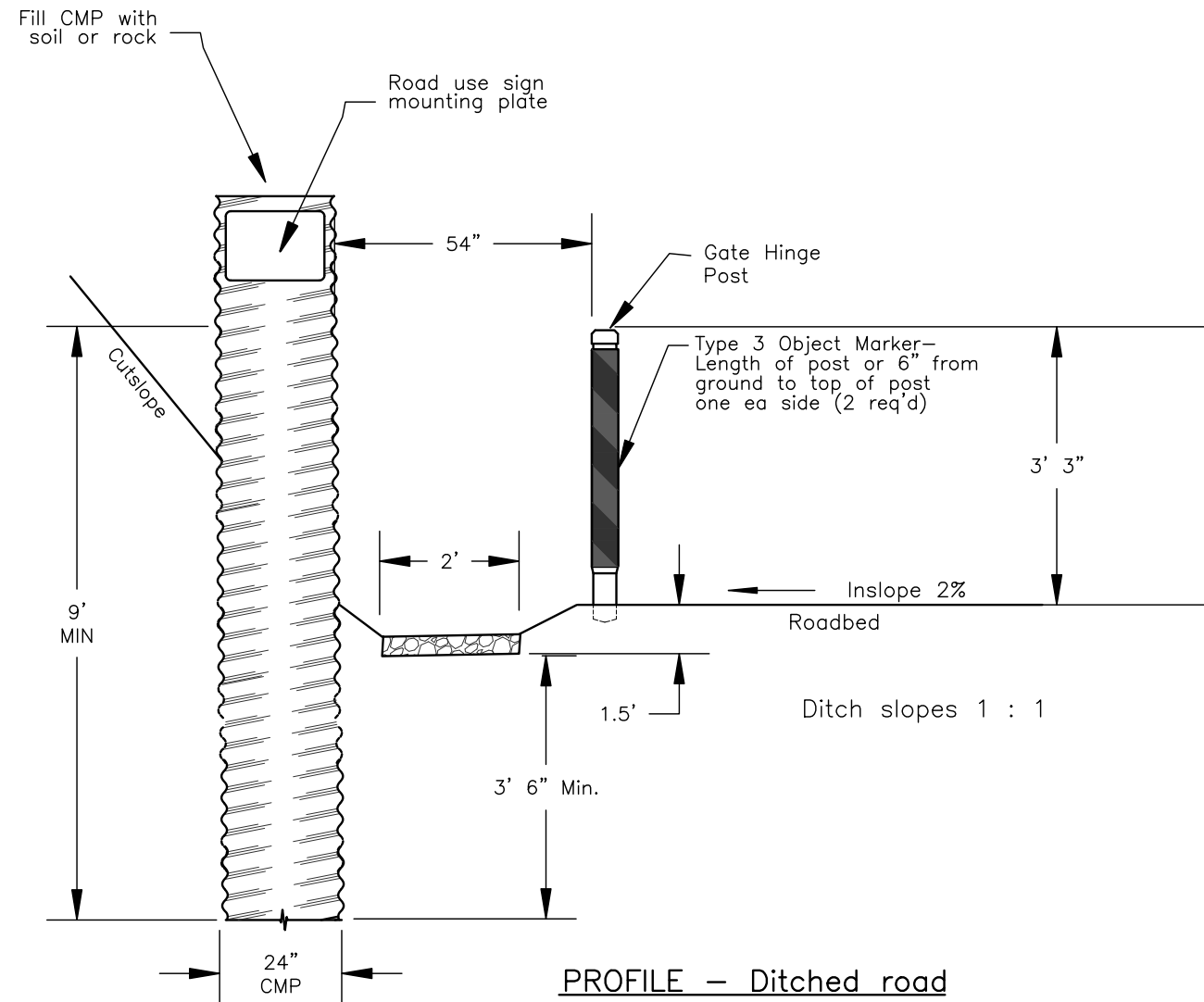
GUARDRAIL ATTACHMENT DETAIL

Gate Bypass Sht 2

Gate Installation Typical

GENERAL NOTES:

1. Surface bypass 20' each side of barrier with 6" crushed aggregate.
2. Remove any burrs or sharp edges on top end of culvert.
3. Place type 3 object markers on both sides of gate hinge post. Apply according to MUTCD, FS EM7100-15.
4. Fill culvert and overfill for future settlement with material from excavation or adjacent cutbank.
5. Install road use mounting plate facing closure.



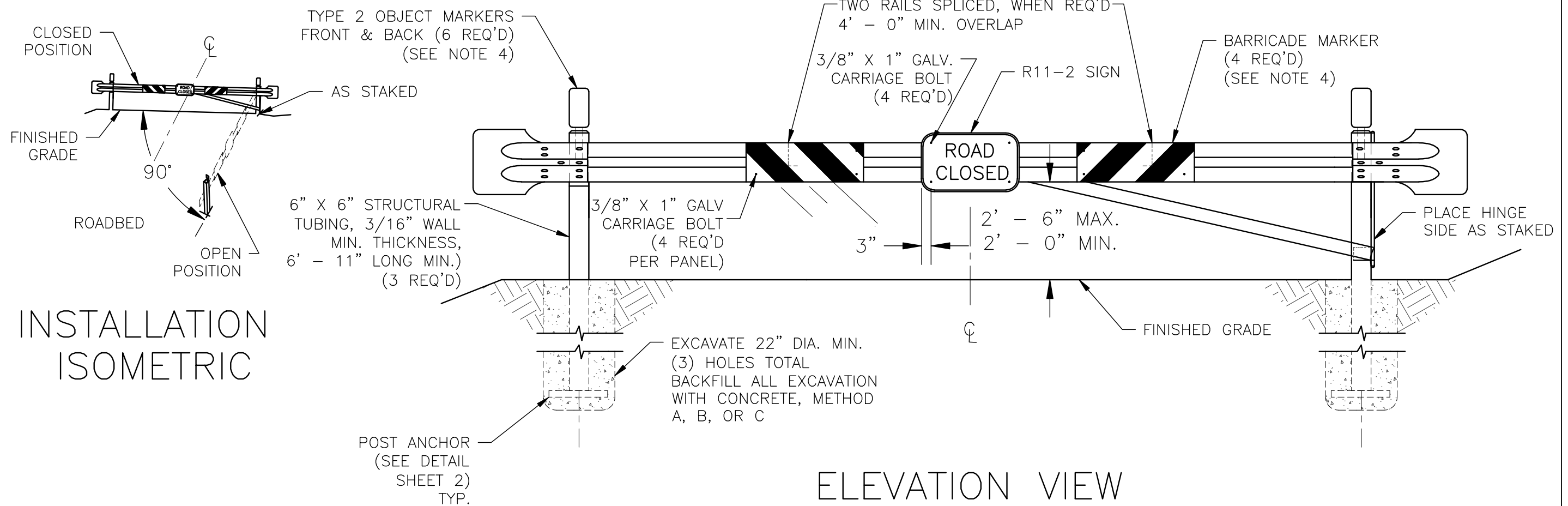
No Scale

GATE BYPASS SHT 3

GATE BARRIER — RAIL TYPE

PROJECT	SHEET	TOTAL SHEETS
	1 OF 2	

H0000028
11-1-89



NOTES:

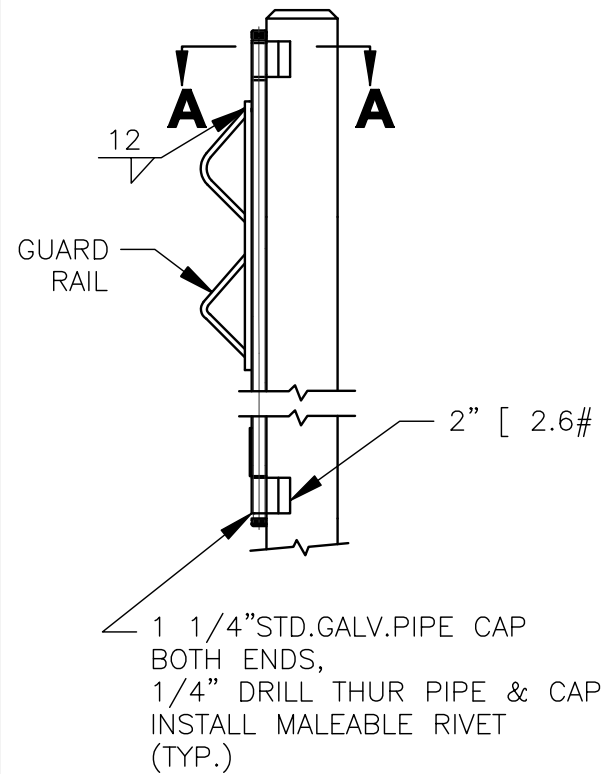
1. ALL STEEL COMPONENTS EXCEPT GUARDRAIL, END SECTIONS, PIPE & BOLTS PER A.S.T.M. DESIGNATION A36.
2. ALL WELDS 3/16" EXCEPT AS SHOWN. WELDING TO BE PER STRUCTURAL WELDING CODE-AWS.
3. GATE SECTION TO BE "ECONO-BEAM" GUARDRAIL — MANUFACTURED BY ARMCO STEEL FABRICATORS OR EQUAL. END SECTIONS TO BE OF LIKE MATERIAL & CROSS SECTION USED FOR GATE SECTION.
4. BARRICADE MARKERS, TYPE 2 OBJECT MARKERS & ROAD CLOSED SIGN (R11-2) SHALL BE IN ACCORDANCE WITH THE "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES", FS EM7100-15.
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 PRIOR TO CUTTING POSTS FOR LENGTH. ENTIRE STRUCTURE TO BE SHOP FABRICATED EXCEPT MINOR FIELD ADJUSTMENTS ARE PERMITTED IN THE LOCKING DEVICE & RECEIVING SLOTS.
7. ENTIRE STRUCTURE EXCEPT SIGN & OBJECT MARKERS TO BE THOROUGHLY CLEANED OF RUST, SLAG, & OTHER FOREIGN MATTER & PRINED WITH ON COAT OF WHITE MACHINE PAINT IN ACCORDANCE WITH SECTION 708.
8. LUBRICATE HINGE ASSEMBLY FULL LENGTH WITH MULTIPURPOSE MARINE A-LUBE OR EQUAL.

HD000042 1-11-89

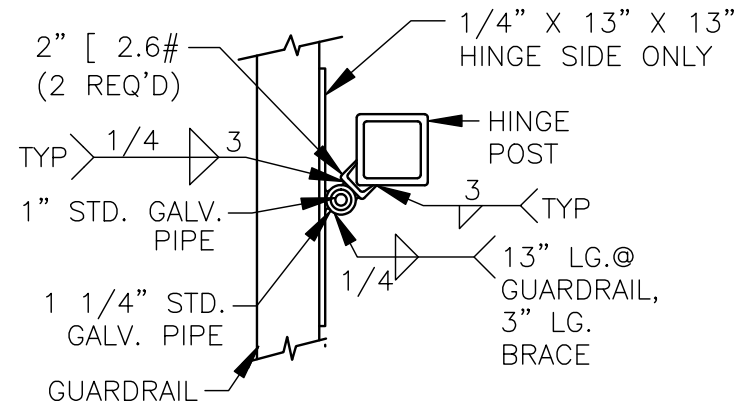
GATE BARRIER — RAIL TYPE

PROJECT	SHEET	TOTAL SHEETS
	2 OF 2	

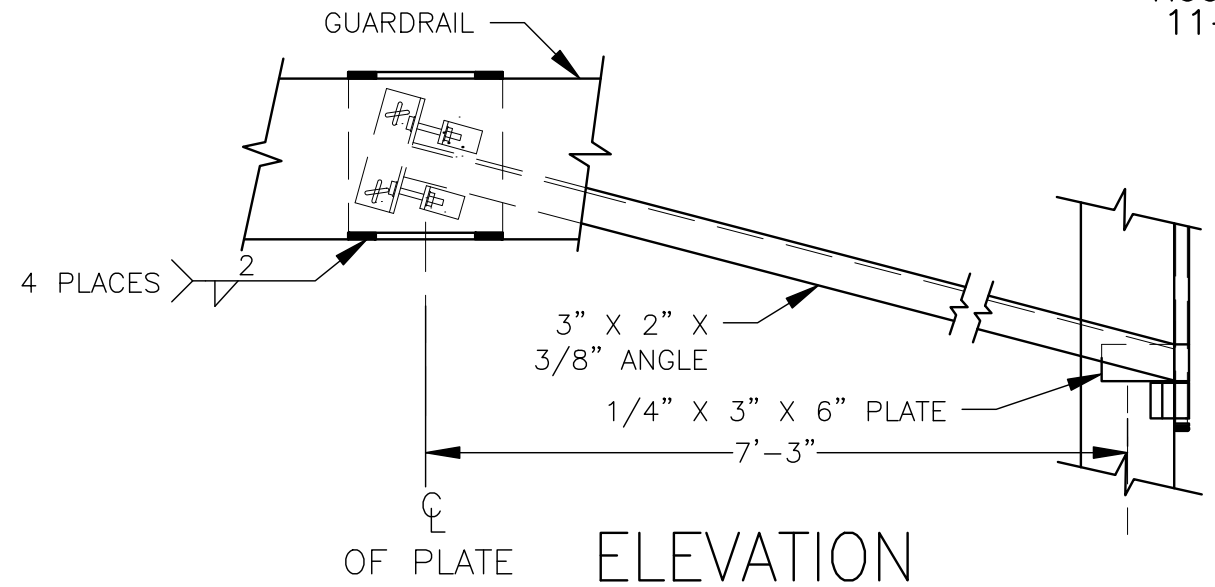
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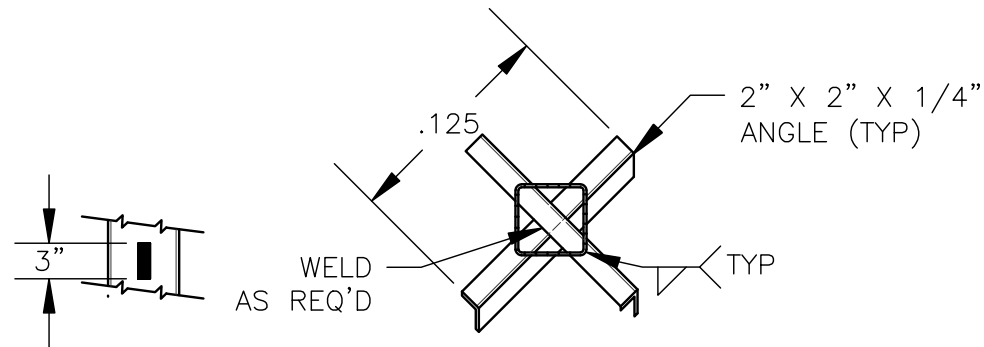
HINGE
DETAIL



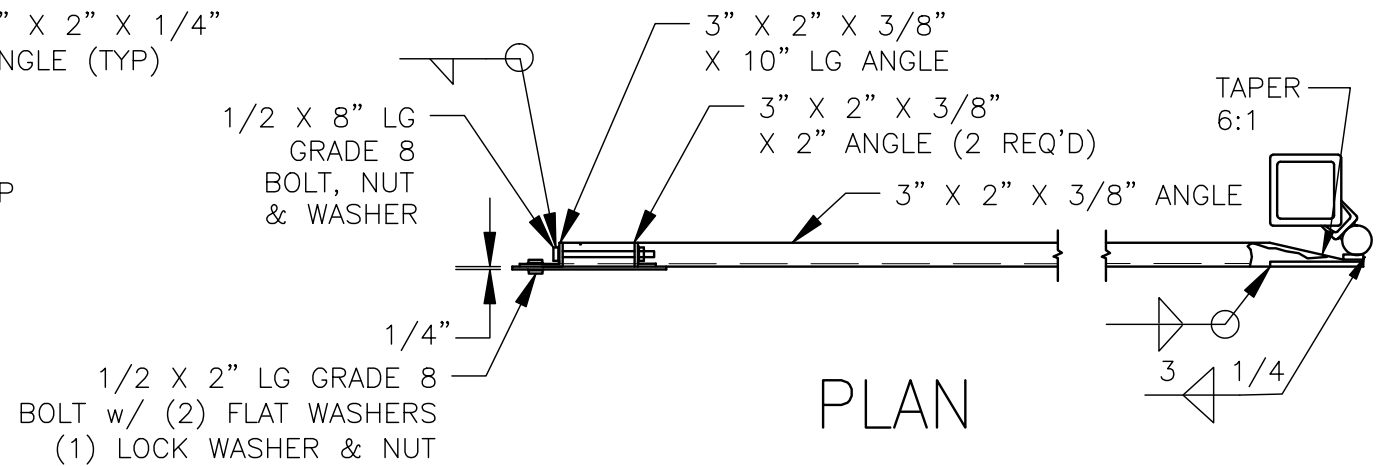
SECTION A-A



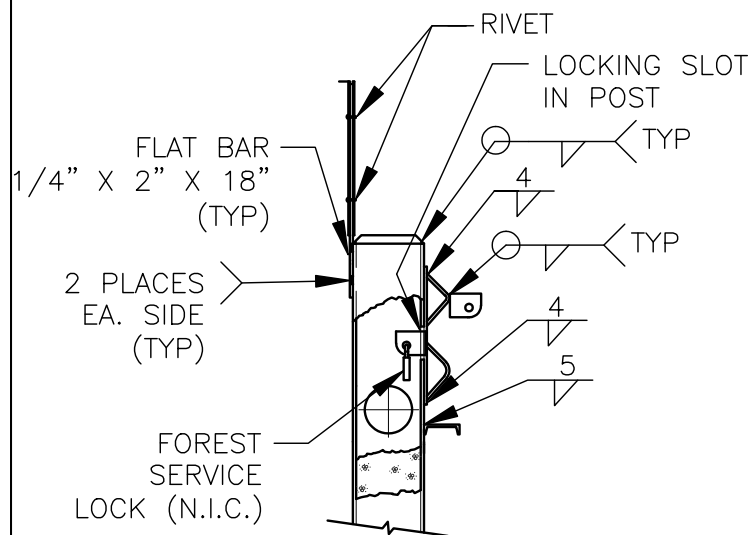
ELEVATION
OF PLATE



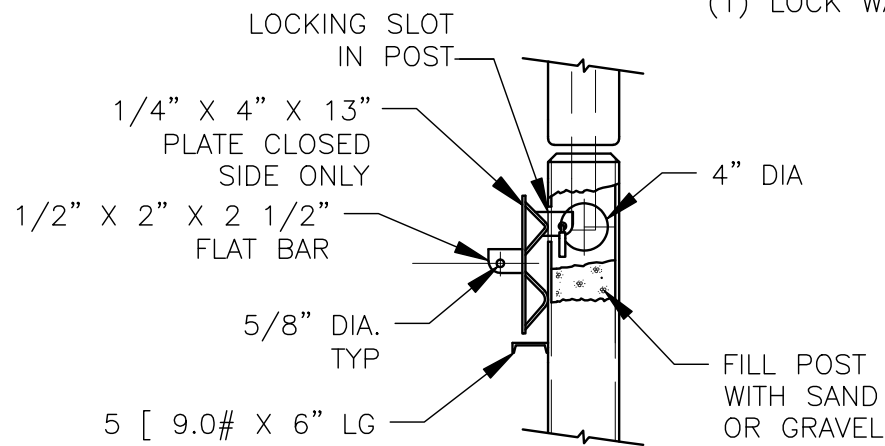
POST ANCHOR
DETAIL



PLAN



CLOSED POSITION
LOCKING POST & GATE



OPEN POSITION
LOCKING POST & GATE

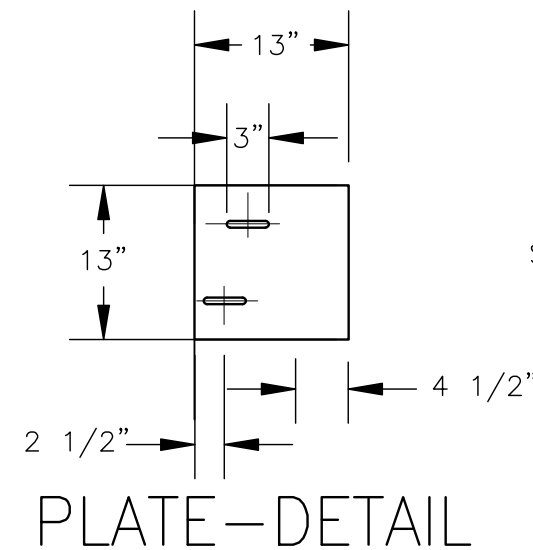
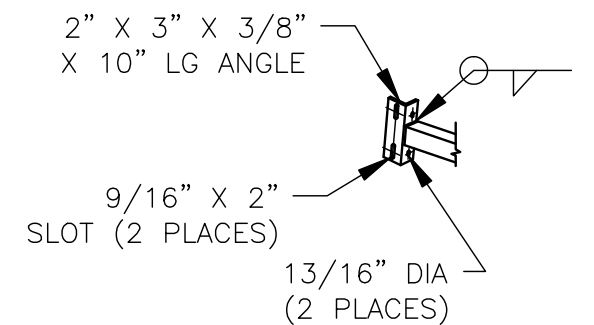
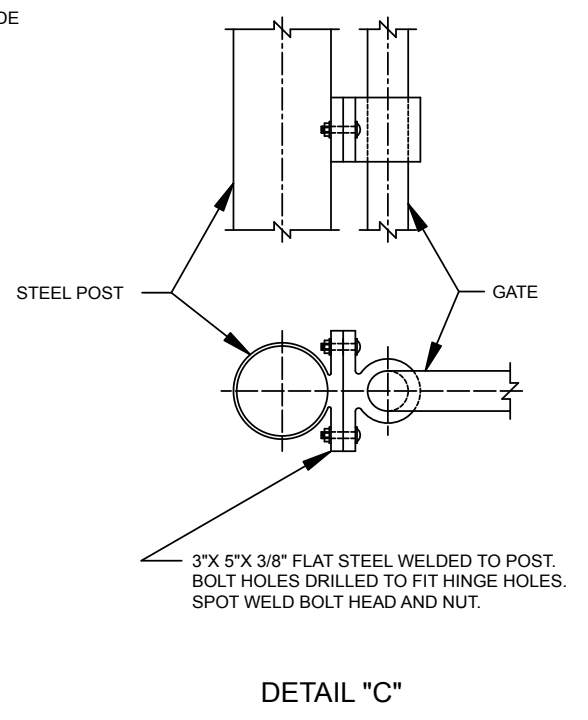
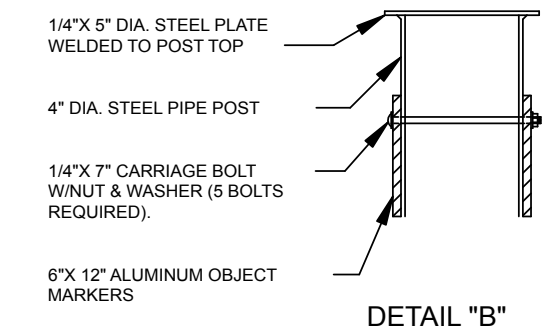
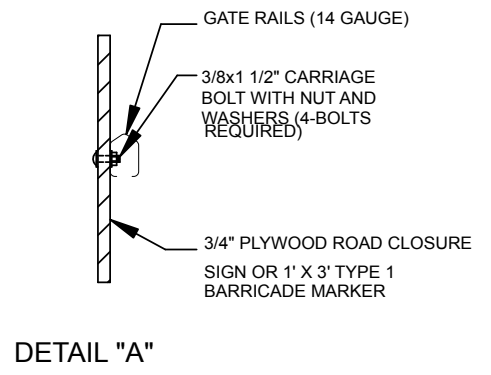
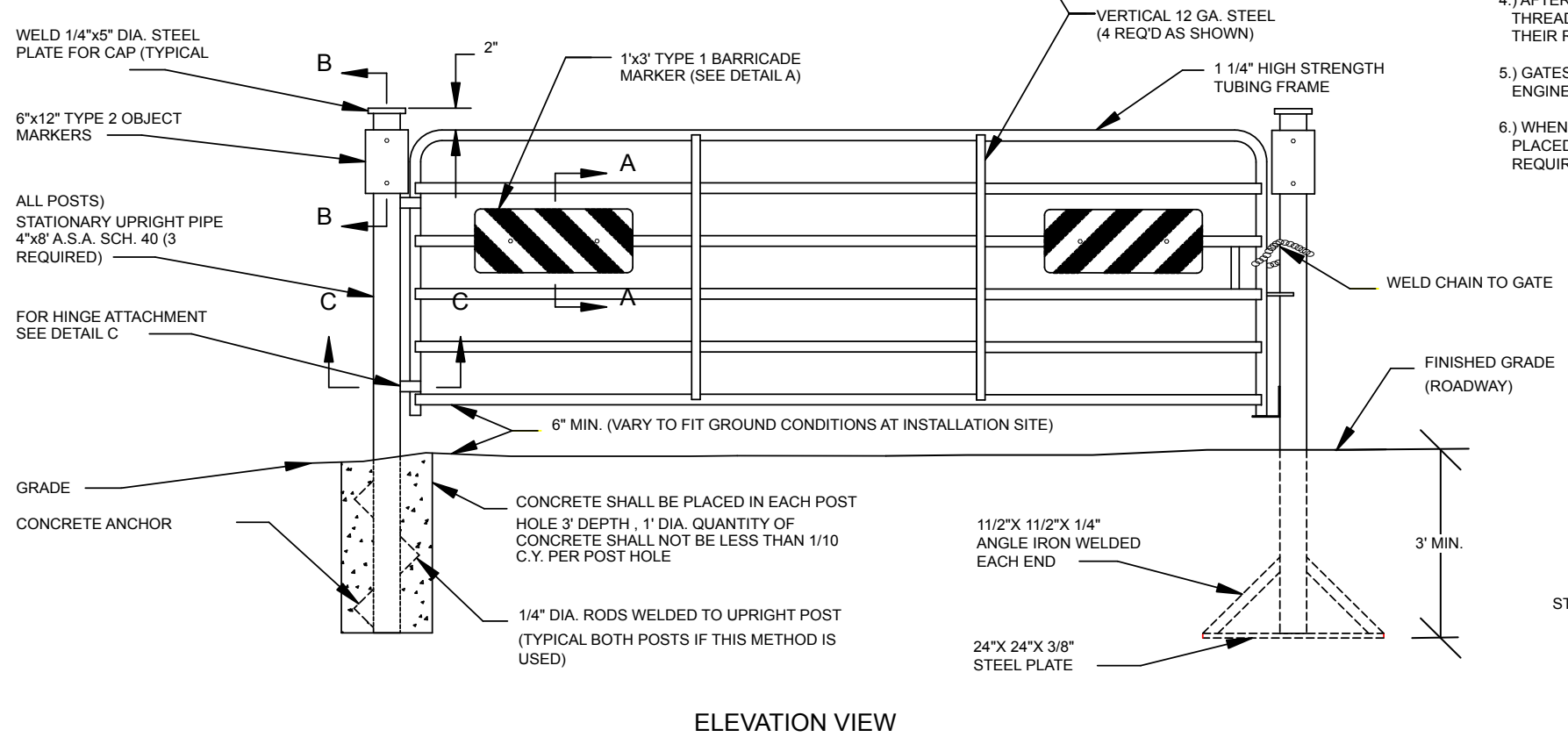
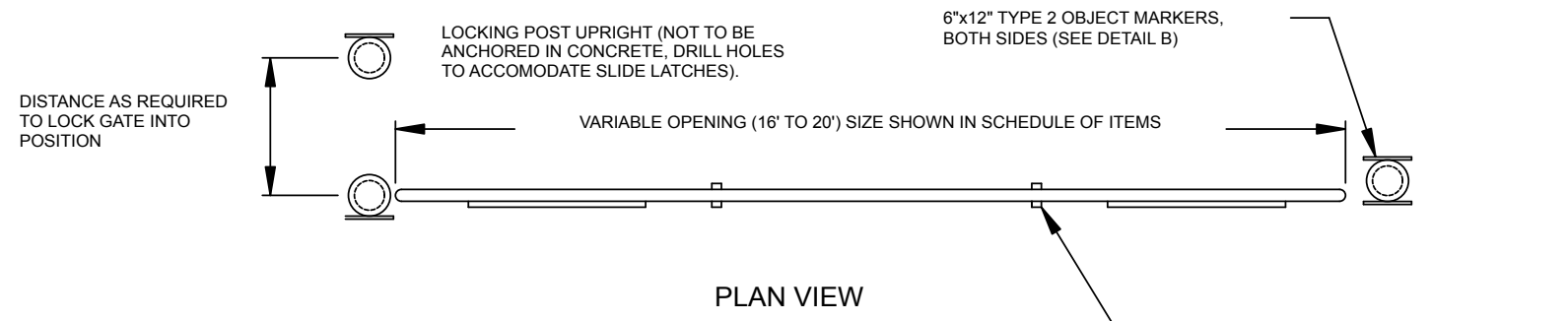


PLATE-DETAIL



ADJUSTABLE
BRACE DETAILS

H000029 9/11/88



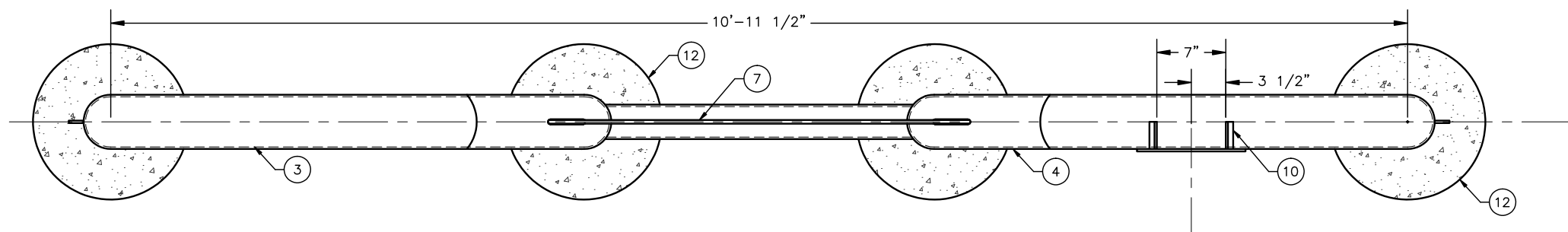
- NOTES:**
- 1.) GATE, ALL HARDWARE, SIGNS AND SIGN PLACEMENT, ETC. TYPICAL WITH ELEVATION VIEW AS SHOWN ABOVE. HEAVY DUTY GATE MANUFACTURED BY POWDER RIVER CO. OR EQUAL IS ACCEPTABLE.
 - 2.) ALL STEEL SURFACES SHALL RECEIVE ONE COAT OF PAINT AFTER FABRICATION AND ONE COAT AFTER INSTALLATION. PAINT SHALL MEET THE REQUIREMENTS 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.

LIGHTWEIGHT METAL GATE

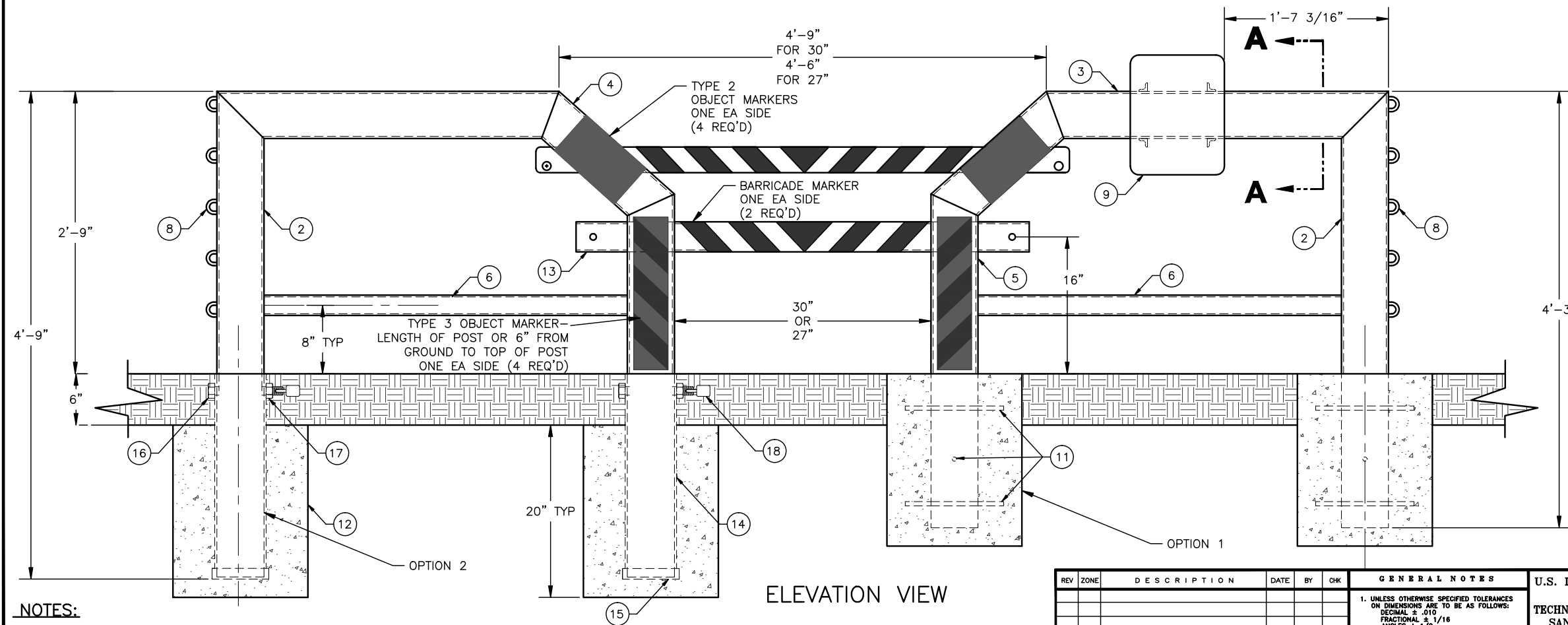
PR-GATE.DWG REV. 1/97

1 ASSEMBLY

ITEM NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	SHT NO.	ITEM NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	SHT NO.
1	ASSEMBLY	1	PARTS 2 THRU 18		10	SIGN BRACKET	2	18" X 1" X 2" X 4" LG ANGLE, HRMS	
2	END POST	2	SEE PART NO. 2	2	11	ANCHOR	12	5/8" X 13" LG ROUND ROD, HRMS	
3	HORIZONTAL RAIL	2	SEE PART NO. 3	2	12	FOOTING	4	PORTLAND READY MIX CONCRETE	2
4	DIAGONAL RAIL	2	SEE PART NO. 4	2	13	PIPE INSERT	1	SEE PART NO 13	2
5	VERTICAL POST	2	SEE PART NO. 5	2	14	SLEEVE	4	SEE PART NO. 14	
6	STIFFENER	2	2" X 42 -1/2" LG SCH. 40 BL PIPE (OR SCH 80)		15	CAP	4	SEE PART NO. 15	2
7	BAR-SLIDE THRU	1	SEE PART NO. 7	2	16	BOLT MODIFICATION	4	SEE PART NO. 16	2
8	TIE IN	10	SEE PART NO. 8	2	17	NUT	4	SEE PART NO. 17	2
9	SIGN PLATE	1	SEE PART NO. 9	2	18	LOCK	4	SEE PART NO. 18	2



PLAN VIEW



ELEVATION VIEW

NOTES:

- ALL WELDED CONSTRUCTION.
- USE SCHEDULE 40 BLACK PIPE, SCHEDULE 80 IN HIGH VANDALISM AREA.
- APPLY OBJECT & BARRIER MARKERS ACCORDING TO MUTCD, FS EM7100-15.
- CONSTRUCT ON FLAT LEVEL GROUND.
- PROVIDE FOR SUFFICIENT SIGHT DISTANCE.
- PROVIDE A TURN AROUND ON ONE SIDE OF BARRIER.
- PLACE TRAIL DESIGNATION SIGNING ON RIGHT HAND SIDE OF BARRIER.
- USE CORTEN STEEL, DO NOT PAINT.
- SLIDE THRU CLOSURE BAR, SHALL BE LOCKABLE IN BOTH OPEN AND CLOSED POSITION OR REMOVABLE.
- WELD TIE IN TO OUTSIDE OF BARRIER POST TO ATTACH FENCING.
- VARIOUS CONFIGURATIONS FOR BARRIER, COMPONENTS CAN BE PREFABRICATED FOR EASE OF GETTING TO SITE.

REV	ZONE	DESCRIPTION	DATE	BY	CHK

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.

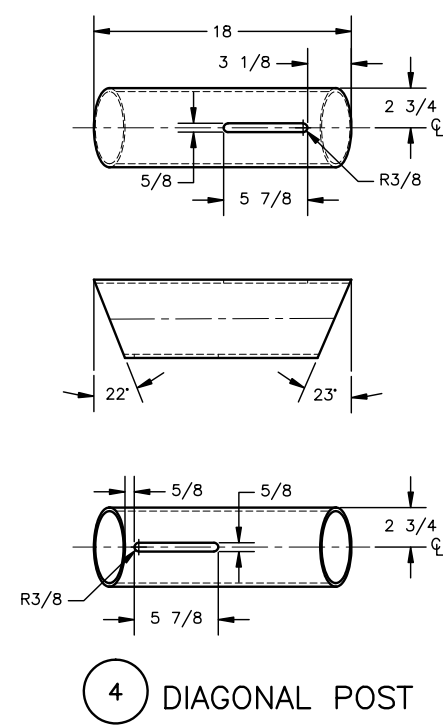
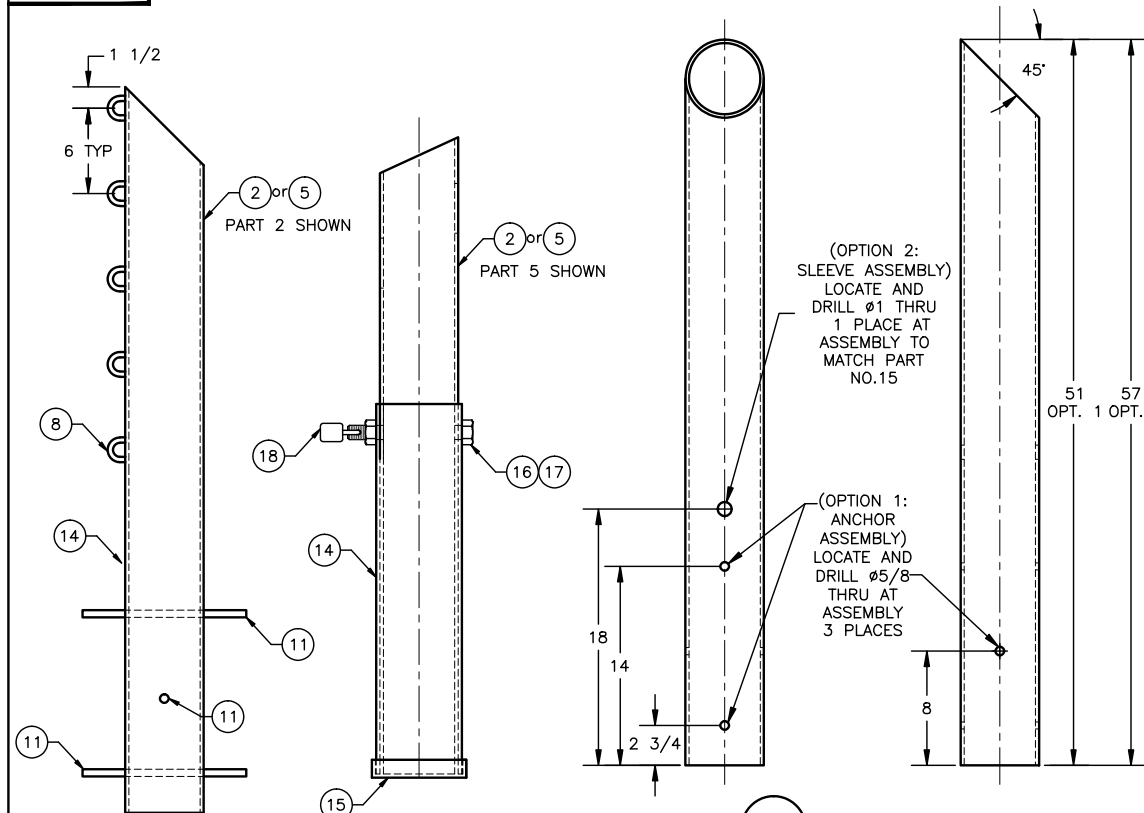
U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
TECHNOLOGY & DEVELOPMENT CENTER
SAN DIMAS, CALIFORNIA 91773

WIDTH LIMITER GATE 27-30"
ASSEMBLY AND DETAILS

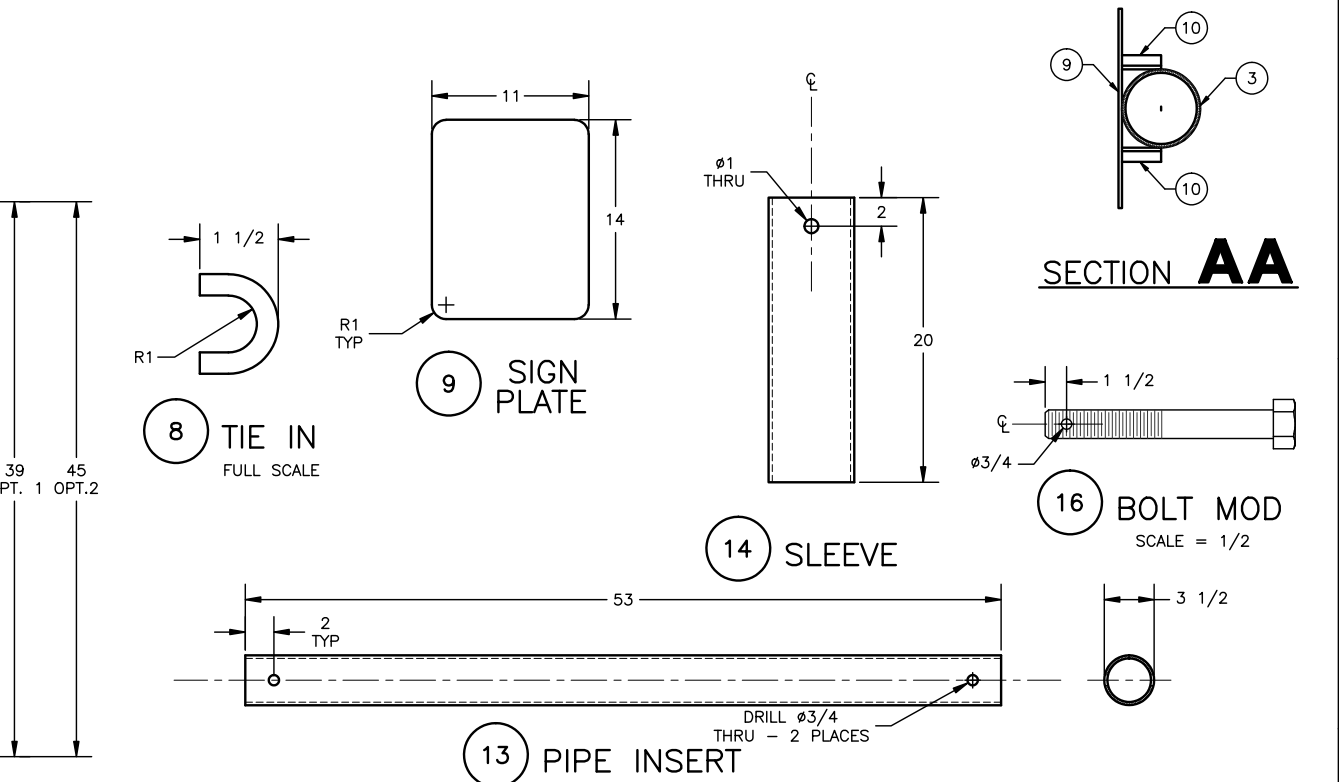
DRAWN BY M.M.Damale CHKD. BY DJ DATE 6-9-03
REVIEWED BY Cam Lockwood DATE 9-03
APPROVED BY D. Meadows DATE 9-03
SCALE NONE DATE 6-03

DWG NUMBER REC40-01
REV 0
SHEET 1 OF 2

REC40-01



MATERIAL LIST				
ITEM NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	SHT NO.
1	ASSEMBLY	1	PARTS 2 THRU 18	
2	END POST	2	5" SCH. 40 BL PIPE (OR SCH 80)	
3	HORIZONTAL RAIL	2	5" SCH. 40 BL PIPE (OR SCH 80)	
4	DIAGONAL RAIL	2	5" SCH. 40 BL PIPE (OR SCH 80)	
5	VERTICAL POST	2	5" SCH. 40 BL PIPE (OR SCH 80)	
6	STIFFENER	2	SEE PART NO. 6	1
7	BAR-SLIDE THRU	1	1/2" X 3" BAR STOCK HRMS	
8	TIE IN	10	3/8" ROUND ROD, HRMS OR CHAIN LINK THAT MEETS BOTH STRUCTURAL & DIMENSIONAL REQUIREMENTS	
9	SIGN PLATE	1	SEE PART NO. 9	1
10	SIGN BRACKET	2	SEE PART NO. 10	1
11	ANCHOR	12	SEE PART NO. 11	1
12	FOOTING	4	SEE PART NO. 12	1
13	PIPE INSERT	1	3" SCH. 40 BL PIPE	
14	SLEEVE	4	BL PIPE OR USED WELL CASING 1/4" DIA. MAX. LARGER THAN POST	
15	CAP	4	CAP TO FIT SLEEVE, PART NO. 14	
16	BOLT MODIFICATION	4	1-BNC X 8 LG HEAVY HEX HEAD BOLT, GALV.	
17	NUT	4	1-BNC HEAVY HEX NUT	
18	LOCK	4	2" WEATHER PROOF PADLOCK, 5/16 SHACKLE, BRINKS STOCK NO. 4333-4MK, MASTERLOCK STOCK NO 312MK OR EQUAL	



REV	ZONE	DESCRIPTION	DATE	BY	CHK

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.
- DIMENSIONS ARE IN INCHES UNLESS NOTED.

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

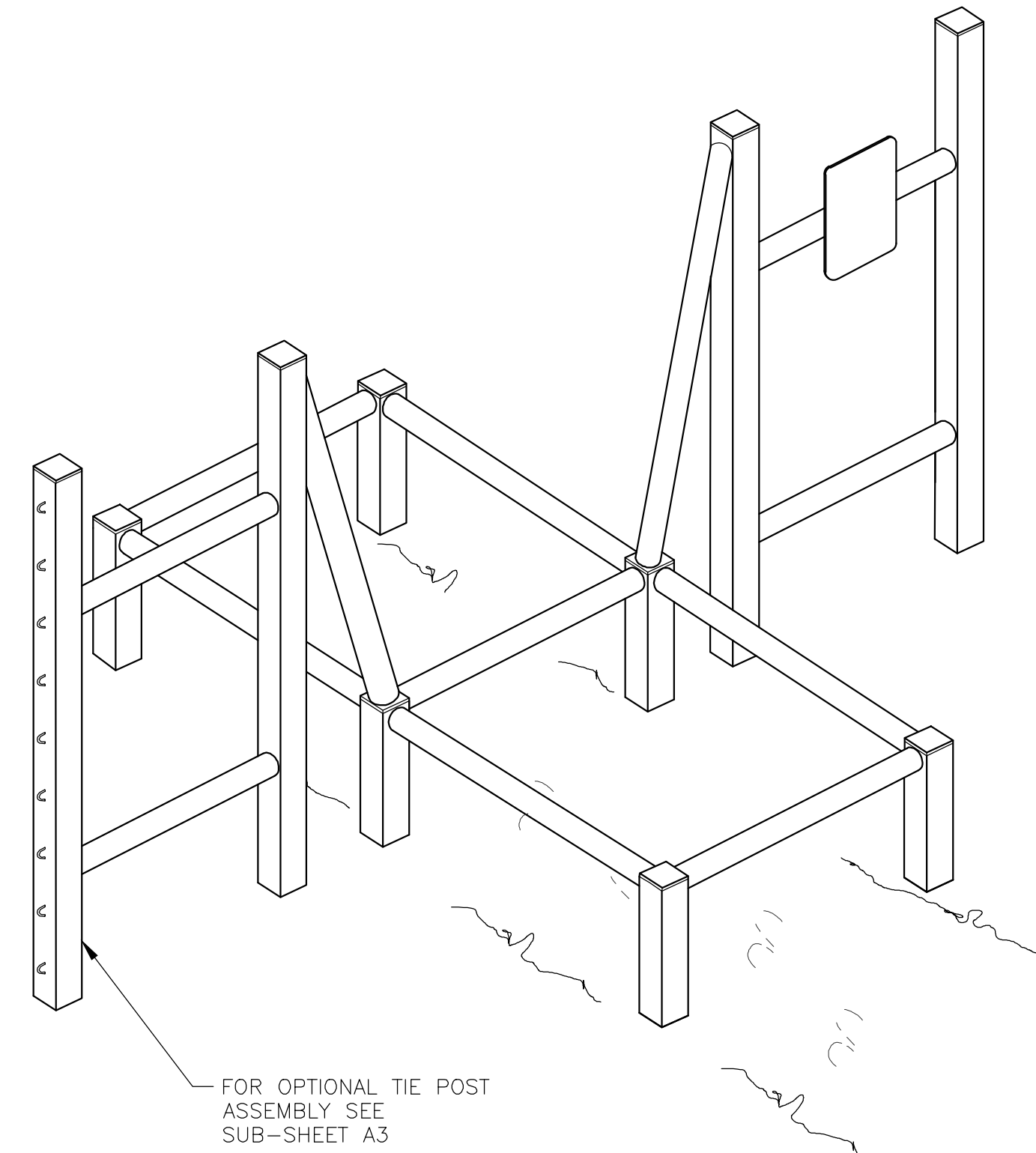
WIDTH LIMITER GATE 27-30"
ASSEMBLY AND DETAILS

DRAWN BY M.M.Damole CHKD. BY DT DATE 6-9-03
REVIEWED BY Cam Lockwood DATE 9-03
APPROVED D. Meadows DATE 9-03
SCALE 1/4 & NOTED DATE 6-03

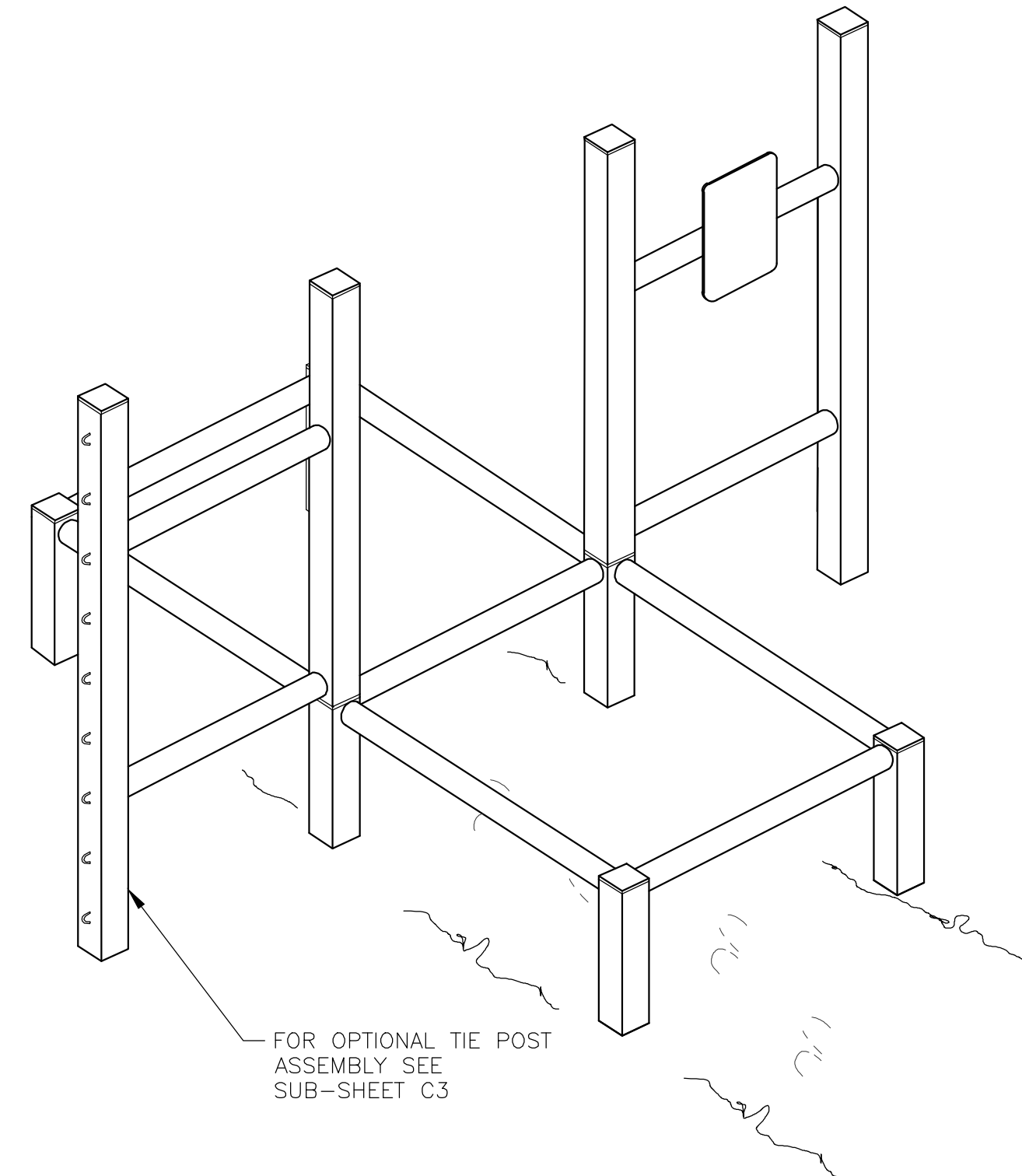
DWG NUMBER REC40-01
REV 0
SHEET 3 OF 3

8 7 6 5 4 3 2 1

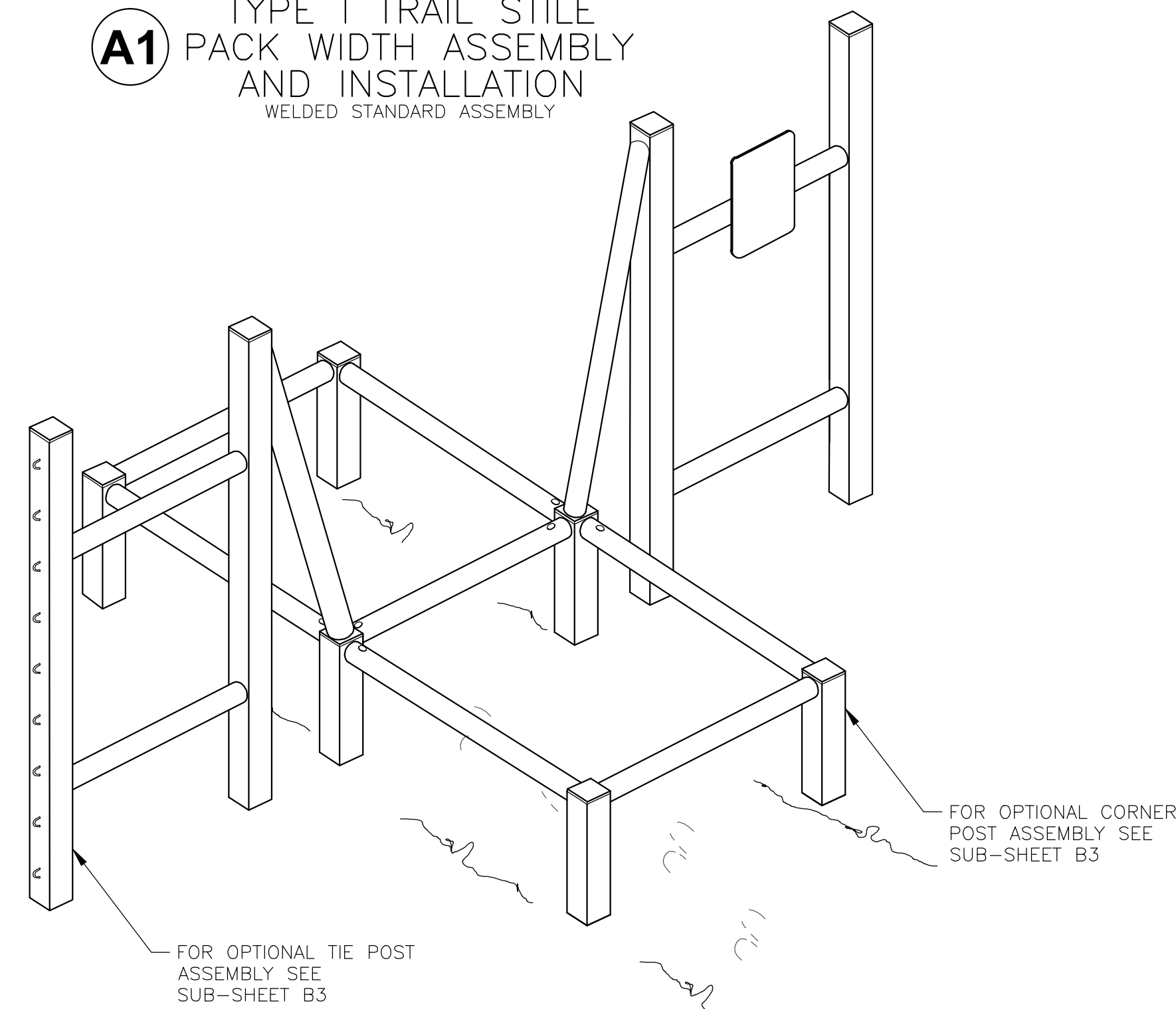
READ INSTRUCTIONS BEFORE USING THIS FILE



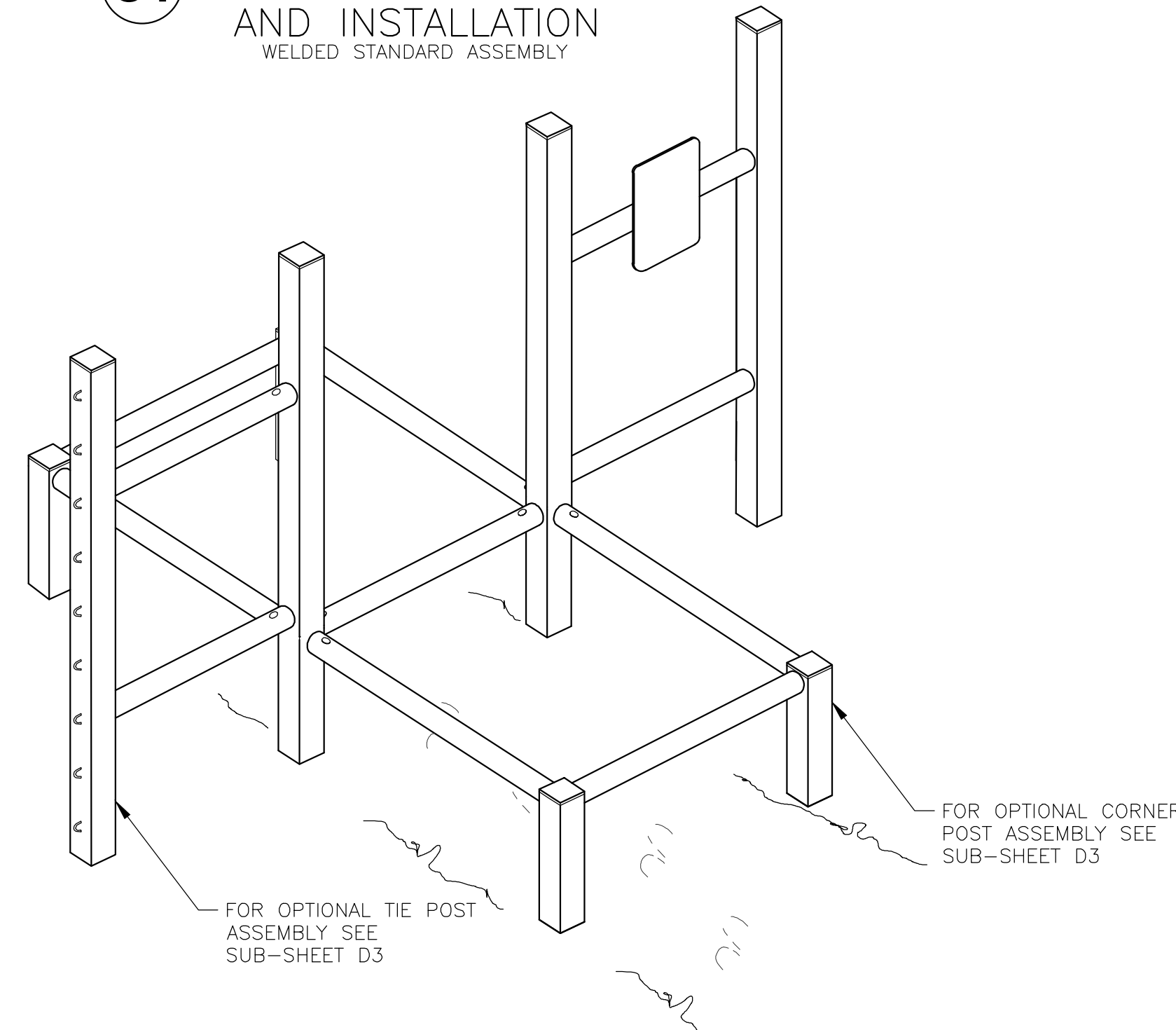
A1 TYPE I TRAIL STILE
PACK WIDTH ASSEMBLY
AND INSTALLATION
WELDED STANDARD ASSEMBLY



C1 TYPE II TRAIL STILE
PACKLESS ASSEMBLY
AND INSTALLATION
WELDED STANDARD ASSEMBLY



B1 TYPE I TRAIL STILE
PACK WIDTH ASSEMBLY
AND INSTALLATION
BOLTED AND WELDED STANDARD ASSEMBLY



D1 TYPE II TRAIL STILE
PACKLESS ASSEMBLY
AND INSTALLATION
BOLTED AND WELDED STANDARD ASSEMBLY

MATERIAL LIST

NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SHEET
A1	TYPE I TRAIL STILE	-	WELDED CONSTRUCTION PARTS A2 THUR A21	2,3,4
	PACK WIDTH ASSEMBLY AND INSTALLATION			
B1	TYPE I TRAIL STILE	-	BOLTED AND WELDED CONSTRUCTION PARTS B2 THUR B25	5,6,7
	PACK WIDTH ASSEMBLY AND INSTALLATION			
C1	TYPE II TRAIL STILE	-	WELDED CONSTRUCTION PARTS C2 THUR C20	8,9,10
	PACKLESS ASSEMBLY AND INSTALLATION			
D1	TYPE II TRAIL STILE	-	BOLTED AND WELDED CONSTRUCTION PARTS D2 THUR D21	11,12,13
	PACKLESS ASSEMBLY AND INSTALLATION			

NOTES:

- UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES.
- SCHEDULE 80 PIPE MAY BE USED IN PLACE OF SCHEDULE 40 PIPE IN HIGH VANDALISM AREAS.
- CONSTRUCT STILE ON FLAT AND LEVEL GROUND.
- REFER TO "EM-7100-15 SIGN AND POSTER GUIDELINES FOR THE FS" FOR OBJECT AND BARRICADE MARKER SPECIFICATIONS, MATERIALS, AND PLACEMENT.

NOT TO SCALE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
RECREATION FACILITIES
DESIGN CATALOG

DRAWING NAME
HORSE STILE
TYPE A,B,C & D
EF_STIL_HORS_01-01.pdf

BUILT ENVIRONMENT IMAGE GUIDE PROVINCE(S) (BEIG)

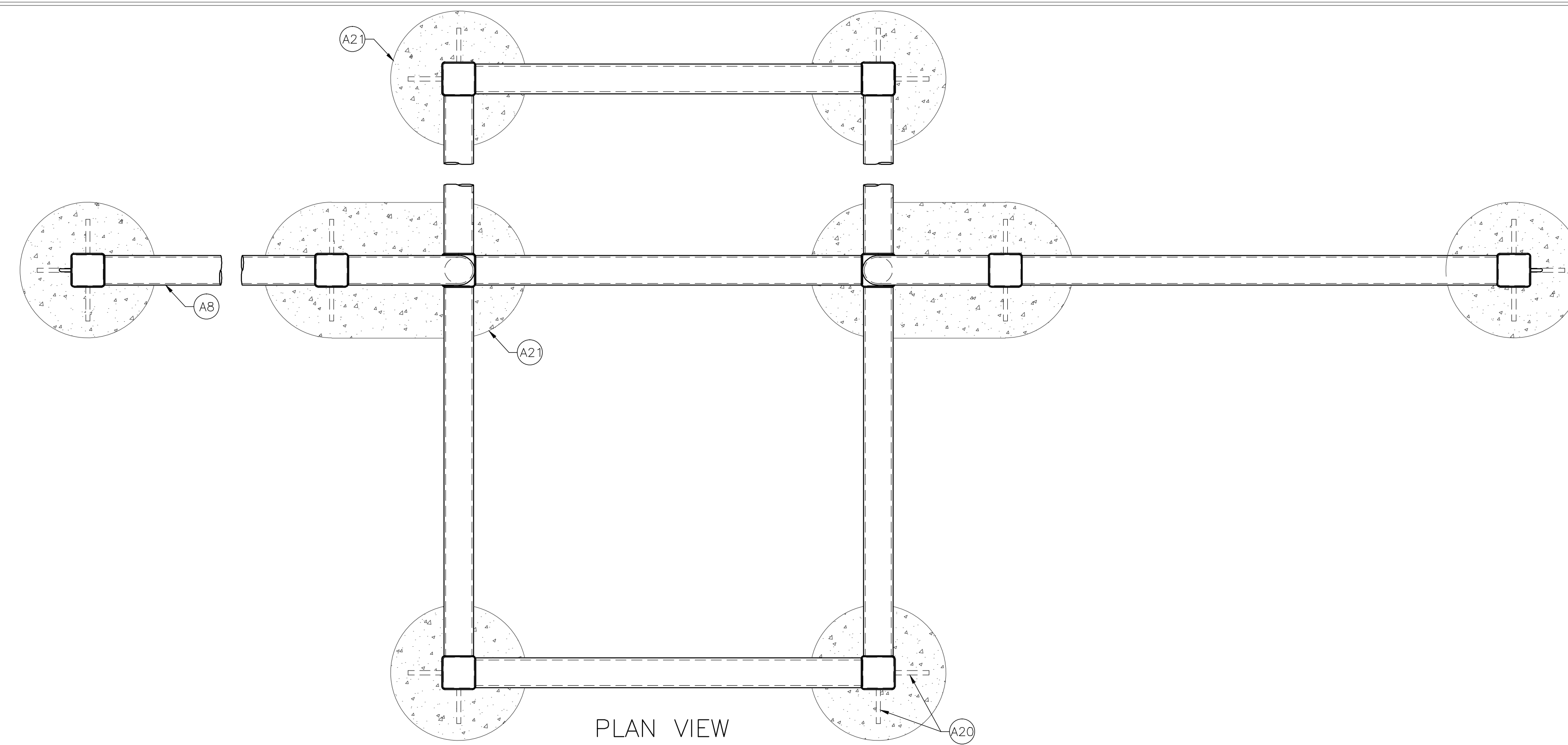
ALL NORTHEAST SOUTHEAST COASTAL GREAT PLAINS NORTH PACIFIC
 LAKES SOUTHEAST MOUNTAIN ROCKY MOUNTAIN SOUTHWEST

RECREATION OPPORTUNITY SPECTRUM (ROS)

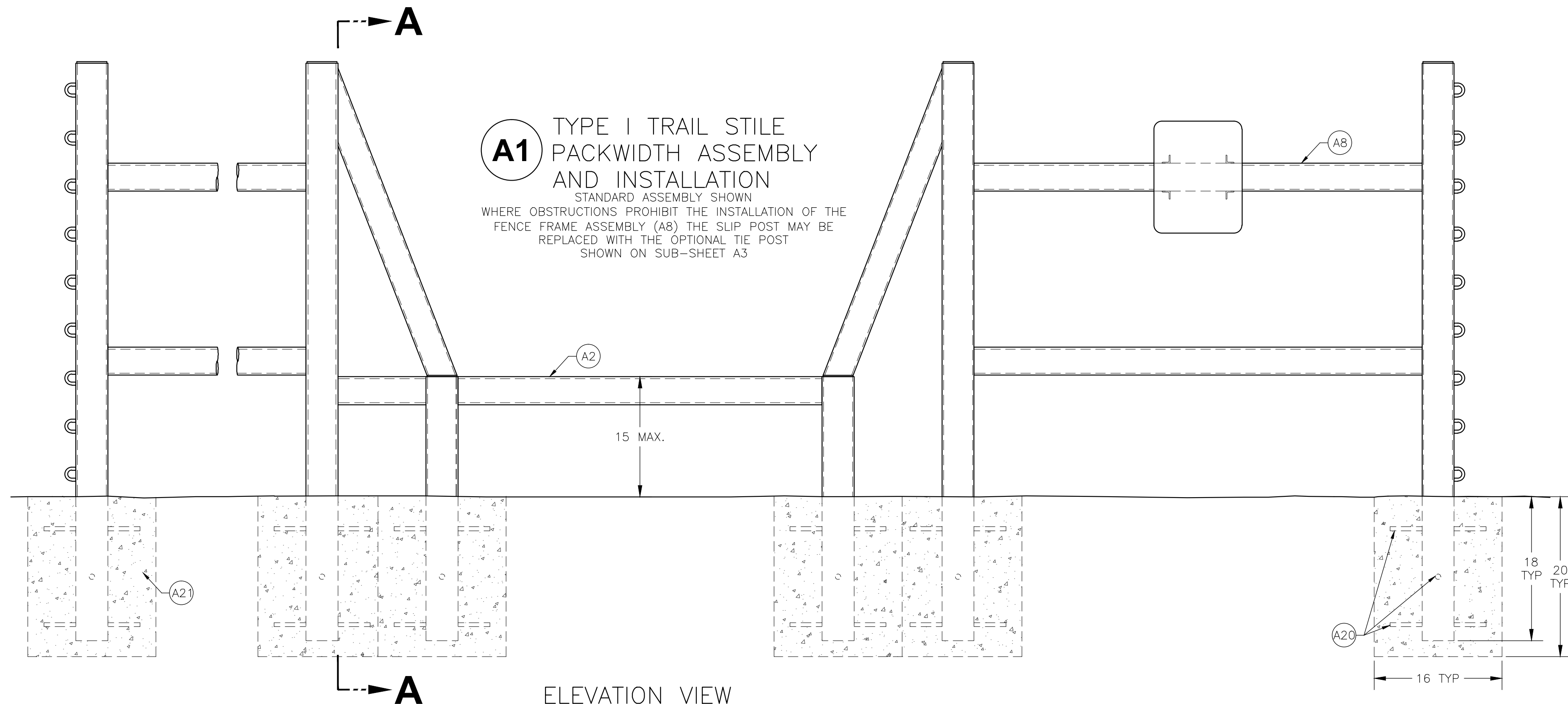
PRIMITIVE SEMI-PRIMITIVE MOTORIZED RURAL
 SEMI-PRIMITIVE NON-MOTORIZED ROADED NATURAL URBAN

SHEET
1 OF **13**

READ INSTRUCTIONS BEFORE USING THIS FILE

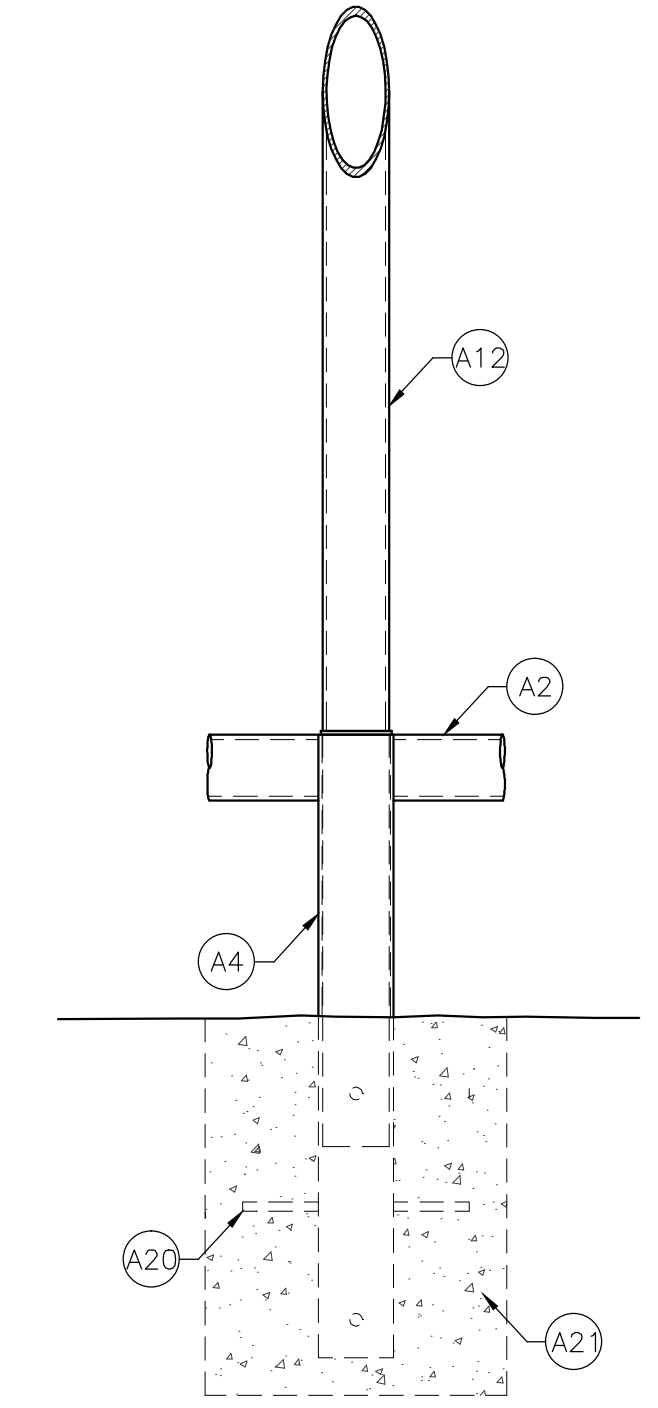


PLAN VIEW



ELEVATION VIEW

MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
A1	TYPE I TRAIL STILE PACK WIDTH ASSEMBLY & INSTALLATION	1	PARTS A2 THRU A21	
A2	BOX ASSEMBLY	-	SEE PART NO. A2	A2
A4	BOX POST	-	SEE PART NO. A4	A3
A8	FENCE FRAME ASSEMBLY	-	SEE PART NO. A8	A2
A12	SLIP POST SUB-ASSEMBLY	-	SEE PART NO. A12	A3
A20	ANCHORS	30	NO. 5 REBAR HRMS, 12 LG	
A21	FOUNDATION	AR	PORTLAND READY MIX CONCRETE OR EQUAL	
PART NO. A16 NOT USED				



SECTION AA

WELDED CONSTRUCTION
SPECIFIC WELDS NOTED

NOT TO SCALE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
RECREATION FACILITIES
DESIGN CATALOG

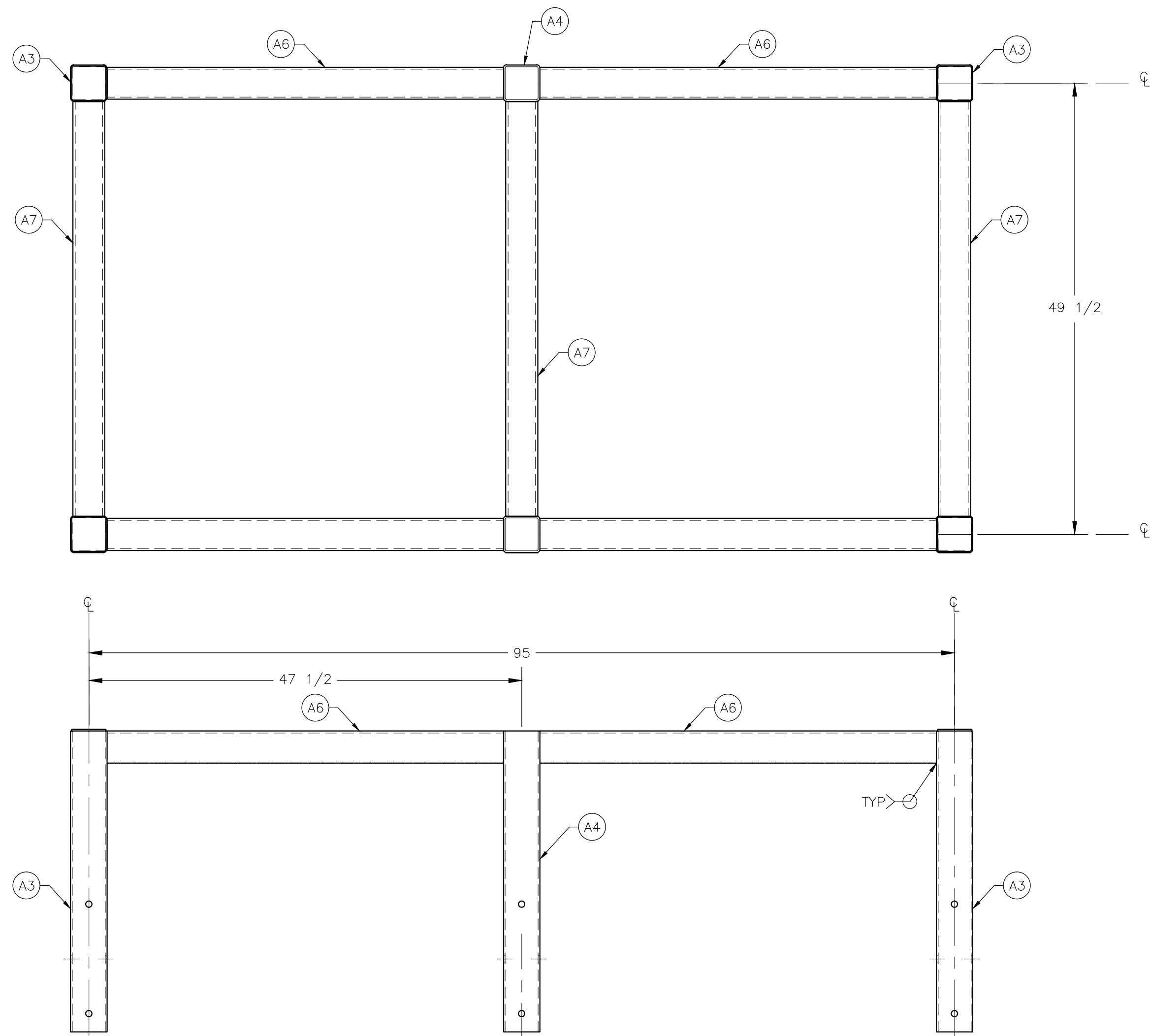
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HORSE STILE
TYPE I, A - PACKWIDTH
EF_STIL_HORS_A_01-02.pdf

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 LAKES SOUTHEAST MOUNTAIN ROCKY MOUNTAIN SOUTHWEST

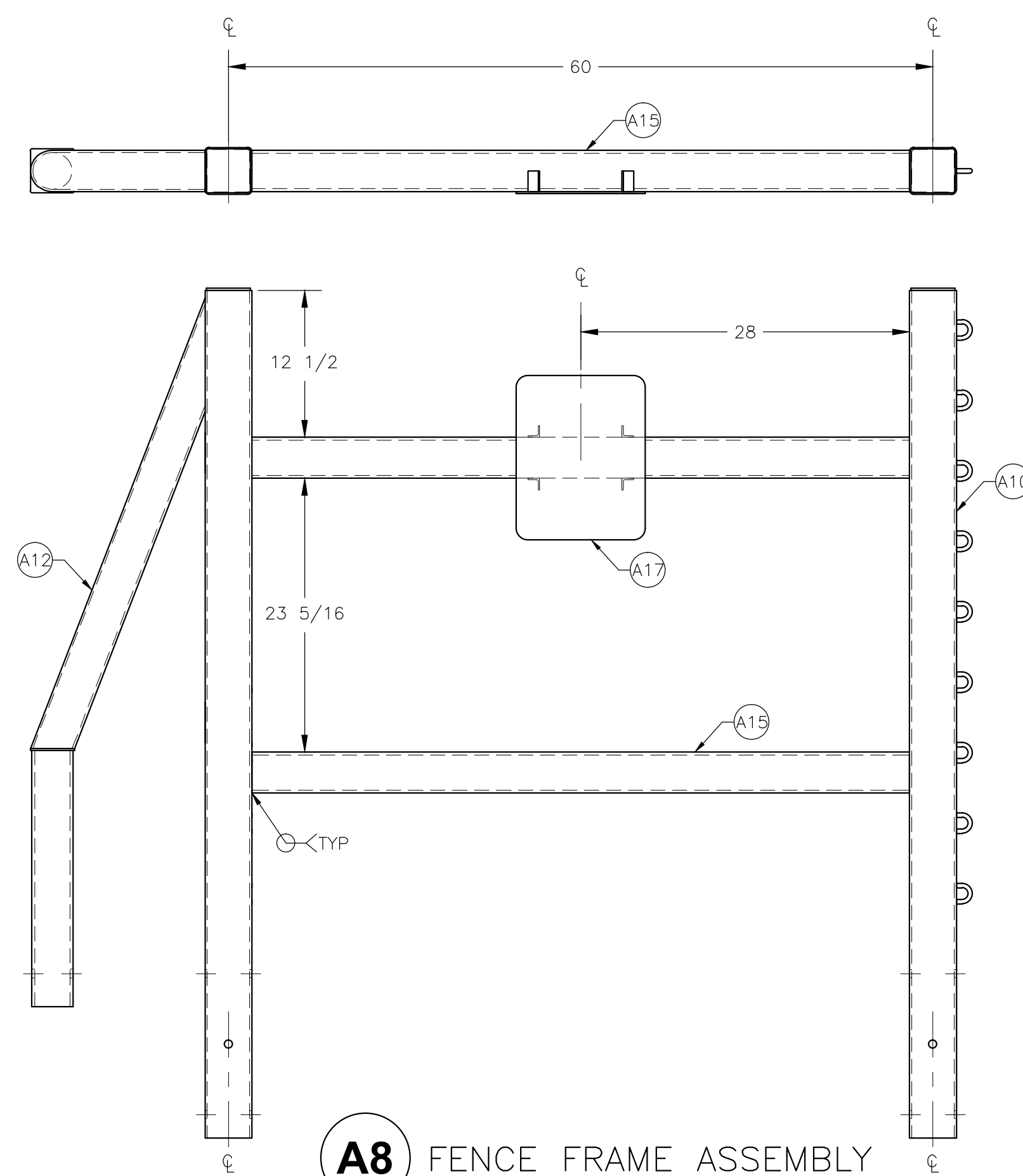
RECREATION OPPORTUNITY SPECTRUM (ROS)
 PRIMITIVE SEMI-PRIMITIVE MOTORIZED RURAL
 SEMI-PRIMITIVE NON-MOTORIZED ROADED NATURAL URBAN

SHEET
2 OF **13**

READ INSTRUCTIONS BEFORE USING THIS FILE



A2 BOX ASSEMBLY

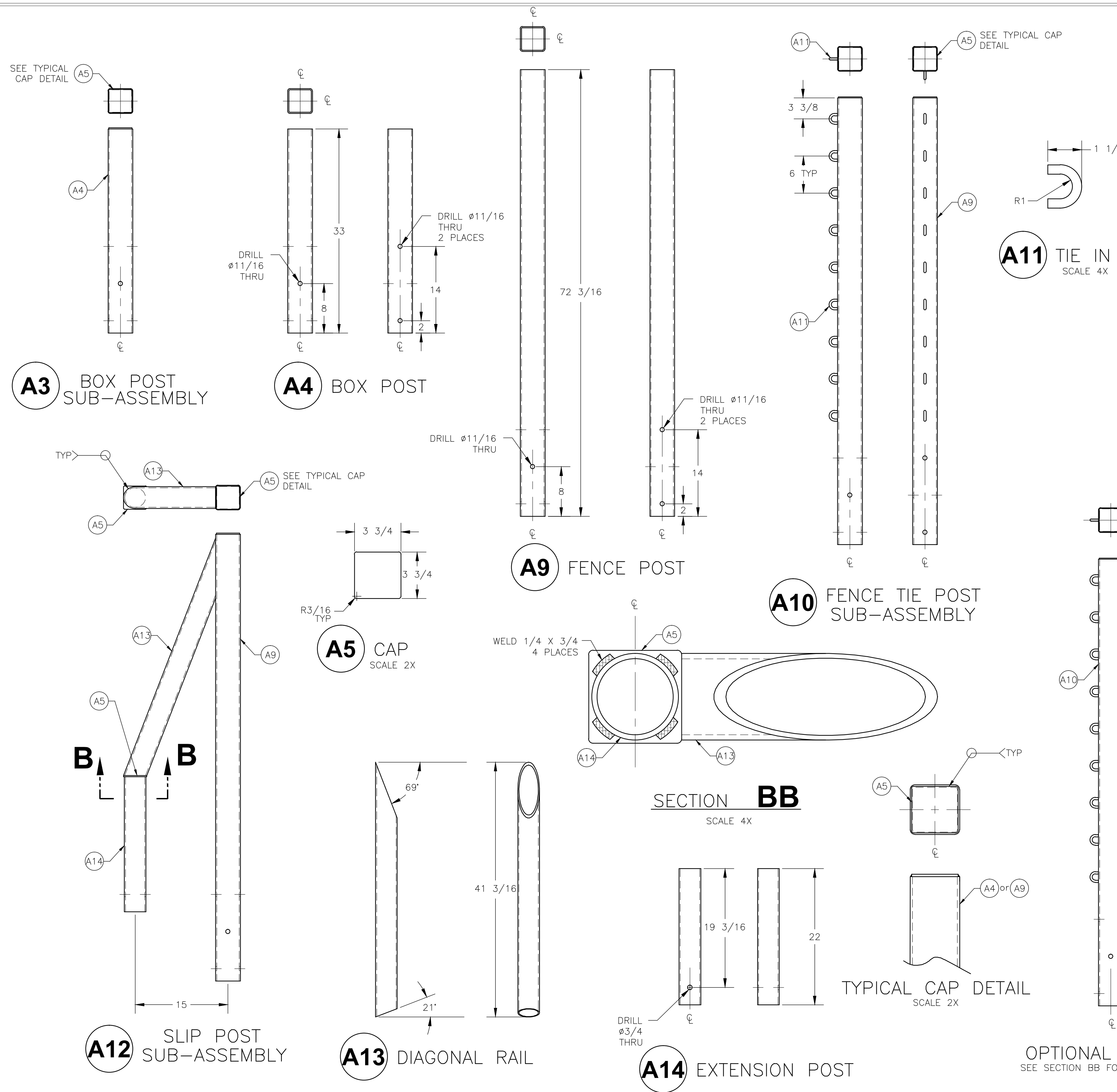


A8 FENCE FRAME ASSEMBLY
(1 SHOWN - 2 REQ'D)

MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
A2	BOX ASSEMBLY	1	PARTS A3 THRU A7	
A3	BOX POST	-	SEE PART NO. A3	A3
	SUB-ASSEMBLY			
A4	BOX POST	-	SEE PART NO. A4	A3
A6	SIDE RAIL	4	3-INCH SCH 40 BL PIPE 43-1/2 LG	
A7	CROSS RAIL	3	3-INCH SCH 40 BL PIPE 45-1/2 LG	
A8	FENCE FRAME	-	PARTS A5 & A9 THRU A16	A3
	ASSEMBLY			
A10	FENCE TIE POST	-	SEE PART NO. A10	A3
	SUB-ASSEMBLY			
A12	SLIP POST	-	SEE PART NO. A12	A3
	SUB-ASSEMBLY			
A15	FENCE RAIL	4	3-INCH SCH 40 BL PIPE 56 LG	
A17	SIGN PLATE	-	SEE PART NO. A17	A3
	SUB-ASSEMBLY			

NOT TO SCALE

READ INSTRUCTIONS BEFORE USING THIS FILE



MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
A3	BOX POST SUB-ASSEMBLY	4	PARTS A4 & A5	
A4	BOX POST	6	3/16 X 4-INCH SQ. MECH. TUBING, STEEL	
A5	CAP	10	3/16-INCH PLATE STEEL	
A9	FENCE POST	4	3/16 X 4-INCH SQ. MECH. TUBING, STEEL	
A10	FENCE TIE POST SUB-ASSEMBLY	2	PARTS A5, A9 & A11	
A11	TIE IN	18	3/8-INCH ROUND ROD, STEEL OR CHAIN LINK THAT MEETS BOTH STRUCTURAL AND DIMENSIONAL REQUIREMENTS	
A12	SLIP POST SUB-ASSEMBLY	2	PARTS A5(2), A9, A13 & A14	
A13	DIAGONAL RAIL	2	3-INCH SCH 40 BL PIPE	
A14	POST EXTENSION	2	3-INCH SCH 40 BL PIPE	
A17	SIGN PLATE SUB-ASSEMBLY	1	PARTS A18 & A19	
A18	SIGN TABS	4	L2 X 1 X 1-1/8 ANGLE, STEEL 1-3/4 LG	
A19	SIGN PLATE	1	3/16-INCH PLATE, STEEL	
OPTIONAL TIE POST ASSEMBLY			PARTS A5, A10, A13 & A14 PARTS SHOWN FOR 1 ASSEMBLY	
A5	CAP	1		
A10	FENCE TIE POST SUB-ASSEMBLY	1		
A13	DIAGONAL RAIL	1		
A14	POST EXTENSION	1		

NOT TO SCALE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
RECREATION FACILITIES
DESIGN CATALOG

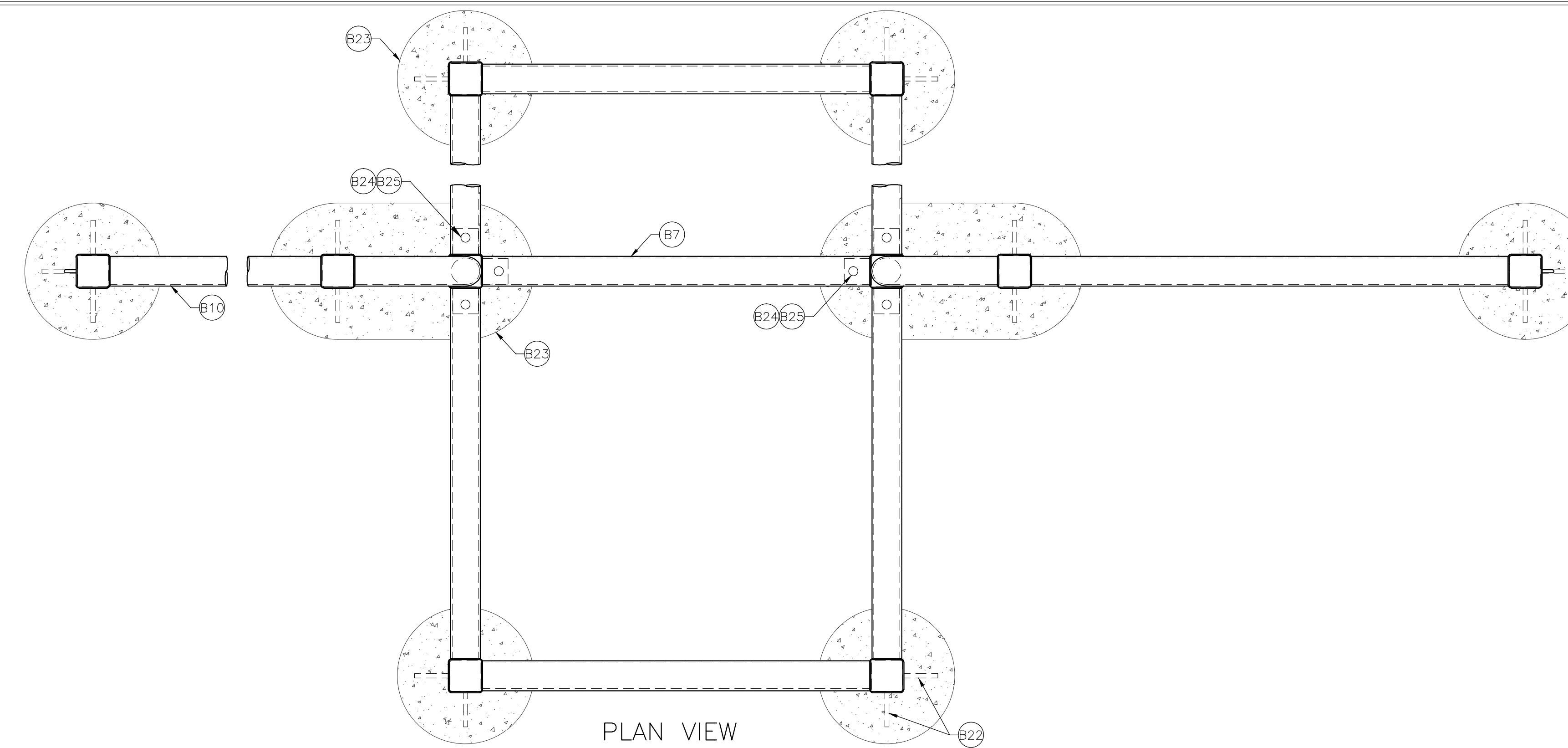
DRAWING NAME
HORSE STILE
TYPE I, A - PACKWIDTH
EF_STIL_HORS_A_01-04.pdf

BUILT ENVIRONMENT IMAGE GUIDE PROVINCE(S) (BEIG)
 ALL NORTHEAST SOUTHEAST COASTAL GREAT PLAINS NORTH PACIFIC
 LAKES SOUTHEAST MOUNTAIN ROCKY MOUNTAIN SOUTHWEST

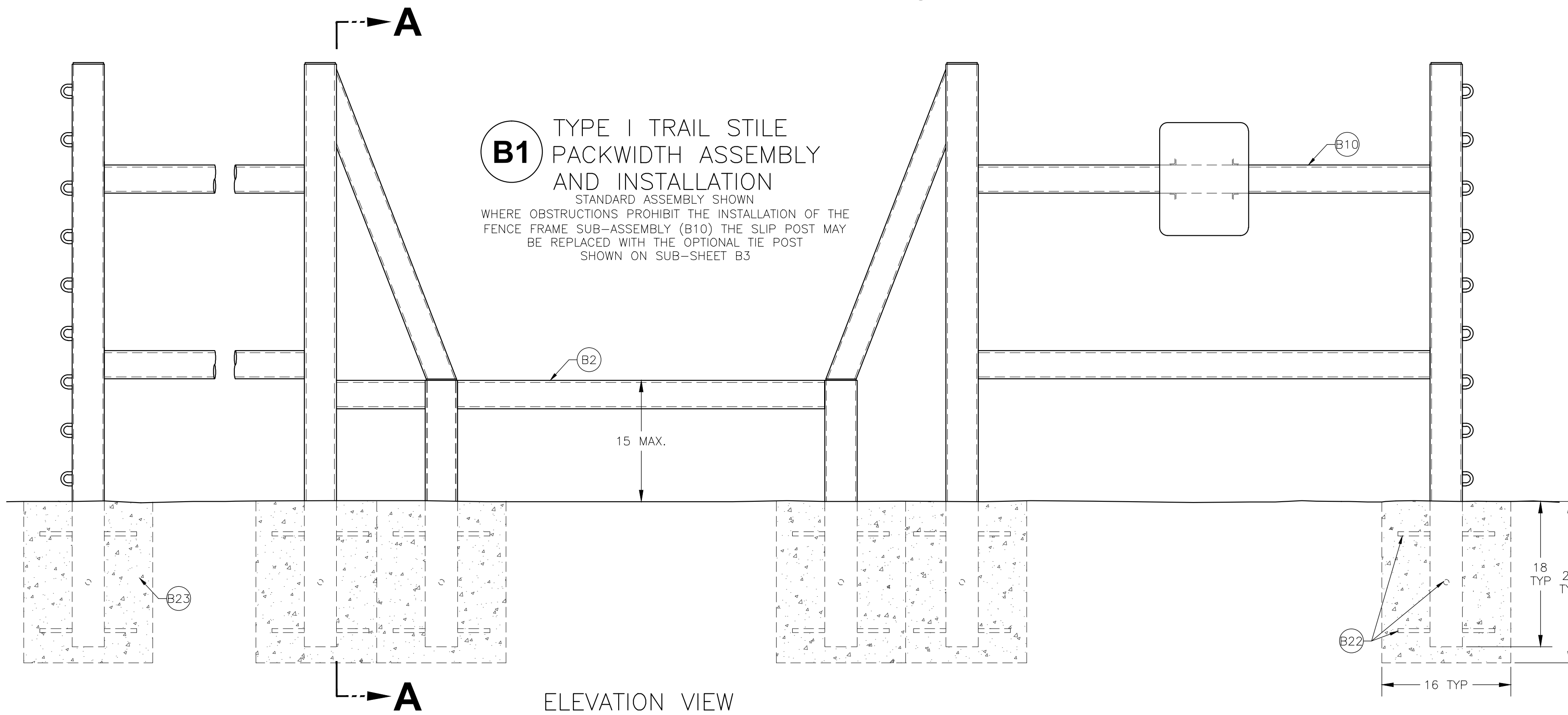
RECREATION OPPORTUNITY SPECTRUM (ROS)
 PRIMITIVE SEMI-PRIMITIVE MOTORIZED RURAL
 SEMI-PRIMITIVE NON-MOTORIZED ROADED NATURAL URBAN

SHEET
4 OF **13**

READ INSTRUCTIONS BEFORE USING THIS FILE



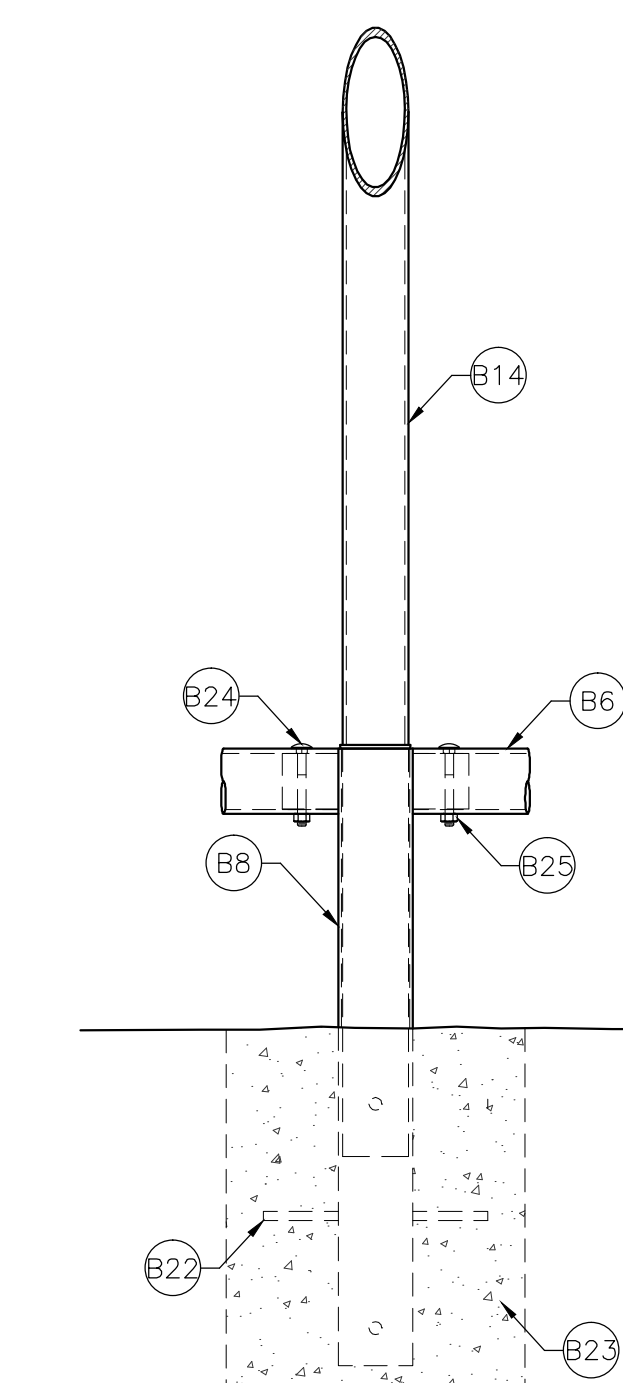
PLAN VIEW



ELEVATION VIEW

MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
B1	TYPE I TRAIL STILE PACK WIDTH ASSEMBLY & INSTALLATION	1	PARTS B2 THRU B25	
B2	BOX ASSEMBLY	-	SEE PART NO. B2	A2
B6	SIDE RAIL	-	SEE PART NO. B6	A2
B7	CROSS RAIL (CENTER)	-	SEE PART NO. B7	A2
B8	BOLT POST SUB-ASSEMBLY	-	SEE PART NO. B8	A2
B10	FENCE FRAME ASSEMBLY	-	SEE PART NO. B10	A2
B14	SLIP POST SUB-ASSEMBLY	-	SEE PART NO. B14	A3
B22	ANCHORS	30	NO. 5 REBAR HRMS, 12 LG	
B23	FOUNDATION	AR	PORTLAND READY MIX CONCRETE OR EQUAL	
B24	BOLT	6	1/2-13NC X 4-1/2 LG CARRIAGE BOLT	
B25	NUT	6	1/2-13NC HEAVY HEX NUT	

PART NO. B18 NOT USED



SECTION AA

WELDED CONSTRUCTION
SPECIFIC WELDS NOTED

NOT TO SCALE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
RECREATION FACILITIES
DESIGN CATALOG

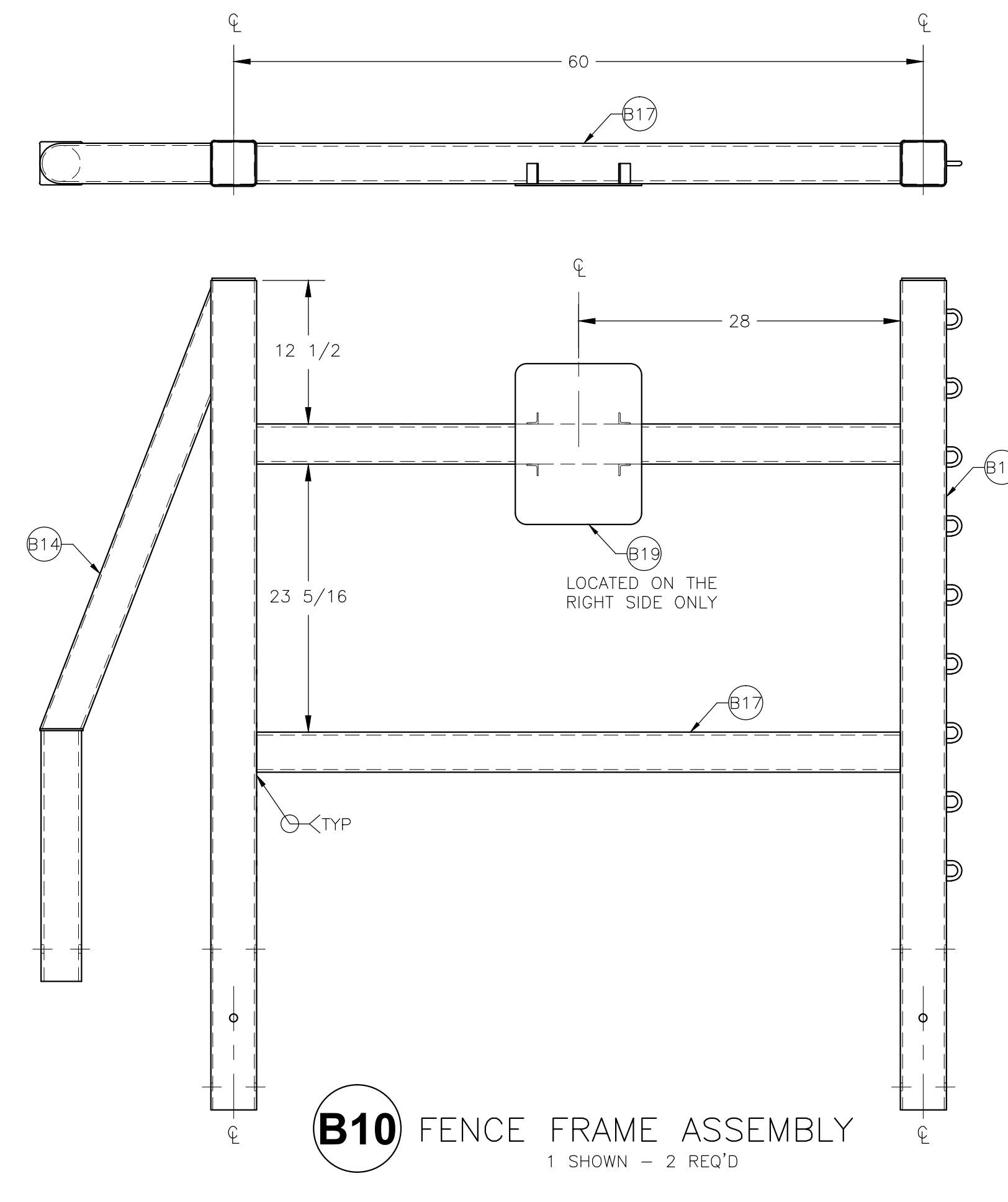
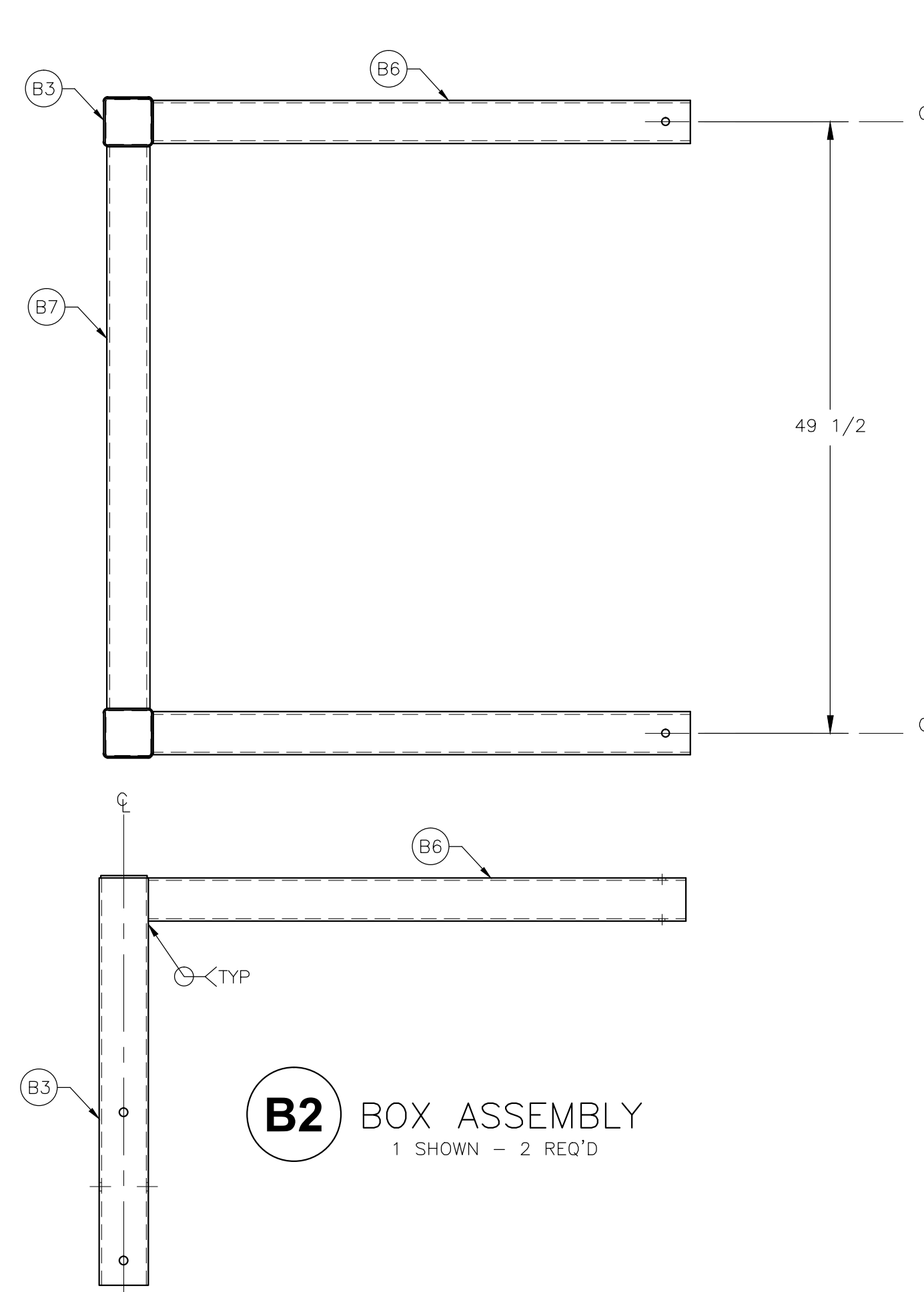
DRAWING NAME
HORSE STILE
TYPE I, B - PACKWIDTH
EF_STIL_HORS_B_01-05.pdf

BUILT ENVIRONMENT IMAGE GUIDE PROVINCE(S) (BEIG)
 ALL NORTHEAST SOUTHEAST COASTAL GREAT PLAINS NORTH PACIFIC
 LAKES SOUTHEAST MOUNTAIN ROCKY MOUNTAIN SOUTHWEST

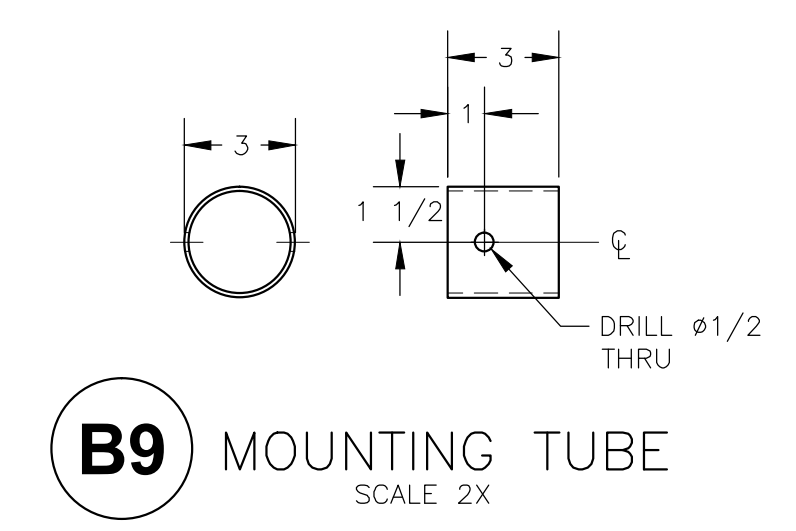
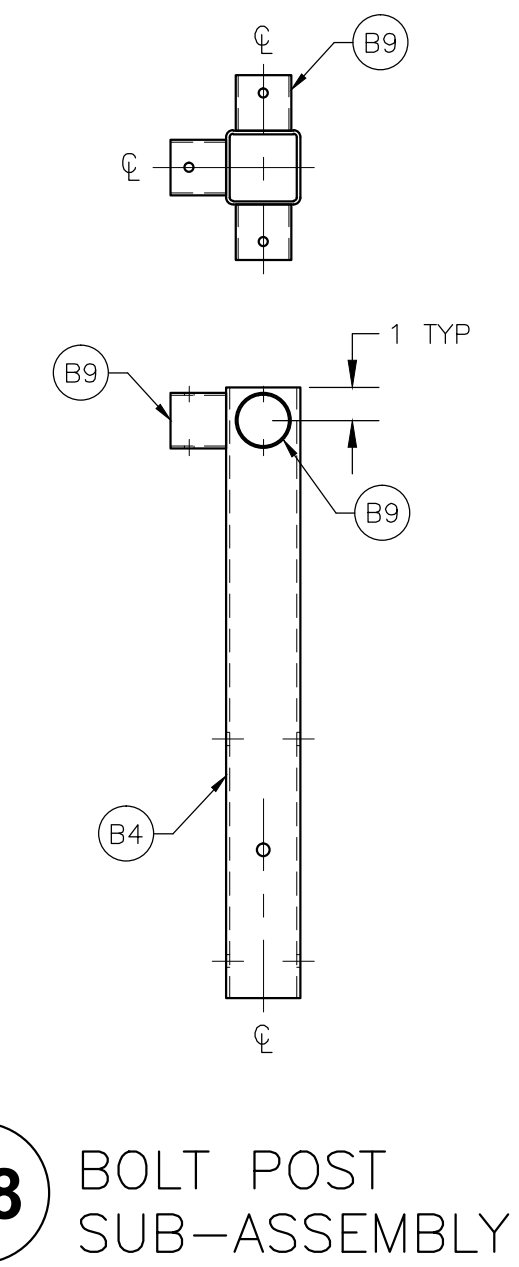
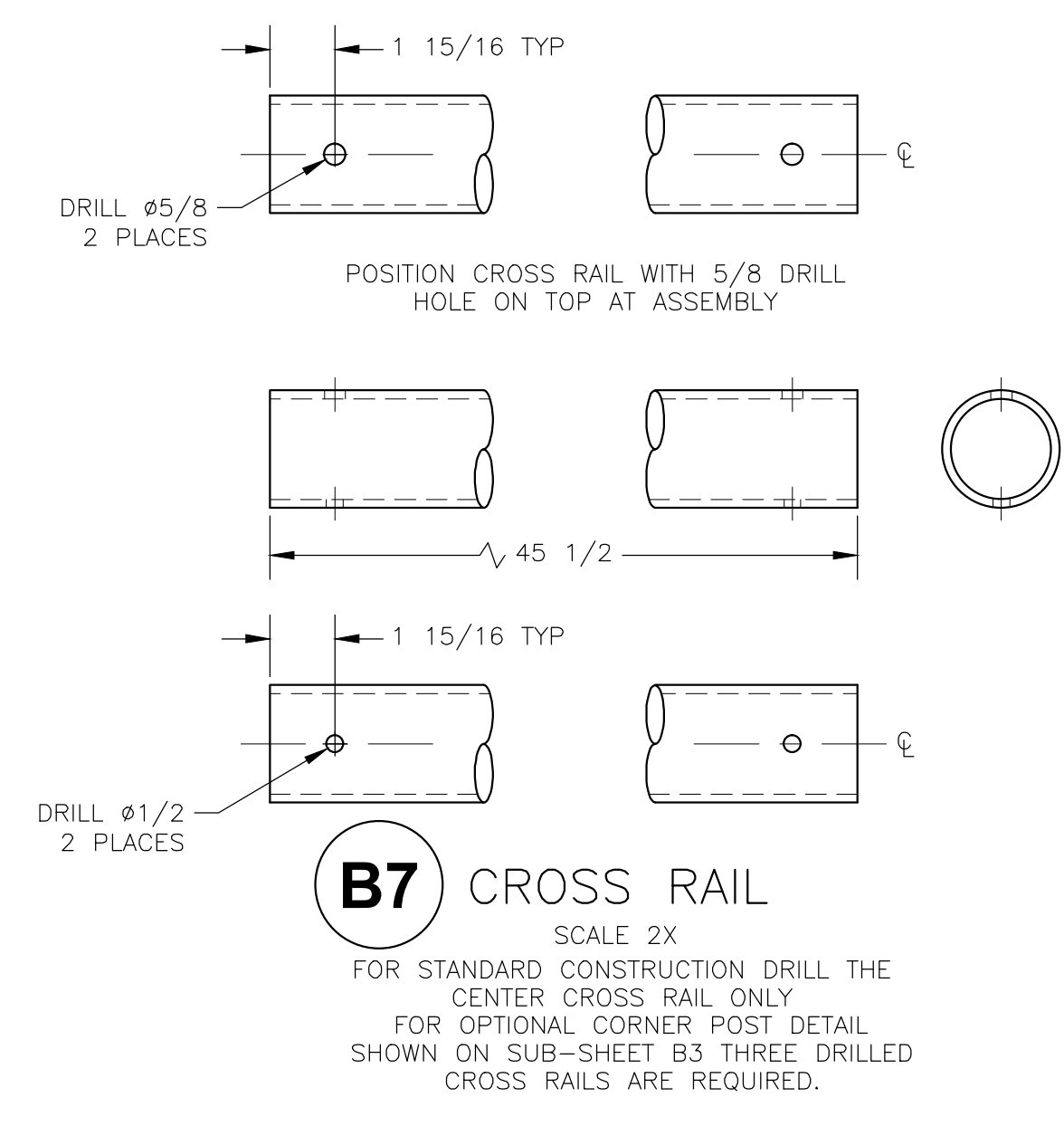
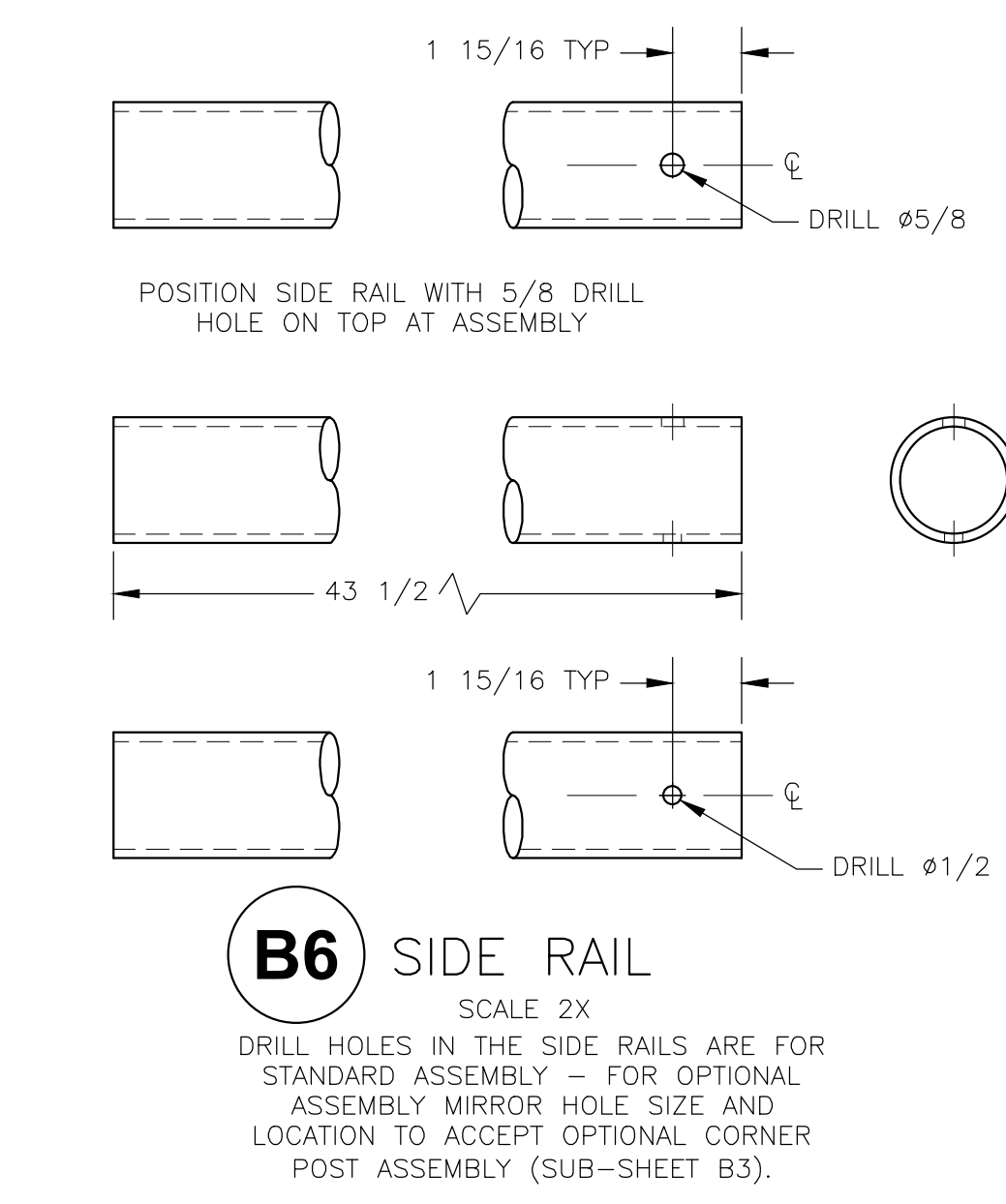
RECREATION OPPORTUNITY SPECTRUM (ROS)
 PRIMITIVE SEMI-PRIMITIVE NON-MOTORIZED SEMI-PRIMITIVE MOTORIZED RURAL
 SEMI-PRIMITIVE NON-MOTORIZED ROADED NATURAL URBAN

SHEET
5 OF **13**

READ INSTRUCTIONS BEFORE USING THIS FILE



MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
B2	BOX ASSEMBLY	2	PARTS B3 THRU B9	
B3	BOX POST	2	PARTS B4 THRU B5	B3
	SUB-ASSEMBLY			
B4	BOX POST	-	SEE PART NO. B4	B3
	SUB-ASSEMBLY			
B6	SIDE RAIL	4	3-INCH SCH 40 BL PIPE	
B7	CROSS RAIL	2	3-INCH SCH 40 BL PIPE	
B8	BOLT POST	2	PART B4 & B9	
	SUB-ASSEMBLY			
B9	MOUNTING TUBE	6	1/8 X 3-INCH OD MECH. TUBING, STEEL	
B10	FENCE FRAME ASSEMBLY	-	PARTS B12, B14, B17 & B19	
	SUB-ASSEMBLY			
B12	FENCE TIE POST	-	SEE PARTS NO. B12	B3
	SUB-ASSEMBLY			
B14	SLIP POST	-	SEE PART NO. B14	B3
	SUB-ASSEMBLY			
B17	FENCE RAIL	4	3-INCH SCH 40 BL PIPE 56 LG	
B19	SIGN PLATE	-	SEE PART NO. B19	B3
	SUB-ASSEMBLY			



NOT TO SCALE



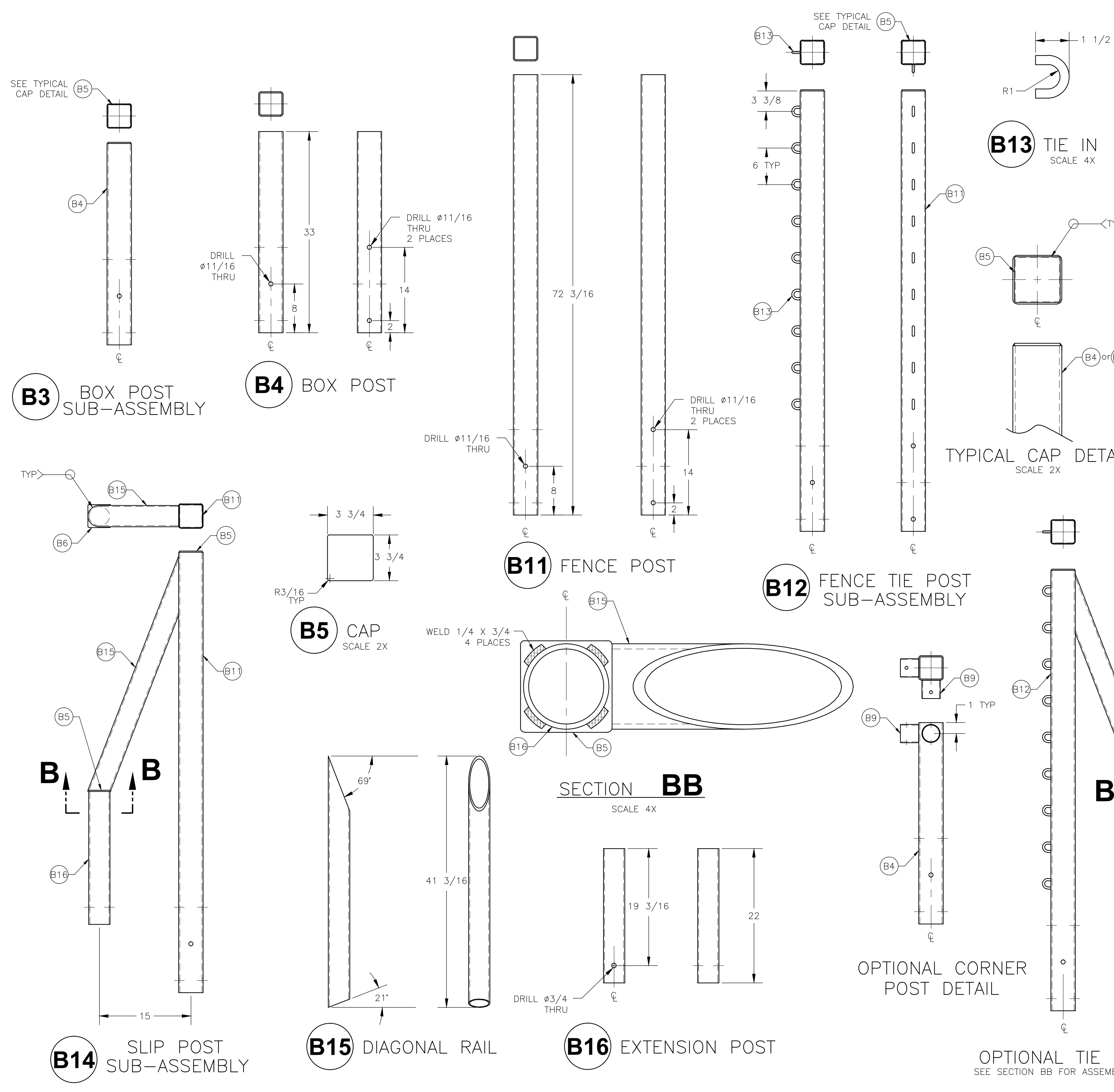
DRAWING NAME
HORSE STILE
TYPE I, B - PACKWIDTH
EF_STIL_HORS_B_01-06.pdf

BUILT ENVIRONMENT IMAGE GUIDE PROVINCE(S) (BEIG)
 ALL NORTHEAST SOUTHEAST COASTAL GREAT PLAINS NORTH PACIFIC
 LAKES SOUTHEAST MOUNTAIN ROCKY MOUNTAIN SOUTHWEST

RECREATION OPPORTUNITY SPECTRUM (ROS)
 PRIMITIVE SEMI-PRIMITIVE MOTORIZED RURAL
 SEMI-PRIMITIVE NON-MOTORIZED ROADED NATURAL URBAN

SHEET
6 OF **13**

READ INSTRUCTIONS BEFORE USING THIS FILE



MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
B3	BOX POST SUB-ASSEMBLY	4	PARTS B4 THRU B5	
B4	BOX POST	6	3/16 X 4-INCH SQ. MECH. TUBING, STEEL	
B5	CAP	10	3/16-INCH PLATE STEEL	
B11	FENCE POST	4	3/16 X 4-INCH SQ. MECH. TUBING, STEEL	
B12	FENCE TIE POST SUB-ASSEMBLY	2	PARTS B5, B11, & B13	
B13	TIE IN	18	3/8-INCH ROUND ROD, STEEL OR CHAIN LINK THAT MEETS BOTH STRUCTURAL AND DIMENSIONAL REQUIREMENTS	
B14	SLIP POST SUB-ASSEMBLY	2	PARTS B5(2), B11, B15 & B16	
B15	DIAGONAL RAIL	2	3-INCH SCH 40 BL PIPE	
B16	EXTENSION POST	2	3-INCH SCH 40 BL PIPE	
B19	SIGN PLATE SUB-ASSEMBLY	1	PARTS B20 & B21	
B20	SIGN TABS	4	L2 X 1 X 1-1/8 ANGLE, STEEL 1-3/4 LG	
B21	SIGN PLATE	1	3/16-INCH PLATE, STEEL	
OPTIONAL TIE POST ASSEMBLY			PARTS B5 B12, B15 & B16 PARTS SHOWN FOR 1 ASSEMBLY	
B6	CAP	1		
B12	FENCE TIE POST SUB-ASSEMBLY	1		
B15	DIAGONAL RAIL	1		
B16	EXTENSION POST	1		
OPTIONAL CORNER POST DETAIL			PARTS B3 & B9 PARTS SHOWN FOR 1 ASSEMBLY	
B3	BOX POST SUB-ASSEMBLY	1	BOLT & NUTS FOR THIS OPTION ARE NOT INCLUDED IN THE MATERIALS LIST	
B9	MOUNTING TUBE	2		2

NOT TO SCALE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
RECREATION FACILITIES
DESIGN CATALOG

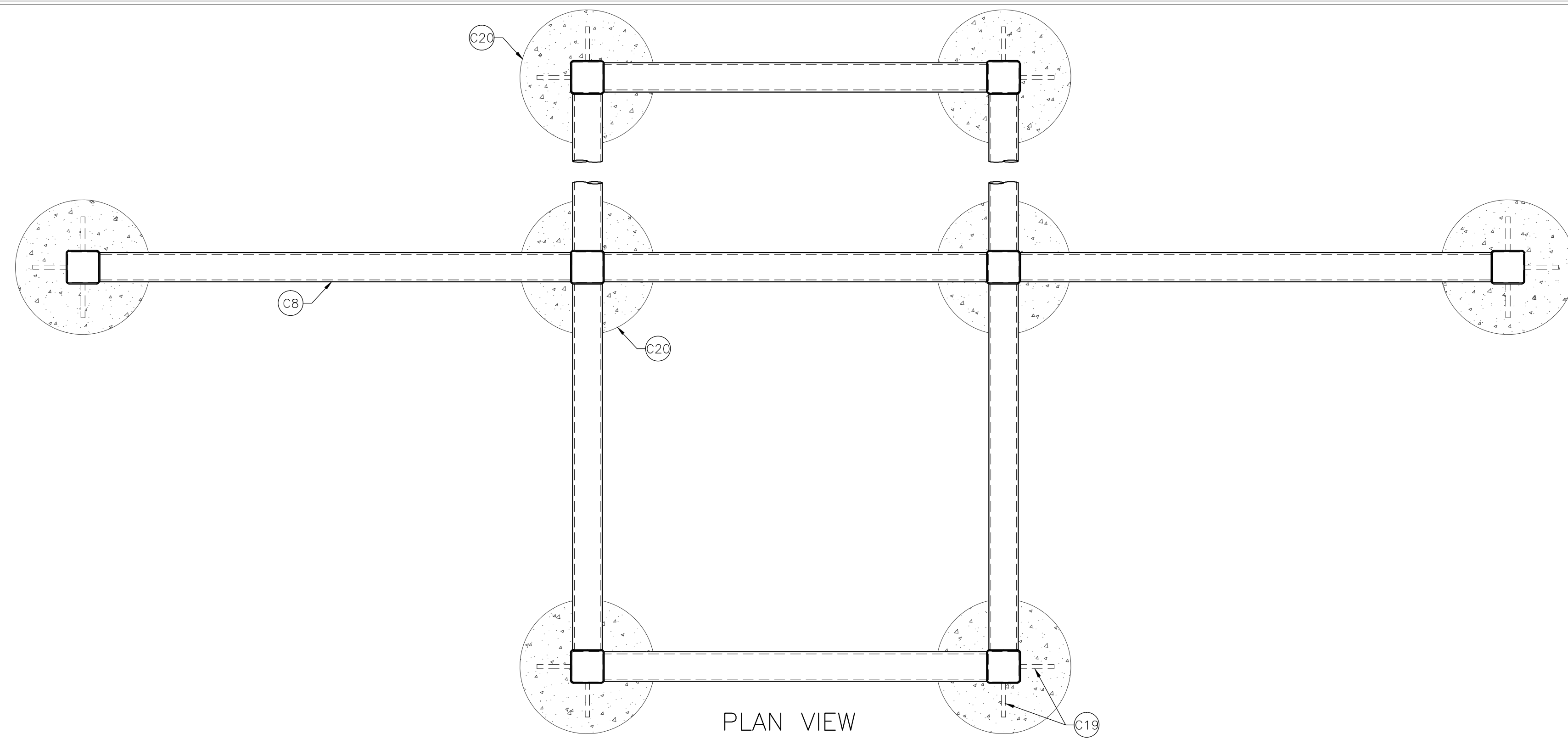
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HORSE STILE
TYPE I, B - PACKWIDTH
EF_STIL_HORS_B_01-07.pdf

BUILT ENVIRONMENT IMAGE GUIDE PROVINCE(S) (BEIG)
 ALL NORTHEAST SOUTHEAST COASTAL GREAT PLAINS NORTH PACIFIC
 LAKES SOUTHEAST MOUNTAIN ROCKY MOUNTAIN SOUTHWEST

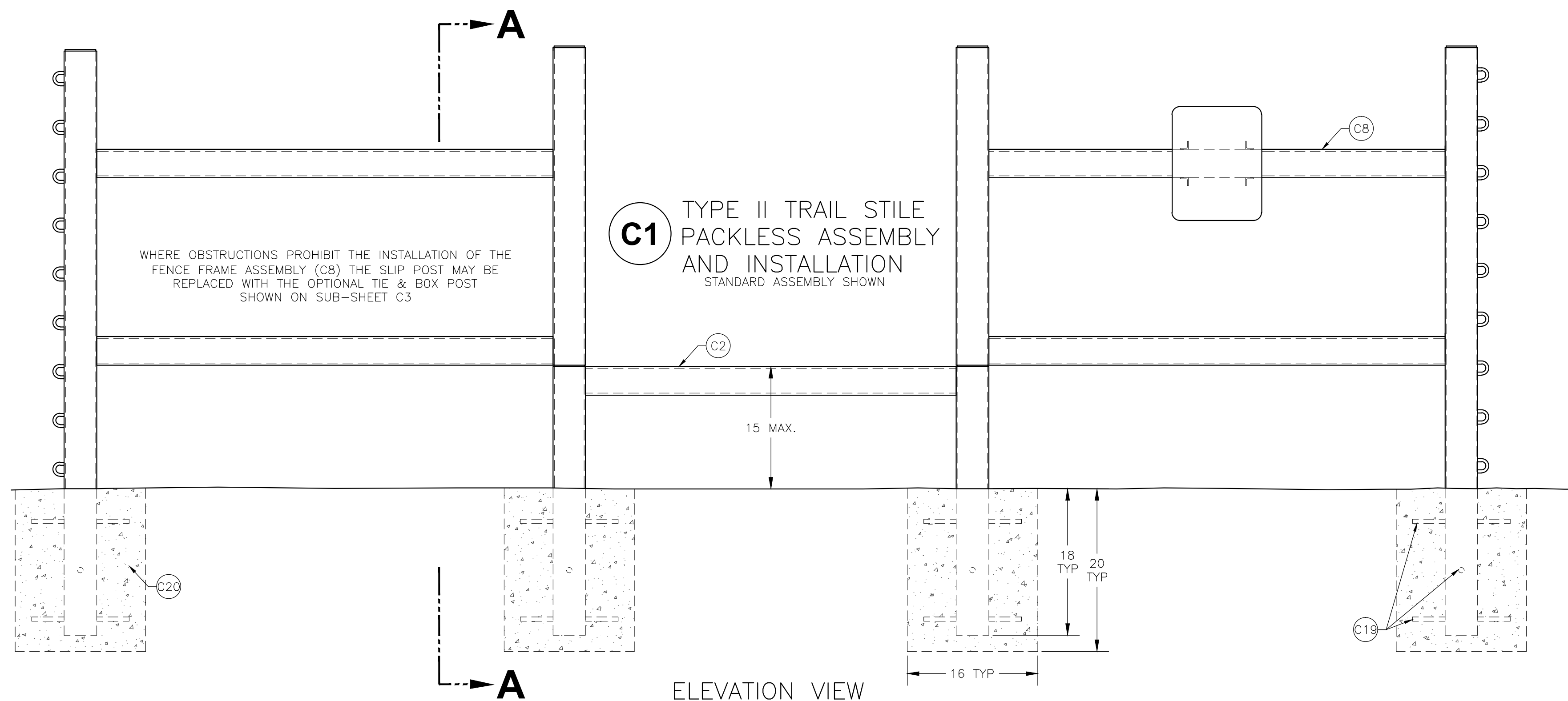
RECREATION OPPORTUNITY SPECTRUM (ROS)
 PRIMITIVE SEMI-PRIMITIVE NON-MOTORIZED SEMI-PRIMITIVE MOTORIZED RURAL
 SEMI-PRIMITIVE NON-MOTORIZED ROADED NATURAL URBAN

SHEET
7 OF **13**

READ INSTRUCTIONS BEFORE USING THIS FILE



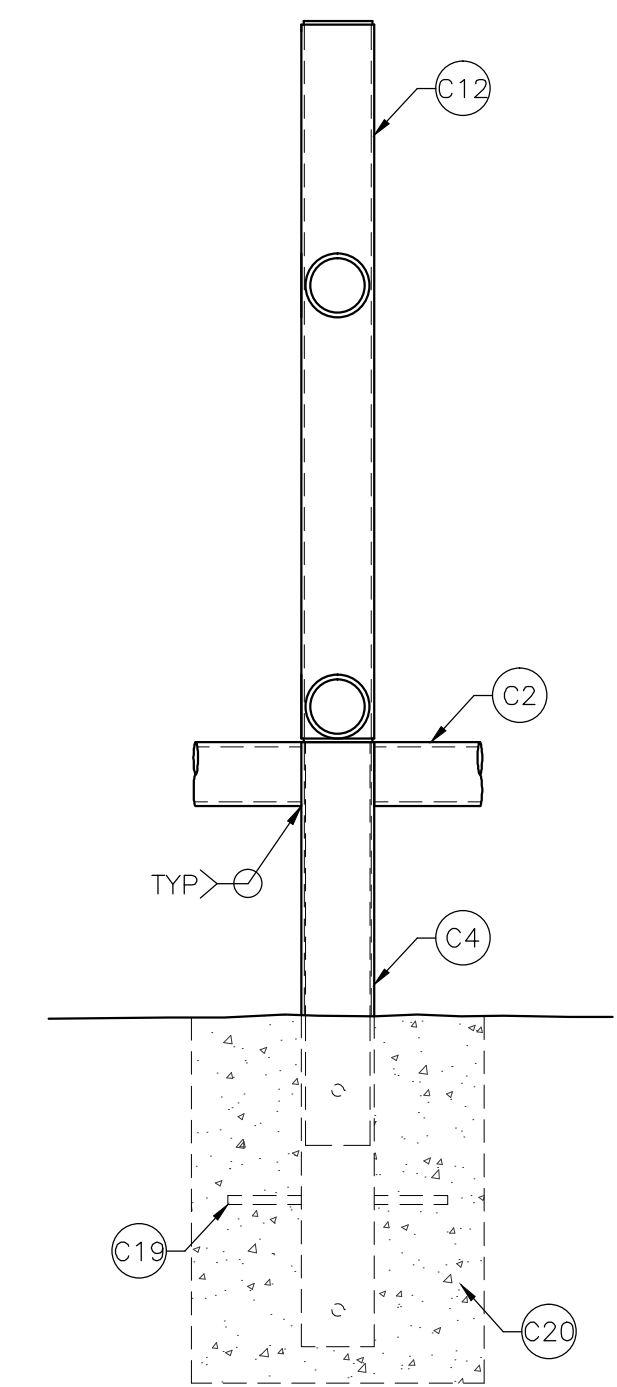
PLAN VIEW



ELEVATION VIEW

MATERIAL LIST

NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
C1	TYPE II TRAIL STILE PACKLESS ASSEMBLY & INSTALLATION	-	PARTS C2 THRU C20	
C2	BOX ASSEMBLY	-	PARTS C3 THRU C7	C2
C4	BOX POST	-	SEE PART NO C4	C3
C8	FENCE FRAME ASSEMBLY	-	PARTS C9 THRU C18	C2
C12	SLIP POST SUB-ASSEMBLY	-	SEE PART NO. C12	C2
C19	ANCHORS	24	NO. 5 REBAR HRMS, 12 LG	
C20	FOUNDATION	AR	PORTLAND READY MIX CONCRETE OR EQUAL	



SECTION **AA**

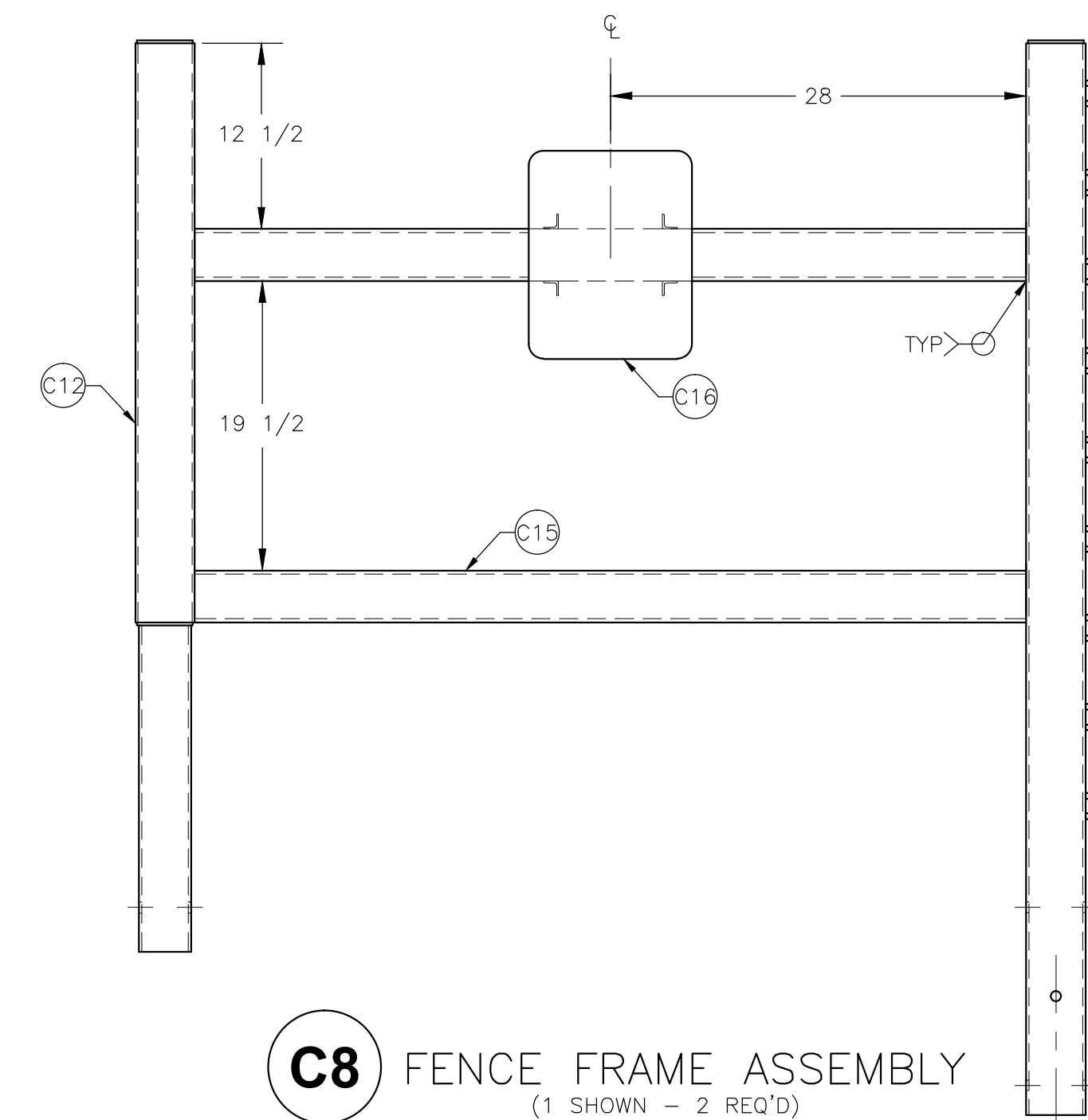
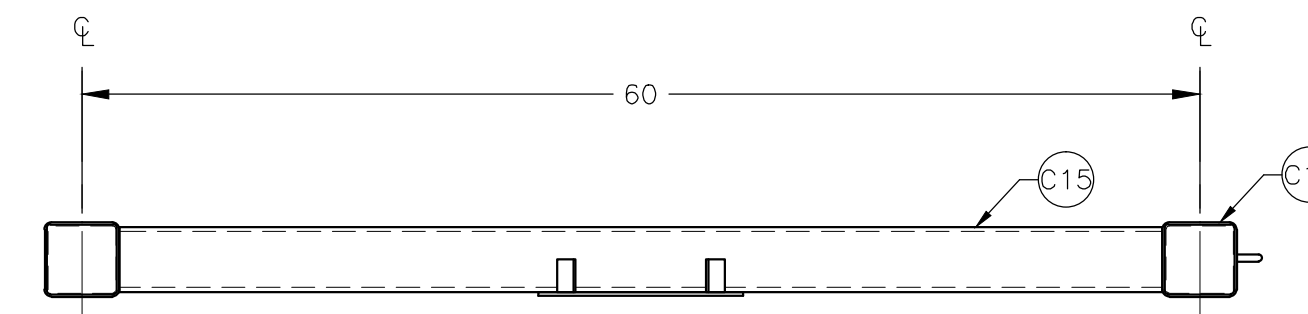
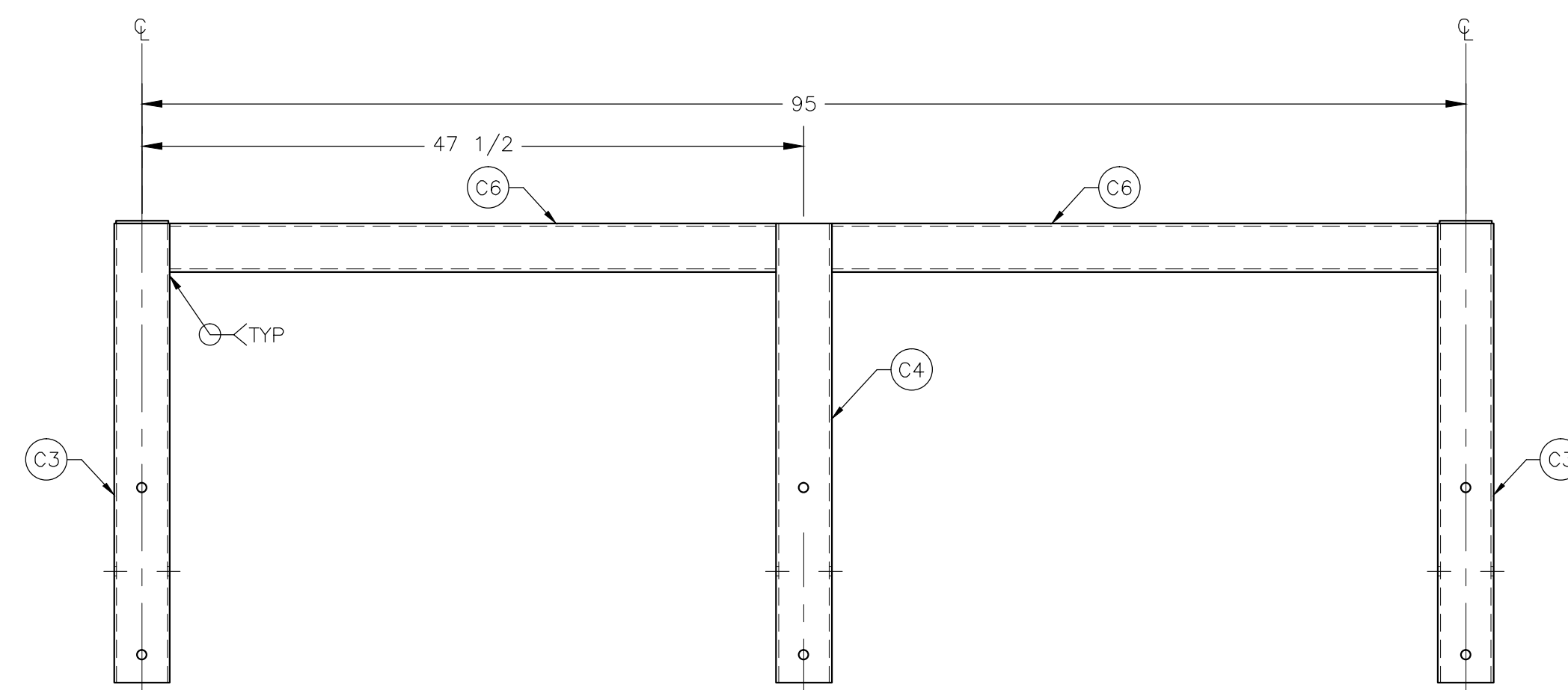
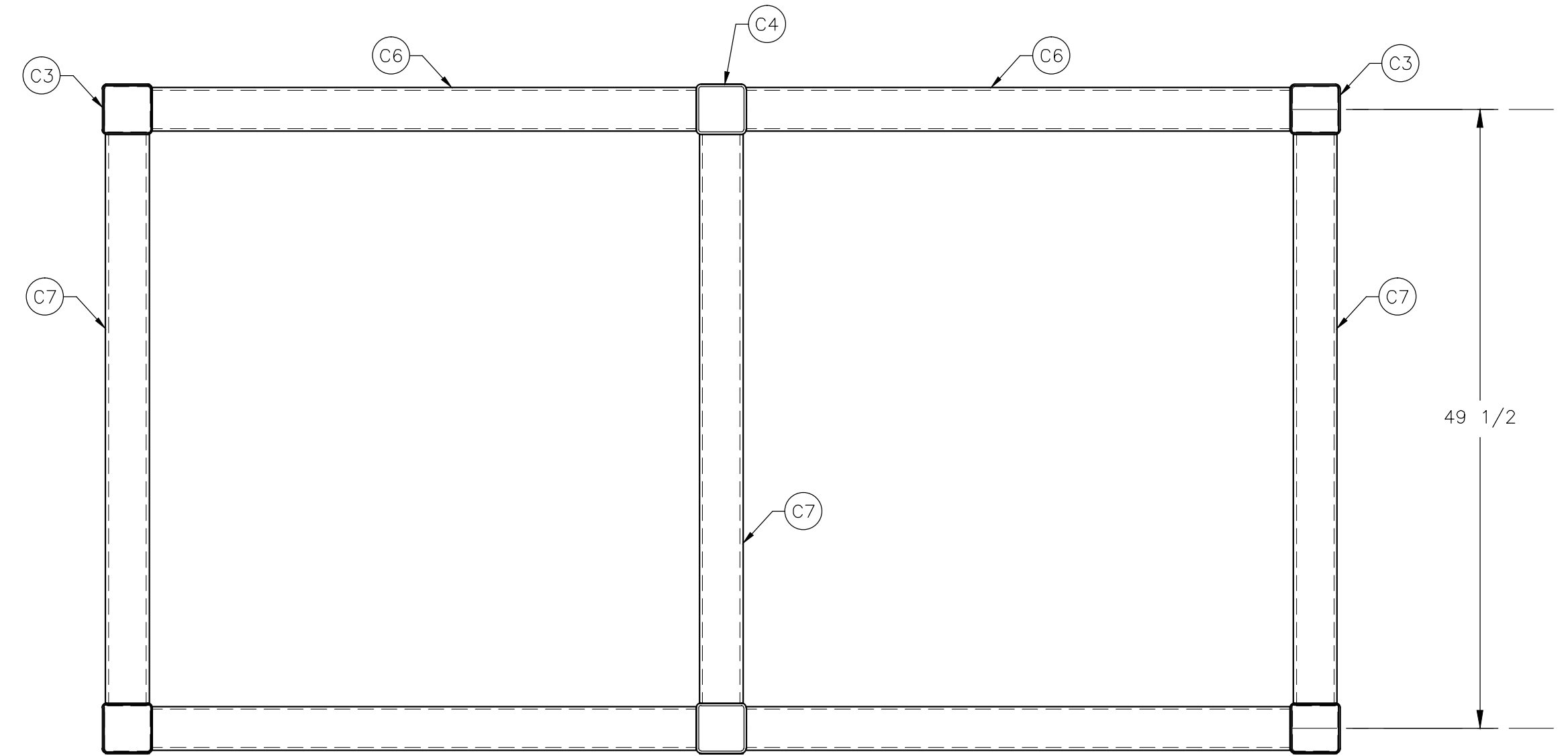
WELDED CONSTRUCTION
SPECIFIC WELDS NOTED

NOT TO SCALE

READ INSTRUCTIONS BEFORE USING THIS FILE

MATERIAL LIST

NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
C2	BOX ASSEMBLY	-	PARTS C3 THRU C7	
C3	BOX POST	-	SEE PART NO. C3	C3
	SUB-ASSEMBLY			
C4	BOX POST	-	SEE PART NO. C4	C3
C6	SIDE RAIL	4	3-INCH SCH 40 BL PIPE 43-1/2 LG	
C7	CROSS RAIL	3	3-INCH SCH 40 BL PIPE 45-1/2 LG	
C8	FENCE FRAME	-	PARTS C9 THRU C15	C3
	ASSEMBLY			
C10	FENCE TIE POST	-	SEE PART NO. C10	C3
	SUB-ASSEMBLY			
C12	SLIP POST	-	SEE PART NO. C12	C3
	SUB-ASSEMBLY			
C15	RAIL	4	3-INCH SCH 40 BL PIPE 56 LG	
C16	SIGN PLATE	-	SEE PART NO. C16	C3
	SUB-ASSEMBLY			



C2 BOX ASSEMBLY

C8 FENCE FRAME ASSEMBLY
(1 SHOWN - 2 REQ'D)

NOT TO SCALE



DRAWING NAME

HORSE STILE
TYPE II, C - PACKLESS

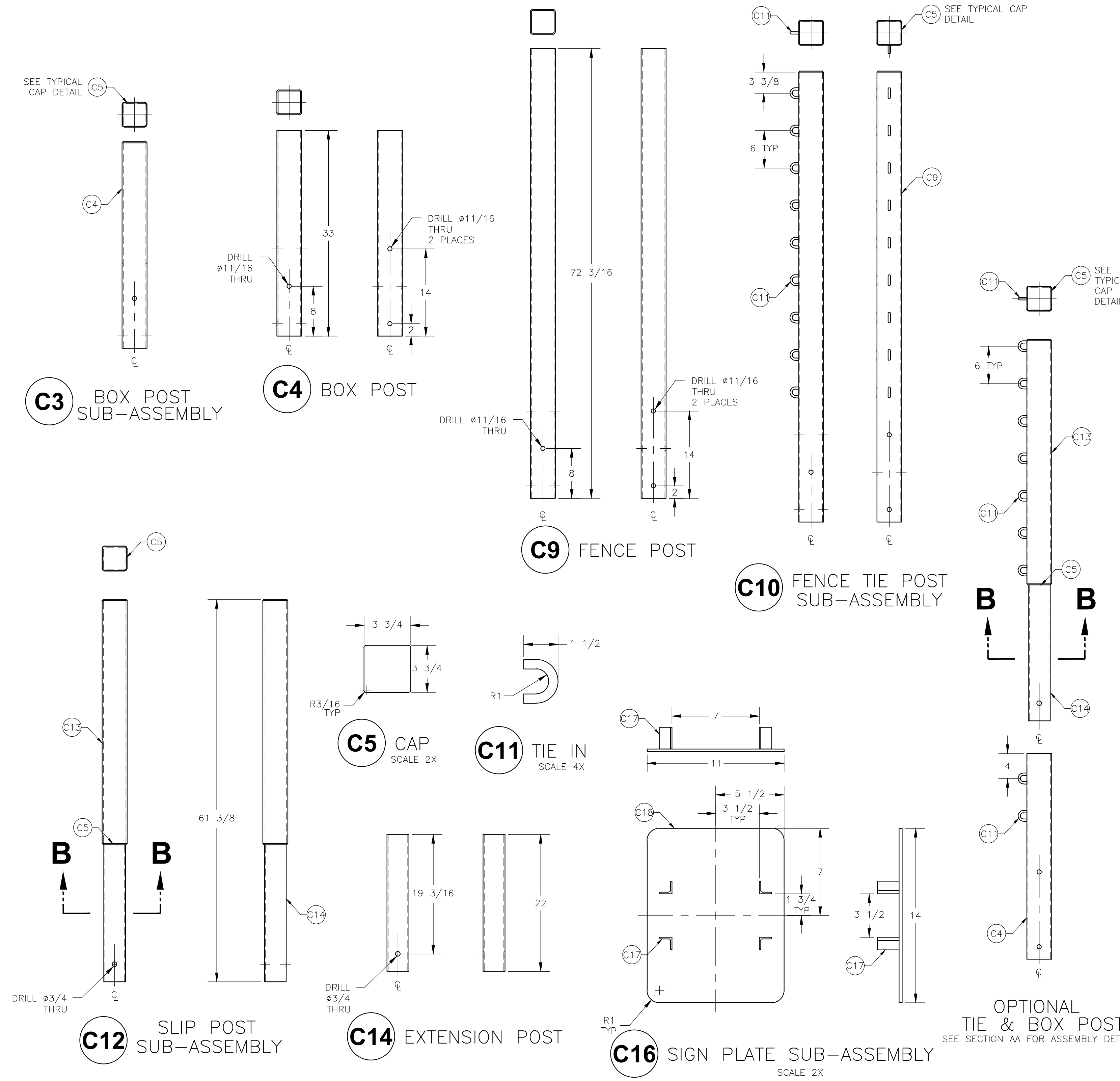
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- BUILT ENVIRONMENT IMAGE GUIDE PROVINCE(S) (BEIG)
- ALL
 - NORTHEAST
 - SOUTHEAST COASTAL
 - GREAT PLAINS
 - NORTH PACIFIC
 - LAKES
 - SOUTHEAST MOUNTAIN
 - ROCKY MOUNTAIN
 - SOUTHWEST
- RECREATION OPPORTUNITY SPECTRUM (ROS)
- PRIMITIVE
 - SEMI-PRIMITIVE NON-MOTORIZED
 - SEMI-PRIMITIVE MOTORIZED
 - ROADED NATURAL
 - RURAL
 - URBAN

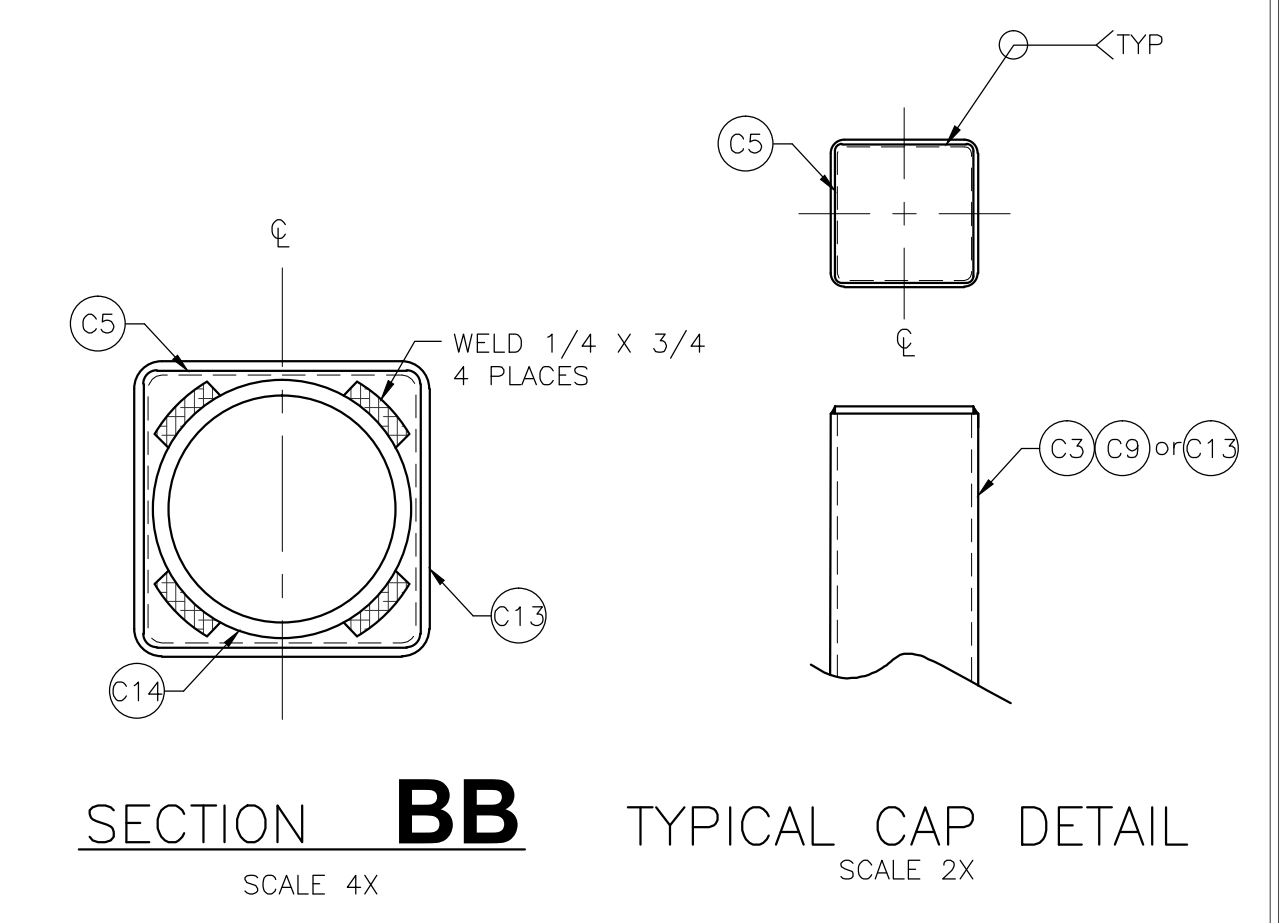
SHEET

9 OF **13**

READ INSTRUCTIONS BEFORE USING THIS FILE



MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
C3	BOX POST SUB-ASSEMBLY	4	PARTS C4 & C5	
C4	BOX POST	6	3/16 X 4-INCH SQ. MECH. TUBING, STEEL	
C5	CAP	10	3/16-INCH PLATE STEEL	
C9	FENCE POST	2	3/16 X 4-INCH SQ. MECH. TUBING, STEEL	
C10	FENCE TIE POST SUB-ASSEMBLY	2	PARTS C5, C9 & C11	
C11	TIE IN	18	3/8-INCH ROUND ROD, STEEL OR CHAIN LINK THAT MEETS BOTH STRUCTURAL AND DIMENSIONAL REQUIREMENTS	
C12	SLIP POST SUB-ASSEMBLY	2	PARTS C5(2), C13 & C14	
C13	SHORT POST	2	3/16 X 4-INCH SQ. MECH. TUBING, 39 LG, STEEL	
C14	EXTENSION POST	2	3-INCH SCH 40 BL PIPE	
C16	SIGN PLATE SUB-ASSEMBLY	1	PARTS C17 & C18	
C17	SIGN TABS	4	L2 X 1 X 1-1/8 ANGLE, STEEL 1-3/4 LG	
C18	SIGN PLATE	1	3/16-INCH PLATE, STEEL	
	OPTIONAL TIE & BOX POST ASSEMBLY		PARTS C4, C5, C11, C13 AND C14 PARTS SHOWN FOR 1 ASSEMBLY	
C4	BOX POST	1		
C5	CAP	2		
C11	TIE IN	9		
C13	SHORT POST	1		
C14	EXTENSION POST	1		



NOT TO SCALE

U.S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE
RECREATION FACILITIES
DESIGN CATALOG

DRAWING NAME
HORSE STILE
TYPE II, C - PACKLESS

EF_STIL_HORS_C_01-10.pdf

BUILT ENVIRONMENT IMAGE GUIDE PROVINCE(S) (BEIG)

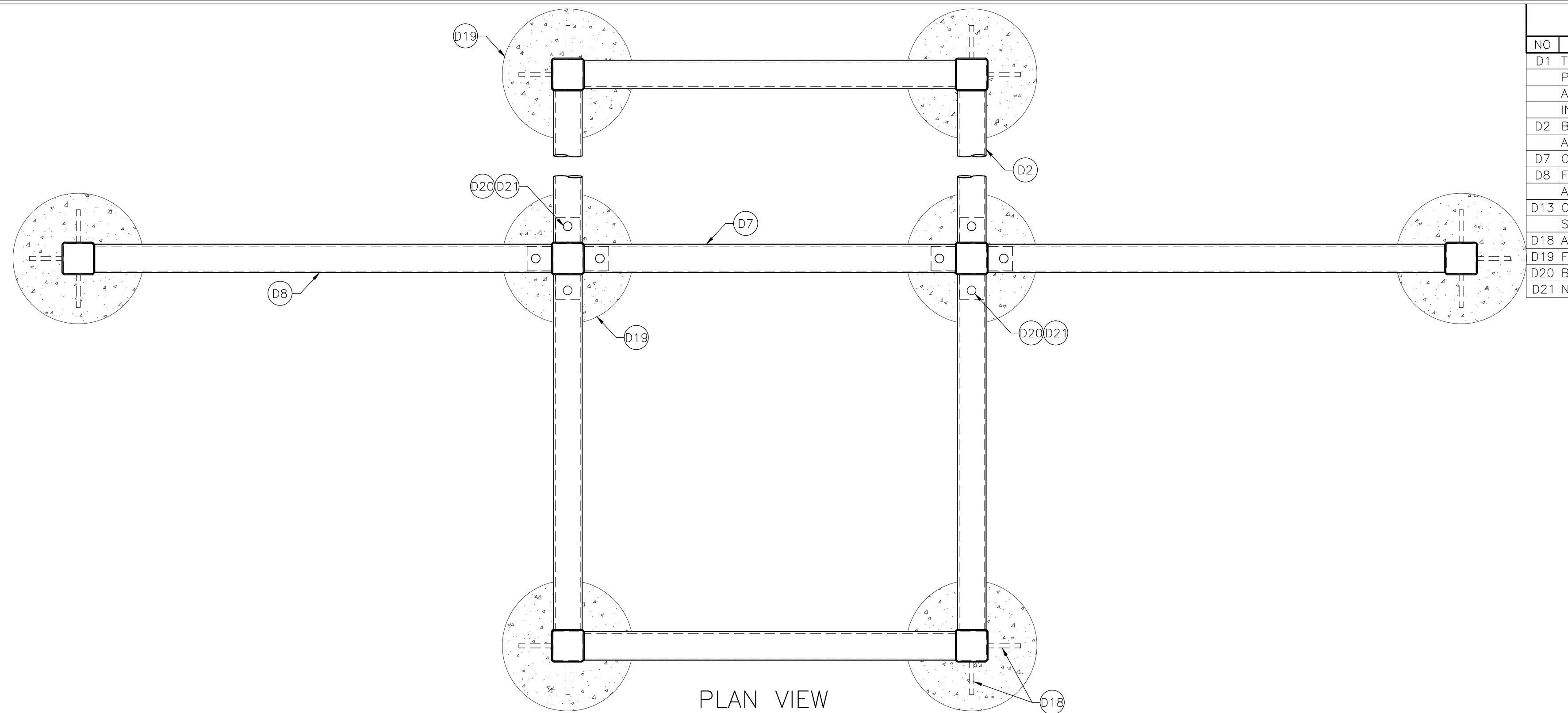
ALL NORTHEAST SOUTHEAST COASTAL GREAT PLAINS NORTH PACIFIC
 LAKES SOUTHEAST MOUNTAIN ROCKY MOUNTAIN SOUTHWEST

RECREATION OPPORTUNITY SPECTRUM (ROS)

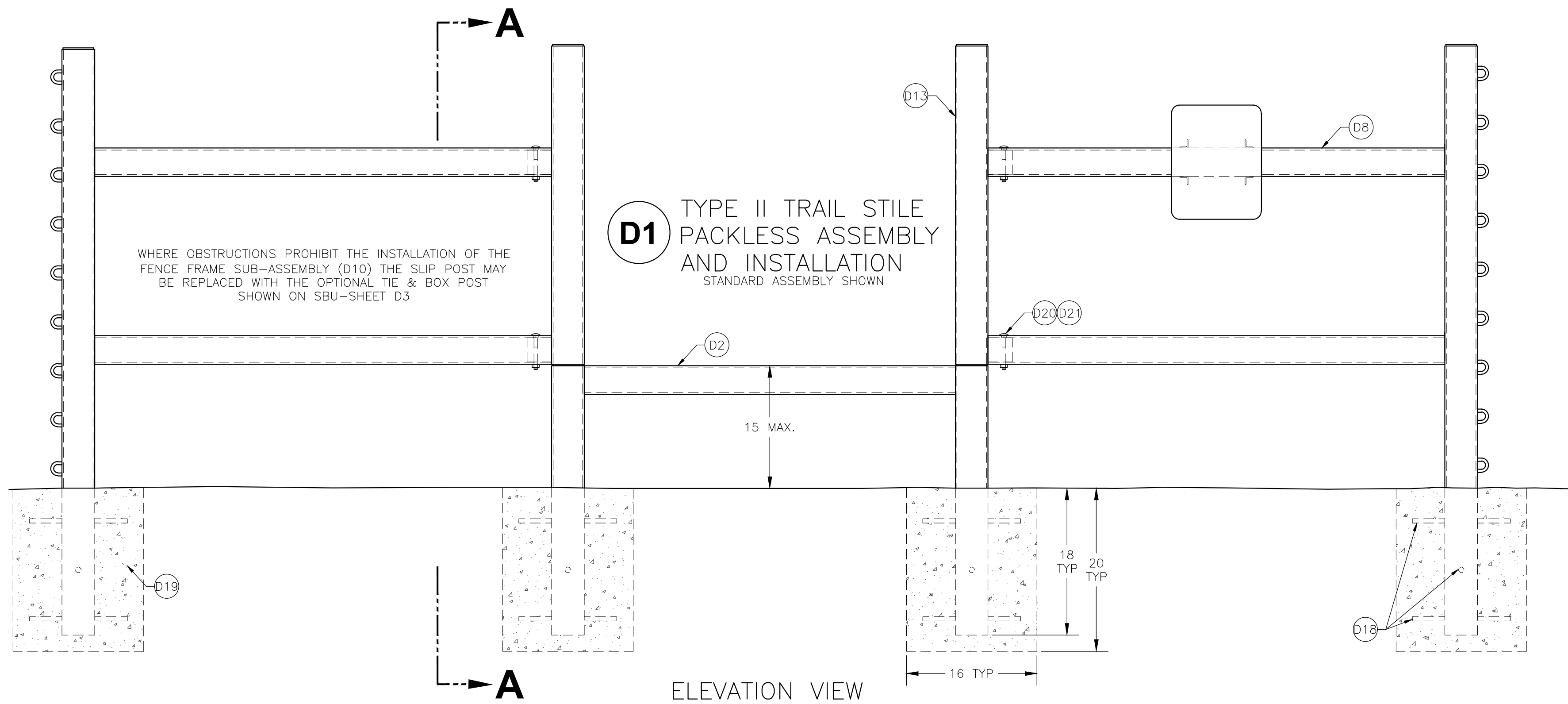
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 SEMI-PRIMITIVE NON-MOTORIZED ROADED NATURAL URBAN

SHEET
10 OF **13**

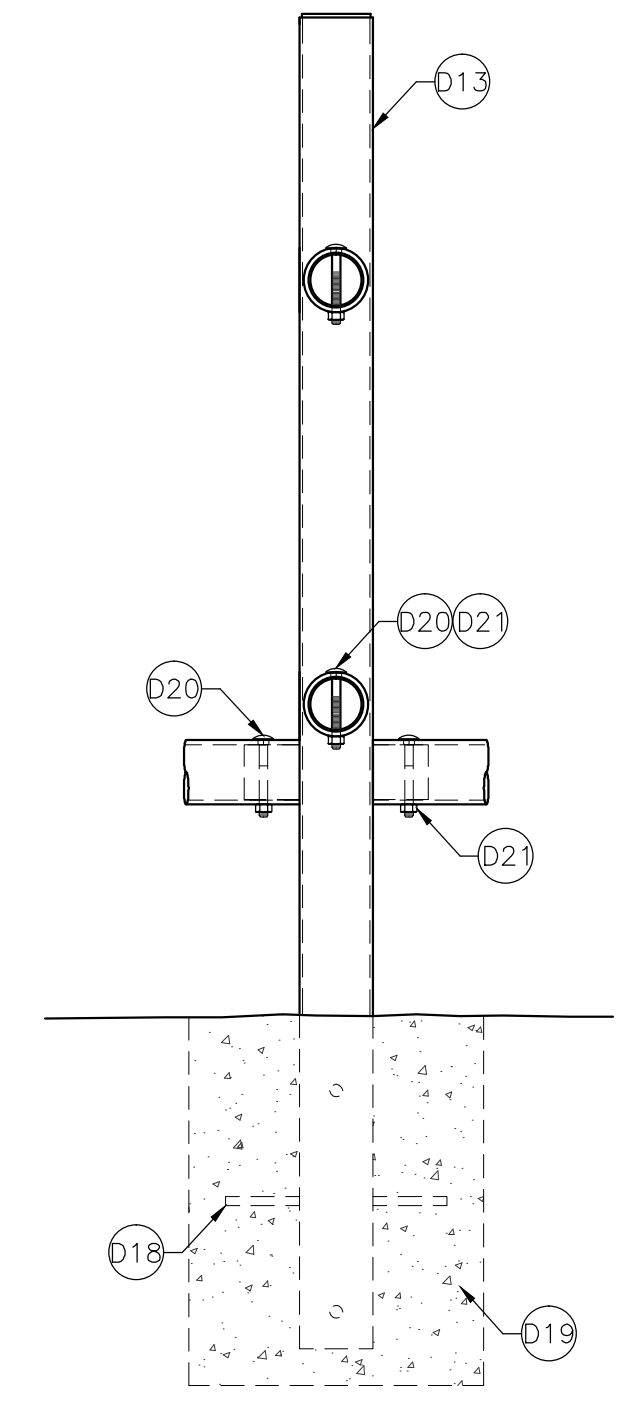
READ INSTRUCTIONS BEFORE USING THIS FILE



PLAN VIEW



ELEVATION VIEW



SECTION AA

WELDED CONSTRUCTION
SPECIFIC WELDS NOTED

NOT TO SCALE

MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
D1	TYPE II TRAIL STILE	-	PARTS D2 THRU D21	
	PACKLESS ASSEMBLY & INSTALLATION			
D2	BOX ASSEMBLY	-	SEE PART NO. D2	D2
D7	CROSS RAIL	-	SEE PART NO. D7	D2
D8	FENCE FRAME ASSEMBLY	-	SEE PART NO. D8	D2
D13	CENTER POST SUB-ASSEMBLY	-	SEE PART NO. D13	D3
D18	ANCHORS	24	NO. 5 REBAR HRMS, 12 LG	
D19	FOUNDATION	AR	PORTLAND READY MIX CONCRETE OR EQUAL	
D20	BOLT	10	1/2-13NC X 4-1/2 LG CARRIAGE BOLT	
D21	NUT	10	1/2-13NC HEAVY HEX NUT	

DRAWING NAME

HORSE STILE

TYPE II, D - PACKLESS

EF_STIL_HORS_D_01-11.pdf

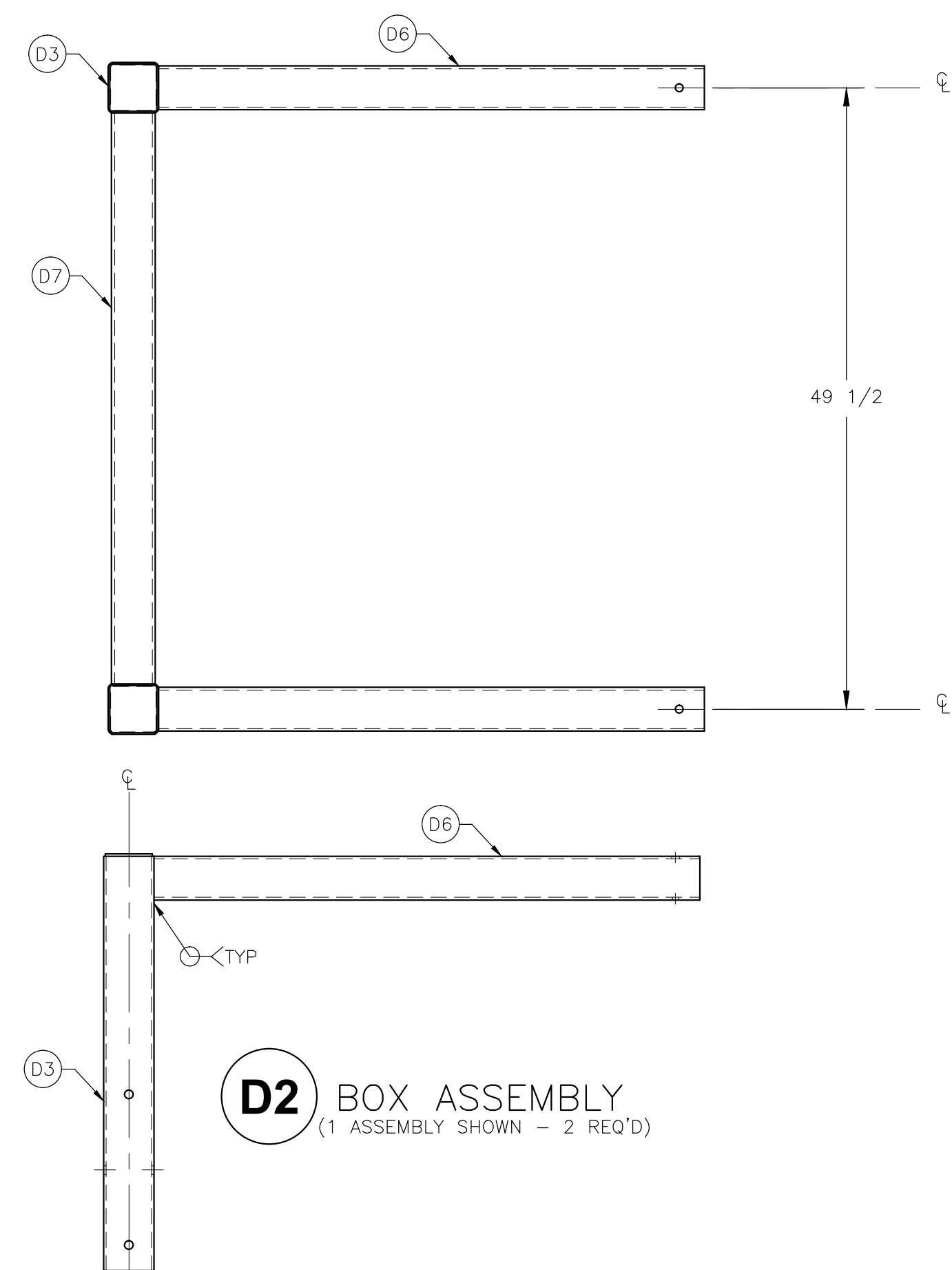
- BUILT ENVIRONMENT IMAGE GUIDE PROVINCE(S) (BEIG)
- ALL
 - NORTHEAST
 - SOUTHEAST COASTAL
 - GREAT PLAINS
 - NORTH PACIFIC
 - LAKES
 - SOUTHEAST MOUNTAIN
 - ROCKY MOUNTAIN
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- RECREATION OPPORTUNITY SPECTRUM (ROS)
- PRIMITIVE
 - SEMI-PRIMITIVE NON-MOTORIZED
 - SEMI-PRIMITIVE MOTORIZED
 - ROADED NATURAL
 - RURAL
 - URBAN

SHEET

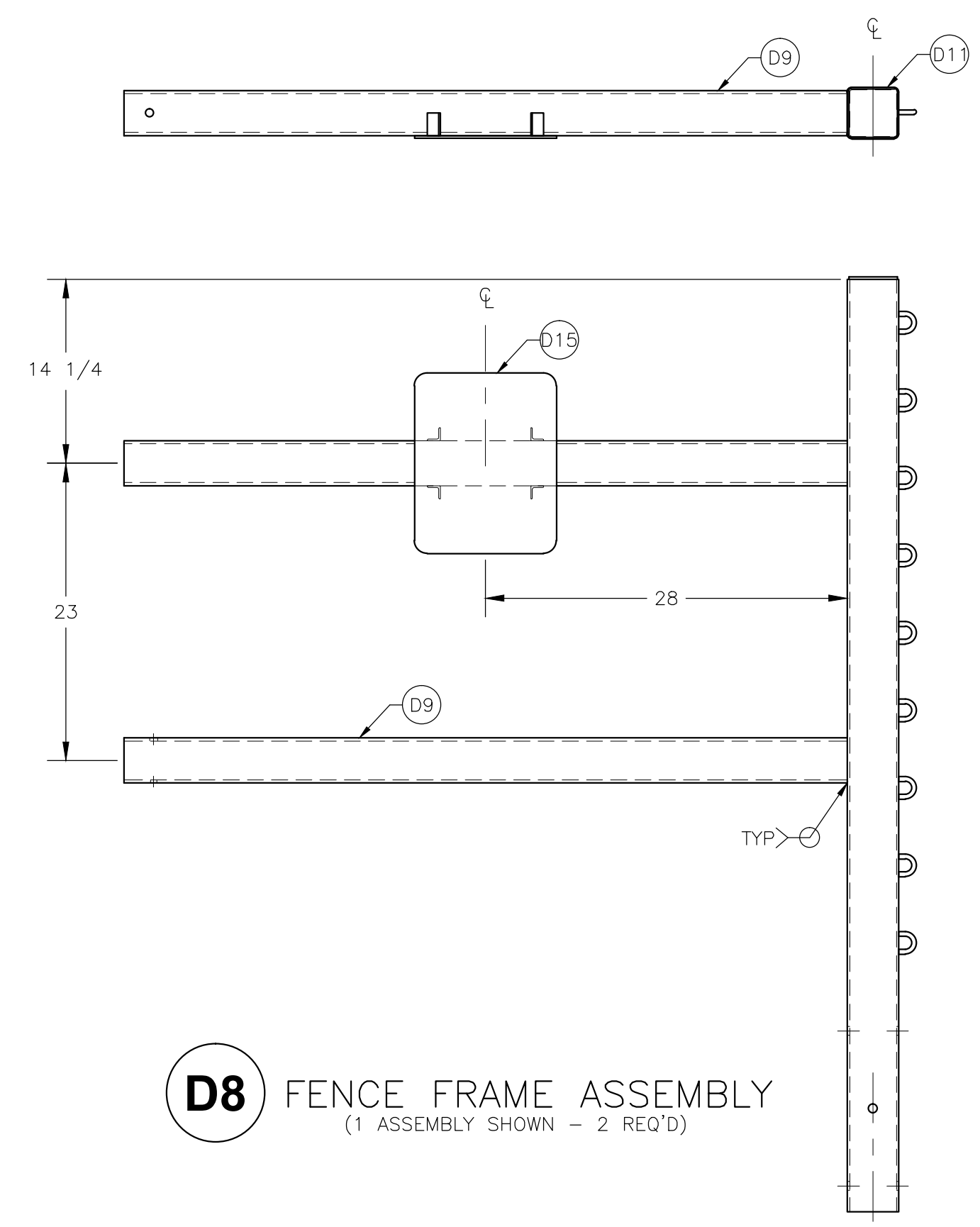
11 OF 13



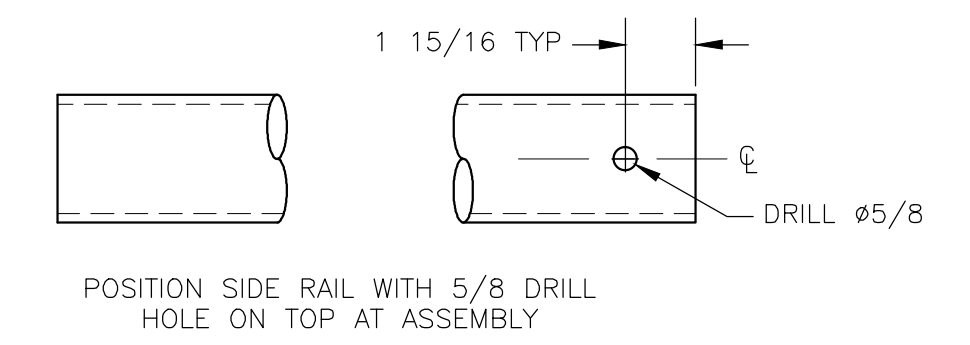
READ INSTRUCTIONS BEFORE USING THIS FILE



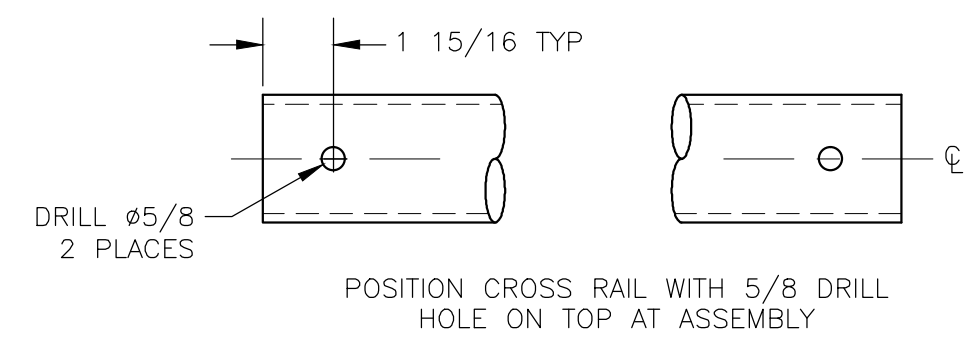
D2 BOX ASSEMBLY
(1 ASSEMBLY SHOWN - 2 REQ'D)



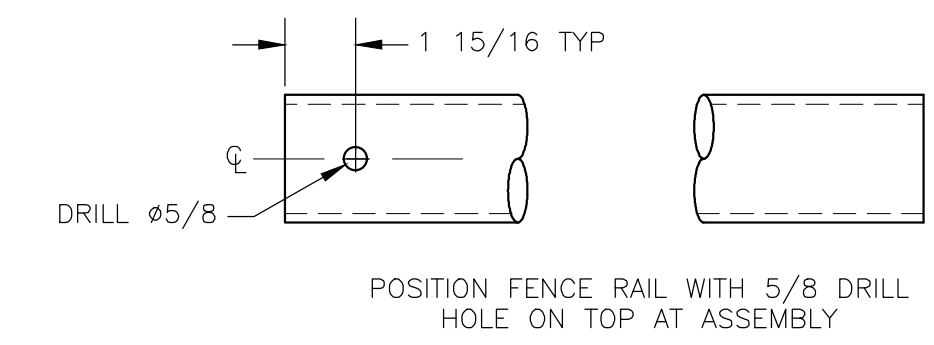
D8 FENCE FRAME ASSEMBLY
(1 ASSEMBLY SHOWN - 2 REQ'D)



D6 SIDE RAIL
SCALE 2X
DRILL HOLES IN THE SIDE RAILS ARE FOR STANDARD ASSEMBLY - FOR OPTIONAL ASSEMBLY ON SUB-SHEET D3 MIRROR HOLE SIZE AND LOCATION.



D7 CROSS RAIL
SCALE 2X
FOR STANDARD CONSTRUCTION DRILL THE CENTER CROSS RAIL ONLY FOR OPTIONAL CORNER POST DETAIL SHOWN ON SUB-SHEET D3 (3) DRILLED CROSS RAILS ARE REQUIRED.

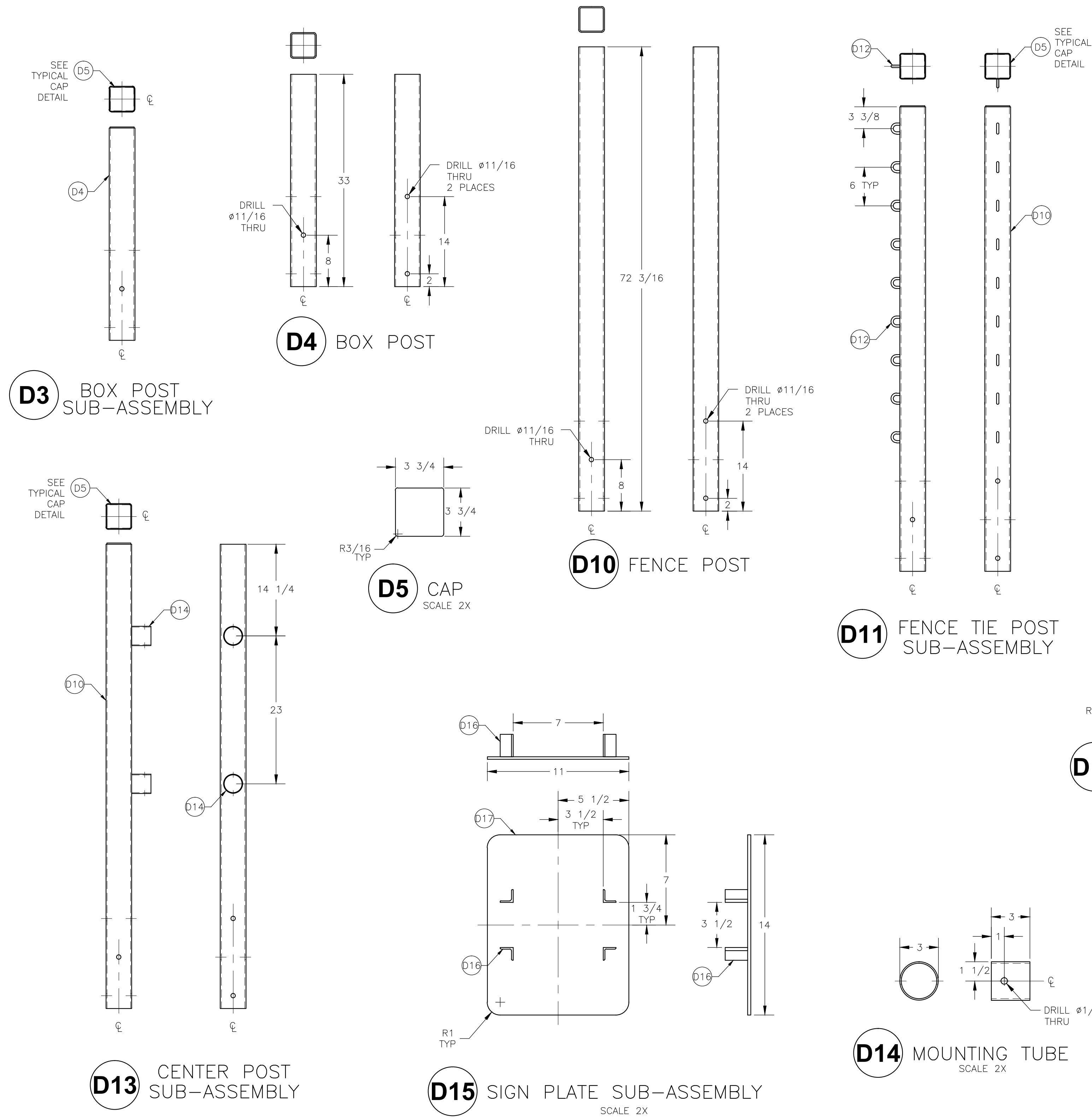


D9 FENCE RAIL

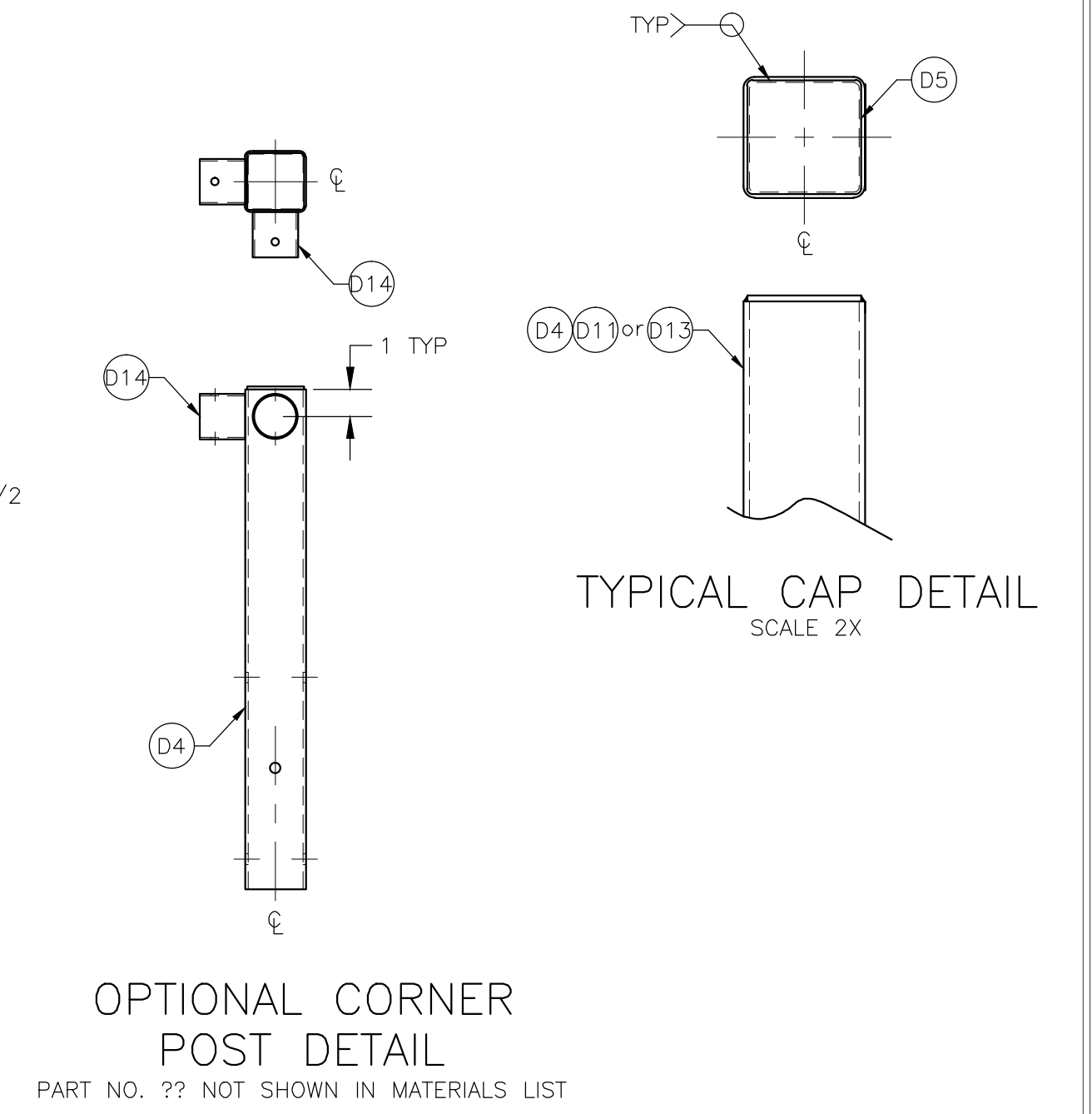
MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
D2	BOX ASSEMBLY	-	PARTS D3 THRU D9	
D3	BOX POST	-	PARTS D4 THRU D5	D3
SUB-ASSEMBLY				
D6	SIDE RAIL	4	3-INCH SCH 40 BL PIPE 43-1/2 LG	
D7	CROSS RAIL	3	3-INCH SCH 40 BL PIPE 45-1/2 LG	
D8	FENCE FRAME	-	PARTS D9, D11 & D15	
ASSEMBLY				
D9	FENCE RAIL	4	3-INCH SCH 40 BL PIPE 56 LG	
D11	FENCE TIE POST	-	PARTS D5, D10 & D12	D3
SUB-ASSEMBLY				
D15	SIGN PLATE	-	PARTS D16 & D17	D3
SUB-ASSEMBLY				

NOT TO SCALE

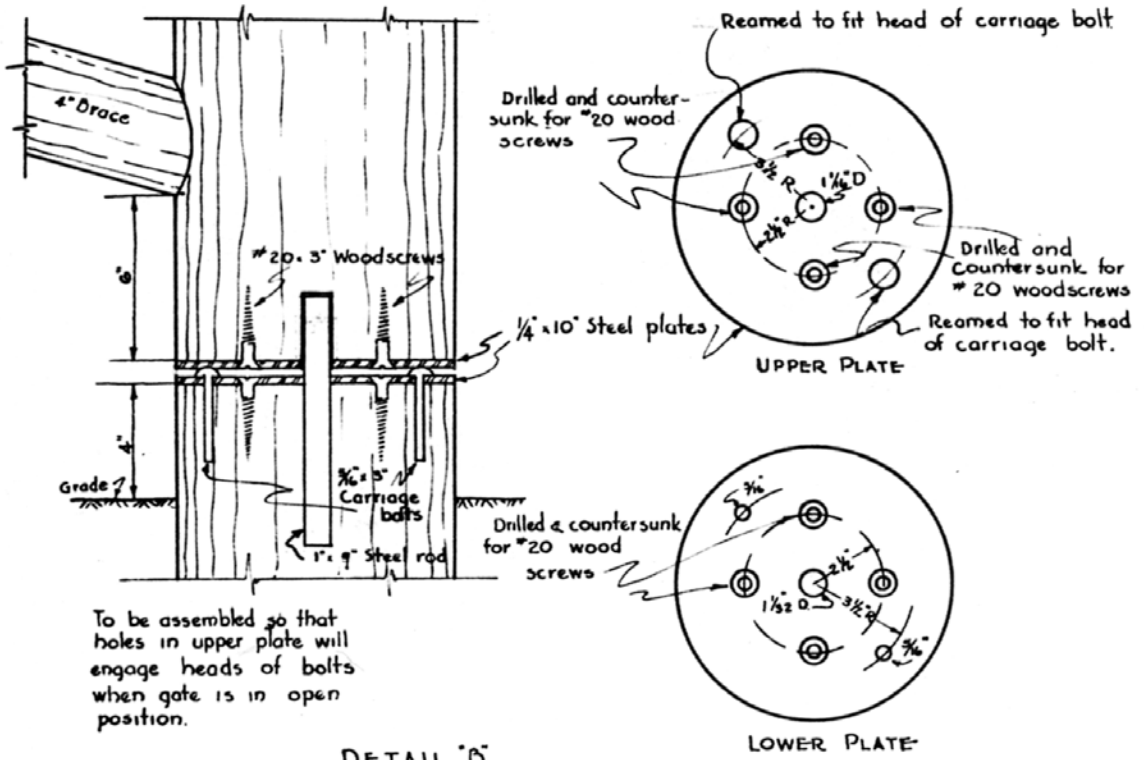
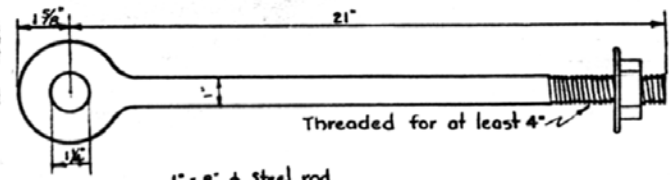
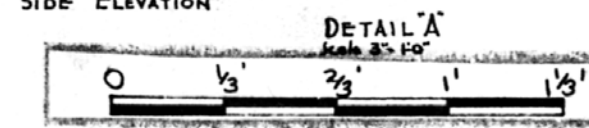
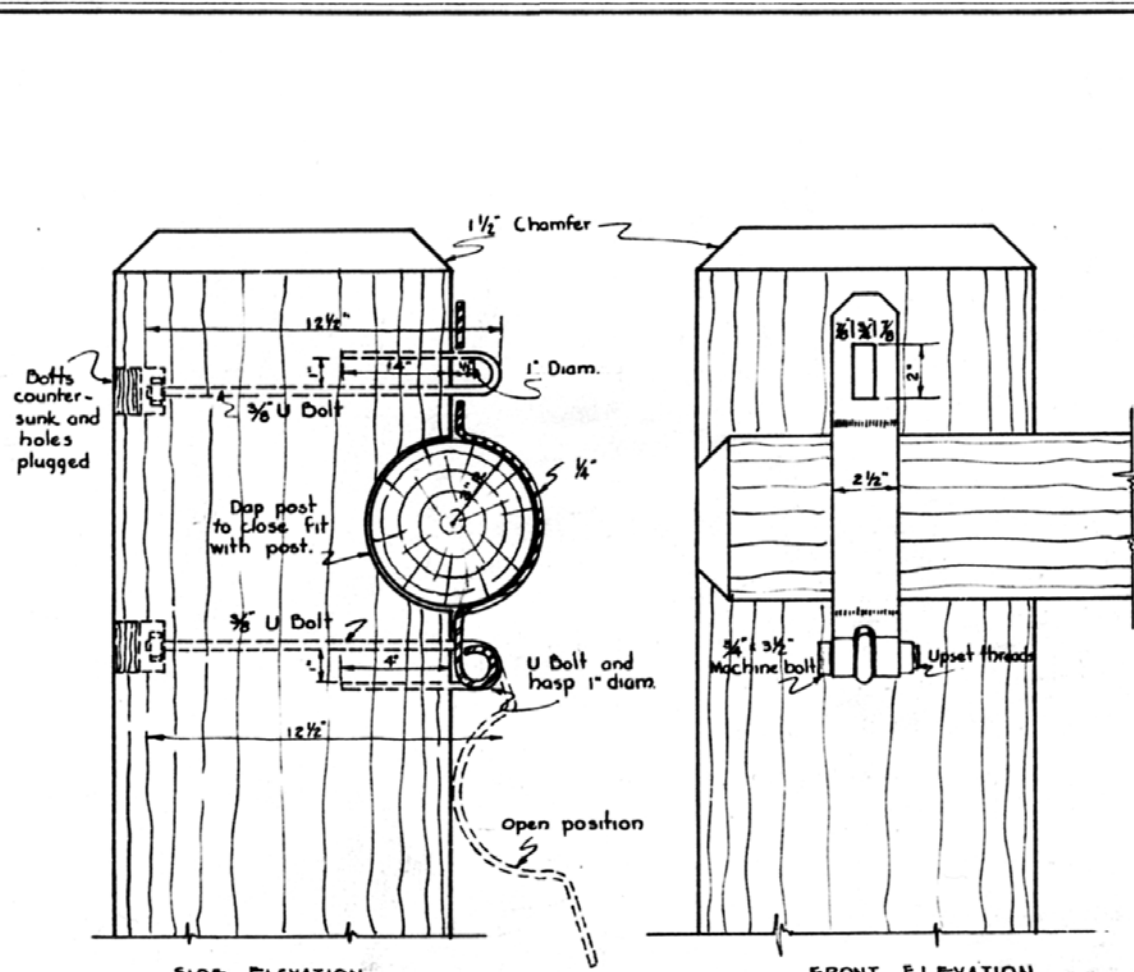
READ INSTRUCTIONS BEFORE USING THIS FILE



MATERIAL LIST				
NO	PART NAME	REQD	MATERIAL-DESCRIPTION	SUB-SHEET
D3	BOX POST	4	PARTS D4 & D5	
	SUB-ASSEMBLY			
D4	BOX POST	4	3/16 X 4-INCH SQ. MECH. TUBING, STEEL	
D5	CAP	10	3/16-INCH PLATE STEEL	
D10	FENCE POST	2	3/16 X 4-INCH SQ. MECH. TUBING, STEEL	
D11	FENCE TIE POST	2	PARTS D5, D11 & D13	
	SUB-ASSEMBLY			
D12	TIE IN	18	3/8-INCH ROUND ROD, STEEL OR CHAIN LINK THAT MEETS BOTH STRUCTURAL AND DIMENSIONAL REQUIREMENTS	
D13	CENTER POST	2	PARTS D5, D10 & D14	
	SUB-ASSEMBLY			
D14	MOUNTING TUBE	4	3-INCH OD X 1/8 WALL ROUND MECH. TUBING,	
D15	SIGN PLATE	1	PARTS D16 & D17	
	SUB-ASSEMBLY			
D16	SIGN TABS	4	L2 X 1 X 1-1/8 ANGLE, STEEL 1-3/4 LG	
D17	SIGN PLATE	1	3/16-INCH PLATE, STEEL	
	OPTIONAL CORNER POST DETAIL		PARTS D4, D5 & D14	
D4	BOX POST	1		
D5	CAP	1		
D14	MOUNTING TUBE	2		



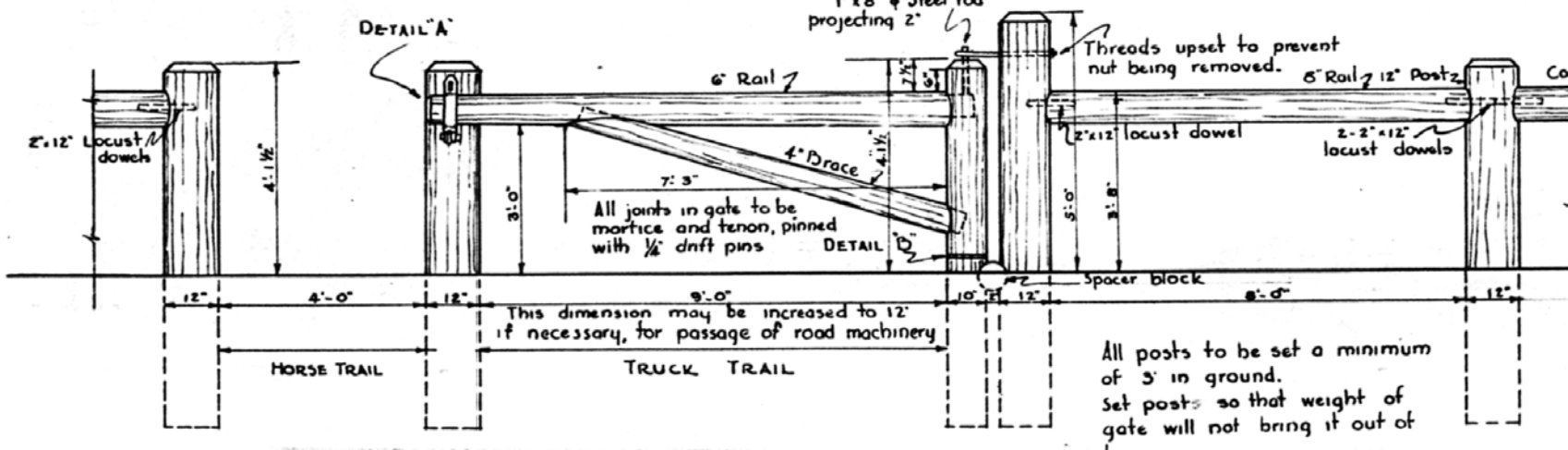
NOT TO SCALE



DETAIL B
Scale - 5"=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.
- 2 1" x 8" φ Steel Rods
- 2 3/8" x 18" φ Steel Rods, Threaded one end, with nut and washer.
- 1 3/8" x 3 1/2" Machine bolt.
- 8 # 20 - 3" Wood screws.
- 2 3/8" x 3" Carriage bolts.



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

NOTES
 Posts to be set not less than 5' 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 log and sides of posts. Iron collars may be used to further increase strength of gate post at ends.

ORIGINAL DRAWING NPGSM 3029
CHECKED
DESIGNED BY
HDS DTD

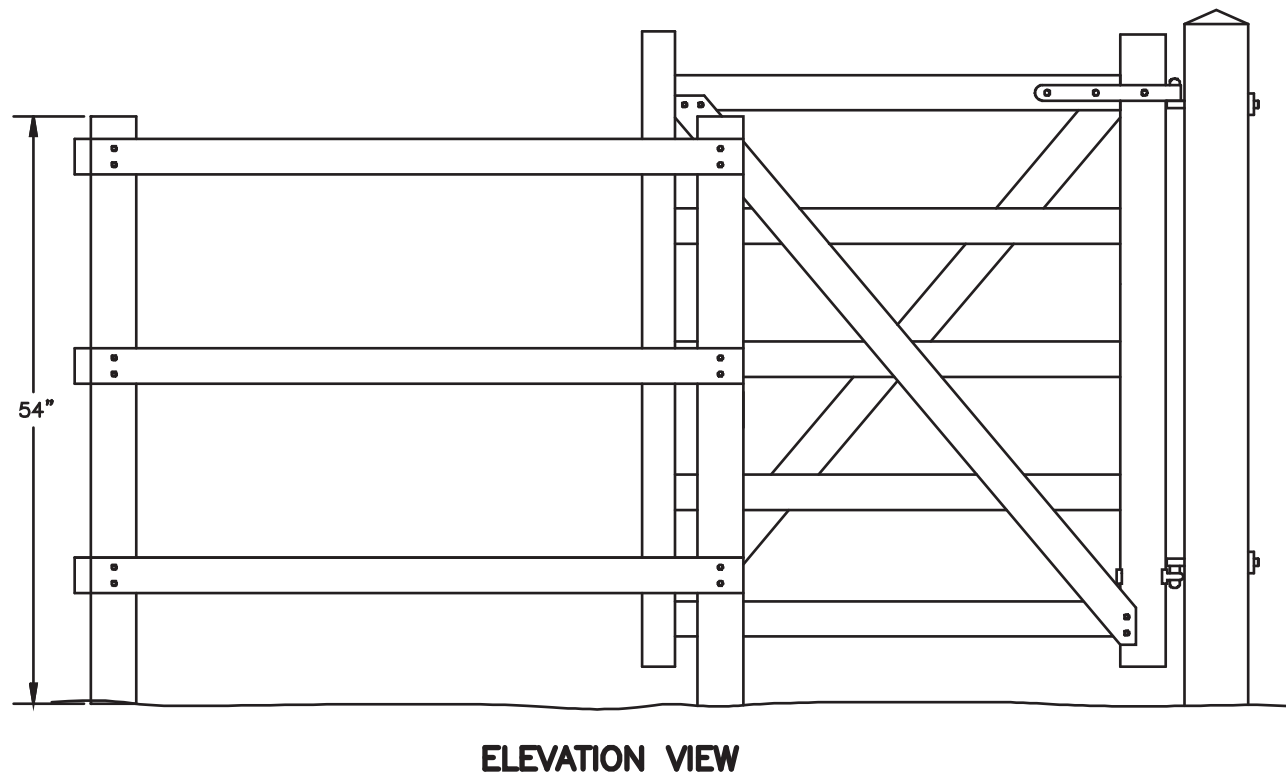
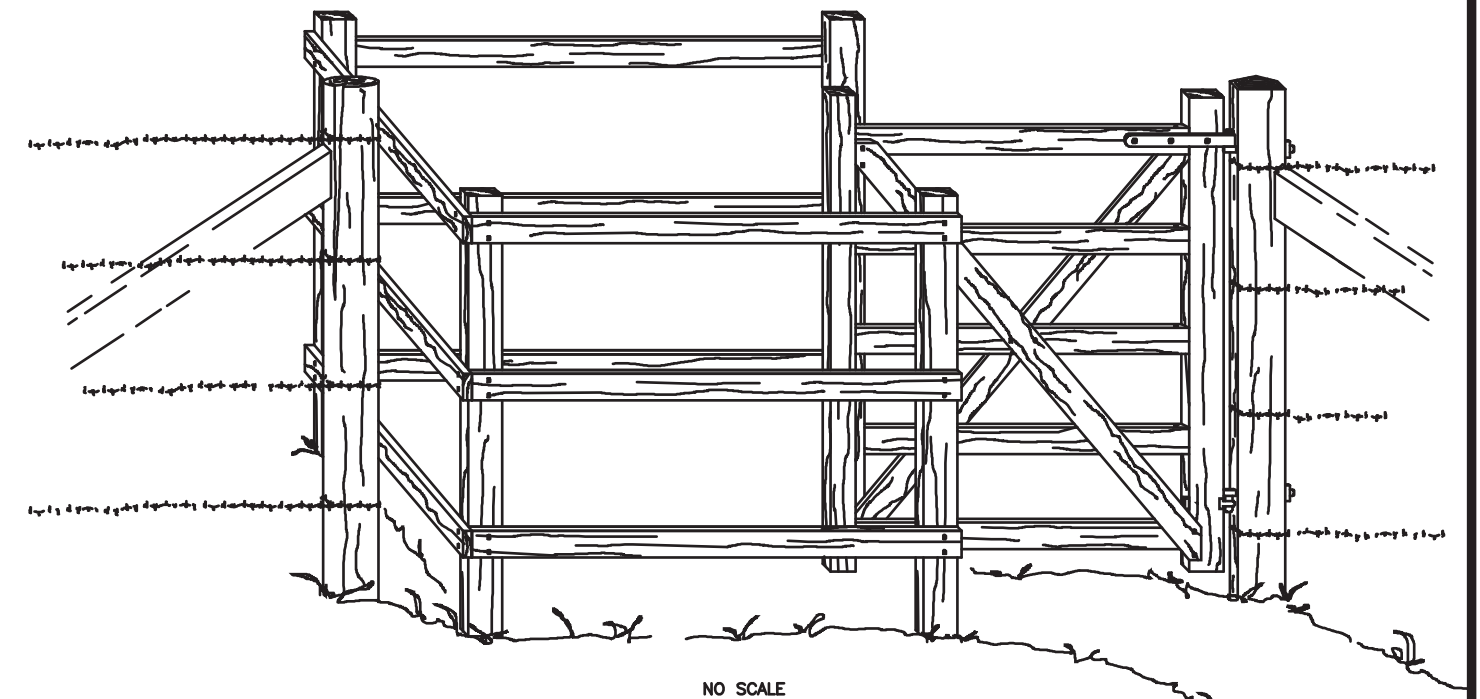
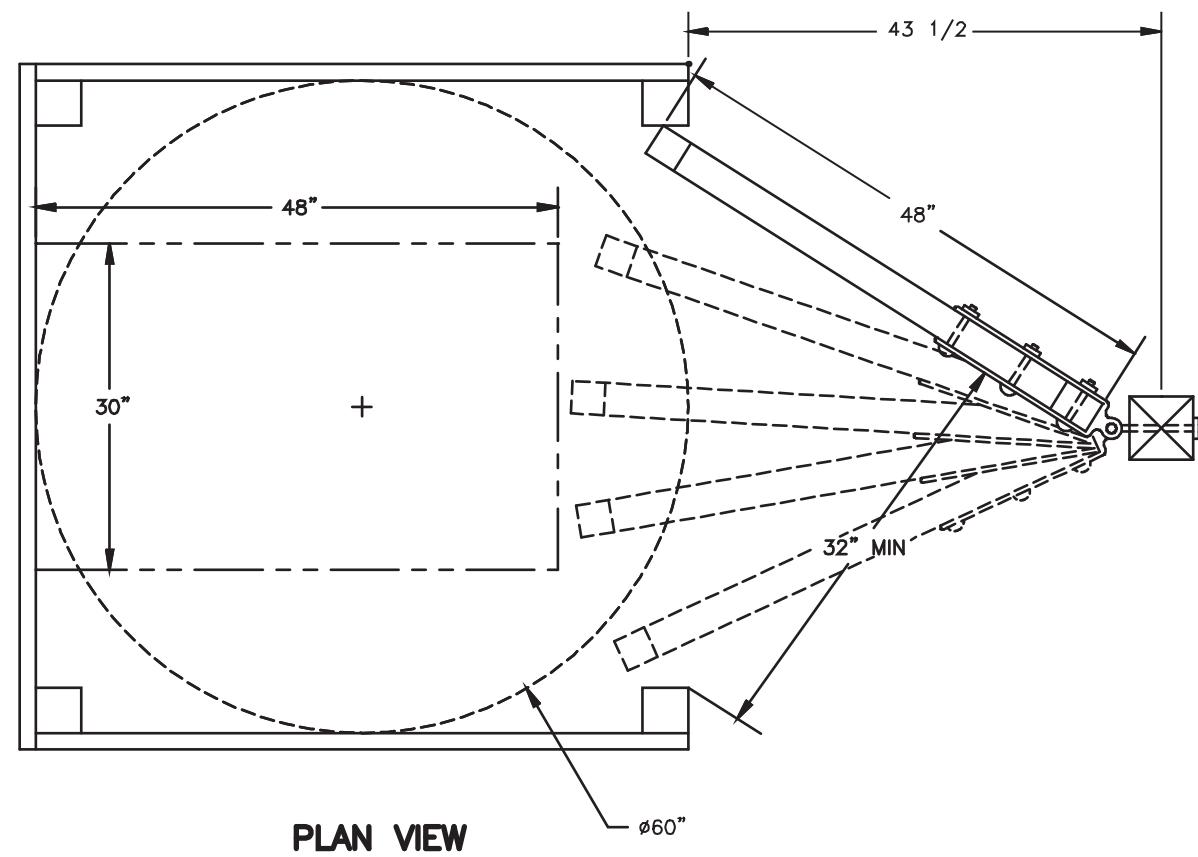
U. S. DEPARTMENT OF THE INTERIOR
 NATIONAL PARK SERVICE
 BRANCH OF PLANS AND DESIGN

NAME AND LOCATION OF PROJECT
TRUCK TRAIL BARRIER
 NAME OF PARK OR MONUMENT
GREAT SMOKY MOUNTAINS NATIONAL PARK

RECOMMENDED BY	<i>W. J. Carno</i>	5/15/27	DRAWING NO.	NP-GSM
CHECKED FOR ENGINEERING	<i>Joseph W. ...</i>	6/21/27	2052	
CONSTRUCTED BY	<i>...</i>	5/21/27	SHEET	1
APPROVED	<i>...</i>	1-29-27	1	SHEET

HALF-SIZE REPRODUCTION

133/2052



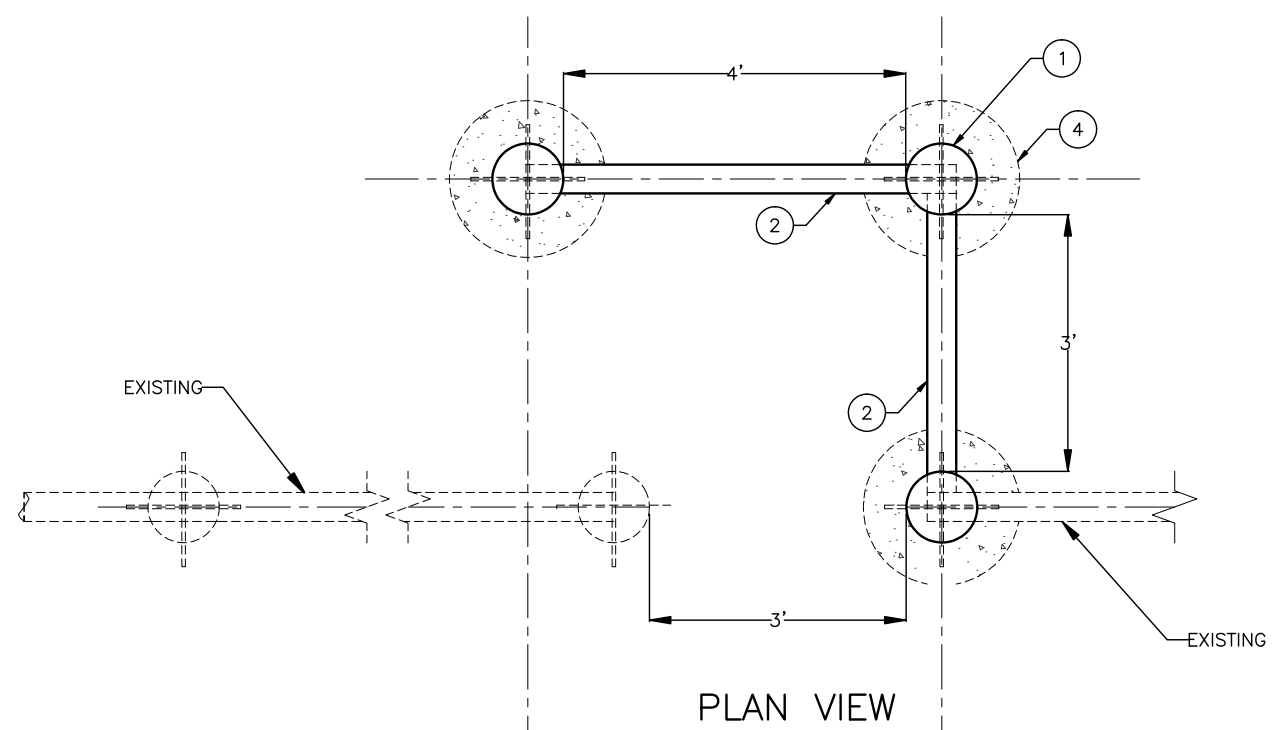
NOTES:

- 1 INSIDE DIMENSIONS ARE MINIMUM CLEAR DISTANCES REQUIRED TO MEET ACCESSIBILITY STANDARDS.
- 2 THESE DRAWINGS ARE TYPICAL DRAWINGS AND MAY REQUIRE MINOR MODIFICATION FOR INSTALLATION.

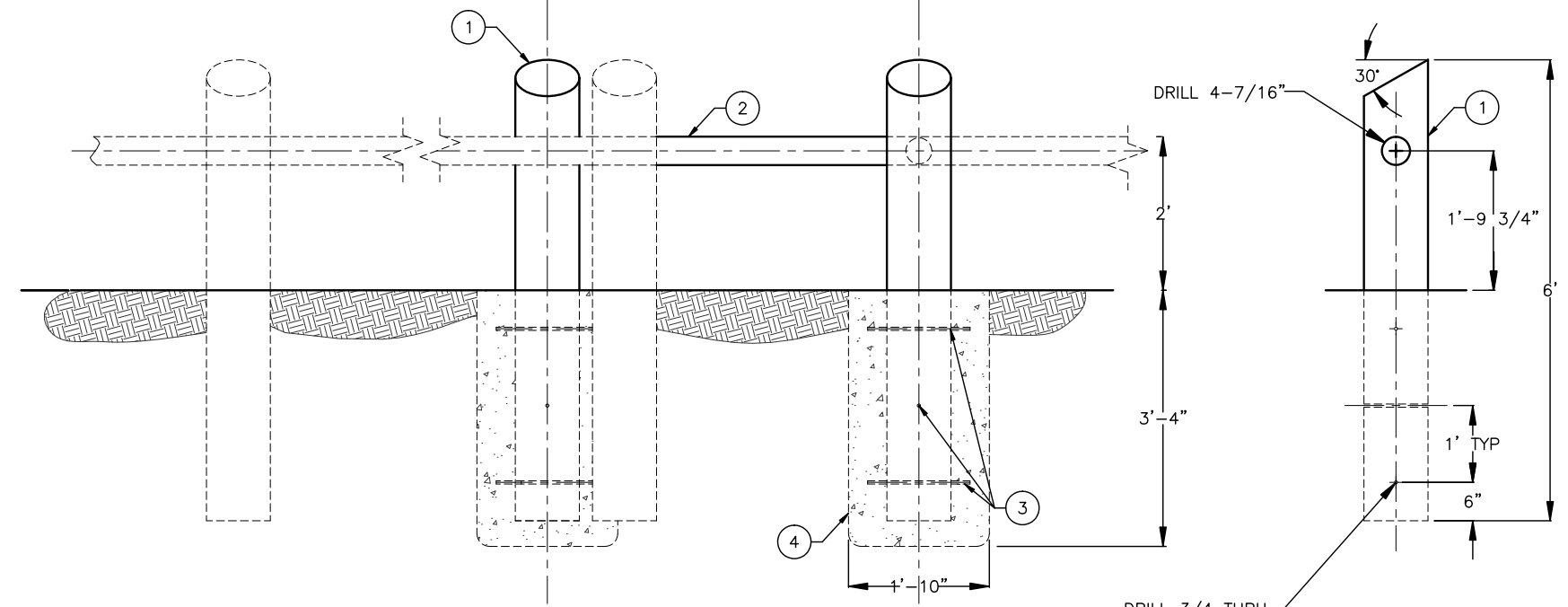
UNLESS OTHERWISE SPECIFIED:		DATE	REVISION	BY
TOLERANCES:	FRACTIONS +/-	U. S. DEPT. OF AGRICULTURE FOREST SERVICE TECHNOLOGY & DEVELOPMENT CENTER MISSOULA, MONTANA		
	DECIMALS +/-			
	ANGLES +/-			
DIMENSIONS ARE IN INCHES SHOWN UNLESS NOTED OTHERWISE				
DRAWN	D.MUCCI	TITLE TIMBER KISSING GATE FOR WHEELCHAIR ACCESSIBILITY		
DESIGNED	X			
CHECKED	J.GROENIER			
APPROVED	J.GROENIER			
SCALE	1/8" & NOTED X	SHEET X OF X		MTDC- X
DATE	NOV 2005			

MATERIAL LIST

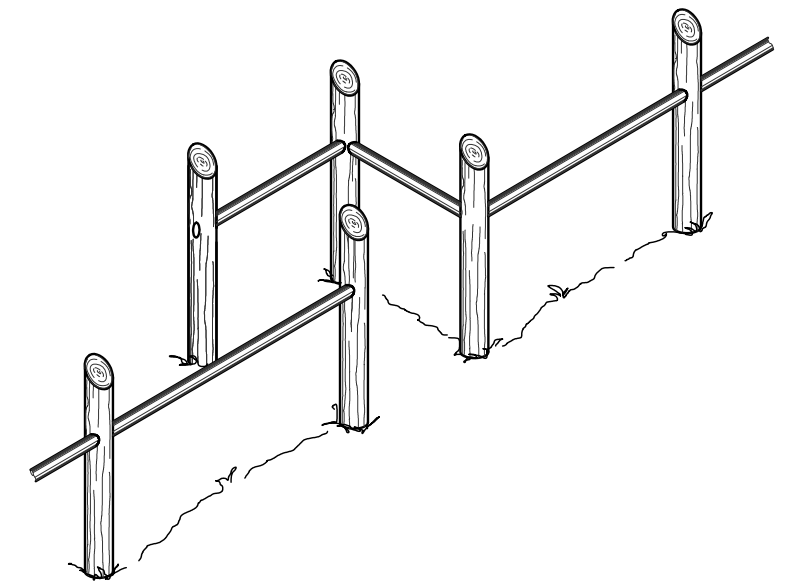
ITEM NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	SHT
1	POST	3	10" DIA. CCA TREATED POST 6' LONG	
2	PIPE RAIL	AR	4-7/16" GALV. STEEL PIPE (4" ID)	
3	ANCHORS	9	STEEL ROD, 5/8" DIA x 16" LG	
4	FOOTINGS	3	MIXED CONCRETE BAGS X 100 #	



PLAN VIEW



ELEVATION VIEW



ISOMETRIC VIEW

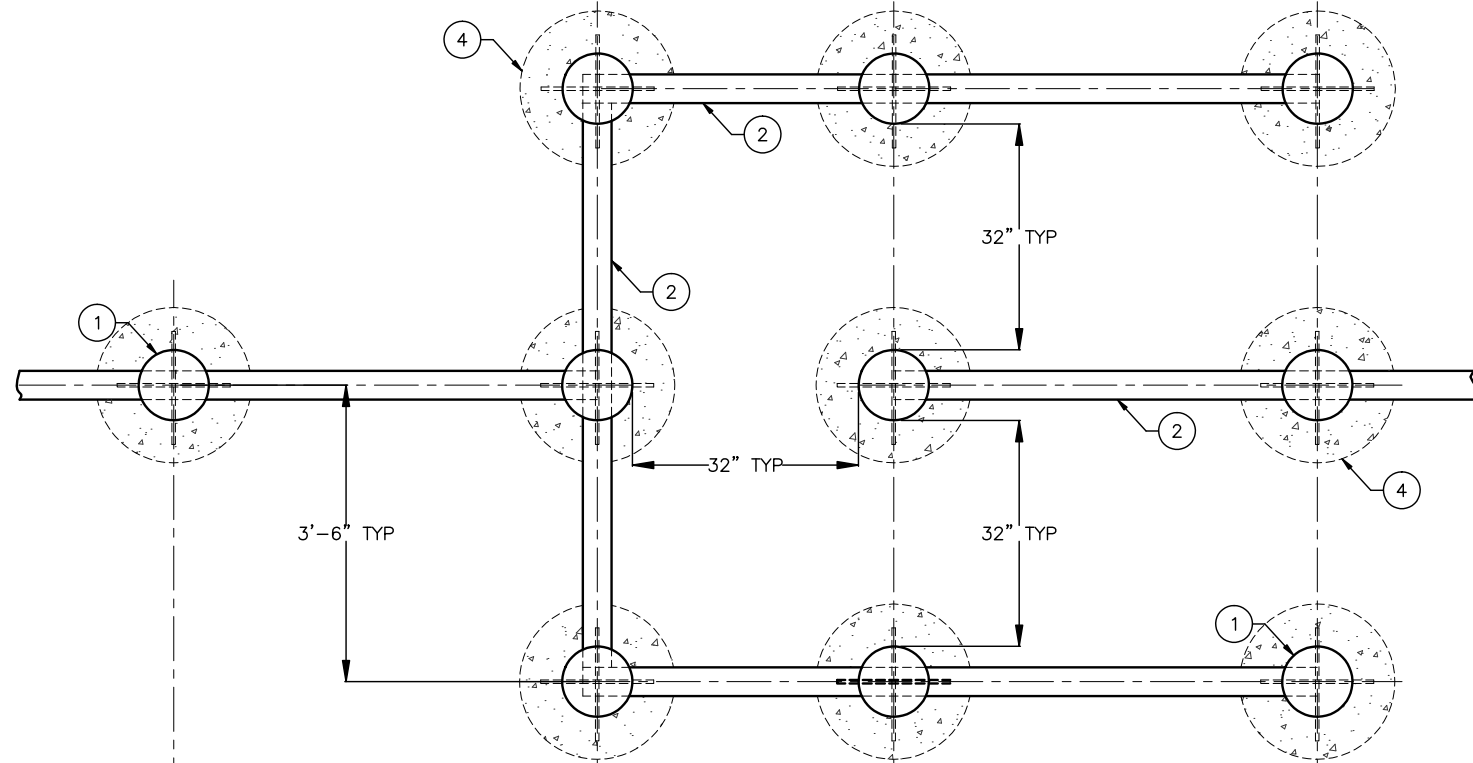
NOTES:

1. SALVAGED WELL CASING MAY BE USED IN PLACE OF GALVANIZED PIPE RAILS. (SHOWN IN THE DRAWING). ADJUST THE HOLE IN THE POSTS TO 3 7/8" DIAMETER IF WELL CASING IS USED. AN OUTFITTING COMPANY MAY HAVE INFORMATION ON SALVAGED PIPE.
2. PIPE JOINTS TO BE 20' IN LENGTH AND JOINED BY WELDING TO CREATE A CONTINUOUS RUN THROUGH POSTS.
3. ON THE END RAILS, RAILS SHOULD END IN THE CENTER OF THE POST.
4. THE 4' RAIL SECTION IS NECESSARY TO HELP BLOCK MOTORCYCLE ENTRY.

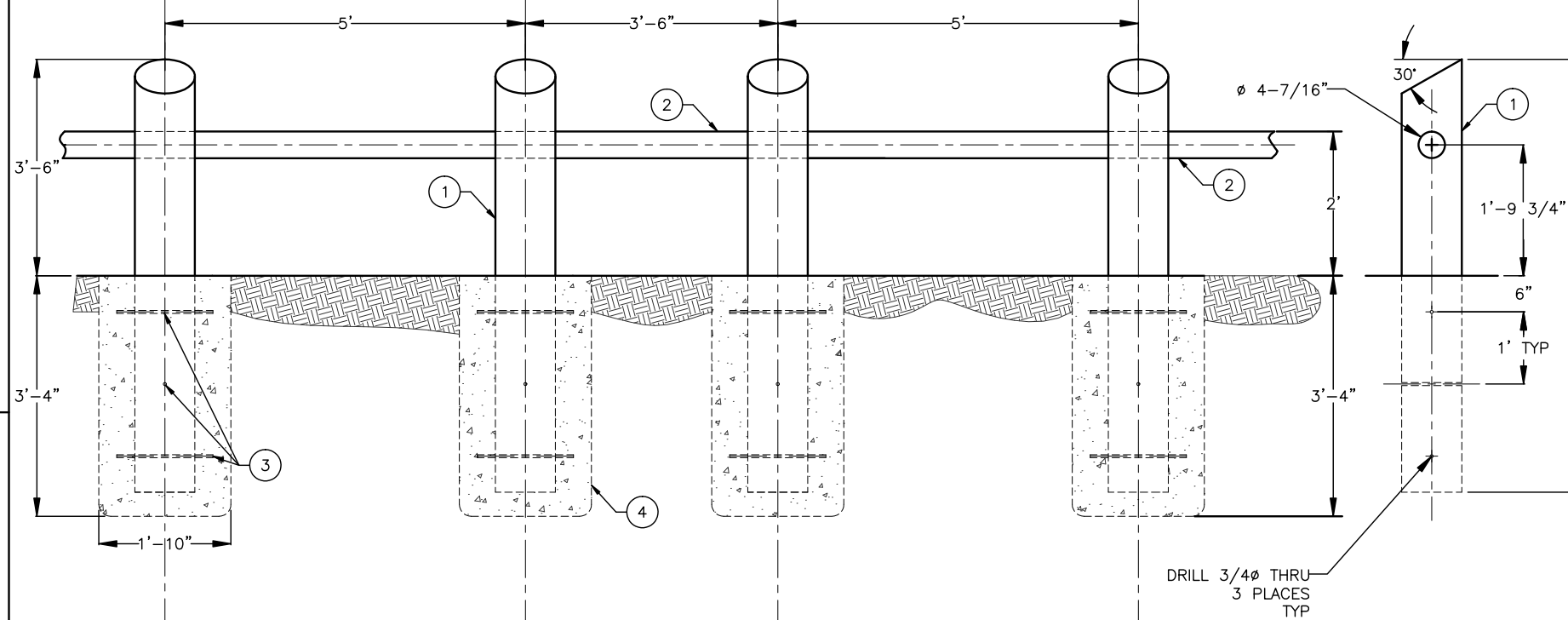
<p>GENERAL NOTES</p> <p>1. UNLESS OTHERWISE SPECIFIED TOLERANCES ON DIMENSIONS ARE TO BE AS FOLLOWS: DECIMAL ± .010 FRACTIONAL ± 1/16 ANGLES ± 1/2</p> <p>2. REMOVE ALL BURRS AND SHARP CORNERS.</p> <p>3. DO NOT SCALE DRAWING.</p> <p>4. MAKE NO SUBSTITUTION OF MATERIALS OR ALTERATION OF DIMENSIONS WITHOUT PRIOR WRITTEN APPROVAL BY THE TECHNOLOGY AND DEVELOPMENT CENTER.</p>		<p>U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE TECHNOLOGY & DEVELOPMENT CENTER SAN DIMAS, CALIFORNIA 91773</p> <p>KISATCHIE NATIONAL FOREST EVANGELINE RANGER DISTRICT LORAN SITE TRAFFIC CONTROL BARRIER</p>	
<p>REV ZONE DESCRIPTION DATE BY CHK</p>	<p>DRAWN BY M.M.Demole CHKD. BY E.J. DATR 9-9-05</p> <p>REVIEWED BY ELLEN EUBANKS DATE 9-9-05</p> <p>APPROVED D. Meadows DATE 9-9-05</p> <p>SCALE Full DATE 9-9-05</p>	<p>DWG NUMBER REC49-01</p> <p>REV 0</p> <p>SHEET 1 OF 1</p>	<p>FY 05</p>

MATERIAL LIST

ITEM NO.	PART OR ASSEMBLY NOMENCLATURE	NO. REQ'D.	MATERIAL OR DESCRIPTION	SHT
1	POST	10	TREATED PINE 10" DIA X 6'-0" LG	
2	PIPE RAIL	AR	GALV PIPE, 4" DIA x 20'-0" LG	
3	ANCHORS	30	STEEL ROD, 5/8" DIA x 16" LG	
4	FOOTINGS	10	MIXED CONCRETE (25) BAGS X 100 #	

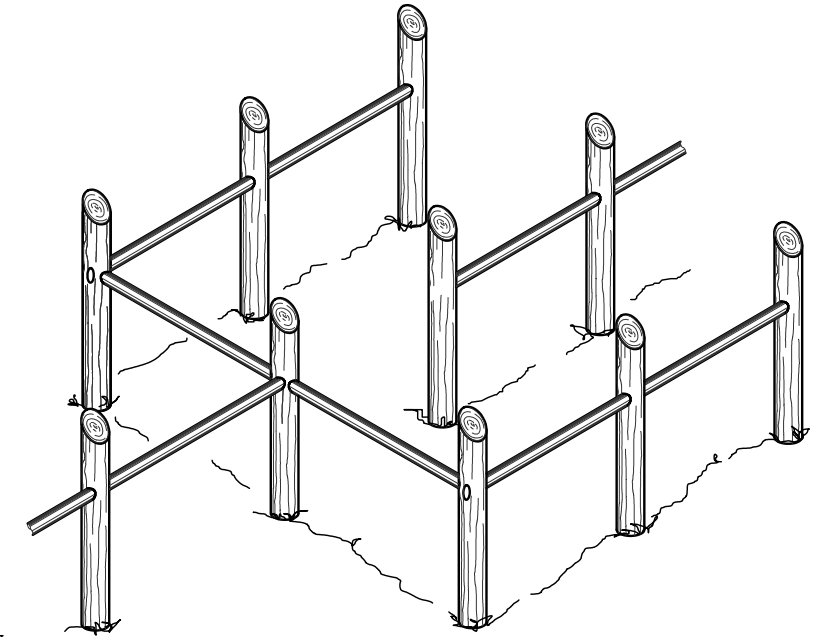


PLAN VIEW



ELEVATION VIEW

1 ASSEMBLY



ISOMETRIC VIEW

NOTES:

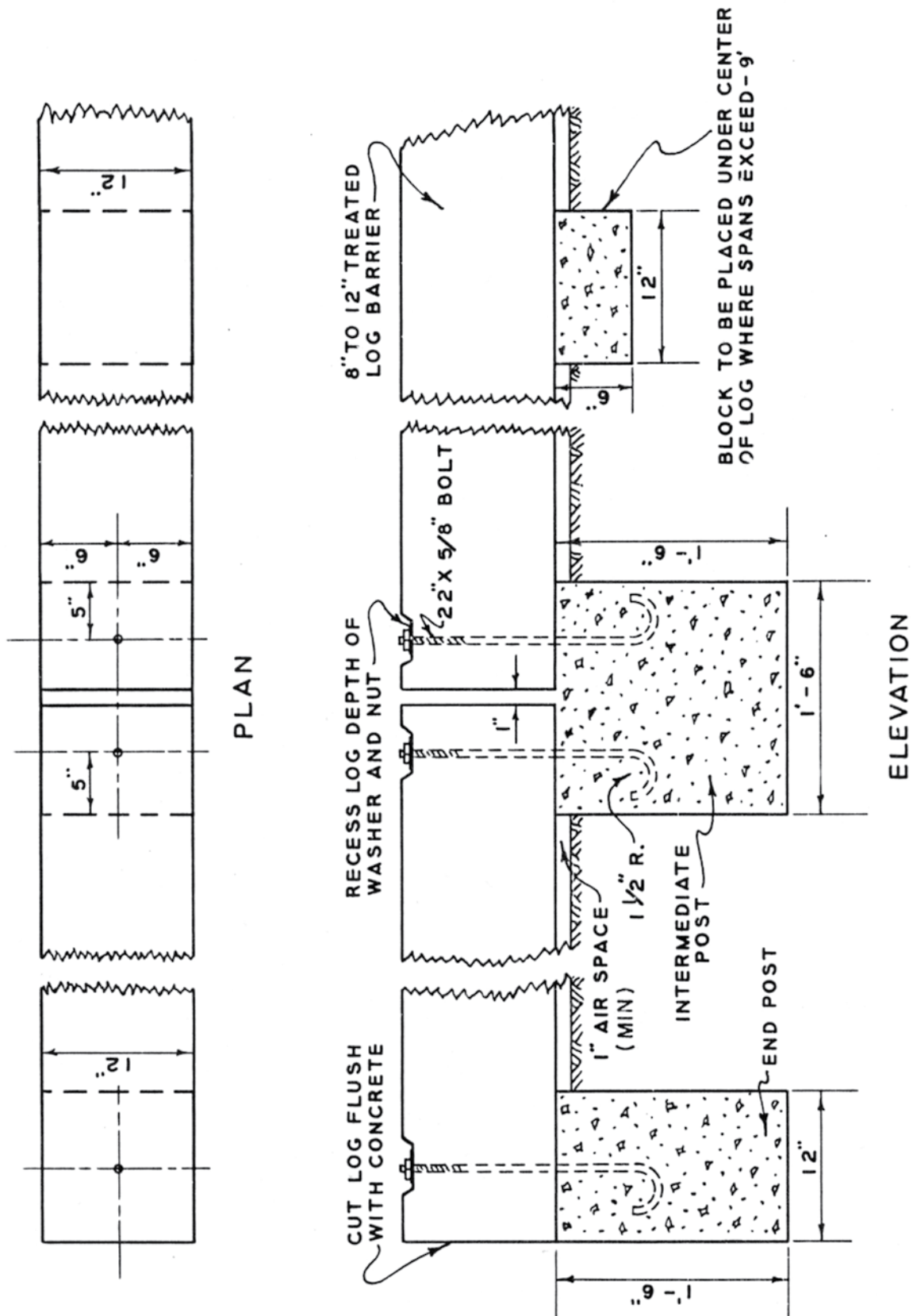
1. SALVAGED WELL CASING MAY BE USED IN PLACE OF GALVANIZED PIPE RAILS. (SHOWN IN THE DRAWING). ADJUST THE HOLE IN THE POSTS TO 3 7/8" DIAMETER IF WELL CASING IS USED. AN OUTFITTING COMPANY MAY HAVE INFORMATION ON SALVAGED PIPE.
2. TO MAKE A TALLER BARRIER WITH TWO RAILS MAKE THE POSTS 4'-4" TALL WITH RAILS AT 1'-4" AND AT 2'-0".
3. ON THE END RAILS, RAILS SHOULD END IN THE CENTER OF THE POST.

<p>GENERAL NOTES</p> <p>1. UNLESS OTHERWISE SPECIFIED TOLERANCES ON DIMENSIONS ARE TO BE AS FOLLOWS: DECIMAL ± .010 FRACTIONAL ± 1/16 ANGLES ± 1/2</p> <p>2. REMOVE ALL BURRS AND SHARP CORNERS.</p> <p>3. DO NOT SCALE DRAWING.</p> <p>4. MAKE NO SUBSTITUTION OF MATERIALS OR ALTERATION OF DIMENSIONS WITHOUT PRIOR WRITTEN APPROVAL BY THE TECHNOLOGY AND DEVELOPMENT CENTER.</p>	<p>U.S. DEPARTMENT OF AGRICULTURE FOREST SERVICE TECHNOLOGY & DEVELOPMENT CENTER SAN DIMAS, CALIFORNIA 91773</p>		<p>DWG NUMBER REC48-01</p> <p>REV 0</p>	
	<p>U-TURN BARRIER - NONACCESSIBLE</p>			
	<p>DRAWN BY M.M.Damole</p>	<p>CHKD. BY E.U. DATE 9-9-05</p>		<p>SCALE Full</p>
	<p>REVIEWED BY ELLEN_EUBANKS</p>	<p>DATE 9-9-05</p>		<p>DATE 9-9-05</p>

REV	ZONE	DESCRIPTION	DATE	BY	CHK

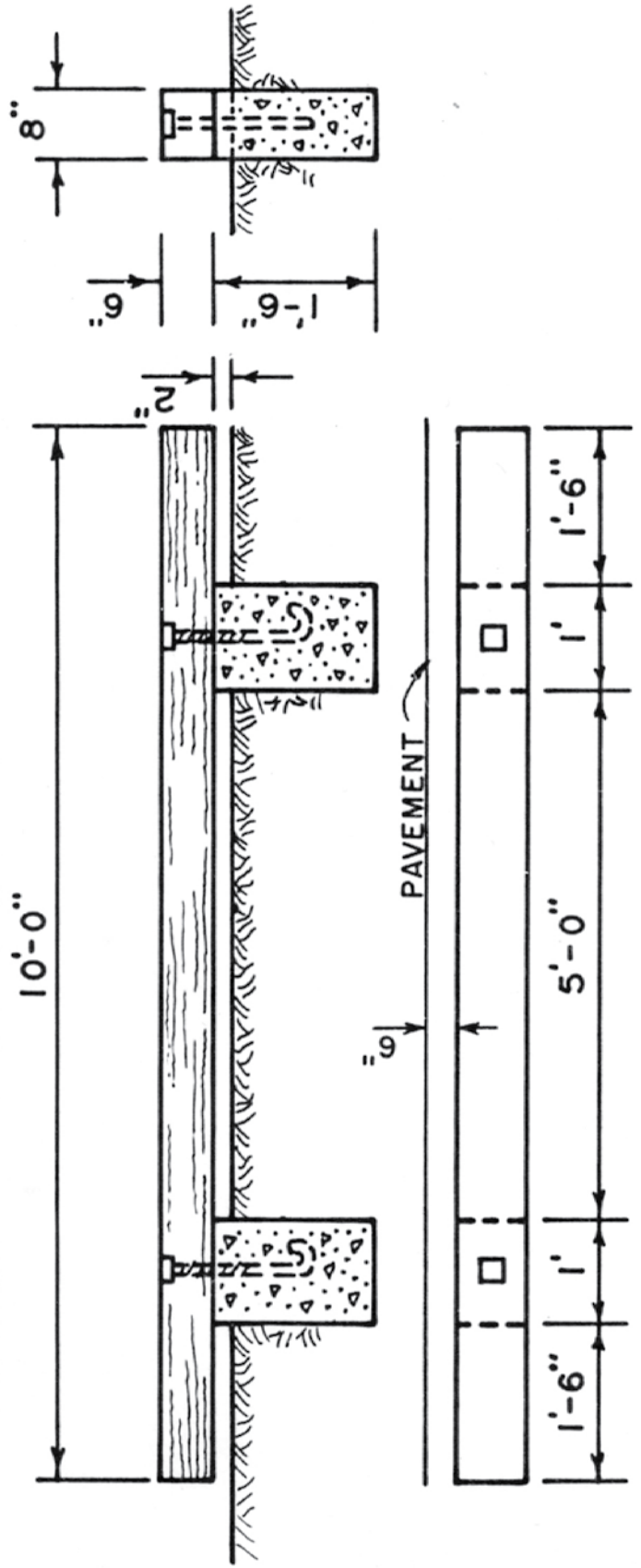


GUARDRAILS

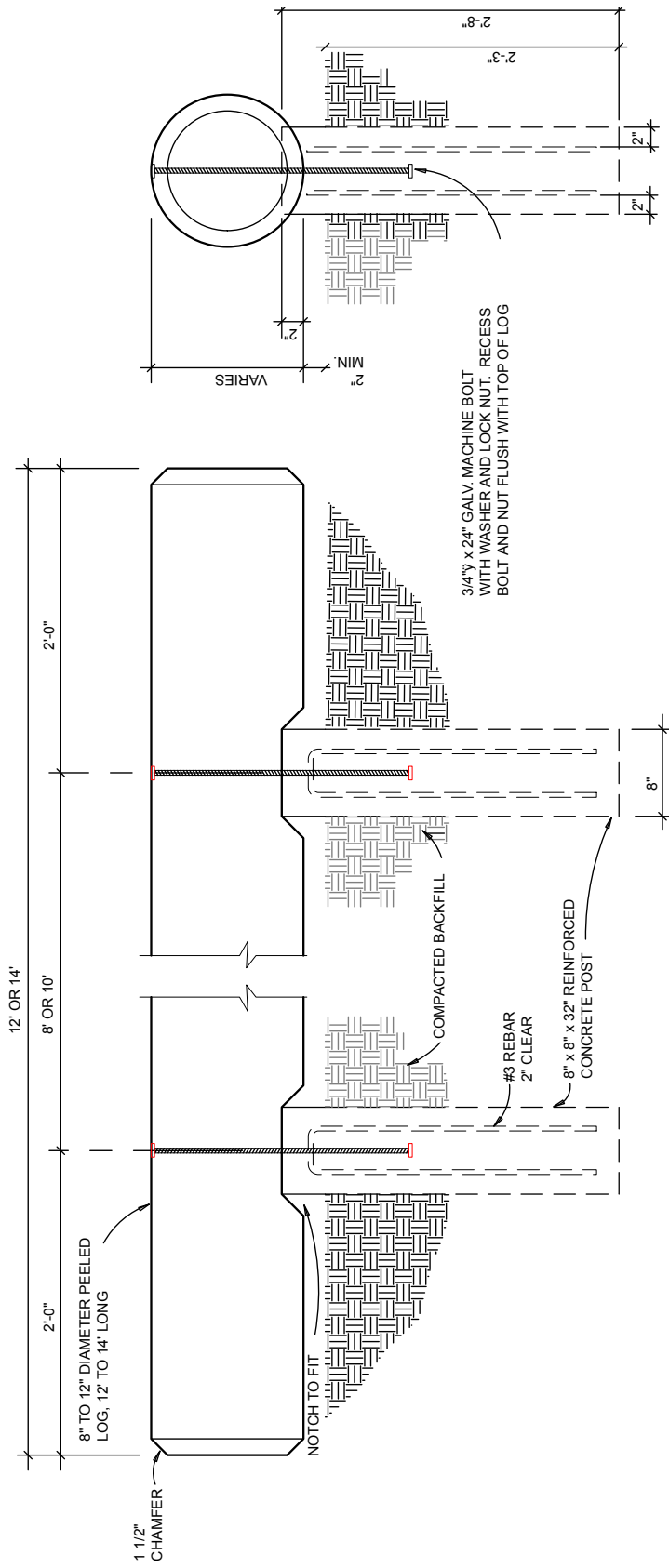


CONCRETE ANCHOR POSTS & BARRIER LOGS

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



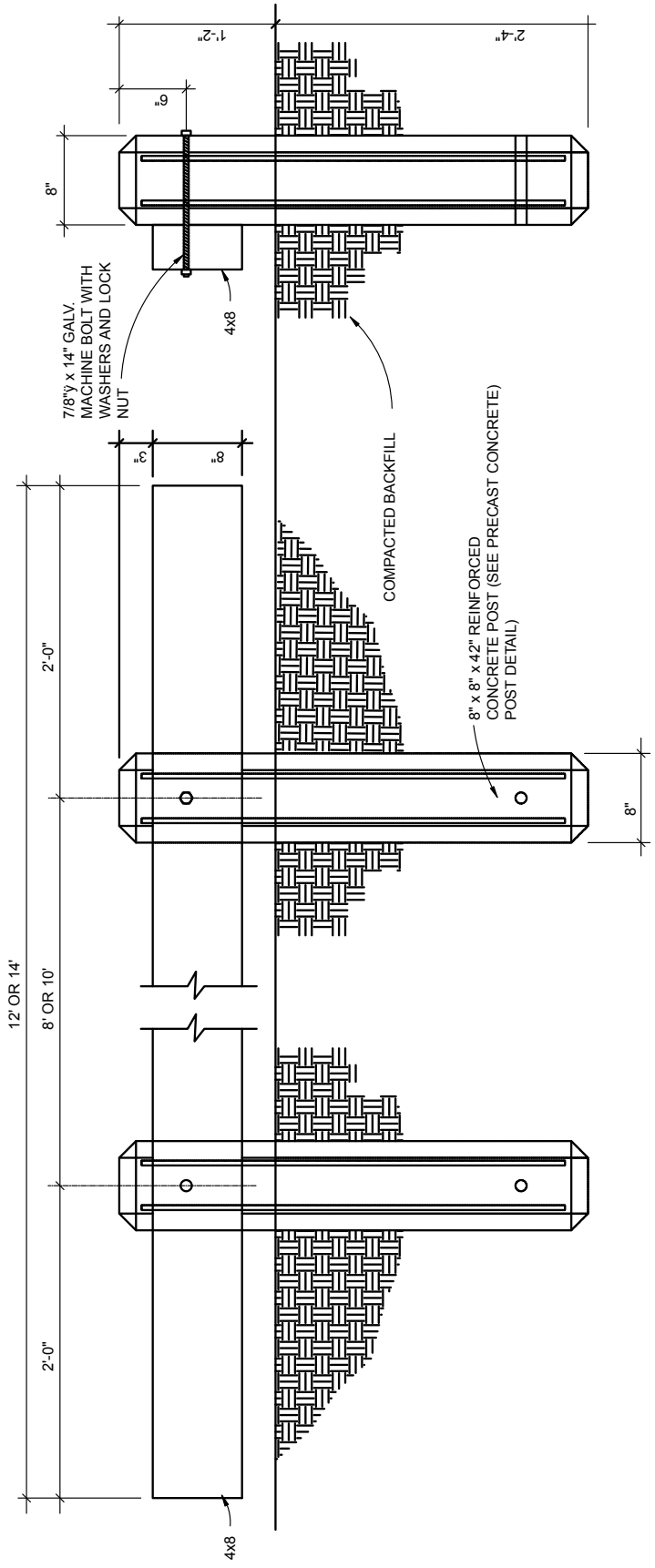
TIMBER BARRIER W/ CONCRETE ANCHOR POST



SIDE ELEVATION

FRONT ELEVATION

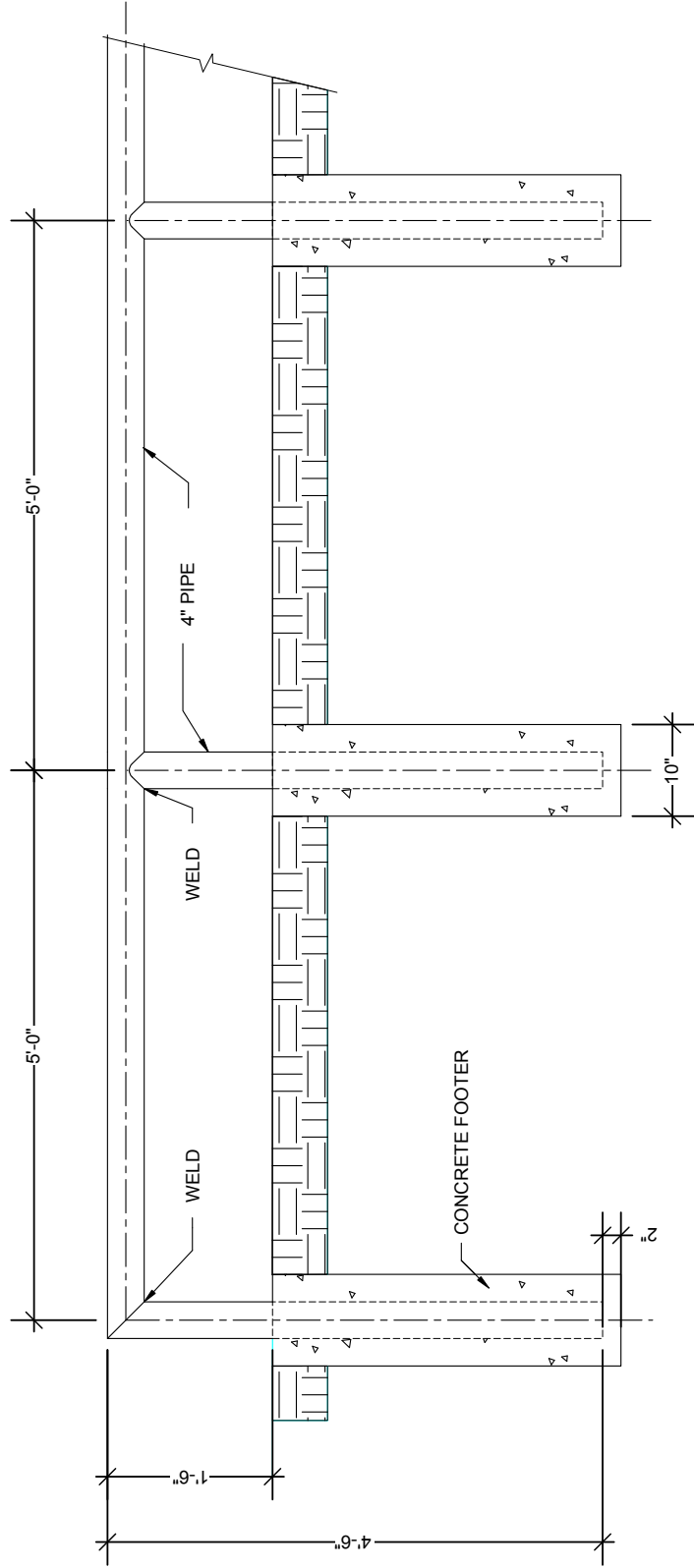
LOG BARRIER



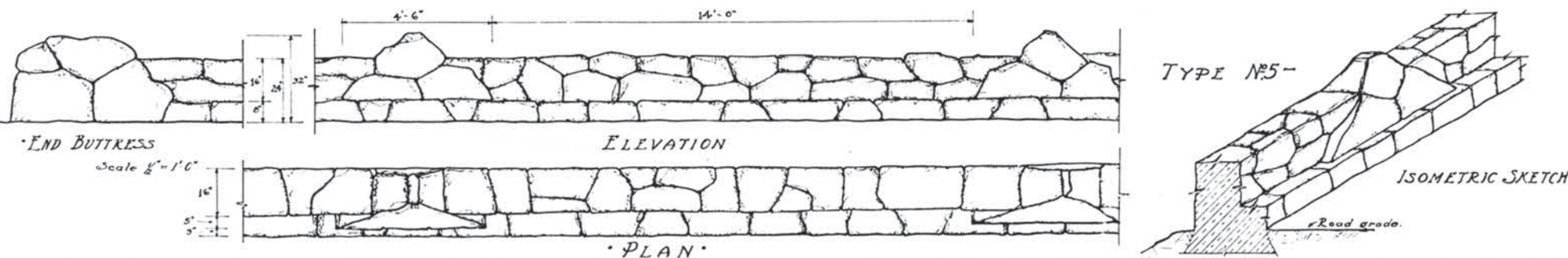
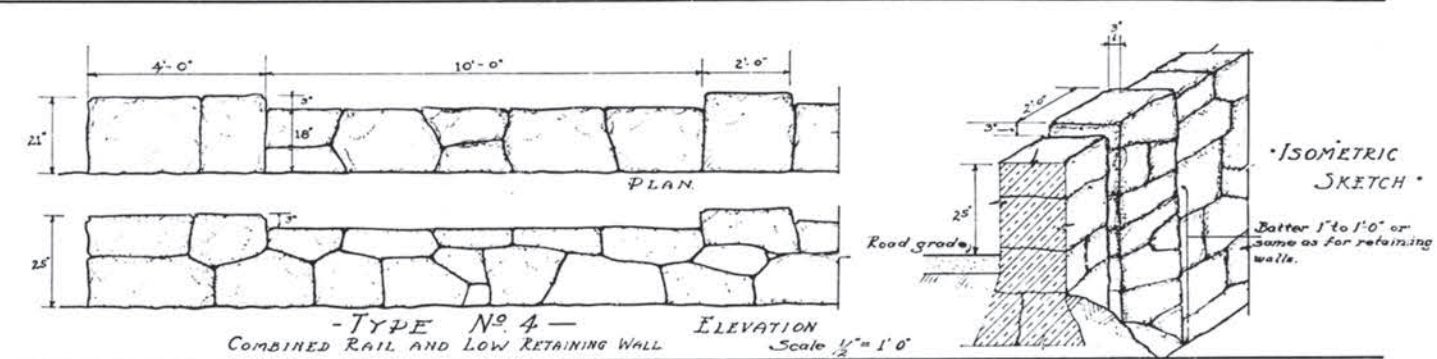
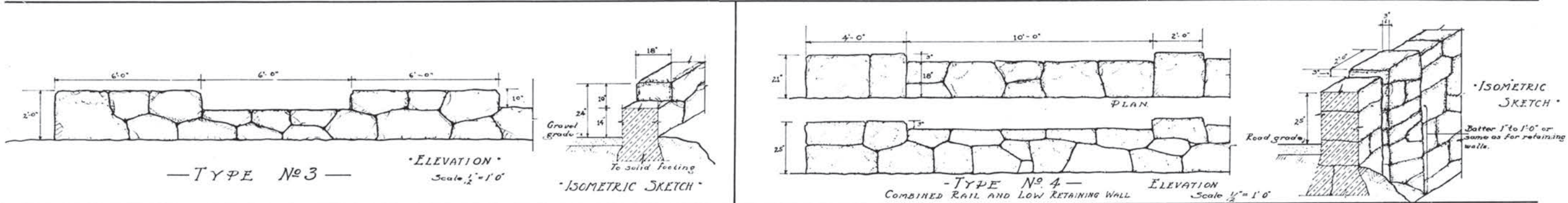
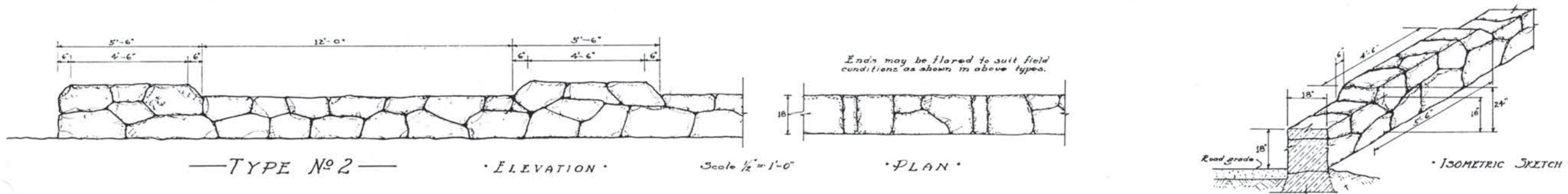
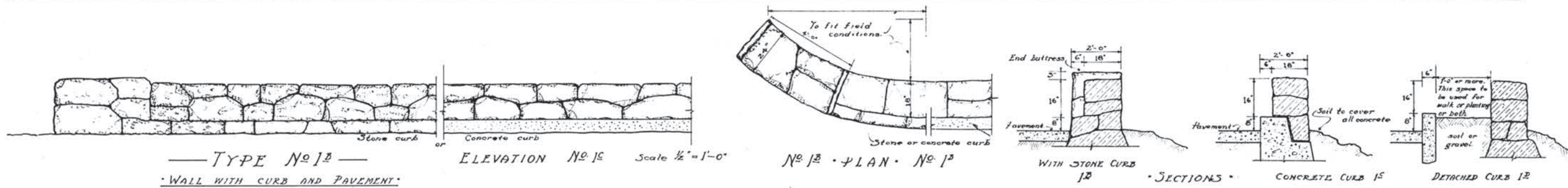
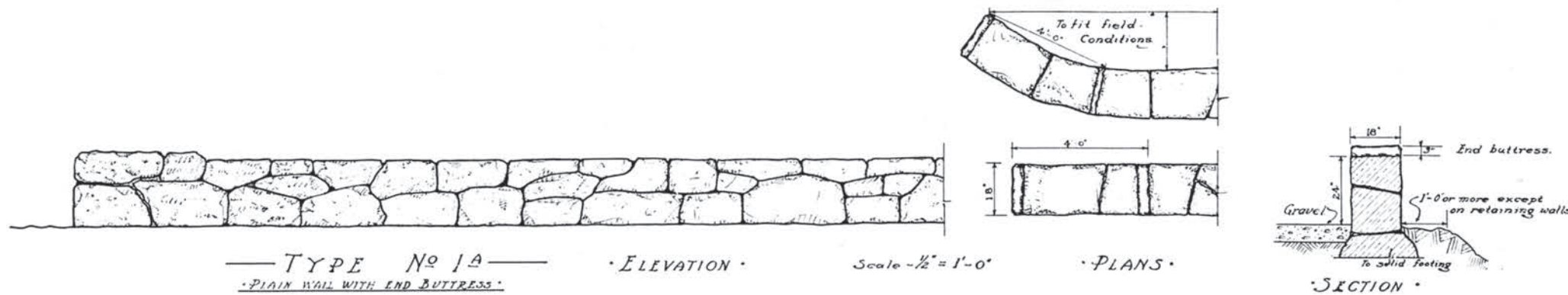
SIDE ELEVATION

FRONT ELEVATION

SAWED TIMBER GUARD - RAIL TYPE BARRIER



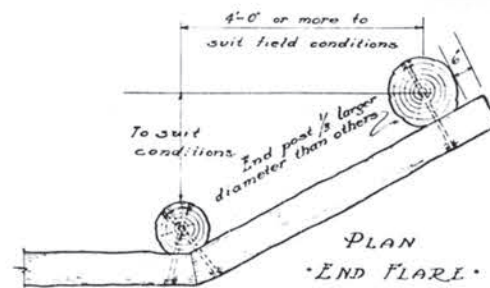
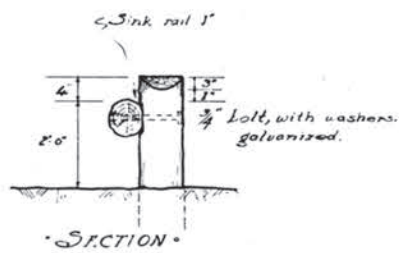
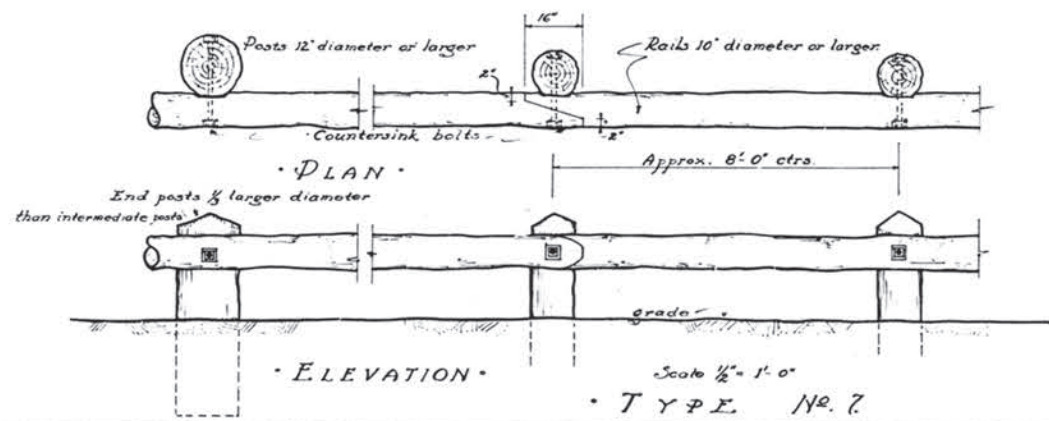
PIPE RAIL



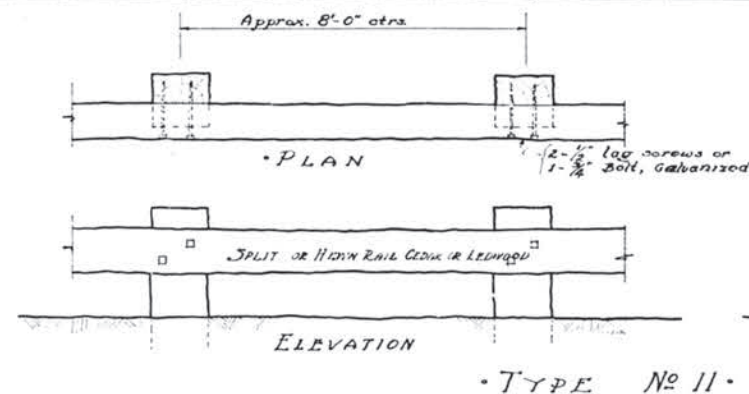
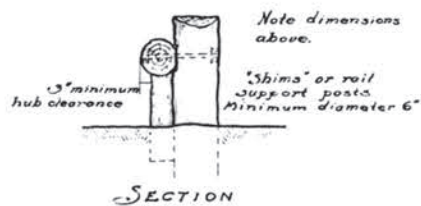
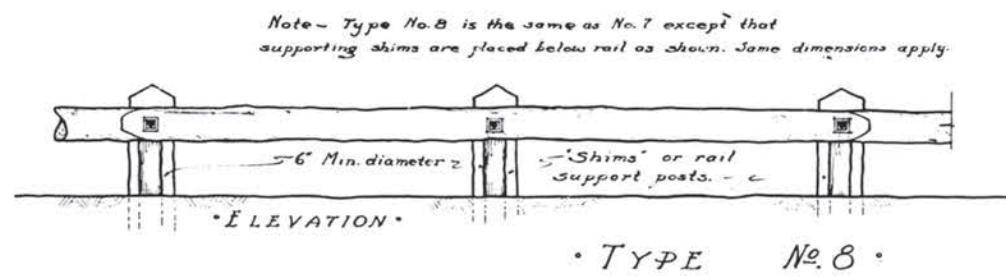
HALF-SIZE REPRODUCTION PG-20

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. *S. C. Vint*
 Date Dec 16, 1929 Chief Landscape Architect
 DEPARTMENT OF THE INTERIOR - NATIONAL PARK SERVICE Date 9/20/29
 Drawn by E.A.D.
 Tr. by H.E.M.
 NATIONAL PARK ROAD PROJECTS - Designed by Landscape Division Ck. by

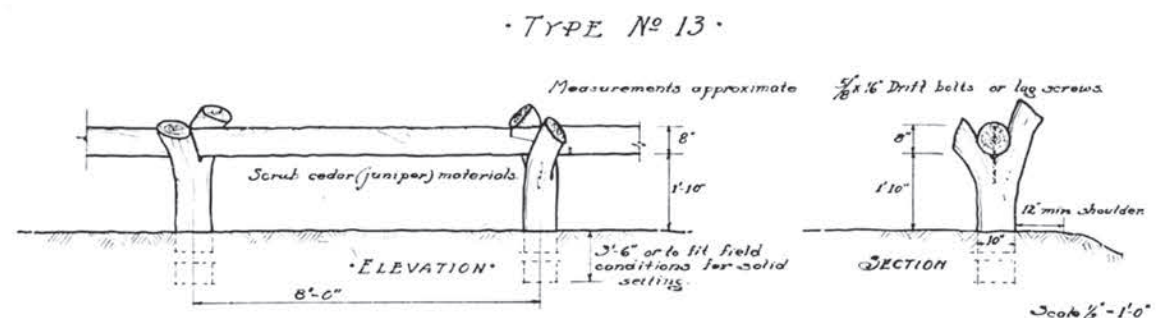
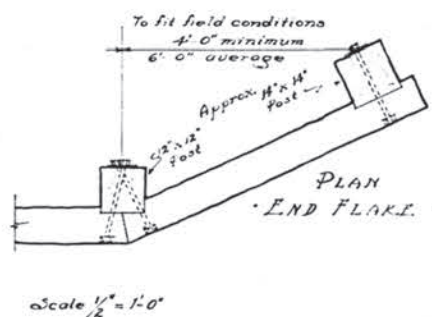
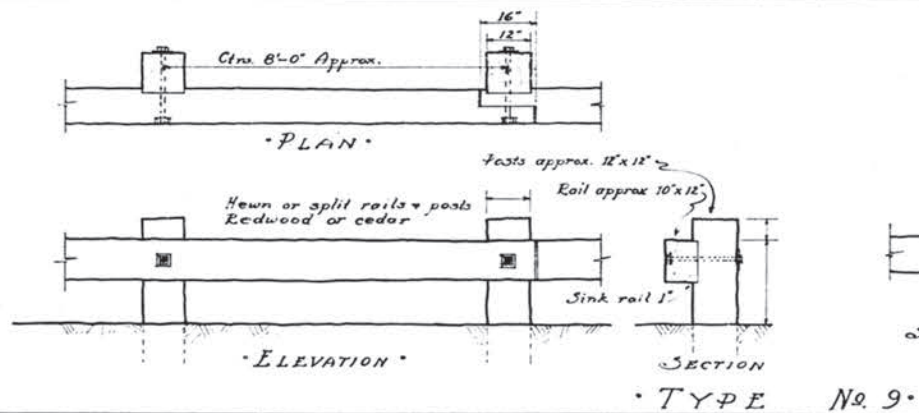
971/20



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"

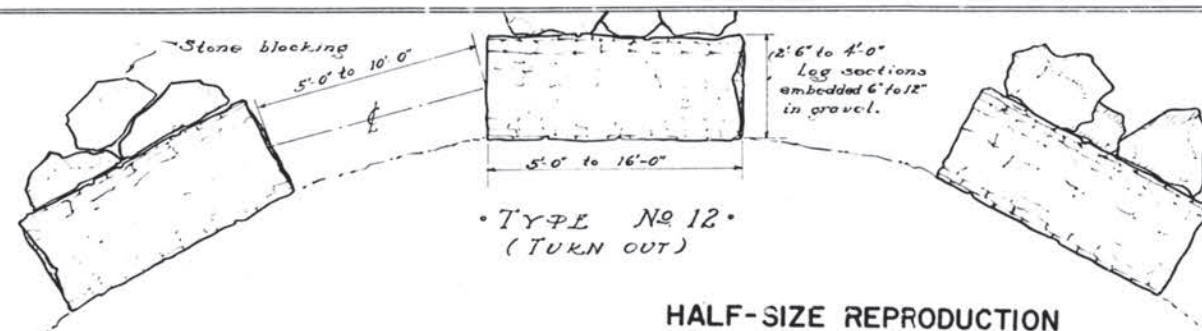
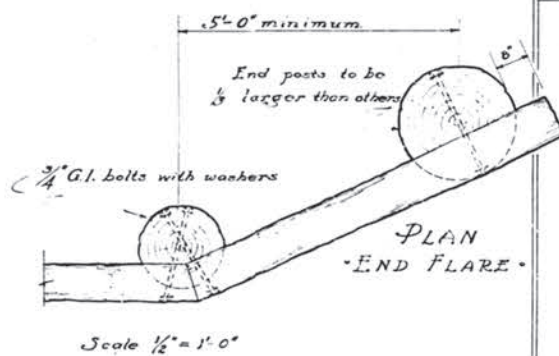
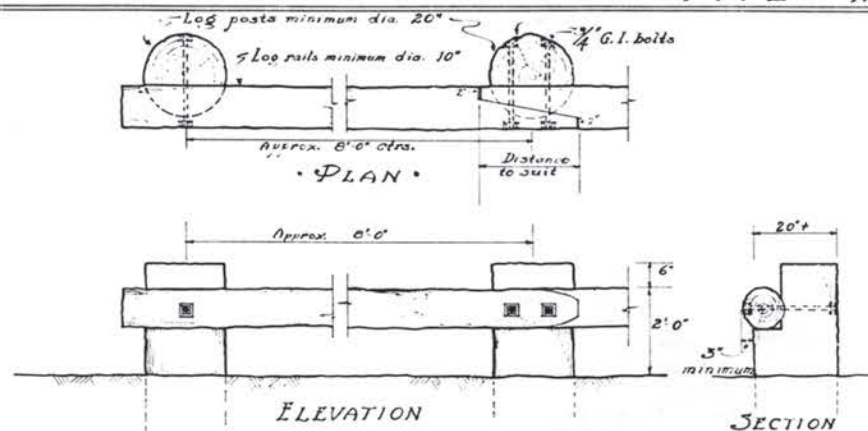


Measurements approximate



TYPE No 13

Measurements approximate



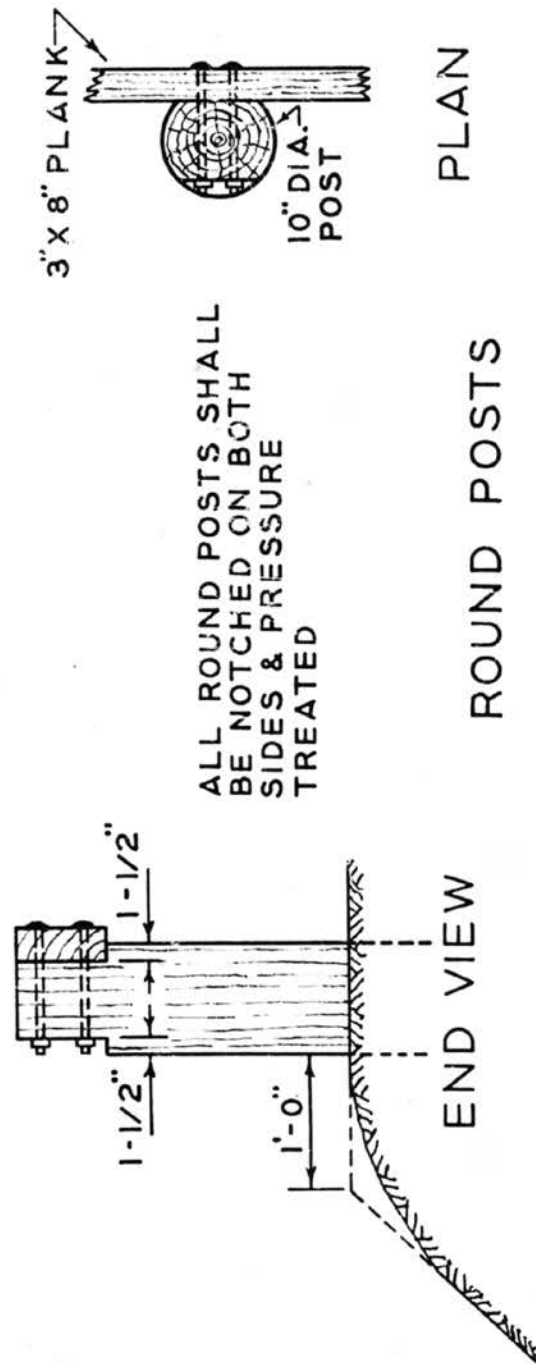
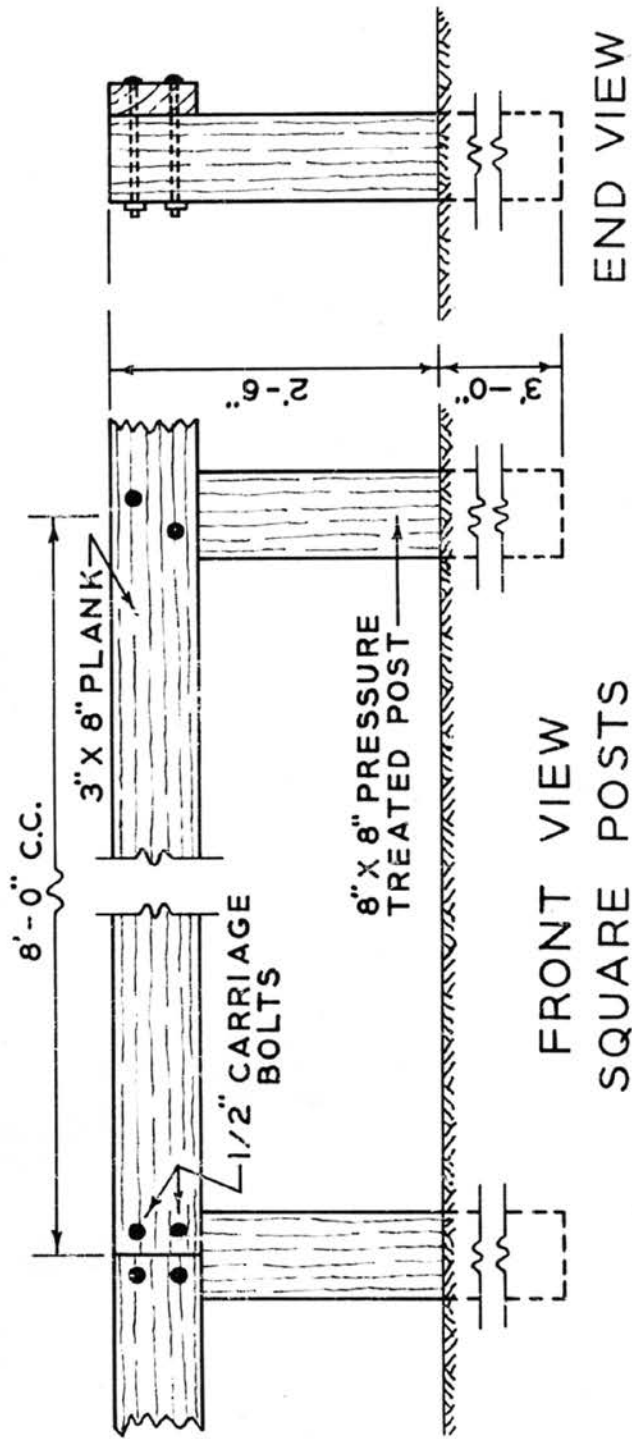
TYPE No 12 (TURN OUT)

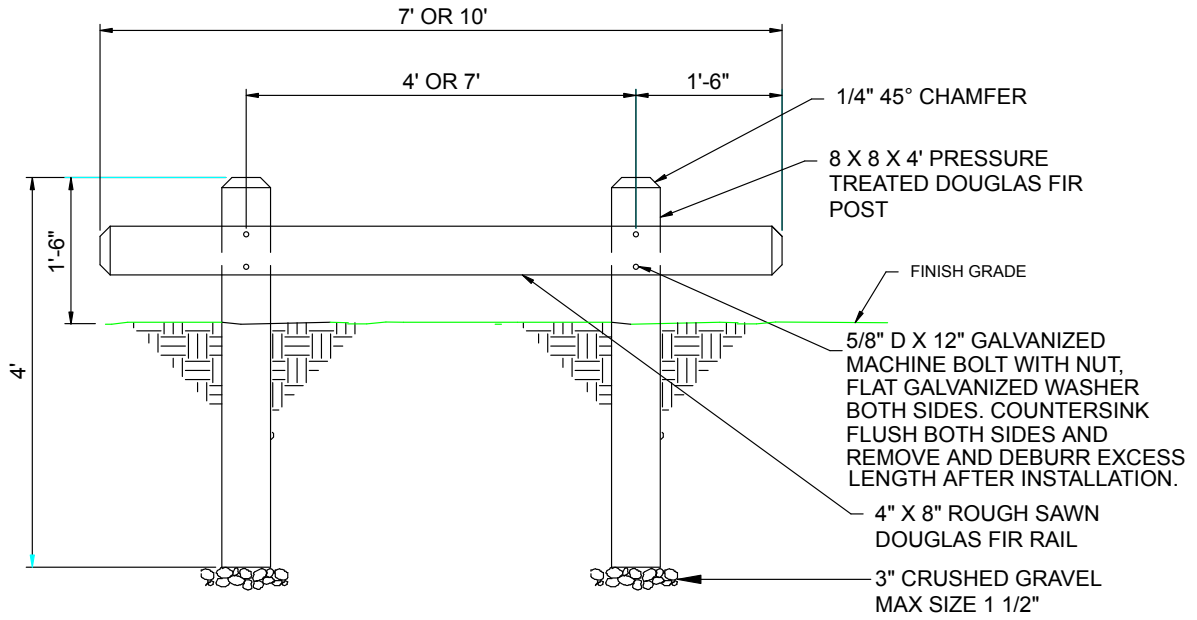
HALF-SIZE REPRODUCTION

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 16, 1929 Chief Landscape Architect

DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE
WOOD GUARDRAIL TYPES
NATIONAL PARK ROAD PROJECTS
Designed by Landscape Division

Date 11/2/29
Dr. by E.A.G.
Tr. by W.E.M.
Sheet 21 of 2 sheets

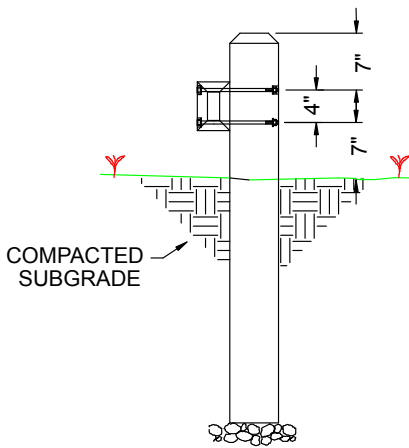




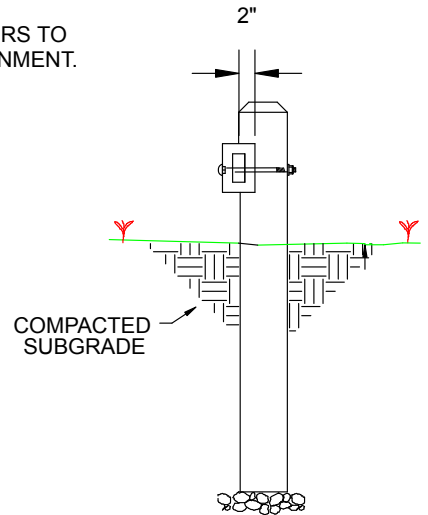
FRONT ELEVATION

NOTES:

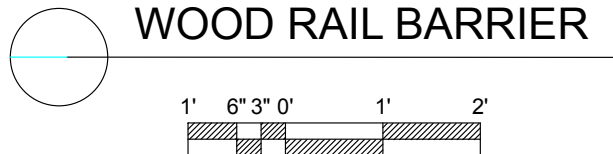
OPTIONAL 8"-10" POLE. NOTCH POLE 3" TO FIT POST. 1/4" 45° CHAMFER ON ENDS. STAIN ALL WOOD MEMBERS TO MATCH DESIGN THEME OR ENVIRONMENT.



RIGHT ELEVATION



OPTIONAL ATTACHMENT



WOOD RAIL 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 and Tools

Construct the no-dig barrier from railroad ties. Purchase the railroad ties in bulk for about \$9 each from a lumber yard.

Materials

Standard railroad ties, #1 or relay grade
Pressure-treated 8-inch by 8-inch by 8- or 10-foot long Hem-Fir or Douglas-fir posts
5/8-inch steel rebar in 20-foot lengths

Tools

Chain saw
Cutting torch
Heavy-duty drill (1/2 horsepower)
5/8-inch bell-hangers drill bit
Sledge hammer
Stringline
Drilling template

Assembly

1. Cut the 8-inch by 8-inch pressure-treated wood (Hem-Fir) into 12-inch lengths using a chain saw. Yield is 8- to 10-support blocks.
2. Cut rebar into 30-inch lengths. Yield is 8 units per 20-foot stick.
3. Use a simple drilling template; set the railroad ties on top of the 8- by 8- by 12-inch blocks, which are placed lengthwise in the template with the outside edge of the block 12 inches from the end of the railroad tie (12.6 inches) on center.
 - a. The template consists of two plywood squares with a framed "bunk" to hold the 12-inch long lengths of pressure treated Hem-Fir support blocks. Once the blocks are cut to length they are put in the bunks on the two properly spaced templates. A railroad tie is placed on top of the two Hem-Fir blocks. The templates allow for a one foot extension of the railroad tie beyond the outside edges of the two Hem-Fir blocks. Once the railroad tie is in the proper position, the tie and the support block are vertically drilled on center with a 5/8-inch diameter bell hangers bit. After drilling, a 30-inch piece of 5/8-inch rebar is pounded down through the hole in the railroad tie and the block, stopping at ground level.

4. Drill through the railroad tie and the pressure treated blocks with the 5/8-inch drill bit.
5. Pound a 30-inch stick of rebar through the railroad tie and block with a sledge hammer until flush with the bottom on the block. This will leave about 12 to 14 inches of rebar sticking out of the lumber. (See figure 30.)



Figure 30.

At this point the no-dig barriers are ready to transport on a trailer to the jobsite.

Installation

1. Transport the barriers to the jobsite.
2. Use a stringline to lineup the barriers. (This step may not be necessary.)
3. Lineup the barriers with Hem-Fir blocks are in contact with the ground.
4. Use an 8- to 20-pound sledge hammer to pound the 12- to 14-inch length of rebar into the ground until flush with the top of the railroad tie.
5. Simple eyeballing and a little leveling with a McLeod results in a finished product. (See figures 31 and 32.)



Figure 31.

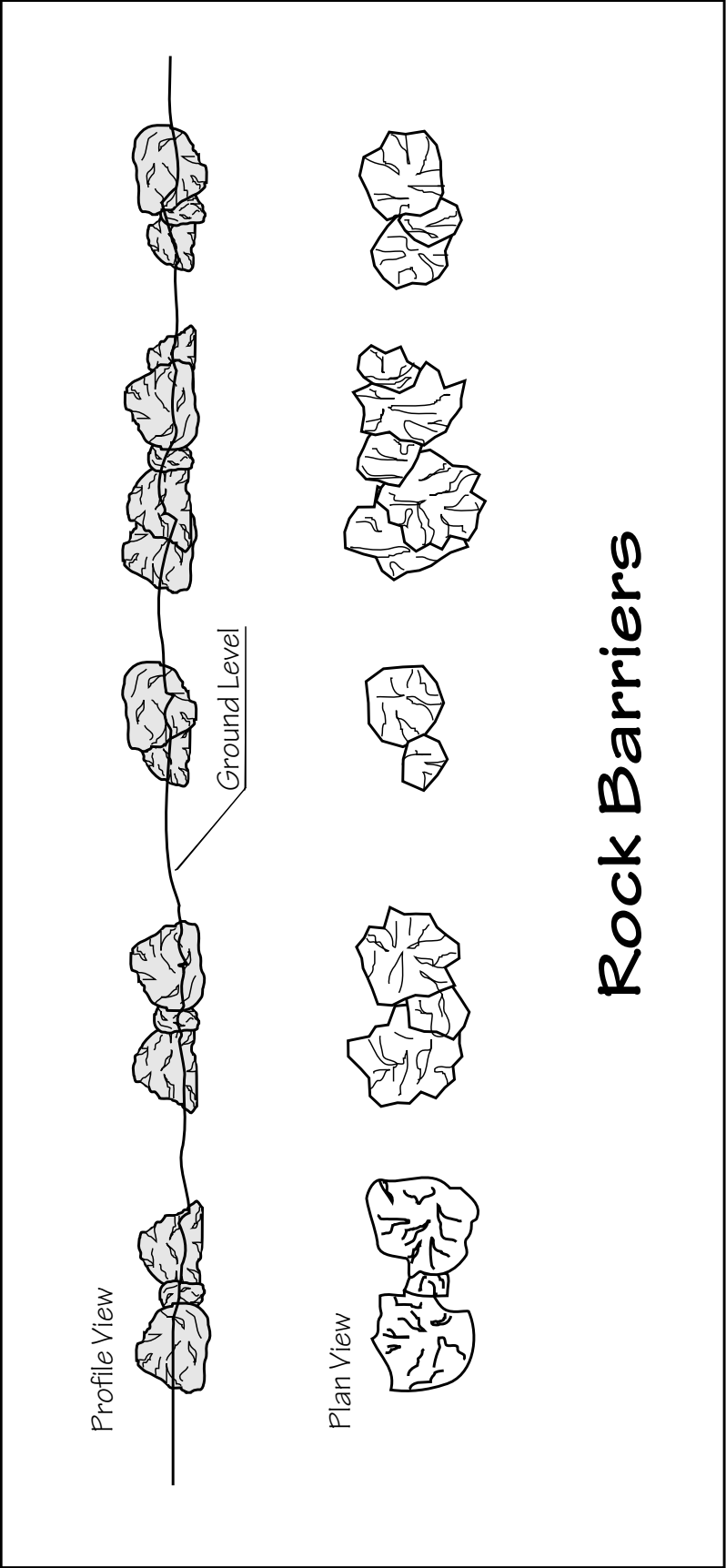


Figure 32.

When in use, if a barrier is backed over or moved out of place by frost heave use a digging bar as a lever to right the barrier. Barriers can be jacked out with a jack and, unless the rebar is badly bent, they can be easily reinstalled.

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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, Roded 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://fswweb/beig/BEIG_Training/default.htm.

WEB SITES

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

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

(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).

U.S. Department of Agriculture, Forest Service. 2005. Sign and poster guidelines for the Forest Service.

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

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

U.S. Department of Agriculture, Forest Service, Northern Regional Office. Access and travel management.

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

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

<http://fsweb.wo.fs.fed.us/rhwr/ohv/index.shtml>

U.S. Department of Agriculture, Forest Service. 2006. Built environment image guide training. (San Dimas Technology and Development Center.)

http://fsweb/sdttdc.wo.fs.fed.us/programs/rec/beig/BEIG_Training/default.htm.

(26 May 2006).

U.S. Department of Agriculture, Natural Resources Conservation Service. 2006.

Delaware standard engineering drawings.

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

(26 May 2006).

U.S. Department of Transportation, Federal Highway Administration. 2003. Manual on uniform traffic control devices (MUTCD).

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

(26 May 2006).

Acknowledgements

SDTDC wishes to thank the following individuals for their review of this publication:

Scott Groenier, civil engineer,
USDA Forest Service,

Missoula Technology and Development Center.

Greg Napper, civil engineer,
USDA Forest Service,

San Dimas Technology and Development Center.

Don Trammell, USDA Forest Service,
Southwest Region,
Trails Unlimited Enterprise Unit.

SDTDC also extends thank yous to all the persons who shared their barrier drawings.

SDTDC’s national publications are available at

<http://www.fs.fed.us/eng/pubs>.

U.S. Department of Agriculture, Forest Service and U.S. Department of the Interior Bureau of Land Management employees also can view SDTDC’s videos, CDs, and individual project pages on their internal computer networks at:

<http://fsweb.sdttdc.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 retroreflective, 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 create 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

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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.

