

INDIANA DEPARTMENT OF TRANSPORTATION



INTER-DEPARTMENT COMMUNICATION



232-6775

August 18, 2006

DESIGN MEMORANDUM No. 06-06
TECHNICAL ADVISORY

TO: All Design, Operations, and District Personnel, and Consultants

FROM: /s/ Anthony L. Uremovich
Anthony L. Uremovich
Design Policy Engineer
Contracts and Construction Division

SUBJECT: Interior Diaphragms with Prestressed-Concrete Members

REVISES: *Indiana Design Manual* Section 63-7.02

EFFECTIVE: January 10, 2007, Letting

I. Structural-Steel Interior Diaphragms

Structural-steel interior diaphragms should be specified if interior diaphragms are required for a prestressed-concrete-members bridge. This use of structural steel instead of concrete does not affect the bridge design. Structural-steel interior diaphragms should be specified on the plans. Steel interior diaphragms are not a separate pay item. Their cost should be included in that of the concrete structural members. However, the quantities of pounds (kilograms) should be shown in the superstructure bill of materials and on the Bridge Summary sheet.

Recurring Special Provision 707-B-173, and Recurring Plan Detail 707-B-173d, both attached hereto, should be called for beginning with the January 10, 2007, letting, if steel diaphragms are detailed and are to be placed.

II. Reinforced-Concrete Interior Diaphragms

If the designer determines that cast-in-place concrete interior diaphragms should be used for a particular bridge, he or she should provide the Production Management Division's Structural Services manager with a written justification for the concrete diaphragms. Once the Structural Services manager concurs in the justification, such diaphragms should be detailed on the plans. The required quantities of concrete and reinforcing steel should be incorporated into those for the bridge deck.

Recurring Special Provision 707-B-172, attached hereto, should be called for beginning with the January 10, 2007, letting, if concrete diaphragms are detailed and are to be placed.

III. Reinforced-Concrete Interior Diaphragms Detailed, Structural-Steel Interior Diaphragms Permitted

For a structure with plans at the Final Check Prints stage that show details for concrete interior diaphragms, and the designer has determined that steel diaphragms are acceptable, the diaphragm details should not be changed. The contractor will be permitted to substitute steel diaphragms for the concrete diaphragms. The substitution does not affect the bridge design.

Steel interior diaphragms are not a separate pay item. Their cost should be included in that of the concrete structural members. A note should be placed under the superstructure bill of materials which reads as follows:

“The Contractor will be permitted to substitute structural-steel diaphragms for the reinforced-concrete interior diaphragms. The estimated quantity of structural steel is _____. If the substitution is made, this quantity shall be placed in lieu of _____ of concrete class C in superstructure and _____ of epoxy coated reinforcing steel.”

Recurring Special Provision 707-B-171, and Recurring Plan Detail 707-B-173d, both attached hereto, should be called for beginning with the January 10, 2007, letting, if concrete diaphragms are detailed but steel diaphragms may instead be placed.

The appropriate recurring special provision and recurring plan detail, if required, should be called for through the August 22, 2007, letting. Beginning with the September 19, 2007, letting, the recurring special provisions will be incorporated into the INDOT *Standard Specifications*, and the recurring plan detail will be incorporated into the INDOT *Standard Drawings*. A provision and detail will then no longer be required to be called for in a specific contract.

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Attachments

ALTERNATIVE INTERIOR DIAPHRAGMS

This work shall consist of fabrication and erection of structural steel interior diaphragms as an alternative to the concrete interior diaphragms shown on the plans. All structural steel shall be fabricated and erected in accordance with 711 and the following requirements. Five sets of shop drawings in accordance with 711.05 shall be submitted for approval.

The Standard Specifications are revised as follows:

SECTION 707, AFTER LINE 22, INSERT AS FOLLOWS:

Structural steel for steel intermediate diaphragms shall be in accordance with 910.02(a) and shall be galvanized in accordance with ASTM A 123 after cutting, bending, and welding. Bolts for steel intermediate diaphragms shall be 7/8 in. (22 mm) and in accordance with 910.02(e)1, except they shall be type 1. All bolts, nuts, washers, and similar threaded fasteners shall be galvanized in accordance with ASTM A 123 or may be mechanically zinc coated in accordance with ASTM B 695, class 50.

SECTION 707, AFTER LINE 29, INSERT AS FOLLOWS:

Structural steel diaphragms shall be fabricated and erected in accordance with 711. Steel diaphragms shall include all connection angles, plates, and associated hardware required for a complete installation. The Contractor shall replace, re-galvanize, or repair all damaged galvanized material at the discretion of the Engineer.

SECTION 707, BEGIN LINE 333, INSERT AS FOLLOWS:

707.11 Method of Measurement

Precast or prestressed concrete structural members will be measured by the linear foot (meter) along the top of each member or by the square foot (square meter) of top surface of each member. Railing will be measured in accordance with 706.05 if specified as a pay item. *Structural steel for intermediate diaphragms will not be measured.*

SECTION 707, AFTER LINE 367, INSERT AS FOLLOWS:

The cost of all materials, including galvanizing, labor, and equipment for furnishing and installing steel intermediate diaphragms shall be included in the cost of structural member, concrete of the type and size specified.

INTERIOR DIAPHRAGMS

The substitution of structural steel interior diaphragms for cast-in-place reinforced concrete interior diaphragms will not be allowed on this contract.

ARCHIVED

STRUCTURAL STEEL INTERMEDIATE DIAPHRAGMS

The Standard Specifications are revised as follows:

SECTION 707, AFTER LINE 22, INSERT AS FOLLOWS:

Structural steel for steel intermediate diaphragms shall be in accordance with 910.02(a) and shall be galvanized in accordance with ASTM A 123 after cutting, bending, and welding. Bolts for steel intermediate diaphragms shall be 7/8 in. (22 mm) and in accordance with 910.02(e)1, except they shall be type 1. All bolts, nuts, washers, and similar threaded fasteners shall be galvanized in accordance with ASTM A 123 or may be mechanically zinc coated in accordance with ASTM B 695, class 50.

SECTION 707, AFTER LINE 29, INSERT AS FOLLOWS:

Structural steel diaphragms shall be fabricated and erected in accordance with 711. Steel diaphragms shall include all connection angles, plates, and associated hardware required for a complete installation. The Contractor shall replace, re-galvanize, or repair all damaged galvanized material at the discretion of the Engineer.

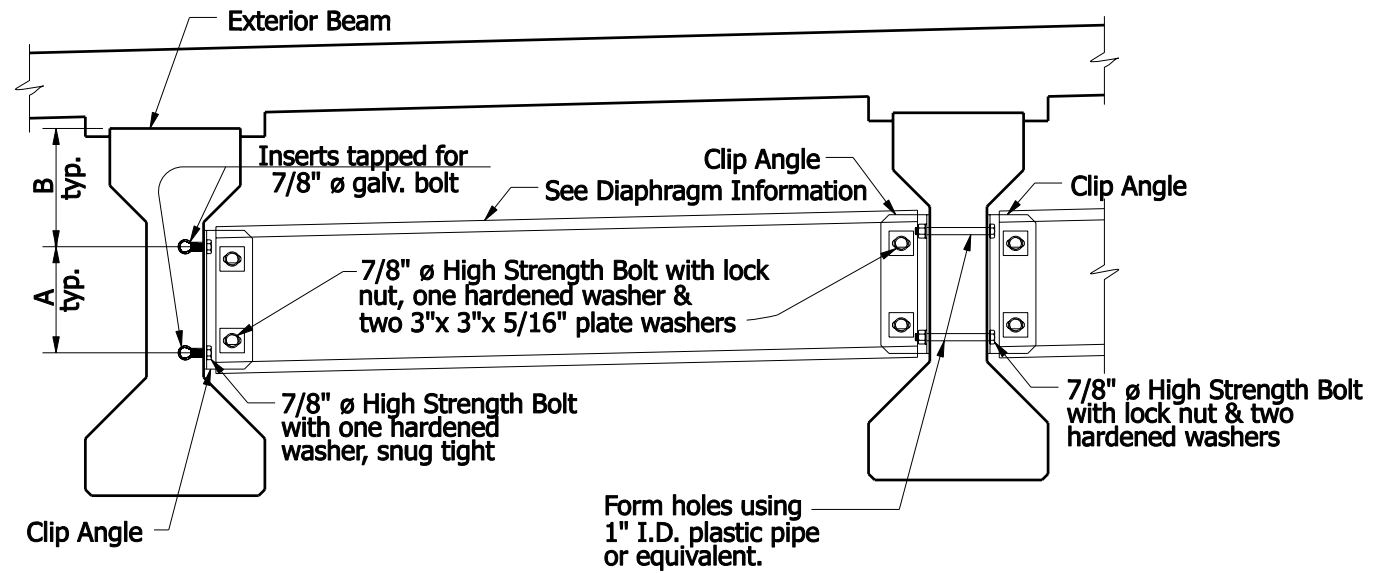
SECTION 707, BEGIN LINE 333, INSERT AS FOLLOWS:

707.11 Method of Measurement

Precast or prestressed concrete structural members will be measured by the linear foot (meter) along the top of each member or by the square foot (square meter) of top surface of each member. Railing will be measured in accordance with 706.05 if specified as a pay item. *Structural steel for intermediate diaphragms will not be measured.*

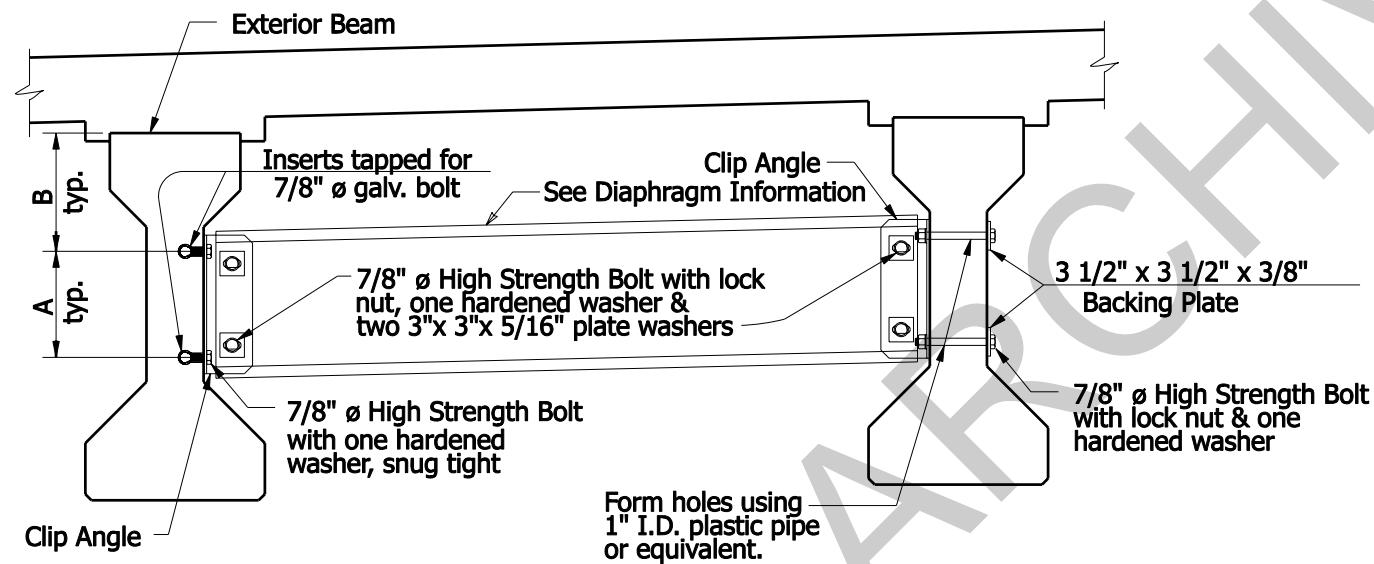
SECTION 707, AFTER LINE 367, INSERT AS FOLLOWS:

The cost of all materials, including galvanizing, labor, and equipment for furnishing and installing steel intermediate diaphragms shall be included in the cost of structural member, concrete of the type and size specified.



INTERMEDIATE DIAPHRAGM

Typical for Square Structure



INTERMEDIATE DIAPHRAGM

Typical for Skewed Structure

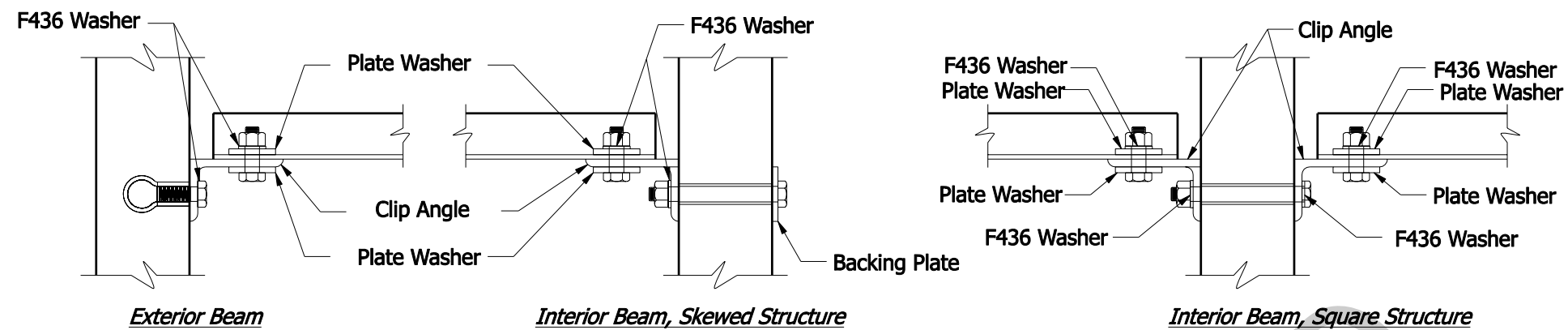
NOTES:

1. See Recurring Drawing E 707-B-173d 2 of 6 for connection details.

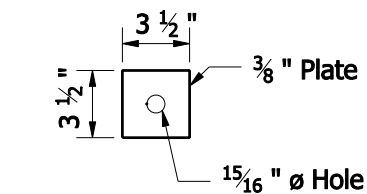
Beam Type	Diaphragm Information						Channel Type
	Dimension						
	A	B	C	D	E	F	
Type II	9"	1'-0"	1'-1"	6"	3 1/2"	3"	C 12 x 20.7
Type III	1'-1"	1'-2 1/2"	1'-5"	10"	3 1/2"	4"	MC 18 x 42.7
Type IV	1'-4"	1'-5 1/2"	1'-8"	10"	5"	4"	MC 18 x 42.7

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS
AASHTO I-BEAMS



CONNECTION DETAILS



BACKING PLATE
Skewed Structure Only

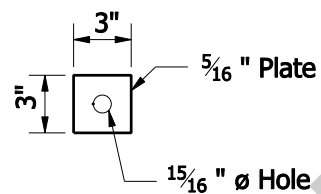
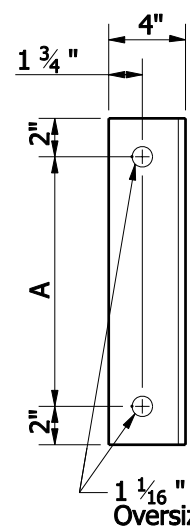
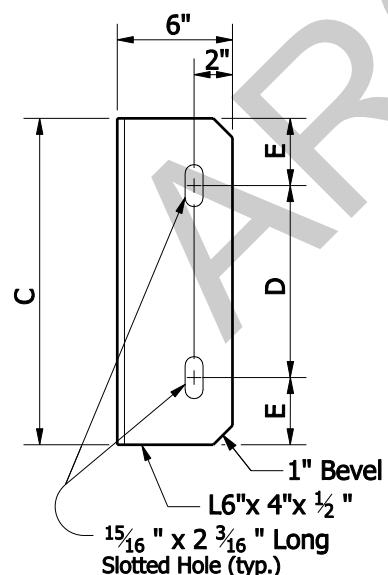


PLATE WASHER

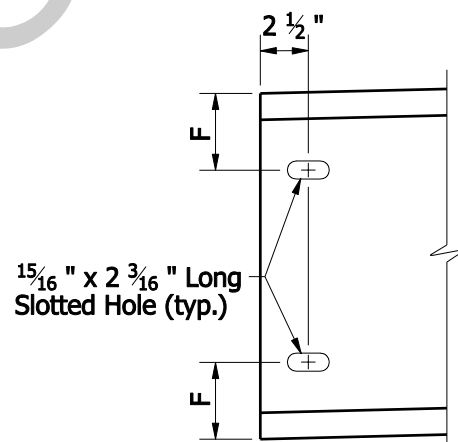


Beam Face



Diaphragm Face

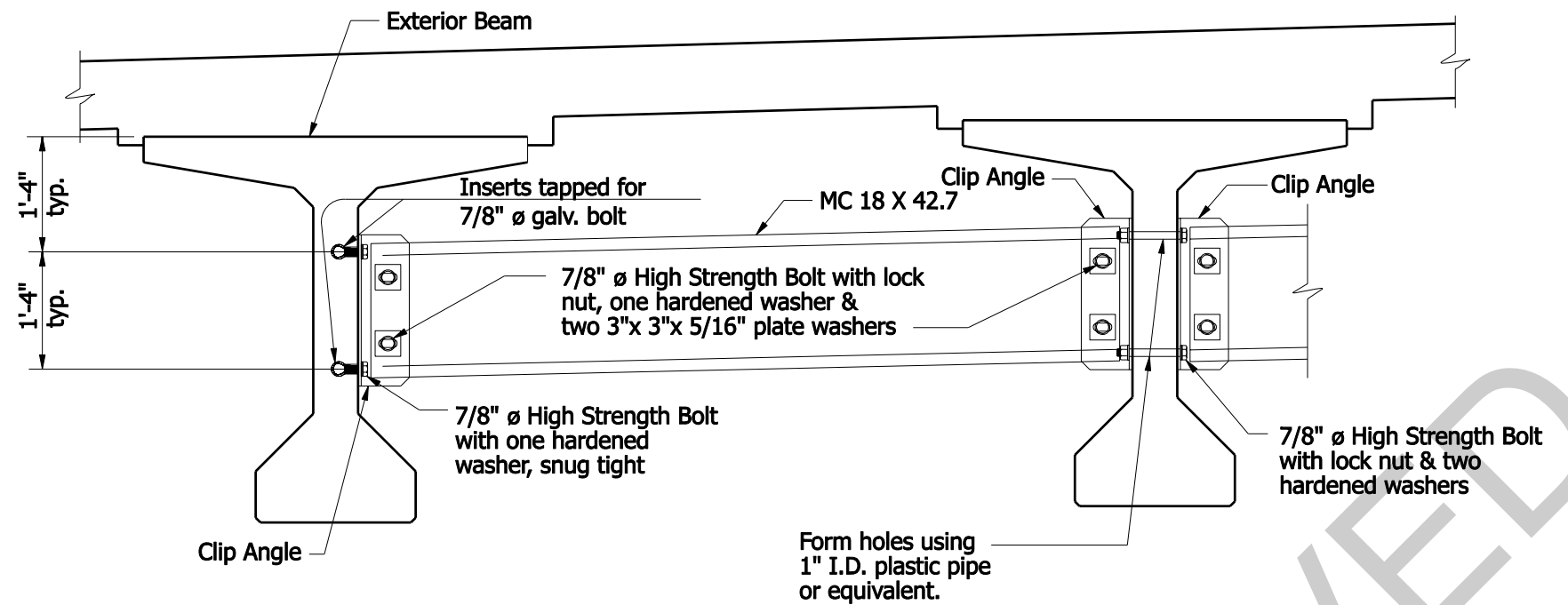
CLIP ANGLE



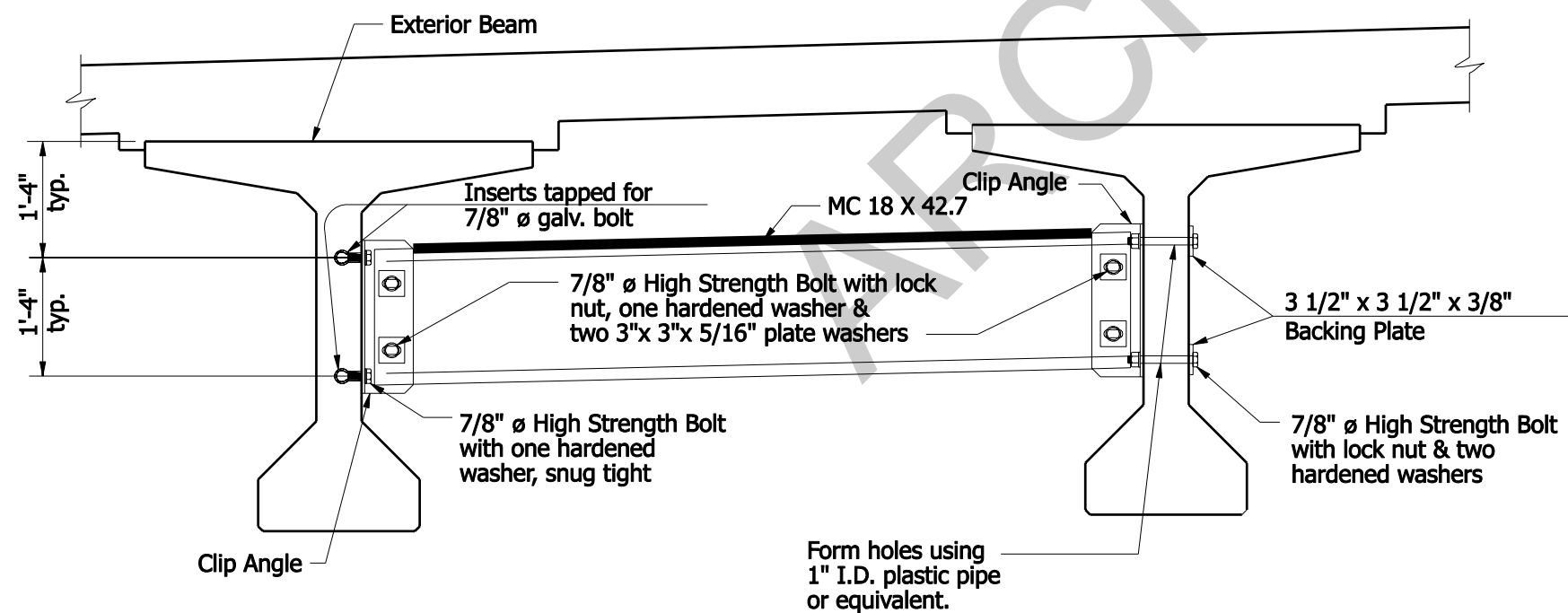
CHANNEL END

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS
AASHTO I-BEAMS



INTERMEDIATE DIAPHRAGM
Typical for Square Structure



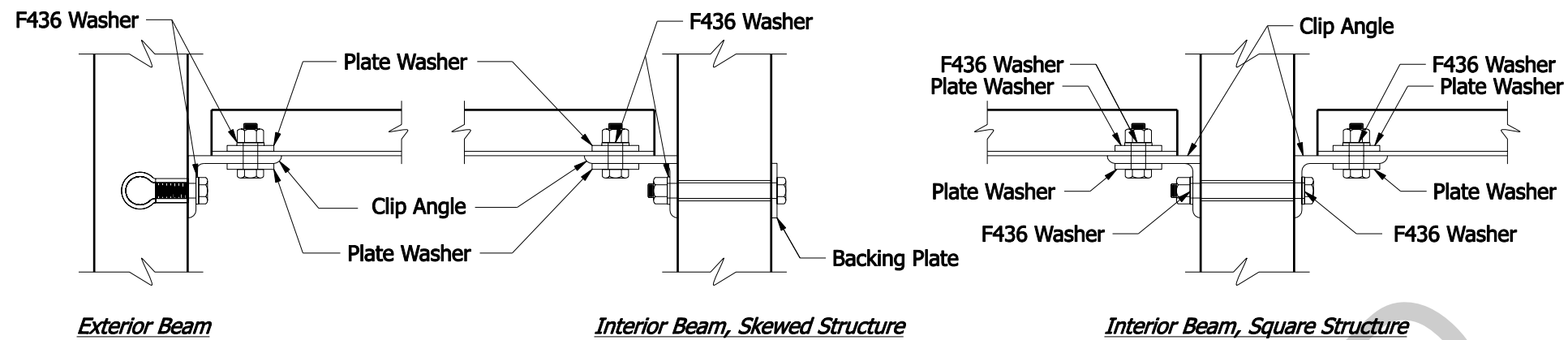
INTERMEDIATE DIAPHRAGM
Typical for Skewed Structure

NOTES:

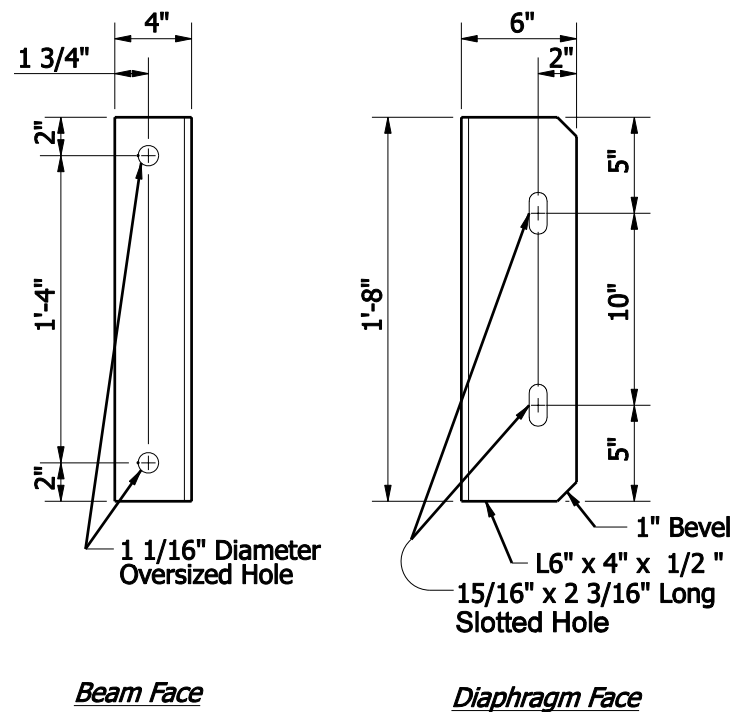
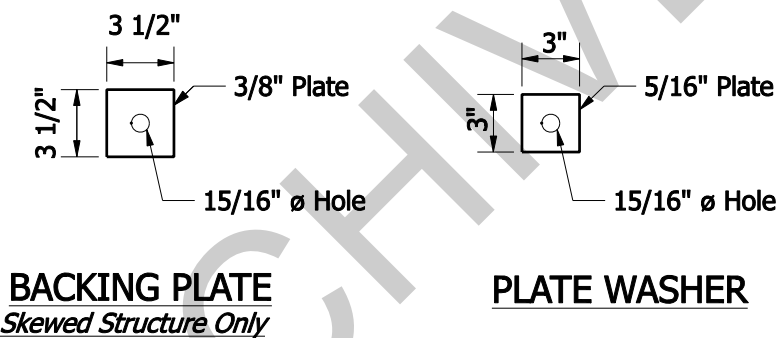
1. See Recurring Drawing E 707-B-173d 4 of 6 for connection details.

INDIANA DEPARTMENT OF TRANSPORTATION

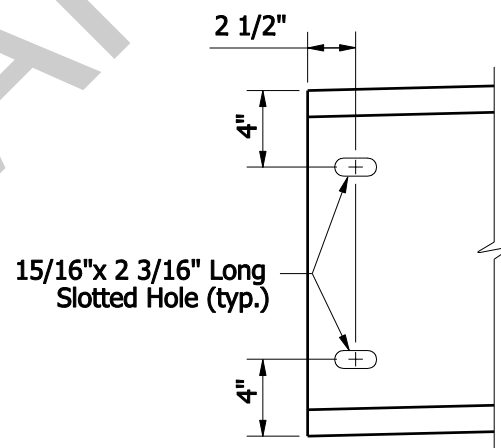
STEEL DIAPHRAGMS
 INDIANA BULB-TEES, 54-IN. DEPTH



CONNECTION DETAILS



CLIP ANGLE

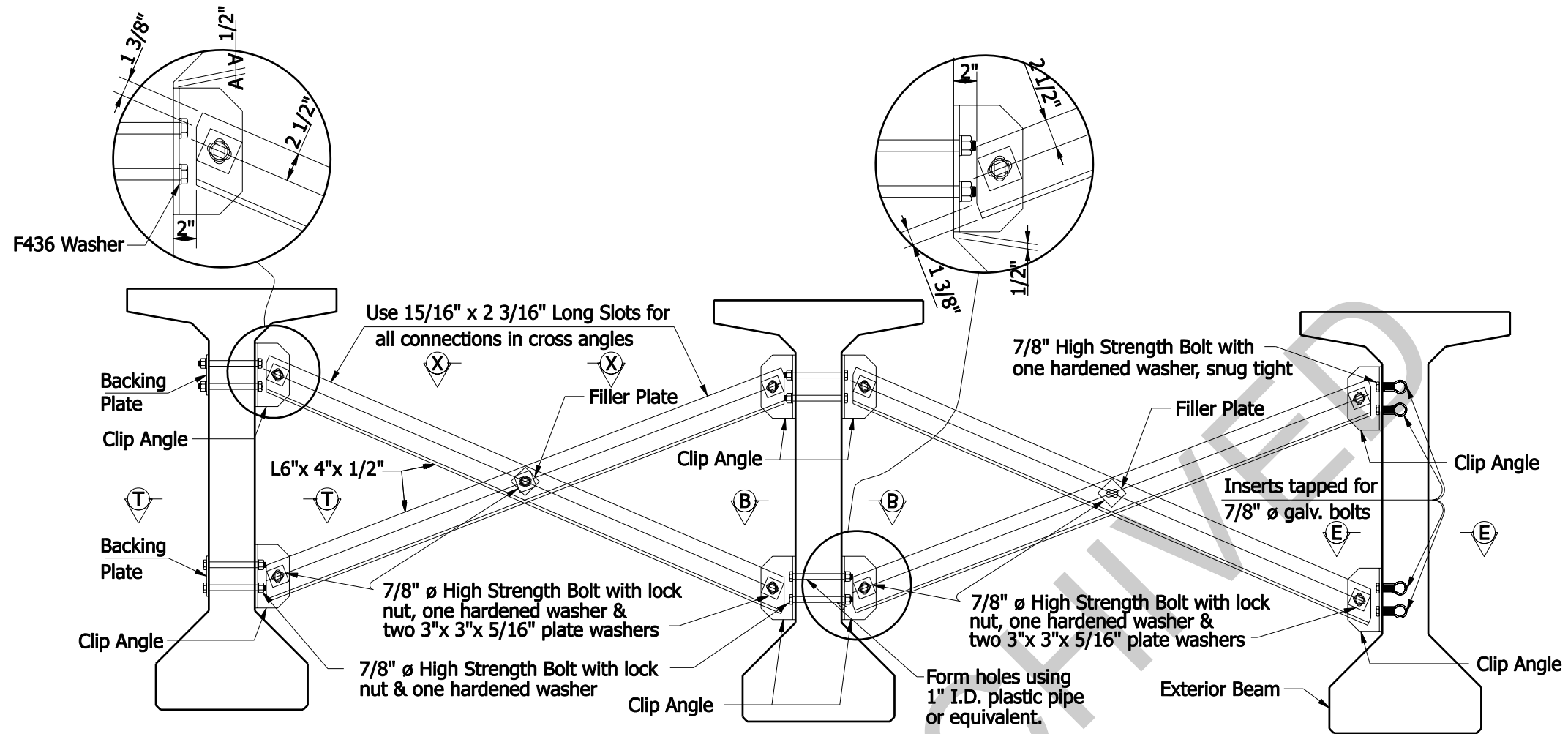


CHANNEL END

INDIANA DEPARTMENT OF TRANSPORTATION
STEEL DIAPHRAGMS
INDIANA BULB-TEES, 54-IN. DEPTH

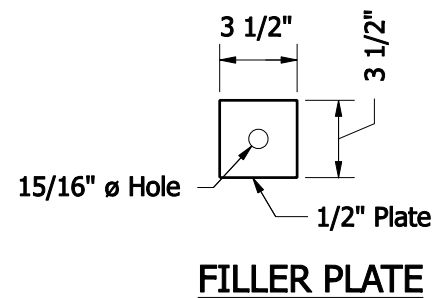
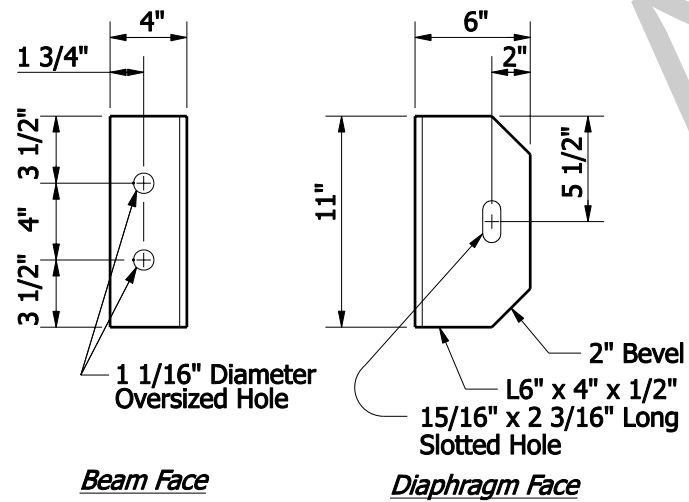
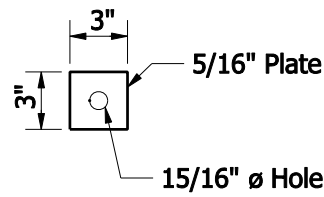
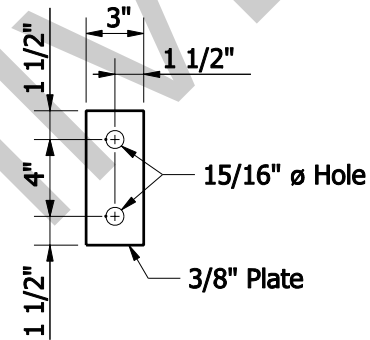
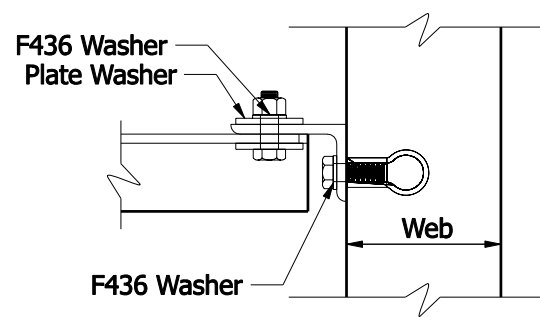
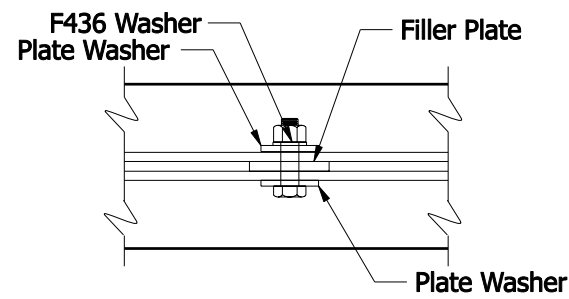
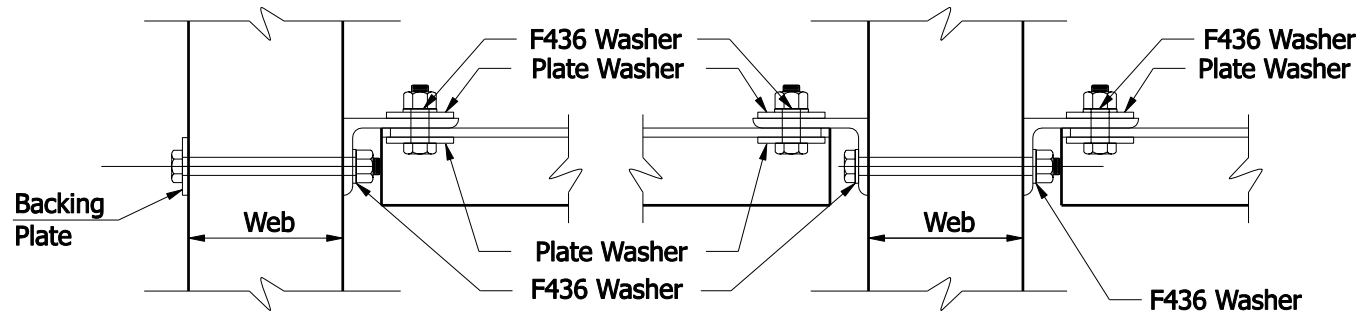
NOTES:

1. See Recurring Drawing E 707-B-173d 6 of 6 for connection details.

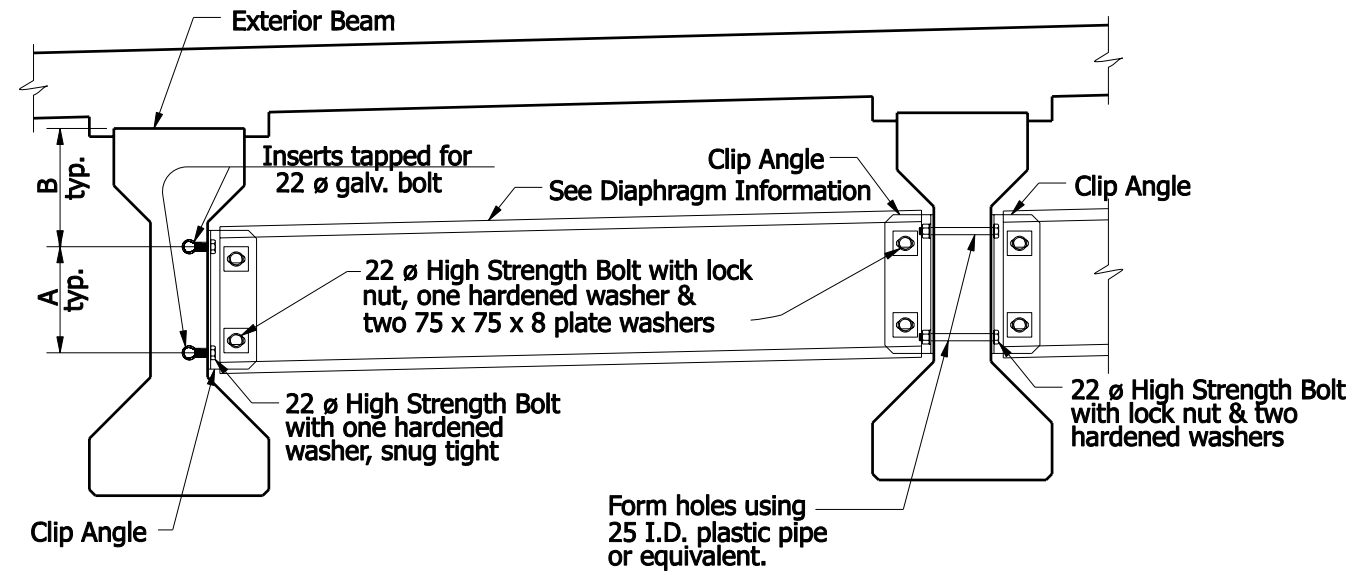


INTERMEDIATE DIAPHRAGM DETAILS

INDIANA DEPARTMENT OF TRANSPORTATION
STEEL DIAPHRAGMS
INDIANA BULB-TEES, 60 IN. OR DEEPER

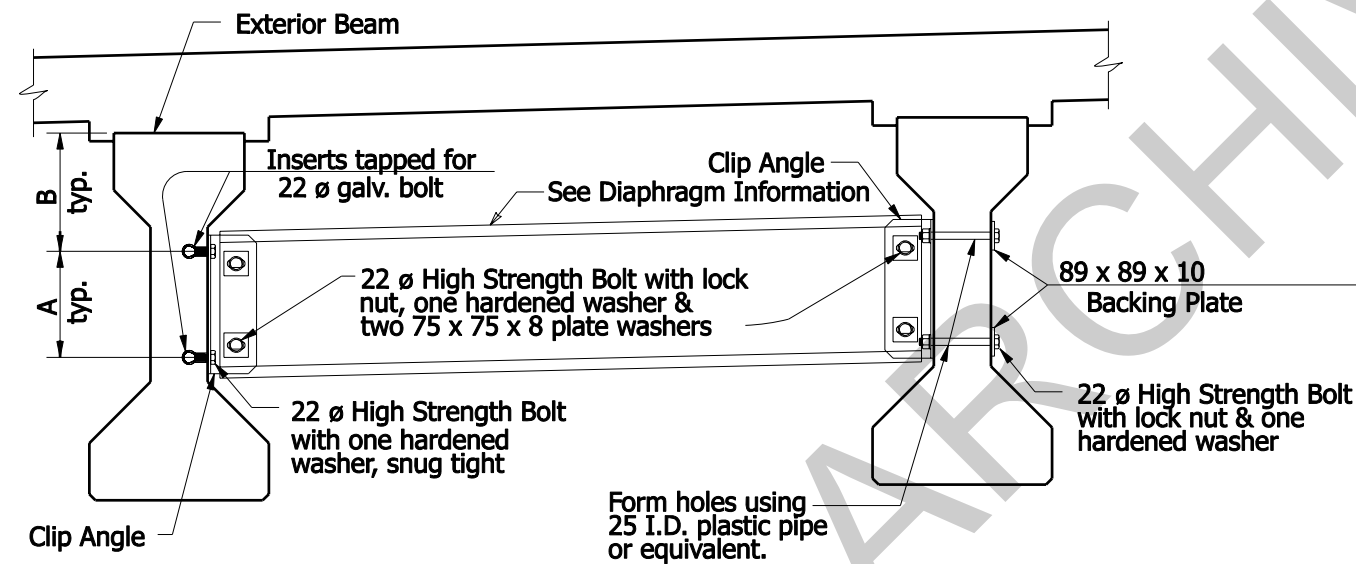


INDIANA DEPARTMENT OF TRANSPORTATION
 STEEL DIAPHRAGMS
 INDIANA BULB-TEES, 60 IN. OR DEEPER



INTERMEDIATE DIAPHRAGM

Typical for Square Structure



INTERMEDIATE DIAPHRAGM

Typical for Skewed Structure

NOTES:

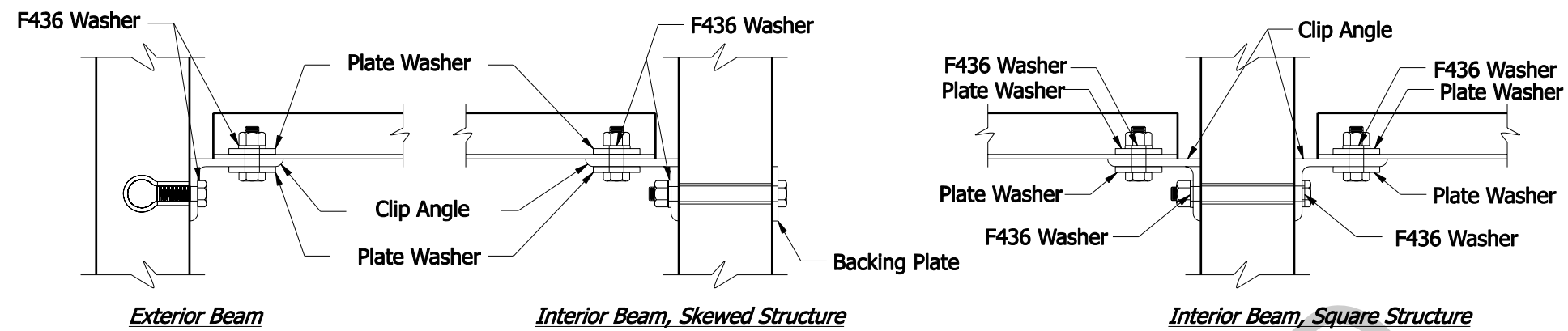
1. See Recurring Drawing 707-B-173d 2 of 6 for connection details.

Beam Type	Diaphragm Information						Channel Type
	Dimension						
	A	B	C	D	E	F	
Type II	229	305	330	152	89	75	C 310 x 31
Type III	330	368	432	254	89	100	MC 460 x 63.5
Type IV	406	445	508	254	13	100	MC 460 x 63.5

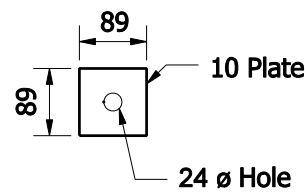
All Dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

**STEEL DIAPHRAGMS
AASHTO I-BEAMS**



CONNECTION DETAILS



BACKING PLATE
Skewed Structure Only

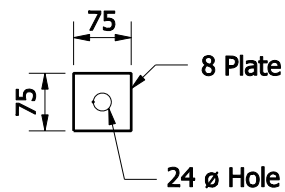
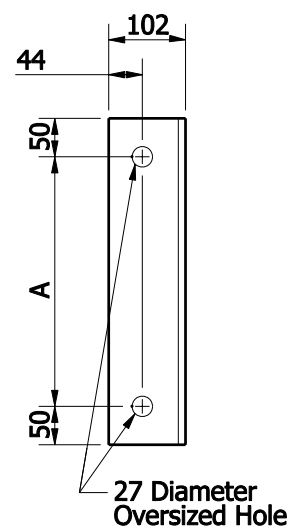
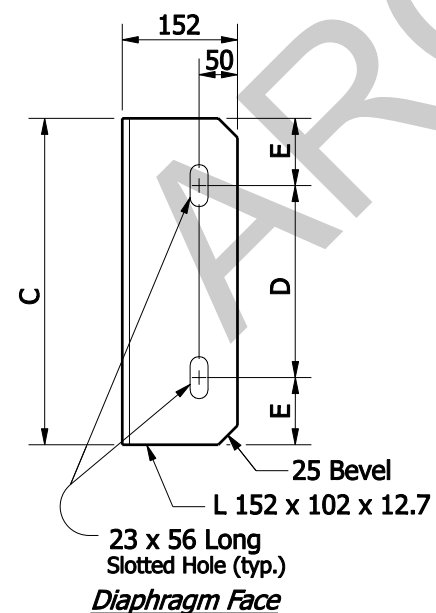


PLATE WASHER

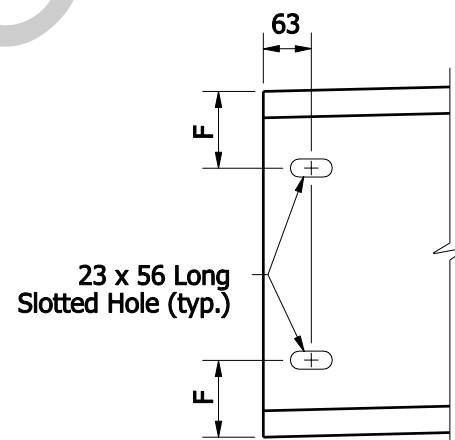


Beam Face



Diaphragm Face

CLIP ANGLE

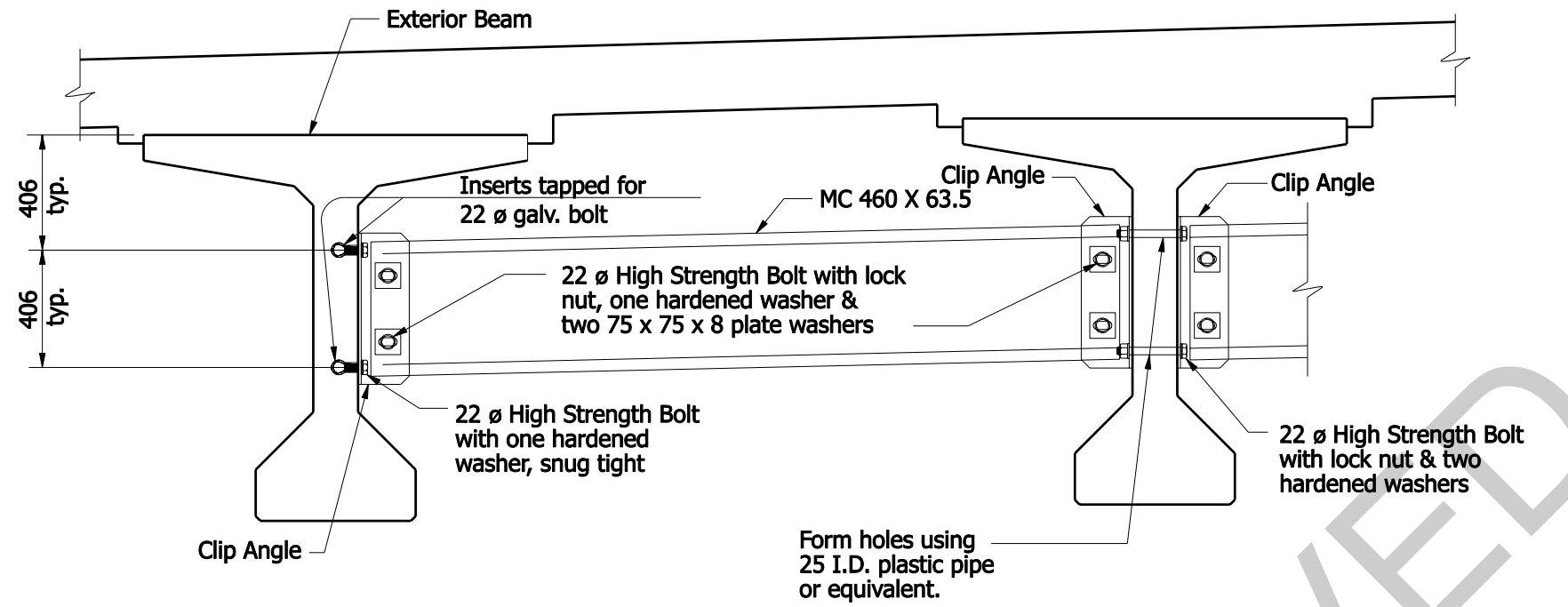


CHANNEL END

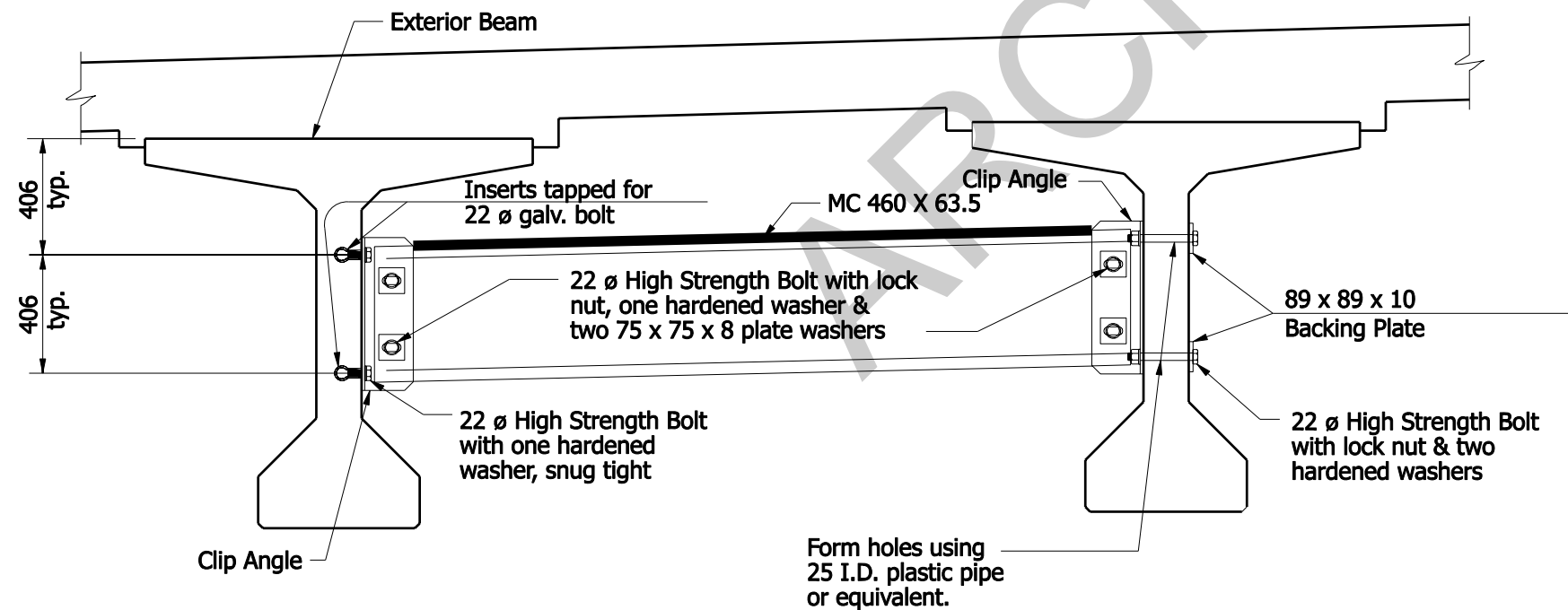
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INDIANA DEPARTMENT OF TRANSPORTATION

**STEEL DIAPHRAGMS
AASHTO I-BEAMS**



INTERMEDIATE DIAPHRAGM
Typical for Square Structure



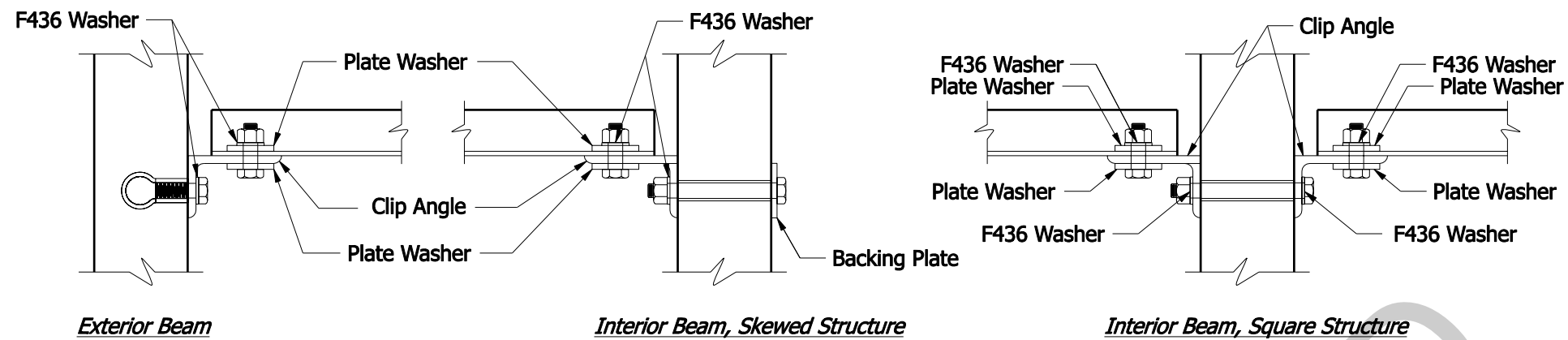
INTERMEDIATE DIAPHRAGM
Typical for Skewed Structure

NOTES:

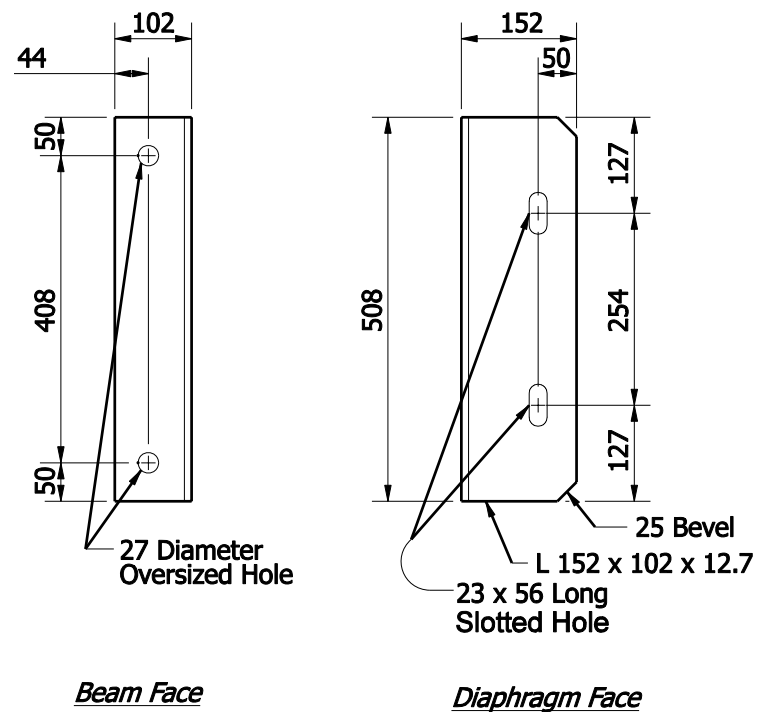
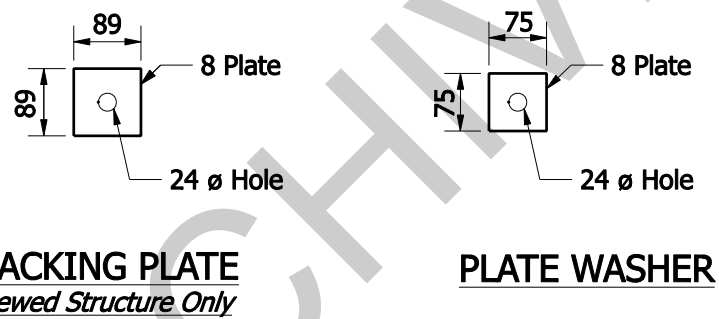
1. See Recurring Drawing 707-B-173d 4 of 6 for connection details.

All Dimensions are in mm unless otherwise specified.

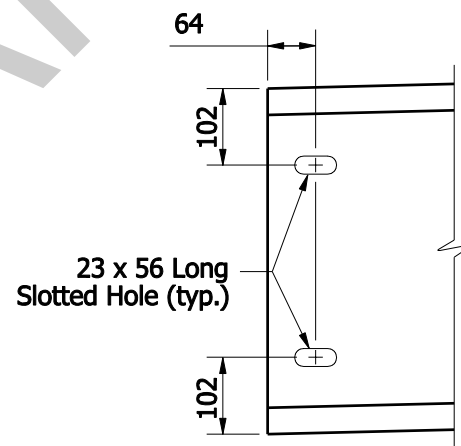
INDIANA DEPARTMENT OF TRANSPORTATION
STEEL DIAPHRAGMS
INDIANA BULB-TEES, 1372-mm DEPTH



CONNECTION DETAILS



CLIP ANGLE



CHANNEL END

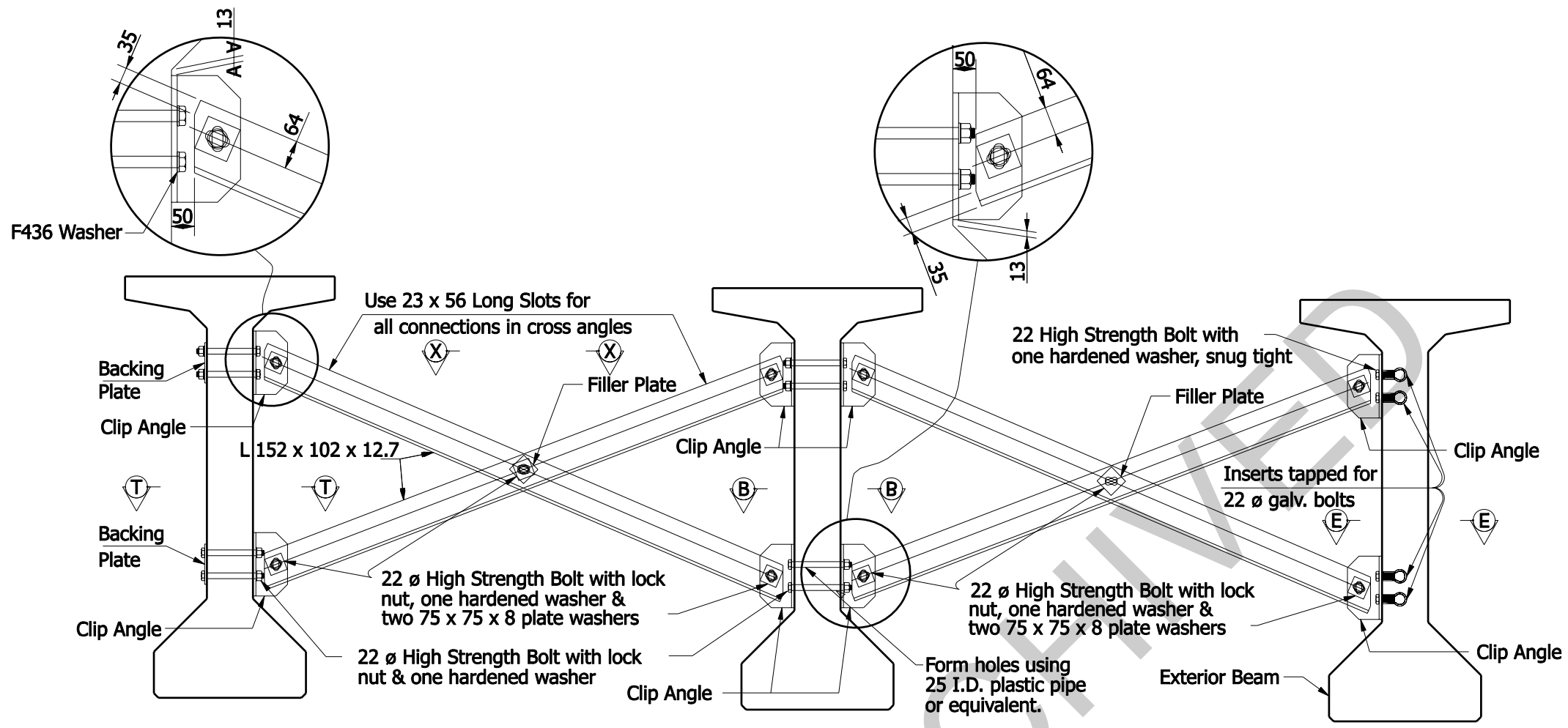
All Dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS
INDIANA BULB-TEES, 1372-mm DEPTH

NOTES:

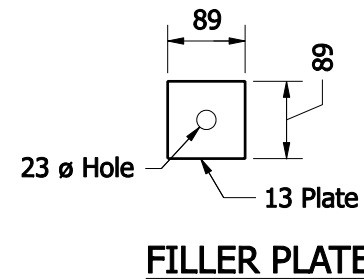
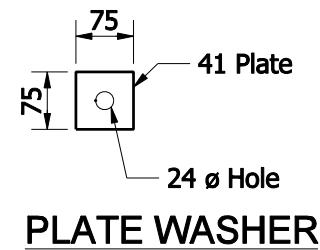
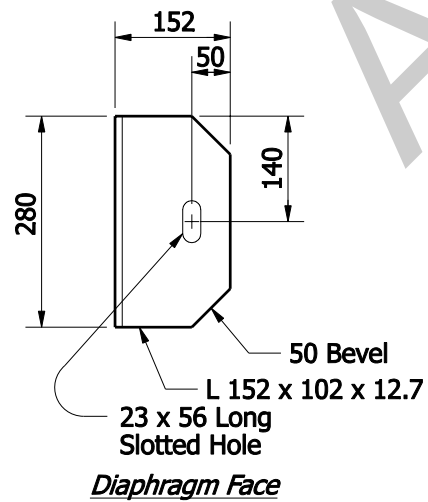
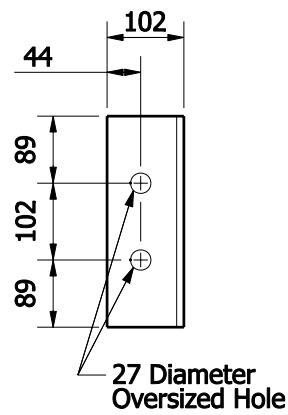
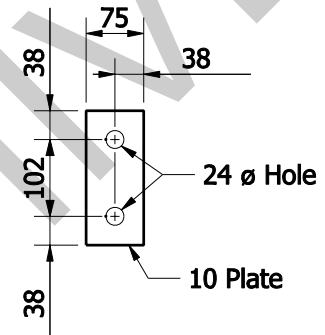
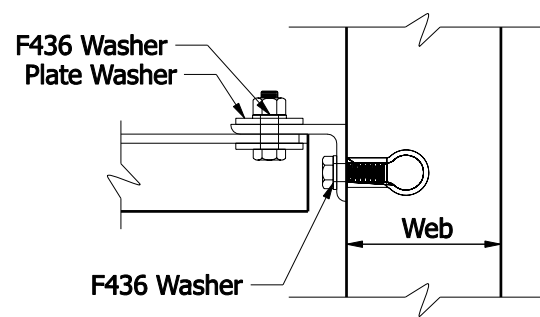
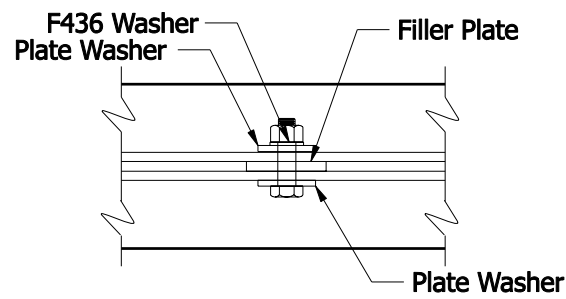
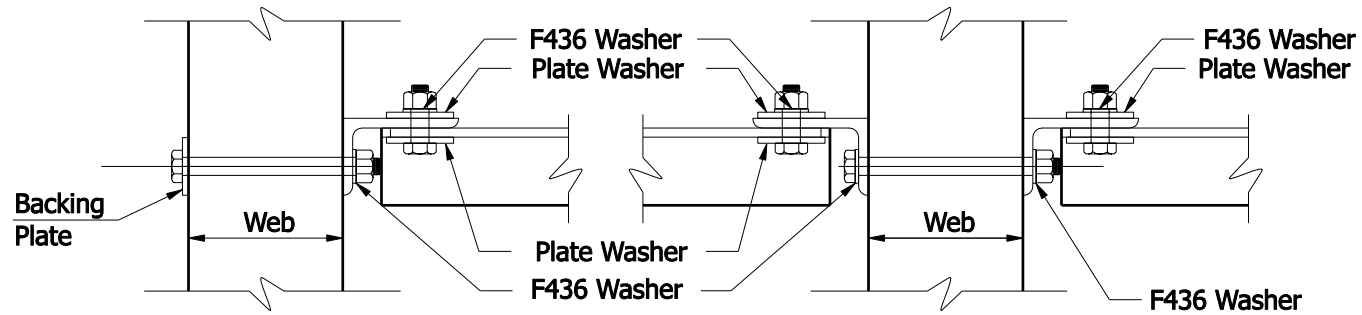
- 1. See Recurring Drawing 707-B-173d 6 of 6 for connection details.



INTERMEDIATE DIAPHRAGM DETAILS

All Dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION
STEEL DIAPHRAGMS
INDIANA BULB-TEES, 1524 mm OR DEEPER



CLIP ANGLE

All Dimensions are in mm unless otherwise specified.

INDIANA DEPARTMENT OF TRANSPORTATION

STEEL DIAPHRAGMS

INDIANA BULB-TEES, 1524 mm OR DEEPER