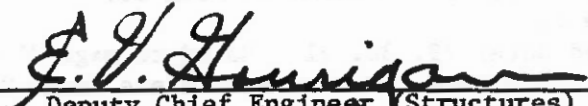


TO:		ENGINEERING INSTRUCTION	
SUPERSEDED BY EI 82-011 EFFECTIVE 3/1/82		NEW YORK STATE DEPARTMENT OF TRANSPORTATION	
		SUBJECT: STANDARD DETAILS FOR HIGHWAY BRIDGES, REVISIONS TO	
		Subject Code: 7.35-11	
Distribution:		<input type="checkbox"/> Main Office	<input type="checkbox"/> Regions
		<input checked="" type="checkbox"/> Special	
APPROVED:		Code: EI 77-50	Date: 11/1/77
 Deputy Chief Engineer (Structures)		Supersedes:	
		MODIFIES EI 77-031 DATE 5/1/77	

The attached pages are revisions to the Standard Details for Highway Bridges Manual dated May 1977.

Engineering Bulletin, EB 6-15, dated October 20, 1976, is cancelled by this Engineering Instruction.

I through V

Revised Table of Contents to agree with following revisions.

- | | | |
|------|--------------|--|
| 13 | | No change. |
| 14 | | Revised "8" to "7" and "10" to "16" in "Note" at bottom of page. |
| 17 | Art. 21.5 | Corrected reference shown between parenthesis in second line. |
| 18 | | No change. |
| 19 | Art. 21.5.2 | Revised title and text. |
| 20 | | No change. |
| 27 | Art. 21.11 | Revised "Epoxy Coated" to "Uncoated" in line 3.
Revised "2-1/2" to "3-1/2" in line 4. |
| 28 | Art. 21.11 | Added new last paragraph. |
| | Art. 21.12 | Moved from page 27. No change. |
| | Art. 21.13 | Added new paragraph. |
| | Art. 21.14 | Revised 4 feet to 5 feet. |
| | Art. 21.15 | No change. |
| 29 | Art. 21.16 | Text on page respaced. No change. |
| 30 | Art. 21.16.1 | Text on page respaced. No change. |
| | Art. 21.16.2 | Text on page respaced. No change. |
| 30-1 | Art. 21.16.3 | Page added. No change. |
| 30-2 | | Blank page. |

Manual	Code 7.35-11	Date	Page 2
Subject: STANDARD DETAILS FOR HIGHWAY BRIDGES, REVISIONS TO			

- 46-1 Added: Rewrote the two new Proposal Notes which had been copied from EI 77-28 dated June 6, 1977.
- 46-2 Added: Continuation of Notes from page 46-1.
- 47 Added: Note 11 was formerly Note 31.
Added: Note 12 was formerly Note 29.
Added: Note 13 was formerly Note 30.
- 48 No change.
- 49 Deleted Notes 29, 30, 31. Moved to page 27 as Notes 11, 12 and 13. Revised "Piers Under Deck Joints."
- 50 Added Note 53.
- 53 No Change.
- 54 Note 203: Rewrote to correct meaning.
- 59 Art. 22.1 Added new last paragraph.
- 60 No change. Blank page.
- 65 Art. 23.1.4 Deleted last two paragraphs.
- 66 No change.
- 69 No change.
- 70 Art. 24.2 Revised. Added second sentence.
Art. 24.2.1 No change.
Art. 24.2.2 No change.
- 71 Art. 24.2.3 Moved title from page 70. No change. Deleted item numbers.
Art. 24.3 No change.
Art. 24.4 No change.
Art. 24.5 No change.
Art. 24.6 No change.
- 72 No change.
- 85 Corrected "tow" to "toe" in third line. Corrected page number references in ninth line.
- 86 No change.
- 87 Art. 25.2 Deleted "and 25.11" in first line.
Revised "18" to "24" in second line. Deleted second paragraph.
- 88 Art. 25.4 Revised Title to subparagraph A.
- 89 Added subparagraph B. Changed "B" to "C" for subparagraph titled Reinforcing Bars in Pier Caps.

Manual	Code 7.35-11 Date	Page 3
Subject: STANDARD DETAILS FOR HIGHWAY BRIDGES, REVISIONS TO		

89-1		Added: Continuation from page 89.
89-2		Added: Blank page due to revisions.
90	Art. 25.5 Art. 25.6	No change. Revised.
91	Art. 25.6 Art. 25.7	Continuation of Article. Revised.
92		No change.
93	Art. 26.2	Revised to agree with information on GLD Sheets.
94		No change.
95	Art. 26.6	Revised.
96	Art. 26.7	New page number. No change in text.
99	Art. 27.6 Art. 27.7	Deletion in third line. Revised A441 to A572 in first line.
100		Deleted second and third lines.
108-1	Art. 27.19	Added new Article.
108-2		Added blank page.

TABLE OF CONTENTS

	<u>PAGE</u>
<u>SECTION 21 - GENERAL</u>	1
21.1 Material not covered by Department Specifications	1
21.1.1 Proprietary item on Federal Aid Project	2
21.2 Preparation of Special Specifications	2
21.2.1 References to other Specifications	2
21.3 Standard Sheets	3
21.4 Aesthetics	3
21.5 Bridge Estimates	17
21.5.1 Preliminary Comparative Cost Estimates	18
21.5.2 Breakdown of Concrete on Contract Plans	19
21.5.3 Estimate of Quantities Table	21
21.6 Bridges over Navigable Waterways	23
21.7 Provision for Future Lanes in Bridge Design	23
21.8 Medians on Structures	23
21.8.1 Closed Medians	23
21.8.2 Median Barrier	24
21.8.3 Raised Medians	24
21.8.4 Flush Medians	24
21.9 General Drawings	24
21.9.1 Layout Drawings	24
21.9.2 Subsurface Profile Drawings	25
21.10 Water Crossings	26
21.10.1 Hydraulic Data	26
21.10.2 Clearances	26
21.10.3 Clearances over Navigable Waterways	27
21.10.4 Water Elevations	27
21.11 Reinforced Concrete Approach Slabs	27
21.13 Granite Curbs	28
21.14 Sidewalks on Bridges	28

Revised September 1977

	<u>PAGE</u>	
21.15	Details of Railings	28
21.16	Bridge Drainage	29
	21.16.1 Bridges - No Curbs on Approaches	30
	21.16.2 Bridges - Curbed Approaches	30
	21.16.3 Downspouts	30-1
21.17	Substructure Joints	31
	21.17.1 Definitions and Descriptions	31
	21.17.2 Uses and Locations	32
21.18	Superstructure Bridge Joints	35
21.19	Detailing Directives for Stone Masonry	36
21.20	Utilities on Bridges	38
	21.20.1 Lighting	40
21.21	Notes	43
	Proposal Notes	43
	Notes To Be Placed on Plans (Dulseal)	47
	Notes To Be Typed In Office When Required	54
<u>SECTION 22 - LOADS</u>		59
22.1	Design Loads on Plans	59
<u>SECTION 23 - DECK SYSTEMS</u>		61
23.1	Concrete Deck Slabs	61
	23.1.1 Monolithic Decks	61
	23.1.2 Two Course Bridge Decks	61
	Design Table	63
	23.1.3 Reinforcement in Deck Slabs	64
	23.1.4 Haunches	65
	23.1.5 Forming	66
<u>SECTION 24 - SUBSTRUCTURE AND RETAINING WALLS</u>		69
24.1	Rock Lines	69
24.2	Sheeting and Cofferdams	70
	24.2.1 Permanent or Temporary Sheet Piling	70
	24.2.2 Safe Operation Sheet Piling	70
	24.2.3 Cofferdams	71

	<u>PAGE</u>	
24.5	Excavation and Backfill at Structures	71
24.6	Berms	71
24.7	Slope Protection	71
24.8	Guidelines for Slope Protection	72
	24.8.1 Materials	72
	24.8.1.1 Highway Overpasses	72
	24.8.1.2 Railroad Overpasses	73
	24.8.1.3 Stream Bridges	73
	24.8.1.4 Others	73
	24.8.2 Details	73
	24.8.2.1 Concrete Block Paving	73
	24.8.2.2 Select Granular Fill Slope Protection	73
24.9	Piles	74
	24.9.1 Splices for Steel Bearing Piles	75
24.10	Pier Nose	76
24.11	Reinforcement for Temperature	76
24.12	Drainage of Structure Backfill	76
24.13	Location of Pedestals on Abutments	77
24.14	Centilevered Ends of Walls	77
24.15	Stepped Footings	77
24.17	Solid Abutments and Solid Piers	78
24.18	Substructure, General Shape	78
	24.18.1 General	78
	24.18.2 Protruding Filleted Seats	78
	24.18.3 Battered Walls	79
	24.18.4 Curved Wingwalls	79
	24.18.5 U-Wall Abutments	80
<u>SECTION 25 - REINFORCING STEEL</u>		81
25.1	Minimum Anchorage, Lap and Embedment	81
25.2	Spacing	87
25.3	Covering	87

Revised September 1977

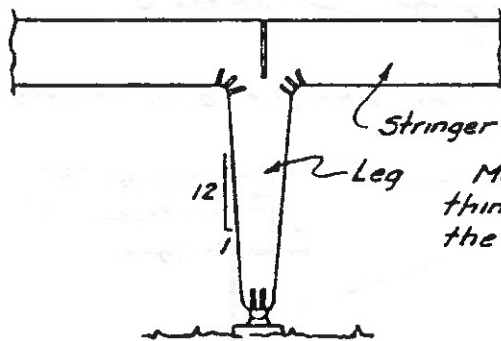
	<u>PAGE</u>
25.4 <u>Maximum Bar Lengths</u>	88
25.5 Splicing	90
25.6 <u>Marking of Bars</u>	90
25.7 Tied Columns	91
<u>SECTION 26 - PRESTRESSED CONCRETE</u>	93
26.1 Design	93
26.2 Camber	93
26.3 Diaphragms	93
26.3.1 Box Beams	93
26.3.2 I-Beams	94
26.4 Transverse Tendons for Box Beams	94
26.5 Width of Box Beams	95
26.6 Concrete Slab for Box Beams	95
26.7 Miscellaneous	96
<u>SECTION 27 - STRUCTURAL STEEL</u>	97
27.1 Thickness of Metal	97
27.1.1 Minimum Thickness of Metal	97
27.1.2 Outstanding Leg of Angles	97
27.2 Copies for Framed Connections	97
27.3 Shear Connectors	98
27.4 Location of Anchor Bolts for Bearings	98
27.5 Bearings on Level Pedestals	98
27.6 Designation of Tension Zones	99
27.7 Combinations of Different Types of Structural Steel	99
27.8 Camber	99
27.8.1 Bottom of Slab Elevations	101
27.8.2 Stringer Haunch	102

<u>Section 21 - General (Continued)</u>		<u>Page</u>
27.9	Transverse Intermediate Stiffeners	103
27.10	Longitudinal Stiffeners	104
27.11	Bearing Stiffeners	104
27.13	Flange Splices at Thickness Changes	104
27.14	Fasteners	105
	27.14.1 Size of Fasteners (High-Strength Bolts)	105
	27.14.2 Spacing of Fasteners	105
	27.14.3 Maximum Spacing of Fasteners	106
	27.14.4 Edge Distance of Fasteners	106
27.15	Field Splices	107
27.16	Steel Bearings	107
27.17	Minimum Size of Fillet Welds	108
27.18	Diaphragms	108
27.19	Bottom Lateral Connection Plates	108-1
	Appendix A	109
	<u>GUIDE LINE DRAWINGS SECTION</u>	

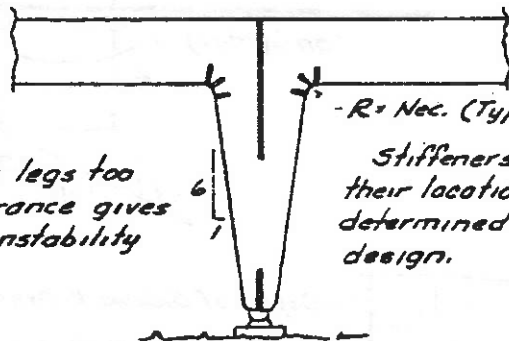
FIGURE I (CONTINUED)

STEEL PIERS

With the future use of "Weathering Steels" comes the problem of rust stains. Since piers are the most noticeable part of the substructure it only follows that this is where the staining will be the most noticeable. One answer to the problem is steel piers or steel legs.



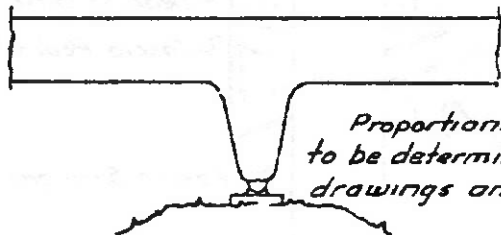
Making the legs too thin in appearance gives the look of instability



- R = Nec. (Typ.)

Stiffeners and their location to be determined by design.

STANDARD HEIGHT LEG

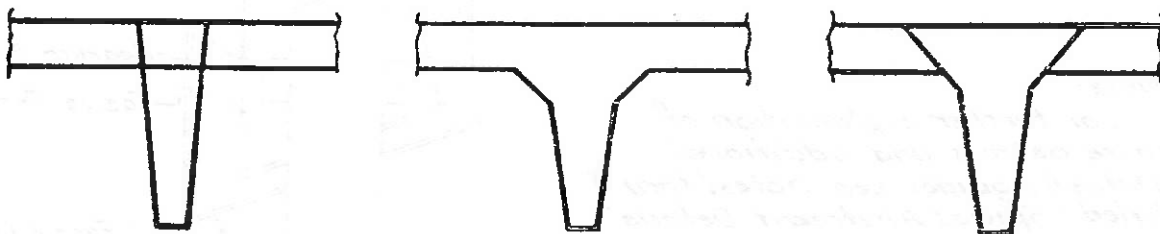


Proportions and batters to be determined by scale drawings and design

SHORT LEG DUE TO RAISED MEDIAN

The sketches here are for similar legs under each stringer.

VARIATIONS FOR LEGS

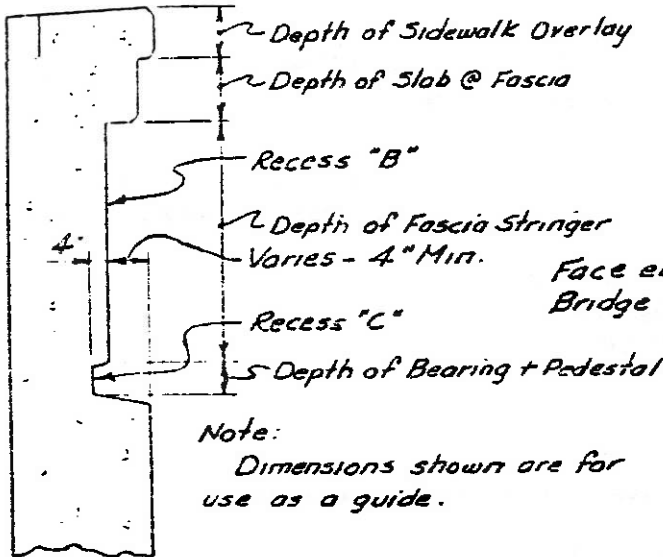
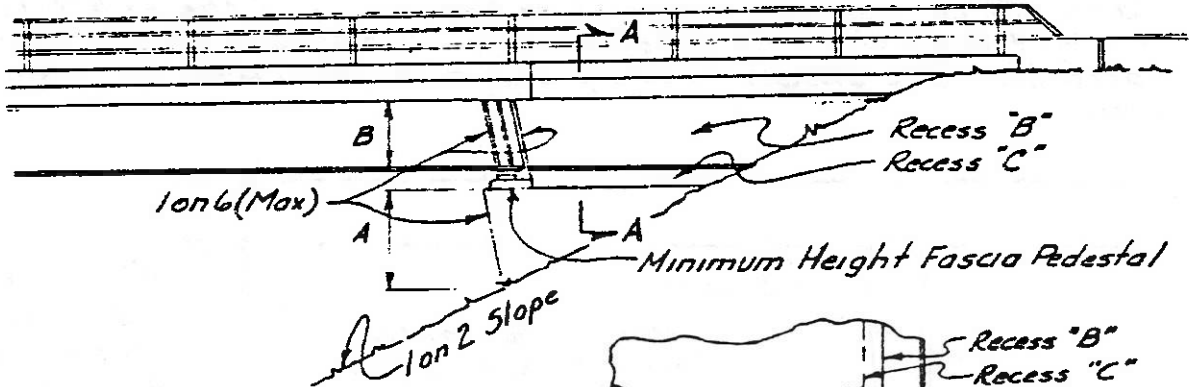


Desired shape and appearance may easily be obtained by rearranging stiffeners if the design will so allow.

FIGURE II

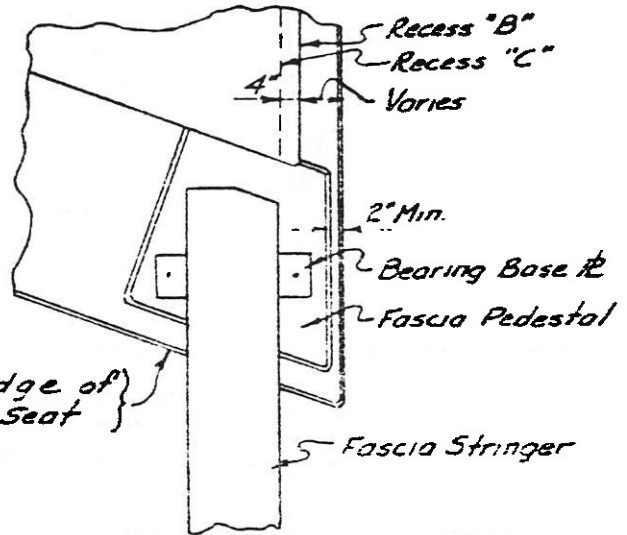
No Scale

- A = Exposed abutment face below bridge seat should be approximately 1.5B but not less than 6'-0"
- B = Beam Depth



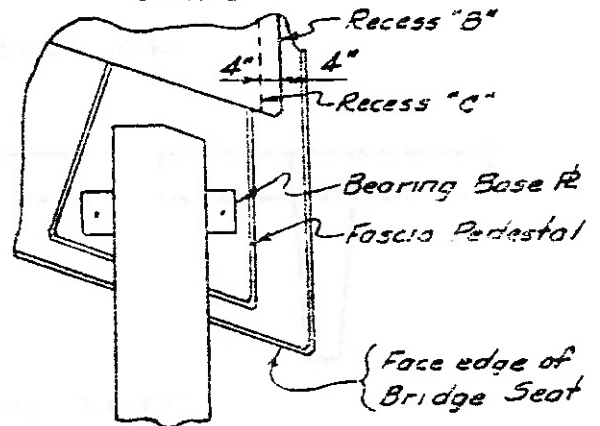
Note:
Dimensions shown are for use as a guide.

SECTION A-A
No Scale



FASCIA PEDESTAL PLAN
No Scale

Note:
For further explanation of these details and additional aesthetic guides see notes thru 7 titled "Special Abutment Details" on page 16.



ALTERNATE FASCIA PEDESTAL PLAN
No Scale

Revised September 1977

21.5 - BRIDGE ESTIMATES

All estimates shall be divided into separate columns for substructure, superstructure and miscellaneous (see Estimate of Quantities Table in Appendix A).

Separate quantity estimates for companion bridges with an open median are to be placed on the plans and separate cost estimates are to be made for each structure. If the structures have a connecting wall, the dividing line for estimating shall be the center line of the median.

Bridges with a closed median are to have one quantity estimate on the plans and one cost estimate.

Every component of a structure shall be identified on the plans by a payment item.

Where more than one type of structural steel is used, a table shall be placed on the estimate sheet listing the various types.

Estimates shall be made for bridges which support utilities in accordance with Article 21.20. The estimate table put on the plans shall 11 show the estimated quantities for both the State and utility shares. In addition, the table shall include a blank column entitled FINAL for field use.

21.5.1 PRELIMINARY COMPARATIVE COST ESTIMATES:

Comparative cost estimates shall generally be based on the latest edition of

New York State
Department of Transportation
Division of Design and Construction
Weighted Average Bid Prices

Generally, the average bid prices for the Region in which the structure is located shall be used for items with the following exceptions:

In estimating structural steel, the Statewide average bid price for this item shall be used as a basis for estimating all structures using the following procedures:

PROCEDURE FOR ADJUSTING STATEWIDE AVERAGE BID PRICES

<u>TYPE OF DESIGN</u>	<u>ADJUSTMENT TO AVERAGE</u>
Rolled Beam Steel (less than 50 ksi)	Deduct 2¢ per pound
A36 Plate Girder Steel	Use Average
A588 Rolled Beam	" "
A441 Plate Girder Steel	Increase 2¢ per pound
A588 Plate Girder Steel	Increase 3¢ per pound

PROCEDURE FOR INCREASING ABOVE ADJUSTMENTS FOR CURVED GIRDERS

<u>RADIUS OF CURVATURE</u>	<u>INCREASE ABOVE ADJUSTMENTS</u>
2000 ft. and Greater	0
Less than 2000 ft to 1500 ft	1/2¢ per pound
Less than 1500 ft to 1000 ft	1¢ per pound
Less than 1000 ft to 500 ft	2¢ per pound
Less than 500 ft*	5¢ per pound

*Note: Flame cutting of flanges to required radius becomes more desirable as flange size increases. This note applies only to radii less than 500 feet.

21.5.2 - BREAKDOWN OF CONCRETE ON CONTRACT PLANS

The following classes will be used for various components of the Structure.

<u>Description</u>	<u>Class</u>
Mass Concrete - Abutments, Solid Piers and Retaining Walls	B
Pier Footings	B
Pier Columns, Caps and Beams	A
Slabs	E
All Pedestals	A
Sidewalks (Superstructure and Substructure)	A
Malls and Abutment Headers	A
Cement Concrete Pavement	C or F
Heavily Reinforced Section (Steel Spacing Less Than 6 inches)	A

In order to facilitate the preparation of field estimates for the various portions of the subject items as they are constructed, the Contract Plans shall clearly state the volume of structural concrete to the nearest hundredth of a cubic yard. The area of surface of the structural slab shall be indicated to the nearest square foot. The weight of reinforcement in each pour shall be indicated to the nearest pound, either on the appropriate plan sheet or as a part of the bar list.

The estimate for each unit, such as an abutment, pier, slab, parapet, curb and sidewalk per span shall be broken down by pours.

For simple spans, each span shall be considered as a unit and the quantities for the concrete and bar reinforcement items indicated for that unit. For continuous beams, each separate pour as indicated in the pouring sequence shall be considered as a unit.

The quantities in the pedestals in any one substructure unit may be listed in the table as the total for all the pedestals instead of listing the quantities in each pedestal.

21.10.3 - CLEARANCES OVER NAVIGABLE WATERWAYS

1. Horizontal and vertical clearances as shown on the Coast Guard Permit Application shall be shown in plan and elevation as noted in 21.9.1, Layout Drawings.
2. Vertical clearances will be shown above maximum navigable water surface for bridges over the Barge Canal, and over mean (ordinary) high water elevation for others.

21.10.4 - WATER ELEVATIONS

Except for the table described in Article 21.10.1, only the following water elevations are to be shown on the plans:

1. Design High Water Elevation for all waterway crossings except where the waterway elevations are completely controlled.
2. Normal pool elevation and maximum navigable water surface for all canal crossings.
3. All water elevations indicated on the Coast Guard Permit. (All elevations are to be shown and identified on the "Elevation A-A" detail of the preliminary plan.)

21.11 - REINFORCED CONCRETE APPROACH SLABS:

All bridges shall be provided with a reinforced concrete approach slab.

(See current BDD Sheets.)

Uncoated bars shall be used in the top mat.

The cover to the top steel shall be 3-1/2 inches, which includes a 1/2-inch construction tolerance.

Revised September 1977

If the approach slab is made continuous with the superstructure slab, use epoxy-coated bars in the top mat. The cover to the top steel shall be 2-1/2 inches which includes a 1/2-inch construction tolerance.

21.12 - Not Used

21.13 - GRANITE CURBS

Granite curbs shall be used on all bridges where curbs are required and should be so shown on the plans.

Granite curbs shall not be used with safety-shape concrete parapets or barriers.

21.14 - SIDEWALKS ON BRIDGES

When required, raised sidewalks shall have a minimum clear width of 5 feet. Sidewalks on or adjacent to walls may be jointly supported on the embankment and walls.

21.15 - DETAILS OF RAILINGS

Complete plan or elevation of railing shall be detailed. These views may be schematic. The location of the railing shall be set by tying in one or more posts to the end of slab or end of wingwall. Location of special posts and rail expansion joints shall be shown.

Revised September 1977

21.16 - BRIDGE DRAINAGE

The spacing of bridge drains shall be based on a 5-minute storm of a 10-year frequency. Bridge drains are to be provided to maintain a maximum puddle width determined by the following conditions:

- a. Maximum puddle width is limited to 12 feet.
- b. Maximum puddle depth is one-half inch less than the curb height.
- c. Lane width clear of puddle must be a minimum of 8 feet.

Recommended design practice for hydraulic computations shall be those of the Federal Highway Administration (FHWA) as published in Circular HEC No. 12, Drainage of Highway Pavements March 1969.

Bridge drains on stream bridges with curbs shall be located midway between diaphragms or crossframes and shall discharge directly into the stream in such a way that no part of the superstructure can be affected.

For bridge drains on bridges over land, horizontal runs of drain pipe shall be avoided whenever a reasonable modification of the design scupper spacing will permit placement of drains adjacent to piers at the low end of spans. Scuppers shall not be discharged on embankments or ungrouted block paved slopes.

Drainage from bridge superstructure or embankments shall not discharge onto or drain across a railroad right-of-way without the approval of the railroad company.

Revised September 1977

21.16.1 - BRIDGES - ENDS

At the ends of all curbed bridges, where curbs are not used on the approaches, granite curbs shall be installed as indicated on the appropriate bridge design data sheet. Sod gutters shall be provided where required for drainage.

On the downgrade end of a curbed bridge, where the computed flow from the high point or nearest bridge drain exceeds the allowable, provide a catch basin located in front of the flared granite curb as shown on the appropriate bridge data sheet. The allowable flow for curbed approaches is based on the puddle width. When there are no curbs on approaches, the allowable is 2 cfs or the flow from the puddle width, whichever is smaller. An 8-inch diameter C.M. pipe shall be used to drain catch basins' down slopes. The size of pipe under the pavement, leading from one catch basin to another, shall be 18-inch diameter pipe.

21.16.2 - BRIDGES - UPGRADE ENDS WITH CURB APPROACHES

At the upgrade end of all bridges, when the approach pavement is curbed, a catch basin located in front of the curb should be provided approximately 10 feet from end of the bridge wingwall or reinforced concrete approach slab, whichever is farther from the bridge, in order to collect the highway drainage before it reaches the bridge. A granite curb shall be used between this point and the bridge.

21.16.3 - DOWNSPOUTS

Except as noted below, all downspouts shall be PVC pipe, and preferably shall be encased in concrete. When encased in concrete, they shall be provided with a one-inch compressible protective covering between the pipe and the concrete to accommodate expansion of the pipe and shrinkage of the concrete.

If downspouts must be exposed, in urban areas, where there is a danger of malicious damage, steel pipe may be used.

Downspouts may be connected to an underground drainage system or outletted approximately one foot above finished grade by using a long radius elbow. Downspouts shall be placed at the least objectionable location and the surface below the outfall shall be protected by the use of a stone, concrete slab, or grouted block paving.

Blank page due to revisions

PROTECTION AND OVERLAYING OF MEMBRANE WATERPROOFING SYSTEM FOR STRUCTURAL SLABS

The bituminous concrete overlay shall be placed on the structural slab preferably within 24 hours, but not later than seven (7) days after the placement of the membrane waterproofing system.

The temperature of the first course of bituminous paving material, at the time of placement, shall not be less than 275°F nor greater than 310°F.

On grades, bituminous paving equipment shall be operated in the "downhill" direction to minimize damage to the membrane waterproofing system.

No vehicular or equipment traffic shall be allowed directly on the membrane. Only that equipment necessary for transporting, placing and compacting the overlay shall be allowed on the membrane waterproofing system following placement of the protective sheet. Bituminous concrete pavers shall be rubber-tired. Vehicles transporting the overlay material shall be rubber-tired and operated at slow speeds (not to exceed 5 mph). All vehicles shall avoid making sharp turns, sudden stops and starts, or other movements on the membrane system that may cause breaks, lifting, or other damage. If vehicle tires cause pick-up of the membrane waterproofing system, small quantities of talc, cement, or powdered limestone may be used to dust the tires.

Any damage to the membrane waterproofing system during the overlay operations shall be repaired immediately and prior to the placement of bituminous concrete. A quantity of repair material shall be kept on hand against such a contingency. No additional payment will be made for any areas that require repairs.

Revised September 1977

PROPOSAL NOTES CONTINUED

Blisters that may rise during the overlay operation shall be vented to insure adhesion of the overlay to the membrane system. The blistered area will be most noticeable during the rolling operation. Venting shall be done by inserting an icepick or other suitable instrument into the affected area. These vent holes need not be repaired.

COMPACTION OF ASPHALT OVERLAYS ON BRIDGE DECKS

Compaction of asphalt overlays within six feet of headers or joints shall be accomplished by using a vibratory roller having a maximum width of 36 inches. The vibratory roller shall be approved by the Deputy Chief Engineer (Technical Services). Application for approval of a vibratory roller shall be made to the DCETS at least 21 days prior to the placement of the overlay. Compaction in accordance with Subsection 401-3.12, Compaction, shall overlap this area and proceed as near as practical to headers or joints.

NOTES TO BE PLACED ON PLANS (DULSEAL)1. GENERAL NOTES:

2. Design Specifications: New York State Department of Transportation. Standard Specifications for Highway Bridges dated April 1, 1976.

Note No. 3 is to be used only for the bridges carrying either the main line of Interstate highways or the Southern Tier Expressway. Otherwise, use Note No. 4.

3. Live Load: HS20-44 or two 24,000 lb. axles spaced 4'-0" on centers.

4. Live Load: HS20-44.

5. Material and Construction Specifications: Standard Specifications, Construction and Materials, New York State Department of Transportation, Design and Construction Division, dated January 2, 1973, with current additions and modifications.

6. The cost of furnishing and placing water used for Select Structure Fill, Item _____, will be paid for under Items _____ and _____ (included in Highway Estimate.)

Note No. 7 is to be used when the aggregate amount of the Bridge share and the Highway share exceeds 500 square yards of SODDING, as defined in Section 612 of the Standard Specifications. The sod area shall be watered at a rate of 5 gallons per yard per application. (Contact Region for number of applications.)

7. The cost of furnishing and placing water used for Sod Gutters will be paid for under Item _____ (included in Bridge Estimate).

Note No. 8 is to be used when the quantity of SOD is less than 500 square yards.

8. The cost of furnishing and placing water used for Sod Gutters shall be included in the Sodding Item.

9. The cost of all joint material will be included in the price bid for the various items of the Contract, unless otherwise specified on the Plans.

10. The Contractor's attention is directed to Subsection 105-09, Work Affecting

NOTES 11, 12 and 13 shall be used when the new structure is replacing an existing structure. The preliminary bridge plans must indicate location on plan or Location Plan.

11. Existing Substructures shall be removed to within the limits shown on the plans under Item _____ in the Bridge Estimate.

12. The existing substructure shall be completely removed within a lateral limit of 3 feet of the new substructure. The portion of the existing substructure which is outside this lateral limit shall be removed to one foot below the finished ground line; unless under a highway where the depth of removal shall be 2 feet.

13. Existing Superstructure shall be removed under Item _____, in the Bridge Estimate.

NOTES TO BE PLACED ON PLANS (DULSEAL) - Continued

20 SUBSTRUCTURE NOTES

- 21 Unsuitable material, including topsoil, shall be removed from beneath substructures placed on fills less than 20 feet in height. The height of fill shall be measured from the original ground surface to the theoretical grade line. Replacement of the removed material shall be done with the item indicated on the Contract Plans.
- 22 All embankments of Select Structure Fill, Item _____ shall be compacted to 100 percent of standard Proctor maximum density as defined under Subsection 203-3.12 - Compaction.
- 23 Where piles are to be placed through the embankment, the embankment shall be compacted to 95 percent of standard Proctor maximum density as defined under Subsection 203-3.12 - Compaction.
- 24 Embankment in Place, Item _____, and Select Structure Fill, Item _____, shall be placed simultaneously, in contact, on both sides of the vertical payment line. Sheeting or other means shall not be used to separate the two materials.
- 25 The installation of Select Structure Fill, Item _____, as shown on the Structural Plans, shall be completed immediately following the completion of abutments or walls.
- 26 Footing elevations may have to be adjusted slightly depending on the elevation of bedrock. Where sound rock is found 2 feet or less below the planned elevations of the bottom of footing, backfill of Class B concrete shall be installed to the bottom of footing elevation shown on the Plans. Backfill concrete may be poured monolithically with the footing concrete. Where sound rock is found more than 2 feet below planned elevations of the bottom of footing, the Deputy Chief Engineer (Structures) shall be so advised and a redesign of the substructure may be made.
- 27 Excavation below planned footing elevation will not be allowed without written permission from the Engineer. Backfill of unauthorized excavations below or beyond payment lines will be at the Contractor's expense. Backfill material will be Class B Concrete unless otherwise directed by the Engineer.
- 28 Rock shall be presplit along the lower roadway in front of and for 50 feet to either side of the abutment footing. This lower roadway excavation work shall be performed prior to any work on the abutment footing excavation proper. In addition, when the bottom of the abutment footing is more than 5 feet below the rock surface, the rock shall be presplit adjacent to the footing as shown on the plans to the required depth. The cost of such presplitting shall be included in the excavation item.

NOTES TO BE PLACED ON PLANS (DULSEAL)- Continued

Revised
September, 1977

- 32 Piles for the existing structure shall be removed where they interfere with the pile driving for the new structure. No extra payment shall be made for the work.
- 33 The Contractor's attention is directed to the very compact nature of the soil described on the subsurface profile drawing in the area to be excavated or retained during construction. The Contractor shall govern his operations and procedures accordingly, within the appropriate specification items, including the selection and possible use of sheeting with sufficient size and section to withstand the expected hard driving.
- 34 Top of backwalls on which Asbestos Sheet Backing (Subsection 728-06) is to be placed shall be steel-trowel finished.
- 35 Bituminous Material, Item _____, shall be applied to the backs of all abutments and wingwalls above top of footings where fill is in contact with the walls.
- 36 Epoxy Protective Coating for Concrete, Item _____, shall be applied to the following surfaces:

ABUTMENTS: All exposed pedestal surfaces, bridge seats, including the area under the bearings, exposed vertical surfaces of backwall, and curtainwalls facing the superstructure.

SOLID PIERS: All pedestal surfaces, including the area under the bearings, and top surface of pier between pedestals, including the edge chamfer at top edge of pier.

PIERS WITH COLUMNS:

Piers under Deck Joints

The entire pier beam and pedestals, including the surfaces under the bearings.

Piers Not under Deck Joints:

All pedestal surfaces, including the area under the bearings and the top surface of pier between pedestals including the edge chamfer at top edge of pier.

NOTES TO BE PLACED ON PLANS (DULSEAL) - Continued

37 The Contractor, with the permission of the Deputy Chief Engineer (Structures) may elect to introduce construction joints in the abutments at locations not shown on the Plans. These construction joints shall be provided with shear keys and waterstops. Vertical construction joints introduced in the backwall should preferably be placed midway between the pedestals.

38 TITLE OF SUBSTRUCTURE UNIT

The compacted embankment shall stand for ____ calendar days prior to any substructure construction. The full waiting period must be observed.

39 TITLE OF SUBSTRUCTURE UNIT

The compacted embankment shall stand for ____ calendar days. No substructure construction shall be allowed until permission is obtained from the Deputy Chief Engineer (Structures). The decision to permit substructure construction will be based on readings obtained from settlement data recorded during the waiting period.

50 SUPERSTRUCTURE NOTES

51 The structural slab for this structure shall be formed using permanent corrugated metal forms for concrete decks. (See details in Proposal.)

52 The structural slab for this structure shall be formed using removable forms.

Note No. 53 is to be used when unpainted self weathering steel is called for over highways and other locations where staining would be objectionable.

53. All exposed concrete shall be covered with polyethylene sheeting or other material approved by the Engineer. The covering shall remain until the completion of the Contract or A. C. B. E. The cost of the covering shall be included in the Structural Concrete Item.

NOTES TO BE PLACED ON PLANS (DULSEAL) - Continued

90 PRESTRESSED CONCRETE NOTES

- 91 The prestressing strands shall be 1/2-inch diameter with a guaranteed ultimate strength of 270 ksi, Jacking force shall be _____ lbs. per strand.
- 92 Required minimum concrete strength at transfer shall be _____ psi.
Required minimum concrete strength at 28 days shall be _____ psi. The allowable tension in the prestressed concrete units at transfer shall be _____ /f'ci psi, at 28 day strength shall be _____ /f'c psi.
- 93 Downward deflection under slab dead load shall not exceed _____
- 94 Downward deflection under slab and superimposed dead load shall not exceed _____
- 95 Upward camber at transfer due to prestress force and beam dead load _____
- 96 All temporary inserts shall be approved by the Deputy Chief Engineer (Structures) and detailed on the prestressed concrete "Working Drawings".
- 97 Bar Reinforcement shall be ASTM A615, Grade 40, unless the Contract Plans indicate Grade 60.
- 98 The tops of prestressed units shall receive a broom finish.
- 99 The transverse tendons shall be 1/2-inch diameter strand with a guaranteed ultimate strength of 270 ksi. The transverse tendons shall be polystrand, galvanized strand or equal, and shall be tensioned to a force of 30,000 lbs.
- 100 All exposed corners, except the top, shall be chamfered 3/4-inch.

NOTES TO BE TYPED IN OFFICE WHEN REQUIRED

201. Stress graded lumber and timber has been designed for the following allowable stresses and the type used must meet these minimum requirements:

Extreme fiber in bending and tension parallel to grain

Compression perpendicular to grain

Modulus of elasticity

202. During the course of construction, the Contractor shall conduct his operations in such a manner to prevent or reduce to a minimum any damage to any stream from pollution by debris, sediment, or other foreign material, or from manipulation of equipment and/or materials in or near such streams. He shall not return directly to a stream any water which has been used for wash purposes or other similar operations which cause this water to become polluted with sand, silt, cement, oil, or other impurities. If he uses water from a stream, he shall construct an intake or temporary dam required to protect and maintain water rights and to sustain fish life downstream.

Note 203 should be used in rare instances since it originated with the use of armored joints. It is now included in Appendix No. 3, page 51, Art. A-3. This note can be used for Pier Nose details, etc.

203. All concrete anchor studs which are attached to the various steel details shall meet the requirements listed in Subsection 709-05, Stud Shear Connectors. Payment for furnishing and placing the concrete anchors will be included in the unit price bid for the item to which the anchors are attached.

SECTION 22 - LOADS

22.1 - DESIGN LOADS ON PLANS

Contract Plans for Structures shall show the design loads, the working stresses used, and the permissible classes of concrete and grades of steel.

Contract Plans shall indicate the assumed dead load and superimposed dead load (including an allowance of 20-lbs/sq-ft for future wearing surface) per foot, and the total reactions at each support.

In addition, for simple span bridges, the maximum dead load, superimposed dead load and maximum live load moment (including impact) shall be shown. For other types of structures, the dead load, superimposed dead load and maximum and minimum live load moments (including impact) and shears at the tenth points of each span shall be shown.

Maximum moments and shears are to be shown in tabular form.

To allow for placement of the concrete shape barrier at some future date, supporting members should be designed to support a dead load of 500-lbs per foot for each barrier.

BLANK PAGE

23.1.4 - HAUNCHES

All steel stringer bridges with monolithic deck slabs shall be provided with a haunch over each stringer, poured monolithically with the slab. The minimum depth of haunch shall be 2 inches as measured at the centerline of web from the top of steel to the theoretical bottom of slab. A deeper minimum haunch may be required when the top flange exceeds 16 inches in width to allow for pavement slope.

For simple span bridges, the depth of the haunch at the centerline of bearings shall be the minimum depth, plus the difference in thickness between the maximum and minimum top flange plates, plus the correct allowance for horizontal curvature.

Haunches on fascia beams of multispan bridges shall be set so that the top of the webs of fascia beams in adjacent spans line up.

23.1.5 - FORMING

The type of form system to be used in the construction of a concrete deck slab shall be indicated on the Contract Drawings.

The selection of the type of form system, whether removable or metal stay-in-place, shall be made by the Project Engineer. This selection shall be based on an evaluation of the project conditions and probable costs. Some of the guideline criteria which should be considered in determining the type of deck forms to be used are as follows:

- A. Accessibility of stringers for forming purposes.
- B. Ease in placing or removing forms.
- C. Difficulties inherent in erection and stripping of removable forms over waterways and railroads.
- D. Risks and safeguards involved in inspection.
- E. When the height of the superstructure is 25 feet or more above ground or water surface, corrugated metal forms shall be used to avoid use of construction nets.

In projects where more than one bridge is to be constructed, the evaluation shall be made on an individual bridge basis.

The form system selected shall be indicated on the structure drawings and the design shall take into consideration any increase in dead load that may occur due to the form system.

It shall be assumed that the weight of the form, plus the additional weight of concrete lying in the corrugations, will amount to sixteen (16) lbs per square foot. Stringers of bridges where stay-in-place forms are specified, shall be so designed that they will not be overstressed due to this additional load.

SECTION 24 - SUBSTRUCTURE AND RETAINING WALLS

24.1 - ROCK LINES

Rock lines shall be shown only where footings are on or in rock or where tubular cast-in-place concrete piles are socketed into the rock.

The rock lines shall be as shown on the "Subsurface Profile Sheet" which is prepared by the Soil Mechanics Bureau. The Subsurface Profile Sheet shall be included in the Contract Plans.

All rock lines shown shall be marked "Assumed Rock Surface" and no elevations of the rock are to be shown on the plans.

When it is planned to place the footings on or in rock, the plans shall show the top-of-footing elevation and the minimum depth of footing. This will enable adjustments to be made in the depth of footing, keeping the top-of-footing elevation constant, where the actual rock line varies from that assumed during design.

Revised September 1977

24.2 - SHEETING AND COFFERDAMS

Payment lines for each item shall be shown on the drawings. Generally, payment lines shall be 3 feet from the edge of the foundation. The upper pay limit for cofferdams (for the purpose of estimating) shall be 2 feet above ordinary water as indicated on the Preliminary Structure Plan.

24.2.1 - PERMANENT OR TEMPORARY SHEET PILING

When sheeting is required to sustain railroad tracks, highways or structures, or when it is apparent that slopes cannot be laid back because of restricted area due to topographic features, right-of-way limitations, or other factors, permanent or temporary sheet piling, as appropriate, shall be specified. The sheeting shall be fully detailed on the plans, showing the size and limits and all necessary waling, bracing and deadmen.

The Soil Mechanics Bureau will establish the safe slope at which the earth may be laid back and this information will be included in the Foundation Design Report (FDR). This safe slope shall be used in determining whether design sheeting is required where there is no surcharge affecting the excavation due to railroad tracks, highways or structures.

24.2.2 - SAFE OPERATION SHEET PILING

When the depth of excavation exceeds 5 feet and design sheeting is not required in accordance with 24.2.1, safe operation sheet piling shall be specified. This allows the Contractor the option of laying back the slopes, or installing sheeting. No design or detailing is required for safe operation sheet piling.

24.2.3 - COFFERDAMS

When the criteria of the Department of Environmental Conservation requires that sheeting be used for cofferdams, Item . , Cofferdams (Water Discharge Control), shall be specified. When there is no such requirement for sheeting, Item , Cofferdams, shall be specified.

Where cofferdams (Item) are required on the water side, but not on the land side of an excavation, the pay line for the cofferdam item shall extend completely around the excavation and shall be shown on the plans in that way.

When it is apparent that sheeting (Item) is not necessary on the land side, the Special Note which allows laying back the slopes shall be placed on the plans.

24.3 - Not Used

24.4 - Not Used

24.5 - EXCAVATION AND BACKFILL AT STRUCTURES

The details and payment lines shall be shown on all Contract Plans and shall conform to the details shown on the applicable BDD Sheet, and as described in the Foundation Design Report.

24.6 - BERMS

A wash of one-inch per foot shall be used on the top of all earth berms (paved or not paved).

24.7 - SLOPE PROTECTION

The preliminary drawing for each bridge shall show the slope protection to be used on slopes under the structure. The slope protection shall extend a minimum of three feet beyond the fascia lines of the structure. The guide lines in Article 24.8 indicate suggested materials for use in particular situations. Other materials may be used when there are special circumstances which warrant them. Approval of the Deputy Chief Engineer (Structures) is required. A Regional Office which prefers slope protection material other than that indicated on the preliminary drawing may so indicate with comments on the drawing. These guidelines may be varied somewhat from Region to Region, depending on Regional preference.

24.8 - GUIDELINES FOR SLOPE PROTECTION

24.8.1 MATERIALS

24.8.1.1 HIGHWAY OVERPASSES

A. Concrete Block Paving

In urban or other developed areas where the lower road has a sidewalk or is otherwise commonly used by pedestrians.

B. Select Granular Fill Slope Protection (Structures)

1. All bridges in rural areas.
2. Bridges in urban areas over controlled access highways or other highways not utilized by pedestrians.

Note: Select granular fill slope protection shall not be placed on the recovery area with 1 on 4 or

Except when piles are used, transverse reinforcement in footings will be provided only where required by design (generally bottom of toe and top of heel).

Hooks are required only where embedment length to develop bars beyond point of maximum moment is not adequate.

Vertical dowels No. 6 or smaller may be straight if depth of footing permits sufficient embedment, i.e., minimum embedment of dowels used to develop tension bars, as shown in the table on pages 81, 82, 83 and 84. Otherwise, dowels may be hooked and/or bent into the toe of the footing to provide toe reinforcement or a portion thereof.

Longitudinal reinforcement in footings shall be No. 5 bars at 2'-0" maximum spacing adjacent to all transverse reinforcement and dowels to form mats, unless a larger area of steel is required by design.

ACI STANDARD HOOKS

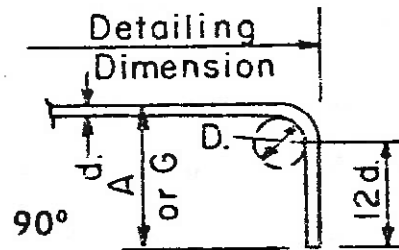
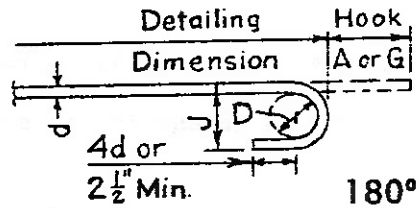
All specific sizes recommended by CRSI below meet requirements of ACI 318-71

RECOMMENDED END HOOKS All Grades

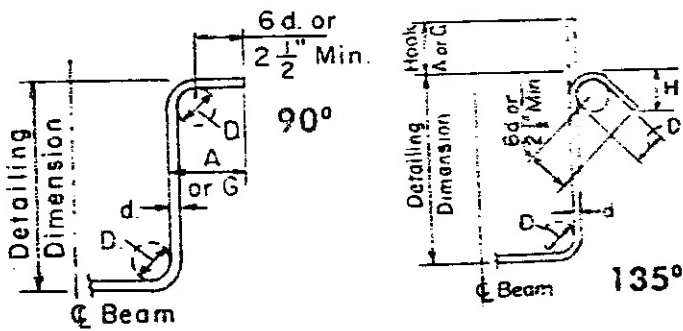
D = 6d for #3 through #8
D = 8d for #9, #10, and #11
D = 10d for #14 and #18

Bar Size	180° HOOKS*		90° HOOKS
	A or G	J	A' or G'
#3	5	3	6
#4	6	4	8
#5	7	5	10
#6	8	6	1-0
#7	10	7	1-2
#8	11	8	1-4
#9	1-3	1 1/4	1-7
#10	1-5	1-0 3/4	1-10
#11	1-7	1-2 1/4	2-0
#14	2-2	1-8 1/2	2-7
#18	2-11	2-3	3-5

*With Grade 40 only, where available depth is limited, bars may be bent with D = 5d for #3 through #11.



STIRRUP AND TIE HOOKS



STIRRUPS (TIES SIMILAR)

STIRRUP AND TIE HOOK DIMENSIONS Grades 40-50-60 ksi

Bar Size	D (in.)	90° Hook		135° Hook	
		Hook A or G	Hook A or G	H Approx.	
#3	1 1/2	4	4	2 1/2	
#4	2	4 1/2	4 1/2	3	
#5	2 1/2	6	5 1/2	3 3/4	

25.2 - SPACING

Except as noted in Sections 24.11, the clear distance between parallel bars shall not be more than 24 inches, nor less than 1-1/2 times the nominal diameter of the bars, 1-1/2 times the maximum size of the coarse aggregate, nor 1-1/2 inch.

Where reinforcement in beams or girders is placed in two or more layers, the bars in the upper layers shall be placed directly above those in the bottom layer.

The clear distance between bars shall also apply to the clear distance between the contact splice and adjacent splices or bars.

Structural Deck Slabs on Beams or Stringers:

- Top of slab with separate wearing surface 1-1/2 in.
- Top of slab with integral wearing surface 2-1/2 in.*
- Bottom of slab 1 in.
- Beams and columns 2 in.
- Walls and piers above footings (including those 2 in.
adjacent to water)
- Footings (including unformed bottom). This may 3 in.
be increased to accommodate piles when necessary

* Cover based on use of coated bars in top mat.

Face of culverts in contact with earth	2 in.
Bottom of bottom slab of culvert	3 in.
Bottom of top slab of culverts and low rise rigid frames	1- $\frac{1}{2}$ in.
Arches, introdos and extrados.	2 in.
Precast and cast-in-place piles.	2 in.
Precast piles exposed to sea water	3 in.
All other surfaces exposed to sea water.	4 in.
Top of sidewalk slabs.	1- $\frac{1}{2}$ in.
Pedestal	2 in.

25.4 MAXIMUM BAR LENGTHS

Most Reinforcing Bar Plants in the United States produce bars in a standard length of 60 feet. Therefore, our plans should not include any straight bars or bent bars with a projected length in excess of 60 feet.

A. Uncoated Reinforcing Bars in Deck Slabs.

1. Top bars 30 feet or less in projected length may be hooked at both ends.
2. Bottom bars, which will be straight, may be up to 60 feet long.
3. Due to fabrication shop limitations, there is a sizable cost extra for bars over 30 feet long with hooks on both ends.

Therefore, if the projected length of a hooked top bar exceeds 30 feet, it shall be replaced with two spliced bars, each with a hook on one end.

- a. When top bars are spliced, the splices shall be staggered such that not more than 50 percent of the bars are spliced at one location. The splices shall be located midway between girders.

- b. When it is necessary to splice bottom bars, the splices shall also be staggered but shall be located directly over girders.

B. Epoxy-Coated Top Bars in Deck Slabs:

1. For transverse bars under 60-feet long, provide a straight bar with hook bars on each end. The splice between the hook bars and the straight bar shall be located midway between the fascia and first interior stringers.
2. For transverse bars over 60-feet long: The above statement (B.1.) is to be followed and an additional splice will be required in the straight bar midway between interior stringers. These splices shall be staggered.

C. Reinforcing Bars in Pier Caps:

1. Straight bars may be up to 60 feet long.
2. In spite of the cost extra described above, due to the small number of bars involved and the clearance and spacing requirements, hooked bars may have a projected length of up to 60 feet. However, consideration should be given to the total weight of each bar for ease of handling in the fabrication shop and in the field. In some cases, it may be more economical to limit the length of a hooked bar to 30 feet and avoid the cost extra for bending.
 - a. When it is necessary to splice top bars, the splices shall be staggered so that no more than 50 percent of the bars are spliced at one location. These splices shall be located in areas of low negative moment to minimize splice lengths.

Revised September 1977

- b. When it is necessary to splice bottom bars, the splices shall also be staggered, but shall be located directly over columns.
- c. When pier cap bars are spliced, these splices shall be attained by lapping the bars in a vertical plane so that the bars will be in the proper position for attachment to stirrups. To accommodate this type of splice, where more than one layer of reinforcement is required, it may be necessary to increase the distance between the layers of reinforcement.

25.5 - SPLICING VERTICAL REINFORCEMENT IN WALLS

For bar sizes 5, 6, and 7, splices between main vertical reinforcement and the reinforcement emerging from the footing may be made directly over the footing. In some cases, it may be practical to eliminate splices by extending the bars emerging from the footing to the top of wall. No. 8 and larger bars emerging from the footing shall be extended to a distance above the footing where bars of smaller diameter may be spliced to them. The lap length required for such splices shall be based on the smaller bar.

25.6 - MARKING OF BARS

Bars shall be marked consecutively, beginning with the number one (1), through each structural unit. A structural unit, such as an abutment, includes all concrete subdivisions (abutment footing, abutment stem, wing-wall footing, wingwall stem, etc.) which together comprise the entire unit. In the bar list, structural units are to be identified by a general heading, e.g., South Abutment. Appropriate subheadings shall also precede the listing of bars in each subdivision, e.g., Southeast Wingwall Stem. When a subdivision is still further divided into more than one pour, the listing of bars in each pour shall also be preceded by appropriate identification, e.g., Abutment Stem, Pour 1. A typical bar marking might be 9A20.

When certain bars are to be epoxy coated or galvanized, the letters E or G, respectively, shall follow the structural unit letter in the bar mark. An epoxy-coated slab bar, for example, might be marked SSE4.

When a bar is embedded in two or more subdivisions (such as a dowel), the subheading under which the bar is listed shall be the subdivision in which the bar is initially embedded.

In applying the bar marks where two or more structure units are involved, such as two or more similar abutments, piers, spans, etc., it is desirable that the same bar marks be applied to bars in similar locations in the structure unit. The fact that two bars lying in different structure units may have the same bar mark but have different lengths, or they may have the same length but have different sizes, or any combination of these factors will not be confusing to the fabricator due to our practice of providing a separate bar list, properly titled, for each structure unit.

Any deviation from the above system of marking bars must have the approval of the Deputy Chief Engineer (Structures).

For varying length bars, give minimum, maximum and average lengths and number of sets of bars.

25.7 - TIED COLUMNS

1. Vertical Reinforcement: Vertical reinforcement shall consist of at least four No. 5 bars or larger, placed at the corners of the section.
2. Lateral Ties: Continuous ties shall surround the vertical reinforcement. Ties shall be not less than No. 4 bars and shall be spaced not more than 12 inches apart. Adequate auxiliary ties shall be provided to support intermediate vertical bars whose distance from any tied bar exceeds 2 feet.

BLANK PAGE

SECTION 26 - PRESTRESSED CONCRETE

26.1 - Design

Draped strands are not to be used unless absolutely necessary.

The following design sequence shall be followed in selecting a beam section.

- a. Straight strands, $f'_c = 5000$ psi
- b. Straight strands, $f'_c = 6000$ psi
- c. Draped strands, $f'_c = 5000$ psi
- d. Draped strands, $f'_c = 6000$ psi

Allowable tension: $3 \sqrt{f'_c}$, unless a higher value is accepted by the Deputy Chief Engineer (Structures) (DCES).

NOTE: For box beams, the thickness of the top flange at the ends may be increased to avoid draped strands.

NOTE: On box beams, do not use double strands in each web unless absolutely necessary.

26.2 - CAMBER

A beam camber chart shall appear on the plans. The chart shall include entries for the camber at prestress transfer and final camber (after losses) due to prestress force and beam dead load. The chart shall also include entries for the following deflections: Noncomposite dead loads, superimposed dead loads and live load.

26.3 - DIAPHRAGMS

26.3.1 - Box Beams

Internal diaphragms for voided boxes shall be placed normal to the length of the box beam.

Internal diaphragms or spreaders within the precast box beams shall be placed at midspan for spans up to 50 ft.; at quarter points for spans over 50 ft.

26.3.2 I-Beams

I-Beam structures shall have end diaphragms.

Diaphragms shall be placed parallel to the skew.

Spacing of Diaphragms

- a. No intermediate diaphragms on spans up to 40 feet.
- b. Midspan diaphragms for spans greater than 40 feet and up to 80 feet.
- c. Diaphragms at the third points for spans greater than 80 feet.

26.4 - TRANSVERSE TENDONS FOR BOX BEAMS

Transverse tendons shall be placed parallel to the skew.

Spacing of transverse tendons.

- a. No transverse tendon on spans up to 50 feet.
- b. Transverse tendon at the center for spans greater than 50 feet and up to 75 feet.
- c. Transverse tendons at the outer quarter points on spans greater than 75 feet.

26.5 - WIDTH OF BOX BEAMS:

Widths of box beams shall be detailed as 4'-0" to 3'-0". The beam deck shall consist of (1) multiples of 4'-0" beams, or (2) multiples of 3'-0" beams, or (3) as a combination of 4'-0" beams and a minimum number of 3'-0" beams. The beam deck shall be selected in the order listed. The overall beam deck width shall be the sum of the nominal beam widths plus 1/2 inch per joint, e.g. (to be shown on plans).

11 beams @ 4'-0" nominal = 44'-5".

26.6 - CONCRETE SLAB FOR BOX BEAMS:

A concrete slab on prestressed concrete box beams shall be a minimum of 6 inches thick (normally at centerline of span) and shall be made composite with the beams. It shall be placed under the Monolithic Slab, Item 601.0302.

For simple spans, and the positive moment regions of continuous span, the slab shall be reinforced with fabric reinforcement. This reinforcement shall have zero gauge wires at 6-inch center-to-center in both transverse and longitudinal directions. Fabric reinforcement shall be paid for under Item _____. The wire gauge and spacing shall be shown on the plans. At splices, the fabric shall be lapped 1'-0". Fabric reinforcement shall be placed to provide a clear cover of 3-1/4 inches and the top 2-1/4 inches of the slab shall not be considered in the design.

In the negative moment regions of slabs which are continuous over piers or abutments, epoxy-coated bars shall be used in conjunction with the prestressed concrete beams to develop the negative moment. These bars shall be extended from the pier or abutment to provide initial development beyond the tension zone of the slab and shall be placed to provide a clear cover of 2-1/2 inches.

Revised September 1977

26.7 - MISCELLANEOUS:

On box beams, transverse tendons shall be placed as close to the mid-depth of the section as possible.

The area of transverse tendon anchor plate shall be at least 20 square feet.

Box beams shall not be used when the skew angle is greater than 30° unless it is allowed by the Deputy Chief Engineer (Structures).

Make sure on box beam structures that the transverse tendon void is all beams and the transverse tendon blockout on the bascia beams do not interfere with the longitudinal prestressing strand and bar reinforcement.

Unless prohibited by the nature of the foundation material, all multispan box beam and I-beam structures shall be designed for continuity under live load. A constant depth of section is preferable for all spans.

Bearing pads shall be placed perpendicular to the longitudinal axis of the beams.

27.6 - DESIGNATION OF TENSION ZONES

For other than simple spans, the Contract Plans shall clearly indicate the limits of the flanges of all stringers which are subject to tensile stresses. This shall be done to facilitate radiographic inspection and the control of welding during fabrication and erection. This requirement shall apply to reconstruction projects, which require new deck slabs, as well as to new structures.

27.7 - COMBINATION OF DIFFERENT TYPES OF STRUCTURAL STEEL

In general, when more than one type of steel, such as A36, A572 or A588 is used in one contract, the types used shall be clearly described in the plans. The payment for furnishing and placing these steels shall be made under the current structural steel item.

A table shall be placed on the plans, adjacent to the estimate table, indicating the neat quantities of each type of steel.

27.8 - CAMBER

A. Simple Spans: The Contract Plans shall show the design cambers for structural steel, concrete and superimposed dead load, vertical curve and total dead load, plus vertical curve at the centerpoint of each stringer for spans under 125 feet and at quarter points for spans over 125 feet.

B. Continuous and Cantilever Spans. The Contract Plans shall show the design cambers for structural steel, concrete and superimposed dead load, vertical curve and total dead load, plus vertical curve at inflection points and at

tenth point of spans.

- C. Sag Cambers. Because of the objectional appearance of a sag camber in a stringer, sag or negative cambers should be avoided. The following are a few guidelines on possible means of avoiding the necessity of having to call for a negative camber in a stringer: (1) Avoid sag vertical curves on bridges. (2) Never begin or end a superelevation transition or runoff in the middle of a span. Always begin or end transitions off the structure or, if this is impossible, begin or end the transition at a centerline of bearings or a centerline of pier. (3) Never place a sag camber in a straight stringer on a curved roadway in order to accommodate the variation in the theoretical bottom of slab elevations. The variation should be taken up in the haunch. (4) In the case of a continuous girder where the spans are enough unequal to cause some area of upward dead load deflection, thought should be given to specifying less than the full negative camber calculated to offset all of the anticipated upward deflection. This is suggested because of the possibility of not all of the negative camber coming out of the girder upon the application of the dead load, thereby leaving an objectionable sag in the girder.

27.19 - BOTTOM LATERAL CONNECTION PLATES

For curved girders, the bottom strut of diaphragms at centerline of bearings shall be connected to the web as shown for end diaphragm details on
BDD -30.

Lateral diagonals shall be connected to the flange with separate plates for each diagonal. Lateral connection plates shall be located such that they will not interfere with downhand welding of the flange to the bearing.

Added September 1977

B L A N K P A G E