TO:
Main Office
and
Regional Offices

SUPERSEDED BY EI 79-055
EFFECTIVE 12/5/1979

ENGINEERING INSTRUCTION

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

SUBJECT: BRIDGE DESIGN DATA SHEETS, 77-30, 77-31, and 77-32

Subject Code: 7.35-2-30-31-32

Distribution: [G] Main Office [G] Regions [ ] Special

APPROVED: E. V. Hourigan
Deputy Chief Engineer, Structures

Code: EI 77-4

Date: 1/17/77

Supersedes:
EI 72-091 DATE 9/5/72

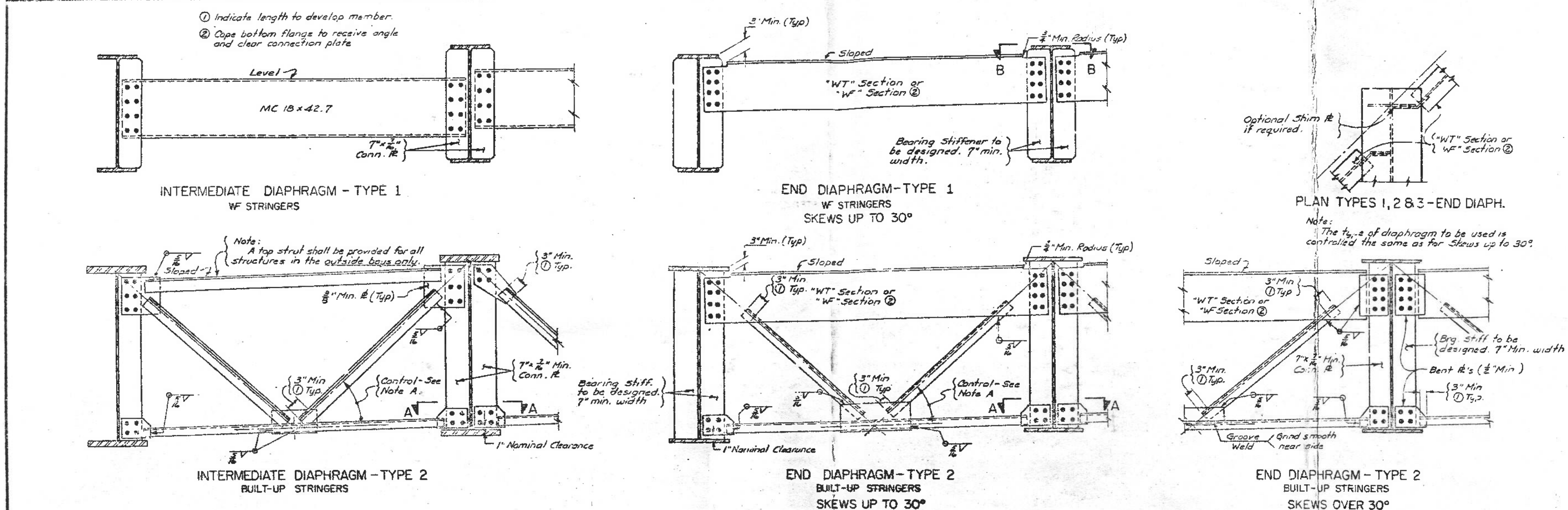
Attached are copies of the subject BDD's sheets for distribution to your personnel.

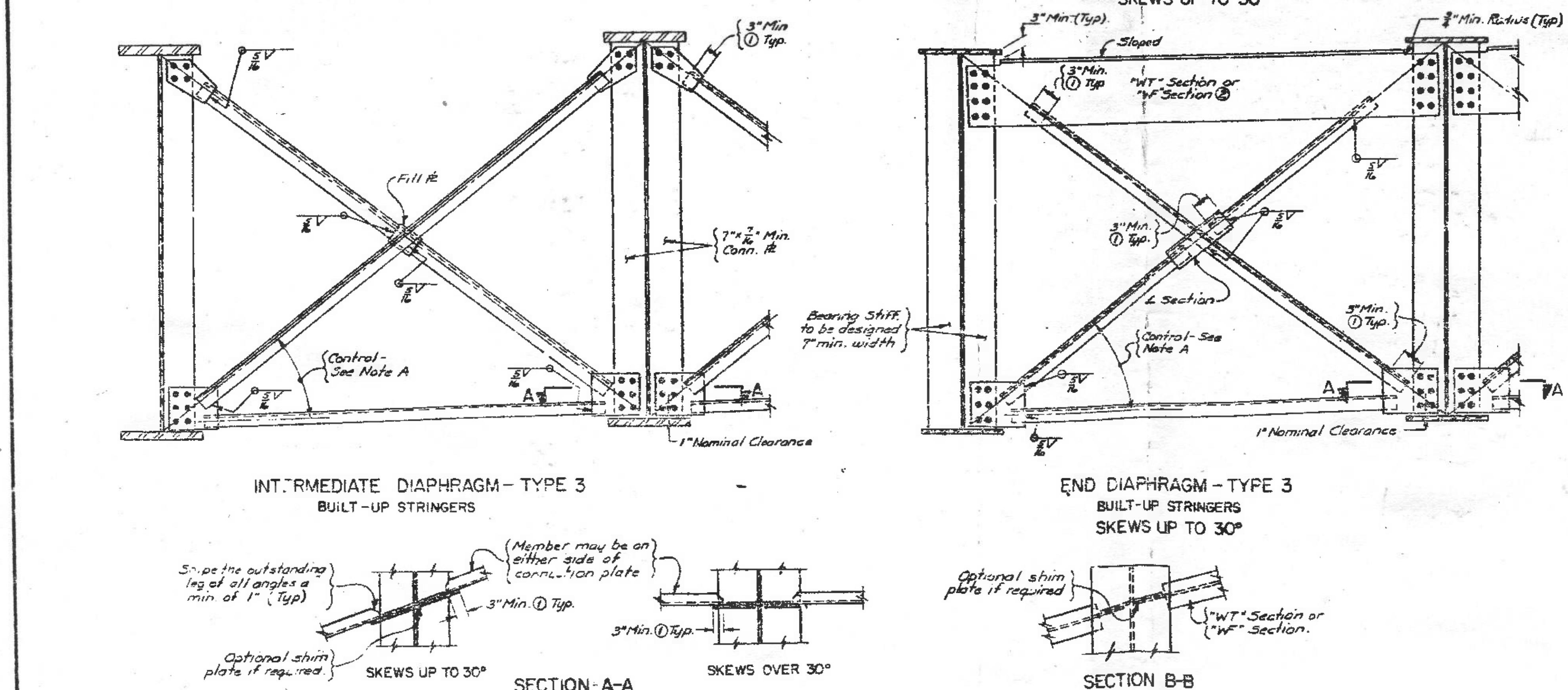
The principal change is in the end diaphram details. The center of gravity of the diagonals has been moved from the center of gravity of the bolt group to the intersection of the center line of web and the top flange.

The 1'-3" dimension from the top of slab to the top of the Tee or W section has been removed.

The notes have been re-edited and additional notes added.

These sheets shall be effective immediately and shall also be used on structures already detailed, if the changes can be made without extensive revisions.





NOTES TO BE PLACED ON PLANS:

1. Where holes are indicated, connections shall be 7/8" diameter high-strength bolts.
2. The following note shall be placed on the plans as applicable: "Cross frames may be fabricated to fit the girders in their erected position and cambered shape, but deflected vertically under the dead load of the steel work only."
3. The Contractor may place diaphragms on either side of the bearing stiffeners or stiffener connection plates as necessary to correct alignment provided there will be no interference with other structural details.
4. Snipe the outstanding leg of all angles and plates 1" minimum.
5. Tapered or flat shim plates may be used in the connection between skewed diaphragms and the bearing stiffeners or stiffener connection plates. Variable thicknesses of shim plates may be used. The minimum thickness of shim plate shall be 1/8" with a maximum number of three shim plates permitted at any connection. The total [illegible]kness of all shim plates used at any connection shall not exceed 1". Shim plates shall have the dimensions of the fa[illegible]ing surface. The shim material shall conform to ASTM Designation A36, except that on unpainted structures, the shim material shall conform to ASTM Designation A588. No additional payment will be made for furnishing and placing the shim plates.

NOTES TO THE DESIGNER:

A. This angle shall be approximately 45°. The type of diaphragm to be used will be controlled by this angle. Use the type in which this angle is the nearest to 45°. It may be necessary to use a "W" shape in place of the "V" shape in the Type 2 Diaphragm in some cases where the frame is shallow. The details of the "W" shape will be similar to the details shown.
B. The "WT" section shown at end diaphragm is typical for most end diaphragms. The designer's attention, however, is directed to the fact that an alternate shape is permitted. This detail appears on Sheet BDD 75-60A.
C. The designer's attention is directed to the fact that the use and location of an inspection handrail is not shown on this sheet. The location of the handrail may require revisions to the details shown for connecting the "WT" section or WF section to the stiffener connection plates.
D. The details shown on this sheet are primarily drawn to show typical diaphragms and their connection to the stringers. An attempt shall be made to detail all end diaphragms parallel to the skew. Bearing stiffeners for skews of 30° and under should be [illegible] parallel to the skew. Bearing stiffeners for skews over 30° should be placed at right angles using a bent plate to make the connection.
E. The designer's attention is directed to the fact that the details shown on this sheet are to be used as a guide only. They [illegible] be revised if dictated by other factors such as the angle indicated in Note A, location of utilities. The principles of intersection of working lines and method of connections shall be followed as much as possible.
F. Minimum thickness of rolled sections and plates shall be as shown in the New York State Department of Transportation Standard Specifications for Highway Bridges, unless otherwise indicated.
G. In plan all intermediate diaphragms shall be placed as follows:
   For skews 30° and under place in line and parallel to skew
   For skews over 30° with parallel stringers place in line and perpendicular to stringers
   For skews over 30° with flared stringers place in line and perpendicular to stringer closest to center of group
   When depth of web is 42" or less the Type 1 diaphragm may be used in lieu of Types 2 and 3 for the intermediate or end diaphragms or built-up stringers.
H. Size of all members and their connections shall be determined by stress requirements and Minimum L/r for compression.
J. If a longitudinal joint in the slab is shown and intermediate diaphragms are indicated under the joint, only one side of these diaphragms shall be connected when erected. After both halves of slab are poured and set to the satisfaction of the Engineer the other side of the diaphragms shall be connected.

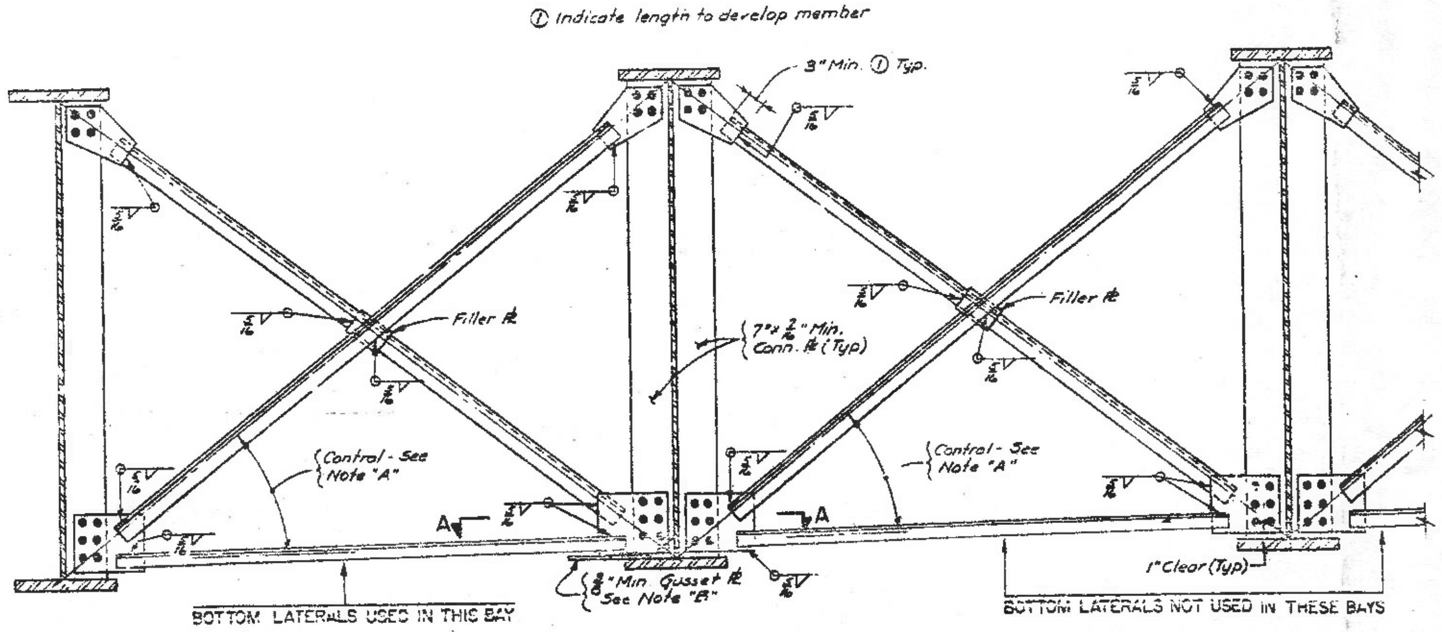
APPROVED 1/1/77

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
DIVISION OF CONSTRUCTION

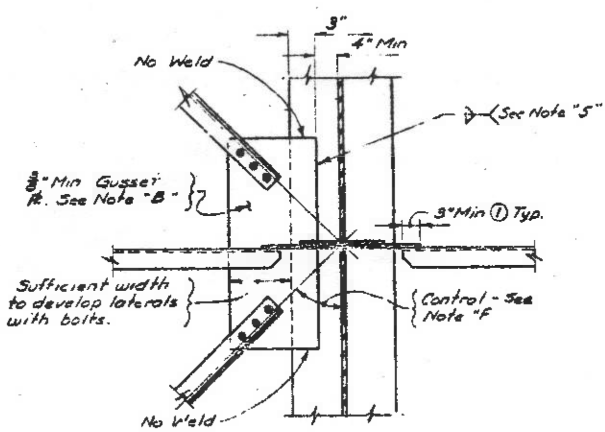
DIAPHRAGM DETAILS
BRIDGES WITH STRAIGHT STRINGERS
SPANS UP TO AND INCLUDING 125 FT.

IN CHARGE — CHECKED BY —
DETAILED BY — REVISED BY RCQ 7/78

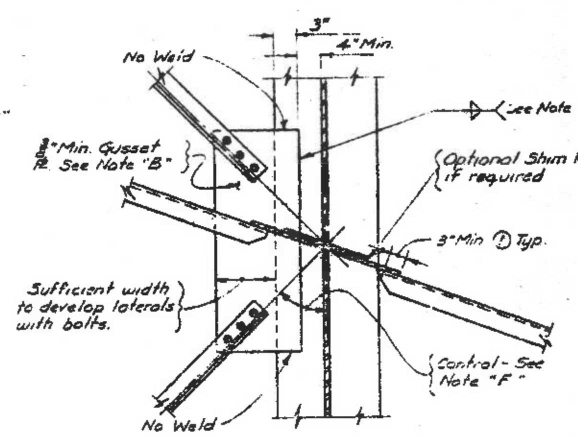
① Indicate length to develop member



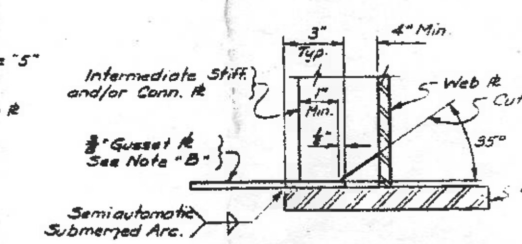
INTERMEDIATE DIAPHRAGMS



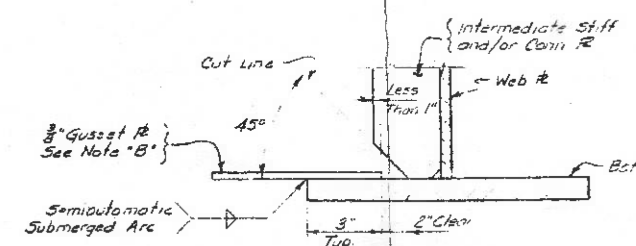
SECTION A-A
SKEWS OVER 30°



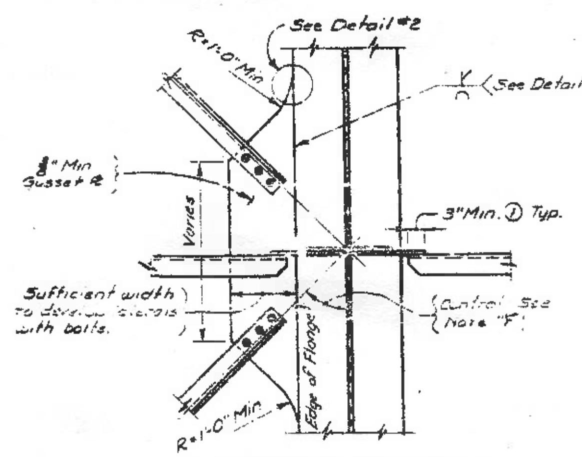
SECTION A-A
SKEWS UP TO 30°



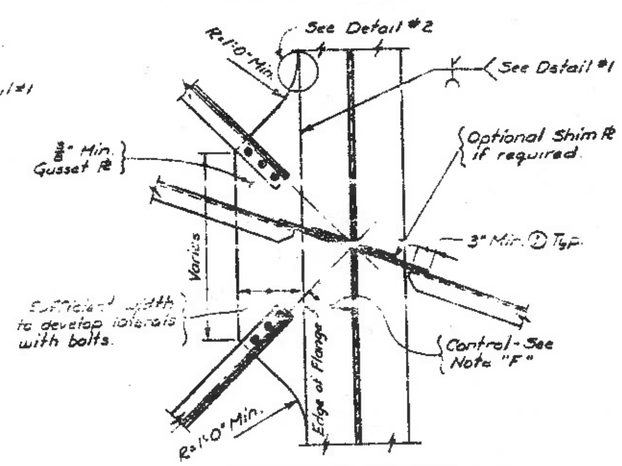
DETAIL SHOWING METHOD OF CONNECTING GUSSET PLATE AFTER STIFFENER AND/OR CONNECTION PLATE ATTACHMENT



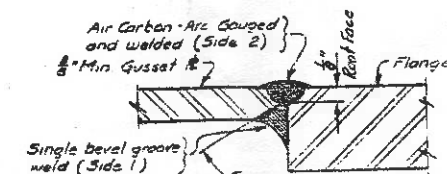
ALTERATE METHOD OF CONNECTING GUSSET PLATE



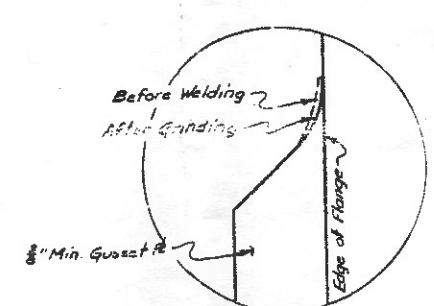
ALTERNATE SECTION A-A
SKEWS OVER 30°



ALTERNATE SECTION A-A
SKEWS UP TO 30°



DETAIL #1



Note:
All reference to "gusset plate" in notes 1 thru 4 of "Notes to be placed on the plans" refer to the gusset plate shown above.

DETAIL #2

NOTES TO BE PLACED ON THE PLANS:

1. The gusset plate shall be prepared and welded as a single bevel groove weld as shown in Detail #1. It shall then be Air Carbon-Arc gouged from the second side into sound weld metal and then welded as detailed. All welding shall be in the flat or "downhand" position.
2. The gusset plate may be of any shape that will provide after welding, cutting and finish grinding a smooth transition from the flange edge at a minimum radius of 12-inches.
3. Both the gusset plate and flange are to be same type of steel.
4. Field welding to the gusset plate will not be permitted.
5. Care shall be taken when welding gusset plates to the flanges of plate girders, especially at the start and end of the fillet welds, to insure complete fusion at the root and that weld craters are properly filled. The materials to be welded shall be preheated to a minimum of 250°F.

For additional notes to be placed on the plans, see BDD 77-30.

NOTES TO THE DESIGNER:

A. This angle shall be approximately 45°. In order to achieve this angle it may be desirable to use a "V" or "W" shape instead of the "X" shape shown.
B. When required by design criteria, the alternate method for connecting bottom bracing shall be substituted for this detail.
C. For details of end diaphragms and pertinent notes, see Sheet BDD 77-30.
D. In plan all intermediate diaphragms shall be placed in line as follows:
   Stringers on skews up to 30° place parallel to skew.
   Parallel stringers on 0° skew or on skews over 30° place perpendicular to stringers.
   Flared stringers on 0° skew or on skews over 30° place perpendicular to stringers closest to center of group.
E. The details drawn for "SECTION A-A" show bottom struts of cross-frames in addition to the bottom laterals. Lateral Connections made between cross-frames will be similar to this detail except that the bottom strut of a cross-frame would not be shown.
F. This angle shall be approximately 45°. A "V" or "W" shaped bottom lateral system placed between the cross-frames may be used in order to achieve this approximate angle.
G. The gusset plate details shown on this sheet will apply only at intermediate stiffeners. At bearing stiffeners, the designer should give considerable thought to the location of the cross-frames so that the gusset plate will not interfere with the required field welding of the bottom flange to the bearing.
H. The designer's attention is directed to the fact that the details shown on this sheet are to be used as a guide only. They shall be revised if dictated by other factors such as the angle indicated in Note A and Note F. The principles of intersection of working lines and method of connections shall be followed as much as possible.
J. Minimum thickness of rolled sections and plates shall be as shown in the New York State Department of Transportation Standard Specifications for Highway Bridges, unless otherwise indicated.
K. Size of all members and their connections shall be determined by stress requirements and minimum L/r for Compression.

DESIGN CRITERIA FOR THE USE OF THE ALTERNATE METHOD FOR CONNECTING BOTTOM BRACING:

It shall first be assumed that a straight side fillet welded gusset plate connection will be used. If the allowable fatigue stress for the base metal at details attached by fillet welds (Stress Category E) is exceeded then a curved groove welded gusset plate connection shall be used.

When a curved welded gusset plate connection (as shown on this detail) is used, the allowable fatigue stress for base metal at details attached by groove welds (Stress Category C) shall be used. The actual stress must be compared with the allowable fatigue stress at each gusset connection.

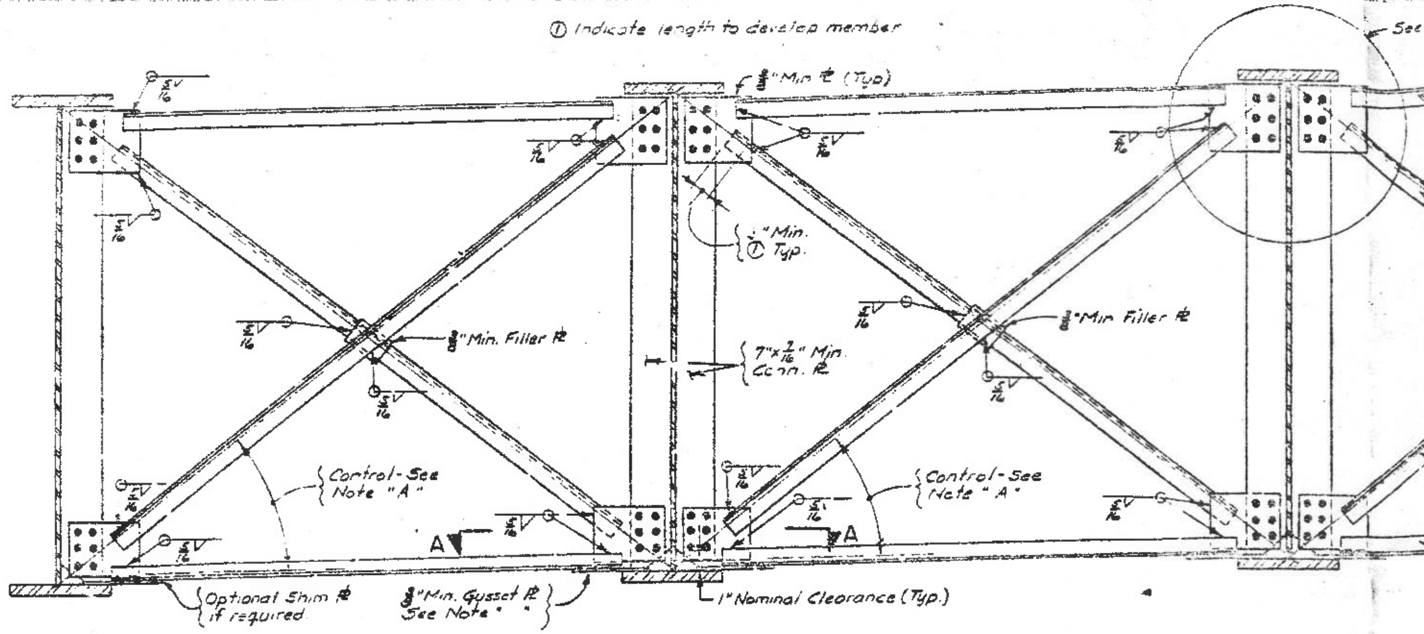
It should be pointed out that due to the high cost of fabricating and welding the curved groove welded gusset plate connection, it may be more economical to increase the area of the flange plate and use the straight side fillet welded gusset plate connection.

APPROVED 1/1/77
Deputy Chief Engineer (Structures)

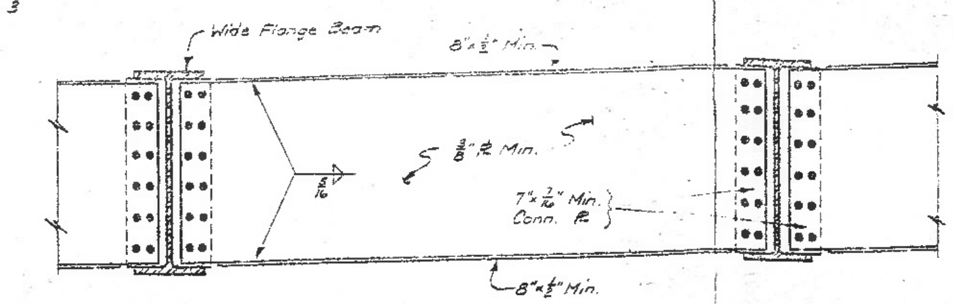
STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
DIVISION OF CONSTRUCTION

DIAPHRAGM DETAILS
BRIDGES WITH STRAIGHT STRINGERS
SPANS OVER 125 FT.

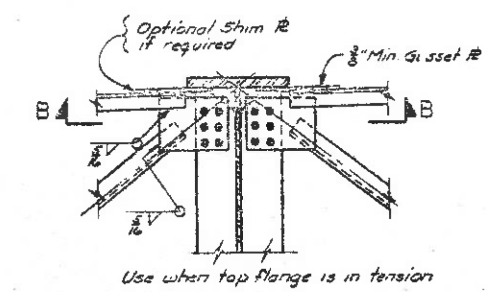
IN CHARGE OF [signature] CHECKED BY
DETAILED BY [signature] REVISED BY [signature]



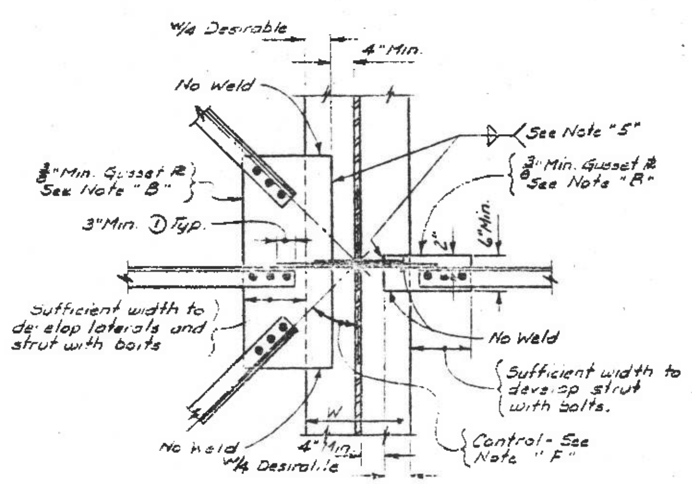
INTERMEDIATE DIAPHRAGM



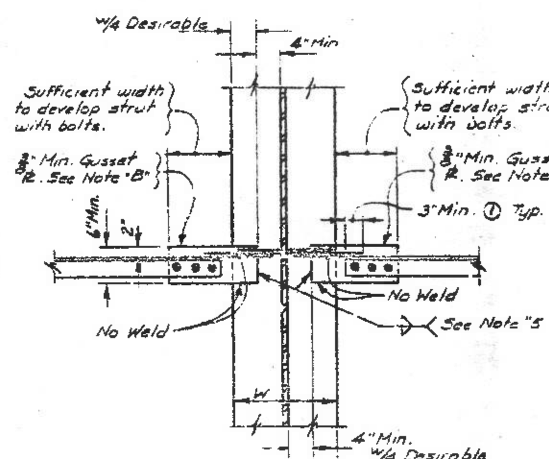
INTERMEDIATE DIAPHRAGM
WIDE FLANGE SECTION



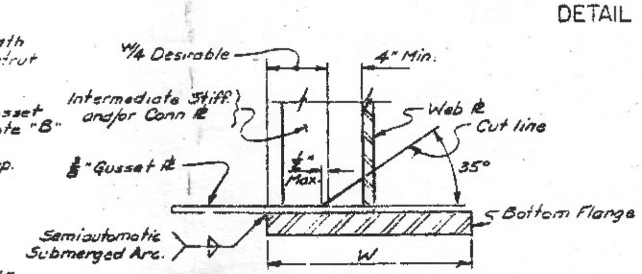
DETAIL #3



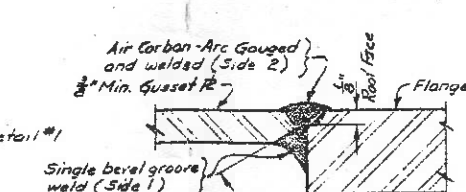
SECTION A-A



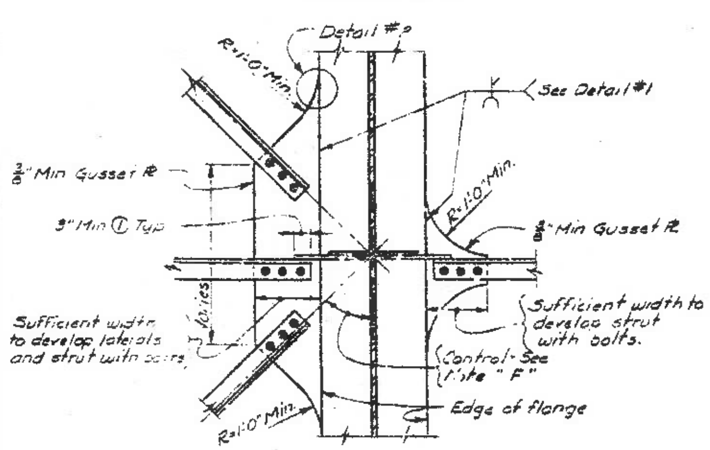
SECTION B-B



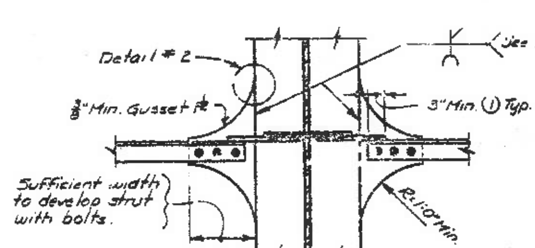
DETAIL SHOWING METHOD OF CONNECTING GUSSET PLATE AFTER STIFFENER AND/OR CONNECTION PLATE ATTACHMENT



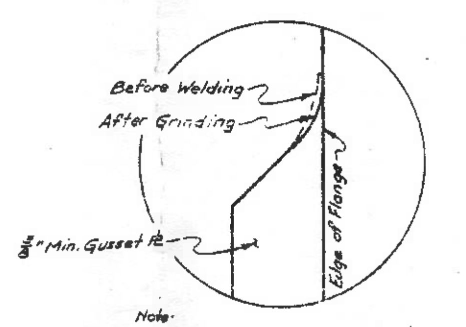
DETAIL #1



ALTERNATE SECTION A-A



ALTERNATE SECTION B-B



Note: Notes 1 thru 4 of "Notes to be placed on the plans" refer to gusset plate shown above.

DETAIL #2

NOTES TO BE PLACED ON THE PLANS:

1. The gusset plate shall be prepared and welded as a single bevel groove weld as shown in Detail #1. It shall then be Air Carbon-Arc gouged from the second side into sound weld metal and then welded as detailed. All welding shall be in the flat or "downhand" position.
2. The gusset plate may be of any shape that will provide, after welding, cutting, and finish grinding a smooth transition from the flange edge at a minimum radius of 12 inches.
3. Both the gusset plate and flange are to be the same type of steel.
4. Field welding to the gusset plate will not be permitted.
5. Care shall be taken when welding gusset plates to the flanges of plate girders, especially at the start and end of the fillet welds, to insure complete fusion at the root and that weld craters are properly filled. The materials to be welded shall be preheated to a minimum of 250°F.

NOTES TO THE DESIGNER:

A. This angle shall be approximately 45°. In order to achieve this angle, it may be desirable to use a "V" or "W" shape instead of the "X" shape shown.
B. When required by design criteria, the alternate method for connecting bottom bracing shall be substituted for this detail.
C. For details of end diaphragms see Sheet BDD 77-30.
D. In plan, all intermediate diaphragms shall be placed in line [illegible] radially to stringer closest to center of group.
E. The details drawn for "SECTION A-A" shows bottom struts of cross-frames in addition to the bottom laterals. Connections made between cross-frames will be similar to this detail except that the bottom strut of a cross-frame would not be shown.
F. This angle shall be approximately 45°. A "V" or "W" shaped bottom lateral system placed between the cross-frames may be used in order to achieve this approximate angle.
G. All diaphragms shall be designed to carry the moment and shear stresses.
H. Detail 3 will only be used on a continuous span where tension stresses (based on dead load only) occurs in the top flange.
J. On structures with curved stringers, a bottom lateral system should be placed in every other bay and always in the outside bays. All stringers should have a bottom lateral system attached to at least one side of the stringer.
K. The gusset plate details shown on this sheet will apply only at intermediate stiffeners. At bearing stiffeners, the designer should give considerable thought to the location of the cross-frames so that the gusset plate will not interfere with the required field welding of the bottom flange to the bearing.
L. Shim plates may be used in the connection between the top [illegible] bottom struts of the cross-frames and the top or bottom gusset plates. Variable thicknesses of s[illegible] plates may be used. The minimum thickness of shim plate shall be 1/8" with a maximum number of thre[illegible] shim plates permitted at any connection. The total thickness of all all shim plates used at any connection shall not exceed one inch. Shim plates shall have the dimensions of the faying surface. The shim material shall conform to ASTM Designation A36, except that on unpainted structures the shim material shall conform to ASTM Designation A588. No additional payment will be made for furnishing and placing the shim plates.

DESIGN CRITERIA FOR THE USE OF THE ALTERNATE METHOD FOR CONNECTING BOTTOM BRACING:

It shall first be assumed that a straight side fillet welded gusset plate connection will be used. If the allowable fatigue stress for the base metal at details attached by fillet welds (Stress Category C) is exceeded then a curved groove welded gusset plate connection shall be used.

When a curved welded gusset plate connection (as shown on this detail) is used, the allowable fatigue stress for base metal at details attached by groove welds (Stress Category C) shall be used. The actual stress must be compared with the allowable fatigue stress at each gusset connection.

It should be pointed out that due to the high cost of fabricating and welding the curved groove welded gusset plate connection, it may be more economical to increase the area of the flange plate and use the straight side fillet welded gusset plate connection.

APPROVED
1/11/77
Deputy Chief Engineer (Structures)

STATE OF NEW YORK
DEPARTMENT OF TRANSPORTATION
DIVISION OF CONSTRUCTION

DIAPHRAGM DETAILS
BRIDGES WITH CURVED STRINGERS
ALL SPANS

IN CHARGE [illegible] CHECKED BY
DETAILED BY [illegible] REVISED BY [illegible]