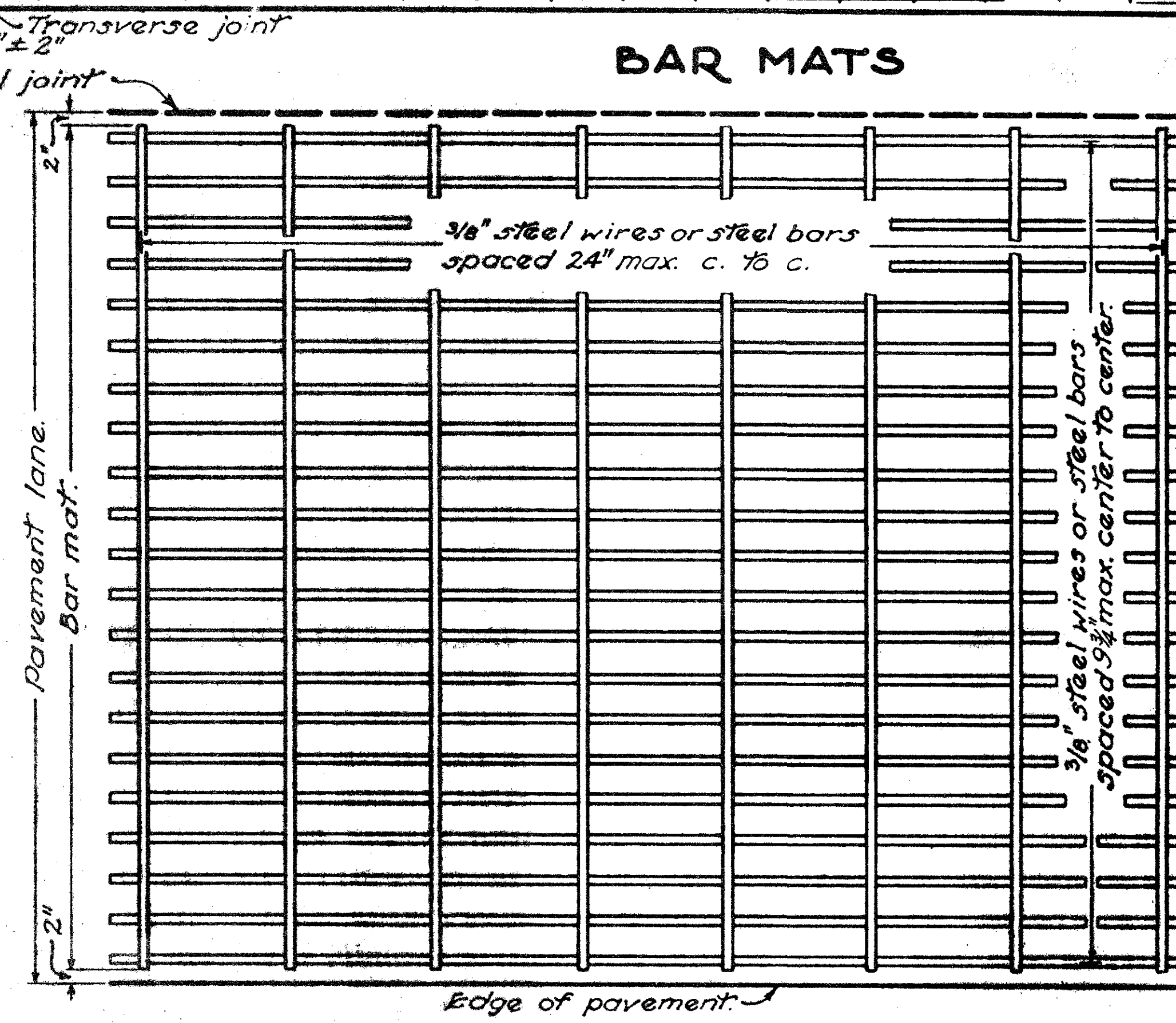
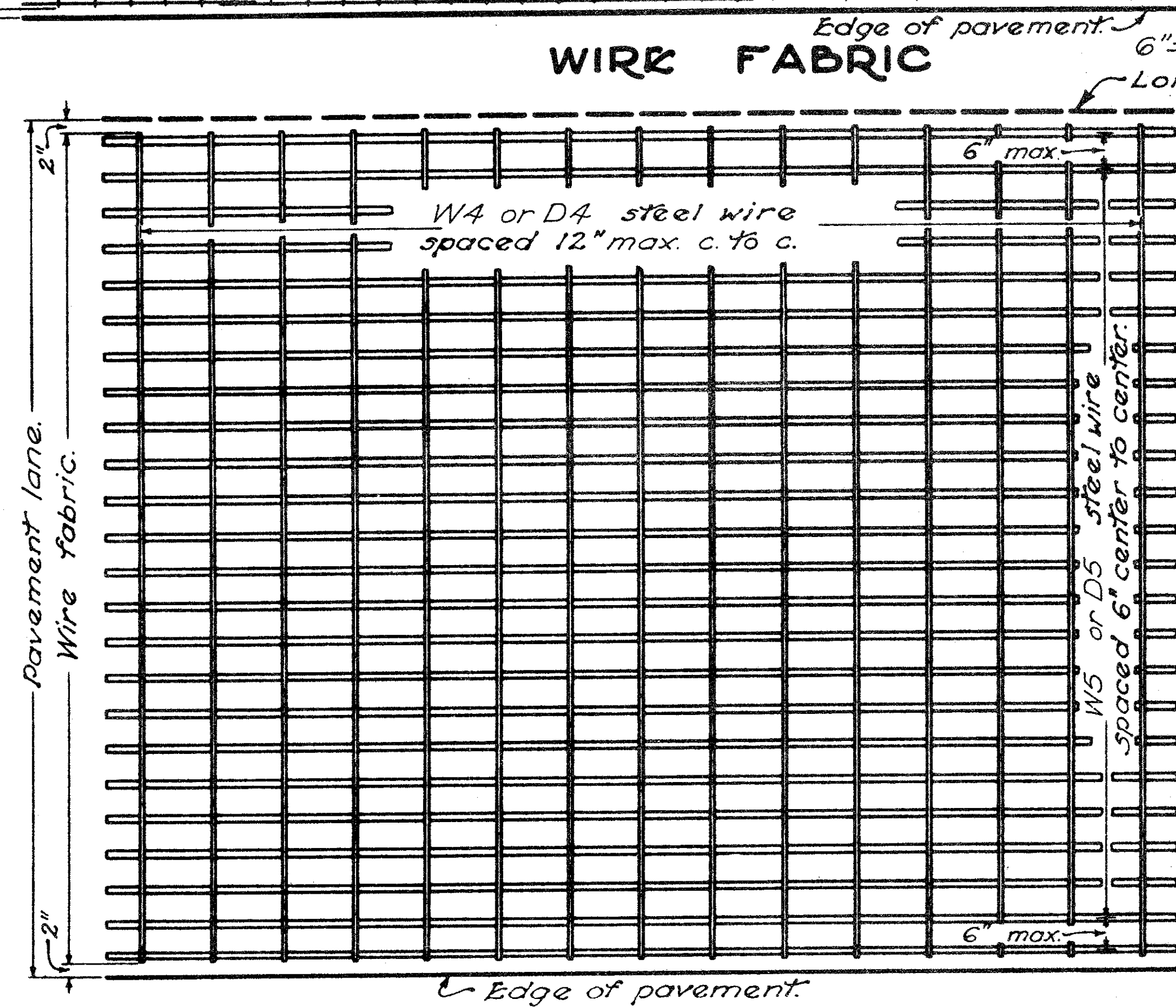
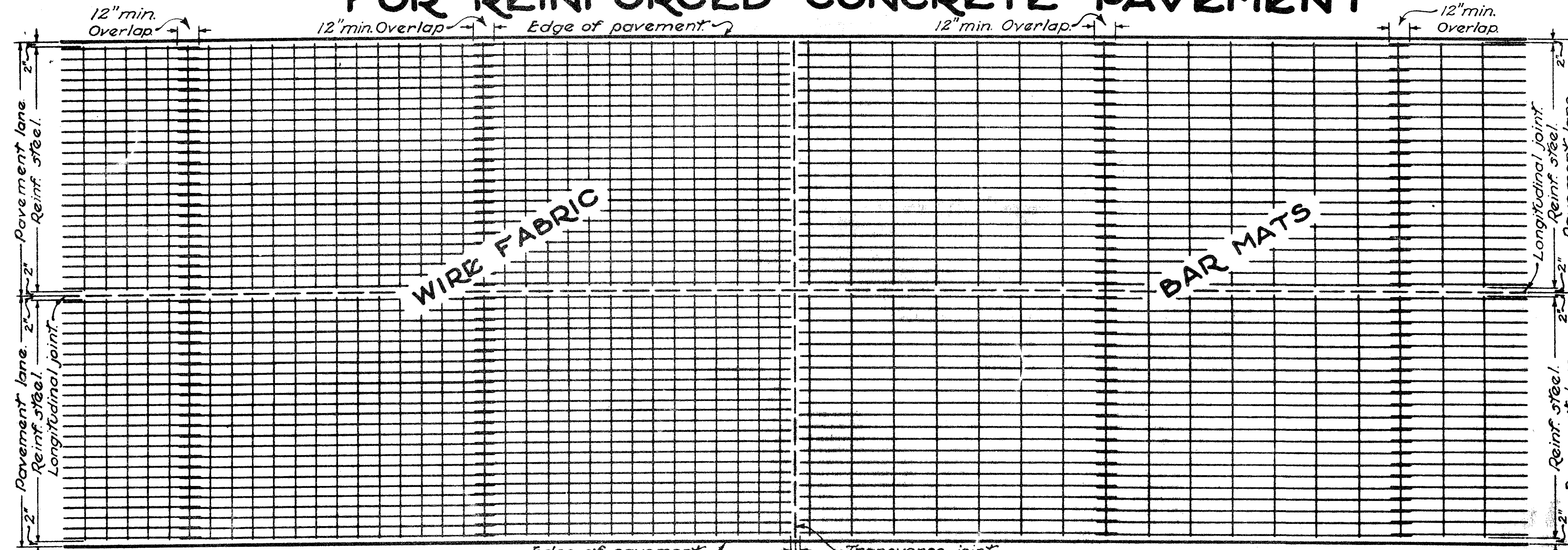


# STEEL REINFORCING FOR REINFORCED CONCRETE PAVEMENT



## NOTES

Steel reinforcing in normal or wider lane widths may consist of two units with an approved longitudinal hinge. The hinge shall consist of W4 or D4 steel wires connecting the two units such that the longitudinal members on either side of the hinge will be properly spaced when the reinforcing is in final position.

The distance from the top of the concrete pavement to the reinforcing steel may vary from 2 1/2 inches to 1/3 + 1 inch, where T = thickness of the concrete pavement.

The requirement for clearance between the transverse joints and the ends of wire or bar reinforcing is modified to the extent that the clearance may be 12" plus or minus 2" if the Contractor installs the dowel bars by using a dowel installing machine.

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OHIO DEPARTMENT OF TRANSPORTATION

## PAVEMENT REINFORCING

DATE  
6-1-65  
1-10-67  
1-17-68  
12-1-68  
12-6-76

STANDARD  
CONSTRUCTION  
DRAWING

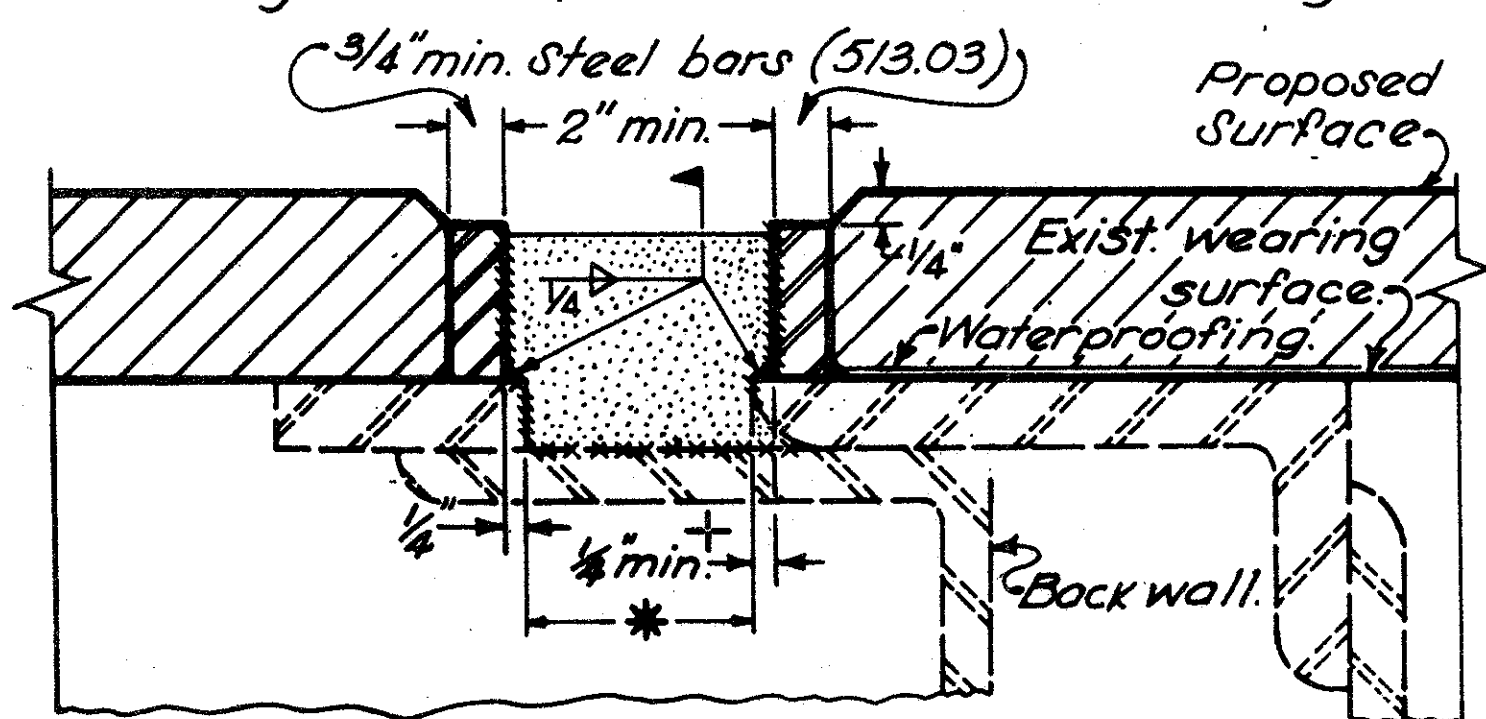
BP-2

APPROVED *M. J. Cunningham* ENGR., L. & D.



# RESURFACING

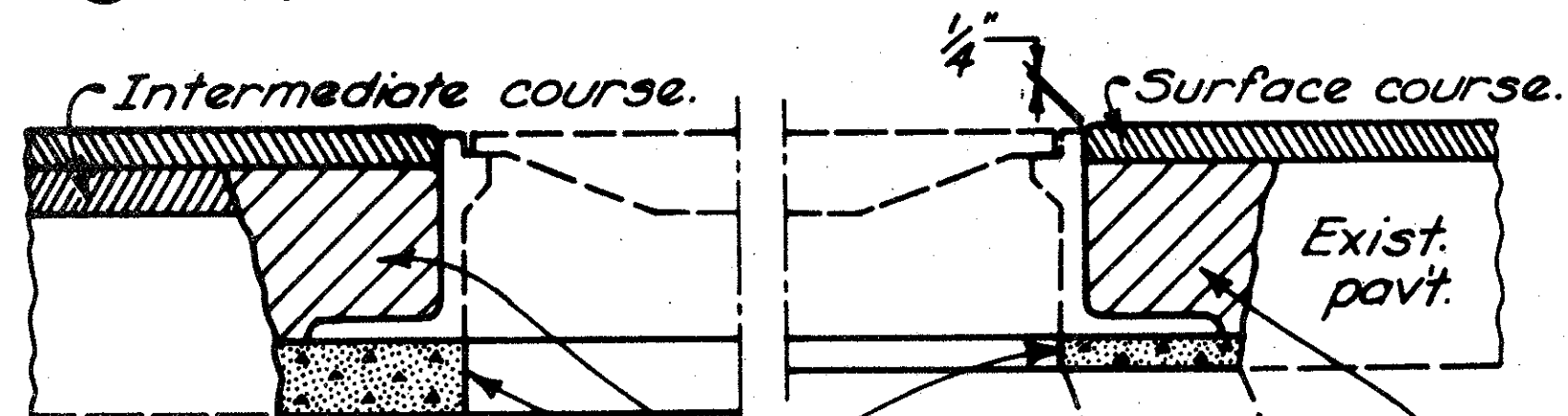
- † Increase as necessary to maintain 2" min. opening.
- \* Vertical extension of joints found to be closed to 1/2" or less may be non-performed as directed by the Engineer.



As a part of item 516, seal joint with a hot-applied bridge deck waterproofing material which also meets the requirements of 705.01. Sandblast vertical surfaces (⊥) and wipe clean. Seal joint before rust forms. If rust forms, re-sandblast. Use bond breaker on the horizontal surface (-----).

**MAINTENANCE OF TRAFFIC:** Generally the bars shall be welded while the lane is closed for waterproofing or resurfacing. However, if traffic is routed over the bars before resurfacing, temporary ramps shall be constructed to the tops of the bars using 402 or 404 feathering at a max. slope of 6 7/8 in. The ramps shall be removed prior to resurfacing. Payment for placing and removing the ramps shall be included in the lump sum bid for Item 614.

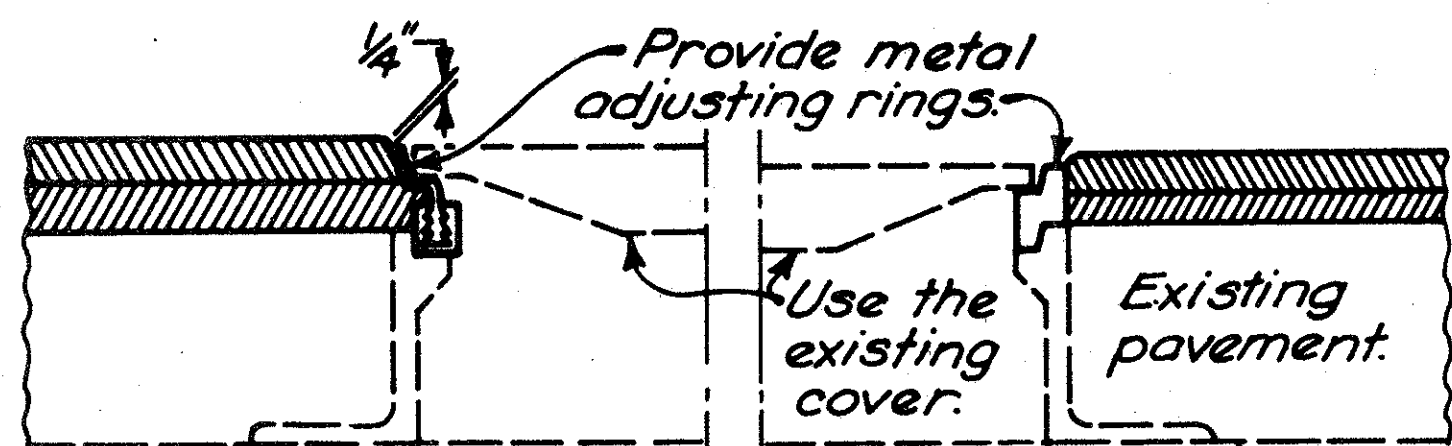
## VERTICAL EXTENSION OF STRUCTURAL EXPANSION JOINTS



Grade rings, bricks, Class C concrete or mortar. Max. mortar thickness 1 1/2".

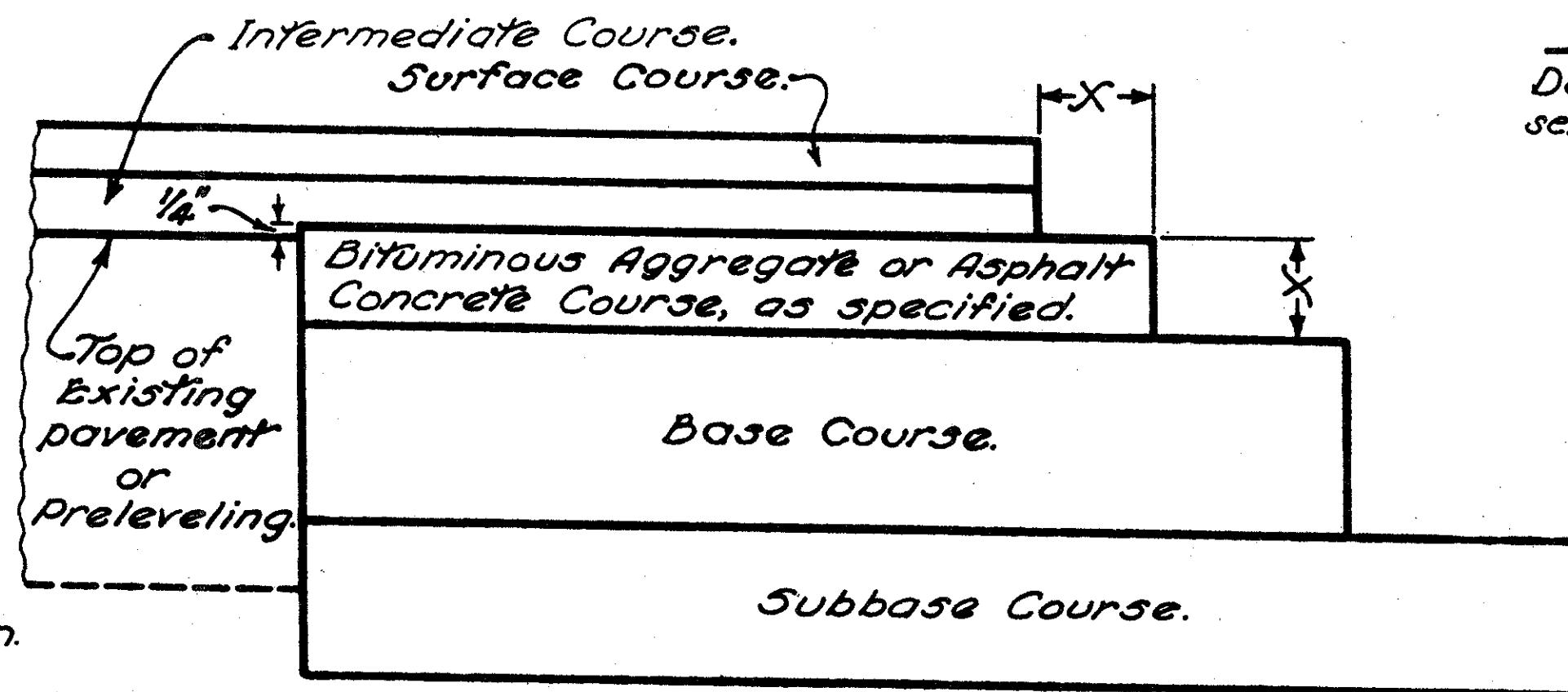
Class C concrete or 3" layers of compacted asphalt concrete.

### USING CONCRETE OR MORTAR



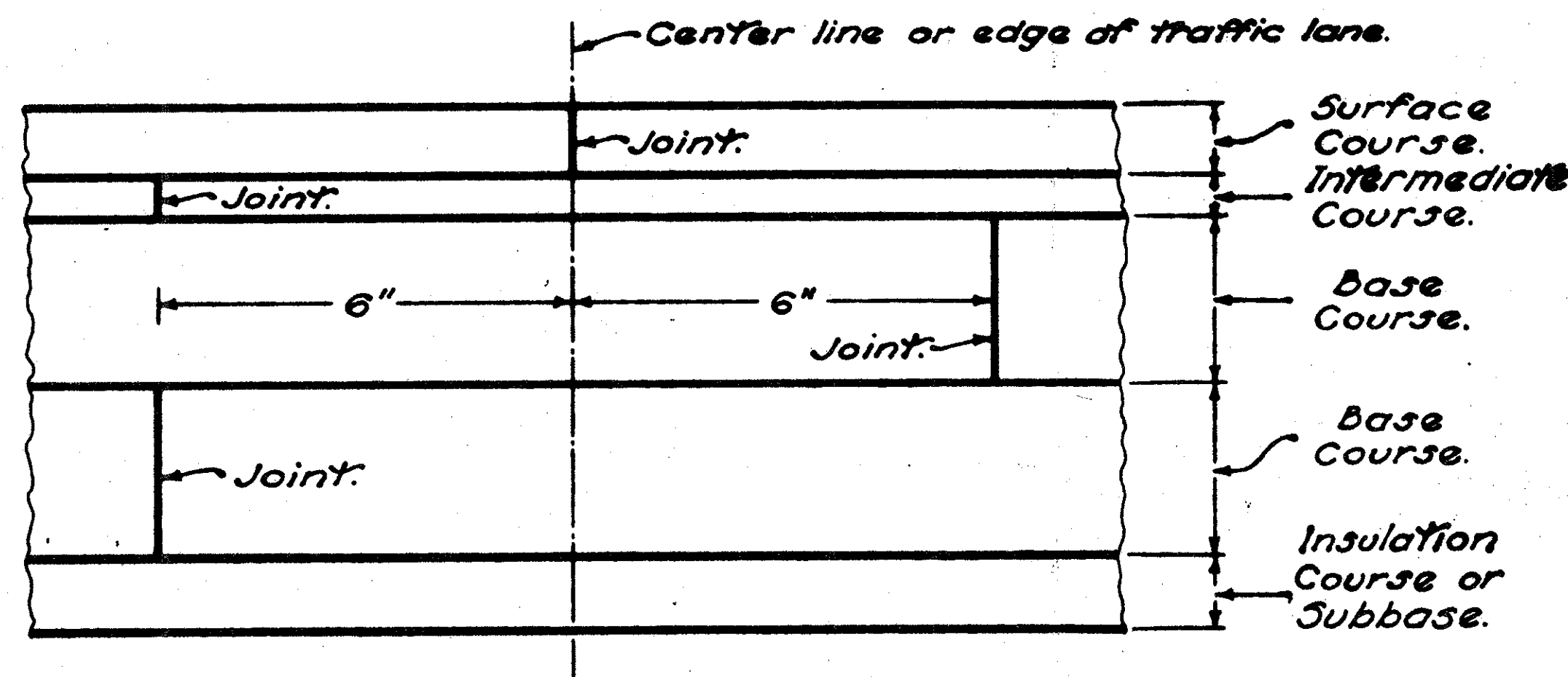
Metal adjusting rings shall fasten or tighten securely in the existing frame, or be welded permanently to the frame and be one piece or fabricated into one piece. Any installation unacceptable to the Engineer, including a poorly seated cover, shall be replaced by the Contractor at his expense.

### USING METAL ADJUSTING RINGS MANHOLES ADJUSTED TO GRADE

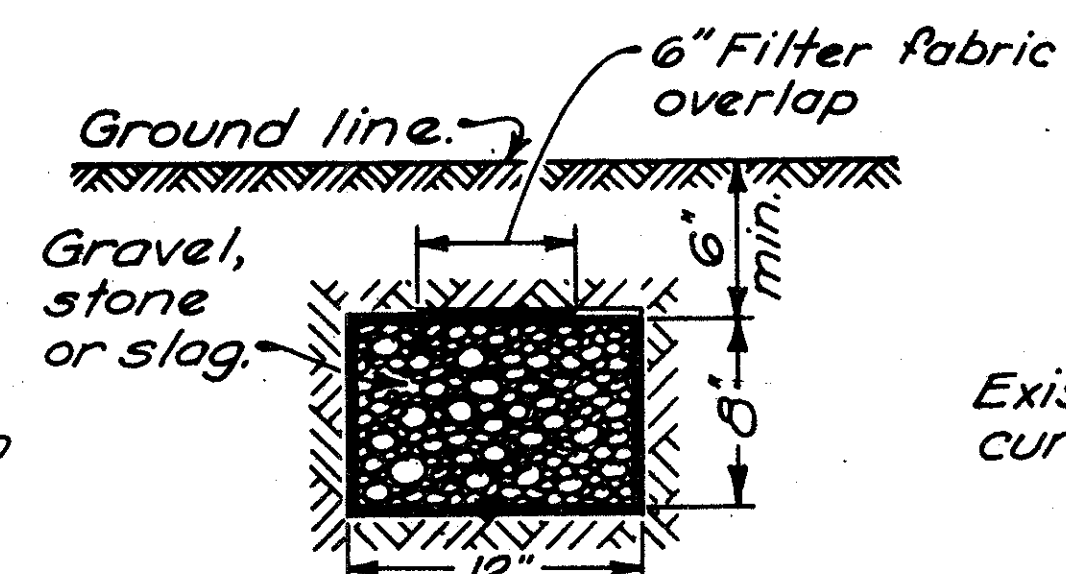


The Bituminous Aggregate in the upper part of the base widening shall finish approximately 1/4" above the edge of the existing pavement where no preleveling is used. Where a preleveling (using intermediate course material) is specified, it shall be placed prior to excavation of the widening trench and the upper course of the base widening shall finish approximately 1/4" above the preleveling.

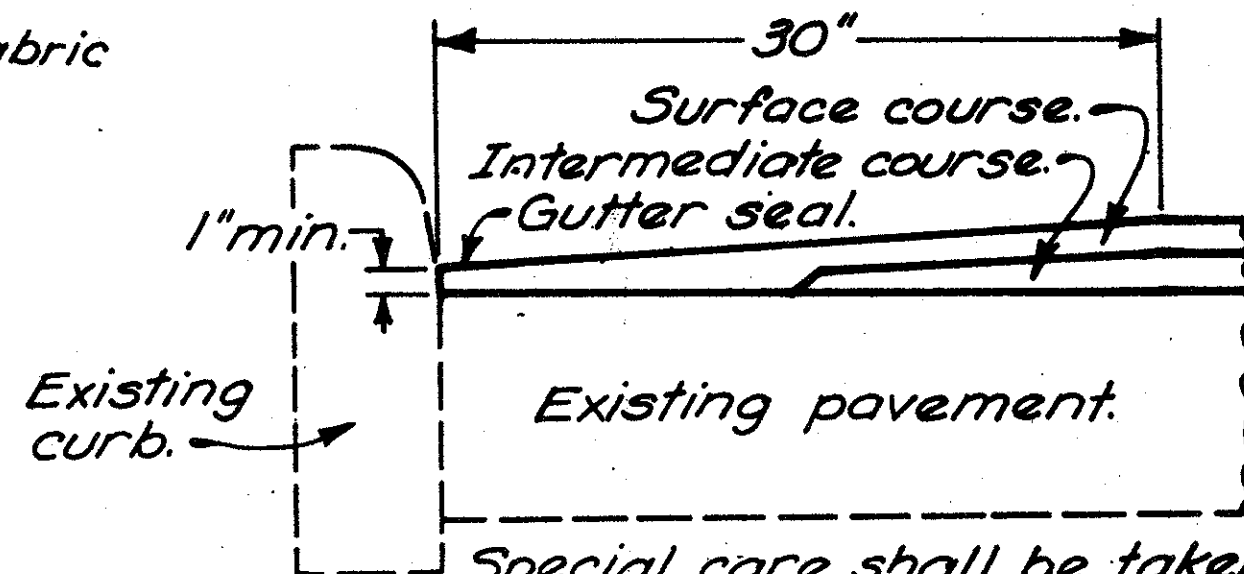
## COURSE DETAIL FOR WIDENING



## LAPPING LONGITUDINAL JOINTS

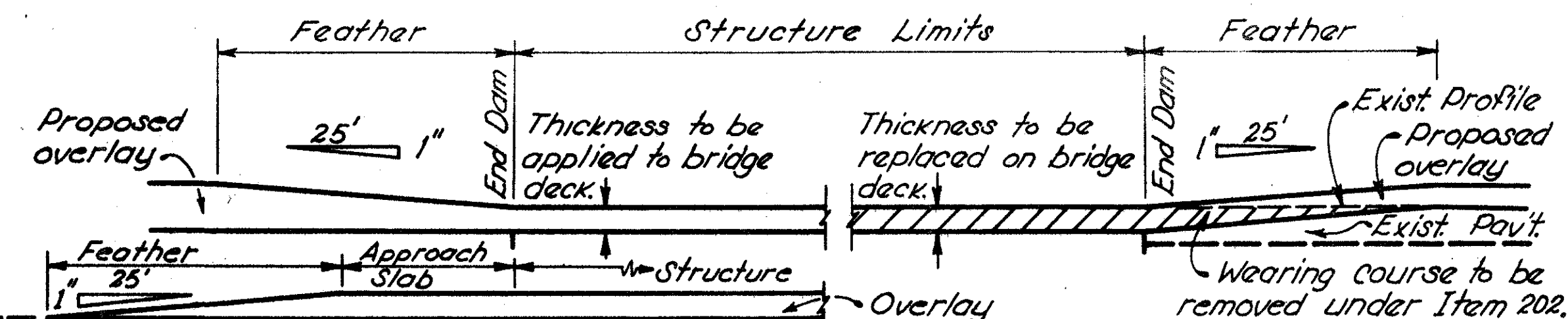


Aggregate drains to be placed where and as directed by Engineer. Provide filter fabric when specified as a separate pay item.



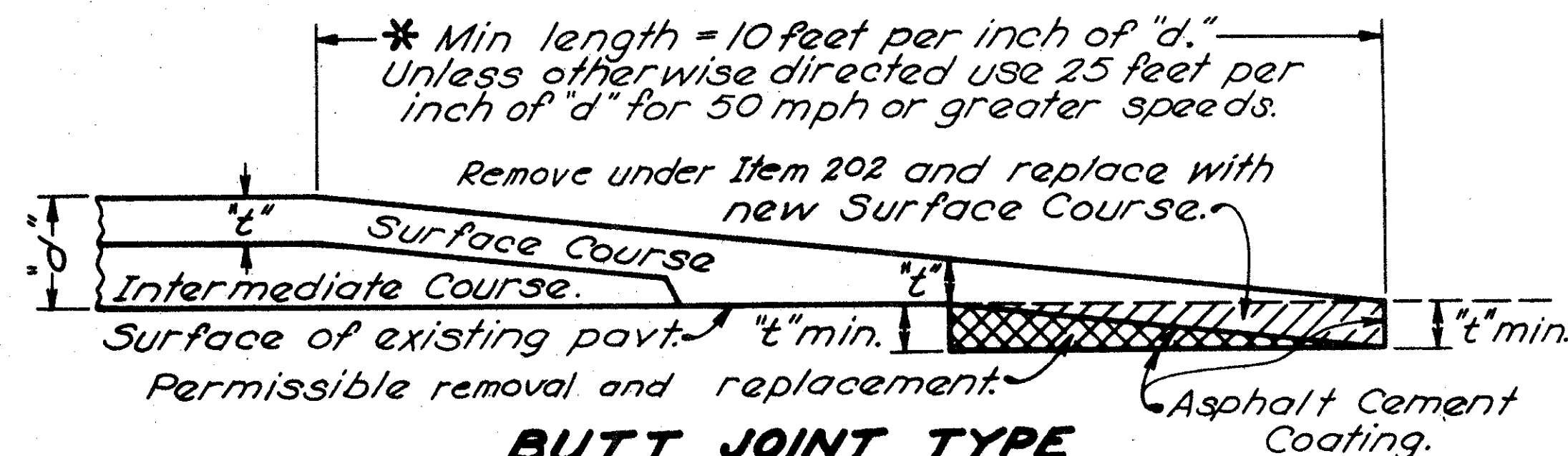
Special care shall be taken during construction to obtain maximum compaction of bituminous concrete in gutters.

## GUTTER FINISH

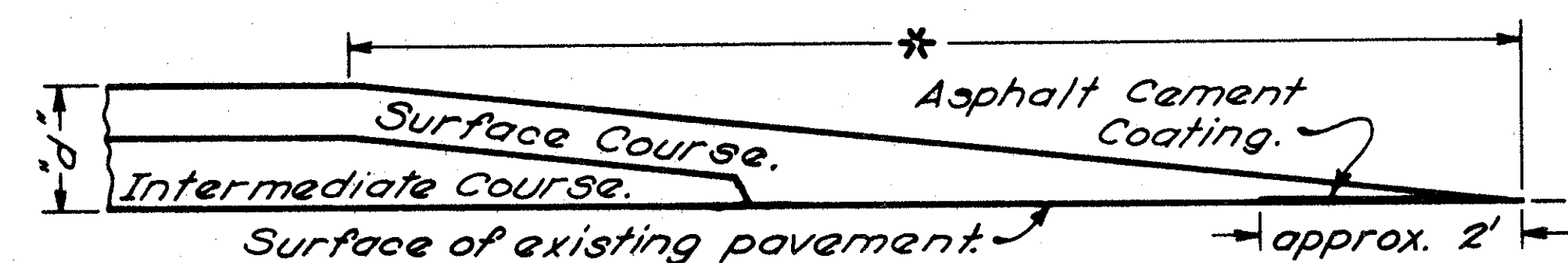


Details assume non-settled approach slabs. Smoothing of the profile for settlement is required per plan grades or as directed by the Engineer.

## FEATHERING AT STRUCTURES



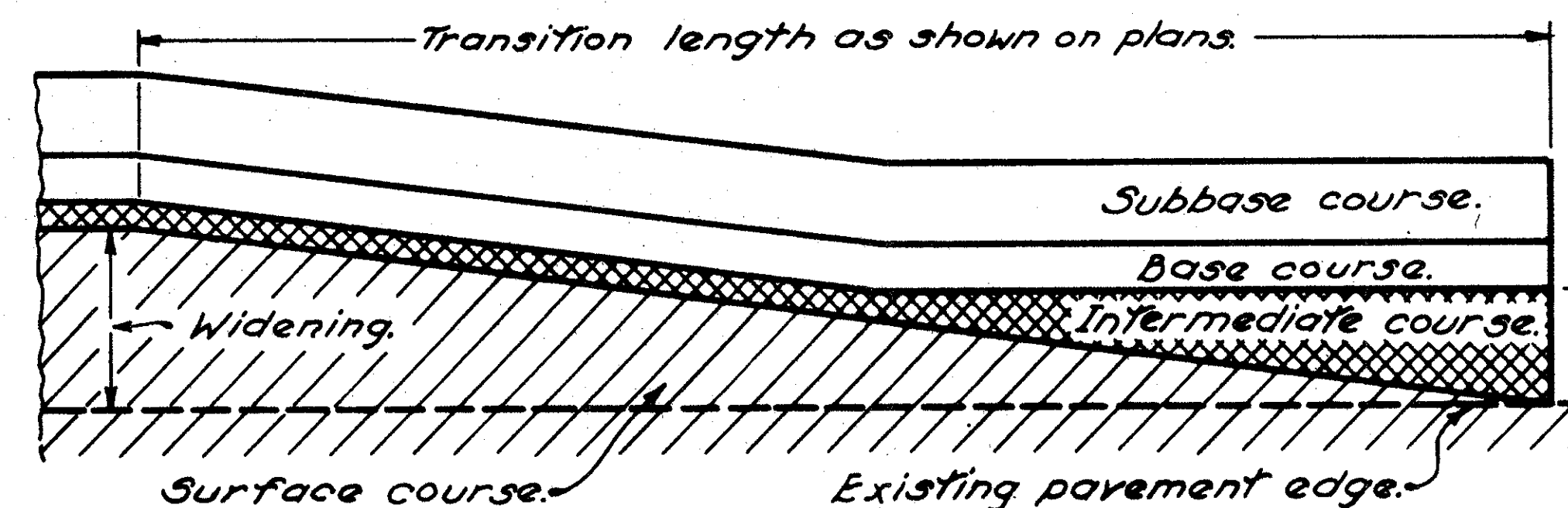
## BUTT JOINT TYPE



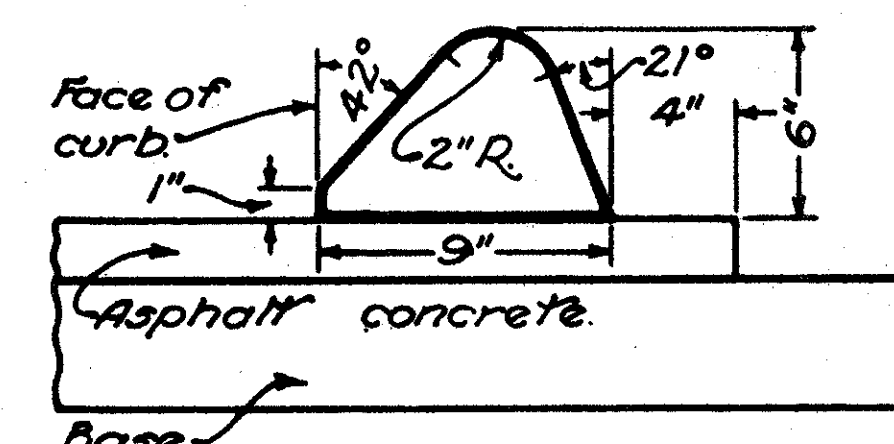
## FEATHER EDGE TYPE

NOTE: Either butt or feather type may be used unless type is specified by the plan.

## PLACING FEATHERED AREAS



## MERGING EDGE OF PAVEMENT WIDENING WITH EDGE OF EXISTING PAVEMENT



## TYPE I ASPHALT CONCRETE CURB

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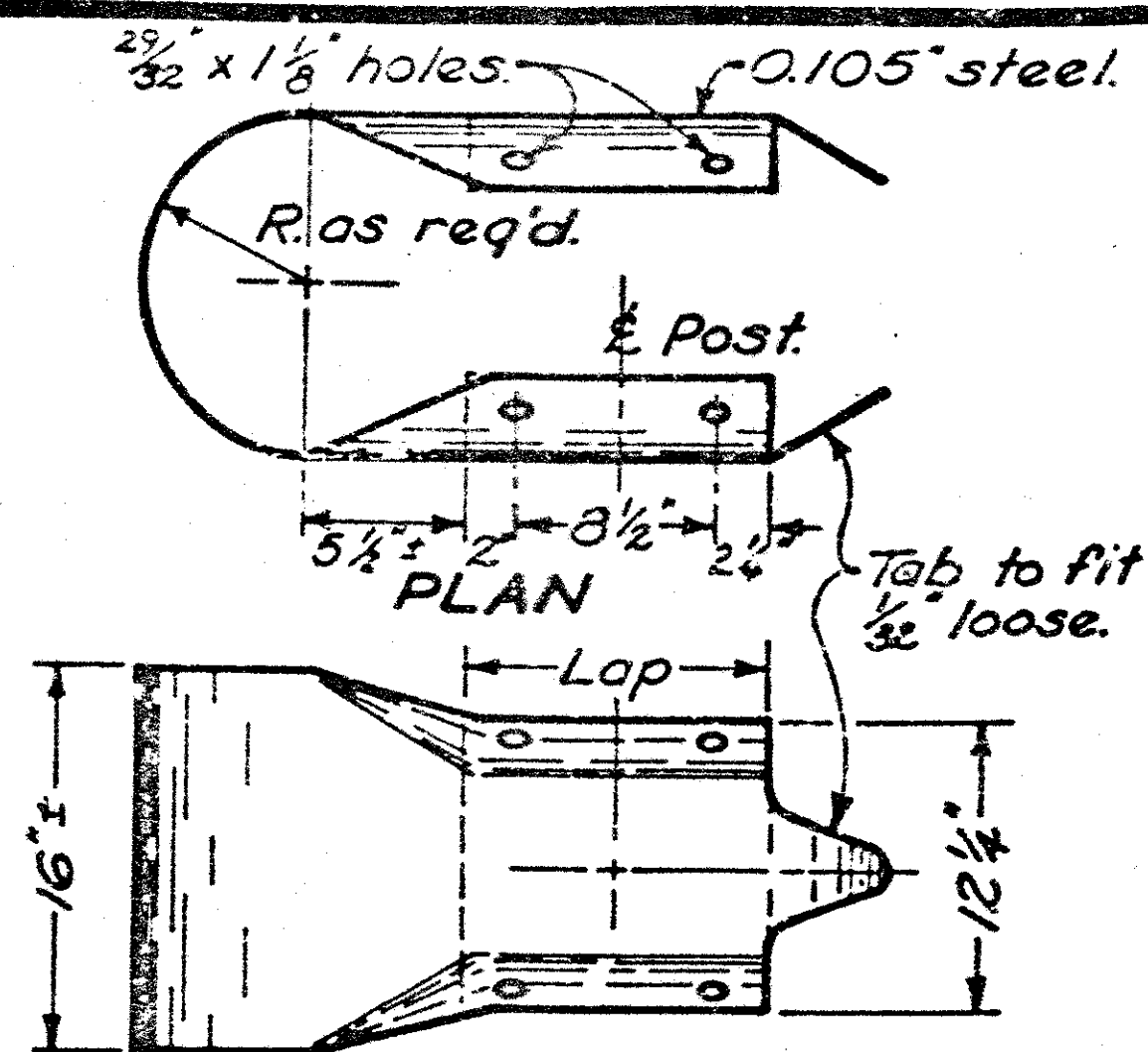
## RESURFACING

STANDARD CONSTRUCTION DRAWING  
APPROVED [Signature] ENGR., L.D.

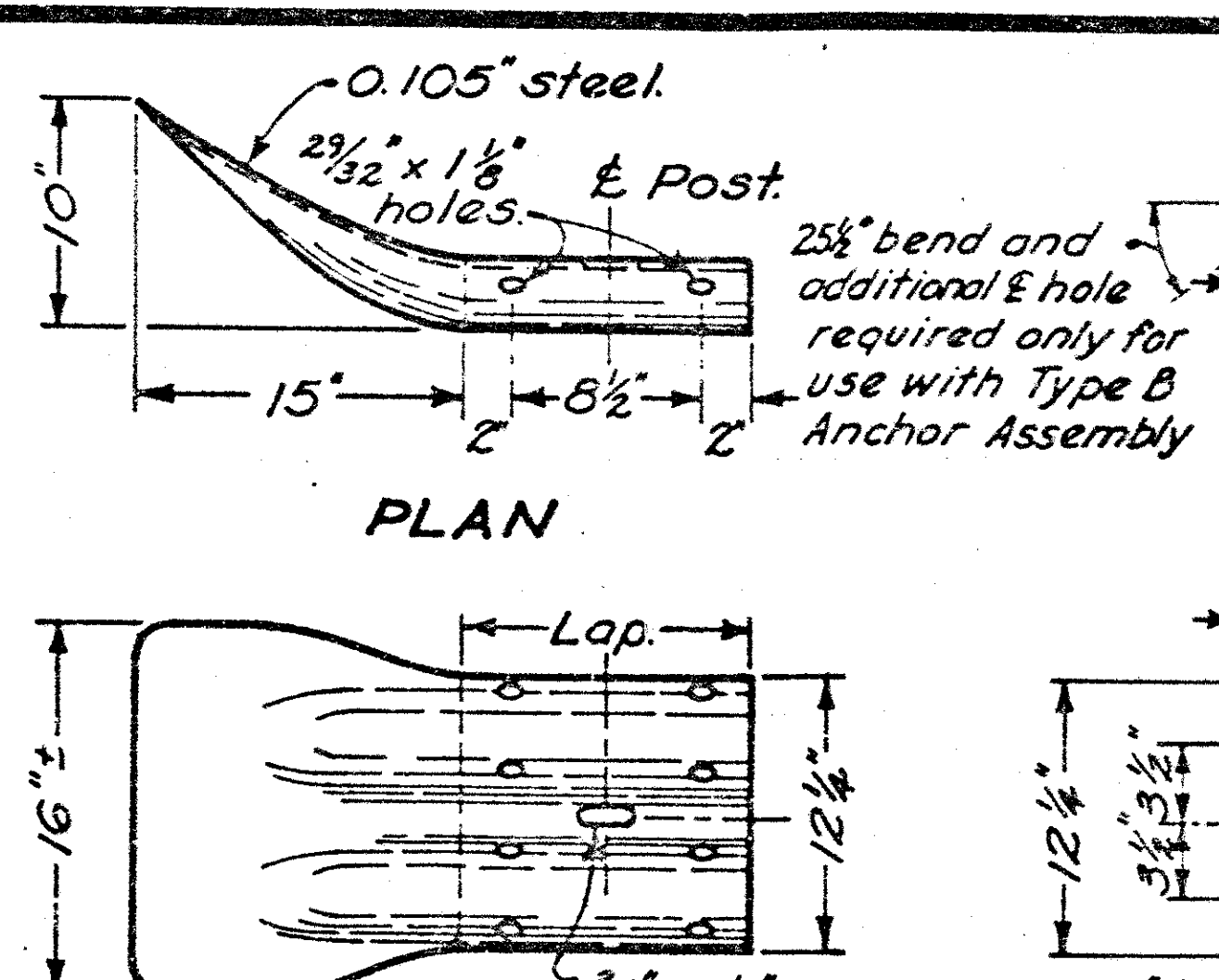
DATE  
6-1-76  
1-1-71  
6-1-72  
8-11-75  
4-16-79  
7-16-81

BP-5

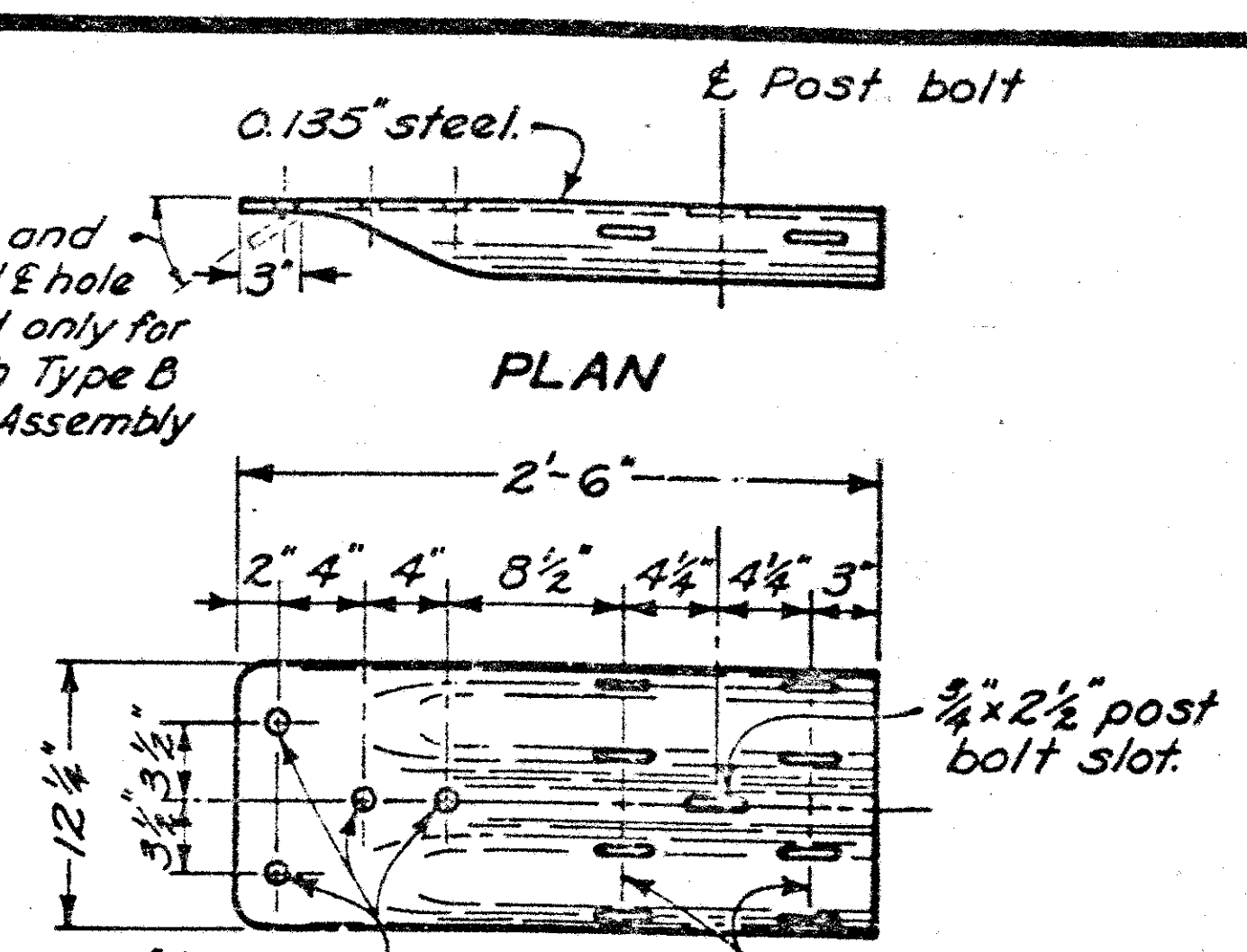




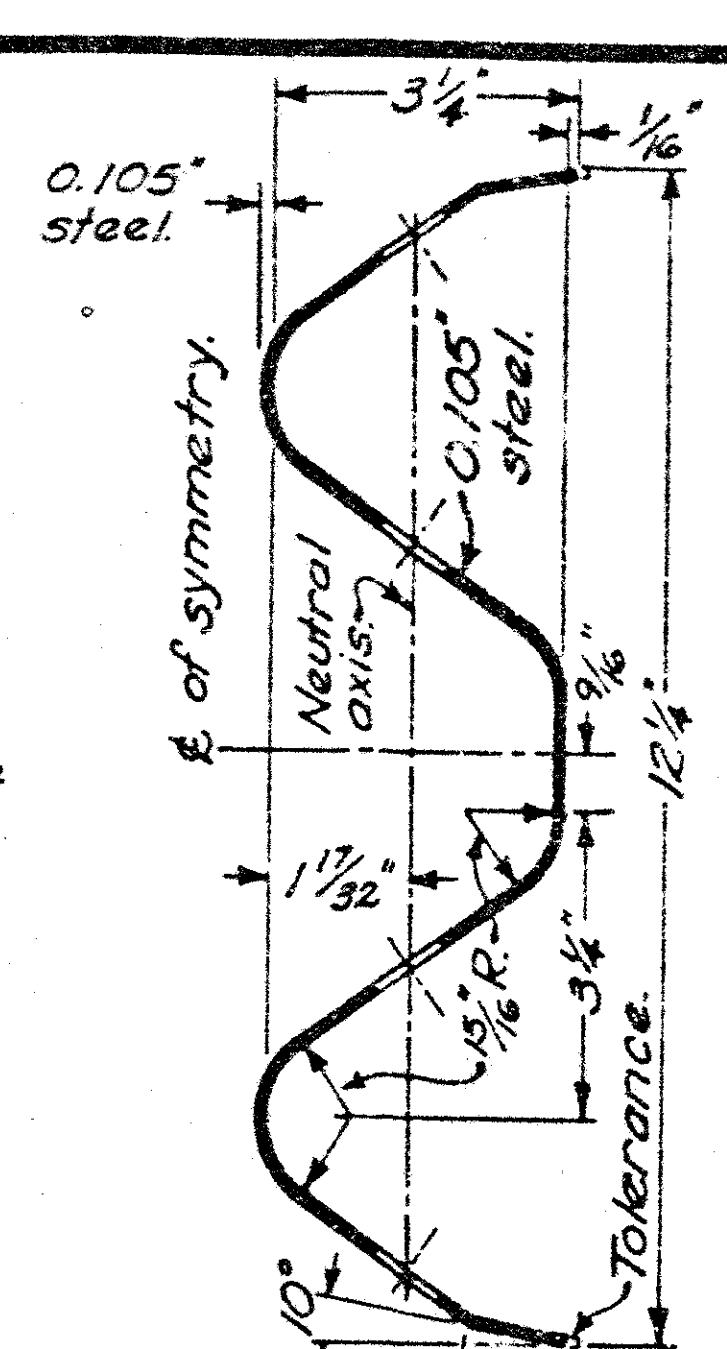
**BUFFER END SECTION**



**FLARED END SECTION**



**TERMINAL CONNECTOR**



**SECTION BEAM RAIL**

**NOTES**  
**BEAM RAIL ELEMENTS** shall be 12'-6" effective length, unless otherwise specified, with 3/4" x 2 1/2" post bolt slots on 6'-3" centers regardless of post spacing. Field punching or drilling of bolt holes or slots for irregularly spaced posts shall be according to 606.05.

**BEAM RAIL SPLICE** between two rail elements, or rail and terminal connector shall be lapped in the direction of traffic. The buffer or flared end sections shall lap on the traffic face. A 12" length of beam rail (Back-Up Plate), with a 3/4" dia. bolt hole or a 3/4" x 2 1/2" slot, shall be provided at posts not having a rail splice.

**SPECIAL POST MOUNTINGS:** Inlet mounted posts are required for guardrail posts located on a drainage inlet. Footing anchors are required for guardrail posts located on footers with less than 3'-5" cover except that for footer cover of 2'-6" to 3'-5" the posts may be installed by using a 4" minimum concrete encasement. The inlet mounted post may be used for footing anchors in runs with steel posts.

When standard post depth is not available due to a culvert, the guardrail posts directly over the culvert shall not be driven, but set in holes with a 4" minimum concrete encasement for the maximum post depth available.

Cost of the inlet mounted posts, footing anchors, and concrete encasement shall be included in the unit price bid for guardrail of the type required by the plan.

**STEEL POSTS** are specified as 9# or 15# but 8.5# and 15.5# sizes respectively may be used.

**ANCHORS** conforming to 712.01, or anchors per FF-5-325 Group II, Type 4, Class 1 or 2 or Group VIII, Type 1 or 2 with proof load certification per 712.01, may be substituted with the same bolt diameter specified. If there is any question of deteriorated concrete, expansion anchors will not be allowed, as determined by the Engineer. Where self-drilling anchors are permitted and used for guardrail construction, the holes shall be drilled with the expansion shield (not by a drill bit) and the shield shall be installed flush with the concrete surface.

The Engineer shall visually inspect, after installation, all expansion anchors used in guardrail construction. The Engineer may require the Contractor to test load any expansion anchor to 1/2 the certified proof load in direct pull. The equipment and method used shall meet the approval of the Engineer. Each expansion anchor that fails to meet the test requirements shall be reset or removed and replaced with bolts extending through the concrete or grouted in place, as directed by the Engineer.

**PROTECTIVE COATING:** In lieu of the requirements of 710.10, expansion shields, anchors and insert anchor assemblies installed (embedded) in concrete may be coated according to good commercial practices. Any bolts screwed into these embedded devices shall meet 710.10.

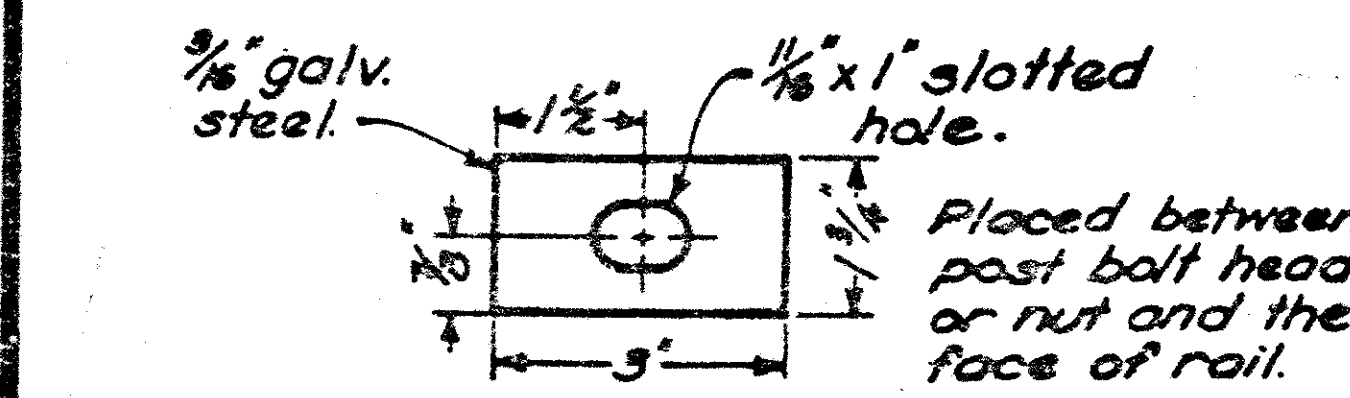
BUREAU OF LOCATION AND DESIGN  
 OHIO DEPARTMENT OF TRANSPORTATION

**GUARDRAIL DETAILS**

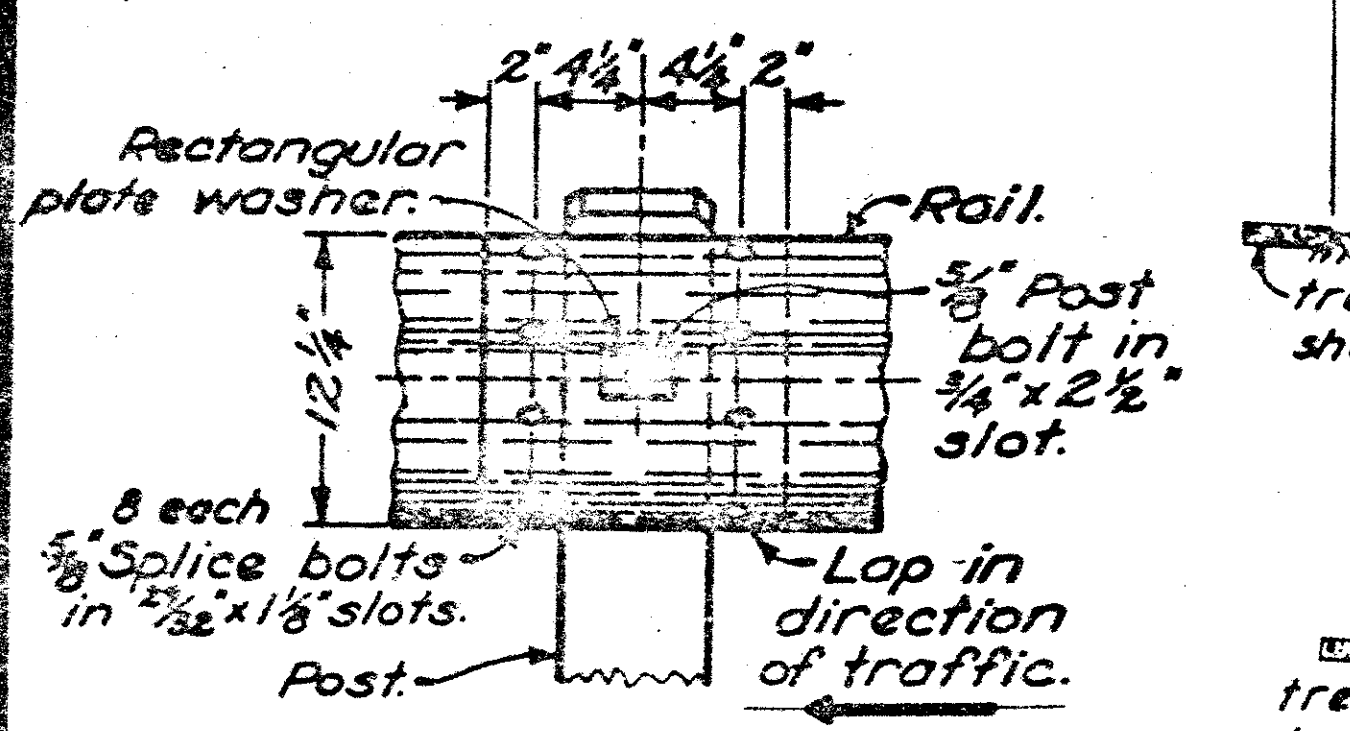
STANDARD CONSTRUCTION DRAWING GR-1

APPROVED: [Signature] ENGR. L. B. D.

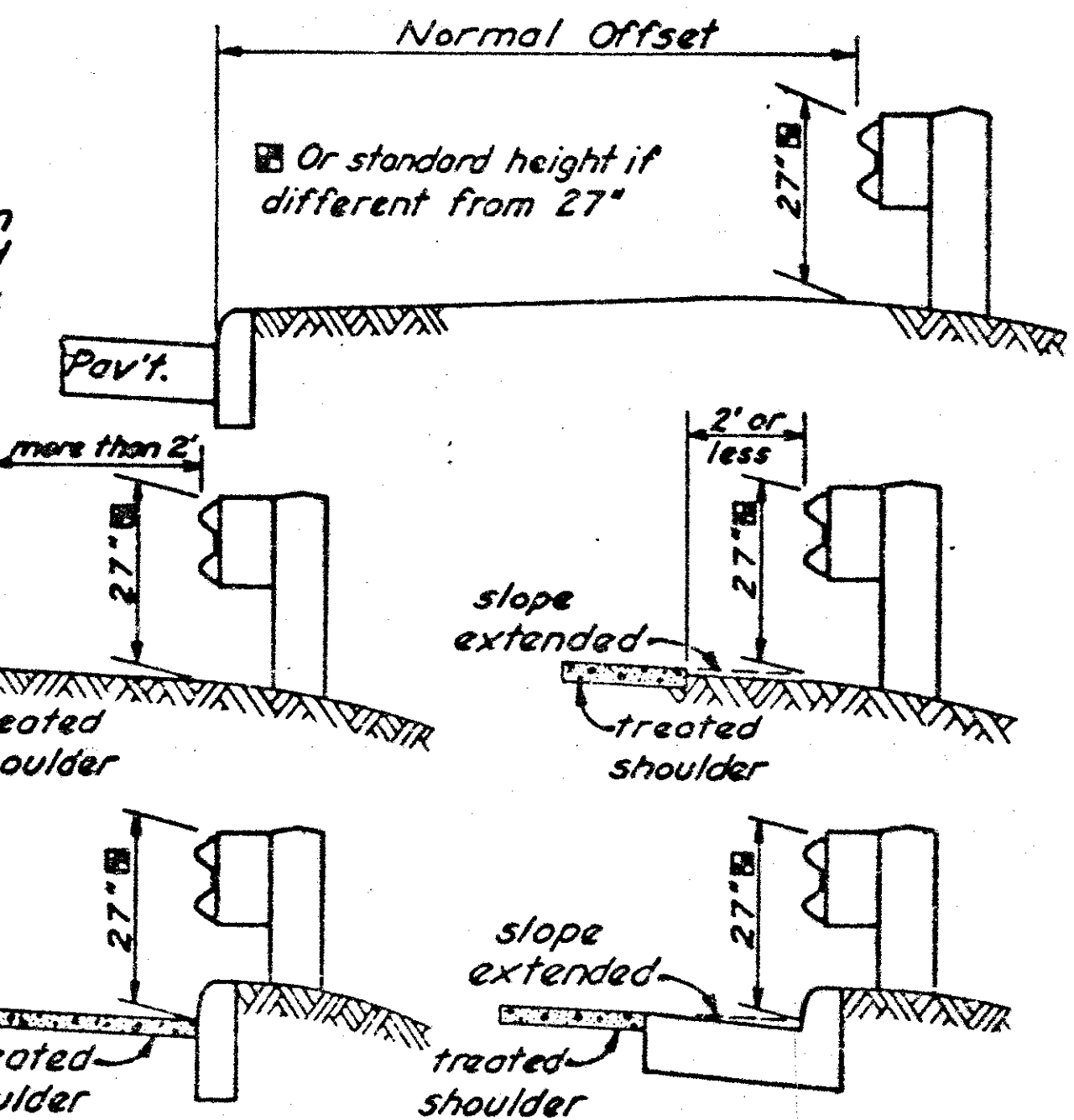
DATE 12-6-73 2-5-82



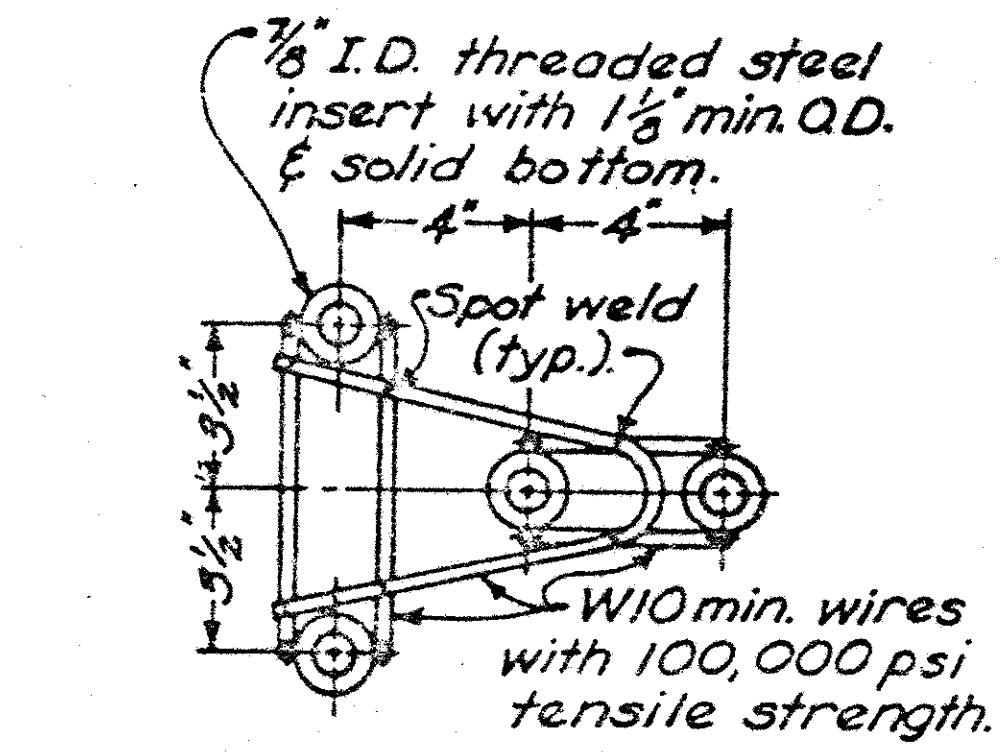
**RECTANGULAR PLATE WASHER**



**BEAM RAIL SPLICE**



**GUARDRAIL HEIGHT**

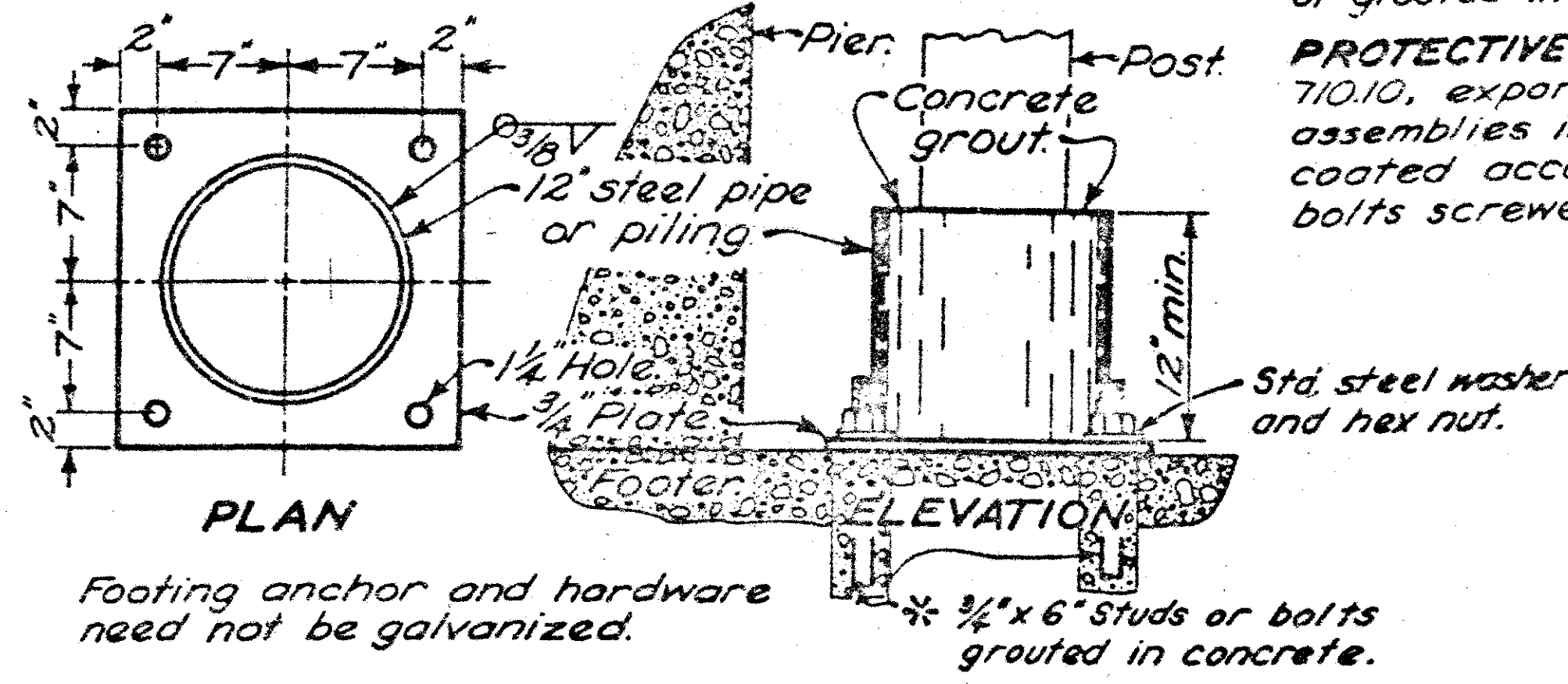


**CONCRETE INSERT ANCHOR ASSEMBLY**

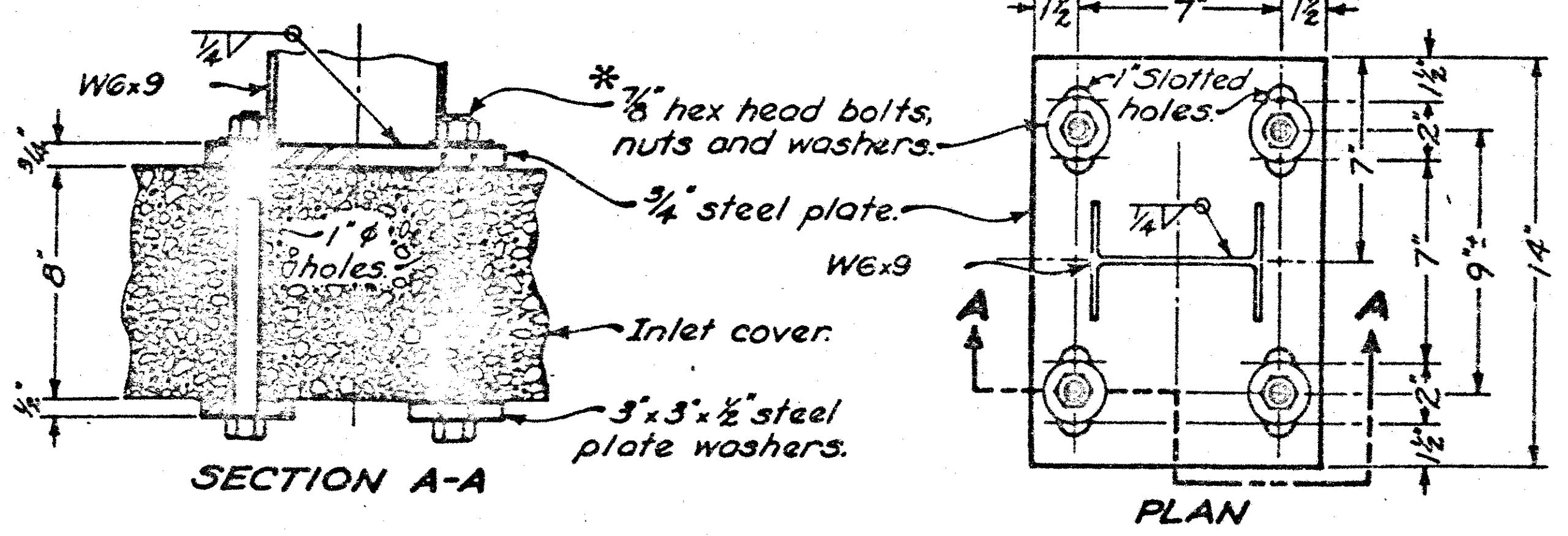
L (in)	7/16 min	Bolt Use
10	2 1/2	Type 4: WP Type 5: SP/WB
2	1 1/2	Type 4: SP Type 5: SPSB or WPSB
1 1/4	Full	Splice bolt

WP=wood post WB=wood block  
 SP=steel post SB=steel block  
 Longer bolt may be needed for round WP larger than 8" dia.

**BUTTON HEAD BOLT** (For post and splice bolts)



**FOOTING ANCHOR**



**INLET MOUNTED POST**



# NOTES

**POSTS** may be round (single rail only) or 6"x8" square-sawed pressure-treated wood or W6x9 galvanized steel. The same type post shall be used throughout the length of project unless otherwise required by the plans or permitted by the Engineer. Round posts shall be 8" plus or minus 1" in diameter at the top and not more than 3" larger at the butt with a uniform taper. Posts may be set in drilled holes or may be driven to grade. Wood posts shall be fabricated with square ends. Posts and spacer blocks shall be pressure-treated as per 710.14. Bolt holes shall be bored and tops of posts trimmed, if required, after posts are set.

**FOR DETAILS** not shown see GR-1.

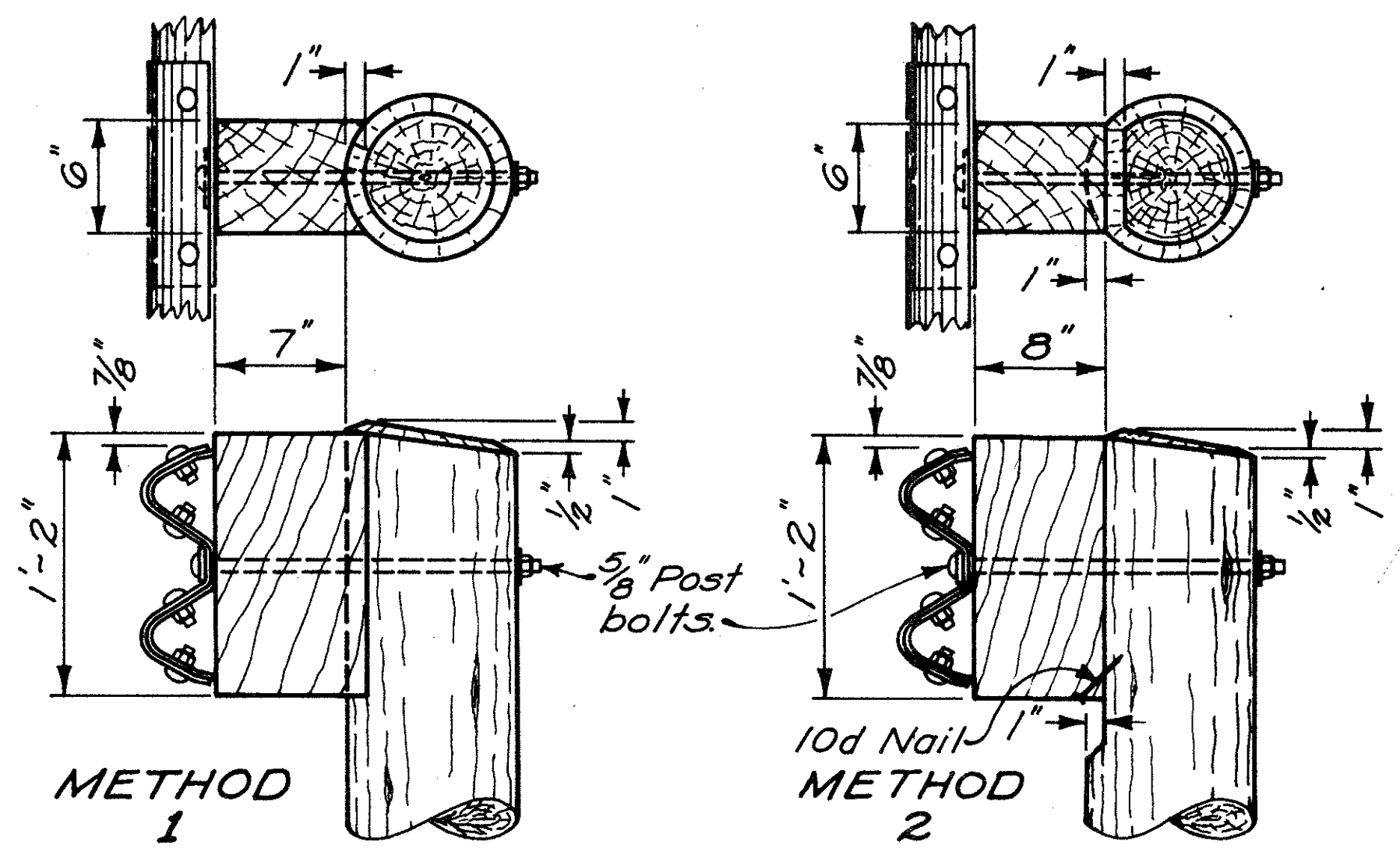
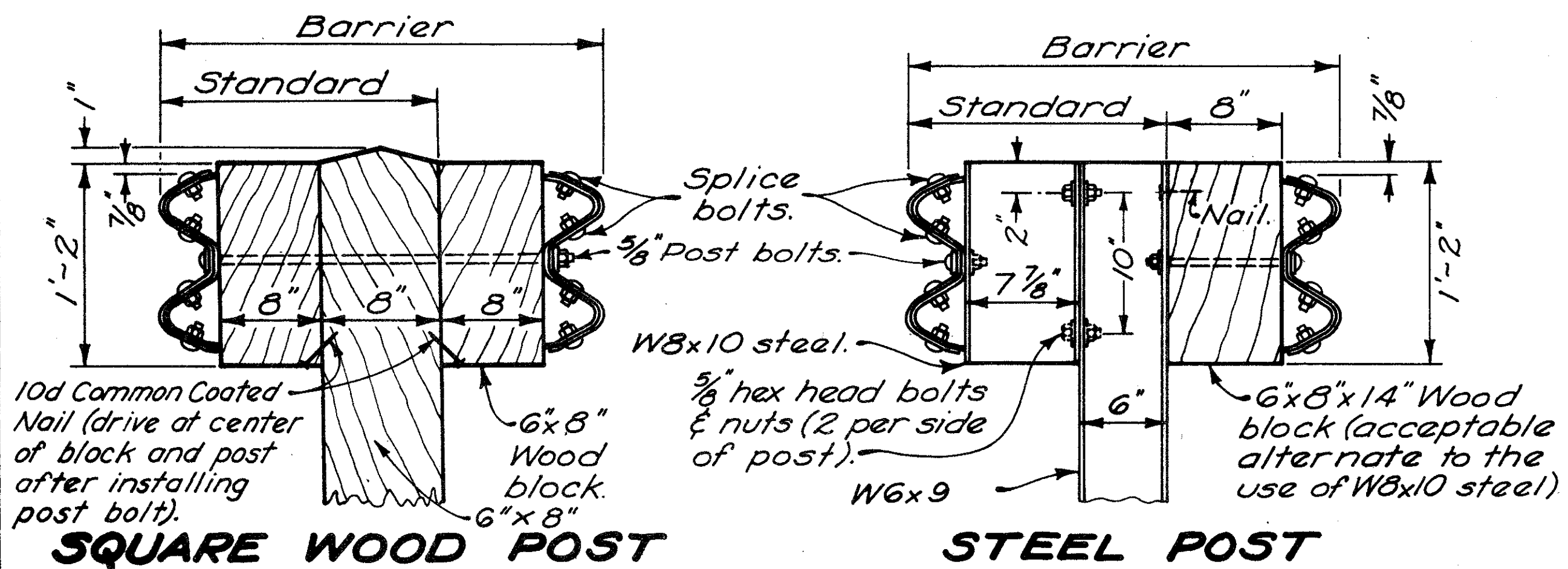
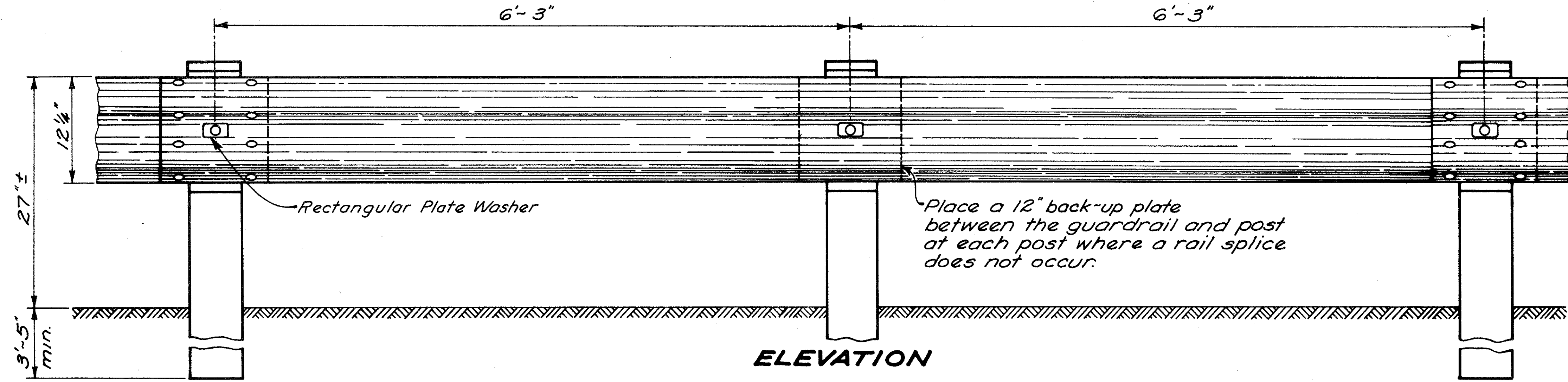
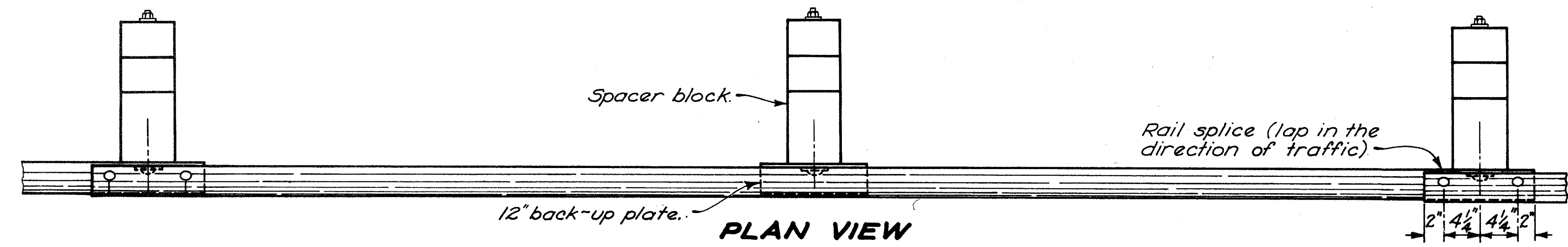
**SPACER BLOCKS:** When wood spacer blocks are used with the steel post, a roofing nail shall be driven through the hole in the adjacent flange to prevent blocks from turning.

**WASHERS:** Place a rectangular plate washer between the face of rail and post bolt head or nut. All other washers indicated are standard galvanized steel of the appropriate size.

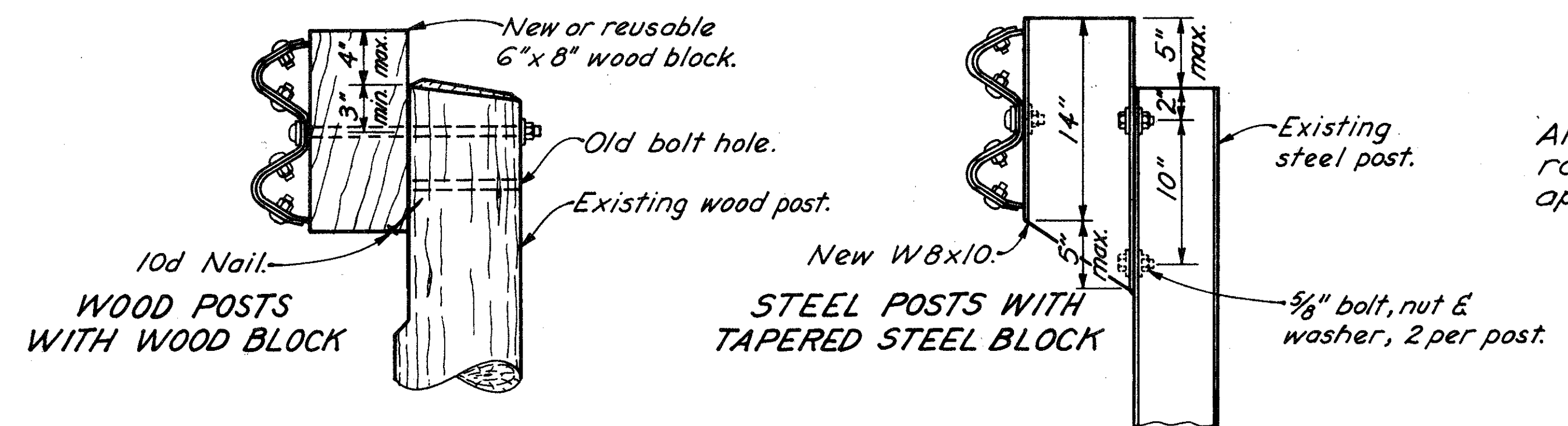
**WELDED BEAM** guardrail posts and spacer blocks may be used for Item 606, Guardrail, provided the web and flange sizes are as shown hereon. Welding of the web to the flanges shall conform to ASTM A769, Class 1 using A36 steel with the following exceptions:

- 7.2 Test reports of tensile properties for each lot shall accompany each shipment.
- 11. Ultrasonic inspection need not be performed on welded beams used for Item 606.
- 12. Beams which have imperfections repaired by welding shall not be accepted for use in Item 606.
- 15. Random samples shall be tested by the Department from materials delivered to the project site or other locations designated by the Laboratory.

STEEL BEAM POSTS & BLOCKS				
Size	Beam depth	Flange width	Flange thickness	Web thickness
Rolled W 6x8.5	5.83"	3.94"	.194"	.170
Rolled W 6x9	5.90"	3.94"	.215"	.170
Rolled W 8x10	7.89"	3.94"	.205"	.170
Welded 6x8.5	6.0"	3.94"	.194"	.170
Welded 6x9	6.0"	3.94"	.215"	.170
Welded 8x10	8.0"	3.94"	.205"	.170



Alternate methods of placing the spacer blocks on the round posts may be submitted for consideration and approval by the Engineer.



## RAISING EXISTING GUARDRAIL HEIGHT

## ROUND WOOD POSTS

**BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION**

**GUARDRAIL  
TYPE 5**

STANDARD CONSTRUCTION DRAWING GR-2B

APPROVED ENGR., L.&D.

DATE

2-15-66

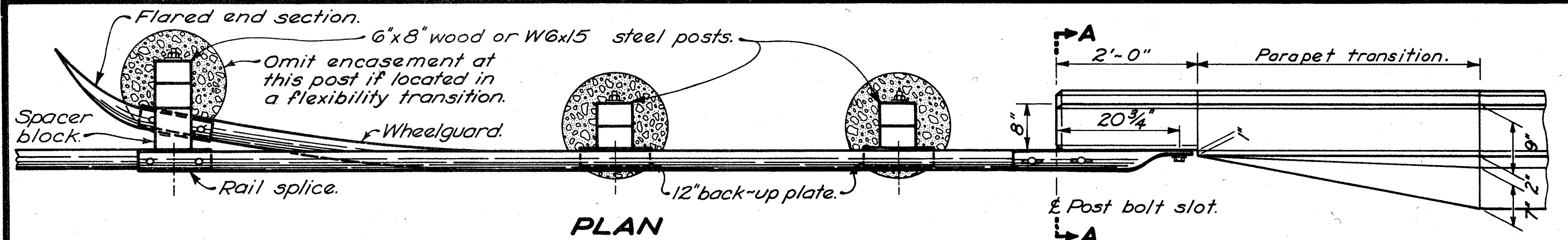
11-1-71

11-9-71

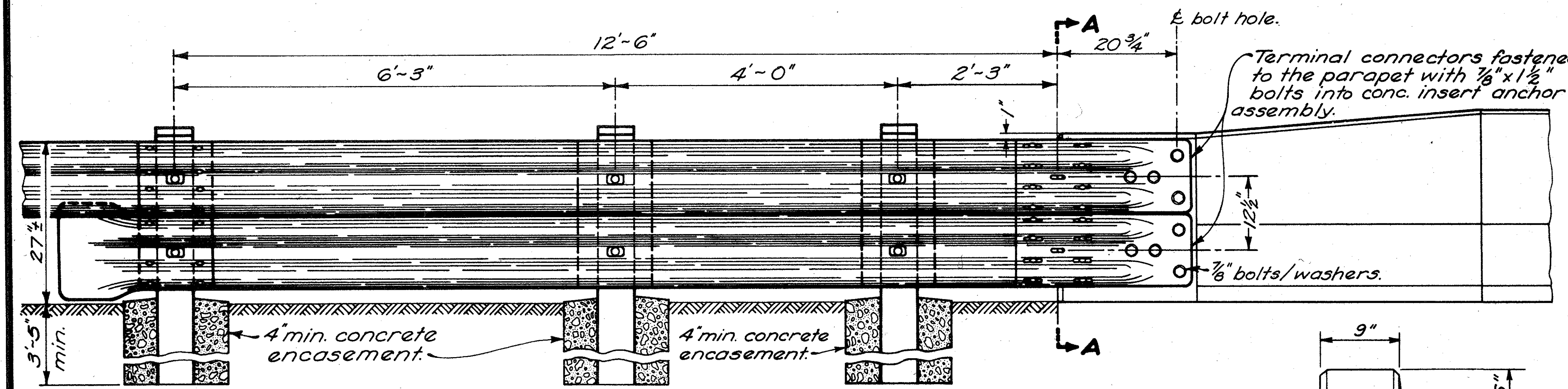
12-6-76

2-5-82

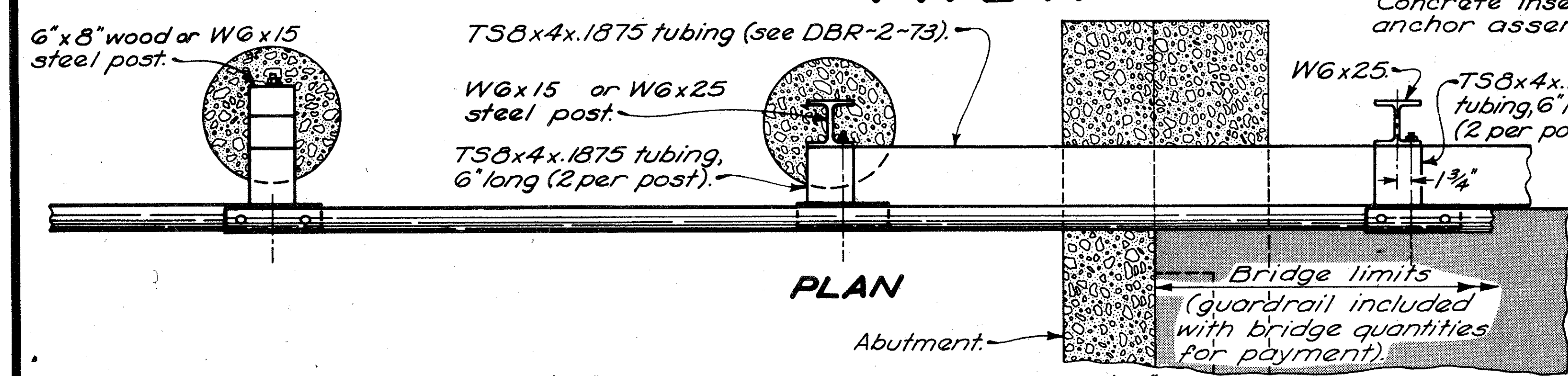




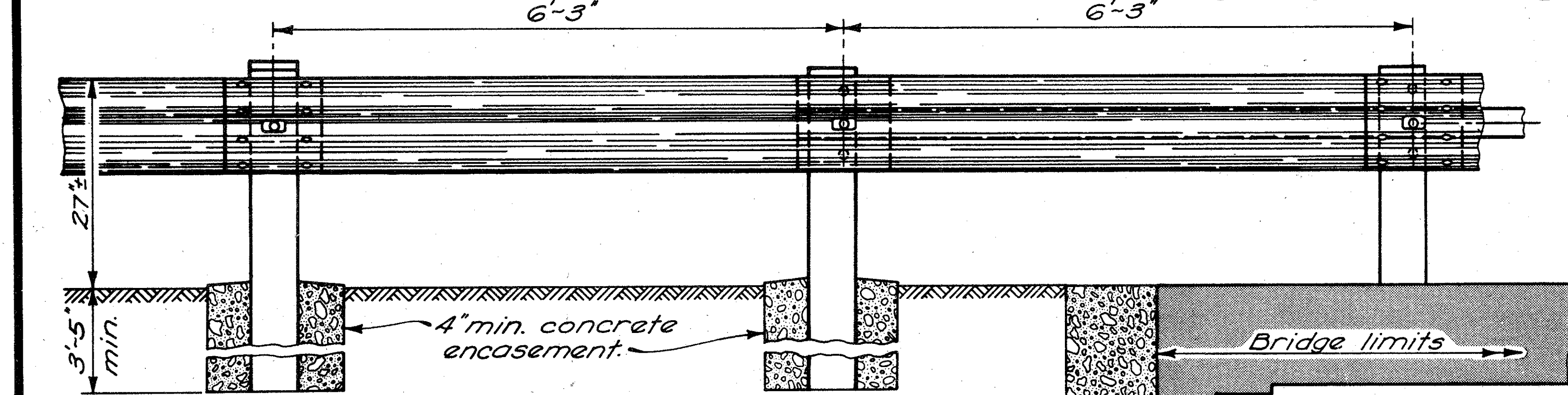
PLAN



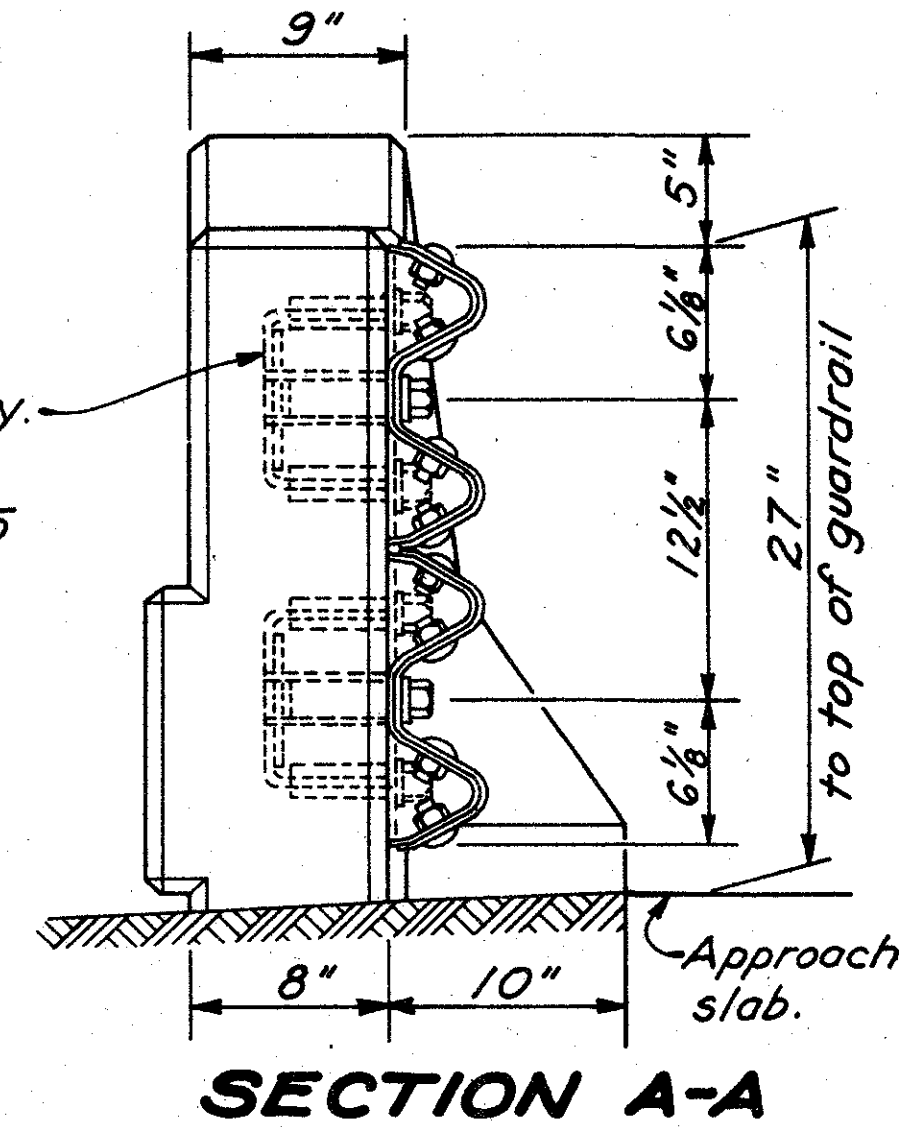
ELEVATION TYPE A



PLAN



ELEVATION TYPE B



SECTION A-A

**NOTES**

**PAYMENT** for item 606, each, Bridge terminal assembly, Type —, shall include the additional cost in excess of normal guardrail cost, such as: additional or heavier posts, concrete encasement, wheelguard, terminal connector, and other hardware, etc.; except, the TS8x4 spacers and tubing outside the bridge limits, and the concrete insert anchor assemblies are included in the bridge rail or parapet cost.

**TYPE A:** The wheelguard shall be required on all uncurbed approach connections and on all uncurbed trailing connections on undivided highways. The wheelguard shall be omitted: on all curbed connections, on uncurbed trailing connections on divided or directional roadways, and all three posts shall have spacer blocks and concrete encasement.

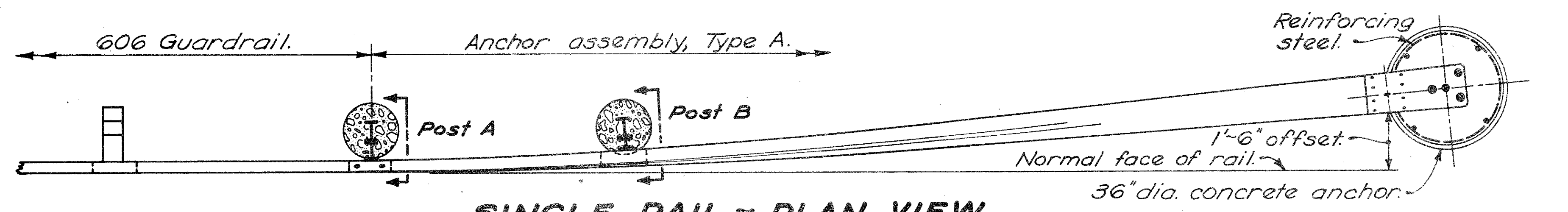
**TERMINAL CONNECTORS** of Type A shall be fastened to existing (safety shape) parapets, not having concrete insert anchor assemblies, with four 7/8" dia hexhead bolts through the parapet with 3" x 3" x 1/2" plate washers and hex nuts on back of parapet.

**POST TYPE** shall be the same material type as used on approach guardrail for Type A and the outermost post of Type B.

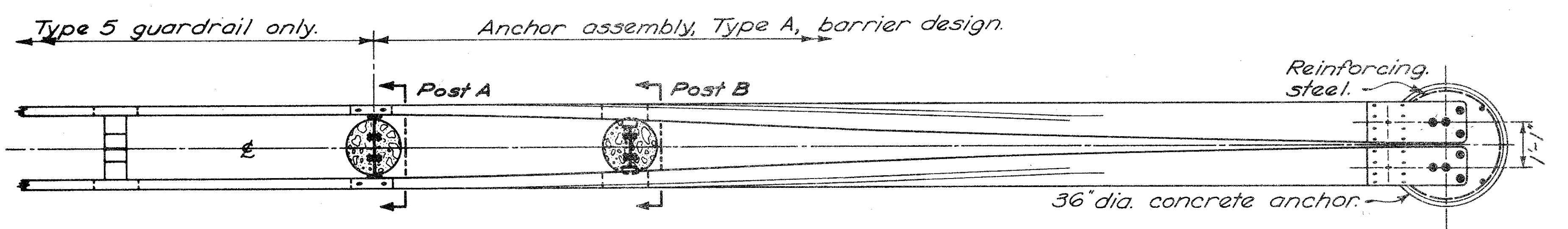
**FOR DETAILS** not shown, see GR-1 and other Standard Construction Drawings pertaining to design of specific guardrail Type.

BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
<b>BRIDGE TERMINAL ASSEMBLIES</b>	
DATE 1-1-71 11-9-71 12-6-76 2-5-82	<b>GR-3</b>
STANDARD CONSTRUCTION DRAWING	
APPROVED _____	ENGR., L.&D.

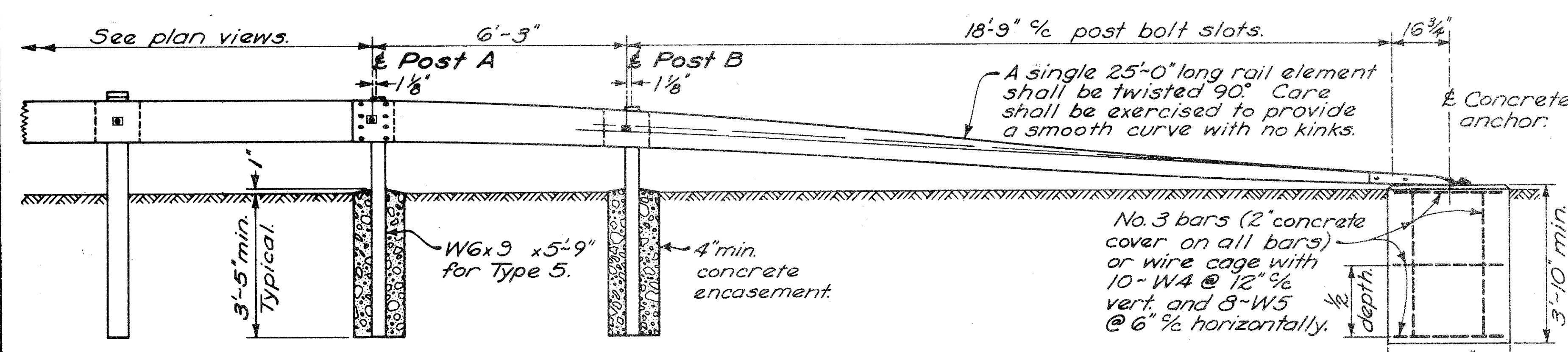




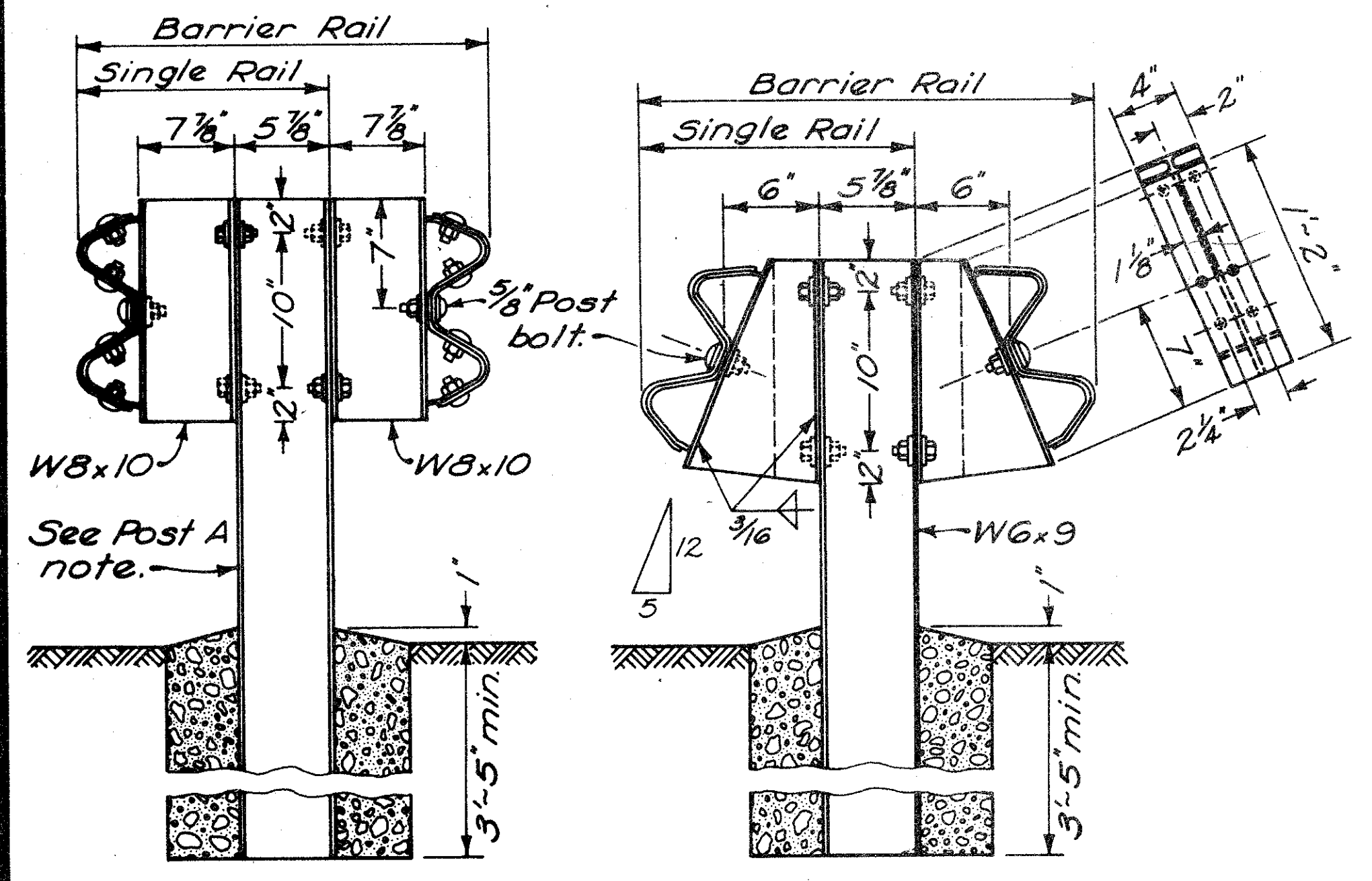
**SINGLE RAIL - PLAN VIEW**



**BARRIER RAIL - PLAN VIEW**

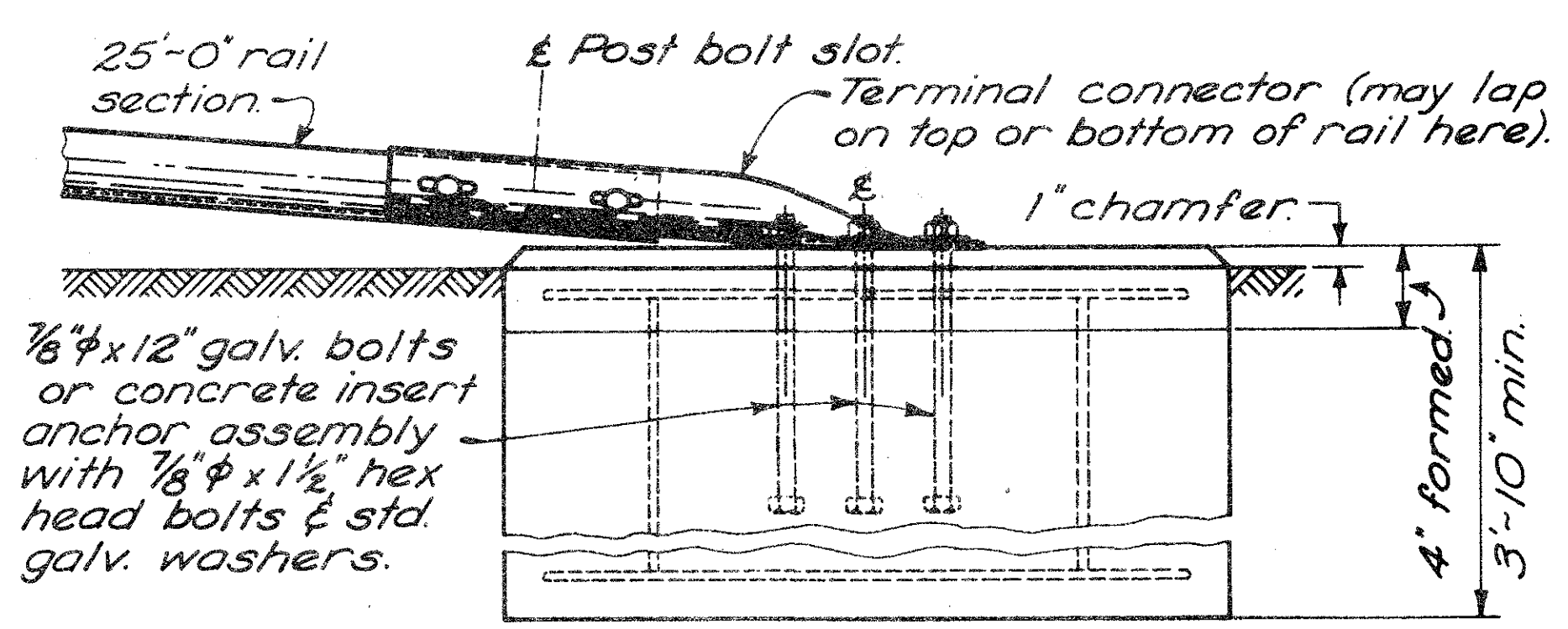


**SINGLE & BARRIER RAIL - ELEVATION VIEW**



**POST A**

**POST B**



**CONCRETE ANCHOR**

**NOTES**

**GENERAL:** For details not shown, see GR-1 and other Standard Construction Drawings pertaining to specific guardrail type. All steel parts shall be galvanized.

**ANCHOR ASSEMBLY TYPE A** can be used at each free end of Type 4, 5 or 7 guardrail or barrier rail. It is primarily an approach end. The 1'-6" flare offset from normal face of rail, shown in the plan view (for single rail installations), will be utilized only where shoulder width is insufficient for providing standard offsets shown on GR-5 and GR-6. Use of the 1'-6" offset will generally be limited to upgrading existing highways for safety or the construction or reconstruction of highways with design traffic less than 1000 ADT or design speeds less than 50 mph.

**SPACERS** for Post B shall be made of 3/16" steel plate 710.15, or two sections of W6x9 or W8x10 cut in the web (see dashed line) and welded together on both sides. All steel spacers and posts may be provided with additional bolt holes so that these items will not be required to be made right and left handed. Spacers shall be fastened to their posts with two 3/8" hexhead bolts and nuts with standard washers on both sides.

**POST BOLT WASHERS:** Place a rectangular plate washer between the face of rail and post bolt head. All other washers indicated on this drawing are standard galvanized steel of the appropriate size.

**CONCRETE ANCHOR:** Form top 4" of anchor and slope the top to conform to slope of the adjacent ground. The 36" diameter anchor may be replaced by a 2'-6" square anchor at the contractor's option.

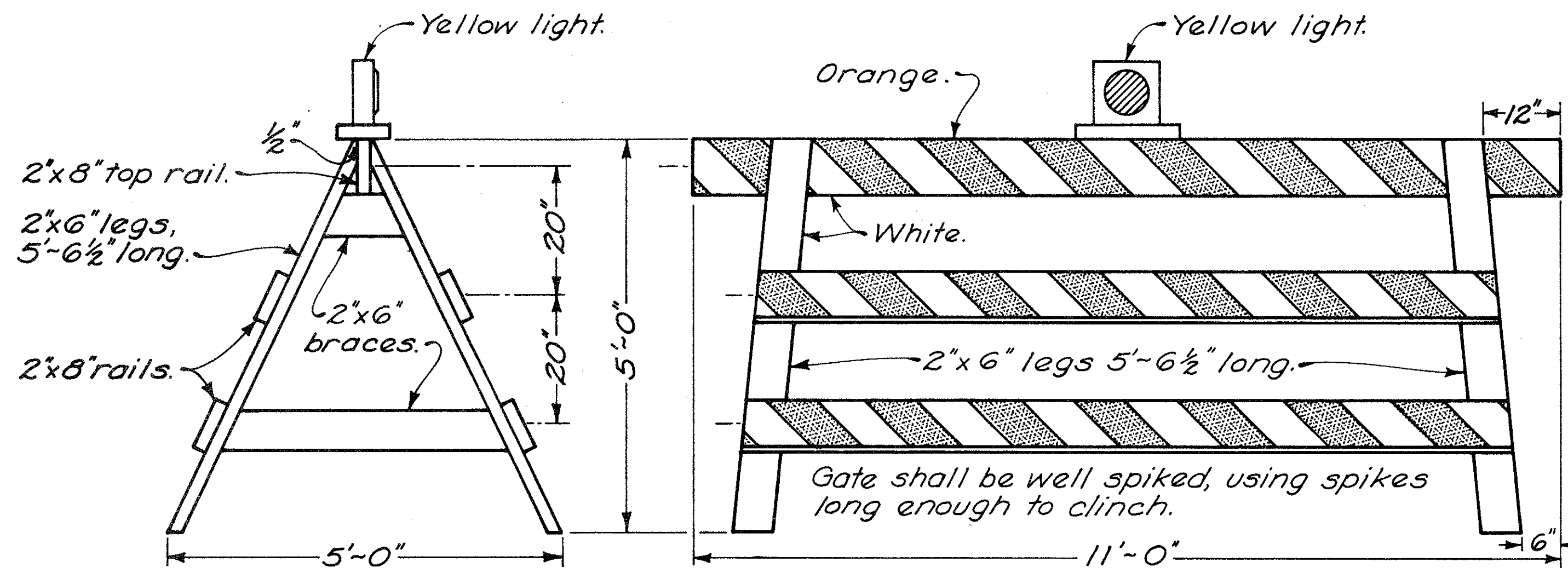
**POST A:** Rail details are shown for Type 5 guardrail. Where anchor assembly is attached to Type 4 or 7 guardrail, Post A shall be a standard Type 4 or 7 line post set in concrete, and the spacer block shall be omitted. Post bolt shall be 3/8" φ.

BUREAU OF LOCATION AND DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
<b>TYPE A ANCHOR ASSEMBLY</b>	
STANDARD CONSTRUCTION DRAWING	<b>GR-4</b>
APPROVED _____	ENGR. L.&D.

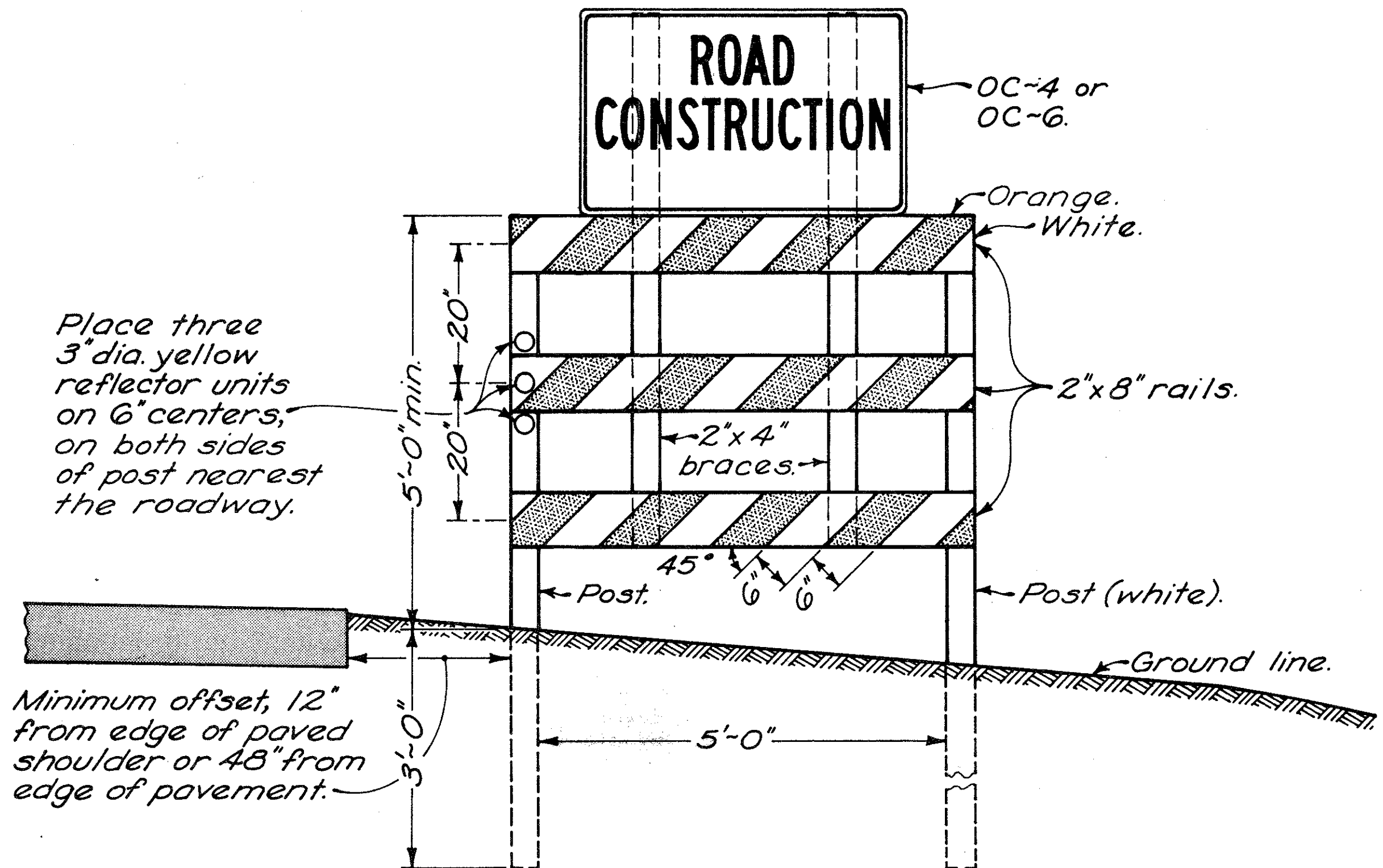
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 1-1-71  
 11-9-71  
 12-6-76  
 2-5-82



# MOVABLE GATE



**ROAD  
CONSTRUCTION**



# WING BARRICADE

# NOTES

**BARRICADES** shall be constructed according to details shown. Where traffic is maintained during construction, wing barricades shall be used on each shoulder: (1) at both ends of the project, (2) on all interchange entrance ramps or on the cross road preceding the entrance ramp, (3) on all other major approach roads as directed by the Engineer. When the road is closed to traffic, barricades and gates shall be used to effectively close the entire roadway including the median of divided highways. In urban areas and at locations where it is impracticable to extend the barricade to the right-of-way line because of a sidewalk or other obstruction, the ends of the barricade shall be located as directed by the Engineer to effect the desired closing of the highway.

**PAINTING AND REFLECTORIZATION:** All rails of the barricades and gates shall be reflectorized with orange and white reflectorized sheeting in 6" wide alternate stripes which slope downward toward the center line of the road at an angle of 45%. All three rails of the Road Closed barricade shall be striped on the side facing traffic. All three rails of the wing barricade and all gate rails shall be striped on both sides. All posts, braces, gate legs and any unstriped rails shall be painted white.

**GATES:** One gate shall be erected for each traffic lane. Gates shall be chained and padlocked to one another and to adjacent posts of the barricades. Chains shall be 1/4" stock or larger with welded links.

A hinged gate may be used and shall be an approved 12' by 4' steel frame farm type, or a type approved by the Engineer. The gate shall be hung on hinge screw hooks, or as otherwise approved. Striping similar to that used on the movable gate shall be accomplished with 1"x8" lumber or with metal strips fastened to the gate. The gate shall be supported at the center in an approved manner.

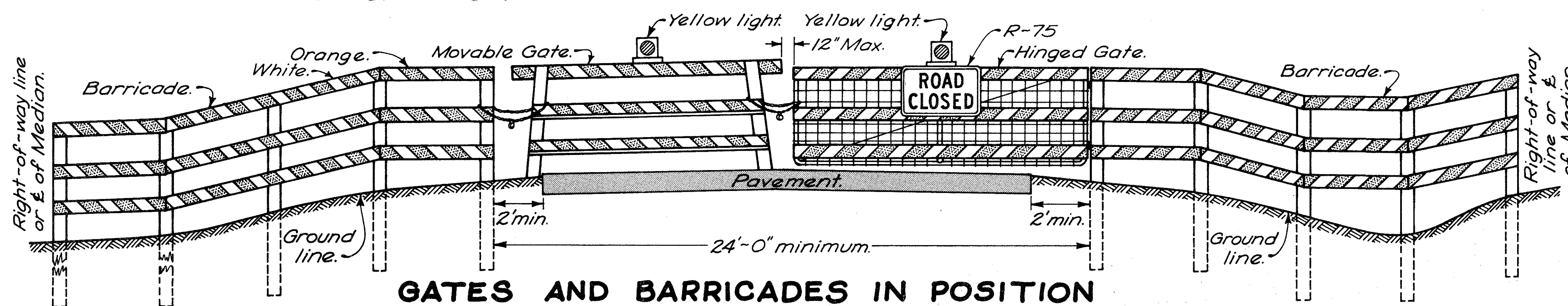
**YELLOW LIGHT:** Each gate shall be equipped with a steady burning yellow light, conspicuously visible at all distances up to 1000' under normal atmospheric conditions. The light, operated by battery, electric generator, commercial power or propane gas, shall be in operation at all times between sunset and sunrise during the period the highway is closed.

**SIGNS:** Where the road is closed to traffic by the erection of gates and barricades, a **ROAD CLOSED** sign (R-75) shall be mounted on the gate as shown. On three-lane pavement, the sign shall be mounted on the middle gate facing traffic.

Where traffic is maintained, a **ROAD CONSTRUCTION TRAFFIC MAINTAINED** sign (OC-4) shall be used on the right shoulder wing barricade on the approaches to major construction or maintenance jobs less than 2 miles in length. A **ROAD CONSTRUCTION NEXT MILES** sign (OC-6) shall be used on the right shoulder wing barricade on the approaches to any major construction or maintenance job of 2 miles or more in length. An **END CONSTRUCTION** sign (OC-8) shall be erected above the right hand wing barricade facing traffic leaving the construction section. The signs on the wing barricades shall be erected above the top rail of the wing barricade on braces, as detailed hereon.

**LUMBER** used in the construction of the gates and barricades shall be No. 1 common yellow pine or No. 1 common Douglas fir, surfaced on four sides standard, or other materials approved by the Engineer. All sizes are nominal.

**POSTS** shall be sound 4"x4" sawed or 4 1/2" round. Rails of the barricade shall be bolted to the posts with 5/8" bolts.

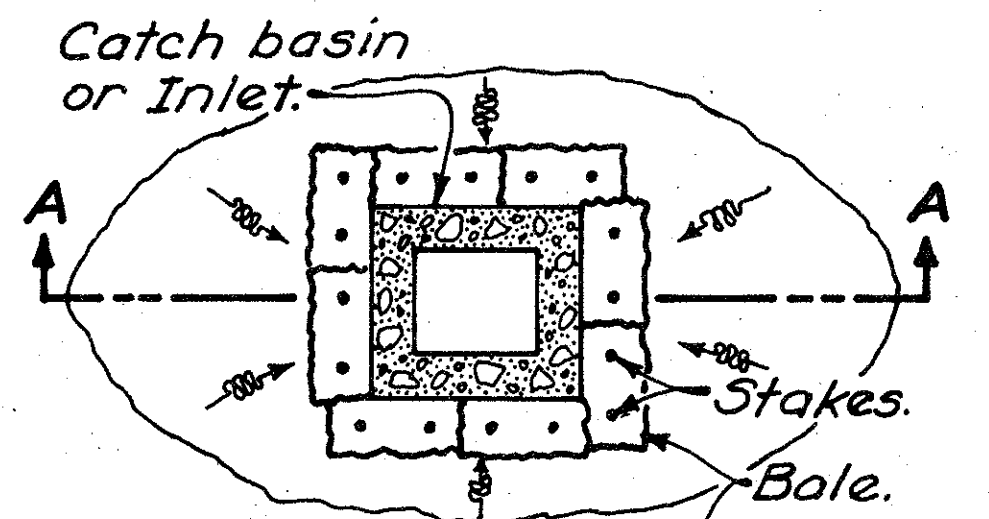


# GATES AND BARRICADES IN POSITION

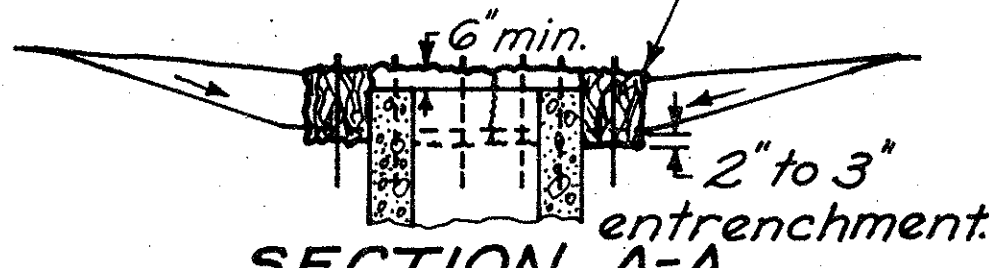
BUREAU OF ROADWAY DESIGN OHIO DEPARTMENT OF TRANSPORTATION	
<b>BARRICADES AND GATES</b>	
STANDARD CONSTRUCTION DRAWING	
<b>MC-3</b>	
APPROVED <i>[Signature]</i> ENGR., R. D.	
DATE	6-1-65
	5-1-66
	11-1-68
	6-20-69
	6-1-73



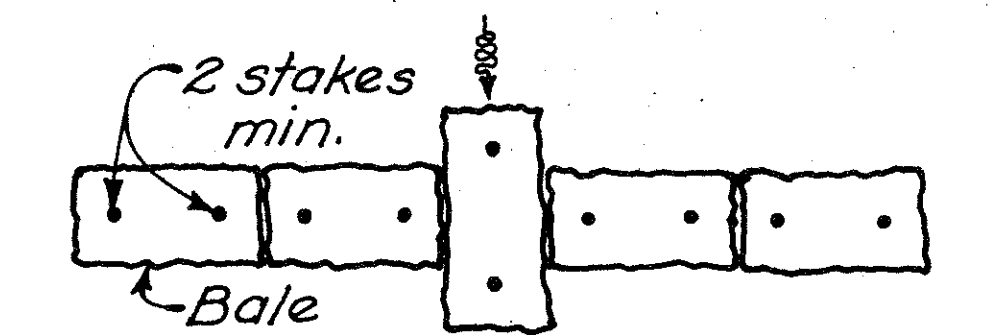
## STRAW OR HAY BALES



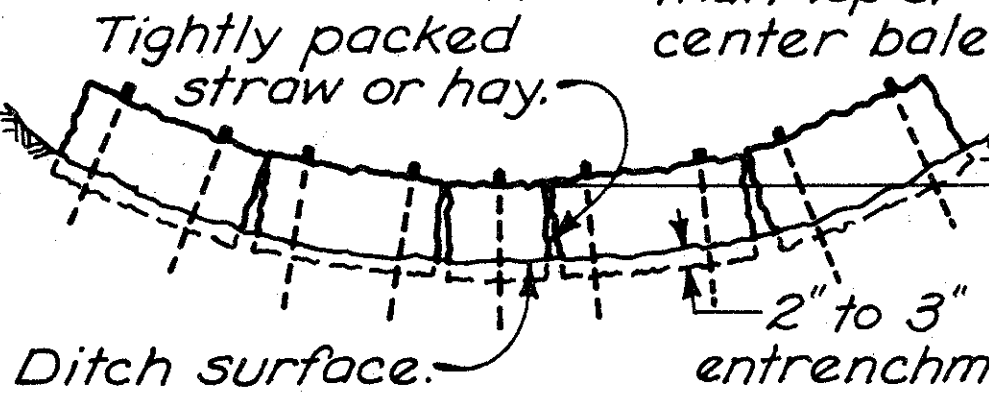
PLAN



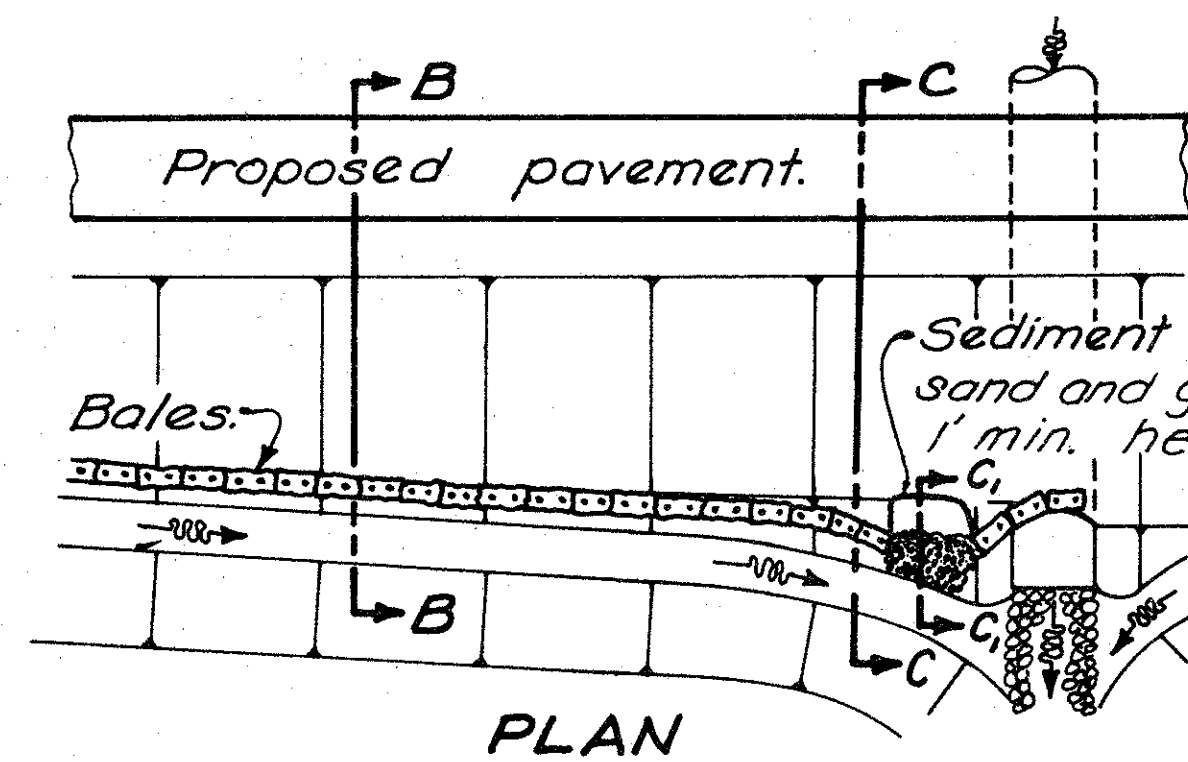
SECTION A-A  
BALE INLET FILTER



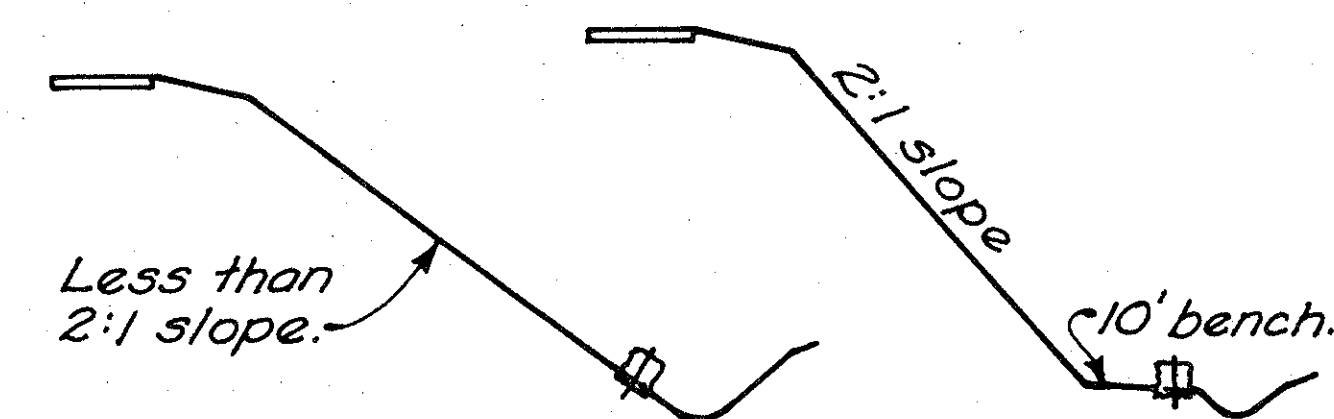
PLAN



ELEVATION  
BALE DITCH CHECK



PLAN



SECTION B-B SECTION C-C  
BALE FILTER DIKE

**BALE PLACEMENT:** Bales shall be tightly placed, adjacently, and entrenched 2" to 3" before staking; or a small amount of loose soil shall be lightly compacted along the upstream edge of the bales.

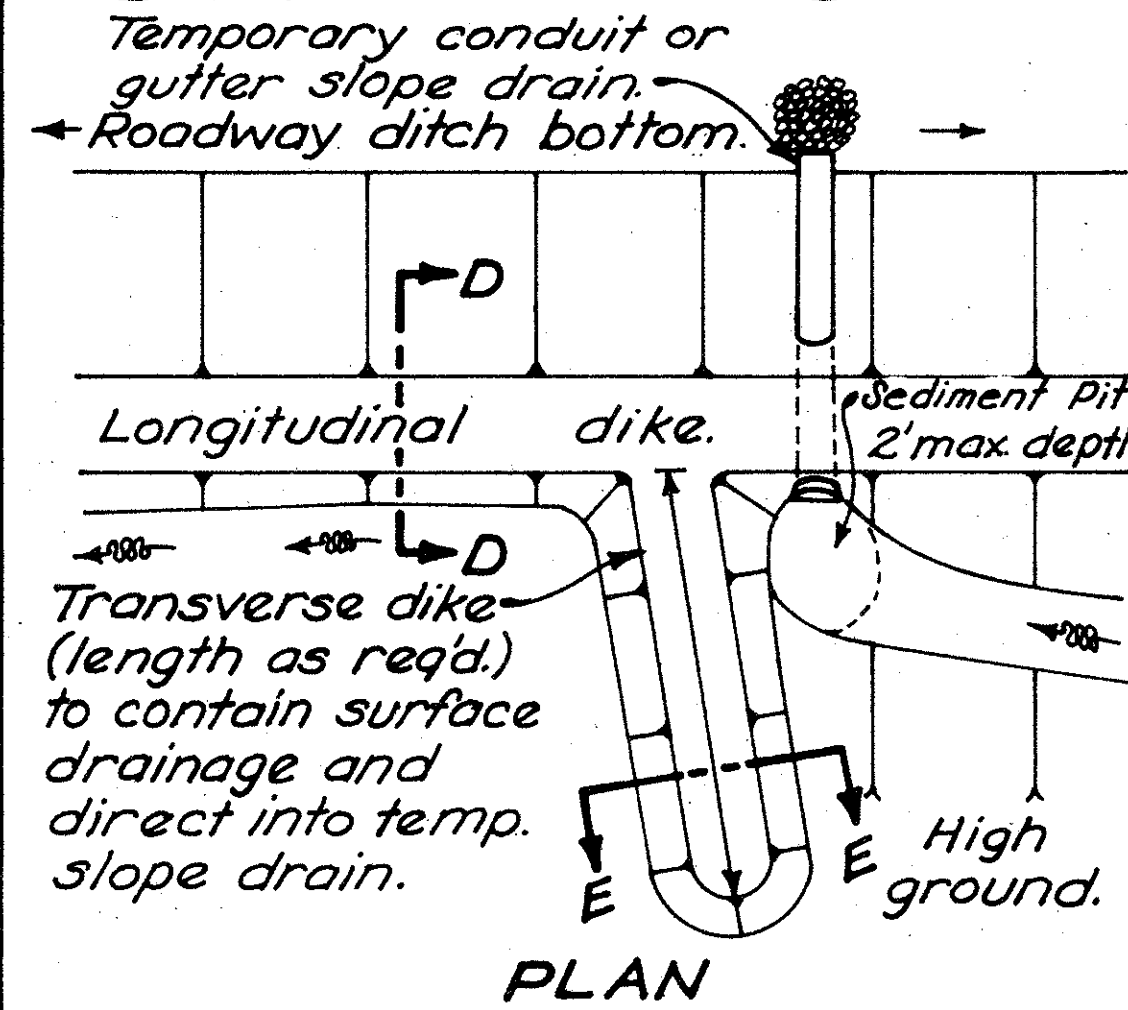
Each bale shall be firmly staked with a minimum of 2 stakes at least 3' in length. Stakes shall be wooden 2"x2", reinforcing bars or fence posts, as approved by the engineer.

Loose straw or hay shall be scattered for a distance of 10' on the upstream side of each ditch check, and shall be wedged between and under staked bales.

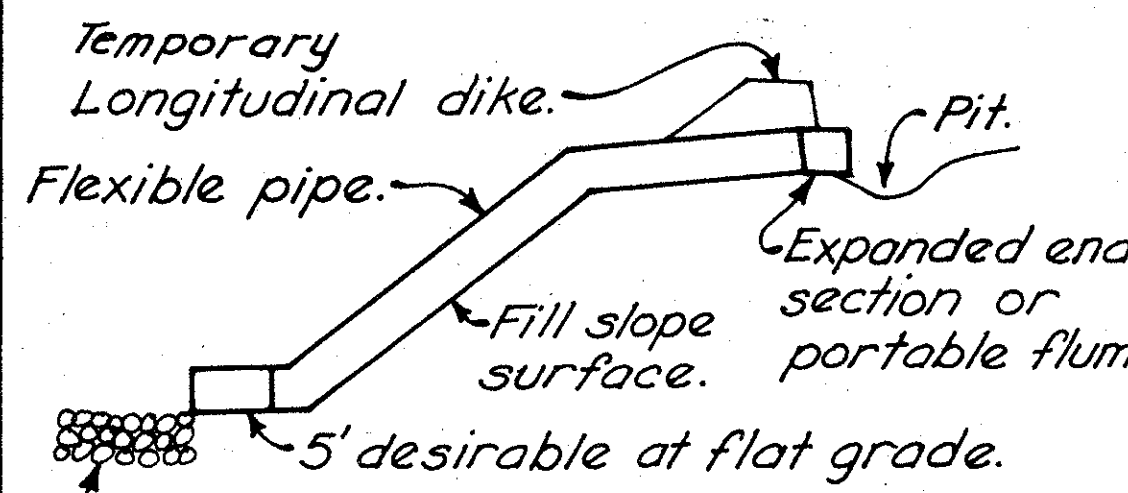
**SEDIMENT PITS** shall be provided where directed by the Engineer and their cost included in the price bid for adjacent 207 Items.

**BASIS OF PAYMENT:** Straw or hay bale installation shall be paid for under Item 207, Each, Straw or hay bales. Cost will include placing, staking, maintaining and removing.

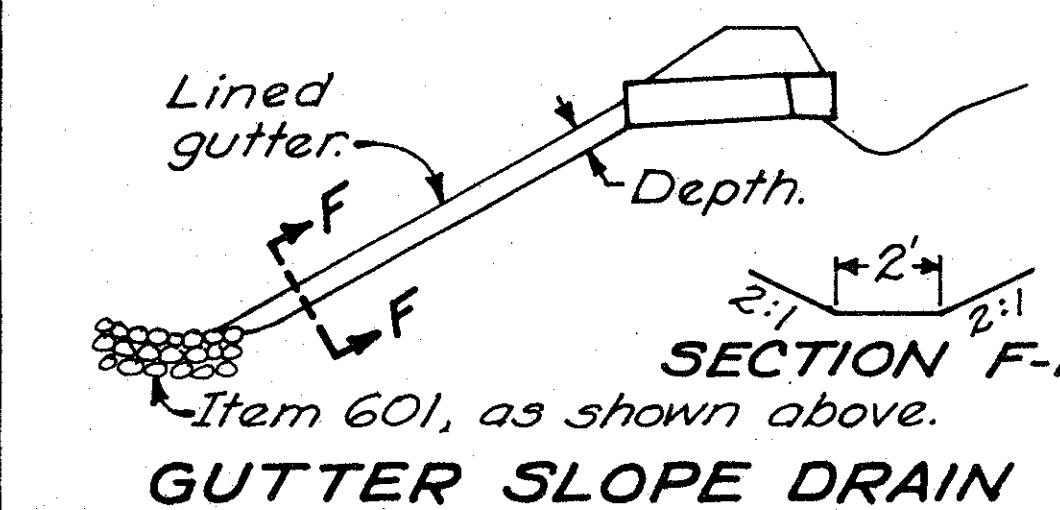
## DIKES AND SLOPE PROTECTION



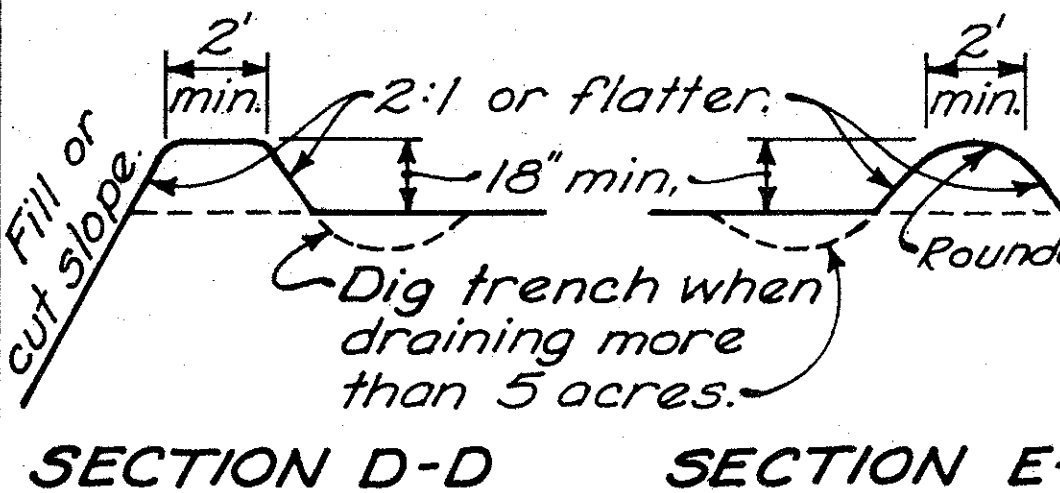
PLAN



CONDUIT SLOPE DRAIN



GUTTER SLOPE DRAIN



SECTION D-D SECTION E-E

**GENERAL:** Dikes & drains shown shall be used when earthwork operations on slopes higher than 8' are suspended for three weeks or more and/or as directed by the Engineer. Smaller dikes used at the end of a day's operation shall be considered as part of the earthwork.

Temporary slope drains shall be suitably positioned and anchored to prevent movement or undermining, as directed by the Engineer.

**LONGITUDINAL DIKES** shall be constructed of suitable 203 material and compacted to 85% maximum density.

**CONDUITS** for slope drains shall be corrugated steel pipe, corrugated or smooth plastic pipe, rubber conduit, or an approved equal.

**GUTTERS** for slope drains shall be lined with Type C rock channel protection, crushed aggregate slope protection, portland cement concrete, bituminous concrete, plastic sheeting (on slopes 4:1 max.), partial pipe section or approved equal.

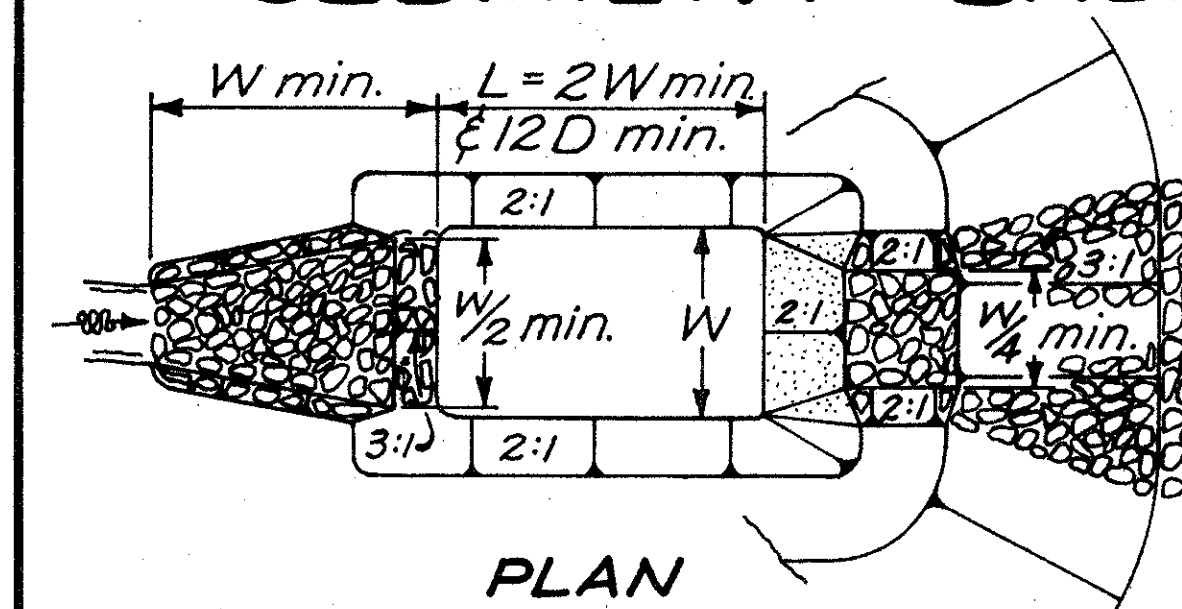
**SEDIMENT PITS** shall be provided where directed by the Engineer and their cost included in the price bid for adjacent 207 Items.

**BASIS OF PAYMENT:** Temporary dikes shall be paid for under Item 207, Cubic Yard, Temporary benches, dikes, dams and sediment basins. Temporary slope drains shall be paid for under Item 207, Linear foot, Temporary slope drains. Rock required shall be paid for under Item 601, Rock channel protection, Type C, w/o bedding.

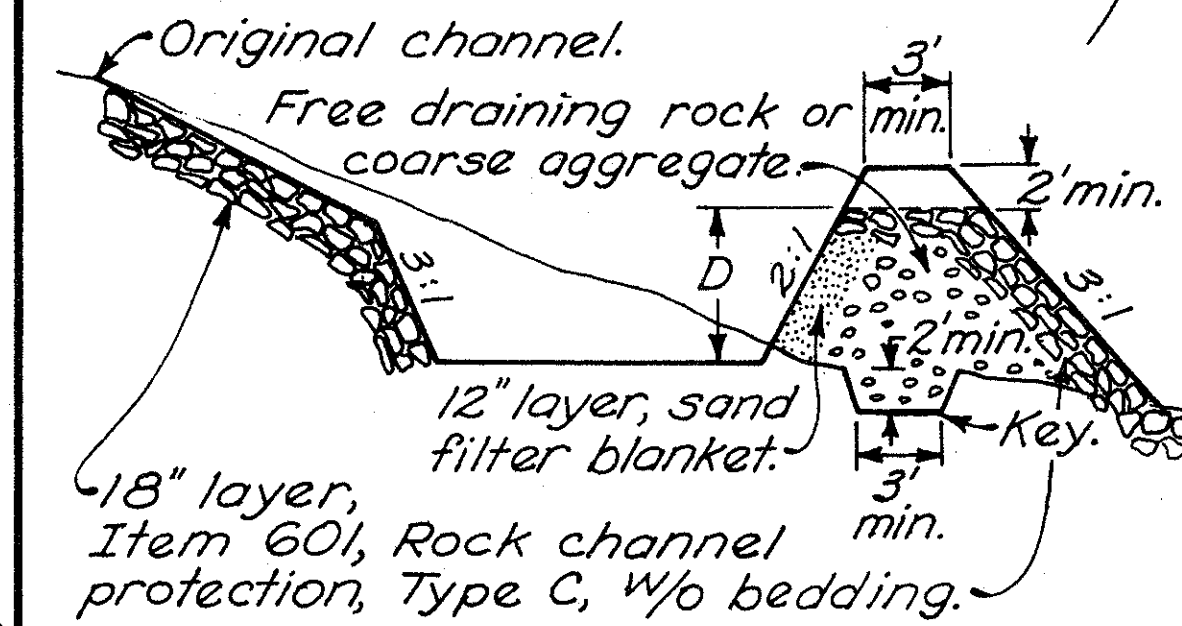
TEMPORARY SLOPE DRAINS RECOMMENDED SIZES				
Area in acres	Pipe Sizes			Gutter depth
	Smooth	Corrugated	Half-round	
0-4	6"	6"	18"	8"
4-8	8"	12"	18"	8"
8-12	10"	15"	21"	12"

Not to scale.

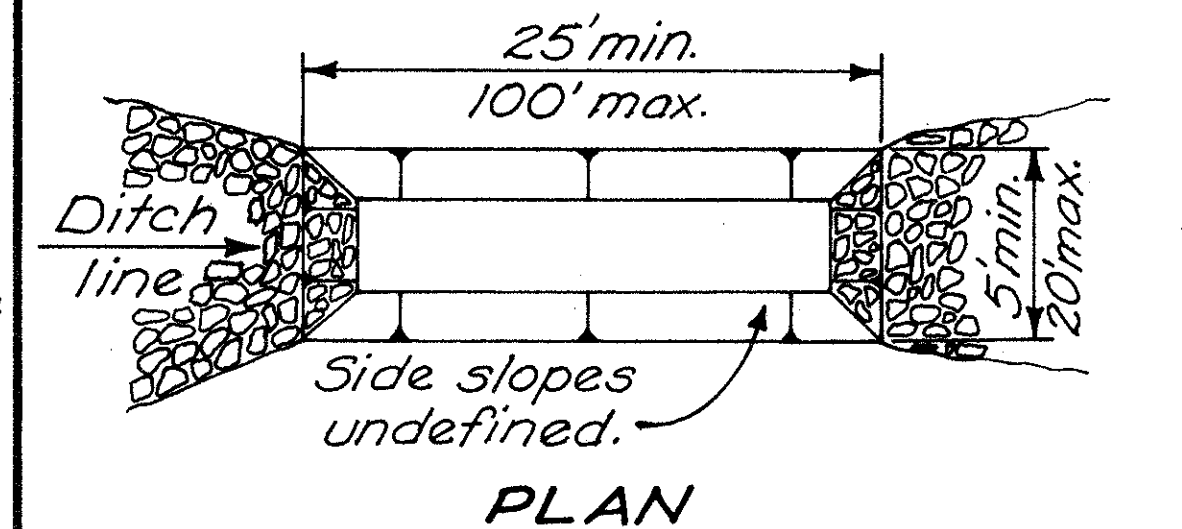
## SEDIMENT BASINS & DAMS



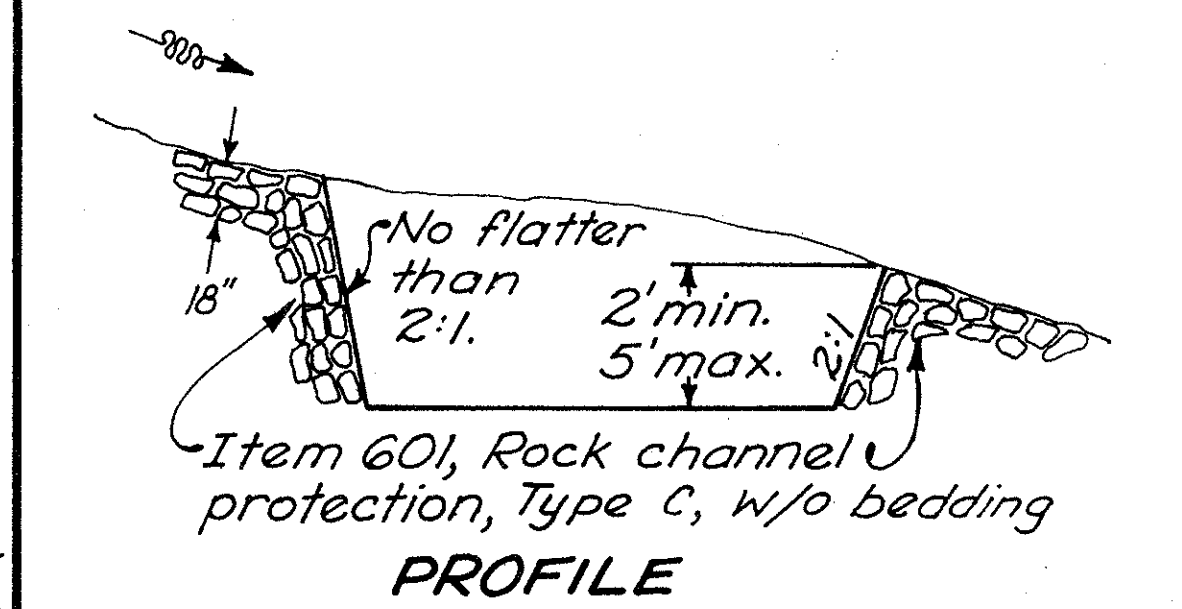
PLAN



PROFILE  
SEDIMENT DAM



PLAN



PROFILE  
SEDIMENT BASIN

**EMBANKMENT** for sediment basin construction shall be as per 203 compacted as directed by the Engineer.

**MAINTENANCE:** Sediment pits, dams and basins shall be acceptably maintained. Deposited sediment shall be removed when the initial volume has been reduced one-half. The sand filter blanket on sediment basins shall be replaced when deposited sediment is removed. The cost of maintenance shall be covered by Item 207.

**FILTERS:** Plastic filter fabric, as approved by the engineer, may be substituted for the sand filter blanket on sediment dams. Such fabrics may be cleaned in lieu of replacement, when approved by the Engineer.

**SIZE:** A series of smaller basins or dams may be substituted for a larger basin or dam when approved by the Engineer.

**BASIS OF PAYMENT:** Sediment Dams and Basins shall be paid for under Item 207 Cubic Yard Temporary benches, dikes, dams and sediment basins. Rock required shall be paid for under Item 601, Cubic Yard, Rock channel protection, Type C, w/o bedding.

BUREAU OF LOCATION AND DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION

TEMPORARY  
EROSION CONTROL

STANDARD  
CONSTRUCTION  
DRAWING  
APPROVED *R. J. Cunningham* ENGR., L. & D.

DATE  
8-1-78

MC-11

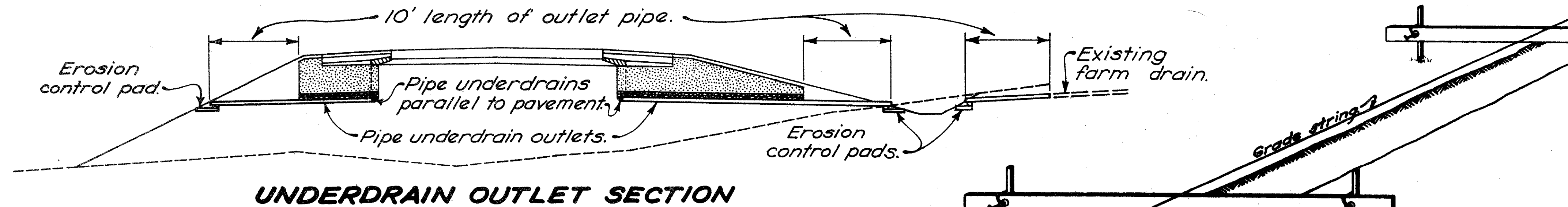
Not to scale.

Not to scale.

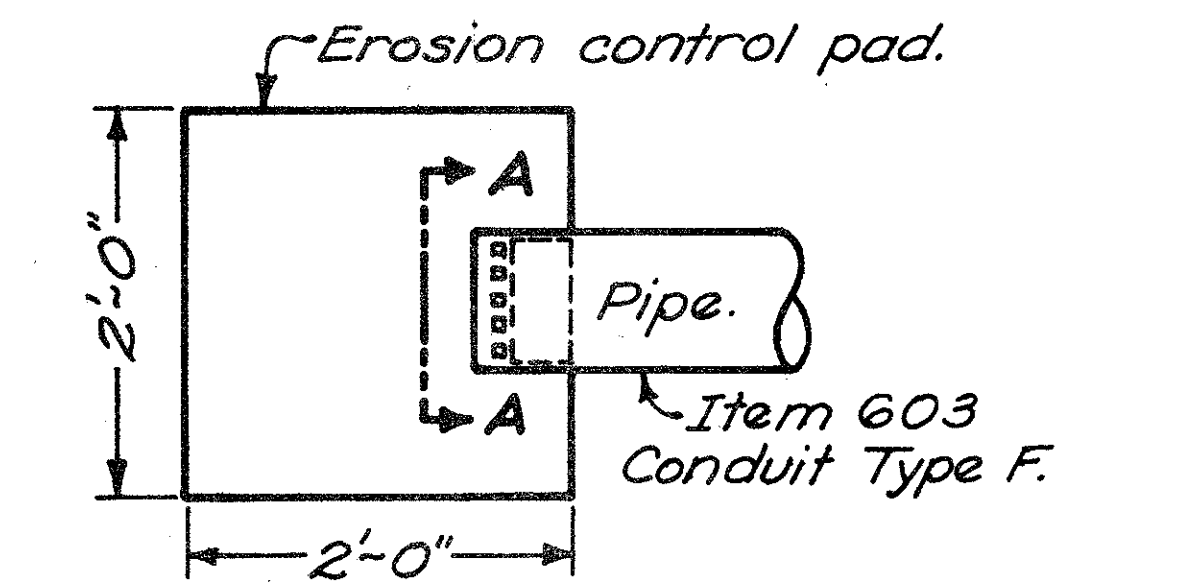


# CONSTRUCTION METHODS

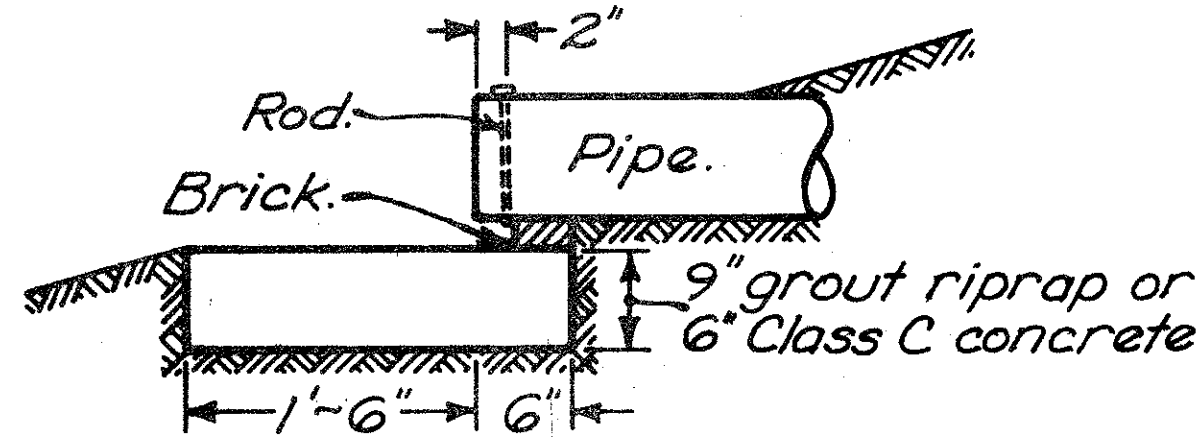
## NOTES



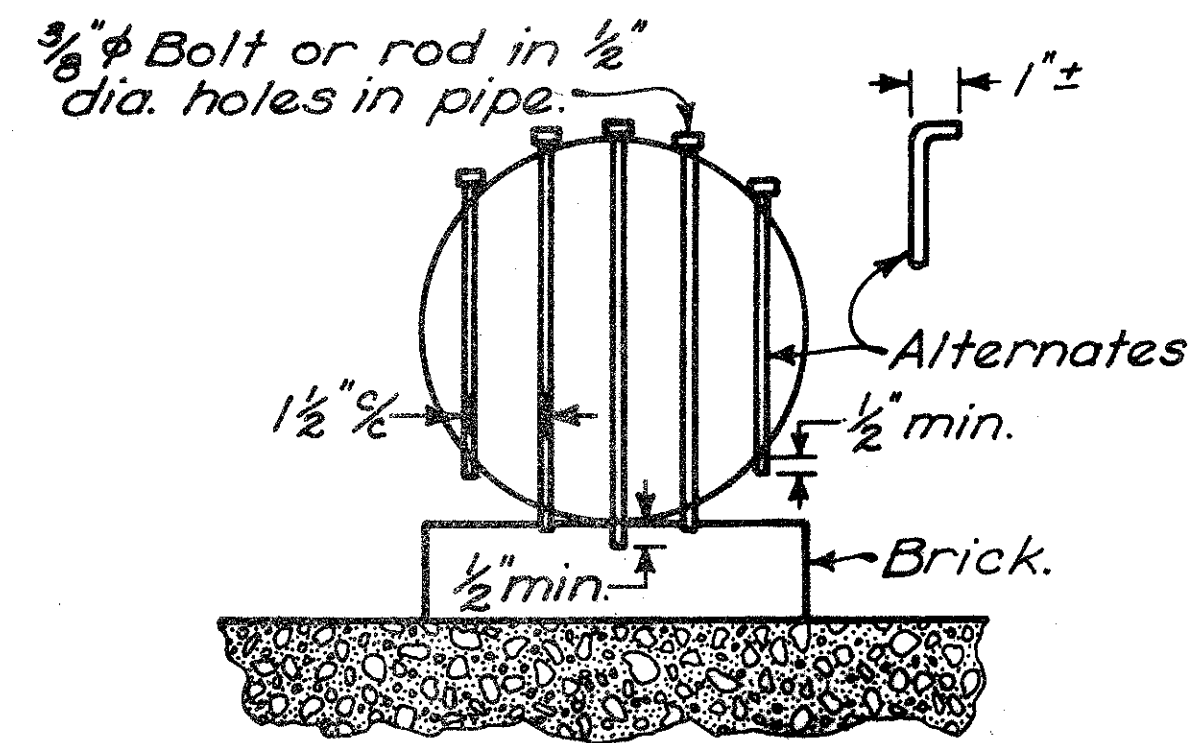
**UNDERDRAIN OUTLET SECTION**



**PLAN**



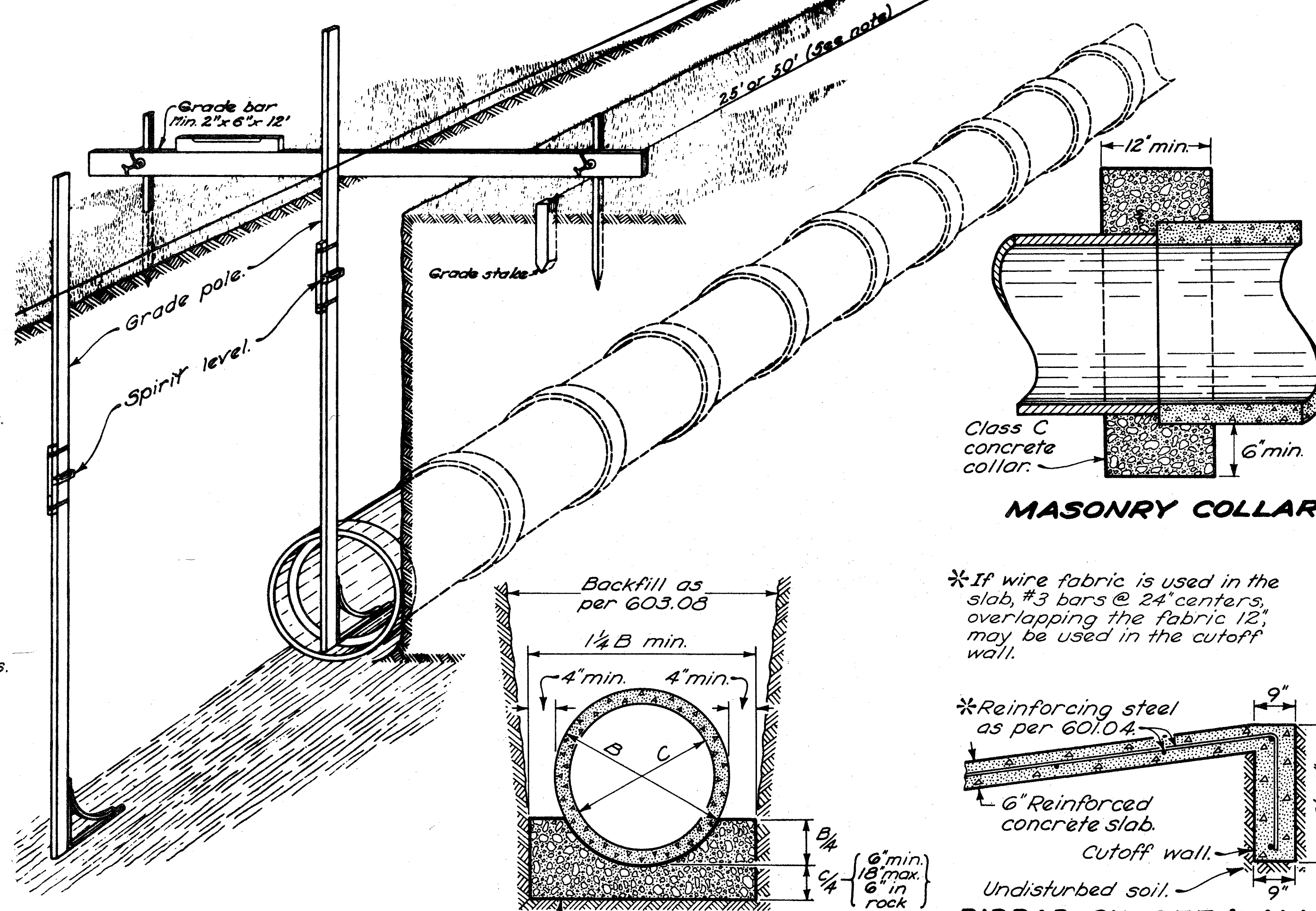
**PROFILE**



**SECTION A-A**

Conduit Size	4"	6"	8"	10"	12"	15"	18"
No. of Bolts	2	3	5	6	7	9	11

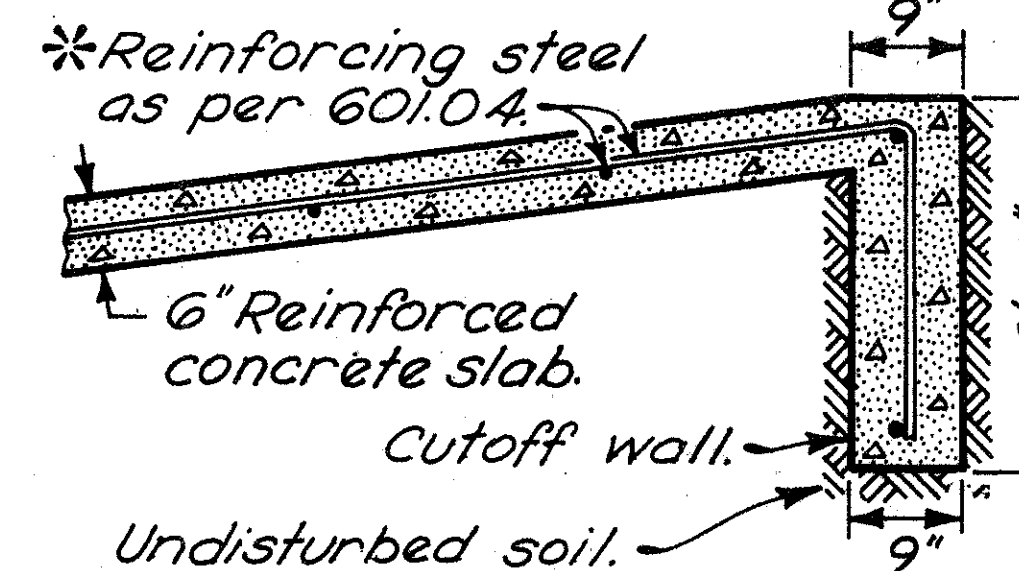
**ANIMAL GUARD AND EROSION CONTROL PAD FOR OUTLET PIPE**



**LAYING PIPE**

**CONCRETE CRADLE CLASS A BEDDING**

\*If wire fabric is used in the slab, #3 bars @ 24" centers, overlapping the fabric 12", may be used in the cutoff wall.



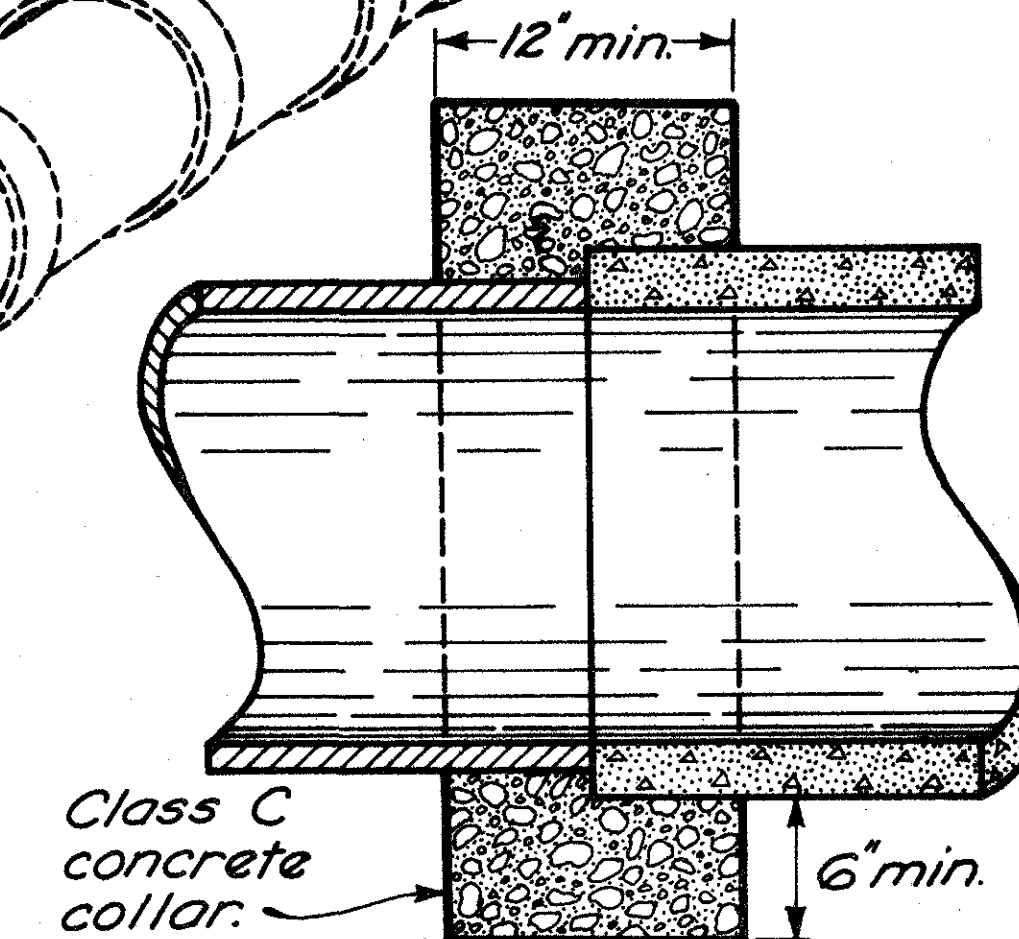
**RIPRAP CUTOFF WALL**  
Cutoff wall shall be included in the price bid for Item 601 Riprap-6" Reinforced Concrete Slab.

**GRADE STAKES** shall be set at the following intervals:  
For grades less than 0.70% - 25 ft.  
For grades of 0.70% and over - 50 ft.

**GRADE POLE** shall be a straight pole dressed with corners rounded, size depending on length but approximately 1" x 2". The pole shall be equipped with a metal bracket on the bottom with a projecting length of 12". Notches shall be cut on the pole for the depth of the flowline below the grade string and for the depth of trench. A spirit level shall be used on the pole to determine when the pole is vertical.

**ALTERNATE METHODS:** The Engineer may approve other methods of determining alignment and gradient of pipe lines if the Contractor can demonstrate that the same degree of accuracy can be obtained as can be obtained by use of the method shown on this drawing.

**MASONRY COLLARS:** Where plans require that a pipe extension be joined to the end of an existing pipe with a butt joint, a collar shall be provided and the cost shall be included in the price bid for new conduit.



**MASONRY COLLAR**

**EROSION CONTROL PADS AND ANIMAL GUARDS** shall be provided at the outlet end of all pipe underdrains and farm drains except when they outlet into a drainage structure.  
The steel bolts or rods for the animal guard shall be galvanized per 710.10. In lieu of drilling or punching the 1/2" diameter holes into the pipe, a metal collar meeting all of the above requirements, may be clamped on the end of the pipe, if approved by the Engineer.  
Payment for the erosion control pads and the animal guards shall be included in the price bid for Item 603 - "Conduit, Type F."

BUREAU OF ROADWAY DESIGN  
OHIO DEPARTMENT OF TRANSPORTATION

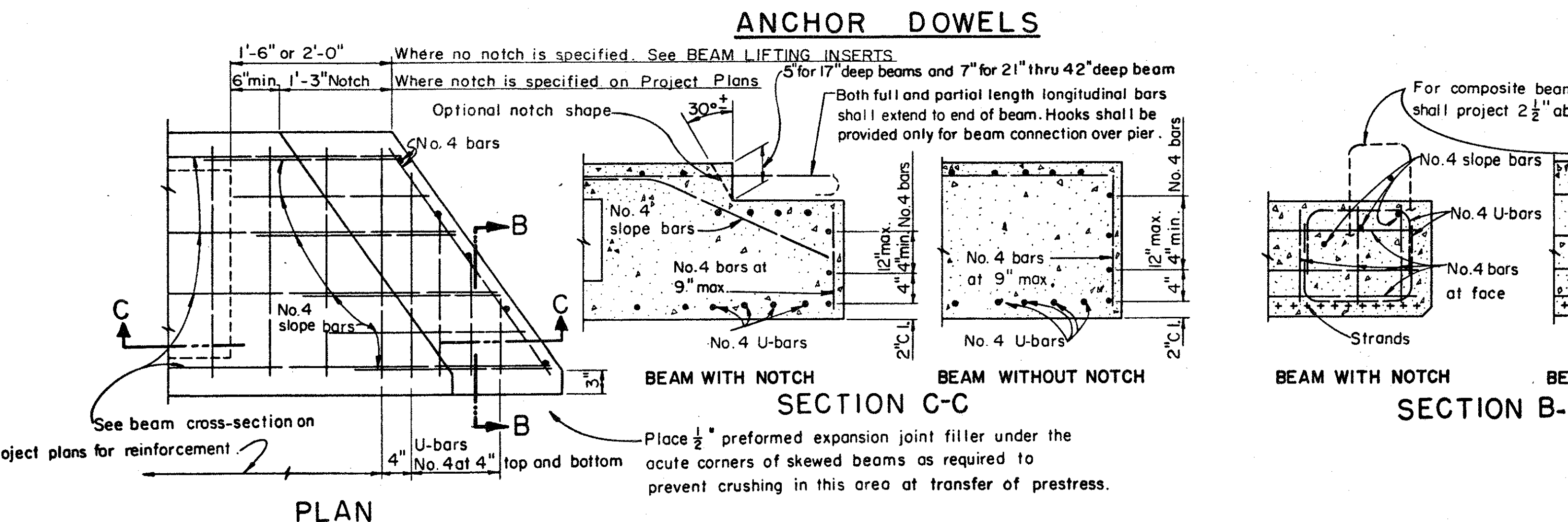
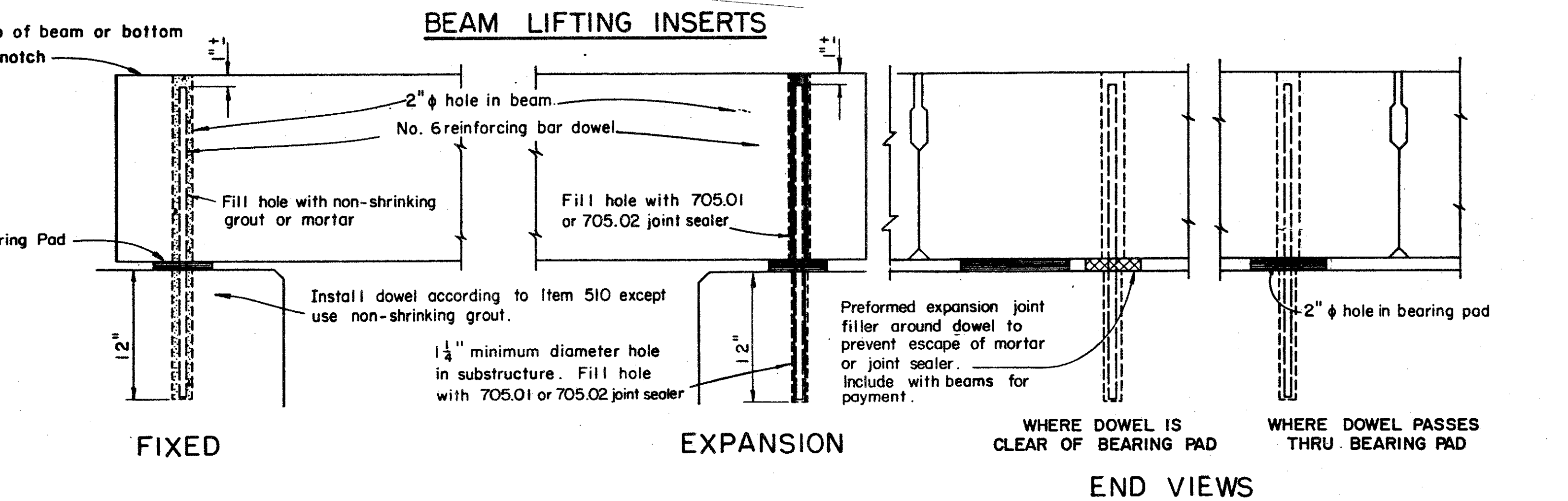
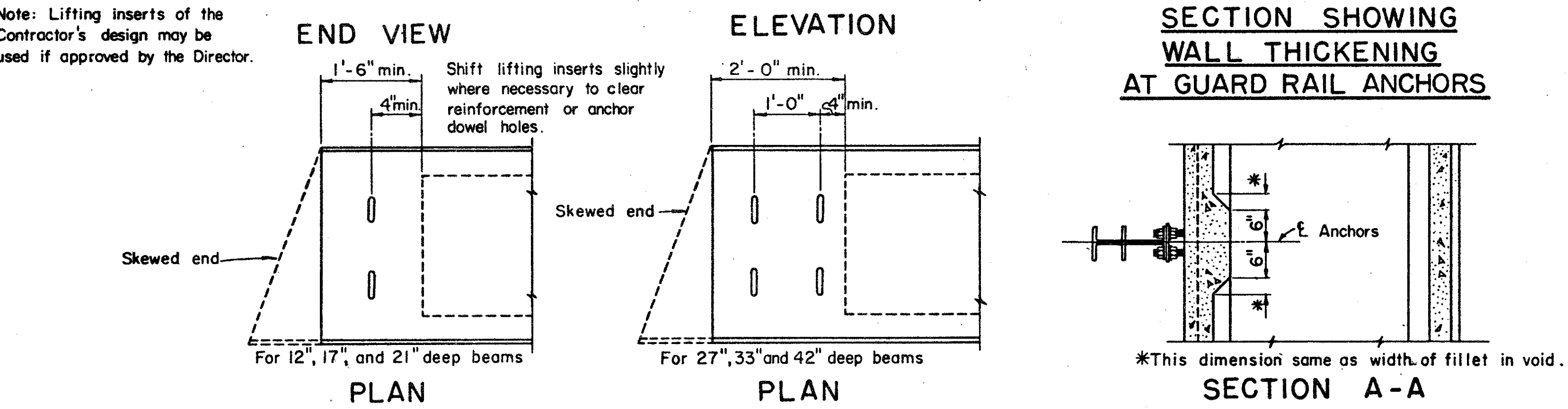
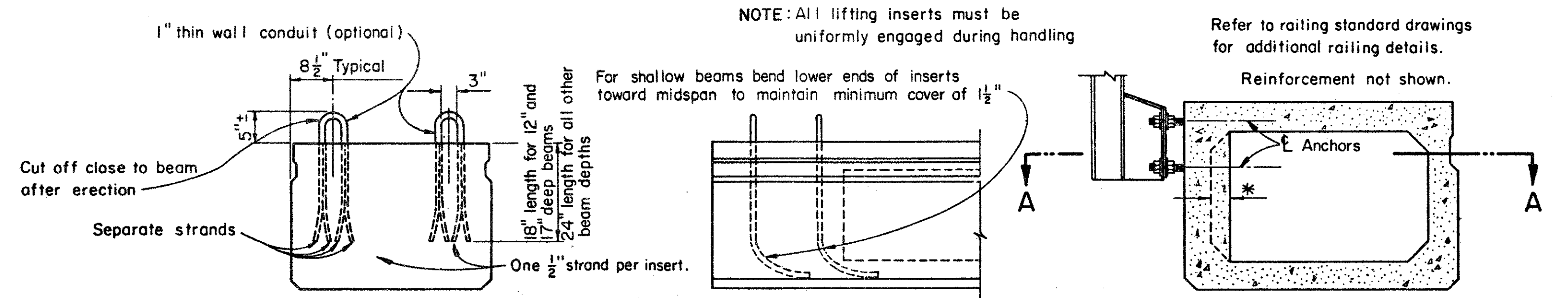
**DRAINS AND SEWERS**

STANDARD CONSTRUCTION DRAWING  
APPROVED *E. J. Schaefer* ENGR., R.D.

DATE  
6-1-65  
6-13-69  
7-26-76

MC-4





**GENERAL:** The project plans shall specify the details on this standard drawing which are to apply.

**TRANSVERSE TIE RODS** shall be 1" diameter steel rods of A36 steel, threaded both ends and with nut and washer at each end. Threads may be cut or rolled. If rolled threads are used, minimum diameter of rod at root of threads shall be 0.838". Tension shall be applied by a torque of approximately 250 foot-pounds. After the tie rods are tightened the recesses in the fascia beams shall be filled with non-shrinking mortar of the same color as the beams.

**PRESTRESSING STRANDS:** The project plans shall specify the number, location, size, and strength of prestressing strands, the required prestressing force and deflected or de-banded strand data.

**GALVANIZING:** All anchor bolts, studs, inserts, tie rods, nuts and washers shall be galvanized per 711.

**ANCHOR DOWELS:** The beam ends to be anchored shall be indicated on the project plans. Anchor dowel holes and prestressing strands shall be located to avoid mutual interference. The lateral spacing of the holes in the beam shall be such that the anchor dowels either clear the elastomeric bearing pads or pass thru 2" holes in the pads. Holes in pads shall have 1" minimum clearance from edges of pads.

After tensioning of the transverse tie rods the dowel holes shall be drilled into the abutment or pier seat and dowels installed. Cost of anchor dowels and installation shall be included with item 515 for payment.

**BEARING PADS:** Size, hardness, and location of elastomeric bearing pads shall be shown on the project plans.

**NOTCHES** shall be provided in beam ends where shown on the project plans to eliminate an open joint over piers (see sheet 4 of 4) or to accommodate anchorage for end dams or expansion joints.

**END OF BEAMS** against which concrete is not to be placed, shall be coated with a bituminous material.

**MORTARING OF SHEAR KEYS:** After the transverse tie rods have been tightened shear keys shall be filled with non-shrinking mortar. Before mortaring, the keyway surfaces shall be wetted, but no free water shall be allowed to remain in the keyways. Mortar shall be placed into the keyways in a manner that insures complete and solid filling. Mortar and labor to place mortar are included with item 515 for payment.

**COMPOSITE BRIDGES:** The following notes apply to composite bridges only:

**CLEANING PRIOR TO PLACEMENT OF COMPOSITE SLAB:** Before placement of the slab concrete, the tops of all beams shall be thoroughly cleaned of all dirt, dust and other foreign matter. The surface shall be flushed with clear water and shall be wet, without free water, when the concrete is placed.

**SLAB PLACEMENT:** On multi-span bridges with slab continuous over piers, construction joints perpendicular to the centerline of roadway may be placed near the center of a span. However, composite slab pours shall be as long as practicable. On multi-span bridges with joints at piers, composite slabs shall be placed between joints without additional construction joints.

**NON-SHRINKING MORTAR OR GROUT,** shall be made with materials and proportions as follows:

2680 lbs. sand, 703.02, @ 6% moisture

9 bags cement, 701.05

40 gallons water, 499.02

9 lbs. expanding grouting aid admixture, Intraplast-N by Sika Chemical Corporation, or approved equal.

The cement, sand and water shall be mixed first, after which the admixture shall be added. Batch size shall be limited so placement can be completed within 30 minutes. Water shall not be added to increase flowability which has been decreased by delayed use of mortar.

**PROJECT PLANS:** The project plans for each structure will include the following:

A beam layout plan showing span length, beam length, skew angle, fixed and expansion ends of beams, location of anchor dowels, size and location of elastomeric bearing pads, location of diaphragm centerlines and locations of railing posts.

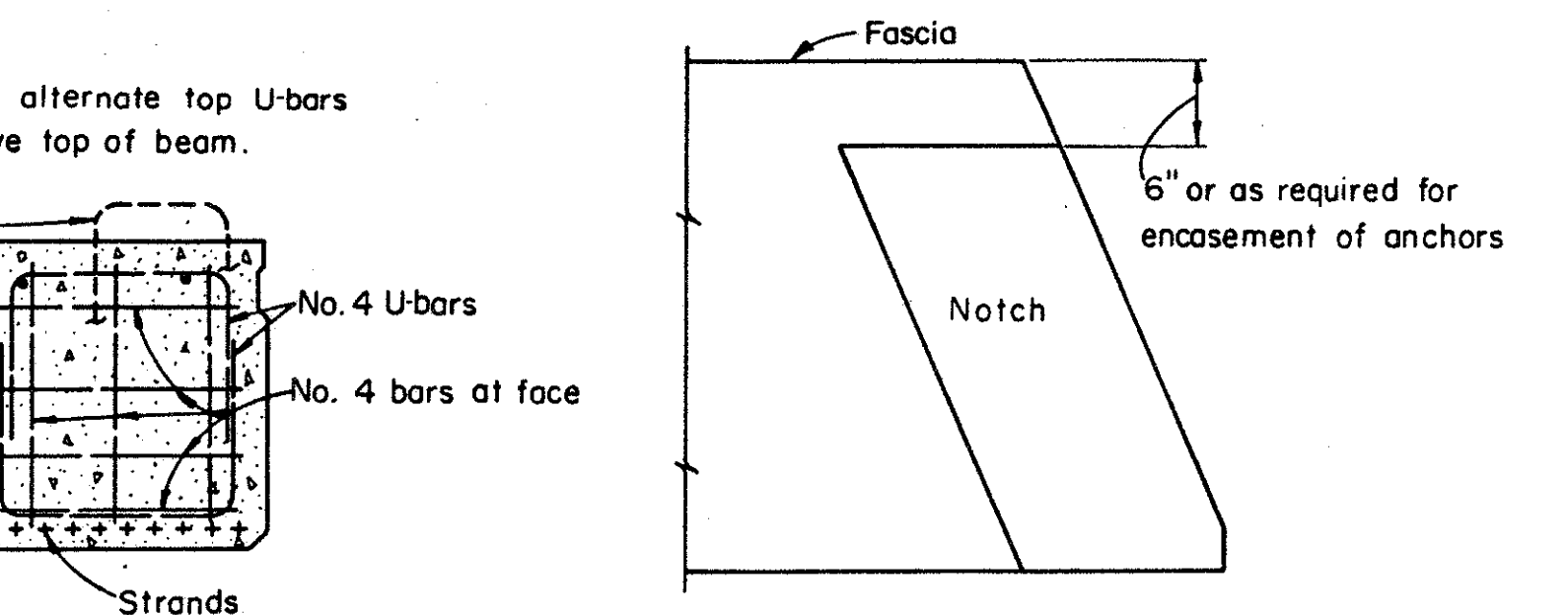
A transverse cross-section thru the deck.

A cross-section of the beam showing beam size, number and location of strands, debanded strands and longitudinal reinforcing steel.

Details at abutments and piers.

All other necessary details and information.

It is not intended that details shown on this standard drawing be repeated on the project plans except as may be required for clarity.



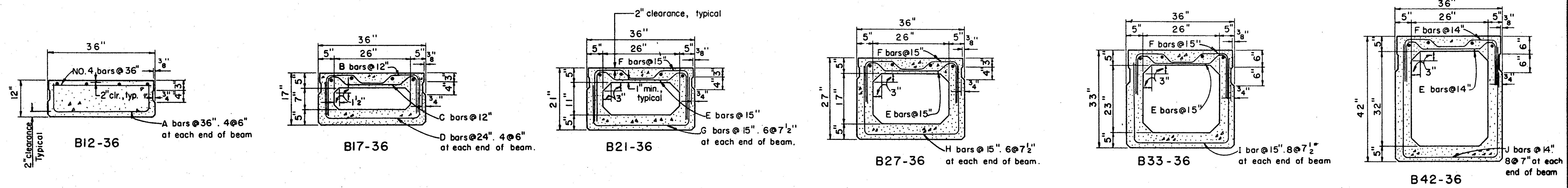
NOTE: The Fabricator's shop drawings shall show complete details of the beam reinforcing.

REVISIONS		STATE OF OHIO DEPARTMENT OF TRANSPORTATION BUREAU OF BRIDGES AND STRUCTURAL DESIGN	
		STANDARD PRESTRESSED CONCRETE BOX BEAM BRIDGE DETAILS	
APPROVED: <i>Robert B. Pfeiffer</i> ENGINEER OF BRIDGES		DRAWING NO. PSBD-1-81	
DATE: 2-18-81	PREPARED: MRG	TRACED: GFJ TDC	CHECKED: PFK REVIEWED: WJJ
			SHEET NO. 1 OF 4 SHEETS



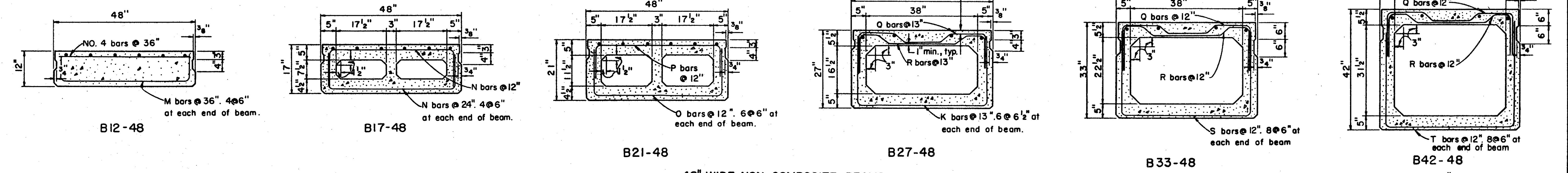




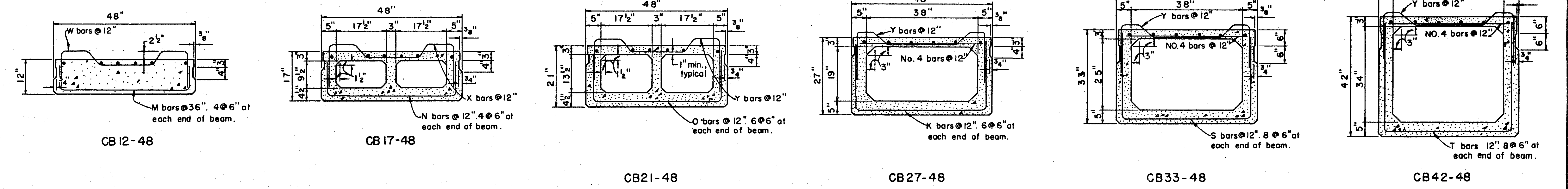


**36" WIDE NON-COMPOSITE BEAMS**

NOTE: Place all bottom stirrups on top of bottom layer of strands.

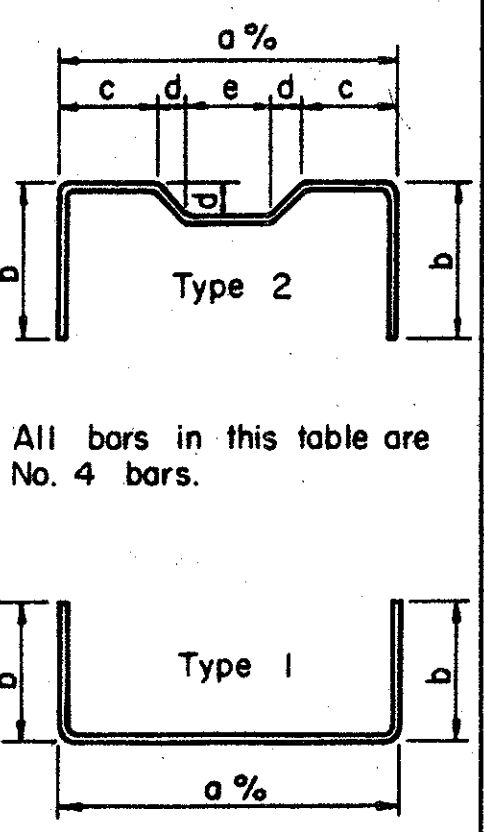


**48" WIDE NON-COMPOSITE BEAMS**



**48" WIDE COMPOSITE BEAMS**

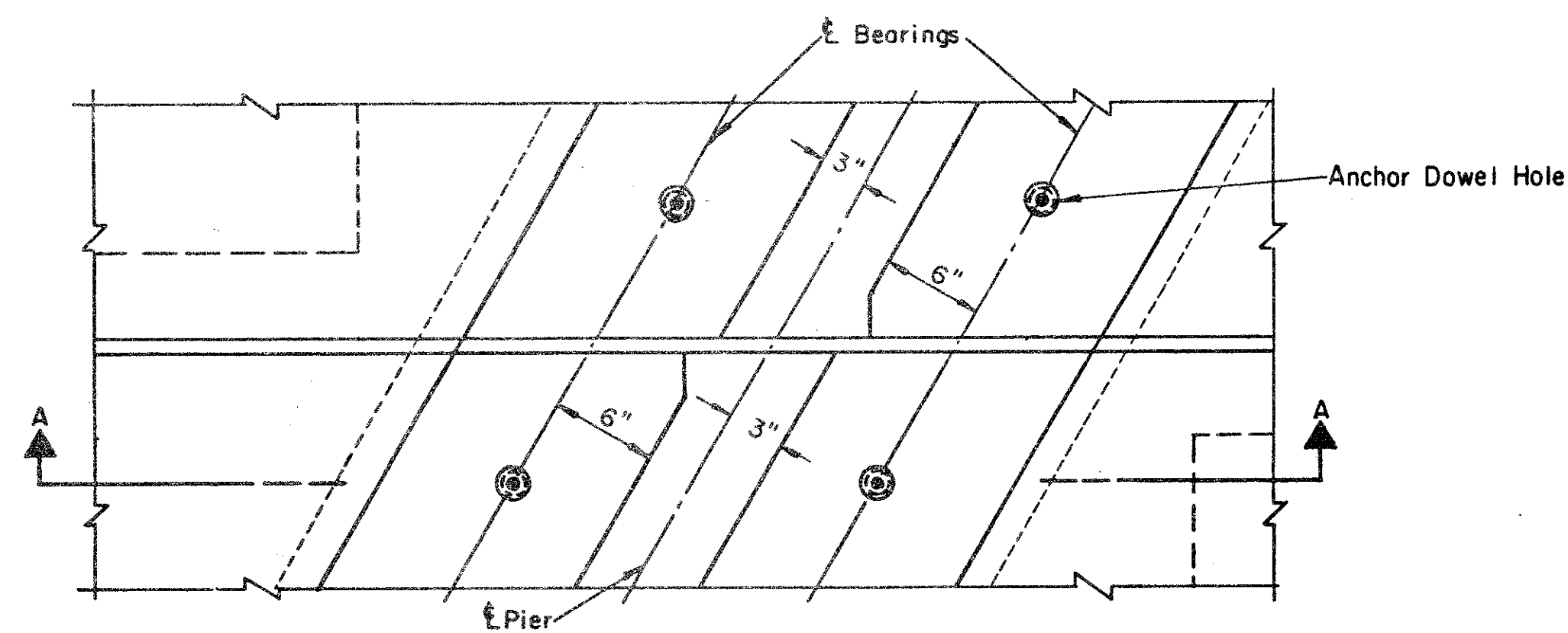
Bent Reinforcing Bars						
Mark	Type	a	b	c	d	e
A	1	31"	8"			
B	2	31"	13"	10"	1 1/2"	8"
C	2	31"	13"	4"	1 1/2"	20"
D	1	31"	13"			
E	2	31"	14"	4"	1 1/2"	20"
F	2	31"	14"	10"	1 1/2"	8"
G	1	31"	17"			
H	1	31"	23"			
I	1	31"	29"			
J	1	31"	38"			
K	1	43"	23"			
M	1	43"	8"			
N	1	43"	13"			
O	1	43"	17"			
P	1	43"	14"			
Q	2	43"	14"	13"	2"	13"
R	2	43"	14"	7"	2"	25"
S	1	43"	29"			
T	1	43"	38"			
W	2	43"	12"	9"	4"	17"
X	2	43"	17"	9"	4"	17"
Y	2	43"	18"	9"	4"	17"



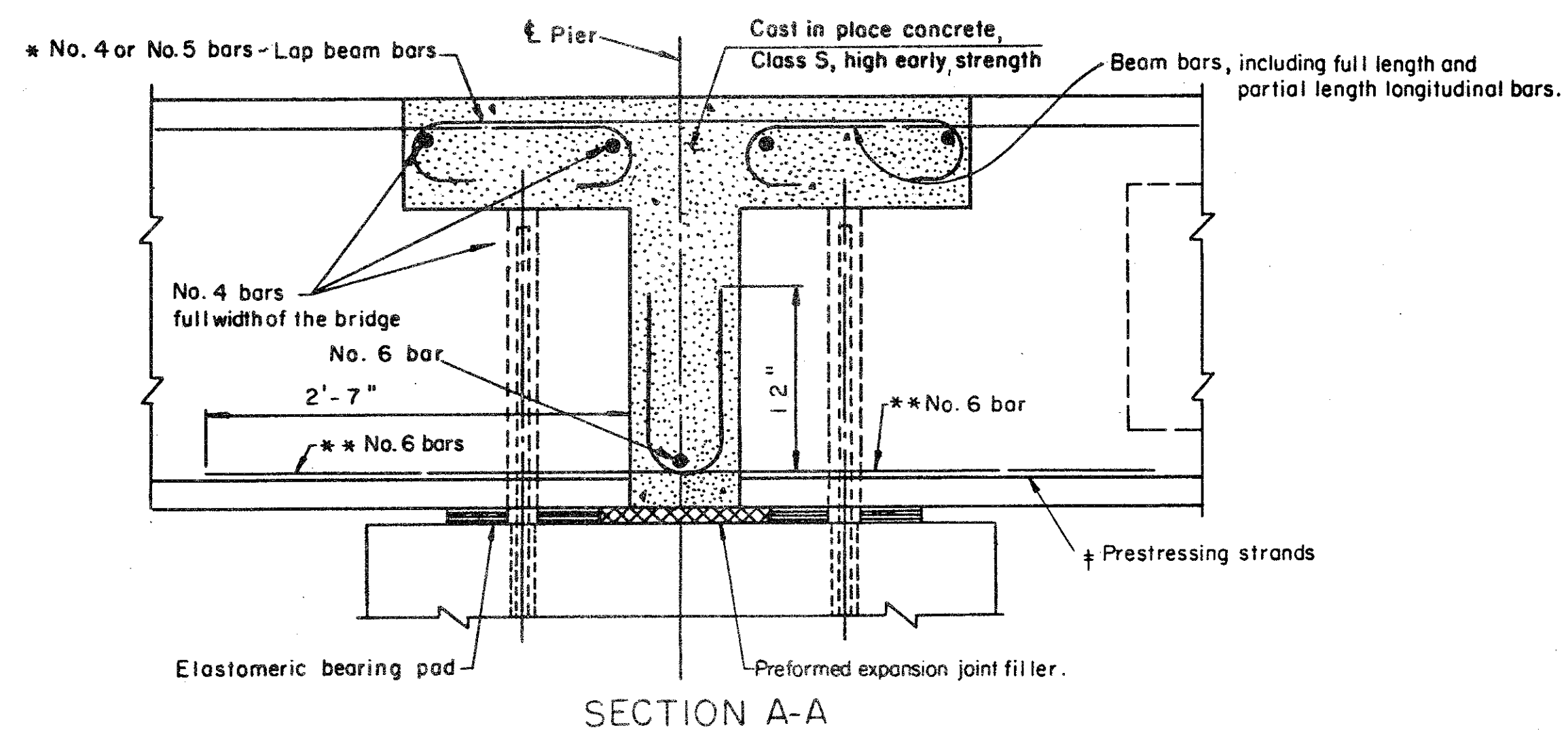
**MINIMUM LONGITUDINAL REINFORCING STEEL**  
 36" wide non-composite beams: 4-No. 5 bars  
 48" wide non-composite beams:  
 B12 thru B21, 6 - No. 4 bars  
 B27 thru B42, 4 - No. 5 bars  
 48" wide composite beams: 6 - No. 4 bars  
 See project plans for any additional longitudinal reinforcing steel bars required.  
**FABRICATOR'S SHOP DRAWINGS** shall show complete details of beam reinforcing.

STATE OF OHIO DEPARTMENT OF TRANSPORTATION BUREAU OF BRIDGES AND STRUCTURAL DESIGN	
STANDARD <b>PRESTRESSED CONCRETE BOX BEAM BRIDGE DETAILS</b>	
APPROVED DATE: 9-18-81 PREPARED MRG	DRAWING NO. PSBD-1-81 ENGINEER OF BRIDGES REVIEWED WJJ SHEET NO. 3 OF 4 SHEETS





PARTIAL PLAN OF BEAM CONNECTION OVER PIER



- \* Lap bars same size and number as beam bars. Hooks may be rotated from the vertical position to provide the required clearance.
- \*\* Provide 6 No. 6 bars each beam end in 48" wide beams and 4 No. 6 bars each beam end in 36" wide beams. No. 6 bars shall be located on top of stirrups and shall be uniformly spaced across the beam.
- † At the fabricator's option, strands may be extended and bent up in lieu of No. 6 bars. 48" wide beams with a total of 12 or more strands shall have a minimum of 6 strands bent up. 48" wide beams with less than 12 strands total shall have approximately one half of the total number of strands bent up. 36" wide beams with a total of 8 or more strands shall have a minimum of 4 strands bent up. 36" wide beams with less than 8 strands total shall have approximately one half of the total number of strands bent up.

Note: The No. 6 bars or prestressing strands which are bent up shall be staggered in abutting beam ends to avoid interference.

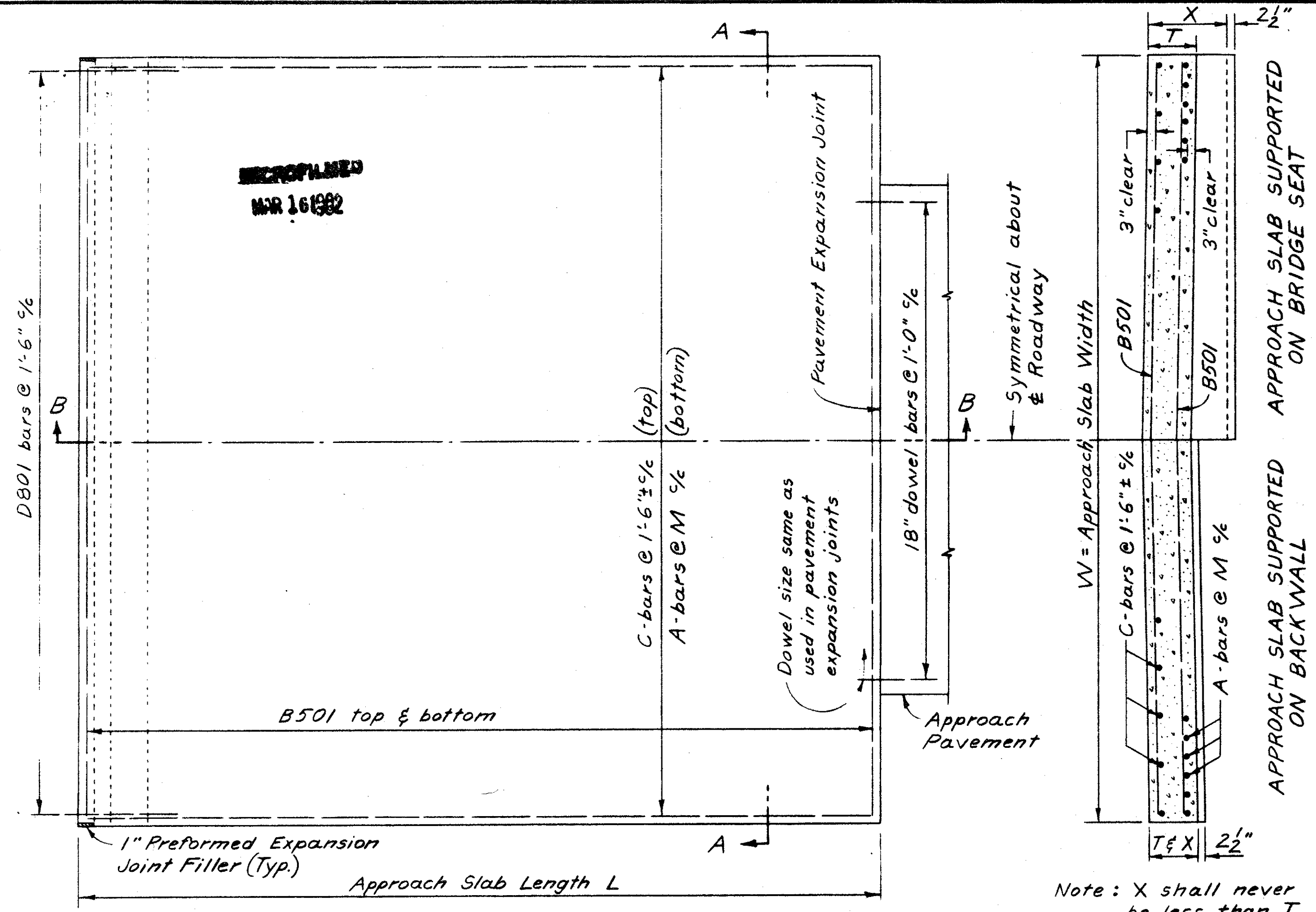
REVISIONS	STATE OF OHIO DEPARTMENT OF TRANSPORTATION BUREAU OF BRIDGES AND STRUCTURAL DESIGN			
	STANDARD PRESTRESSED CONCRETE BOX BEAM BRIDGE DETAILS			
	APPROVED: <i>Robert B. Pfeiffer</i> DATE: 2-18-81 ENGINEER OF BRIDGES		DRAWING NO. PSBD-1-81	
	PREPARED MRG	TRACED G.F.J.	CHECKED FFE	REVIEWED WJJ
			SHEET NO. 4 OF 4 SHEETS	





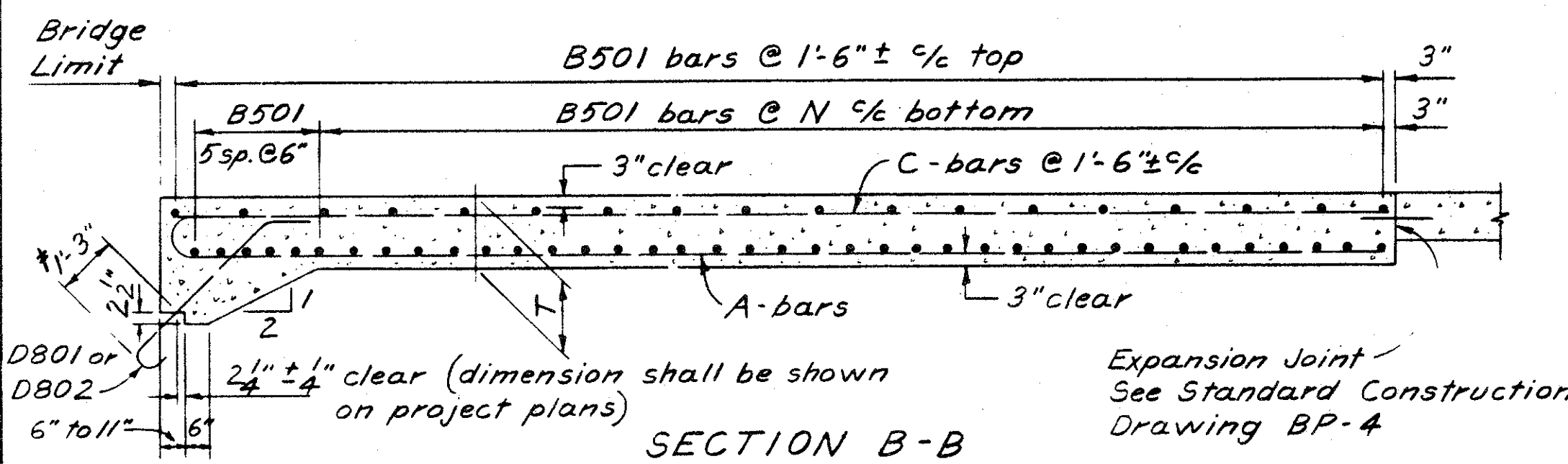


MICROFILMED  
MAR 16 1982



PLAN

Note: X shall never be less than T

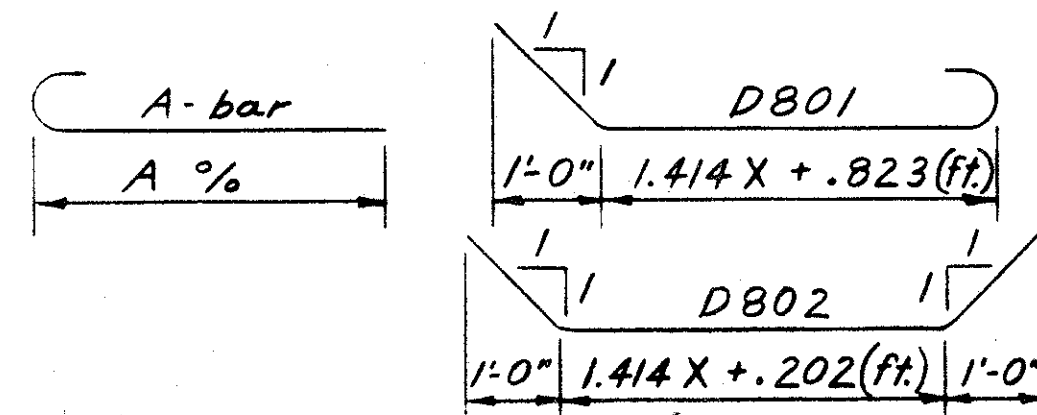


SECTION B-B

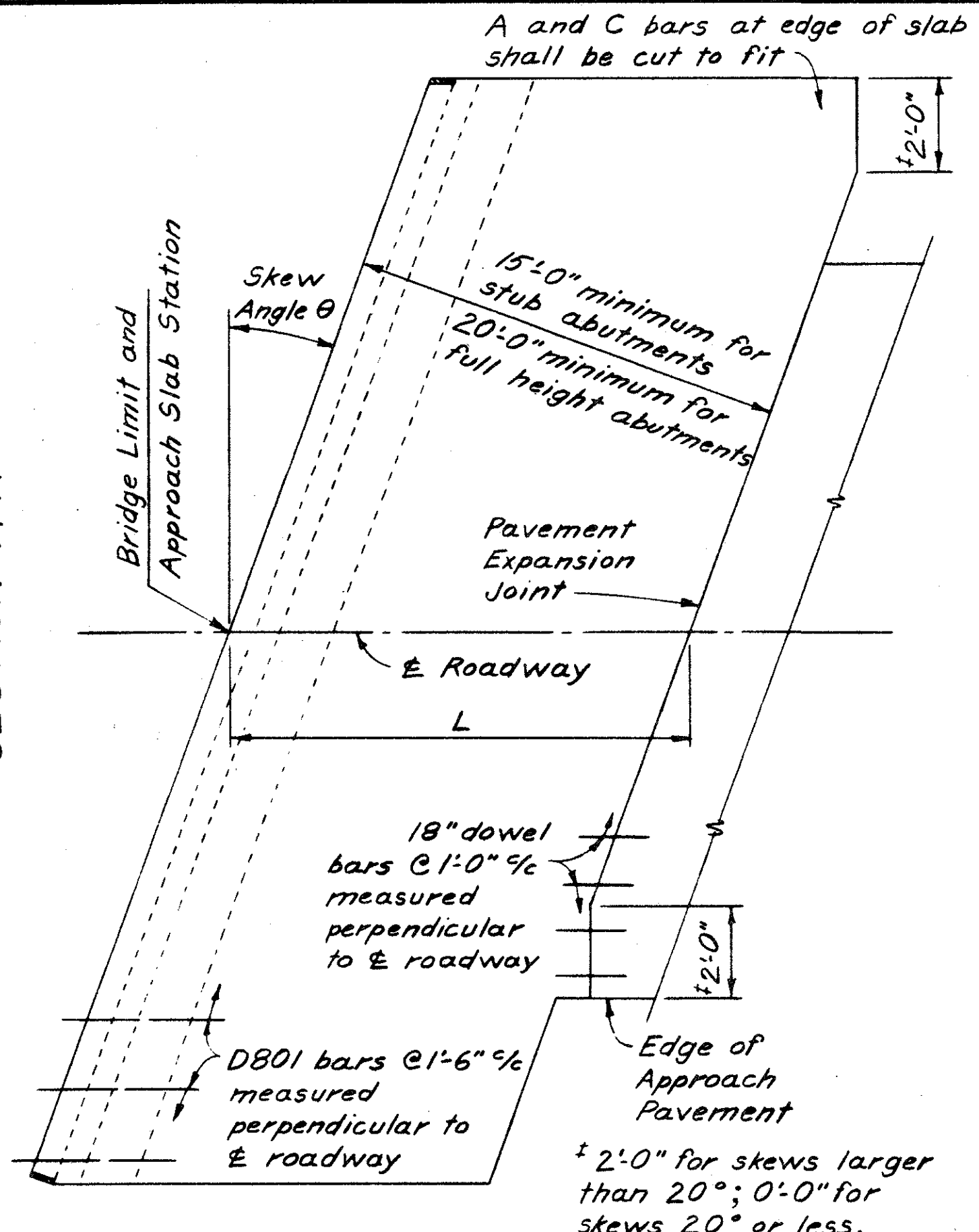
\* 1'-3" embedment length is measured in the plane of the DB01 bar.

REINFORCING STEEL (For one approach slab)																
Length L	Thick-ness T	A - BARS					B501 (bottom)		B501 (top)		C - BARS				DB01 or DB02	
		Sp'c'g M	Mark	Length	Dimension A	No. Req'd	Length	Sp'c'g N	No. Req'd	Length	No. Req'd	Mark	Length	No. Req'd	No. Req'd	
15'-0"	12"	10"	A1001	15'-11"	14'-6"	1	(W-0.5) sec θ	9"	22	(W-0.5) sec θ	11	C501	14'-6"	1	1	
20'-0"	13"	7 1/2"	A1002	20'-11"	19'-6"	1	(W-0.5) sec θ	8"	31	(W-0.5) sec θ	14	C502	19'-6"	1	1	
25'-0"	15"	7"	A1003	25'-11"	24'-6"	1	(W-0.5) sec θ	8"	39	(W-0.5) sec θ	18	C503	24'-6"	1	1	
30'-0"	17"	6 1/2"	A1004	30'-11"	29'-6"	1	(W-0.5) sec θ	8 1/2"	44	(W-0.5) sec θ	21	C504	29'-6"	1	1	

W = Approach Slab Width, out-to-out, in feet  
 θ = Angle of Skew  
 M = A-bar spacing in inches  
 N = B-bar spacing in inches  
 X = Approach Slab Thickness at abutment end in feet.



\* At the option of the contractor, the B501 bars may be lapped 1'-8" minimum at the centerline of roadway, or where required for longitudinal construction joints.



APPROACH SLAB FOR SKEWED BRIDGE

DESIGN SPECIFICATIONS: This standard drawing conforms to "Standard Specifications for Highway Bridges" adopted by the American Association of State Highway and Transportation Officials, 1977, including the 1978, 1979, 1980 and 1981 Interim Specifications and the Ohio "Supplement" to these specifications.

DESIGN DATA  
 Design Loading: HS20-44 and the Alternate Military Loading  
 Concrete Class C: compressive strength 4000 p.s.i.  
 Reinforcing Steel: ASTM A615, A616 or A617 - Grade 60 minimum yield strength 60,000 p.s.i.

REINFORCING STEEL: For skewed bridges the A and C bars shall be placed parallel to the center line of roadway and the B bars shall be placed parallel to the abutments.

PREFORMED EXPANSION JOINT FILLER AND SEALER at the corners and sides of the approach slab shall be included in the price bid per sq. yd. for the approach slab.

PREFORMED ELASTOMERIC JOINT SEALER shown at the bridge limit end of the approach slab shall be included in the price bid per sq. yd. for the approach slab.

LONGITUDINAL CONSTRUCTION JOINTS required for stage construction shall be as per 511.09

CURBS, BRIDGES WITH SIDEWALKS: For bridges constructed with raised sidewalks, deflector parapets or other types of construction which retain roadway surface drainage, the approach slabs shall either include integral curbs or be constructed in conjunction with bridge curbs. Curb height shall be transitioned uniformly between bridge curb height and approach curb height in a length as follows: Where wingwall extends beyond end of approach slab, use a minimum length of 10 ft. beyond end of wingwall. Where the approach slab extends beyond the end of wingwall, transition in this length. However, the transition length shall not be less than 10 ft. and the transition shall extend beyond the end of approach slab if necessary.

APPROACH SLAB WIDTH (W): Generally approach slabs shall be the same width as the bridge roadway.

LENGTH of approach slabs shall be shown on project plans.

CROWN shall conform to that of the approach pavement and bridge deck. If the rate of crown of the bridge deck differs from that of the approach pavement, a smooth transition shall be provided within the limits of the approach slab.

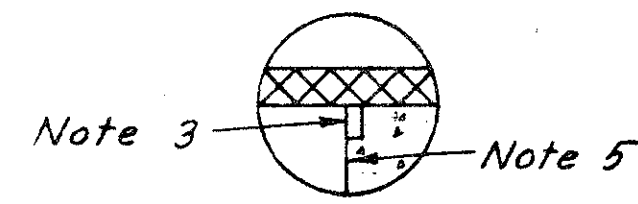
WEARING SURFACE: Generally approach slabs shall have an asphalt concrete wearing surface only when both the approach pavement surface and the bridge wearing surface are asphalt concrete.

EXPANSION JOINT details at the approach pavement end of the approach slab are used only in conjunction with concrete pavement or concrete base course. Payment for the expansion joint, including dowel bars, preformed expansion joint filler and joint sealer, is included in the price bid per sq. yd. for the approach slab.

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STANDARD REINFORCED CONCRETE APPROACH SLABS					
APPROVED: Robert B. Pfeiffer DATE: 11-27-81 ENGINEER OF BRIDGES				DRWG. NO. AS-1-B1	
PREPARED	TRACED	CHECKED	REVIEWED	SHEET NO. 1 OF 3 SHEETS	
FFE		GSB	W.JJ		

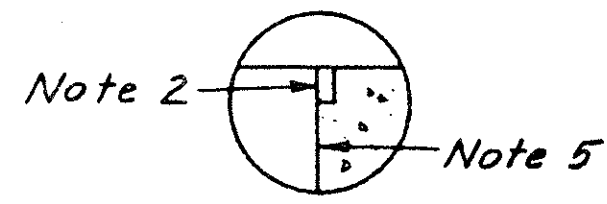
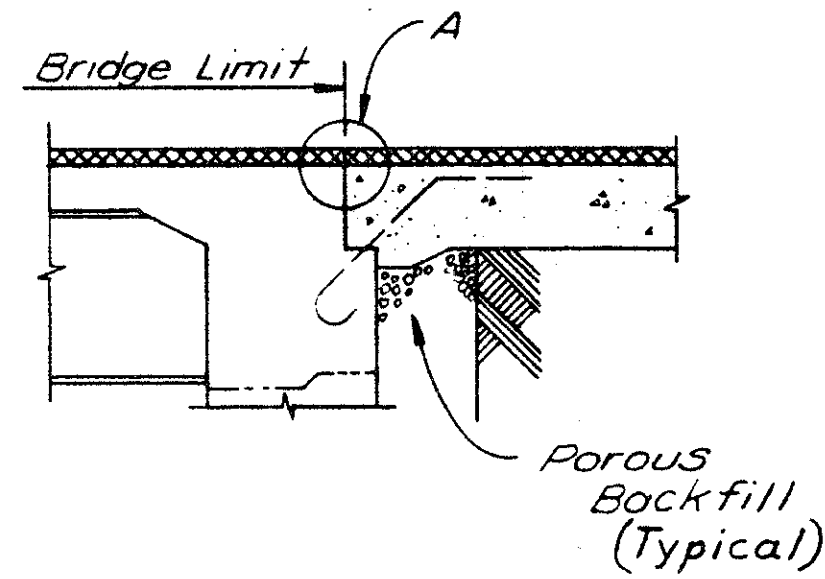


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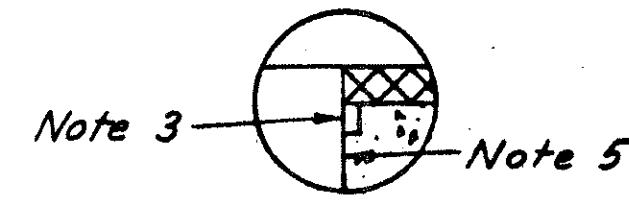
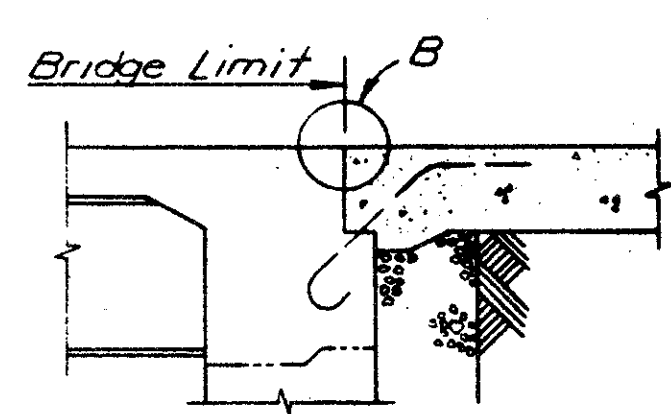
DETAIL A

ASPHALT CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB



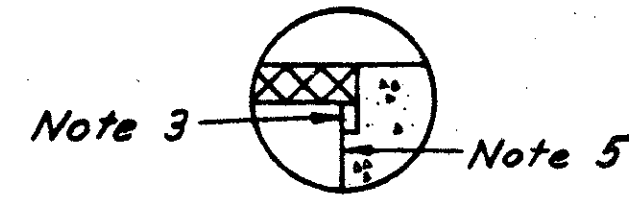
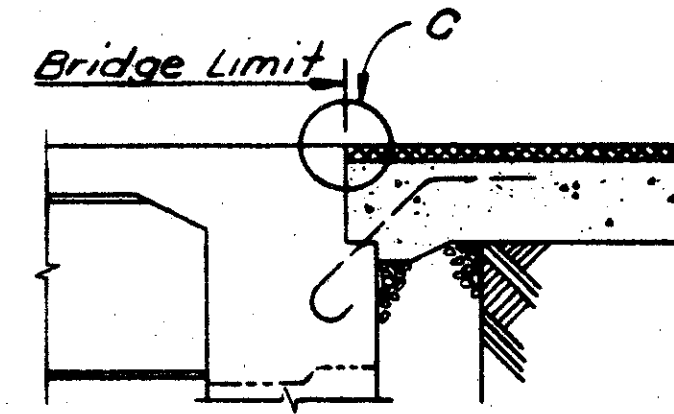
DETAIL B

CONCRETE WEARING SURFACE ON BRIDGE DECK AND APPROACH SLAB



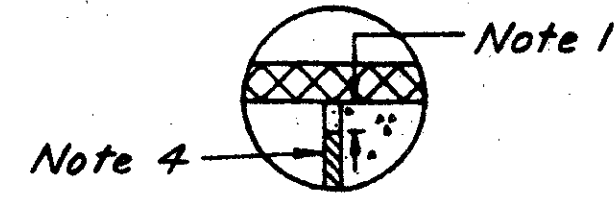
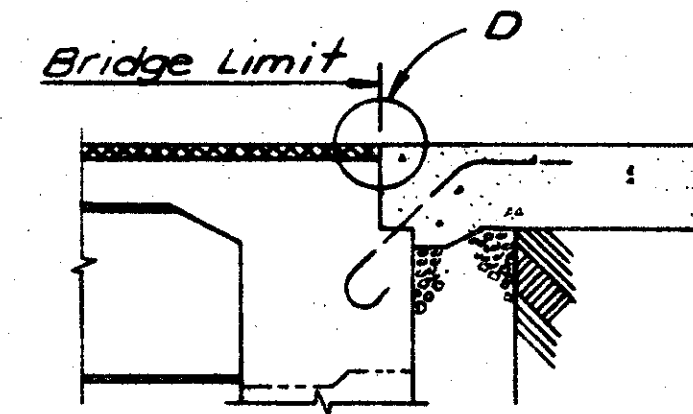
DETAIL C

CONCRETE WEARING SURFACE ON BRIDGE DECK ONLY

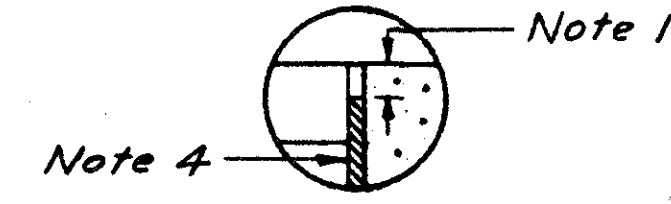


DETAIL D

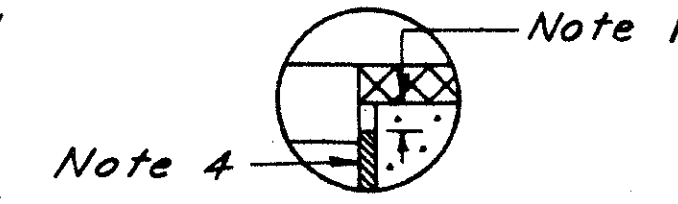
ASPHALT CONCRETE WEARING SURFACE ON BRIDGE DECK ONLY



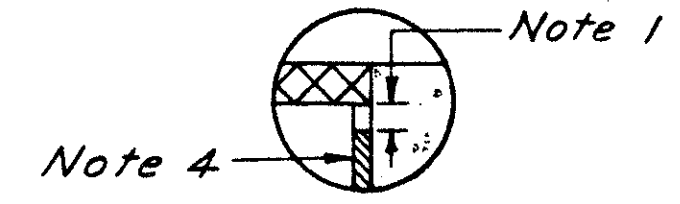
DETAIL E



DETAIL F



DETAIL G



DETAIL H

Note 1: 2" joint sealer 705.01 or 705.02

Note 2: Preformed elastomeric joint sealer 705.11 (1 1/4" for 1/2" joint) depressed 1/8" below roadway, placed in 1/2" x 2 1/4" groove.

Note 3: Preformed elastomeric joint sealer 705.11 (1 1/4" for 1/2" joint) placed in 1/2" x 2 3/8" groove.

Note 4: 1" preformed expansion joint filler.

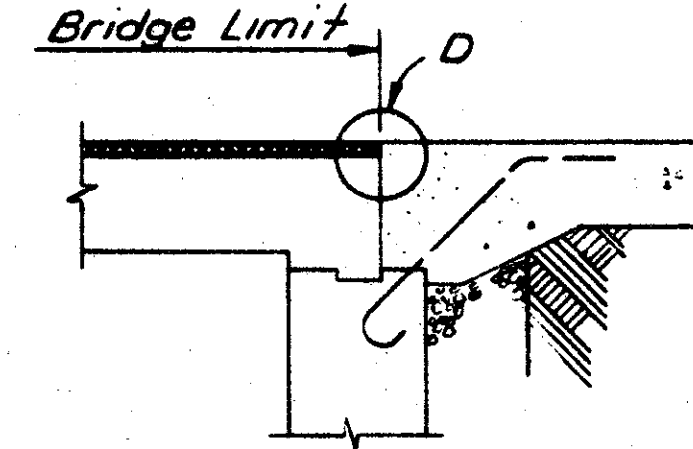
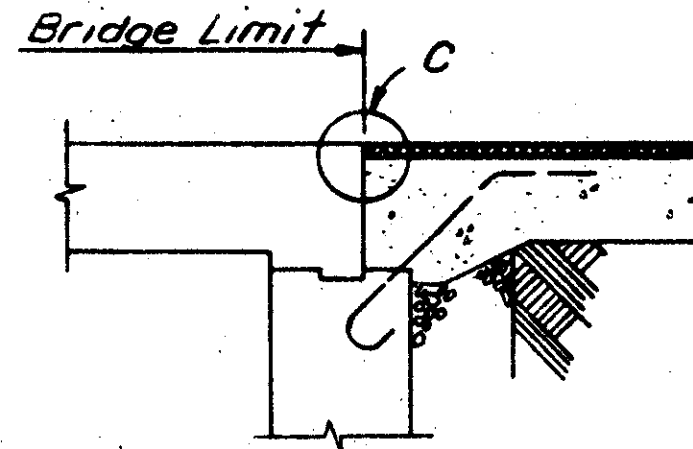
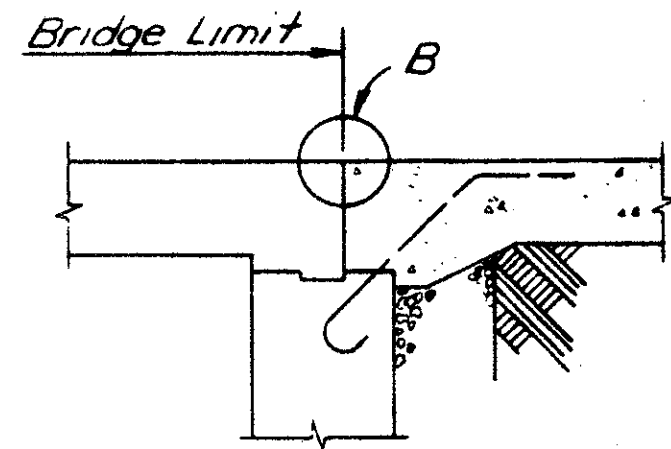
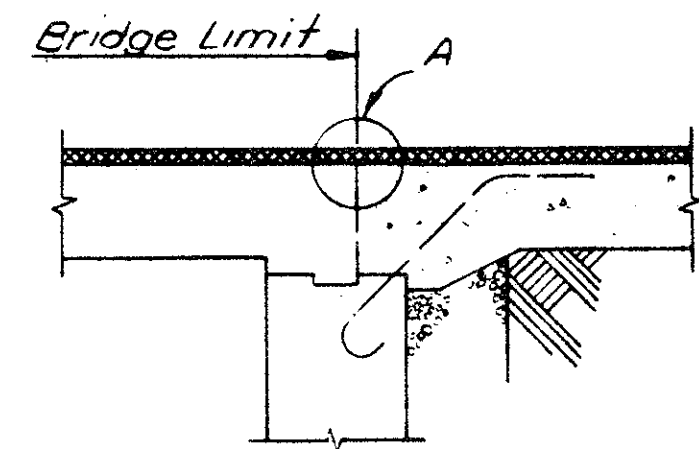
Note 5: Type A waterproofing.

Type A waterproofing shall not extend above the bottom of the groove into which the preformed elastomeric joint sealer is to be placed. It shall be applied to the entire area of the abutment or superstructure which comes into contact with the approach slab.

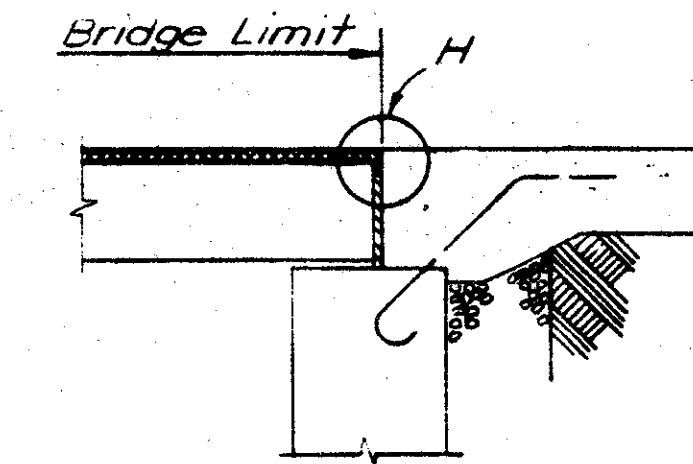
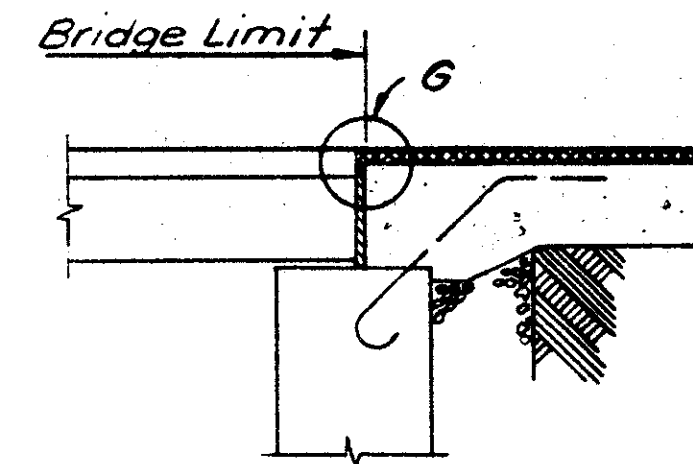
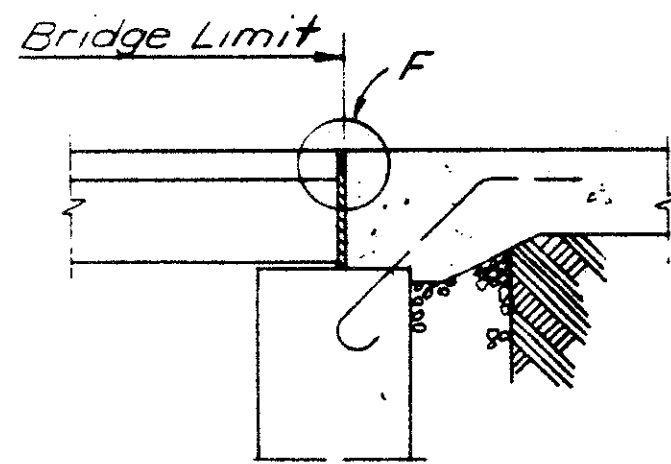
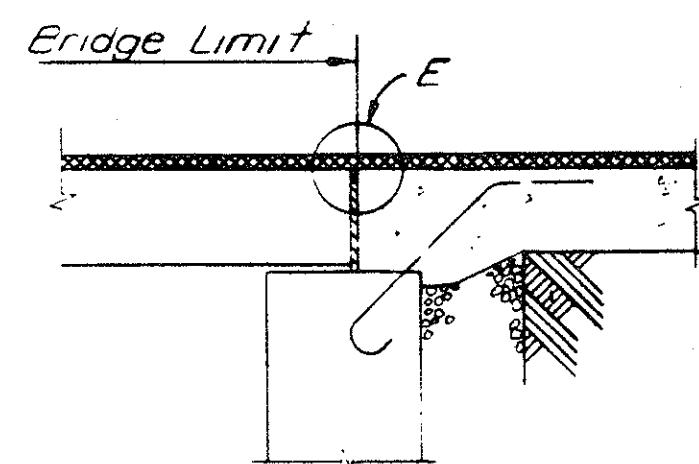
For prestressed concrete box beam bridges with asphalt concrete on both bridge deck and approach slab, the top of approach slab at the bridge end shall be constructed to the level of the top of the beams to facilitate waterproofing of the joint. The thickness of asphalt concrete at the approach end shall be the thickness of asphalt concrete used on the roadway pavement. The thickness of asphalt concrete shall vary uniformly, if necessary, in the length of the approach slab. The base shall be graded to permit the bottom of the approach slab to be parallel to the top.

For structures having asphalt concrete wearing surface on both bridge deck and approach slabs and where no deck expansion devices are provided, the deck membrane waterproofing shall extend beyond the bridge limits a distance of 2'-0".

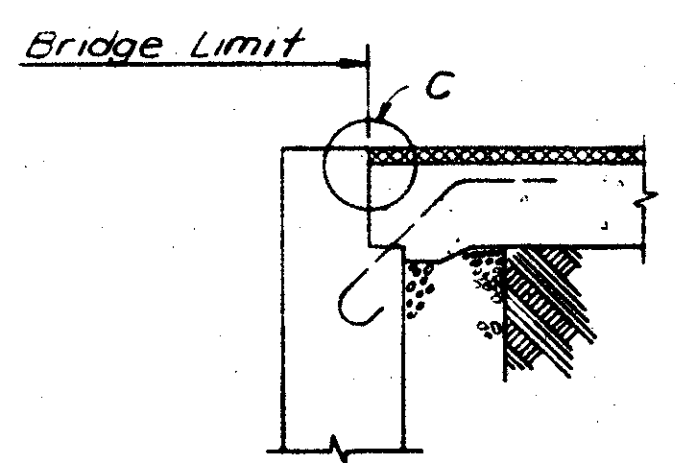
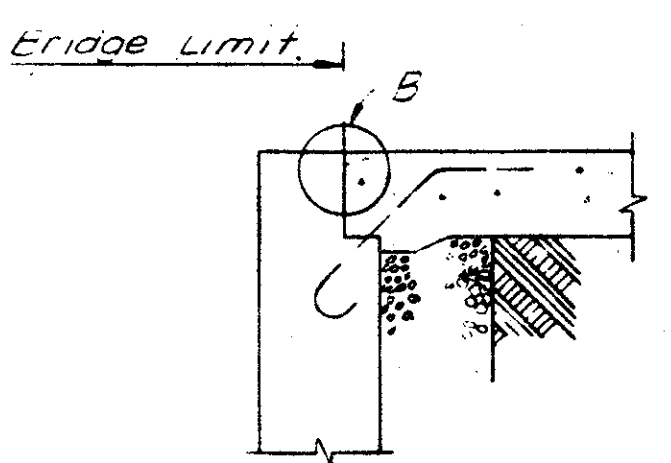
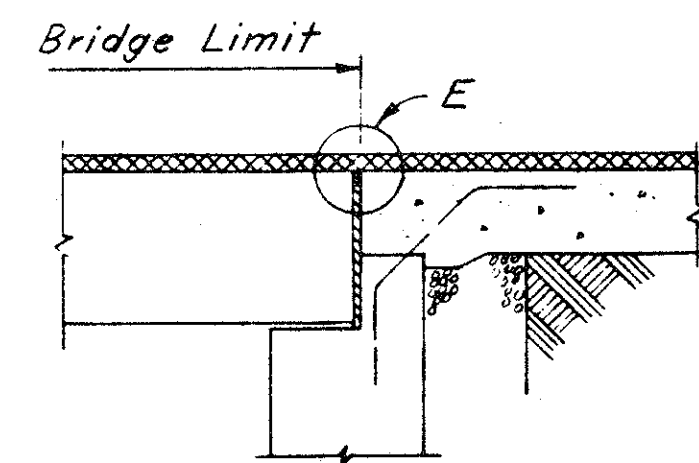
ON BRIDGES WITH INTEGRAL CONSTRUCTION



ON SLAB BRIDGES



ON PRESTRESSED CONCRETE BOX BEAM BRIDGES



Note: Approach slab seat on prestressed concrete box beam bridges is shown at same elevation as beam seat. However, it may actually be higher or lower than the beam seat depending on box beam depth.

APPROACH SLAB SUPPORTED ON ABUTMENT BACKWALL

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	FFE		GSB	WJJ	SHEET NO. 2 OF 3 SHEETS