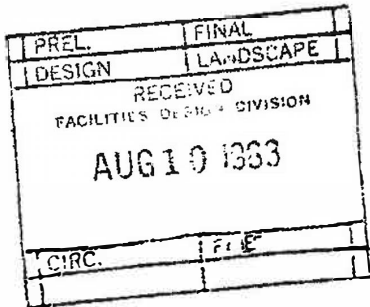


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TO: SUPERSEDED BY EB 97-020 EFFECTIVE 4/4/97		ENGINEERING INSTRUCTION NEW YORK STATE DEPARTMENT OF TRANSPORTATION	
		SUBJECT: CHANGES AND ADDITIONS TO STANDARD DETAILS FOR HIGHWAY BRIDGES	
		Subject Code: 7.35- 4	
Distribution: <input type="checkbox"/> Main Office <input type="checkbox"/> Regions 28 <input checked="" type="checkbox"/> Special		Code: EI 83-30	
APPROVED: <u>J. J. Hourigan</u>		Date: 8/8/83	
		Supersedes:	

Attached herewith are pages to replace pages in the Detail Manual.

- page 26-28 Art. 21.10 thru 21.10.4
These articles have been changed to reflect new office policies.
- page 56 Notes changed to reflect optional forming systems
- page 59 Notes changed to agree with new prestressed office policies
- page 100 changed to reflect new office policies



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 Soil Mechanics Bureau shall be reviewed, but no changes whatsoever may be made which would alter the location, borings, or general notes and symbols pertaining thereto. Any change affecting the existing soil conditions must be made by the Soil Mechanics Bureau.

Changes affecting only the depicting of the structure may be made by the Design Unit. Such changes must be reported by the Project Engineer, through the Foundation Construction Unit, to the Soil Mechanics Bureau and, if requested, a copy of the changed drawing must be made available to the Soil Mechanics Bureau in order that they may update their original drawing. Changes in final footing elevations shall be reported to the Foundation Construction Unit if they exceed the difference permitted in the Foundation Design Report.

21.10 WATERWAY CROSSINGS

21.10.1 HYDRAULIC DATA

- The Preliminary Structure Plan for bridges spanning waterways shall generally contain the following tabular information:

<u>HYDRAULIC DATA</u>			
Drainage Area =	Sq. mil.	Basic Flood	Design Flood
Recurrancy Interval	(yrs)	100	50
Peak Discharge	(c.f.s.)		
High Water Elevation @	Existing		
Pt. of Max. Backwater	Proposed		
Avg. Velocity thru structure @ Design Flood =			f.p.s.

- If reliable information pertaining to the flood of record is available which indicates that it exceeded the basic flood, the Preliminary Structure Plan shall also include the peak discharge, high water elevation and date of occurrence of that flood of record.

- The table and flood of record data shall generally also appear on the Final Contract Plans.

- But the tabular information and flood of record data will not generally be required for those structures for which a traditional hydraulic design is unnecessary, such as structures over deep gorges, or over fully controlled navigable waterways, or over tidal waters or over still waters.

21.10.2 FREEBOARD

1. Freeboard is defined as the vertical clearance measured between the superstructure of a stream bridge and the surface of the waterway below.

2. The Minimum Freeboard of any structure is generally calculated for the design flood and defined as that absolute minimum vertical clearance that occurs anyplace beneath the bridge. It is usually located beneath the upstream fascia stringer of the bridge at a point where that stringer is lowest in relation to the water surface elevation. However, the actual location of the point of minimum freeboard may be influenced by large skew angles, or severe superelevation, or flat stream gradients. It may be necessary to investigate several locations before the absolute minimum freeboard can be determined for any particular structure.

3. Minimum Allowable Freeboard is that vertical clearance which has been determined to be acceptable at a particular stream bridge, for a particular flow, usually the design flood. The final bridge design must satisfy the minimum allowable freeboard requirement.

21.10.3 - ALLOWABLE CLEARANCES

1. Except at flood control projects, any structure that provides a minimum freeboard of two feet for the design flood shall be considered as satisfying normal hydraulic clearance requirements to protect against substantial reduction in waterway opening due to clogging at the structure by drift, debris, or ice. When a minimum freeboard of two feet or more is provided, no special investigation of potential debris clogging problems need be made.

2. However, where that two foot minimum freeboard is difficult or costly to provide, an analysis and evaluation should be accomplished to determine whether a minimum allowable freeboard of less than two feet may be appropriate. Items to be investigated may include (but should not be limited to) the following:
 - a. History of debris clogging at the existing and/or adjacent structures.
 - b. Any changed in water surface elevations caused by the proposed structure.
 - c. Characteristics of the underside of the proposed structure that might impede debris.
 - d. Recommendations by the Regional Office.
 - e. Consequence of debris clogging:

1. Potential damage to the structure or highway.
 2. Potential damage to the upstream community.
 3. Potential effect on vehicular or pedestrian traffic.
- f. The degree of difficulty or the amount of extra cost necessary to provide the full two foot freeboard.
3. In an extreme situation, negative freeboard could be accepted as permissible for a replacement of an existing bridge that is already inundated by the design flood, but in no case shall the proposed negative freeboard exceed the existing negative freeboard.
 4. To protect the Department against potential damage claims, no freeboard less than two feet shall be permitted at a bridge replacement project unless the proposed bridge will provide: greater waterway opening than the existing bridge and unless the proposed minimum allowable freeboard for the design flood will exceed the existing minimum freeboard. Similarly, no freeboard less than two feet shall be permitted at a new bridge on new location, unless careful studies and analyses indicate that the potential advantages outweigh the potential risks.
 5. In the case of a bridge spanning a waterway greater than 300 feet wide, it is permissible that the minimum allowable freeboard can be reduced below two feet, regardless of other considerations, at one or both edges of the waterway, if the average freeboard over the full width of the waterway exceeds two feet.

6. It is important to understand that other than at flood control projects; there is no absolute minimum freeboard requirement or standard which must be met to satisfy a specification or regulation. Whatever minimum allowable freeboard is finally chosen by the hydraulic designer, in accordance with accepted practice and application of the relevant recommendations and instructions contained in this Article, should be considered as meeting all State requirements and standards.
7. Flood control projects, whether in service or under design or still in planning, usually require a minimum freeboard of three feet, or as determined by the Corps of Engineers. That requirement must be met.
8. A summary of the analysis and evaluation, and the final determination of minimum allowable freeboard, shall be entered into the hydraulic design folder for the permanent record.
9. The minimum allowable freeboard finally selected shall be indicated on the Preliminary Structure Plan, on the Elevation View, or in some other conspicuous convenient location. The Preliminary Structure Plan shall also include an "Available depth of beam" dimension, derived from the minimum allowable freeboard and other parameters. After final structural design, the contract plans should indicate the actual minimum freeboard, and its location.

21.10.4 - HYDRAULIC DETAILS

1. The Preliminary Structure Plan and the Final Contract Plans shall generally indicate the Design High Water Elevation at the Bridge (usually in the Elevation A-A detail) and shall generally show the Minimum Allowable Freeboard that has been selected as appropriate for that particular structure (usually in the same detail). This information is not required where a traditional hydraulic design is unnecessary.

2. When channel realignment or improvement is proposed, the Preliminary Structure Plan and the Final Contract Plan shall generally indicate the width of bottom angle and the elevation and/or profile that controls that bottom angle. The specific configuration and location of the proposed channel should also be shown, as well as the existing stream bed. The Preliminary Plan may indicate an exact span length and bearing station.

3. When no channel realignment nor improvement, other than bank modification, is proposed, the Preliminary Structure Plan should indicate and locate the theoretical bottom angle, with appropriate elevation and/or plan views, unless an exact span length is shown, with a specific & bearing station for one or both abutments. When modifications of the existing stream banks are necessary or unavoidable, sufficient information should be shown on the Preliminary

Structure Plan to allow the final designer to properly detail and estimate the Stream Bank Protection item. The final Contract Plans should not indicate the theoretical bottom angle.

4. The PLAN detail should also indicate the direction of stream flow, the name of the waterway, and the location of the edges of the stream at ordinary water stage, or at the time of survey.
5. For canal crossings, the Preliminary Structure Plan and the Final Contract Plans must indicate the normal pool elevation and the maximum navigable water surface elevation. The required vertical and horizontal clearances should also be shown.
6. For bridges requiring Coast Guard Bridge Permits, the preliminary and final plans must indicate all the water elevations and channel clearances shown on the coast guard permit application.

21.11 - REINFORCED CONCRETE APPROACH SLABS

- A. Bridges on new location and bridges being replaced on existing location shall generally have a 40 foot Reinforced Concrete Approach Slab. The primary function of a Reinforced Concrete Approach Slab is to prevent pavement failure adjacent to the bridge by spanning any settlement of abutment backfill which may occur. In some cases modification of the 40 foot approach slab length may be justified. Such justification should be brought to the attention of the Deputy Chief Engineer (Structures) for approval. Uncoated bars shall be used in the top mat.

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

B. Bridges being reconstructed, including removal of a portion or all of the backwall, shall be treated on an individual basis using the following guidelines:

1. No Existing Approach Slab

The minimum length of approach slab shall be 1 1/2 times the depth of abutment backfill plus 5 feet, or the length of U Type wingwalls, whichever is greater.

2. Existing Approach Slab

A determination of the condition of the existing approach slab shall be made by the bridge inspection team. Core samples may be ordered if deemed necessary by the inspectors.

- a. Approach slab in good condition-remove and replace that portion of the slab closest to the bridge in a length sufficient to span the new backfill and provide at least 5 feet of bearing on undisturbed subgrade. Wingwall configurations and other geometric features of the bridge may override the above basic criterion.
- b. Approach slab in poor condition-remove and replace the entire slab. In some cases, when approach highway reconstruction will be included in the same contract, it may be economical to replace a length of approach slab shorter than that removed in accordance with foregoing criteria.

NOTES TO BE PLACED ON PLANS (DULSEAL) - Continued

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.

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. Where outlets are shown in abutments and walls the outlet shall be covered by a 2 foot by 2 foot square of bedding filter fabric from the Department's approved list of Plastic Filter Fabric (Bedding), centered over the rearface of the outlet. The fabric shall be securely attached in a manner approved by the engineer. The cost of the fabric shall be included in the price bid for the Underdrain Filter, Type I item.

50. SUPERSTRUCTURE NOTES

51. The Contractors attention is directed to the provisions of the Structural Slab Concrete (Optional Forming Systems) item, which allow the option of 3 deck forming systems.

However, if the designers believes that one or more of the form options is inappropriate for a given bridge, and obtains approval from the Deputy Chief Engineers (Structures), the following shall be added to Note 51:

However, on this bridge, only the following option(s) will be permitted: (list the option(s).)

Note No. 52 is to be used when A588 steel is used, whether painted or not.

52. Cleaning Faying Surfaces at Bolted Connections (A588 Steel)

Faying surfaces of high strength bolted splices and all other high strength bolted connections shall be blast cleaned to remove all dirt, grease, paint, mill scale and other foreign material prior to assembly. The cleaned surfaces shall meet the preparation standards of ASTM D2200, SSPC-VIS1 grades, BSA2, or CSA2, as applicable, which represent a standard referred to as commercial blast cleaning. The cost of this cleaning shall be included in the price bid for the structural steel items(s).

53. Cleaning Controlled Oxidizing Structural Steel

A. In the Fabrication Shop

The outside surface of the fascial stringers shall be cleaned of all dirt, grease, paint, mill scale or other foreign material prior to shipping. The purpose of the cleaning is to produce fascia surfaces which will weather uniformly.

B. In the Field

The outside surface of the fascia stringers shall be cleaned so that all dirt, grease, paint or other foreign material is removed at the completion of the bridge construction. The purpose of the cleaning is to return the fascia surfaces to the condition in which they left the fabrication shop.

The cost of cleaning this steel in the fabrication shop and the field shall be included in the price bid for the various items in the contract.

54. Painting New Bridges

One of the following special notes shall be included with the superstructure for all steel bridges.

"The structural steel for this bridge shall not be painted."

or

"The structural steel for this bridge shall be completely painted with color paint."

or

"The structural steel for this bridge shall be partially painted with color paint. The following portions of the fascia girder shall be painted: the outside face of the web and the exposed or outside portion of the top and bottom flange including the bottom of the flange."

RECONSTRUCTION NOTES

90. PRESTRESSED CONCRETE NOTES

91. The prestressing strands shall be 1/2-inch diameter with a guaranteed ultimate strength of 270 ksi.

Jacking force = lbs. per strand.

92. Required minimum concrete strength at transfer = psi.

Required minimum concrete strength at 28 days = psi.

The allowable tension in the prestressed concrete units at transfer = f'_{ci} psi, at 28 day strength = f'_{c} psi.

93. Downward deflection under dead load (slab) = in.

94. Downward deflection under dead load (superimposed) = in.

95. Upward camber at transfer due to prestress force and beam dead load =
in.

96. Upward camber after all losses due to prestress force and beam dead
load = in.

97. All temporary inserts shall be approved by the Deputy Chief Engineer (Structures) and detailed on the prestressed concrete "Working Drawings".
98. Bar reinforcement shall be ASTM A615, Grade 40 or Grade 50, unless Contract Plans indicate Grade 60.
Minimum concrete cover to mild steel shall be 1".
99. The tops of prestressed units shall receive a transverse stiff broom finish.
100. All exposed corners, except the top, shall be chamfered 3/4-inch.
101. 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.

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.

SECTION 26 - PRESTRESSED CONCRETE

26.1 - DESIGN:

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

- a. Straight strands, $f'c = 5,000$ psi
- b. Straight strands, $f'c = 6,000$ psi
- c. Unbonded strands, $f'c = 5,000$ psi
- d. Unbonded strands, $f'c = 6,000$ psi

Design beams for a tension of $3 f'c$, unless a higher value is allowed by the Deputy Chief Engineer (Structures) and then as close to $3 f'c$ as possible.

Draped strands are to be used only when unbonded strand design is not possible.

Do not drape strands in slab beams.

Do not use unbonded strands in solid slab (12" depth) beams.

For assistance in design of unbonded strands, contact the Concrete Engineering Unit.

Do not use double rows of strands in the web of box beams unless absolutely necessary and then only with an increased web width.

Avoid the use of center strands in box and slab beams.

The Load Fraction for Multi-Beam Precast Concrete Beams shall be taken as the lesser of the following: (1) Load Fraction as determined by 1.3.ID or (2) 0.67 for 4'-0" wide beams and 0.50 for 3'-0" wide beams. No. (2) shall be in effect as long as the structure has a reinforced concrete slab.

All multi-span box, slab, and I-beam structures shall be designed for continuity under live load using the PCA Engineering Bulletin EB014.01E titled "Design of Continuous Highway Bridges with Precast, Prestressed Concrete Girders," unless prohibited by the nature of the foundation material.

26.2 - WIDTH - BOX BEAMS, SLAB BEAMS and ADJACENT BEAM SUPERSTRUCTURE

Widths of beams shall be detailed as 4'-0" or 3'-0". The beam deck shall consist of (1) multiples of 4'-0" beams, or (2) as a combination of 4'-0" beams and some number of 3'-0" beams, or (3) multiples 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 1/2 inch allowance per joint, e.g. (to be shown on plans.):

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

26.3 - CAMBER:

Beam camber information shall appear on the plans. The information shall include the camber at prestress transfer and final camber (after losses) due to prestress force and beam dead load. The following deflections shall also be included on the plans: Noncomposite dead loads and superimposed dead loads.

NOTE: The beam shall be designed so the arithmetic addition of the final beam camber due to prestress force and beam dead load

and the deflections due to noncomposite dead load and superimposed dead load results in a positive (upward) camber.

26.4 - DIAPHRAGMS:

26.4.1 - BOX AND SLAB BEAMS:

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

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

26.4.2 - 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.

26.5 - TRANSVERSE TENDONS FOR BOX AND SLAB BEAMS:

Transverse tendons shall be placed parallel to the skew.

Spacing of Traverse 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.

For box and slab beams, transverse tendons shall be placed as close to the middepth of the section as possible.

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

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

26.6 - CONCRETE SLAB FOR BOX AND SLAB BEAMS:

A concrete slab on prestressed concrete 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 No. .

For simple spans, and the positive moment regions of continuous span, the slab shall be reinforced with fabric reinforcement. The fabric reinforcement shall be 6 X 6 - W7.5 X W7.5 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", but cut at splice locations where more than

two sheets of fabric would be spliced at the same point. Splices shall be limited to only two layers. 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.

All concrete slab reinforcement shall be tied to the exposed reinforcement in the tops of beams as necessary to assure proper placement.

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 point where the fabric reinforcement in the slab can provide the required reinforcement. The bars shall be placed to provide a clear cover of 2-1/2 inches.

On phase construction projects, particular care shall be taken so that, due to long-term camber growth on Phase II beams, the required minimum slab thickness can be achieved.

26.7 - MISCELLANEOUS:

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

A constant depth of section is preferable for all spans.

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

SECTION 27 - STRUCTURAL STEEL

27.1 - THICKNESS OF METAL:

27.1.1 - MINIMUM THICKNESS OF METAL:

Structural steel (including bracing, cross frames and all types of gusset plates), except for webs of certain rolled shapes, fillers and in railings, shall be not less than 5/16 inches in thickness. The web thickness of rolled beams, channels, or structural tees shall not be less than 0.23 inches.

Where the metal will be exposed to marked corrosive influences, it shall be increased in thickness or specially protected against corrosion.

It should be noted that there are other provisions in this section pertaining to thickness for fillers, segments of compression members, gusset plates, etc. As stated above, fillers need not be 5/16 inches minimum.

For stiffeners and other plates, refer to "Plate Girders."

For compression members, refer to "Trusses."

27.1.2 - OUTSTANDING LEGS OF ANGLES:

The widths of outstanding legs of angles in compression (except where reinforced by plates) shall not exceed the following:

In main members carrying axial stress, 12 times the thickness.

In bracing and other secondary members, 16 times the thickness.

For other limitations, see Article 1.7.39.

27.2 - COPES FOR FRAMED CONNECTIONS:

When the top or bottom end of a beam is coped for a depth of six (6) inches or more, a flange plate of the same width and thickness of the adjacent flanges shall be welded to the coped