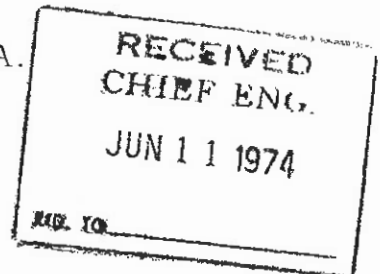


<p>TO:</p> <p>George W. McAlpin Chief Engineer Bldg. 5 Room 401</p> <p>SUPERSEDED BY EI 77-031 EFFECTIVE 5/1/1977</p>	<p align="center">ENGINEERING INSTRUCTION</p> <p align="center">NEW YORK STATE DEPARTMENT OF TRANSPORTATION</p> <p>SUBJECT: STANDARD DETAILS FOR HIGHWAY BRIDGES, REVISION TO</p> <p>Subject Code: 7.35-11</p>
<p>Distribution:</p> <p><input type="checkbox"/> Main Office <input type="checkbox"/> Regions <input checked="" type="checkbox"/> Special</p>	<p align="right"><i>Sup 77.50</i></p> <p>Code: <u>EI 74-36</u></p> <p>Date: <u>4/22/74</u></p> <p>Supersedes:</p>
<p>APPROVED:</p> <p align="center"><i>R. N. Kemp</i></p> <p align="center">Deputy Chief Engineer (Structures)</p>	

The attached pages are revisions to Standard Details for Highway Bridges and should be inserted in your manual immediately:

- Page 17 - Paragraphs 1, 2 and 3 - Revised. Page rewritten.
- Page 18 - Page rewritten due to revision on page 17.
- Page 19 - Page rewritten due to revision on page 17.
- Page 20 - Page rewritten due to revision on page 17.
- Page 21 - Page added due to revision on page 17.
Back of Page 21 is blank.
- Page 22 - Revised. New page number. Replaces old page 20A.
Back of Page 22 is blank.
- Page 22A - ESTIMATE OF QUANTITIES. Revised.
- Page 25 - Section 21.9.1 Revised.
- Page 26 - No change.
- Page 49 - G1 - Revised date from 1973 to 1969.
G2 - Revised.
B4 - Revised - Note added.
Page 49 rewritten.
- Page 50 - G7 - Revised (Page rewritten due to revisions on Pages 49 and 50).
- Page 59 - No change.
- Page 60 - SUB-1E - Revised.
- Page 77 - Paragraph 2 - Revised by adding parenthesis.
Paragraph 3, line 2 - Revised by deleting "and minimum".
Back of Page 77 is blank. Could be Page 78 if needed.
- Page 79 - Paragraphs 1 and 2 - Revised
- Page 80 - Table Revised.
- Page 85 - No change.
- Page 86 - Section 24.3 - Spelling corrected.
Section 24.4 - Revised.
- Page 95 - No change.
- Page 96 - Subdivision - Following changes required, so markings agree with new BAR LIST.
B - Bottom of Slab (Highway Approach Slab Only) - Deleted.
C - Sidewalk - Deleted.
D - Diaphragms - Added.



Manual	Code	Date	Page
Subject: STANDARD DETAILS FOR HIGHWAY BRIDGES, REVISION TO			

- P - Pedestals. Added "and Piles".
- S - Shaft. Deleted "Use also for Cast-in-Place Piles".
- T - Top of Slab (Highway Approach Slab Only) - Deleted.
- Page 99 - Last line on page - deleted.
- Page 100- Spacing of Diaphragms - Deleted and new paragraph added.
Section 26. 3. 2. - No change.
Section 26. 4 - Covers new section title and details.
- Page 101- Sections 26. 5, 26. 6 and 28. 7 - Renumbered.
Were formerly 26. 4, 26. 5 and 26. 6 respectively.
- Page 102- Added, due to revisions and rewriting pages 100 and 101.
- Page 105- Third line - Revised.
- Page 106- No change.
- Page 119- New page added. Back of page is blank.
- Page 119A - TENSION ZONES - Added.
- Page 120- New page added. Back of page is blank.
- Page 120A - BAR LIST WITH DIAGRAMS - Added.
- Page 120B- BARLIST - Added.

21.5 BRIDGE ESTIMATES:

All estimates shall be divided into separate columns for substructure, superstructure and miscellaneous. (See Estimate of Quantities table following page 22).

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.

For all bridges which support utilities, breakdown estimates may be required. Refer to Section 21.20. The estimate table put on the plans shall show the neat and proposed 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 ITEMS ON CONTRACT PLANS

The following items will be used for various components of the structure and will be so indicated on the Contract Plans:

<u>Description</u>	<u>1962 Item No.</u>	<u>1973 Item No.</u>
Mass. Concrete - Abutments, Solid Piers and Retaining Walls	20	601.02
Pier Footings	20	601.02
Pier Columns, Caps and Beams	18	601.01
Structural Slabs	18	601.01
Monolithic Slabs	18MB	601.03
All Pedestals	18	601.01
Sidewalks (superstructure and sub- structure)	18	601.01
Malls and abutment headers	18	601.01
Cement concrete pavement	47B	502.02
Cement concrete approach slab	18	601.01
Cast-in-place concrete piles	85C	629.07
Heavily reinforced section (steel spacing less than 6 inches)	18	601.01

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 Class A and B 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.

21.5.3 ESTIMATE OF QUANTITIES TABLE

The Estimate of Quantities Table shown on the plans shall have three columns for tabulating the quantities for each item. The three columns shall be entitled "Neat," "Proposal" and "Final."

The "Neat" quantity shall be the quantity obtained directly from the estimate computations.

The "Proposal" quantity is the quantity that shall be used by the Contractor in making his bid computations.

The "Final" quantities shall be left blank on the plans. The quantities shall be filled in by the Regional Office on the "As-Built Plans" at the completion of the Contract.

Rounding of the "Neat" quantity to obtain the "Proposal" quantity should be made to the next highest unit of ten to facilitate extensions, except when the estimated quantity is small or not subject to change.

For the item of Class A Concrete for Structures (Monolithic Bridge Slab with Integral Wearing Surfaces), the neat quantity and the proposal quantity shown on the Contract Plans shall be identical.

To estimate the volume of water required for sod, use the value of 20 gallons per square yard. The number computed in M/Gals shall be placed in the neat and proposal columns of the Bridge Estimate of Quantities.

The raw estimated total quantity for the Structural Steel Item shall be increased 3 percent and then rounded off to no more than four significant figures to obtain the "Neat" quantity. This rounding of 3 percent is to take care of paint, welding, bolts and rivets.

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The following figure illustrates an example of a "Table of Quantities." The number of items will be dependent on the Contract. It may be necessary to revise the item numbers to agree with current specifications.

ESTIMATE OF QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	SUBSTR.		SUPER.		MISC.		TOTALS		FINAL
			NEAT		NEAT		NEAT		NEAT	PROPOSAL	
203.21	Select Structure Fill	C.Y.					489		489		490
206.01	Structure Excavation	C.Y.	1,215						1,215		1,220
601.01	Class A Concrete for Structures	C.Y.	198		18		151		367		370
601.02	Class B Concrete for Structures	C.Y.	689						689		690
601.0301	Class A Concrete for Structures (Monolithic Slab - Bottom Formwork Required)	S.F.			24,443				24,443		24,443
601.04	Class B Concrete for Structures Deposited Under Water	C.Y.	178						178		180
602.02	Bar Reinforcement for Structures	Lb.	84,154		224,079		27,855		340,088		340,090
602.03	Stud Shear Connectors for Bridges	Ea.			3,618				3,618		3,618
603.0701	Perforated Corrugated Steel Pipe	LF					162		162		170
605.11	Underdrain Filters Type C @ Structures	C.Y.					74		74		80
609.0301	Stone Curb (Bridge Type)	LF			1,595				1,595		1,595
612.01	Sodding	S.Y.					96		96		100
615.03	Watering Plants and Sod	M.6066					2		2		2
616.01	Structural Steel	Lb.			1,45,300				1,45,300		1,45,300
617.02	Split Face Concrete Masonry	S.F.	1,059						1,059		1,060
620.09	Concrete Block Paving	S.Y.					113		113		120
621.01	Epoxy Protective Coating	S.Y.			125				125		130
622.01	Bituminous Material	S.F.	2,093						2,093		2,100
15628.0501	Safe Operation Sheet Piling	S.F.	1,713						1,713		1,720
636.31	Bridge Bearing, Type CEI (Expansion with PTFE)	Ea.			10				10		10
636.32	Bridge Bearing, Type CF (Fixed with PTFE)	Ea.			5				5		5
642.10	Steel Bridge Rolling (Two Rail)	L.F.			1,453				1,453		1,453
15653.23	Elastomeric Expansion Joint System, Type 200	L.F.			50				50		50
15653.32	Elastomeric Expansion Joint System, Type 650	LF			50				50		50
635.01	Cleaning and Priming New Structural Steel	L.S.									Nec.
635.02	Painting New Structural Steel	L.S.									Nec.

* Items marked with an asterisk are those items necessary for the construction of the Approach Pavement.
 † Items marked with an arrow are those items listed out of numerical sequence.

The designer will please note that this sheet has been prepared to show the desired system for presenting the estimate breakdown and should not be used as an example of item numbers and description.

DATE MADE.....
 PROJECT ENGINEER.....
 IN CHARGE OF.....
 DESIGNED BY.....
 DESIGN CHECKED BY.....
 DETAILED BY.....
 DETAIL CHECKED BY.....

Revised April 1974

Canal Bridges, and Structures over Streams and Navigable Waters, shall be shown and the point to which these minimum clearances prevail shall be indicated on plan and elevation. A location plan shall be shown on the layout drawing to a scale of 1" = 2000'.

21.9.2 SUBSURFACE PROFILE DRAWINGS

The subsurface profile drawings prepared by the Soils Subdivision shall be reviewed, but no changes whatsoever may be made which would alter the location, description, or classification of soil layers, borings, or general notes and symbols pertaining thereto. Any change affecting the existing soil conditions must be made by the Bureau of Soil Mechanics.

Changes affecting the depicting of the structure only may be made by the design squad. Such changes must be reported by the squad boss to the Soils Bureau, and, if requested, a copy of the changed drawing must be made available to Soils in order that they may update their original drawing. Changes in final footing elevations may be reported via telephone unless they are too complex or numerous to be clearly understood.

21.10 WATERWAY CROSSINGS

21.10.1 HYDRAULIC DATA

The layout sheet in the Contract Plans for any bridge crossing a waterway shall contain the following information:

1. Design Discharge C.F.S.
2. Frequency of Flood of Record (e.g., 50-year Design Flood)
3. Design Water Elevation
4. Drainage Area - square miles.

21.10.2 CLEARANCES (General)

1. Whenever possible, a minimum vertical clearance of two feet above design water shall be provided at all stream crossings. A 3-foot minimum underclearance may be required by the Corps of Engineers for waterway crossings where a flood control project is involved.

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 elevations 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.
3. For Intrastate waterways not under the jurisdiction of the Coast Guard and for navigable waterways in the advance approval category, clearances shall be determined by the preliminary plan unit.

21.10.4 WATER ELEVATIONS

Only the following water elevations are to be shown on the Plans:

1. Design Water Elevation for all waterway crossings except where the waterway elevations are completely controlled.
2. Normal pool elevation and maximum navigable water surface shall be given for all canal crossings.
3. All water elevations indicated on the Coast Guard Permit will be shown on the Plans.

21. 21. 2 - GENERAL NOTES: (To be placed on Plans.)

G1 Design Specifications: Current New York State Department of Transportation Standard Specifications for Highway Bridges and 1969 American Welding Society, modified.

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

Note: The latter loading is to be noted only for the bridges carrying either the main line of Interstate highways or the Southern Tier Expressway.

G2 Material and Construction Specifications: Specifications of New York State Department of Transportation dated January 2, 1973, with current additions and modifications.

G3 The cost of furnishing and placing water used for selected granular fill will be paid for under Item 203.15 and 203.16 of the highway portion of the Contract.

G4 The cost of furnishing and placing water used for sod gutters will be paid for under Item 615.03 included in the bridge estimate.

NOTE: The quantity of sodding of 500 square yards given on page 355 of the Standard Specifications is based on an aggregate amount, which includes both the Highway and Bridge shares. The quantity of sodding in the Highway share should be checked with the Regional Office and if the aggregate amount of the Bridge share and the Highway share does not

exceed 500 square yards, the cost of watering the sod should be included in the sodding item which is 612.01. The sodded areas shall be watered at a rate of 5 gallons per square yard.

G5 The cost of all joint material will be included in the price bid for the various items of the Contract, except as otherwise specified.

G6 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

G7 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.

Revised January 1974

21.21.4 - SUBSTRUCTURE NOTES

SUB 1-A - All sod, topsoil and unsuitable material under the substructure embankment shall be removed as specified under Section 203, Excavation and Embankment, and replaced by the same item as the layer of embankment adjacent and above as shown on the plans.

SUB 1-B - All embankments of Select Structure Fill,

Item 203.21 shall be compacted to a minimum dry density of 100 percent of Maximum Density as defined under Subsection 203-3.12 - Compaction,

(Use the paragraph below if applicable.)

However, where piles are to be placed through the embankment, a minimum dry density of 90 percent of the Maximum Density will be required.

SUB 1-C - The Contractor shall place and compact all fill for bridges between the final toes of slope in accordance with the plans and specifications in a manner satisfactory to the Deputy Chief Engineer (Structures).

Use one of the following applicable paragraphs..

1. The embankment constructed to the required grade shall be allowed to stand a maximum of _____ days or for a period of time as determined by the Deputy Chief Engineer (Structures) prior to any substructure construction.
2. The embankment shall be allowed to stand for a period of time satisfactory to the Deputy Chief Engineer (Structures) prior to any substructure construction.

SUB 1-D. Items 203.03 and 203.21 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.

SUB 1-E. The installation of Select Structure Fill, Item 203.21, as shown on the structural plans, shall be completed immediately following the completion of abutments or walls.

SUB 1-F. ALL FOOTINGS ON ROCK: All disintegrated or shattered material shall be removed to the lines and levels ordered by the Engineer. Where sound rock is found two feet or less below the planned levels of the bottom of the footing, backfill of Class B Concrete shall be installed to the levels shown on the plans. Where sound rock is found to be more than two feet below the planned

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.

SECTION 23 - DECK SLABS

23.1 - CONCRETE DECK SLABS

Structural concrete deck slabs shall have a monolithic wearing surface and shall have a minimum thickness of $9\frac{1}{4}$ inches. The top one inch of the concrete shall be neglected in the design. The covers on the top steel shall be $3\frac{1}{4}$ inches and on the bottom steel, one inch.

The wearing surface shall be placed under the Monolithic Slab item (601.0301 or 601.0302), if there are other structures in the project. For single structures, the wearing surface shall be paid for under the Bridge Concrete Pavement item (502.02).

23.2 - REINFORCEMENT IN DECK SLABS

For skews up to and including 30° , the reinforcement shall be placed parallel to the skew. For skews over 30° , the reinforcement shall be placed normal to the beams or girders.

Design span is defined as the distance between stringers less one-half the width of the top flange, these distances being measured along the longitudinal axis of the bar.

Longitudinal reinforcement on top of slab and bottom of slab outside the middle half of the bay shall be No. 5 bars at 1' - 6" centers, except that no steel need be placed in the bottom of the slab over supporting members.

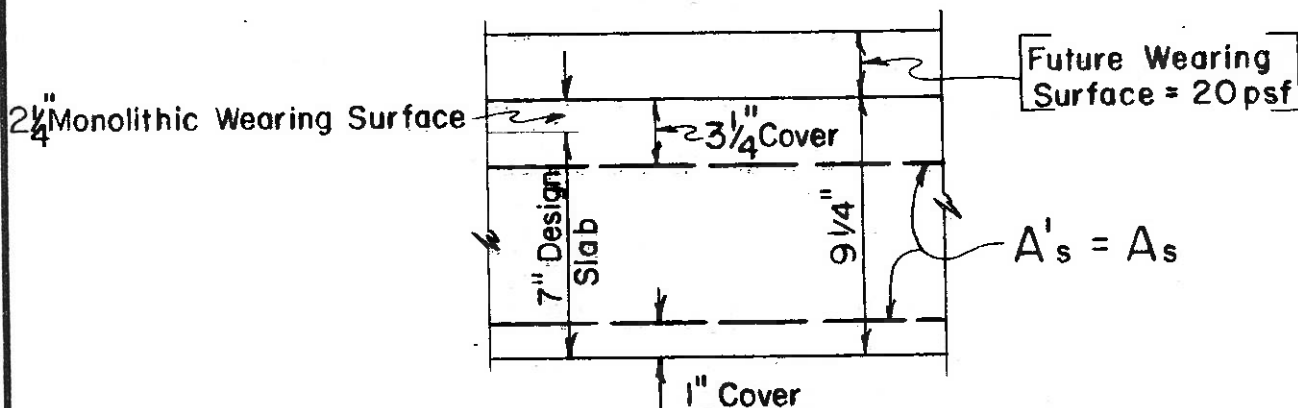
SLAB DESIGN TABLE

CONCRETE REINFORCEMENT ASTM A615 GRADE 60

$f_s = 24,000$ psi

$f_c = 1200$ psi

$n = 10$



BAR SIZE AND SPACING	MAXIMUM DESIGN SPAN		MAXIMUM OVERHANG	
	BARS \perp TRAFFIC	BARS \parallel TRAFFIC	TYPES I, II, III, VII SECTIONS	TYPES IV & VI SECTIONS
#6 @ 5"	10'-3"	7'-7"	4'-0"	3'-9"
#6 @ 5 1/4"	10'-1"	7'-5"	3'-11"	3'-8"
#6 @ 5 1/2"	9'-10"	7'-3"	3'-11"	3'-8"
#6 @ 5 3/4"	9'-8"	7'-2"	3'-10"	3'-7"
#6 @ 6"	9'-6"	7'-0"	3'-10"	3'-7"
#6 @ 6 1/4"	9'-4"	6'-10"	3'-9"	3'-6"
#6 @ 6 1/2"	9'-2"	6'-9"	3'-9"	3'-6"
#5 @ 5"	9'-1"	6'-8"	3'-9"	3'-6"
#5 @ 5 1/4"	8'-10"	6'-6"	3'-8"	3'-5"
#5 @ 5 1/2"	8'-8"	6'-5"	3'-8"	3'-5"
#5 @ 5 3/4"	8'-5"	6'-2"	3'-7"	3'-4"
#5 @ 6"	8'-1"	6'-0"	3'-6"	3'-4"
#5 @ 6 1/4"	7'-9"	5'-9"	3'-6"	3'-3"
#5 @ 6 1/2"	7'-6"	5'-6"	3'-5"	3'-3"
#5 @ 6 3/4"	7'-2"	5'-4"	3'-4"	3'-2"
#5 @ 7"	6'-11"	5'-2"	3'-4"	3'-2"
#5 @ 7 1/4"	6'-9"	5'-0"	3'-4"	3'-1"
#5 @ 7 1/2"	6'-6"	4'-10"	3'-3"	3'-1"
#4 @ 5"	6'-4"	4'-9"	3'-3"	3'-1"

TYPES I, II, III, IV, VI & VII SECTIONS ARE SHOWN ON BDD 73-70.

MAXIMUM OVERHANG SHALL BE MEASURED FROM CENTER LINE OF WEB OF FASCIA STRINGER.

REINFORCEMENT PLACED ON A SKEW SHALL HAVE ITS \perp SPACING REDUCED BY THE COSINE SQUARED OF THE SKEW ANGLE.

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.

24.2 - SHEETING AND COFFERDAMS:

Payment lines for each item shall be as shown on the applicable BDD and BR Sheets and as called for in the specification for the item. Sheeting used to sustain railroad tracks, highways, or structures shall be fully detailed, showing the size and limits of the sheeting and all necessary waling, bracing and deadmen.

Where cofferdams are required on the water side, but not on the land side, use the cofferdam item all the way around.

24.3 - COFFERDAMS (WATER DISCHARGE CONTROL)

Item 628.07 is to be used only when the criteria of the Department of Environmental Conservation require that sheeting be used for cofferdams.

24.4 - SAFE OPERATION SHEET PILING

Safe Operation Sheet Piling shall be used when the depth of excavation exceeds five feet and the Department has no reason to prefer a specific type of sheeting or sheeting detail. Payment lines for this item shall be as shown on the applicable BDD Sheet and as called for in the specification for this item (This item number is subject to change. Check Final Plan Review for current number to use).

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). Refer to Standard Sheet 61-106.

24.7 - SLOPE PROTECTION

The preliminary drawing for each bridge over a highway shall show concrete block paving, six-inch poured slab, or other slope protection, to be used on all fill side slopes under the structure. The slope protection shall extend a minimum of three feet beyond the fascia lines of the structure.

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	1-1/2 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	1-1/2 in.
Pedestal	2 in.

25.4 - MAXIMUM BAR LENGTHS

Maximum bar lengths shall be 60 feet.

25.5 - SPLICING

Long vertical bars should preferably be spliced to dowels with the vertical bar resting on the top of the footing.

Vertically in the upper portion of walls, No. 5 bars at a maximum of 2'-0" spacing may be lapped to back reinforcement when design permits.

Maximum projection of footing dowels above top of footing is limited to 5'-1" maximum.

25.6 - MARKING OF BARS

The following letters shall be used to identify the various structure units, subdivisions and locations or functions in that order. Wingwalls which are usually attached to abutments shall be considered as part of the

abutment. When a bar is embedded in two or more subdivisions (such as a dowel) the bar mark shall be controlled by the subdivisions in which it is initially embedded.

STRUCTURE UNIT

- A - Abutment
- B - Culvert
- F - Foundation Pile
- H - Highway Approach Slab
- P - Pier
- R - Rigid Frame
Arch
- S - Superstructure
- W - Wall (Isolated)

SUBDIVISION

- A - Apron of Culvert (Including Cut-Off Wall)
- B - Backwall
Beam
Bottom Slab or Culvert (Including Cut-Off Wall)
- C - Column
Curb
Safety Walk
- D - Diaphragms (With concrete beams)
- E - Extrados
- F - Footing
- H - Header
- I - Intrados
- P - Parapet
Pedestals and Piles
- S - Shaft
Sidewalk
Slab
Stem
Plinth
- T - Top Slab of Culvert (Including Headwall)
- W - Wingwall above Footing

LOCATION OR FUNCTION

- D - Diagonal
- H - Horizontal
- L - Longitudinal
- S - Stirrups
Ties
- T - Transverse
- V - Vertical

SECTION 26 - PRESTRESSED CONCRETE

26.1 - DESIGN

Draped strands are not to be used unless absolutely necessary.

In selecting a beam section, the following design sequence shall be followed:

- 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).

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

Design camber shall appear on the plans. It shall include the initial camber due to prestress force and beam dead load, and the camber due to prestress force, beam dead load and slab dead load. Camber for vertical curve correction shall be provided for in the thickness of the wearing surface.

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" or 3'-0". The beam deck shall consist of (1) multiples of 4'-0" beams, or (2) multiples of 3'-0" beams, or (3) 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" per joint.

E.G. (to be shown on plans)

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

26.6 - CONCRETE SLAB FOR BOX BEAMS

Concrete slab on prestressed concrete box beams shall be a minimum of 4 inches thick and made composite with the beams by the use of epoxy bonding compounds.

The wearing surface shall be placed under the Monolithic Slab item if there are other structures in the project. For single structures, the wearing surface shall be paid for under the Bridge Concrete Payment item. Fabric reinforcement shall be referenced to Standard Sheets and shall be lapped 1'-0".

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 inches.

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 in all beams and the transverse tendon blockout on the fascia 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, see Appendix C. This shall be done to facilitate radiographic inspection and the control of welding during fabrication and erection.

27.7 COMBINATION OF DIFFERENT TYPES OF STRUCTURAL STEEL

In general, when more than one type of steel, such as A36, A441 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.

See Appendix A on page 113 for an example of a camber table for a continuous girder.

- 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.

Added April 1974.

APPENDIX C

Example of Tension Zones to be
Indicated on the Plans
(Refer to Section 27.6)

Added April 1974.

APPENDIX D

Example of Bar List With Diagrams
and Bar List

FED. REG. NO.	STATE	FEDERAL AND PROJECT NO.	SHEET NO.	TOTAL SHEETS
	NEW YORK			
CAPITAL PROJECT IDENTIFICATION NO.				

1 of 70

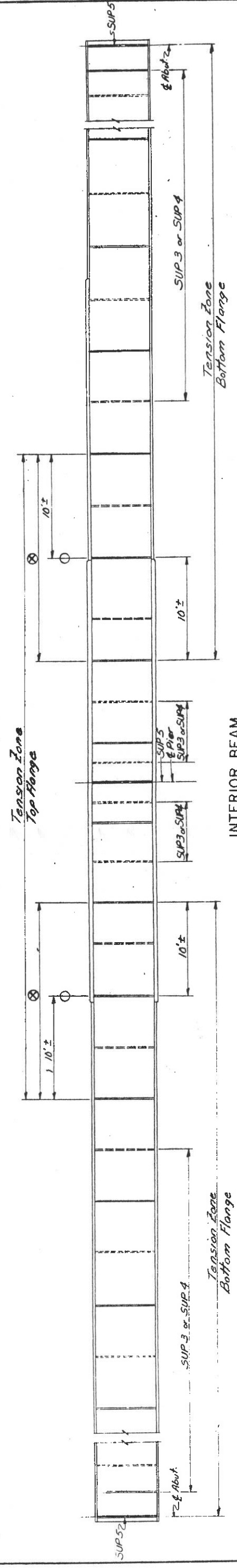
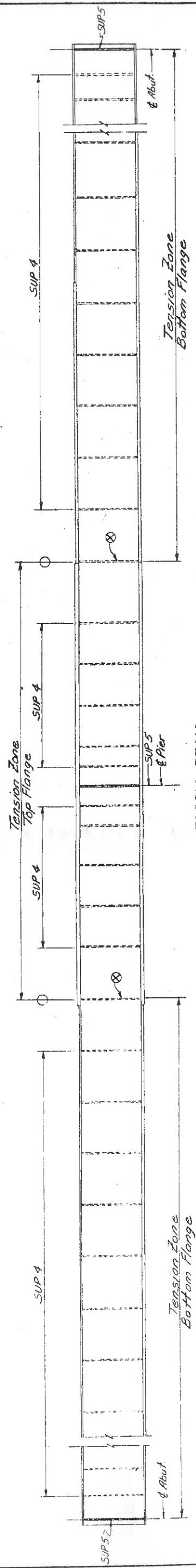
T Denotes Point of Dead Load Contraflexure.

⊗ Denotes Fitted stiffeners & fitted connection plates. Stiffeners and connection plates shall be cut to fit and shall not be driven in place with sufficient force to distort the flange, web, stiffener or connection plate. Stiffeners and connection plates shall be welded to the web and placed point tight against both flanges.

SUP3 Denotes procedure for attaching connection plates.

SUP4 Denotes procedure for attaching stiffeners one side or staggered.

SUP5 Denotes procedure for attaching bearing stiffeners.



Note: The Point of D.L. Contraflexure may not be at a stiffener or connection plate.

NOTE TO CONTRACTOR:
WITHIN THE TENSION ZONES DELINEATED THERE SHALL BE NO CUTTING, WELDING PERMITTED ON THE PLATES, NAILS DETAILLED ON THE ATTACHMENT OF FORMS, TIES, ETC. SHALL NOT BE PERMITTED.

DATE MADE	PROJECT ENGINEER
DESIGNED BY	DESIGN CHECKED BY
DETAILED BY	DETAIL CHECKED BY

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
TENSION ZONES

