DCN #1
DCN #2

DCC NO. 333
THIS DOCUMENT CURRENT AS OF JAN 15 1987
FOR OFFICE AND ENGINEERING USE ONLY

INSPECTION OF UNIT 1 CABLE TRAY SUPPORTS

PREPARED BY: R.G. Roffe 10/16/86 DATE

APPROVED BY: 10/20/86 DATE

APPROVED BY: 10/20/86 DATE

1.0 **REFERENCE**

1-A CP-QP-11.10, "Inspection of Electrical Raceway/Support Systems"

1-B CP-CPM-6.3, "Preparation, Approval and Control of Operation Travelers"

1-C QI-QP-11.14-4, "Control of Material Traceability for Site Fabricated Structural/Miscellaneous Steel"

1-D CP-QP-11.2, "Inspection of Concrete Anchor Bolt Installation"

1-E QI-QP-11.0-15, "Verification of Baseplate for Grouting"

1-F QI-QP-11.21-1, "Requirements for Visual Weld Inspection"

1-G QI-QP-16.0-5, "Reporting of Base Metal Defects"

1-H QI-QP-11.23-2, "Inspection of Completed Installations for Separation/Spacing"

1-I QI-QP-11.14-13, "Separation Verification of Attachments to Loaded Embedded Plates"

1-J CP-QP-18.0, "Inspection Report"

1-K CP-QP-16.0, "Nonconformances"

1-L CP-CPM-6.10, "Inspected Items Removal Form"

CONTROLLED COPY
CONTROL No. PIM-024

2.0 **PURPOSE AND SCOPE**

This instruction supplements Reference 1-A, and provides the inspection criteria and documentation requirements that shall be used to perform inspections of cable tray support and associated component fabrication and installation.

DEC 22 1986

INSPECTION OF UNIT II CABLE TRAY SUPPORTS

PREPARED BY: See original page 1 for approvals _____ DATE

APPROVED BY: See original page 1 for approvals _____ DATE

APPROVED BY: See original page 1 for approvals _____ DATE

1.0 REFERENCE

1-A CP-QP-11.10, "Inspection of Electrical Raceway/Support Systems"

1-B CP-CPM-6.3, "Preparation, Approval and Control of Operation Travelers"

1-C QI-QP-11.14-4, "Control of Material Traceability for Site Fabricated Structural/Miscellaneous Steel"

1-D CP-QP-11.2, "Inspection of Concrete Anchor Bolt Installation"

1-E QI-QP-11.0-15, "Verification of Baseplate for Grouting"

1-F QI-QP-11.21-1, "Requirements for Visual Weld Inspection"

1-G QI-QP-16.0-5, "Reporting of Base Metal Defects"

1-H QI-QP-11.23-2, "Inspection of Completed Installations for Separation/Spacing"

1-I QI-QP-11.14-13, "Separation Verification of Attachments to Loaded Embedded Plates"

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CONTROL NO. PM-024

1-J CP-QP-18.0, "Inspection Report"

1-K CP-QP-16.0, "Reporting Construction Deficiencies"

1-L CP-CPM-6.10, "Inspected Items Removal Form"

2.0 PURPOSE AND SCOPE

This instruction supplements Reference 1-A, and provides the inspection criteria and documentation requirements that shall be used to perform inspections of cable tray support and associated component fabrication and installation.

DOCUMENT CHANGE NOTICE

No. 2 **Page** 1 **of** 1

1. Proc./Inst. No. QIQP1118.2A Rev. 10 Change Proposed By E.S STEWART

2. The following change/revision is recommended.

   a. Description of proposed change(s) CHANGE REFERENCE 1.K TO READ: CP QP 16.D "REPORTING CONSTRUCTION DEFICIENCIES" ALSO AT PARA 3.2.5.1, 3.2.7.1, 3.4, 3.8 CHANGE "NCR TO "CDR"

   b. Justification for change(s) CP QP 16.D REV 26.

CONTROLLED COPY
CONTROL NO: PM-029

   c. List other procedures/instructions affected by change(s) _____

3. Approval:

QC Supervisor Douglas M Shaw 12/14/82

QE Supervisor Randy Good 12/14/82

QC Manager, Site [signature] 12-18-82

DOCUMENT CHANGE NOTICE

No. 1

1. Proc./Inst. No. OI-QP-11.10-2A Rev. 10 Change Proposed By Bob Roffe

2. The following change/revision is recommended.

   a. Description of proposed change(s) Revise Para. 3.2.2.3e to read as follows: e.1 "Where bolts are used on surfaces having slopes greater than 1-in-20 with a plane normal to the bolt axis, beveled washers shall be provided, to reduce the slope to less than 1-in-20. The

   (Con. on page 2)

   b. Justification for change(s) DCA-21941 compliance and clarification.

CONTROLLED COPY

CONTROL No. PIM-524

   c. List other procedures/instructions affected by change(s)

3. Approval:

QC Supervisor [signature] 11/1/86

QE Supervisor [signature] 11/13/86

QC Manager, Site [signature] 11-13-86

beveled washer may be installed with either side against the mating surface of the member.

e.2 An irregular gap of 1/16" maximum is acceptable between each of the following:

a) Bolt head and washer
b) Nut and washer
c) Washer and member
d) Washer and clamp

NOTE: Bolt head and nut gaps are also subject to the provisions of paragraph ~~2~~ 3.2.2.3 (d).

11011
11/17/86

This instruction is applicable to all Seismic Category I supports and associated components supporting tray designated as Unit II in all Category I Buildings.

NOTE: Where criteria in this instruction or CTH drawing refers to cable tray, the criteria shall also be used for "bus duct", when applicable.

3.0 PROCEDURE/INSTRUCTION

The PFG will issue a separate work package that contains the appropriate drawings and Operation Traveler for each cable tray hanger.

3.1 WORK PACKAGES

3.1.1 Cable Spread Room (Structural Steel Framework)

Each work package shall contain as a minimum, the FSE-00159 drawing and Operation Traveler (Attachment 1). The Operation Traveler shall list all design drawings and applicable change documents which will be included in the work package.

NOTE: The FSE-00159 drawings are issued by Civil Engineering Department as a fabrication, location and elevation drawing. These drawings are to be used for location and elevation of unique number marking as well as historical purposes ONLY and are NOT to be used for new work or rework.

The QC Inspector shall perform inspections for the operations listed on the Operation Traveler (Attachment 1) in accordance with this instruction and the work package drawing(s). If a conflict exist between this instruction and the design document(s), the design document(s) listed on the traveler shall govern.

3.1.2 All Other Areas

Each work package shall contain as a minimum the individual Cable Tray Hanger drawing and Operation Traveler (Attachment 2).

The QC Inspector shall perform inspections of the operations listed on the Operation Traveler (Attachment 2) in accordance with this instruction and the work package drawing(s).

NOTE: The individual Cable Tray Hanger drawing will contain a reference to the general notes drawing for cable tray hangers. This note is for Engineering use ONLY, and is NOT applicable for the inspection of the hanger and associated clamps.

3.2 FABRICATION AND INSTALLATION OF SUPPORTS

3.2.1 Material Requirements and Traceability

The following materials (ASTM) shall be used unless otherwise shown on the drawing:

a. Structural shapes - A36
b. Base plates - A36
c. Structural tubing - A500 Grade B

Verification of material traceability is not required for A-36, A500 Grade B material, A & C type clamp materials, and for material used for shim and filler plates less than 3/16" thick. Material requiring traceability verification shall be in accordance with Reference 1-C.

3.2.2 Bolting Inspection

3.2.2.1 Bolt Configuration Verification

The QC Inspector shall perform bolting inspections in accordance with the following:

a. Verify bolting configuration is per the drawing(s) contained in the work package. For bolting of clamps to structural support members, refer to paragraph 3.2.7.2. Bolt and nut types are shown on Attachment 4.

NOTE 1: All thread rod, when used in place of A325 bolts for Richmond Inserts, shall be double nutted and considered A-36 material, unless otherwise denoted on the drawing.

NOTE 2: Verification of nut material is not required unless a friction type connection is specifically noted on the work package drawing(s) (i.e., A325F).

b. Verify Hilti Bolts and Richmond Insert bolts are installed and tensioned in accordance with Reference 1-D and the work package drawing(s). Washers supplied with the hilti bolt are acceptable for use in the installation. Minimum

embedment verification is not required if the hanger drawing specifies bolt projection and bolt length stamp requirements. Tolerance of projection of expansion anchors when shown on drawing is + 3/8", minimum of flush with top of nut.

NOTE 1: Hilti nuts may be installed with or without the washer face against the washer.

NOTE 2: Previously accepted tensioning of Hilti bolts or Richmond Inserts (including thread engagement) are acceptable provided documentation and field conditions are intact. Field verification of previous tensioning is accomplished by verifying that the torque seal is intact.

c. The cable tray hanger drawing will contain the information for the specific cable tray hanger number. In several instances other cable tray hangers connected to the same base angle or base/embedded plate may be shown "ghosted" in the same drawing. Attributes of the "ghosted" cable tray hangers are not to be inspected and verified.

The example of Attachment 8 illustrates the inspection process to be applied in those instances. If the inspector is inspecting CTH XXX, he should not inspect and verify the attributes associated with the base angle (shown ghosted) or CTH YYY. This means that no reinspection or verification of the anchorages, bearings area, etc., will be conducted. That inspection verification will be done when CTH YYY is inspected and verified with its own drawings.

Acceptance of attributes in the common elements of the hangers may be based on acceptable historical documentation.

3.2.2.2 Bolt Hole Verification

Verification of used bolt hole diameter on structural support members is not required unless the work package contains a Construction Operation Traveler for "Bolt Hole Verification". Inspection will be documented on the above stated Operation Traveler.

Bolt hole verification is required only for bolt hole drawings. All other dimensions and details on the bolt hole drawings with the exception of indicated edge distances, are irrelevant and need not be verified. There is no requirement that the bolt hole drawings and CTH drawings be identical. Edge distances shall be

recorded as indicated on the bolt hole drawings and verified as indicated on the CTH drawings.

3.2.2.3 Bolted Connection Verification

The QC Inspector, when inspecting bolted connections, shall visually inspect for the following:

a. Bolts are the correct length as indicated by having the bolts flush with, or outside of, the face of the nut when completely installed.

b. Turning elements are on the correct face.

c. Washers are required for expansion anchors and for high strength bolting. Washers are not required for richmond inserts, or high strength bolts when used as a substitute for A-307 bolts, however washers are acceptable if used. Washer requirements for clamps shall be as specified on Attachment 6. Deviations may be made to these requirements where specifically noted on the work package drawings.

NOTE: Where long slotted holes are used on an outer ply, structural plate washer or a continuous bar not less than 5/16" thick with standard holes shall be provided only when shown on the design drawing. These washers or bars shall have size sufficient to completely cover the slot after installation.

d. Bolt heads and nuts resting against the metal or washer with a slope of 1-in-20 or less shall be considered acceptable.

e. 1) Where bolts are used on surfaces having slopes greater than 1-in-20 with a plane normal to the bolt axis, beveled washers shall be provided, to reduce the slope to less than 1-in-20. The beveled washer may be installed with either side against the mating surface of the member.

2) An irregular gap of 1/16" maximum is acceptable between each of the following:

a) Bolt head and washer
b) Nut and washer
c) Washer and member
d) Washer and clamp

NOTE: Bolt head and nut gaps are also subject to provisions of Paragraph 3.2.2.3(d)

f. ASTM A-449 bolts may be substituted for A-325 bolts. Reuse of A-325 and A-449 bolts in cable tray clamps, is permitted. Reuse of A-325 and A-449 bolts in structural connections is subject to prior engineering approval. A-490 and galvanized bolts shall not be reused. Retightening previously

tightened bolts which may have been loosened by tightening of adjacent bolts shall not be considered as reuse. Upgrading of an A-307 bolt is acceptable.

g. Structural bolting (A-449, A-307, A-325, etc.) used for supports and clamps shall be verified to exhibit no looseness when checked by hand, unless the CTH drawing specifically identifies the connection as a friction type connection (i.e., A325F) [Note: A friction clamp does not mean a friction type connection.] In the latter case previously accepted tensioning of the bolts is acceptable provided documentation is available and torque seal is intact. Tensioning of high strength structural bolts in friction type connections shall be accomplished via a special traveler.

h. The QC Inspector shall apply torque seal to all satisfactorily tightened nuts/bolts.

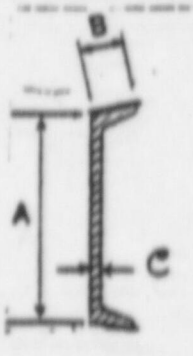
3.2.2.4 Verification of Bolt Holes, Edge Distance and Washer Plates for Previously Installed Structural Support Members

A special Operation Traveler may be issued by Engineering to remove bolts and nuts as required to perform "as-built" of bolt hole size, edge distance, and washer plates for previously installed support members.

3.2.3 Support Configuration Verification

The QC Inspector shall verify the completed support is in accordance with the work package drawing(s). This verification shall include the following attributes:

a. Support member shapes (i.e.; beams, channel, etc.), and size. For standard members (beams, channels, etc.) the size shall be denoted by the AISC member designation closest to matching the dimensions measured in the field (See Attachment 9). The following tolerances shall be used to determine the channel weight group.



Section	Nominal Size, in.	* [a]A, Depth, in.		B, Flange Width, in.		C, Thickness in.	
		Over Detailed Value	Under Detailed Value	Over Detailed Value	Under Detailed Value	Over Detailed Value	Under Detailed Value
Channels	3 to 7, incl.	3/32	1/16	1/8	1/8	1/32	1/32
	Over 7 to 14, incl.	1/8	3/32	1/8	5/32	1/32	1/32
	Over 14	3/16	1/8	1/8	3/16	1/32	1/32

[a]A is measured at back of web for channels.

* Detailed values are as shown in tables (Attachment 9)

b. Verification of dimensions shown on the work package drawing(s) (member length, work points, etc.).

c. When the CTH drawing states "verify presence" for a component, it shall be understood that no dimensional verification is required and only its existence shall be verified.

All dimensions shall have field measurement tolerances as follows unless otherwise shown on the work package drawing(s):

1. Tolerances for support configuration dimensions except clamps:

   A) ± 3/4" for dimension up to and including 5'0".
   B) ± 1" for dimension greater than 5'-0" up to and including 10'-0".
   C) ±1½" for dimension greater than 10'0".
   D) Modified structural shapes, notches on plates, etc; ± 1/8".
   E) Work point ±1".
   F) Transverse location when shown on the drawing for cable tray to associated reference points is ± 2".

2. The distance from centerline of the bolt/hole to the end of the member has a tolerance of ±½" except for clamps members. End of members is defined as the edge at either end of the length of the member. For base plates, end members is defined as either end of the length or width of the member. For clamp members, the end distance has a tolerance of ± 1/8".

3. The gage distance tolerance measured from the centerline of the bolt/hole to the heel of the angle is ± 1/4" except for angles employed in clamps, where the gage has a tolerance of ± 1/8"; for all other shapes, the tolerance is ± 1/8".

4. The center to center dimension of bolt/hole shall have a ±1/8" tolerance.

5. Within the cable tray hanger system, a ± 1" tolerance is permissible in locating:

   - Hilti/Richmond to Hilti/Richmond on the same attachment.
   - Hilti/Richmond to Hilti/Richmond between different attachments when a dimension is given on the drawing.

6. Tolerance for dimension between welded steel attachments on embedded plates is ± 1" when the dimension is shown on the drawing.

7. Tolerance for projection of expansion anchors shall be +3/8" with a minimum of flush with top of nut.

8. Nominal thickness of members and/or plates shall have a tolerance of ±1/32".

NOTE 1: Location, elevation, plumbness, levelness, and span will be verified by Field Engineering (surveyors).

NOTE 2: On travelers (Attachment 2) where Operation 6C has not been signed by QC for "spans", Operation 6C requirements shall be moved from Operation 6 (a QC verification) to Operation 1 (a field engineering verification) as follows:

1) line out Operation 6C, initial and date

2) Add "Span verification" to Operation 1, initial and date. If operation 1 has been signed it shall be reopened per Paragraph 3.3.1

This note gives generic QE authorization required by CP-CPM-6.3 for PFG, craft, or QC/QE to make this traveler change.

NOTE 3: "Angles given on drawings in degrees, except those used for fit-up verification (i.e., 30°) are not to be verified."

NOTE 4: Attributes of "ghosted" items connected to support members are not to be inspected or verified. Attachments connected to cable tray hangers are to be inspected for compliance to CTH drawing dimensions. The support member is to be inspected for possible base metal damage.

3.2.4 Verification of Supporting Member for Bearing

Verification of base members for bearing shall be accomplished per Reference 1-E and shall not be within the scope of this procedure.

When shims are installed under the supporting member to meet bearing requirements, the shim and tack weld are to be considered "NNS". This also applies to tack welds used to attach cap plates to closed sections. These shims and tack welds are not required to be shown on the work package drawing.

3.2.5 Welding Inspection

3.2.5.1 Inspection Requirements

Inspection of welds on cable tray supports and associated components shall be inspected in accordance with criterias denoted in Reference 1-F (with the exception that welds may be painted) and the work package drawing(s). The inspection shall be documented by signing the applicable step(s) of Attachment 1 or 2. If the inspection is unsatisfactory, list the IR number(s) at the applicable step of the traveler.

Fit-up inspection of welds may be accepted provided existing documentation demonstrates that fit-up was previously accepted by QC. If fit-up can not be verified through existing documentation, an CDR shall be initiated per Reference 1-K.

Inaccessible welds may be accepted provided existing documentation demonstrates that weld configuration/profile, including fit-up when required, was previously accepted by QC. If weld configuration/profile can not be verified through existing documentation, an NCR shall be initiated per Reference 1-K.

When welding is designated as "NNS" (i.e., Non-Nuclear Safety) it shall not be inspected except for base metal damage. If base metal damage (including undercut) exists, it shall be inspected and reported per Reference 1-G.

3.2.5.2 Welding on Ends of Structural Shapes

The welds at the ends (or corners) of angles, channels and wide flanges where an all-around fillet weld has been detailed on the individual support drawing are optional and non-safety related.

3.2.6 Repair of Misdrilled Holes

The QC Inspector shall use the following criteria to assess the need for repair of misdrilled holes:

3.2.6.1 Cable Tray Supports

a. All unused holes greater than 3/4 inch diameter shall be repaired.

b. Unused holes which are spaced 2 inches or less (measured center to center) from a used or unused hole shall be repaired.

c. No two holes (used or unused) shall be located in the same cross-sectional plane (see Attachment 5 for typical examples of acceptable and rejectable bolt/hole configurations).

d. Holes which interfere with the design welding requirements shall be repaired.

In summary, when a used hole and an unused hole are in the same cross-sectional plane, the unused hole shall be repaired. Conversely, when two (2) unused holes are in the same cross-sectional plane, one must be repaired. A cross-section is a section normal to the longitudinal axis of the member. The above configurations (A thru D) shall be identified in accordance with Reference 1-G.

NOTE: Holes to be repaired that are not in violation of the above criteria shall be repair welded in accordance with an RPS (Repair Process Sheet).

3.2.6.2 Cable Tray

a. Each cable tray siderail shall be evaluated independently. See Attachment 5 for typical examples of acceptable and rejectable bolt hole configuration. These configurations shall be identified in accordance with Reference 1-G.

NOTE: If cable tray clamp installation results in holes in the cable tray that violate the requirements of Attachment 5, they shall be identified in the same manner as outlined above.

b. Repair of misdrilled holes shall be inspected using the acceptance criteria of Reference 1-F.

3.2.7 Cable Tray Clamps and Components

3.2.7.1 Welded Components

Inspection of welds on splice plates, transverse clamps, heavy duty plates/clips and miscellaneous cable tray components shall be inspected in accordance with criterias denoted in Reference 1-F (with the exception that welds may be painted) and the work package drawings and are in accordance with 3.2.7.3. The inspection shall be documented by signing the applicable step(s) of Attachment 1 or 2. If the inspection is unsatisfactory, list the IR number(s) at the applicable step of the traveler.

Fit-up inspection of welds may be accepted provided existing documentation demonstrates that fit-up was previously accepted by QC. If fit-up can not be verified through existing documentation, an CDR shall be initiated per Reference 1-K.

An CDR will not be required if the fit-up preparation on full and partial penetration welds is visible on the unwelded portion of the plate, and shall be considered as having acceptable penetration when the unwelded portion of the member/plate is beveled as required. However, if lack of penetration is evident, it shall be documented on an CDR as outlined above.

Inaccessible welds may be accepted provided existing documentation demonstrates that weld configuration/profile, including fit-up when required, was previously accepted by QC. If weld configuration/profile can not be verified through existing documentation, an NCR shall be initiated per Reference 1-K.

When welding is designated as "NNS" (i.e., Non-Nuclear Safety) it shall not be inspected except for base metal damage. If base metal damage (including undercut) exists, it shall be inspected and reported per Reference 1-G.

NOTE: In the event that these items are site fabricated, they shall be inspected for compliance with above requirements and documented as required. Fabricated pieces may be stamped with an E number and require acceptance by the QC Inspector on an IR or Traveler. An E number log is kept in the shop by the craft.

3.2.7.2 Bolted Clamps

Bolted clamps shall be verified as follows:

a. Clamps, as shown on the work package drawing(s), shall be verified in accordance with 3.2.7.3.

b. Bolting is installed in accordance with the applicable steps of Paragraph 3.2.2 and the work package drawing(s).

c. Verification of clamp/tray hole diameter for bolting the tray to the clamp and clamp/support member hole diameter for bolting the clamp to the support is not required unless the work package contains a Construction Operation Traveler for "Bolt Hole Verification". Inspection will be documented on the above stated Operation Traveler.

3.2.7.3 Clamp Installation Criteria

Inspection criteria for clamp installation shall be as outlined below.

NOTE 1: Attachment 7 shall be used for inspection orientation.

NOTE 2: For cable tray clamps attached to the structural steel framework in the Cable Spread Room, all dimensions/ attributes shown on the work package drawing(s) shall be verified.

a. Clamp Configuration

Clamp configuration shall be verified to be as shown on the work package drawing(s); (example: angle/plate size, etc.).

b. Welding and Bolting Configuration

Welding and bolting configuration shall be verified to be as shown on the work package drawing(s); (example: weld symbol, bolt type, quantity of bolts, etc.).

c. Dimensions

Only the dimensions required by Attachment 6 and 6A shall be verified by QC.

d. Gaps

Clamp installation gaps shall be inspected to verify that they meet requirements of Attachment 6 and 6A. "Special" clamp gaps shall be as shown on the CTH drawing.

e. Tolerances

Clamps shall be inspected with tolerances given on the CTH drawing, Attachments 6/6A and paragraph 3.2.3.c. However, if conflicting tolerances are given for the same dimension, the tolerance on the CTH drawing shall be used.

NOTE: When Attachment 6 or 6A states "verify presence" for a component, it shall be understood that no dimensional verification is required and only its existence should be verified.

3.2.8 Field Fabricated Clamps

The inspector shall verify that field fabricated clamps meet dimensional requirements as shown on Attachment 6.

NOTE: For cable tray clamps attached to the structural steel framework in the Cable Spread Room, all dimension/ attributes for field fabricated clamps shown on the work package drawing(s) shall be verified.

The only type clamps that are both vendor supplied and field fabricated are types A and C (CTC-23 and CTC-24 for structural steel framework). Type A & C (CTC-23 and CTC-24 for structural steel framework) clamps which are not hot dip galvanized are field fabricated.

3.2.9 Legend for the Individual Support Drawings

The following symbols will be used:

* - Indicates minimum dimension to be the specified weld size + 1/8". If no weld symbol is present, it signifies a minimum dimension of 1/8".

FWP/WP - Field Work Point/Work Point

L_1, L_2 - Tray span to next hanger

IA - Inaccessible

B - Bevel Washer

F - Standard Flat Washer

HS - High Strength

IP - In Place

BTWN - Between

SH or HSKB - Hilti Super Kwik Bolt

H or HKB - Hilti Kwik Bolt

R - Richmond/Screw Anchor

3.3 REWORK

3.3.1 Rework on Operation Traveler

If rework is required on a hanger for which QC/QE review of the traveler has not been completed, hold point(s) may be re-established for signed off operations per Reference 1-B.

3.3.2 Rework Traveler

Once the QC/QE review of the traveler on Attachment 1 or Attachment 2 is signed off, a rework traveler will be required for additional work. Any deviations will require QE approval.

3.4 ITEMS INACCESSIBLE FOR INSPECTION OTHER THAN WELDING

Items that are inaccessible for inspection may be accepted provided existing documentation demonstrates that all inspection attributes was previously accepted by QC. If verification can

not be accomplished through existing documentation, an CDR shall be initiated per Reference 1-K.

3.5. INSPECTION OF COMPLETED INSTALLATIONS FOR SEPARATION/SPACING

Inspections of completed installation for separation/spacing requirements from safety related items will be in accordance with Reference 1-H.

3.6 SEPARATION VERIFICATION OF ATTACHMENTS TO EMBEDDED PLATES

The QC Inspector shall verify attachments welded to embedded plates have been inspected in accordance with Reference 1-I.

3.7 DOCUMENTATION

The QC Inspector shall document the inspection of cable tray support and clamps on the Operations Travelers (Attachment 1 or Attachment 2). The hanger number should be identified as "CTH-xxx" or "2-xxx" on the traveler. However, the field identification stamp is acceptable with the "xxx" number only.

Attachment 3 is to be used only to document unsatisfactory conditions as identified on the IR.

Inspection Reports shall be processed in accordance with Reference 1-J. Operation Travelers shall be processed in accordance with Reference 1-B.

NOTE: Refer to Reference 1-J for alternate methods of closing previously open unsatisfactory Inspection Reports.

Revisions used for inspection will be noted on the Operation Traveler (including inspection procedures, instructions, and drawings).

Upon completion, all documentation shall be returned by Craft to the PFG.

3.8 REPORTING CONSTRUCTION DEFICIENCIES

CDR shall be documented in accordance with Reference 1-K.

ATTACHMENT 1

CONSTRUCTION OPERATION TRAVELER 35-1195

(1) TRAVELER NO. | (2) EQUIPMENT NO. CTH | (3) UNIT NO. 2 | (4) QUANTITY 1 | (5) PAGE 1 OF

(6) ACTIVITY DESCRIPTION CTH and CLAMP INSTALLATION | (7) REFERENCE DRAWINGS SEE BELOW

(8) SPEC/PROC/ENG. INSTR. ES-100, SS-168, ECP-108 | (9) LOCATION | (10) SYSTEM

PREPARED BY _____ DATE _____ DEPT. PEG UNIT #2

REVIEWED BY _____ DATE _____

ANI REVIEW _____ DATE _____

OP. NO	DEPT.	OPERATION	CONSTR	QA/QC ENG.	ANI
		HANGER DESCRIPTION			
1	CRAFT ENGR	A. DRAWINGS: _____			
		B. DETAIL: _____			
2	ENGR	CABLE TRAY SUPPORT LOCATION, ELEVATION, AND IDENTIFICATION PER CABLE TRAY HANGER FSE-00159 OR AS-BUILT DRAWING.			
3	CRAFT QC(V)	VERIFY THAT THE HANGER IS STAMPED WITH THE SAME ID NUMBER AS SHOWN ON THE TRAVELER AND THE FSE-00159 OR AS-BUILT DRAWING. UNSATISFACTORY CONDITIONS LISTED ON IR# _____			
4	CRAFT QC(V)	SUPPORT BOLTING (SEE NOTE 5 PAGE 5) A. STRUCTURAL BOLT INSTALLATION PER DRAWING, QC VERIFY PER QI-QP-11.10-2A; REV. _____ 1. NUMBER _____ 2. SIZE AND TYPE _____ 3. SNUG-TIGHT _____ 3. *BOLT TENSIONED _____ *(SEE NOTE 7 PAGE 5) M&TE NUMBER _____ CAL DUE DATE _____ TORQUE VALUE _____ TYPICAL 4. GAGE DIMENSIONS PER DESIGN DRAWING _____ B. HILTI BOLTS INSTALLED PER DRAWING/CEI-20, REV. _____ 1. NUMBER _____ 2. SIZE AND LENGTH _____ SUPER KWIK _____ REGULAR _____ INSPECTION AS SHOWN ON IR# _____			

ATTACHMENT 1 (Cont)

CONSTRUCTION OPERATION TRAVELER CONTINUATION

TRAVELER NO.	ACTIVITY DESCRIPTION CTH and CLAMP INSTALLATION	PAGE 2 OF

PREPARED BY_____ DATE_____

REVIEWED BY_____ DATE_____

ANI REVIEW_____ DATE_____

OP. NO	DEPT	OPERATION	CONSTR	QA/QC ENG.	ANI
4 (CONT)	CRAFT QC(V)	C. RICHMOND INSERT BOLT INSTALLATION PER DRAWING/CCP-22 REV.____, VERIFY PER QI-QP-11.2-1, REV.____. 1. NUMBER_____ 2. SIZE AND LENGTH_____ 3. SNUG TIGHT_____ INSPECTION AS SHOWN ON IR#_____.			
5.	CRAFT QC(V)	SUPPORT WELDING A. FIT-UP INSPECTION FOR PARTIAL PENETRATION, FULL PENETRATION PER QI-QP-11.21-1, Rev.___ AT:_____ 1. HANGER MEMBERS UNSATISFACTORY CONDITIONS LISTED ON IR#_____ B. FINAL VISUAL INSPECTION PER QI-QP-11.21-1, REV.____ AT_____. 1. HANGER MEMBERS UNSATISFACTORY CONDITION LISTED ON IR#_____ C. WELDING OF MISDRILLED HOLES/UNUSED HOLES VERIFIED PER QI-QP-16.0-5, REV.___AND QI-QP-11.21-1, Rev.____. 1. LOCATION (QC VERIFY PRIOR TO WELDING) IR#_____ 2. FINAL VISUAL INSPECTION.			
6	CRAFT QC(V)	SUPPORT INSTALLATION CONFIGURATION VERIFIED PER QI-QP-11.10-2A, REV. ___ AND DRAWING AS FOLLOWS: A. MEMBERS SIZE AND SHAPE B. MEMBER LOCATION(SUPPORT MEMBER DIMENSIONS INCLUDING WORK POINTS). C. COPING – ALL RE-ENTRANT CORNERS SHALL BE SHAPED, NOTCH FREE, TO A RADIUS OF AT LEAST 1/2 INCH. UNSATISFACTORY CONDITION LISTED ON IR#_____			

TYPICAL

ATTACHMENT 1 (Cont)

CONSTRUCTION OPERATION TRAVELER CONTINUATION

TRAVELER NO. | ACTIVITY DESCRIPTION CTH and CLAMP INSTALLATION | PAGE 1 OF

PREPARED BY_____ DATE_____

REVIEWED BY_____ DATE_____

AMI REVIEW_____ DATE_____

OP. NO	CRAFT	OPERATION	CONSTR	QA/QC ENG.	AMI
7	QC(V)	SUPPORT BEARING AGAINST CONCRETE SURFACES PER DRAWING AND QI-QP-11.0-15, REV._____. UNSATISFACTORY CONDITION LISTED ON IR#_____			
8	CRAFT QC(V)	SPLICE PLATES/HEAVY DUTY PLATES/HEAVY DUTY CLIPS TRANSVERSE CLIPS ATTACHMENT TO SUPPORT A. INDICATE NUMBER, TYPE AND MEANS OF ATTACHMENT TO SUPPORT HEAVY DUTY ____WELDED ____BOLTED; TRANSVERSE ____WELDED ____BOLTED; SPLICE PLATE ____WELDED ____BOLTED; OTHER ____WELDED ____BOLTED B. ITEMS LISTED ABOVE COMPLY DIMENSIONALLY WITH DRAWING/ QI-QP-11.10-2A, REV._____.			
	QC(V)	C. FOR ATTACHMENT BY WELDING, QC VERIFY: 1. FIT-UP INSPECTION FOR PARTIAL PENETRATION AND FULL PENETRATION PER QI-QP-11.21-1, REV._____. 2. FINAL VISUAL INSPECTION PER QI-QP-11.21-1, REV._____ D. WELDING OF MISDRILLED HOLES/UNUSED HOLES VERIFIED PER QI-QP-16.0-5, REV.___ AND QI-QP-11.21-1, REV.___. 1. LOCATION (QC VERIFY PRIOR TO WELDING) IR#_____ 2. FINAL VISUAL INSPECTION. E. FOR ATTACHMENT BY BOLTING, QC VERIFY PER QI-QP-11.10-2A REV._____. 1. NUMBER OF BOLTS____ 2. SIZE AND TYPE_____ 3. _____SNUG-TIGHT _____TORQUE M&TE NUMBER_____ CAL DUE DATE_____ TORQUE VALUE_____			

TYPICAL

ATTACHMENT 1 (Cont)

CONSTRUCTION OPERATION TRAVELER CONTINUATION

TRAVELER NO.	ACTIVITY DESCRIPTION CTH and CLAMP INSTALLATION	PAGE 4 OF

PREPARED BY _____ DATE _____

REVIEWED BY _____ DATE _____

ANI REVIEW _____ DATE _____

OP. NO	DEPT	OPERATION	CONSTR	QA/QC ENG.	ANI
8 (CONT)	CRAFT QC(V)	4. GAGE DIMENSIONS PER DRAWING _____			
9	CRAFT QC(V)	SPLICE PLATES/HEAVY DUTY PLATES/HEAVY DUTY CLIPS/TRANSVERSE CLIP ATTACHMENT TO TRAY. INDICATE NUMBER, TYPE AND MEANS OF ATTACHMENT. HEAVY DUTY ____BOLTED TRANSVERSE _____ SPLICE PLATE ____BOLTED OTHER ____BOLTED 1. VERIFY BOLTING PER QI-QP-11.10-2A, REV. ___ BOLT INSTALLATION TO BE SNUG-TIGHT. 2. GAGE DIMENSIONS PER DRAWING _____			
10	CRAFT QC(V)	VERIFY COMPLETION OF ALL OPERATIONS, AND REVIEW TRAVELER AND ATTACHMENT INCLUDING WPML.			

TYPICAL

ATTACHMENT 1 (Cont)

CONSTRUCTION OPERATION TRAVELER CONTINUATION

TRAVELER NO. | ACTIVITY DESCRIPTION: CTH and CLAMP INSTALLATION | PAGE ___ OF ___

PREPARED BY _____ DATE _____

REVIEWED BY _____ DATE _____

ANI REVIEW _____ DATE _____

OP. NO.	DEPT	OPERATION	CONSTR	QA/QC ENG.	ANI
		NOTES:			
		1. SEQUENCE OF OPERATIONS MAY VARY AS REQUIRED AS LONG AS NO HOLD POINTS ARE VIOLATED.			
		2. ALL OPERATIONS THAT ARE NOT APPLICABLE SHALL BE N/A'ED BY CRAFT AND THE QC INSPECTOR, PROVIDED HOLD POINTS ARE NOT VIOLATED.			
		3. IF AT TIME OF INSPECTION THE OPERATION IS COMPLETE, QC SHALL SIGN THE FACE OF THE TRAVELER. HOWEVER, IF MULTIPLE OR PARTIAL INSPECTIONS ARE REQUIRED, DESCRIBE EACH INSPECTION ON ATTACHED SAVC OR WIDC. THE LAST QC INSPECTOR PERFORMING THE INSPECTION SHALL SIGN THE FACE OF EACH TRAVELER WHEN THE OPERATION IS FINALLY COMPLETE.			
		4. SIGNATURES IN THE CONSTRUCTION COLUMN IDENTIFY THE ATTRIBUTE IS READY FOR QC INSPECTION UNLESS OTHERWISE NOTED ON THE OPERATION.			
		5. FOR OP. NO. 4 COVERING CASES SUCH AS BEAM TO BEAM CONNECTIONS OR BEAM TO COLUMN CONNECTIONS, THE INTERIOR BEAM TRAVELER OR TRAVELER FOR BEAM ATTACHING TO COLUMN SHALL BE USED TO VERIFY THE BOLTING UNLESS NOTED OTHERWISE. THE TRAVELER FOR THE EXTERIOR BEAM(S) AND COLUMN(S) SHALL CROSS REFERENCE THAT TRAVELER(S) WHICH BOLTING WAS CHECKED ON BY PLACING AN * NEXT TO THE NA IN THE CONSTRUCTION COLUMN AND LISTING THE TRAVELER NUMBER UNDER OP. NO. 4			
		6. THIS TRAVELER IS GENERIC.			
		7. REUSE OF A-325 AND A-449 BOLTS IN STRUCTURAL CONNECTIONS IS SUBJECT TO PRIOR CIVIL ENGINEERING APPROVAL BY MEANS OF SIGNATURE AND DATE ON OPERATION 4A.			

TYPICAL

ATTACHMENT 1 (Cont)

TRAVELER NO.: ERS-86-[illegible]

PAGE 6 OF 8

WELD INSPECTION DOCUMENTATION SHEET

PIECE TO PIECE	FIT-UP INSPECTION	VT	MT/PT	UT

TYPICAL

ATTACHMENT 1 (Cont)

TRAVELER NO: ERS-86-CTH

PAGE 7 OF 8

STRUCTURAL ASSEMBLY VERIFICATION CARD

PIECE MARK NO. AND/OR HEAT/MIC NO.	QC VERIFICATION

TYPICAL

ATTACHMENT 1 (Cont)

PAGE 8 of 8

WPS#
I0046

WDC SERIAL NO. ERS-86-CTH

DRAWING NO. CTH-2-

WELD FILLER MATERIAL LOG WELD NO. N/A

WELD NO.	DATE	SIZE/CLASS	WELDER SYMBOL	WPS/PCN#	HEAT/LOT# OR CODE#	AMT. ISS.	AMT. RT'D.	ISSUANCE APPROVAL

TYPICAL

ATTACHMENT 2

CONSTRUCTION OPERATION TRAVELER IS-1195

(1) TRAVELER NO. ERS-86-CTH (2) EQUIPMENT NO. CTH- (3) UNIT NO. 2 (4) QUANTITY 1 (5) PAGE 1 OF 8

(6) ACTIVITY DESCRIPTION CTH and Clamp Installation (7) REFERENCE DRAWING: CTH-2-

(8) SPEC/PROC/ENG. INSTR: SS-168/ECP-10A/QI-QP-11.10-2A (9) LOCATION (10) SYSTEM

PREPARED BY _____ DATE _____ DEPT. PFC

REVIEWED BY Refer to Trav. ERS-85-CTH-9839 DATE 5-31-85

ANI REVIEW N/A DATE N/A

OP. NO	DEPT.	OPERATION	CONSTR	QA/QC ENG.	ANI
		CTH VERIFICATION			
1	PE	CABLE TRAY SUPPORT LOCATION ELEVATION, AND IDENTIFICATION PER CABLE TRAY HANGER (CTH) DRAWING.			
2	PE	SUPPORT IS INSTALLED PLUMB, LEVEL AND SQUARE PER CTH DRAWING.			
3	Craft QC(V)	VERIFY THAT THE HANGER IS STAMPED WITH THE SAME ID NUMBER AS SHOWN ON THE TRAVELER AND THE CTH DRAWING. UNSATISFACTORY CONDITION LISTED ON IR#_____			
4	Craft QC(V)	SUPPORT BOLTING A. STRUCTURAL BOLT INSTALLATION PER CTH DRAWING, QC VERIFY PER QI-QP-11.10-2A; REV._____. 1. SNUG TIGHT_____ 2. BOLT TENSIONED_____ MATE NUMBER_____ CAL DUE DATE_____ TORQUE VALUE_____ UNSATISFACTORY CONDITION LISTED ON IR#_____ B. HILTI BOLTS INSTALLATION PER CTH DRAWING/CEI-20, REV.___ VERIFY PER QI-QP-11.2-1, REV._____. INSPECTION AS SHOWN ON IR#_____. C. RICHMOND INSERT BOLT INSTALLATION PER CTH DRAWING/CEI-20, REV.____, VERIFY PER QI-QP-11.2-1; REV._____. INSPECTIONS AS SHOWN ON IR#_____.			

TYPICAL

ATTACHMENT 2 (Cont)

CONSTRUCTION OPERATION TRAVELER CONTINUATION

TRAVELER NO. ERS-86-CTH	ACTIVITY DESCRIPTION CTH and Clamp Installation	PAGE 2 OF 8

PREPARED BY _____ DATE _____

REVIEWED BY Refer to Trv. ERS-85-CTH-9839 DATE 5-31-85

ANI REVIEW N/A DATE N/A

OP. NO	DEPT	OPERATION	CONSTR	QA/QC ENG.	ANI
5	Craft QC(V)	SUPPORT WELDING A. FIT-UP INSPECTION FOR PARTIAL PENETRATION, FULL PENETRATION, PER QI-QP-11.21-1; REV._____ 1. HANGER TO EMBED 2. HANGER MEMBERS UNSATISFACTORY CONDITIONS LISTED ON IR#_____. B. FINAL VISUAL INSPECTION PER QI-QP-11.21-1; REV._____ 1. HANGER TO EMBED 2. HANGER MEMBERS UNSATISFACTORY CONDITIONS LISTED ON IR#_____. C. WELDING OF MISDRILLED HOLES/UNUSED HOLES VERIFIED PER QI-QP-16.0-5, REV._____AND QI-QP-11.21-1; REV._____ 1. LOCATION (QC VERIFY PRIOR TO WELDING). IR#_____. 2. FINAL VISUAL INSPECTION			
6	Craft QC(V)	SUPPORT INSTALLATION CONFIGURATION VERIFIED PER QI-QP-11.10-2a; REV._____AND CTH DRAWING AS FOLLOWS: A. MEMBER SIZE, SHAPE AND MATERIAL REQUIREMENT. B. MEMBER LOCATION (SUPPORT MEMBERS DIMENSIONS INCLUDING BOLT LOCATIONS) C. SPANS UNSATISFACTORY CONDITIONS LISTED ON IR#_____.			

TYPICAL

ATTACHMENT 2 (Cont)

CONSTRUCTION OPERATION TRAVELER CONTINUATION

TRAVELER NO. ERS-86-CTH | ACTIVITY DESCRIPTION CTH and Clamp Installation | PAGE 3 OF 8

PREPARED BY _____ DATE _____

REVIEWED BY Refer to Trv. ERS-85-CTH-9839 DATE 5-31-85

AMI REVIEW N/A DATE N/A

OP. NO	DEPT	OPERATION	CONSTR	QA/QC ENG.	AMI
7	QC(V)	SUPPORT BEARING AGAINST CONCRETE SURFACES PER CTH DRAWING AND QI-QP-11.0-15; REV._____. UNSATISFACTORY CONDITION LISTED ON IR#_____.			
8	Craft QC(V)	SPLICE PLATES/HEAVY DUTY PLATES/HEAVY DUTY CLIPS/FRICTION CLIPS ATTACHMENT TO SUPPORT. A. VERIFY NUMBER, CONFIGURATION, POSITION, ORIENTATION RELATIVE TO THE SUPPORT MEMBER AND CORRECT TYPE (LONGITUDINAL/TRANSVERSE) CLAMPS PER INDIVIDUAL SUPPORT DRAWING HAVE BEEN USED, INCLUDING BOLT HOLE SIZE IF APPLICABLE. B. FOR ATTACHMENT BY WELDING, QC VERIFY: 1. FIT-UP INSPECTION FOR PARTIAL PENETRATION AND FULL PENETRATION PER QI-QP-11.21-1; REV._____. 2. FINAL VISUAL INSPECTION PER QI-QP-11.21-1; REV.___. 3. UNSATISFACTORY CONDITION LISTED ON IR#_____. C. REPAIR OF MISDRILLED HOLES/UNUSED HOLES VERIFIED PER QI-QP-16.0-5, REV._____AND QI-QP-11.21-1, REV._____. 1. LOCATION (QC VERIFY PRIOR TO WELDING) IR#_____. 2. FINAL VISUAL INSPECTION D. FOR ATTACHMENT BY BOLTING, QC VERIFY PER QI-QP-11.10-2A, REV._____BOLTS ARE TIGHTENED: 1. SNUG TIGHT_____ 2. TORQUE_____ M&TE NUMBER_____ CAL DUE DATE_____ TORQUE VALUE_____ TYPICAL			

ATTACHMENT 2 (Cont)

CONSTRUCTION OPERATION TRAVELER CONTINUATION

TRAVELER NO. ERS-86-CTH	ACTIVITY DESCRIPTION CTH and Clamp Installation	PAGE 4 OF 8

PREPARED BY _____ DATE _____

REVIEWED BY Refer to Trv. ERS-85-CTH-9839 DATE 5-31-85

ANI REVIEW N/A DATE N/A

OP. NO	DEPT	OPERATION	CONSTR	QA/QC ENG.	ANI
9	Craft QC(V)	SPLICE PLATES/HEAVY DUTY PLATES/HEAVY DUTY CLIPS ATTACHMENT TO TRAY. A. VERIFY BOLT HOLE SIZE B. VERIFY BOLTING PER QI-QP-11.10-2A; REV. _____ BOLT TENSIONING TO BE SNUG TIGHT.			
10	Craft QC(V)	VERIFY COMPLETION OF ALL OPERATIONS, AND REVIEW TRAVELER AND ATTACHMENT INCLUDING WFML. LISTING OF REFERENCE INSTALLATION DOCUMENT (HISTORICAL). USED FOR ACCEPTANCE OF INACCESSIBLE ITEMS ARE APPLICABLE.			

TYPICAL

ATTACHMENT 2 (Cont)

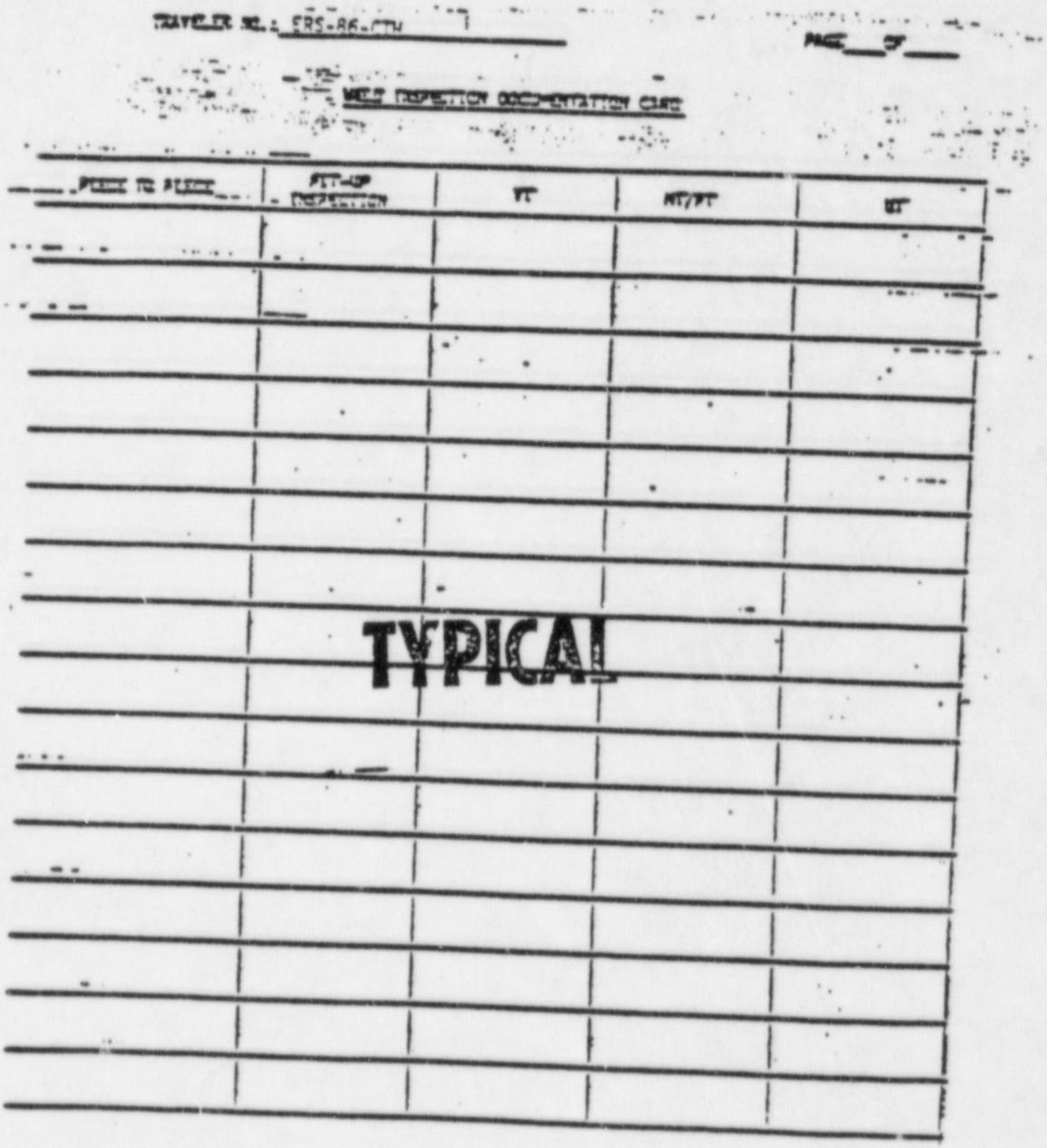
CONSTRUCTION OPERATION TRAVELER CONTINUATION

TRAVELER NO. ERS-86-CTH	ACTIVITY DESCRIPTION CHT and Clamp Installation	PAGE OF	
PREPARED BY		DATE	
REVIEWED BY Refer to Trv. ERS-85-CTH-9839		DATE 5-31-85	
ANI REVIEW N/A		DATE N/A	

OP. NO	DEPT	OPERATION	CONSTR	QA/QC ENG.	ANI
		NOTES:			
		1. SEQUENCE OF OPERATIONS MAY VARY AS REQUIRED AS LONG AS NO HOLD POINTS ARE VIOLATED.			
		2. ALL OPERATIONS THAT ARE NOT APPLICABLE SHALL BE N/A'ED BY CRAFT AND THE QC INSPECTOR, PROVIDED HOLD POINTS ARE NOT VIOLATED.			
		3. IF AT TIME OF INSPECTION THE OPERATION IS COMPLETE, QC SHALL SIGN THE FACE OF THE TRAVELER, HOWEVER, IF MULTIPLE OR PARTIAL INSPECTION ARE REQUIRED, DESCRIBE EACH INSPECTION ON ATTACHED SAVC AND WIDC. THE LAST QC INSPECTOR PREFORMING THE INSPECTION SHALL SIGN THE FACE OF EACH TRAVELER WHEN THE OPERATION IF FINALLY COMPLETE.			
		4. AN ASTERIK (*) ADJACENT TO THE SIGNATURE IN THE CONSTR. COLUMN REPRESENTS THE ATTRIBUTE WAS "AS-BUILT" AND WORK PREFORMED IS AS DOCUMENTED ON HISTORICAL DOCUMENTATION AND THAT CRAFT HAS ONLY VERIFIED/REVERIFIED. A DOUBLE ASTERIK (**) ADJACENT TO THE SIGNATURE IN THE CONSTR./QA/QC/ENG. COLUMN INDICATES THE ITEM (S) IS (ARE) INACCESSABLE. REFER TO THE SECTION FOLLOWING STEP 10 FOR LISTING OF HISTORICAL DOUCMENTS USED FOR ACCEPTANCE OF THE INACCESSABLE ITEM (S). (ENTRIES TO BE MADE BY CRAFT WHEN APPLICABLE AND VERIFIED BY QE/QC).			
		5. SIGNATURES IN THE CONSTR. COLUMN FOR CASES OTHER THAN THOSE IN NOTE 4 (e.g.: SUBSEQUENT BOLT TENSIONING, WELDING, etc.) IDENTIFY THE ATTRIBUTE AS READY FOR QC INSPECTION UNLESS OTHERWISE NOTED.			
		6. THIS TRAVELER IS GENERIC. Per CPM-6.3, THIS TRAVELER REPRESENTS WORK OF A REPETITIOUS NATURE, AND SUBSEQUENT REVIEW FOR EACH TRAVELER BY QE IS WAIVED.			

TYPICAL

ATTACHMENT 2 (Cont)



ATTACHMENT 2 (Cont)

TRAVELER NO: ERS-86-CTH

PAGE____OF____

STRUCTURAL ASSEMBLY VERIFICATION CARD

PIECE MARK NO. AND/OR HEAT/MIC NO.	QC VERIFICATION

TYPICAL

ATTACHMENT 2 (Cont)

PAGE ___ of ___

WPS#
I0046

WELD FILLER MATERIAL LOG

WDC SERIAL NO. EPS-86-CTH
DRAWING NO. CTE-2-
WELD NO. N/A

WELD NO.	DATE	SIZE/CLASS	WELDER SYMBOL	WPS/ICH#	HEAT/LOT# OR CODE#	AMT. ISS.	AMT. RT'D.	ISSUANCE APPROVAL

ATTACHMENT 3

COMANCHE PEAK STEAM ELECTRIC STATION

INSPECTION REPORT

SHEET 1 OF 2

NO. 1

ITEM DESCRIPTION: CABLE TRAY SUPPORTS AND CLAMPS 3 | IDENTIFICATION NO. 4 | SYSTEM/STRUCTURE DESIGNATION 5

SPEC. NO. 9 | REV. 6 | REF. D.C. DOC. & REV. & CHANGE NO.: QI-QP-11.10-2A, Rev. 7 | MEASURE OR TEST EQUIP. IDENT. NO. 8

☐ IN PROCESS INSPECTION ☐ PRE INSTALLATION VERIFICATION ☐ INSTALLATION INSPECTION ☐ FINAL INSPECTION ☐ PRETEST INSPECTION 9

INSP. RESULTS

☐ INSPECTION COMPLETED, ALL APPLICABLE ITEMS SATISFACTORY

☐ INSPECTION COMPLETED, UNSATISFACTORY ITEMS LISTED BELOW

QC INSPECTOR _____ DATE 10

ITEM NO. 11	INSPECTION ATTRIBUTES 12	SAT	UNSAT	DATE	QC SIGNATURE 13
	This inspection report is to be used only to document				
	unsatisfactory conditions (list unsat conditions below				
	or on a continuation sheet(s)).				
1.	Support identification				
2.	Support bolting				
3.	Support welding				
4.	Support configuration verification				

M2/02 4/86

ATTACHMENT 3 (Cont)

COMANCHE PEAK STEAM ELECTRIC STATION

INSPECTION REPORT

(SUPPLEMENTAL) SHEET 2 OF 2

FOR FULL HEADINGS, SEE SHEET 1 NO.

ITEM NO.		SAT	UNSAT	DATE	QC SIGNATURE
5.	Field fabricated clamps				
6.	Clamp and miscellaneous component welding				
7.	Clamp bolting				
8.	Clamp installation/configuration				

REMARKS: (DWGS. SPECS. ETC.)

RELATED NCR NO. | I.R. CLOSED ☐ | DATE | SIGNATURE QC INSPECTOR

M2/02 4/86

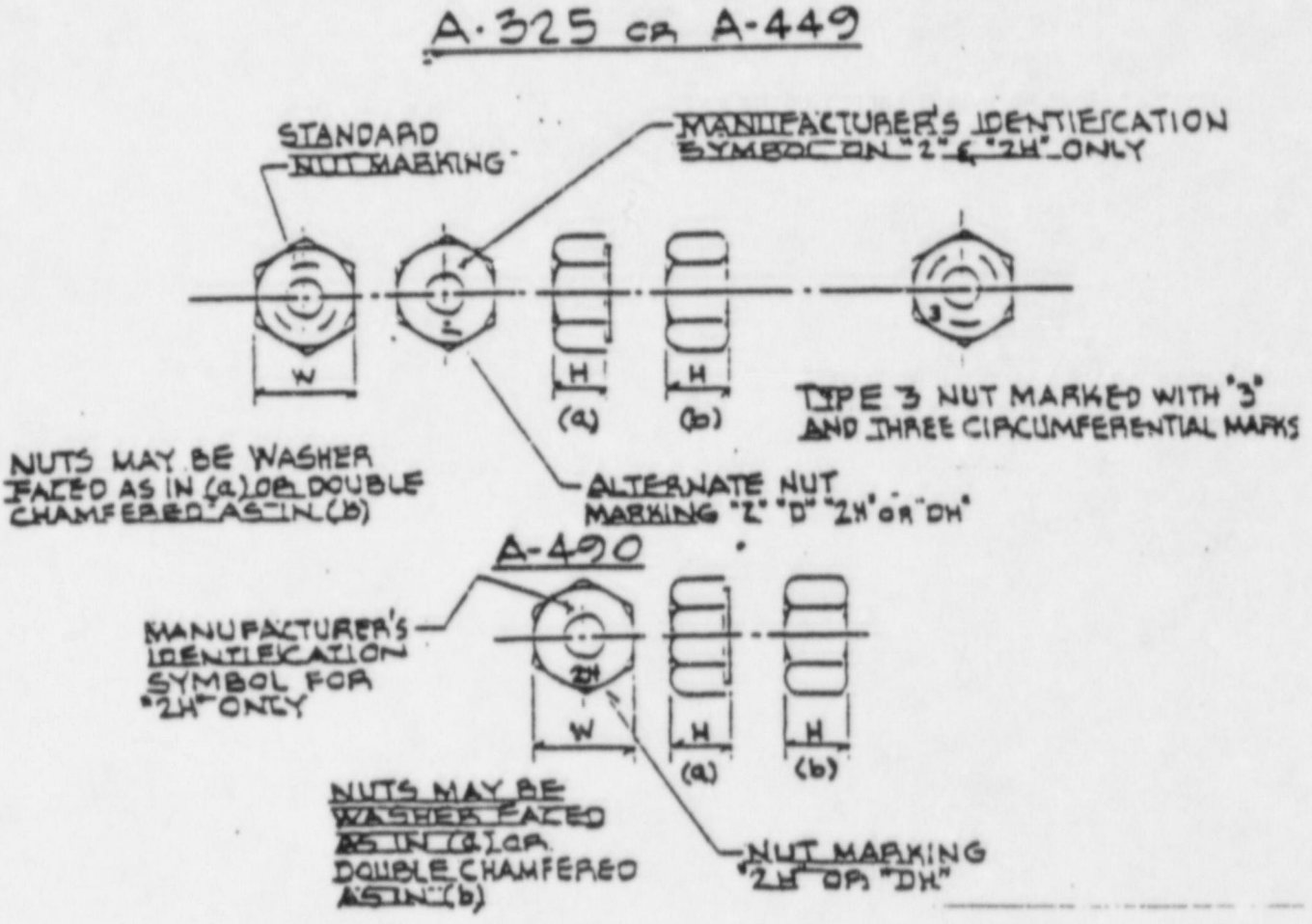
ATTACHMENT 4

ASTM AND SAE GRADE MARKINGS FOR STEEL BOLTS AND SCREWS

GRADE MARKINGS	SPECIFICATION	MATERIAL
 NO MARK	SAE - GRADE 1	LOW OR MEDIUM CARBON STEEL
	ASTM - A 307	LOW CARBON STEEL
	SAE - GRADE 2	LOW OR MEDIUM CARBON STEEL
	SAE - GRADE 5	MEDIUM CARBON STEEL, QUENCHED AND TEMPERED
	ASTM - A 449	
	SAE - GRADE 5.2	LOW CARBON MARTENSITIC STEEL, QUENCHED AND TEMPERED
	ASTM - A 325 TYPE 1	MEDIUM CARBON STEEL, QUENCHED AND TEMPERED
	ASTM - A 325 TYPE 2	LOW CARBON MARTENSITIC STEEL
	ASTM - A 325 TYPE 3	ATMOSPHERIC CORROSION (WEATHERING STEEL), QUENCHED AND TEMPERED
	ASTM - A 354 GRADE BD	LOW ALLOY STEEL, QUENCHED AND TEMPERED
	ASTM - A 354 GRADE BC	LOW ALLOY STEEL, QUENCHED AND TEMPERED
	SAE - GRADE 7	MEDIUM CARBON ALLOY STEEL, QUENCHED AND TEMPERED, ROLL THREADED AFTER HEAT TREATMENT
	SAE - GRADE 8	MEDIUM CARBON ALLOY STEEL, QUENCHED AND TEMPERED
	ASTM - A 354 GRADE BD	ALLOY STEEL, QUENCHED AND TEMPERED
	ASTM - A 490	ALLOY STEEL, QUENCHED AND TEMPERED

Note: All bolts shown on this attachment except those marked with an asterick (*), are considered "High Strength" (HS) as shown on the CTH drawing for the purpose of this procedure.

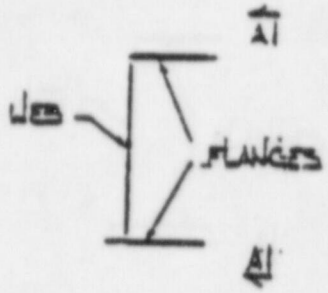
ATTACHMENT 4 (Cont)



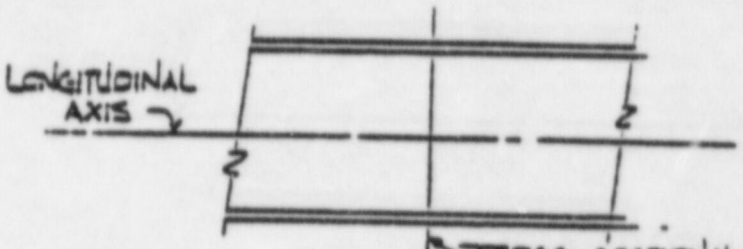
NOTE: Any nut marked other than above shall be considered A-307.

ATTACHMENT 5

CABLE TRAY SUPPORT

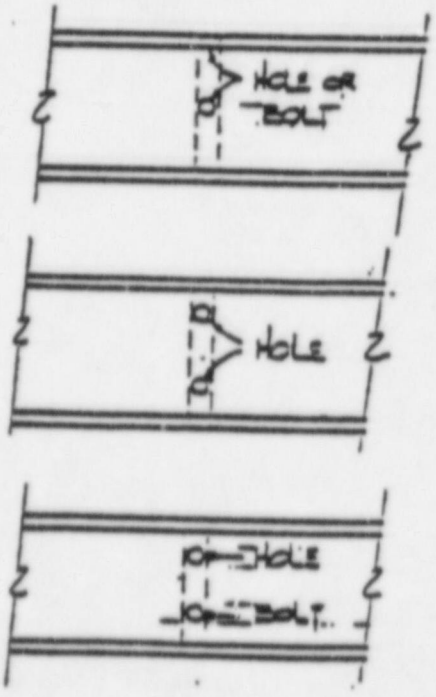


SAMPLE STRUCTURAL SHAPE
(CHANNEL USED FOR EXAMPLE, APPLICABLE FOR ANY SHAPE)

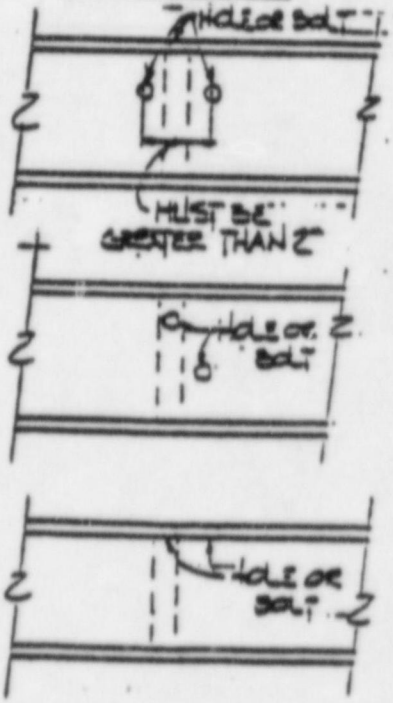


SECTION A-A

REJECT*



ACCEPT**



* Holes or Bolts are in same cross-sectional plane.

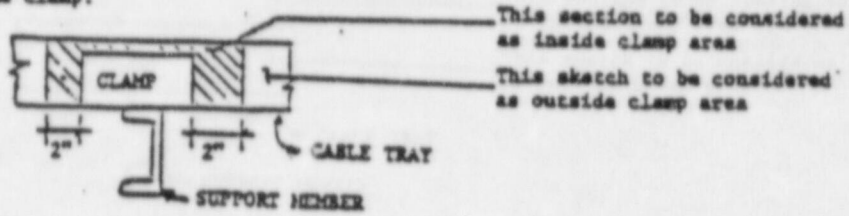
** Holes or bolts are not in same cross-sectional plane must also meet distance criteria (greater than 2") and hole size criteria (less than or equal to 3/4" diameter).

ATTACHMENT 5 (Cont)

CABLE TRAY (CLAMP AREA)

The following criteria shall apply to holes in cable tray rail within the area of the clamps.

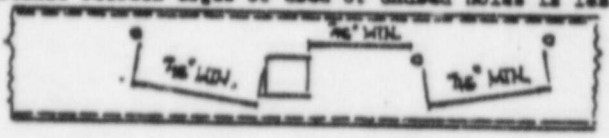
Clamp area is defined as the section of tray rail within 2" of the outside edge of the clamp.



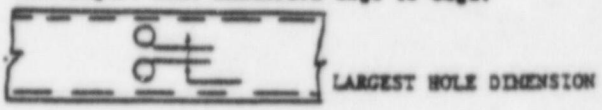
Any unused hole or part thereof falling within the "Clamp Area" as defined above shall meet all of the following criteria:

Repairing of holes in cable tray rail is required if any of the following conditions exist:

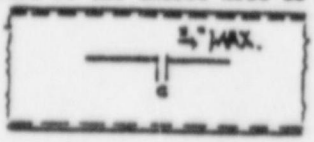
1. Distance between edges of used or unused holes is less than 7/16.



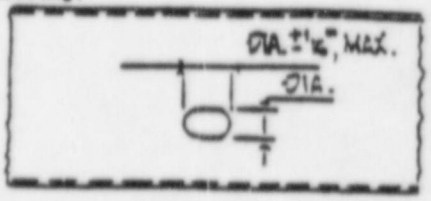
2. More than two (2) unused holes are in the same cross-section, or they are closer than the largest hole dimension edge to edge.



3. The largest dimension of the unused hole is greater than 3/4".



The use of slotted holes is prohibited (slotted cable tray rail hole shall be defined as a hole with a varying diameter of ±1/16") unless specifically authorized by Engineering.



Repair of misdrilled holes in the tray shall be in accordance with approved project procedures.

ATTACHMENT 6 (NOTES)

NOTES:

1. The details shown in this attachment, together with the following notes are to be used for the inspection of clamps and other attributes shown.

2. Attachment 6 specifies those clamp details and dimensions which are for inspection purposes. Dimensions which may not be given on the CTH work package drawings, such as gaps or dimensions of plates used to reduce gaps, dimensions of field fabricated Burndy Husky clamps, etc. shall be as shown in Attachment 6. Extra details or dimensions shown on CTH work package drawings for the type of clamps shown in Attachment 6 are not for inspection. Gap tolerances given in Attachment 6A override any clamp gap tolerances shown on the CTH drawings. For clamp types specified on the CTH drawing as other than type A, C, G and "special", they shall be inspected as a one bolt, two bolt or multi bolt clamp configuration as applicable.

3. For "special" clamps not covered in Attachment 6; details, dimensions and gaps shall be as shown on the CTH work package drawing.

4. Tray clamps shown in this attachment may be attached to a supporting tube steel, angle, plate, channel, section, walls or floors as applicable and as shown on CTH drawings. The structural support is shown schematically in this attachment. For its detailed orientation and configuration refer to the CTH drawings. If a plate (shim/filler/spacer, etc.) is welded to both the clamp member and the structural member, the plate is considered part of the structural support. In this case any welding, exclusive of welds specifically designated as NNS on the drawing, is considered structural and nuclear safety related.

5. Washer plates on one or two bolt clamp details of the connection to the tray of 24" and wider are required, (verify presence) washer plates may or may not be used on tray less than 24". Where A307 round head bolts with standard washers are specified, the conventional symbol on the CTH drawing should not be construed to represent the location of the washer. The washer shall be installed under the nut. In addition, it is acceptable to install a washer under the bolt head.

6. If the irregular gap between the tray and the clamp exceed 3/16, washer plates shall be provided. In case washer plates are used, the maximum irregular gap of 3/16 is to be measured as a total gap between clamp and tray, less the thickness of the washer plate(s) (verify presence).

7. Clamps on both sides of the tray need not be identical.

8. For clamp details this attachment specifies that the total clamp dimensions (i.e., height, width of length) and the dimensions from bolts/holes closest to each edge are to be inspected/verified. The dimensions shown on the CTH drawings may not, in all cases, be recorded in the same manner as shown in this attachment. In those instances QC shall determine that sufficient information

ATTACHMENT 6 NOTES (Cont)

NOTES:

exists on the CTH drawing to permit verification of the dimensions required per Attachment 6, and shall verify said dimensions of Attachment 6.

9. The details shown on this attachment shall be used in conjunction with Attachment 6A.

10. To aid in recognizing specific requirements of different applications of plates used to reduce or eliminate gaps, attachments 6 and 6A employ consistent definition of shim plate, filler plate, and washer plate.

Definitions:

a) Shim plate - A plate which shims a gap between both the clamp and tray and the support or shims a gap between the tray and the support member.
b) Filler plate - A plate which fills a gap between the clamp and the support or shim plate.
c) Washer plate - A plate which reduces the gap between the mating surfaces of the clamp and tray.

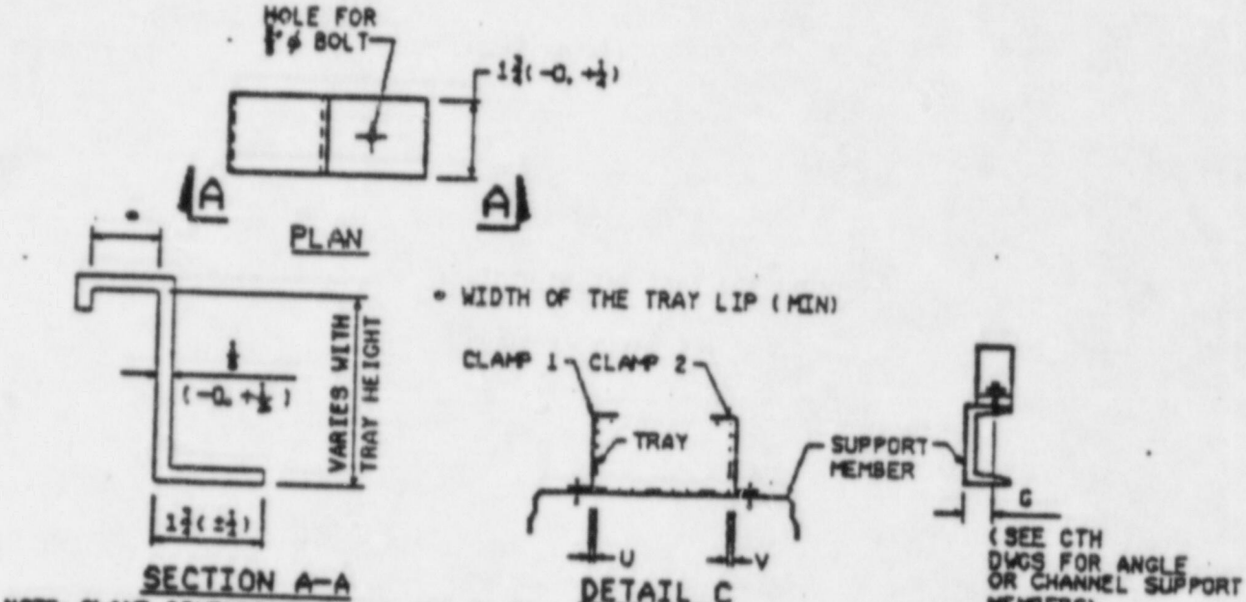
Inspections are to be performed based upon the above definitions regardless what is called out on the drawings. Tolerance on dimensions of plates used to reduce gaps as shown on the CTH drawings are ±1/8" on width and length and ±1/32" on thickness.

11. It is acceptable in all cases to use shim or filler plates or washers to reduce/eliminate excessive gaps between clamp trays and support members. Welds, if used, for those shim/filler plates or washers are NNS.

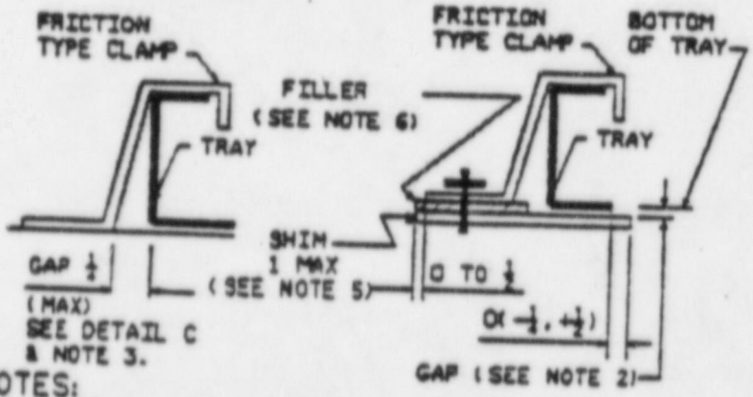
Filler and washer plates may be stacked, and may be used on top of shim plates. Shim plates may be stacked. Whether and how such plates are labeled on the CTH drawings is not an inspection item. Plates shown on the CTH drawing shall be inspected to verify the dimensions shown on the CTH drawings and to verify that the limitations apply, the QC inspector shall classify the plate into the Attachment 6 or 6A definition which most closely matches its configuration. For instance a plate which is shown on the CTH drawing to span both the clamp the the tray shall be classified as a shim, and the limits on tray/clamp overhang shall apply.

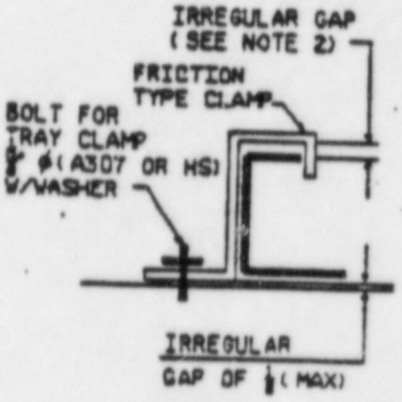
12. The leg dimensions of angles cut from a larger size and used as cable tray clamps have a tolerance of ±1/8".

ATTACHMENT 6 (Cont.)



NOTE: CLAMP DIMENSIONS SHOWN ARE TO BE VERIFIED FOR FIELD FABRICATED CLAMPS ONLY.
CLAMPS WHICH ARE NOT HOT DIP GALVANIZED ARE CONSIDERED FIELD FABRICATED.



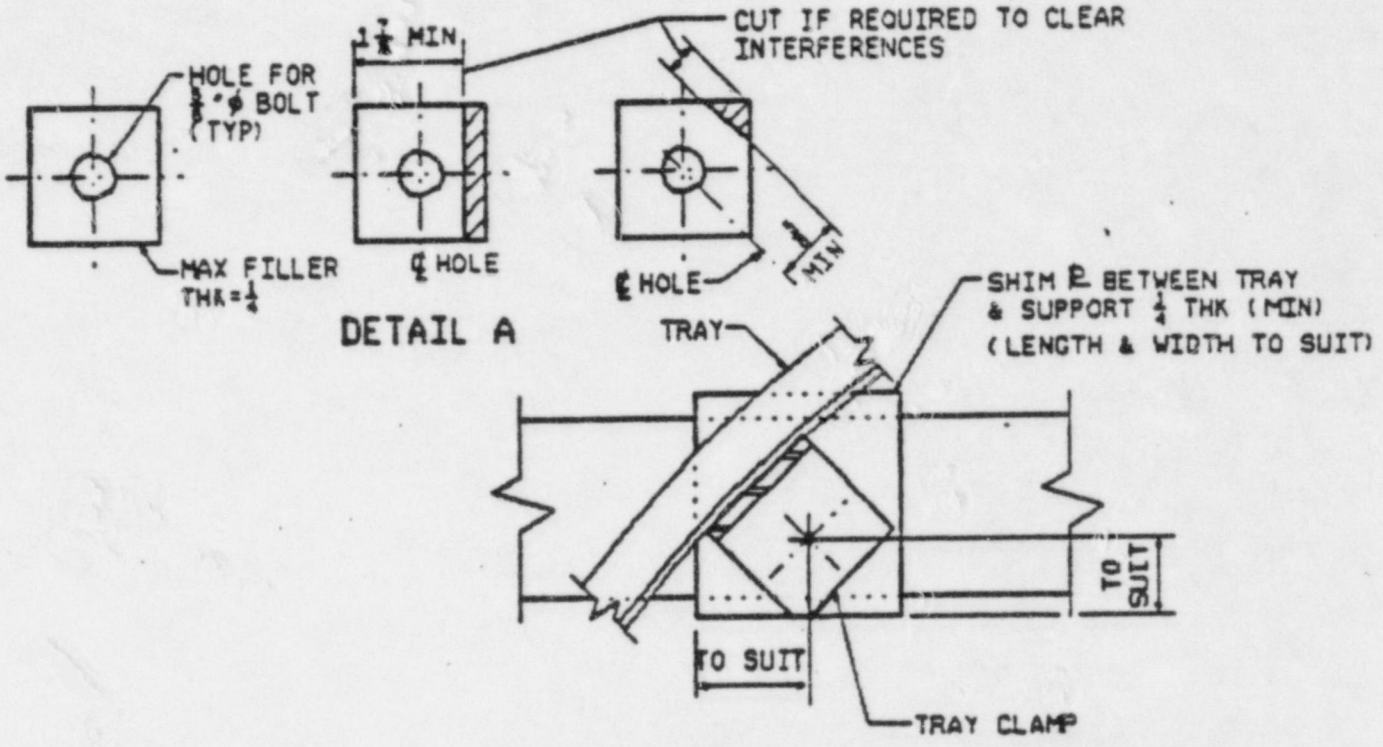


NOTES:

1. FOR WASHER ORIENTATION AND DETAILS SEE ATTACHMENT 6A.
2. TOTAL GAP (TOP & BOTTOM) NOT TO EXCEED ¾.
3. IRREGULAR TOTAL GAP U + V ≤ ¾ APPLICABLE TO A AND A CLAMPS OR A AND G CLAMPS.
4. CLAMPS 1 AND 2 NEED NOT BE IDENTICAL.
5. FOR DIMENSIONS REFER TO CTH DWG. IF NOT SHOWN ON CTH DWG, USE NOTE 12 OF ATTACHMENT 6A.
6. FOR DIMENSIONS REFER TO CTH DWG. IF NOT SHOWN ON CTH DWG, USE DETAIL A ON SH. 2. FILLERS MAY BE STACKED WITH MAX. THICKNESS OF EACH FILLER = ½ IN. OVERALL THICKNESS NOT TO EXCEED 1" UNLESS OTHERWISE NOTED ON THE DRAWING.

TYPE 'A' CLAMP
(TRANSVERSE/FRICTION)
SH 1 OF 2

ATTACHMENT 6 (Cont.)



NOTES:

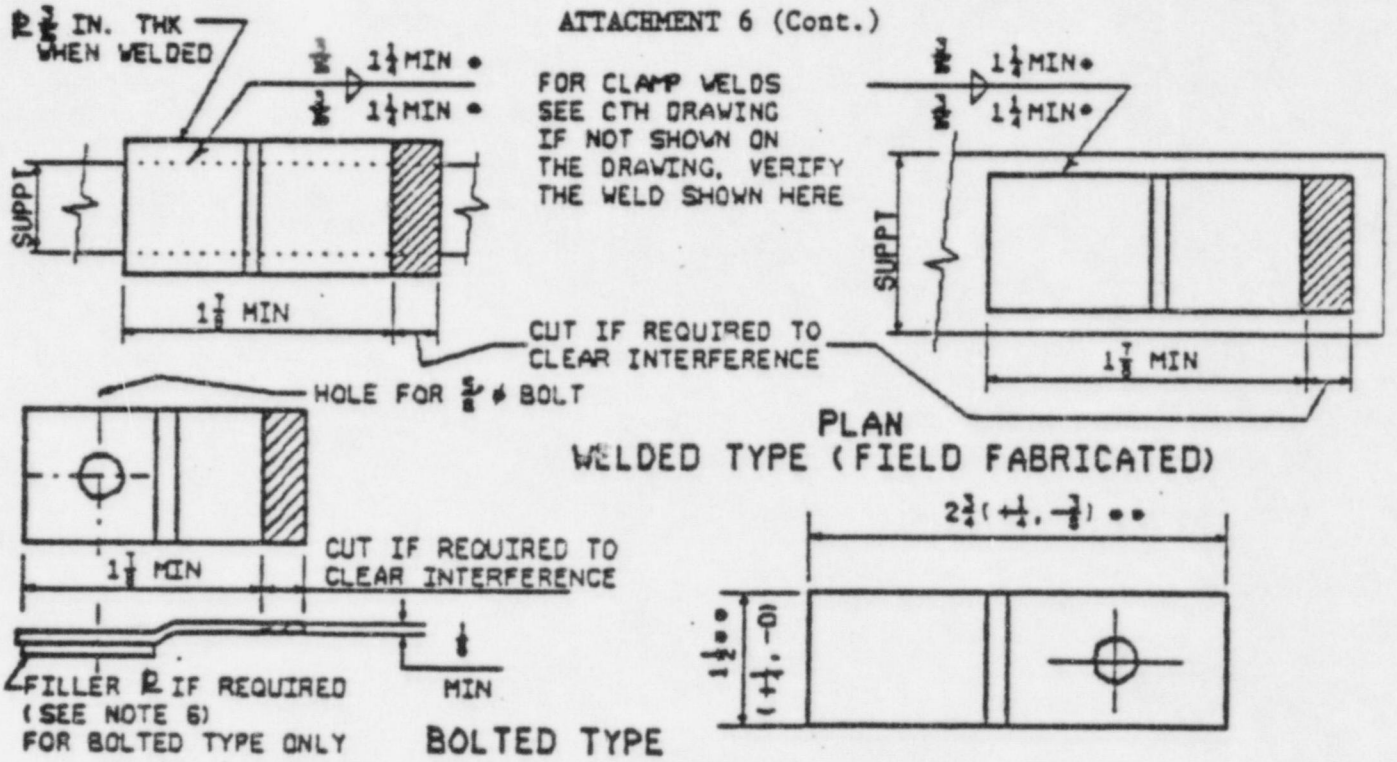
a. SHIM PLATE MAY BE FIELD FABRICATED AND PAINTED WITH GALVANOX PAINT.

b. WELDS FOR SHIM PLATE TO CTH MEMBER ARE NON-SAFETY RELATED WELDS AND NEED NOT BE INSPECTED.

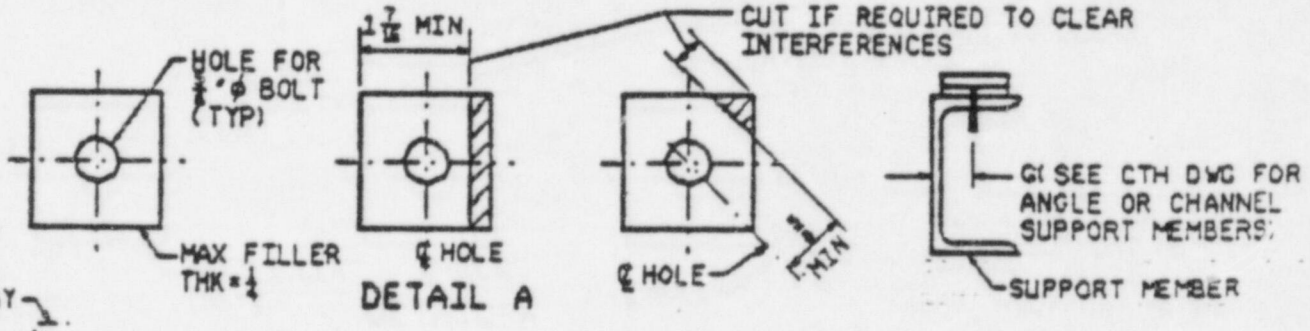
TYPE 'A' CLAMP

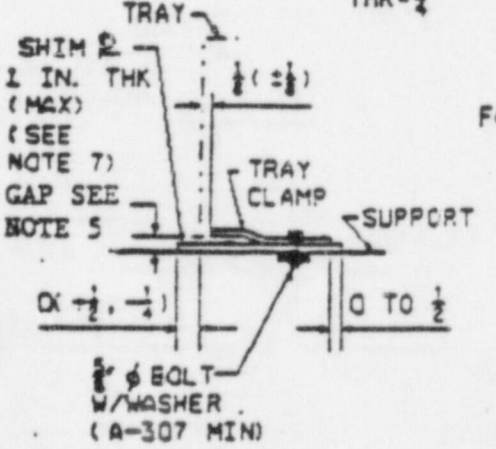
(TRANSVERSE/FRICTION)
SH. 2 OF 2

ATTACHMENT 6 (Cont.)



NOTE: CLAMP SIZE DIMENSIONS ARE PROVIDED FOR VERIFICATION OF FIELD FABRICATED CLAMPS ONLY. ALL CLAMPS NOT HOT DIP GALVANIZED ARE TO BE CONSIDERED FIELD FABRICATED.



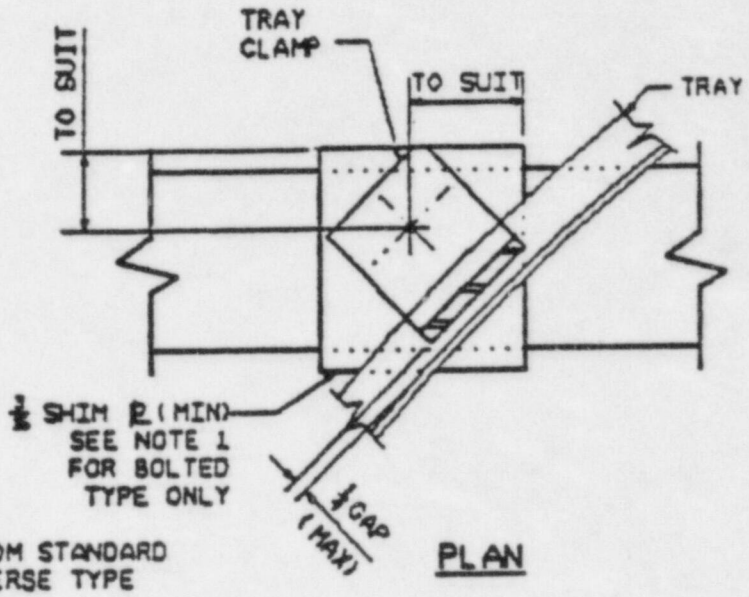


FOR NOTES SEE SH. 3 OF 3.

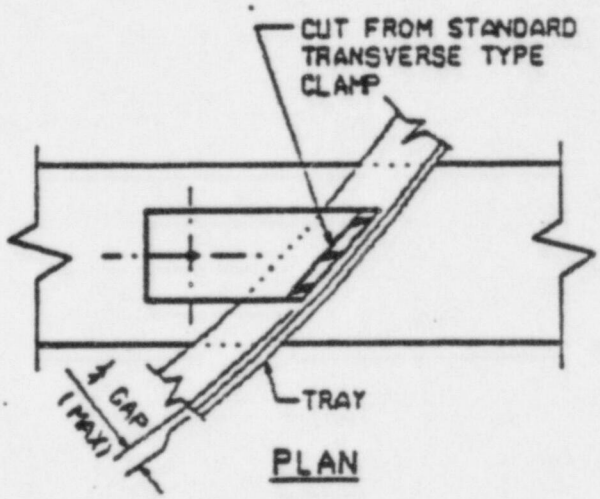
• FOR BUS DUCT LENGTH OF WELD IS 1 INCH MIN
•• FOR BUS DUCT THE LENGTH OF THE CLAMP MAY BE 2-3/4 (+½, -¼), THE WIDTH MY BE 3 (OR LARGER) (±½) AND THE THICKNESS AS INDICATED FOR WELDED OR BOLTED TYPES.

TYPE 'C' CLAMP
(TRANSVERSE/FRICTION)
(SH 1 OF 3)

ATTACHMENT 6 (Cont.)

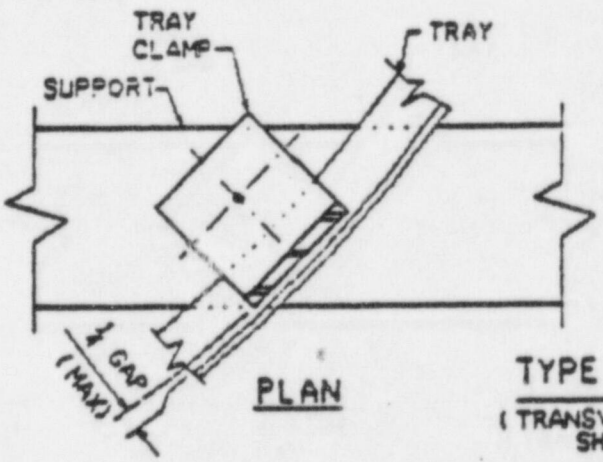


PLAN



PLAN

NOTES:
FOR NOTES SEE SH. 3 OF 3



PLAN

TYPE 'C' CLAMP
(TRANSVERSE/FRICTION)
SH. 2 OF 3

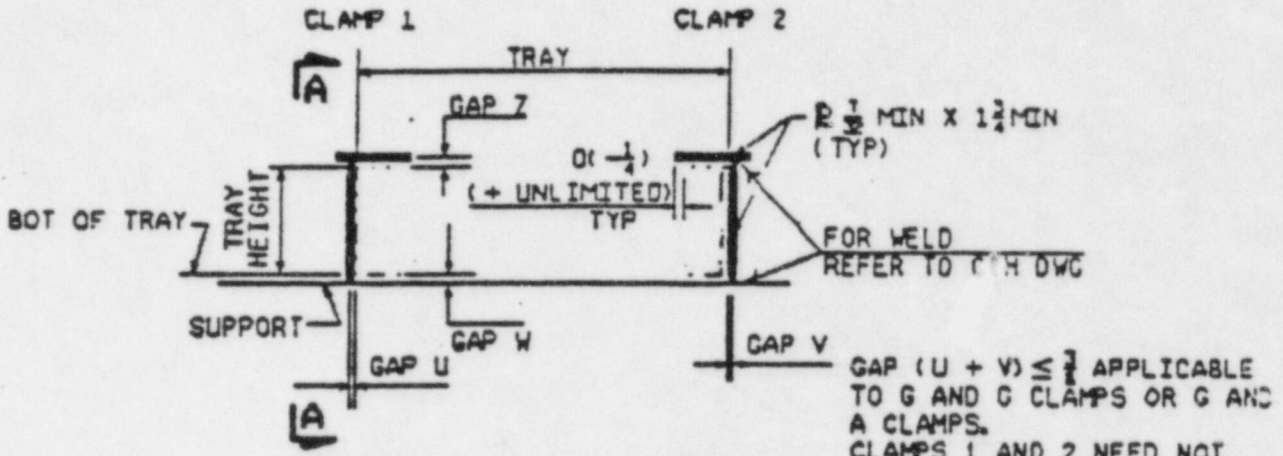
ATTACHMENT 6 (Cont.)

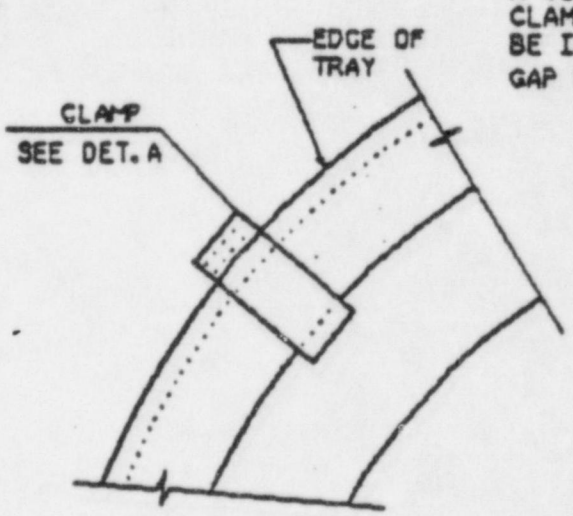
NOTES:

1. SHIM PLATES MAY BE FIELD FABRICATED AND PAINTED WITH GALVANOX PAINT.
2. WELDS FOR SHIM PLATE TO CTH MEMBERS ARE NON-SAFETY RELATED AND NEED NOT BE INSPECTED.
3. FOR WASHER ORIENTATION & DETAILS SEE ATTACHMENT 6A.
4. IRREGULAR GAPS BETWEEN TRAY CLAMP/SHIM PLATE AND SHIM PLATE/STRUCTURAL MEMBER SHALL NOT EXCEED $\frac{1}{8}$ IN. EACH.
5. TOTAL IRREGULAR GAP BETWEEN TRAY-CLAMP, TRAY-SHIM AND SHIM-SUPPORT SHALL NOT EXCEED $\frac{1}{8}$ IN
6. FOR DIMENSION SEE CTH DRAWING. IF NOT GIVEN ON DRAWING, USE DETAIL "A", SHEET 1 OF 3. FILLER PLATES MAY BE STACKED WITH A MAX. THICKNESS OF EACH FILLER = $\frac{1}{4}$". OVERALL THICKNESS NOT TO EXCEED 1" UNLESS OTHERWISE NOTED ON THE DRAWING.
7. FOR DIMENSIONS SEE CTH DRAWING. IF NOT SHOWN, SEE NOTE 12 ON ATTACHMENT 6A.

TYPE 'C' CLAMP
(TRANSVERSE/FRICTION)
(SH 3 OF 3)

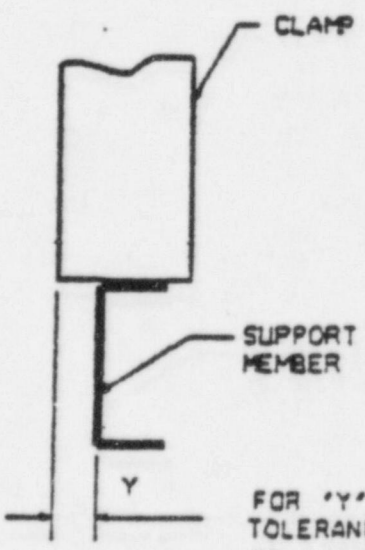
ATTACHMENT 6 (Cont.)





PLAN

THIS DETAIL MAY BE USED WHERE TRAY BENDS. IF REQUIRED, THE VERTICAL PLATE MAY BE BENT TO FIT THE CURVATURE OF TRAY. TOP HORIZONTAL PLATE MAY ALSO BE CUT TO MATCH TRAY.

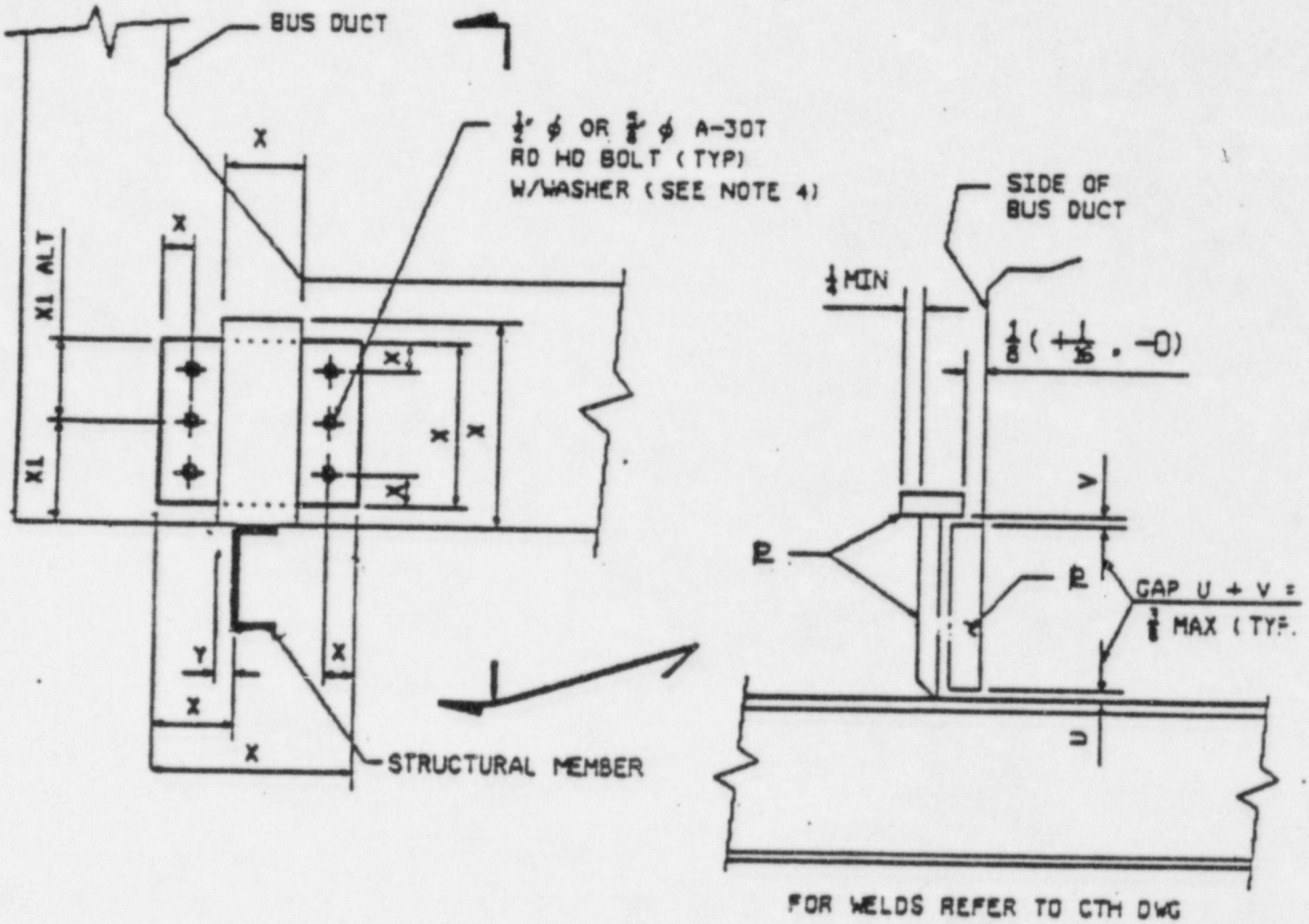


DETAIL A

FOR 'Y' DIMENSION REFER TO CTH DWG. TOLERANCE ON 'Y' DIM. IS ±⅛.
IF 'Y' DIMEMSION IS NOT SHOWN ON THE CTH DWG. CLAMP SHALL AT LEAST SPAN ACROSS OR BE CONTAINED BY THE SUPPORT MEMBER.

TYPE 'G' CLAMP

ATTACHMENT 6 (Cont.)



FRICTION/TRANSVERSE TYPE 'G'
CLAMP DETAIL FOR BUS DUCT

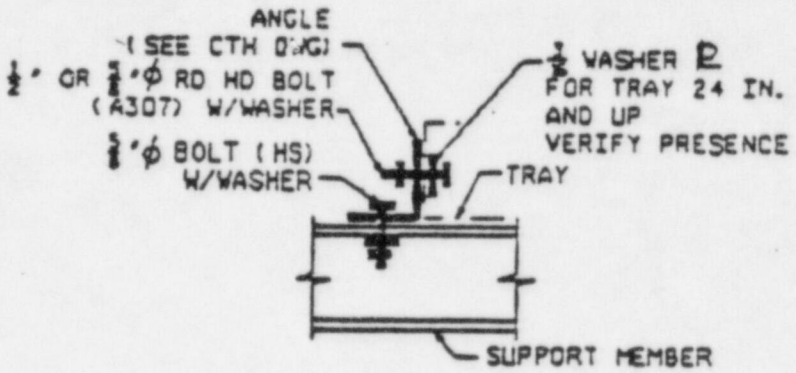
NOTES:

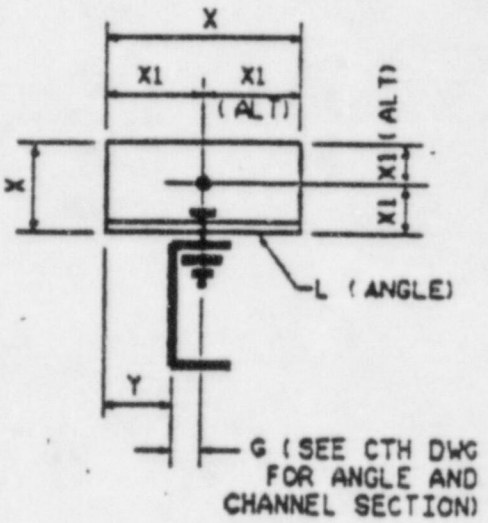
1. TOLERANCES FOR DIMENSIONS X, X1, X1 ALT AND Y IS ± ⅛.
   FOR X, X1, (OR X1 ALT) AND Y, SEE CTH DWG.
2. FOR PLATE SIZE SEE CTH DRAWING.
3. VERIFY EITHER X1 OR X1 ALT AS INDICATED ON CTH DRAWING.
4. FOR NUMBER OF BOLTS REFER TO CTH DWG. PLATE MAY BE ATTACHED BY ANY NUMBER OF BOLTS WITH A MINIMUM OF TWO.

TYPE 'G' CLAMP
SHEET 2 OF 2

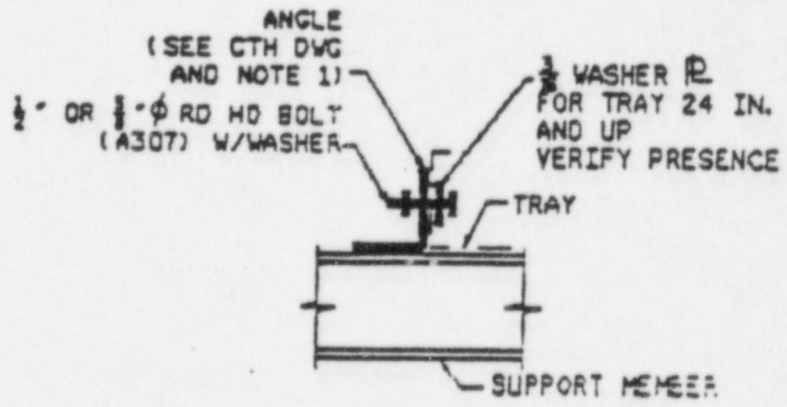
ATTACHMENT 6 (Cont.)

(A) ANGLE TYPE BOLTED TO SUPPORT MEMBER.

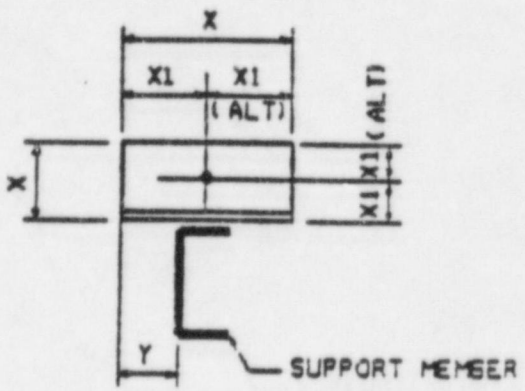




(B) ANGLE TYPE WELDED TO SUPPORT MEMBER.



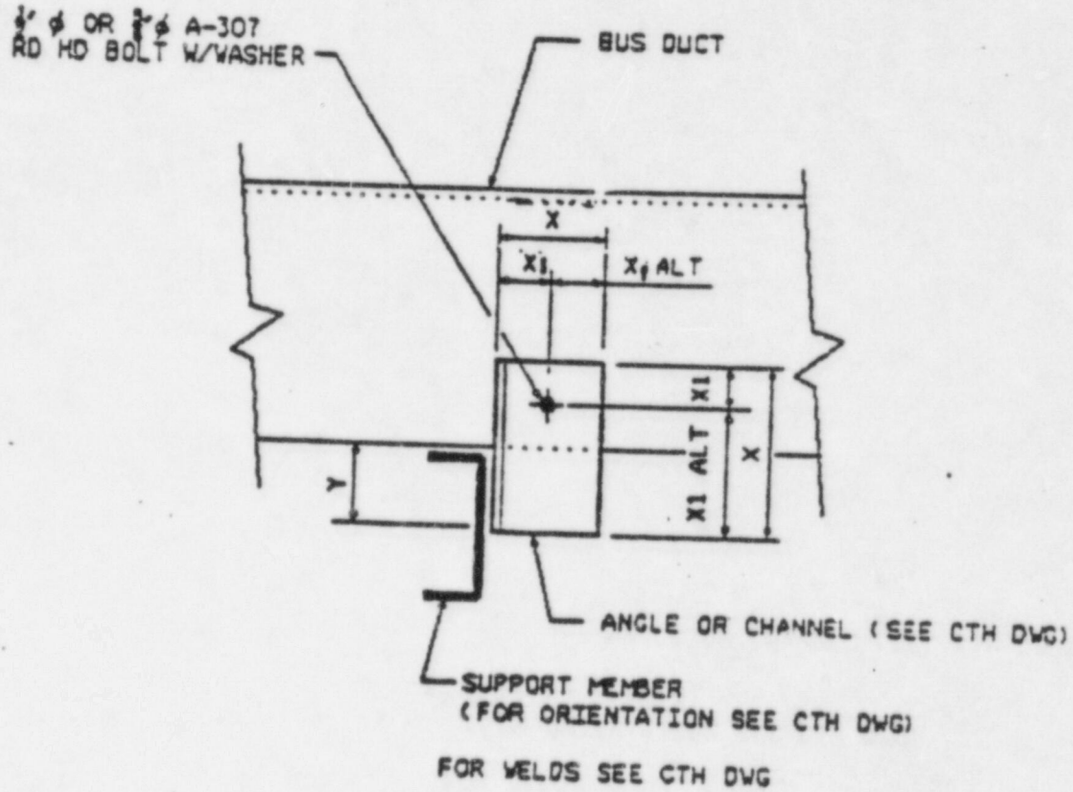
FOR WELDS REFER TO
CTH DRAWINGS.



NOTE: CLAMP MAY BE ANGLE (AS DEPICTED ABOVE) OR PLATE.

ONE BOLT CLAMP CONFIGURATIONS

ATTACHMENT 6 (Cont.)



ONE BOLT CLAMP DETAIL FOR BUS DUCT

ONE BOLT CLAMP CONFIGURATIONS
SHEET 2 OF 3

ATTACHMENT 6 (Cont.)

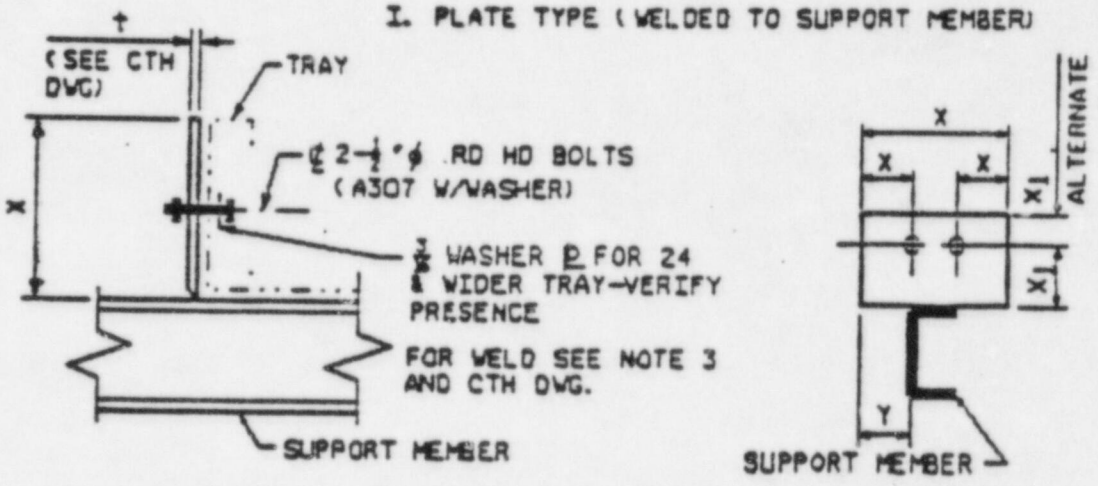
NOTES:

1. ANGLE OR PLATE MAY BE BENT TO FIT THE CURVATURE OF THE TRAY.
2. ANGLE THICKER THAN SHOWN ON CTH DRAWING IS ACCEPTABLE, FOR 3/8" THICK ANGLE, THICKNESS TOLERANCE TO BE ± 1/16".
3. FOR X, X1 OR X1 ALT AND Y DIMENSIONS REFER TO CTH DRAWING. THE MEASUREMENT TOLERANCE FOR THE ABOVE DIMENSIONS IS ± ½".
4. VERIFY EITHER X1 OR X1 ALTERNATE AS INDICATED ON CTH DRAWINGS.
5. IF Y DIMENSION IS NOT SHOWN ON CTH DRAWING VERIFY THAT CLAMP MEMBER SPANS ACROSS OR IS CONTAINED WITHIN THE SUPPORT MEMBER. FOR BUS DUCT IF Y DIMENSIONS IS NOT SHOWN ON THE DRAWINGS, WELD VERIFICATION WILL SUFFICE, IF WELD IS PROVIDED ON THE DRAWING.
6. ANGLE MAY BE TURNED UNDER THE TRAY.
7. THE ABOVE CLAMP TYPES CAN BE INSTALLED ON FLANGES OR WEBS OF STRUCTURAL MEMBERS, BUILT UP MEMBERS, PLATES OR WALLS AND FLOORS AS APPLICABLE AND AS SHOWN ON CTH DRAWINGS.
8. FOR BOLTED CLAMP OVERHANG, SHIM PLATE, GAPS AND WASHERS ACCEPTABILITY DETAILS, ORIENTATION AND OTHER GENERAL NOTES SEE ATTACHMENT 6A.
9. THE LEG DIMENSIONS OF ANGLES CUT FROM LARGER SIZE AND USED AS CABLE TRAY CLAMP SHALL HAVE A TOLERANCE OF ± ½.
10. WELD/BEVEL IF USED, CAN BE EITHER SIDE OF PLATE. FILLET WELD IS ACCEPTABLE IF NO UNWELDED BEVEL IS PRESENT IN THE WELD AREA.

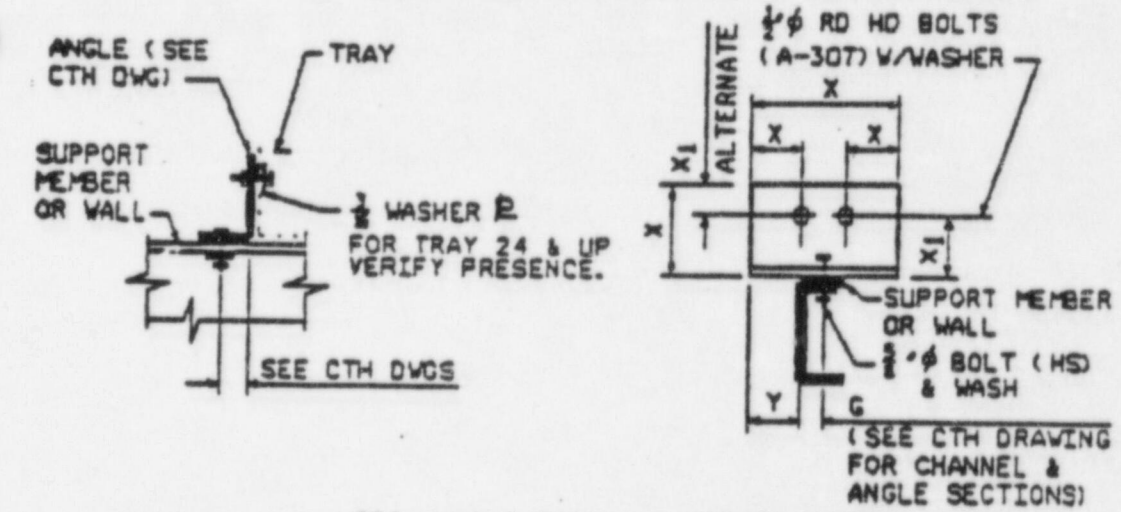
ONE BOLT CLAMP CONFIGURATIONS
SHEET 3 OF 3

ATTACHMENT 6 (Cont.)

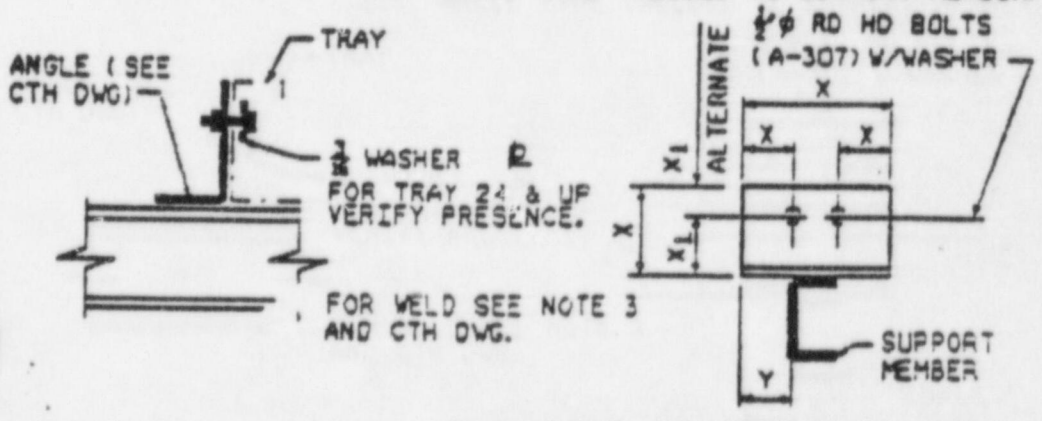
I. PLATE TYPE (WELDED TO SUPPORT MEMBER)



II. ANGLE TYPE (BOLTED TO SUPPORT MEMBER)



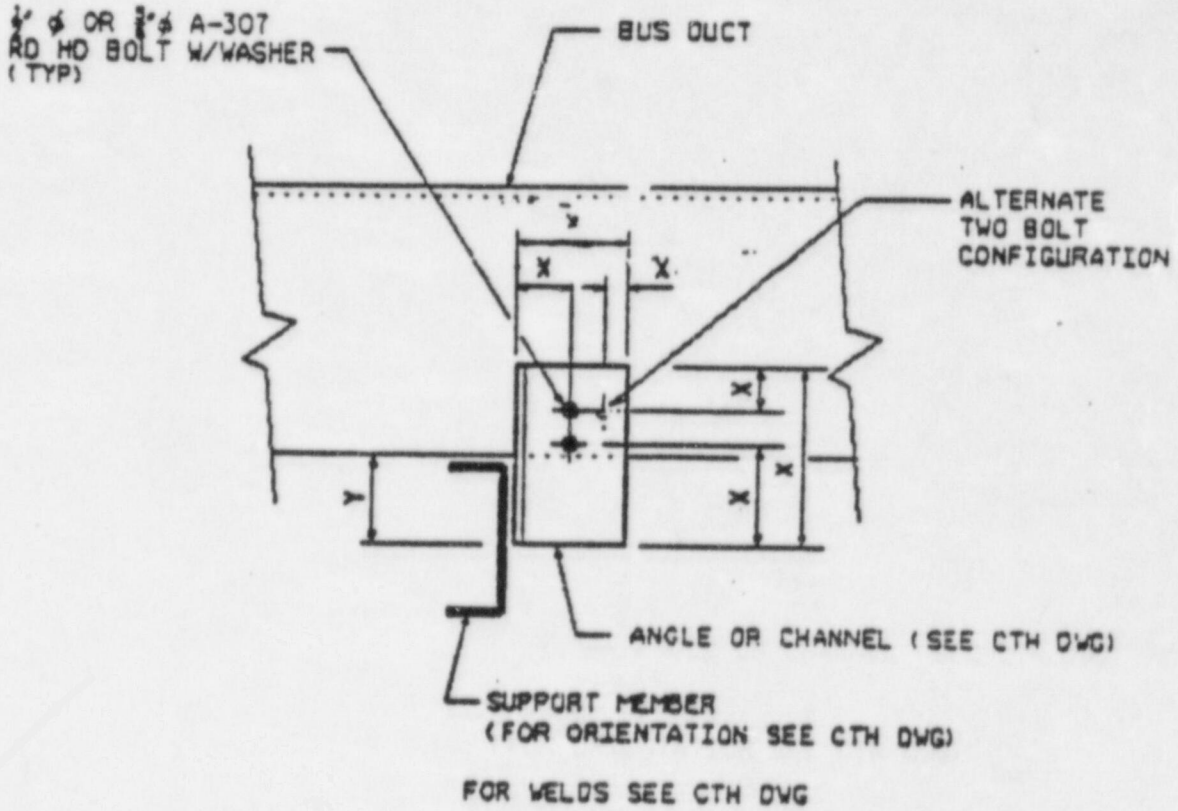
III. ANGLE TYPE (WELDED TO SUPPORT MEMBER)



FOR 'X', 'X_1', AND 'Y' DIMENSIONS FOR TYPES 'I', 'II' AND 'III' REFER TO CTH DWG AND TOLERANCE PER NOTE 2. IF 'Y' DIMENSION IS NOT SHOWN ON DWG. VERIFY THAT CLAMP MEMBER SPANS ACROSS OR IS CONTAINED WITHIN THE SUPPORT MEMBER. VERIFY EITHER X_1 OR X_1 ALTERNATE AS INDICATED ON CTH DWG.

TWO BOLT CLAMP CONFIGURATIONS

ATTACHMENT 6 (Cont.)



TWO BOLT CLAMP DETAIL FOR BUS DUCT

TWO BOLT CLAMP CONFIGURATIONS
SHEET 2 OF 3

ATTACHMENT 6 (Cont.)

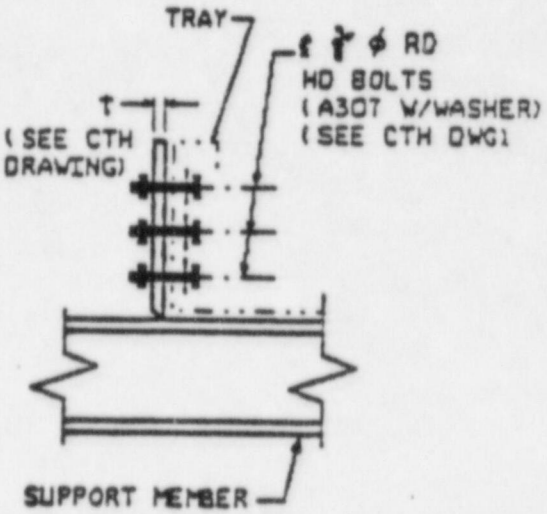
NOTES:

1. THE PLATE OR ANGLE MAY BE BENT TO FIT THE CURVATURE OF THE TRAY.
2. FIELD MEASUREMENT TOLERANCE FOR DIMENSION MARKED 'X', 'X1', X1 ALT' or 'Y' IS ± 1/8".
3. WELD/BEVEL IF USED. CAN BE EITHER SIDE OF PLATE. FILLET WELD IS ACCEPTABLE IF NO UNWELDED BEVEL IS PRESENT IN THE WELD AREA.
4. ANGLE THICKER THAN SHOWN ON CTH DRAWING IS ACCEPTABLE. FOR 3/8 THICK ANGLE, THICKNESS TOLERANCE TO BE ± 1/16.
5. FOR BOLTED CLAMP OVERHANG, SHIM PLATE, GAPS AND WASHERS ACCEPTABILITY DETAILS, ORIENTATION AND OTHER GENERAL NOTES SEE ATTACHMENT 6A.
6. ANGLE MAY BE TURNED UNDER THE TRAY.
7. ABOVE CLAMP TYPES CAN BE INSTALLED ON FLANGES OR WEBS OF STRUCTURAL MEMBERS. BUILT UP MEMBERS. PLATES OR WALLS AND FLOORS AS APPLICABLE AND SHOWN ON THE CTH DRAWINGS.
8. THE LEG DIMENSIONS OF ANGLES CUT FROM LARGER SIZE AND USED AS CABLE TRAY CLAMP SHALL HAVE A TOLERANCE OF ± ⅛.

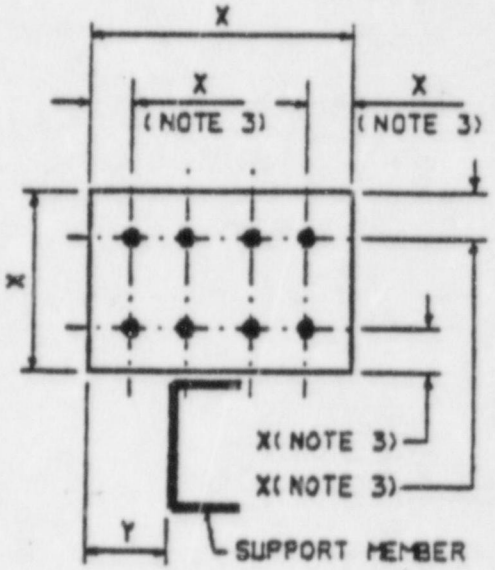
TWO BOLT CLAMP CONFIGURATIONS

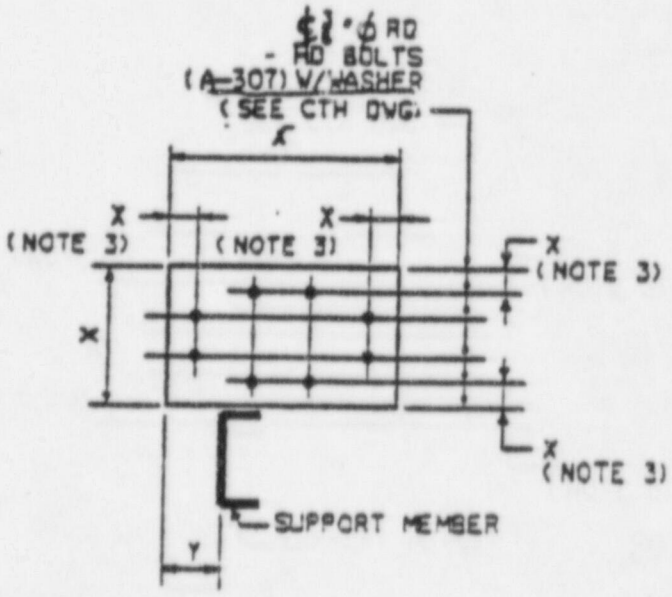
ATTACHMENT 6 (Cont)

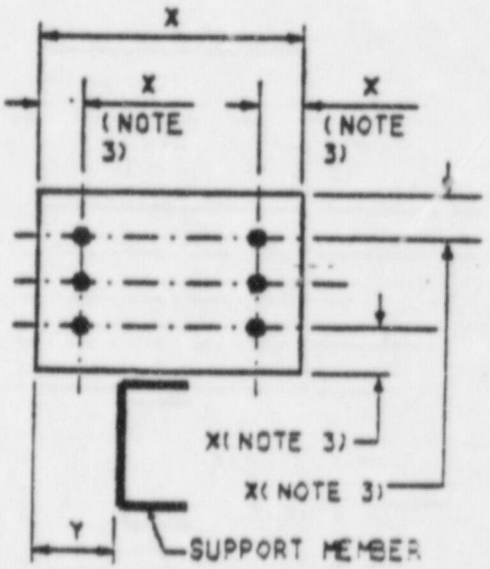
A) PLATE TYPE (WELDED TO A SUPPORT MEMBER).



. FOR WELD SEE NOTE 9 AND CTH DRAWINGS.



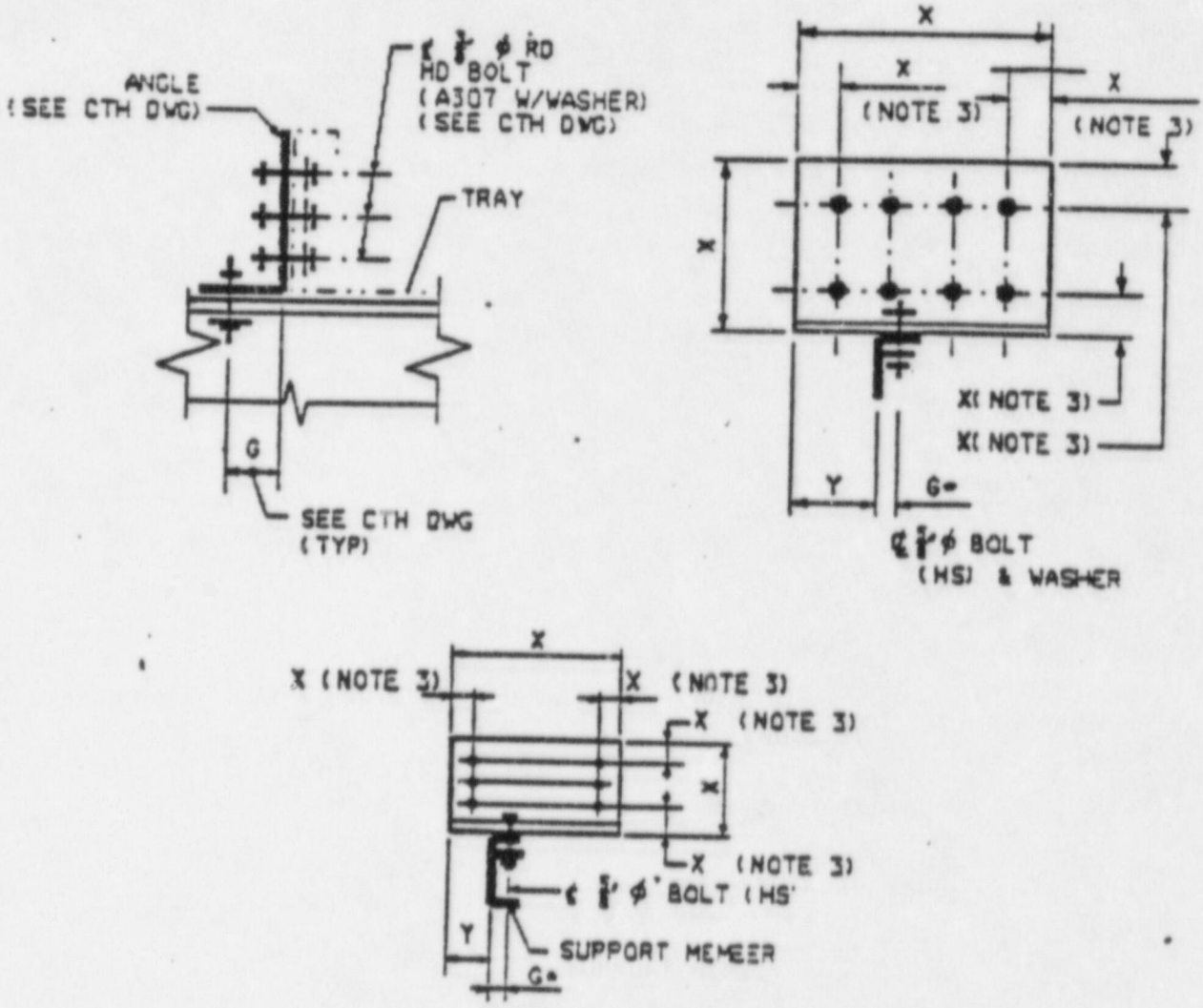




MULTI BOLT CLAMP CONFIGURATIONS
SHEET 1 OF 5

ATTACHMENT 6 (Cont)

E: ANGLE TYPE (BOLTED TO SUPPORT MEMBER).

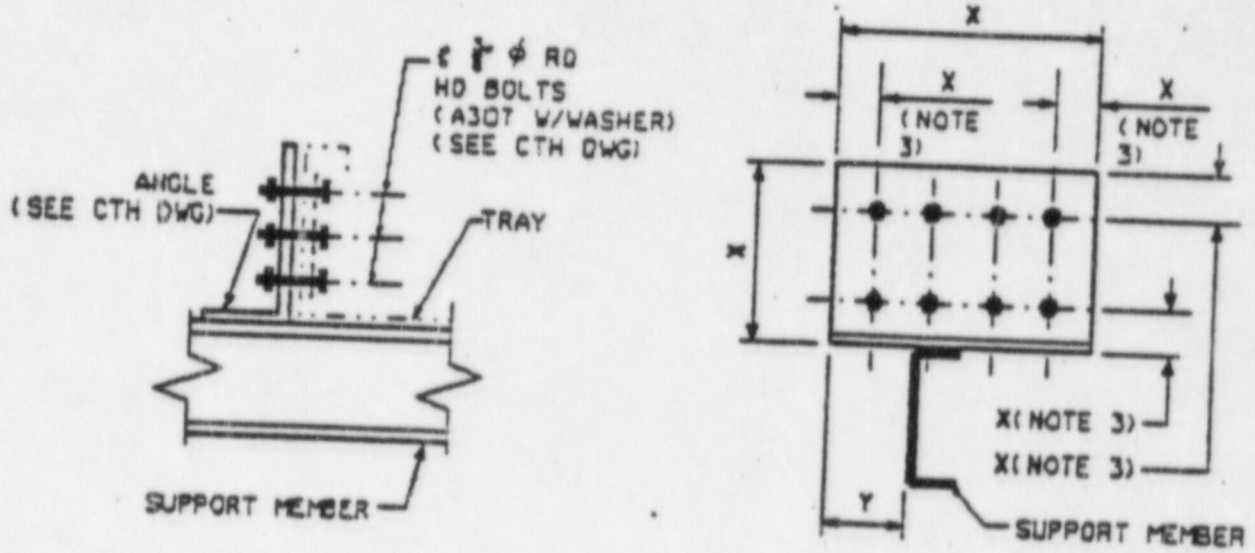


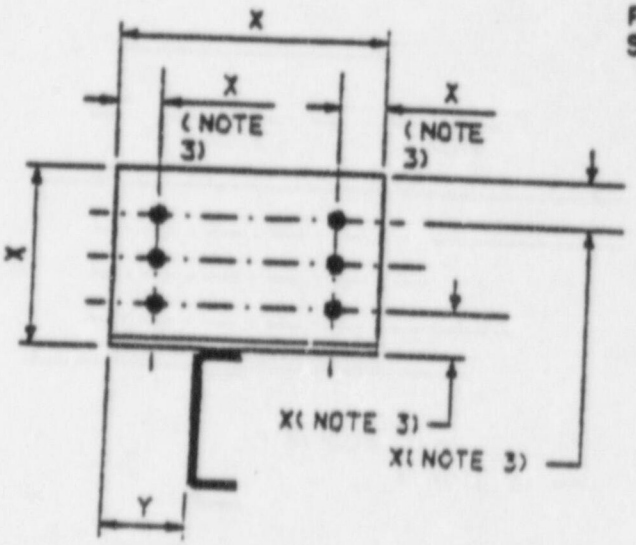
* SEE CTH DRAWINGS FOR G DIMENSION FOR ANGLE AND CHANNEL SUPPORT MEMEERS.

MULTI BOLT CLAMP CONFIGURATIONS
SHEET 2 OF 5

ATTACHMENT 6 (Cont)

(C) ANGLE TYPE (WELDED TO SUPPORT MEMBER).

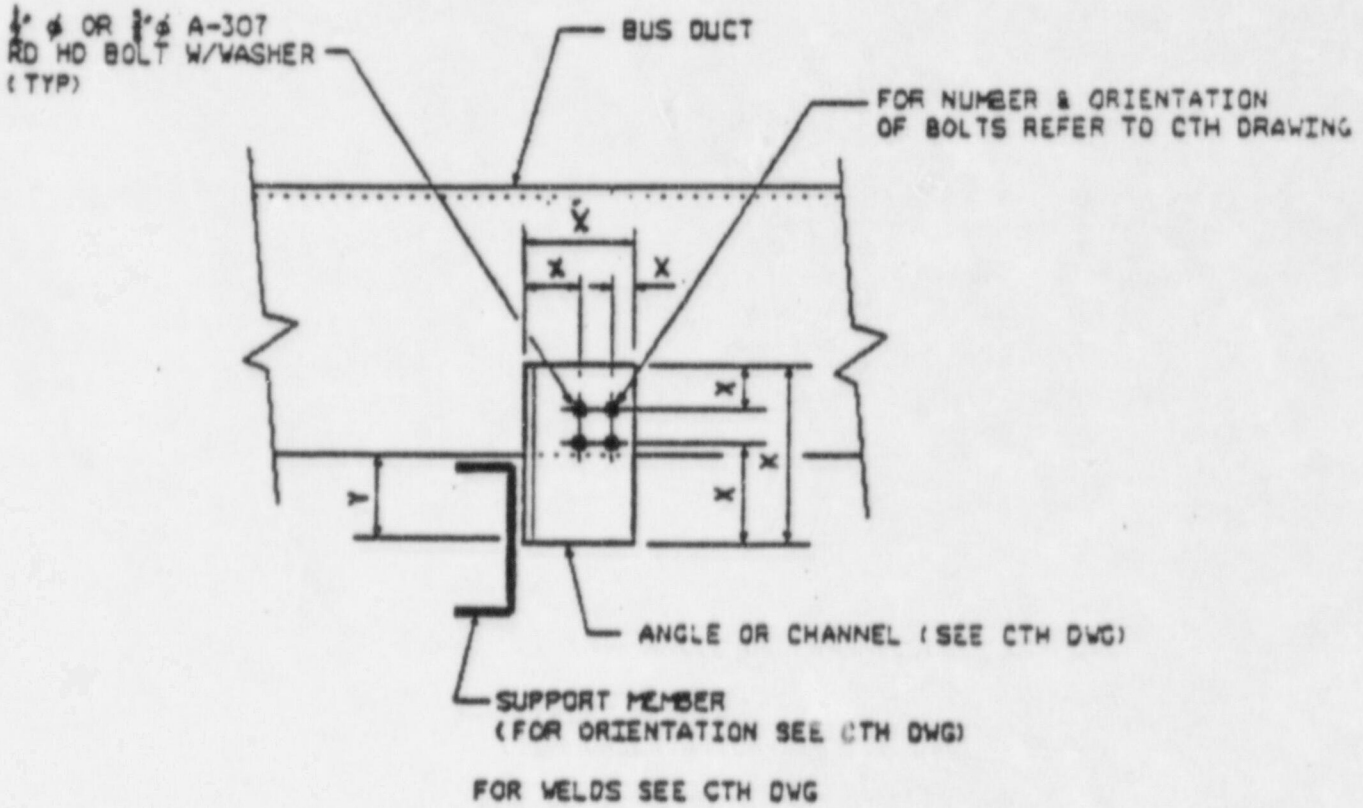




FOR WELD DETAILS
SEE CTH DWG

MULTI BOLT CLAMP CONFIGURATIONS
SHEET 3 OF 5

ATTACHMENT 6 (Cont)



MULTI-BOLT CLAMP DETAIL FOR BUS DUCT

MULTI-BOLT CLAMP CONFIGURATIONS

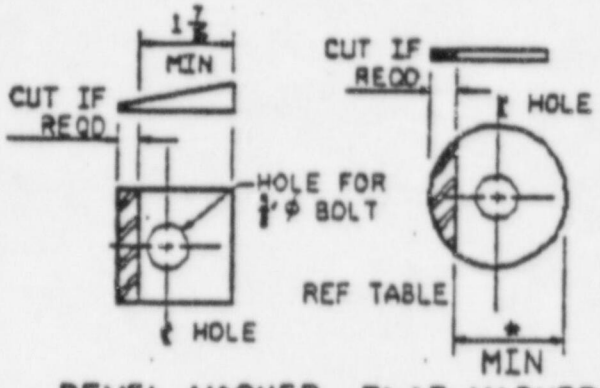
ATTACHMENT 6 (Cont)

NOTES:

1. ANGLE OR PLATE MAY BE BENT TO FIT THE CURVATURE OF THE TRAY.
2. FIELD MEASUREMENT TOLERANCE FOR DIMENSION MARKED 'X' AND 'Y' IS ± $\frac{1}{8}$. FOR X AND Y DIMENSION REFER TO CTH DWG.
3. MEASURE BOLT/HOLE CLOSEST TO THE EDGES ONLY.
4. IF DIMENSION Y IS NOT SHOWN ON THE CTH DRAWING VERIFY THAT CLAMP MEMBER SPANS ACROSS OR IS CONTAINED WITHIN THE SUPPORT MEMBER.
5. ANGLE THICKER THAN SHOWN ON THE CTH DRAWING IS ACCEPTABLE, FOR 3/8 THICK ANGLE, THE THICKNESS TOLERANCE TO BE ± 1/16.
6. ANGLE MAY BE TURNED UNDER THE TRAY.
7. THE ABOVE CLAMP TYPES CAN BE INSTALLED ON FLANGES OR WEBS OF STRUCTURAL MEMBERS, BUILT UP MEMBERS, PLATES OR WALLS AND FLOORS AS APPLICABLE AND AS SHOWN ON CTH DRAWINGS.
8. FOR BOLTED CLAMP OVERHANG, SHIM PLATE, GORS AND WASHERS ACCEPTABILITY DETAILS, ORIENTATION AND OTHER GENERAL NOTES SEE ATTACHMENT 6A.
9. WELD BEVEL, IF USED, CAN BE EITHER SIDE OF PLATE. FILLET WELD IS ACCEPTABLE IF NO UNWELDED BEVEL IS PRESENT IN WELD AREA.
10. THE BOLT PATTERN AND NUMBER OF BOLTS SHOWN IN THIS ATTACHMENT ARE ONLY EXAMPLES OF POSSIBLE CONFIGURATIONS IN THE FIELD. FOR ACTUAL CONFIGURATION REFER TO THE CTH DRAWING REGARDLESS OF CONFIGURATION. VERIFY ~~ONLY~~ THE DIMENSIONS INDICATED IN THIS ATTACHMENT WHERE X IS THE DIMENSION BETWEEN EACH EDGE AND THE BOLT CLOSEST TO THAT EDGE.
11. THE LEG DIMENSIONS OF ANGLES CUT FROM LARGER SIZE AND USED AS CABLE TRAY CLAMP SHALL HAVE A TOLERANCE OF ± $\frac{1}{8}$.

MULTI BOLT CLAMP CONFIGURATIONS
SHEET 5 OF 5

ATTACHMENT 6A

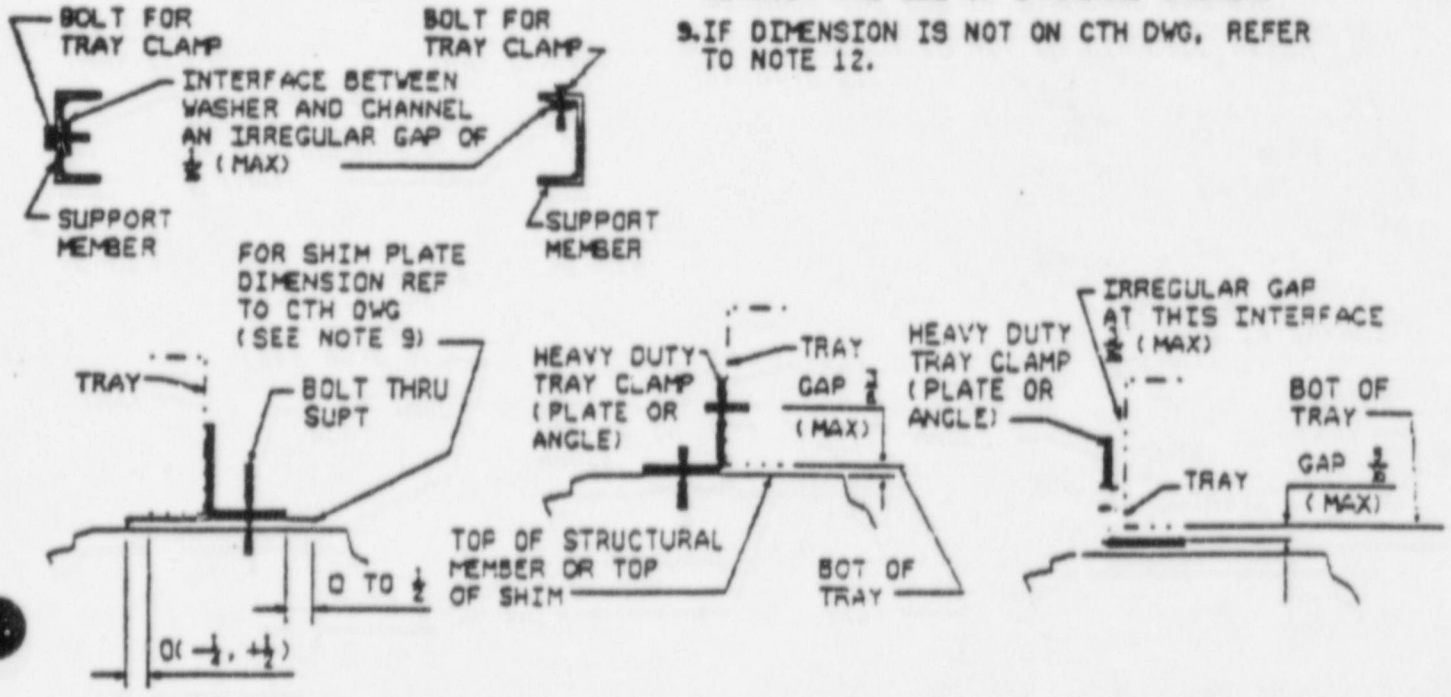


BEVEL WASHER FLAT WASHER

BOLT DIA	WASHER DIA	(DIM *)
3/4	2 1/2	1 1/2
	1	7/8
1/2	1 1/4	1/2
	1 1/8	1 1/16
5/8	1 3/4	1 3/4
3/4	1 7/16	1 3/16

NOTES:

1. OVERHANG DIMENSIONS SHOWN ON CTH DWG. HAS FIELD MEASURE TOLERANCE OF ± 1/8.
2. WELDS FOR SHIM PLATE TO CTH MEMBER ARE IDENTIFIED PER ATTACHMENT 6, NOTE 4.
3. SHIM PLATE THICKNESS SHOWN ON CTH DWG. IF NOT SHOWN AS MAX, OR MIN TOLERANCE ON THICKNESS IS ± 1/32.
4. FIELD MEASUREMENT TOLERANCES FOR DISTANCES OF PERIPHERAL BOLT/HOLES FROM EDGES OF PLATES/ANGLES ARE TO BE ± 1/8. BOLT HOLES CLOSEST TO THE EDGES ONLY NEED TO BE MEASURED. FOR THOSE DISTANCES REFER TO CTH DWG.
5. FIELD MEASUREMENT OF GAGE DISTANCES FOR ANGLE USED IN CLAMP HAVE A TOLERANCE OF ± 1/8 FOR GAGE. REFER TO CTH DWG.
6. IRREGULAR GAP SHIM TO ANGLE/SHIM TO STRUCTURAL MEMBER TO BE 1/32 MAX EACH.
7. FOR IRREGULAR GAPS BETWEEN TRAY AND CLAMP GREATER THAN 1/32 USE WASHER PLATE(S).
8. FOR TRAY CONNECTIONS AT TRAY SPLICES. NUTS WITH BUILT-IN WASHERS ARE ACCEPTABLE WITH OR WITHOUT THE USE OF STANDARD WASHER.
9. IF DIMENSION IS NOT ON CTH DWG, REFER TO NOTE 12.

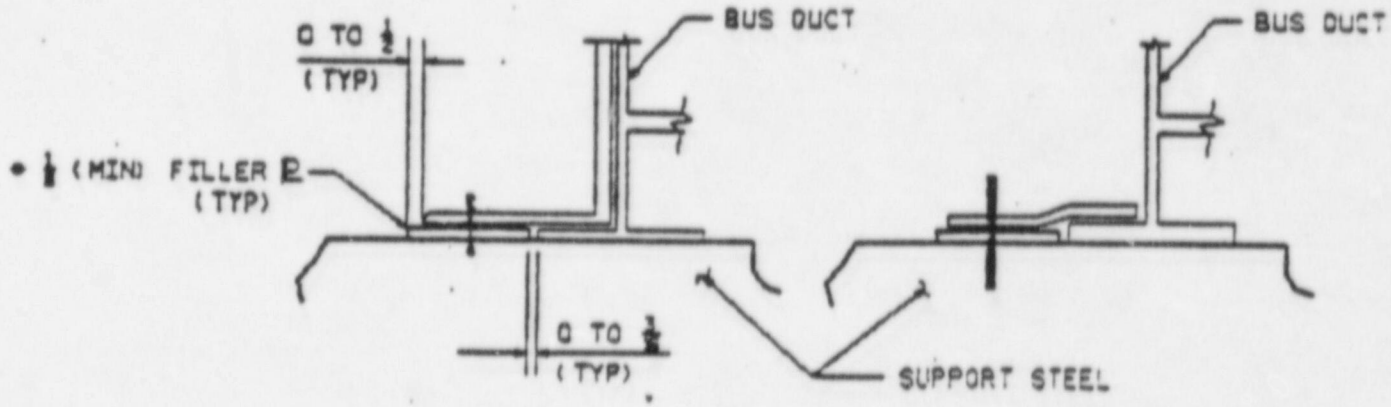


GENERAL NOTES, TOLERANCES AND DETAILS FOR CLAMPS.

ATTACHMENT 6A (Cont)

10. AS SHOWN IN ATTACHMENT 6 A 'SHIM PLATE' SHALL BE CONSIDERED AS A PLATE WHICH SHIMS A GAP BETWEEN BOTH THE CLAMP THE TRAY AND THE SUPPORT, OR SHIM A GAP BETWEEN THE TRAY AND THE SUPPORT MEMBER. WHILE A 'FILLER PLATE' SHALL BE CONSIDERED AS A PLATE WHICK FILLS A GAP BETWEEN THE CLAMP AND THE SUPPORT OR SHIM. A 'WASHER PLATE' SHALL BE CONSIDERED AS A PLATE WHICH REDUCES THE GAP BETWEEN THE MATING SURFACES OF THE CLAMP AND TRAY.

11. FOR BUS DUCT CLAMPS, A FILLER PLATE MAY BE INSTALLED BETWEEN THE CLAMP AND THE SUPPORT MEMBER. THE FILLER PLATE DOES NOT GO UNDERNEATH THE BUS DUCT. THE FILLER PLATE MAY ALSO BE CALLED 'SHIM PLATE' ON THE CTH DRAWING. IT IS CUT TO SUIT WITH THE TOLERANCES ON THE WIDTH AS INDICATED IN NOTE 12, AND LIMITS ON ITS LENGTH AS FOLLOWS:

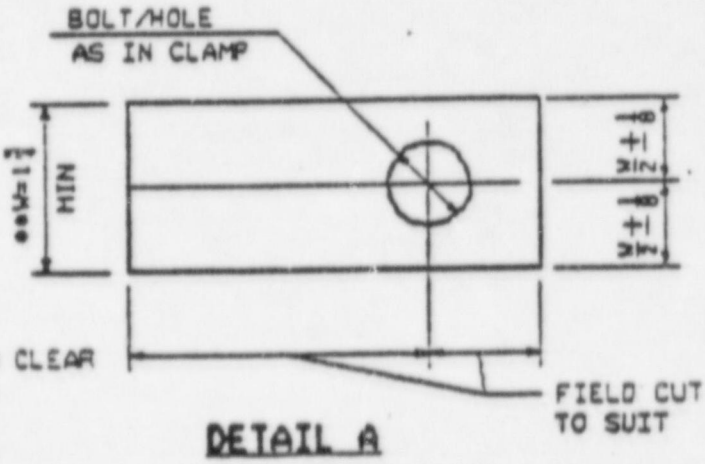


• FOR MAX THICKNESS REFER TO CTH DRAWING

GENERAL NOTES, TOLERANCES AND DETAILS FOR CLAMPS
SHEET 2 OF 3

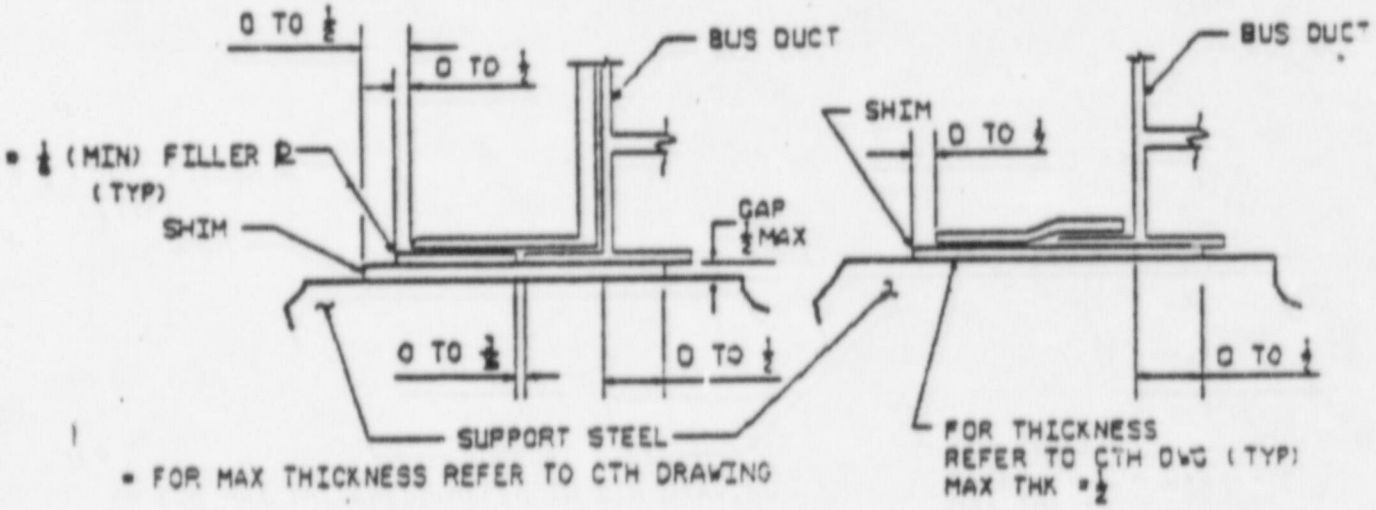
ATTACHMENT 6A (Cont)

12. WIDTH OF THE SHIMS (OR FILLERS FOR BUS DUCTS) BETWEEN THE BOLTED CLAMPS AND THE SUPPORT MEMBER IS AS SHOWN ON CTH DRAWINGS. IF NOT SPECIFICALLY DETAILED ON THE CTH DRAWING THE FOLLOWING SHALL APPLY:



DETAIL A

13. FOR BUS DUCT CLAMP, WHEN THE SHIM PLATE IS INSTALLED BELOW BOTH THE CLAMP AND THE BUS DUCT, THE LIMITATIONS ARE AS SHOWN BELOW:



14. SHIMS OR FILLER PLATES OF DIFFERENT THICKNESS MAY BE COMBINED TO REACH 'MAX' THICKNESS FOR ALL ATTACHMENT 6 DETAILS. MIN. THICKNESS OF SHIMS OR FILLER PLATES ARE TO BE 1/16"

15. PLATE WASHERS MAY BE COMBINED WITH FLAT OR BEVEL WASHERS. NO MORE THAN TWO WASHERS SHALL BE STACKED. WHEN A FLAT & BEVEL WASHER ARE STACKED, EITHER ORDER OF STACKING IS ACCEPTABLE. FLAT WASHERS MAY BE INSTALLED UNDER EITHER THE HEAD OF THE BOLT AND THE NUT OR BOTH.

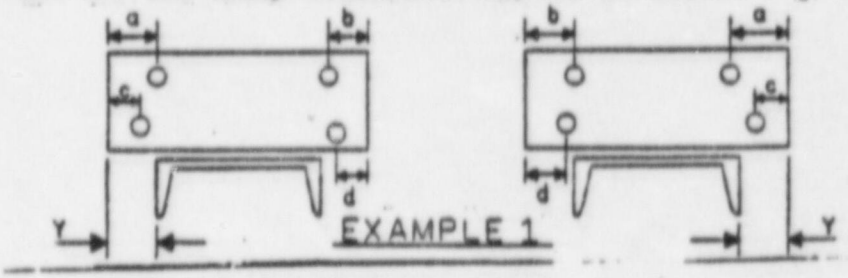
ATTACHMENT 7

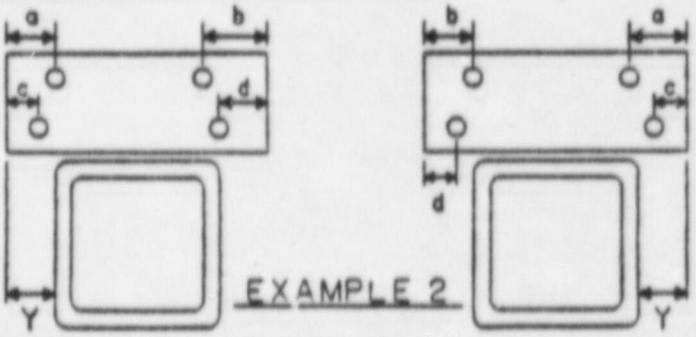
1. Any exceptions to this attachment will be individually drawn on the CTH drawing.

2. Clamps (except type C) shall be inspected by viewing the clamp from the outside of the tray.

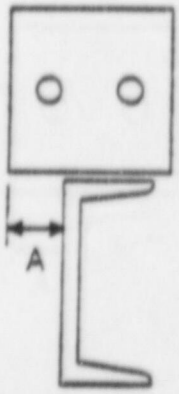
3. Orientation of members supporting clamps shall be determined by the CTH drawing plan or elevation view. Structural member orientation given as part of clamp details is pictorial only and not a required for orientation of the structural member.

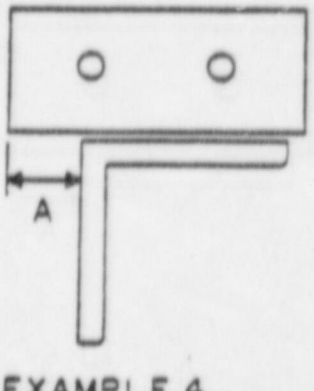
4. When clamps are mounted on symmetrical support members (example 1 and 2), all clamp dimensions may be as shown.

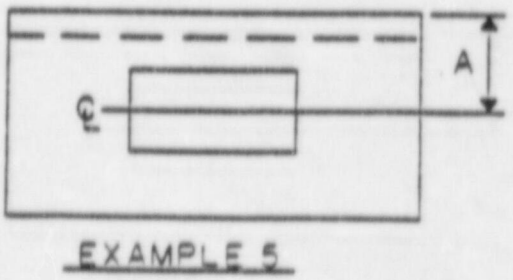




5. Dimensions used to locate clamps on non-symmetrical structural members shall be taken from the heel of the member, (examples 3, 4, and 5).

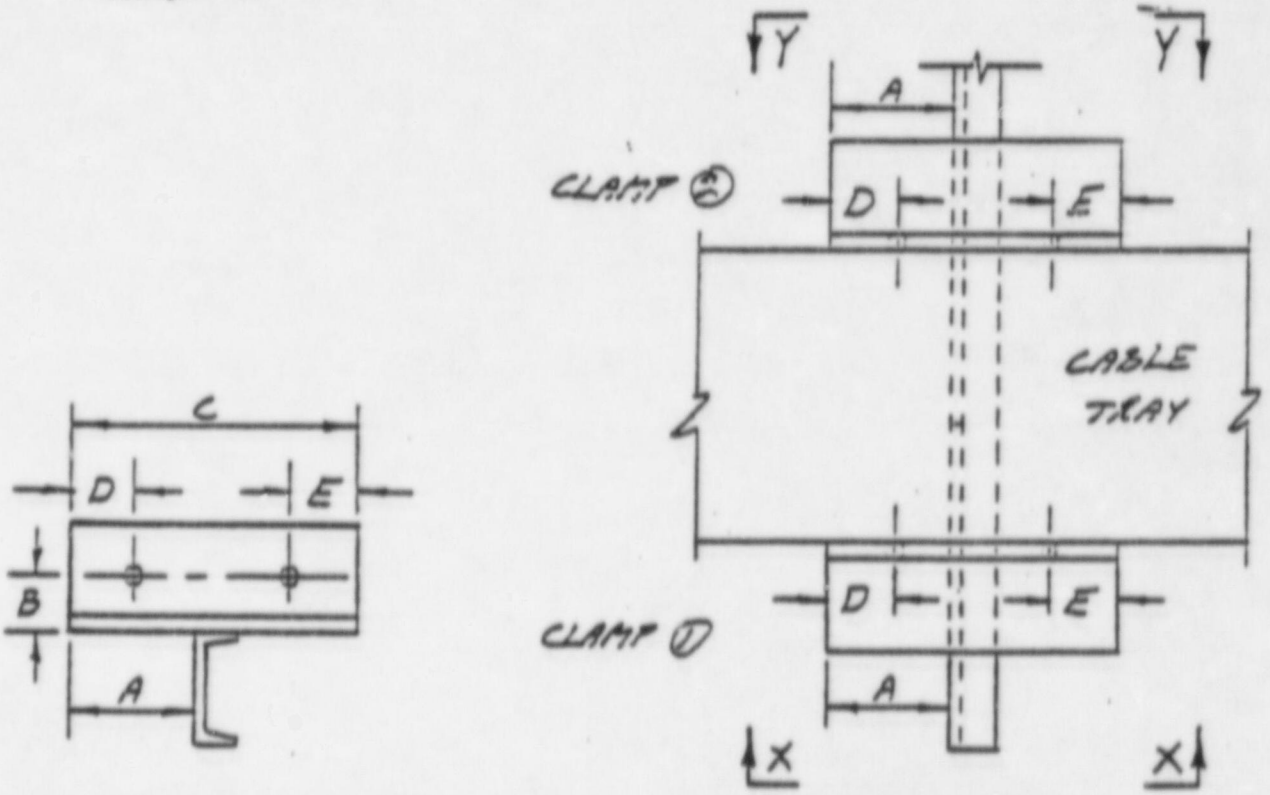






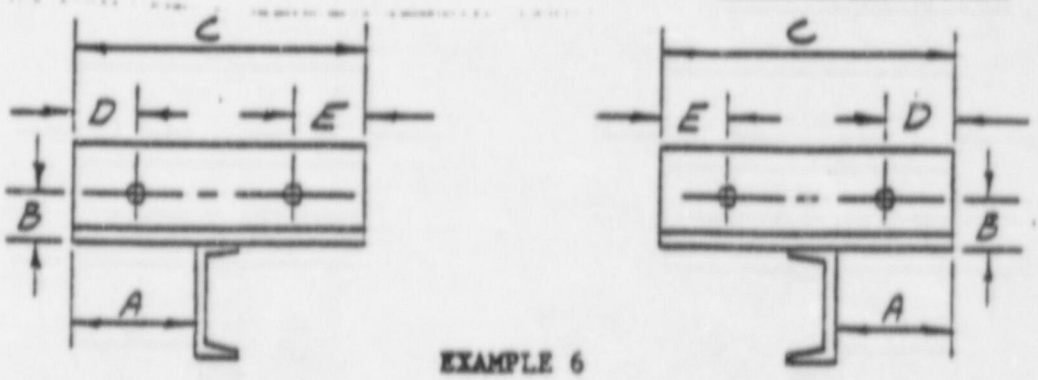
ATTACHMENT 7 (Cont)

6) When clamps are mounted on non-symmetrical support members the clamp dimensions provided on the CTH drawing shall be taken as shown on Example 6.



TYPICAL CLAMP DETAIL AS SHOWN ON DRAWING

TYPICAL PLAN AS INSTALLED

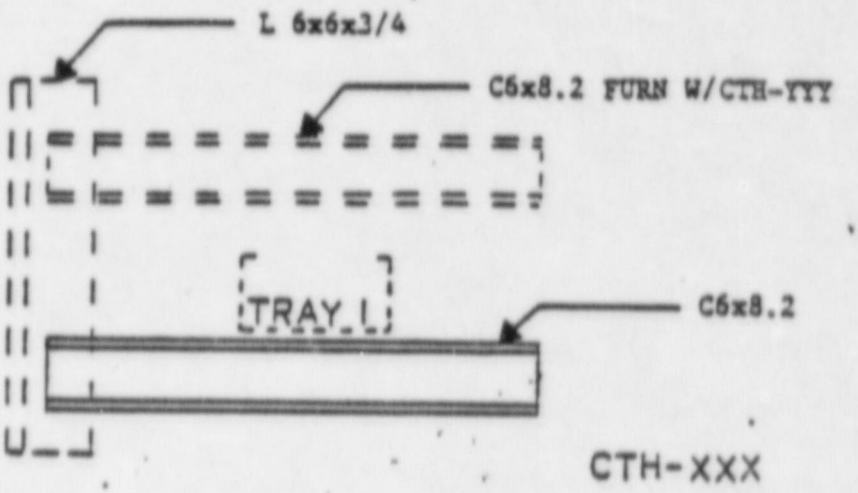


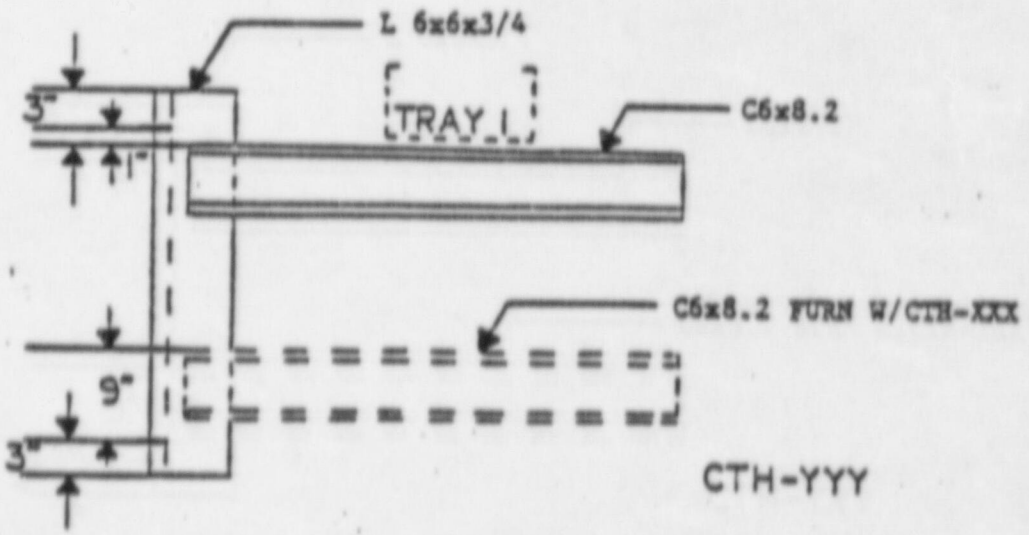
EXAMPLE 6

CLAMP ① ELEV. VIEW X-X

CLAMP ② ELEV. VIEW Y-Y

ATTACHMENT 8



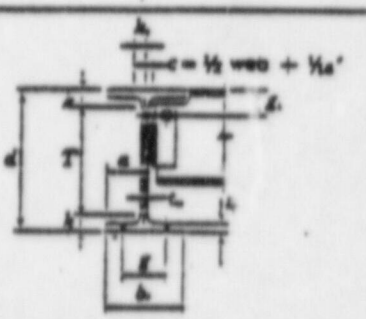


EXAMPLE OF MULTIPLE CTH'S
CONNECTED TO COMMON
BASE ANGLES

ATTACHMENT 9

1-12

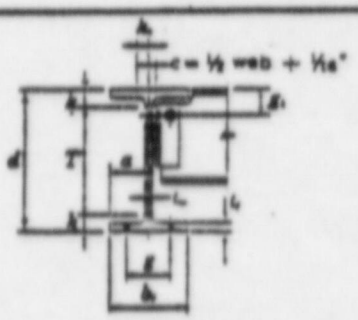
W SHAPES
Dimensions for detailing



Designation	Depth d	Flange: Width b_f	Flange: Thickness t_f	Web Thickness t_w	$\frac{t_w}{t}$	Distances: a	T	k	k_1	g	c	Usual Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W 36×300	36¼	16⅛	1 11/16	15/16	½	7⅞	31⅛	2 5/16	1½	3½	9/16	5½
×280	36⅛	16⅛	1 9/16	⅞	9/16	7⅞	31⅛	2 5/16	1½	3½	½	5½
×260	36¼	16⅛	1 7/16	13/16	7/16	7⅞	31⅛	2⅜	1½	3½	½	5½
×245	36	16⅛	1⅜	13/16	⅜	7⅞	31⅛	2⅜	1⅜	3½	7/16	5½
×230	35⅞	16⅛	1¼	¾	⅜	7⅞	31¼	2⅜	1⅜	3½	7/16	5½
W 36×194	36½	12⅛	1¼	¾	⅜	5⅞	32¼	2⅜	1⅜	3½	9/16	5½
×182	36⅜	12⅛	1 1/16	¾	⅜	5⅞	32¼	2⅜	1⅜	3¼	9/16	5½
×170	36¼	12	1⅛	11/16	5/16	5⅞	32¼	2	1⅜	3¼	⅝	5½
×160	36	12	1	⅝	5/16	5⅞	32½	1 15/16	1⅜	3¼	½	5½
×150	35⅞	12	15/16	⅝	5/16	5⅞	32¼	1⅞	1⅛	3	½	5½
×135	35½	12	15/16	½	9/16	5⅞	32¼	1 13/16	1⅛	3	½	5½
W 33×240	33½	15⅞	1⅝	15/16	7/16	7½	28⅝	2 5/16	1⅝	3½	½	5½
×220	33¼	15¾	1¼	¾	½	7½	28⅝	2 5/16	1⅝	3½	9/16	5½
×200	33	15¾	1⅛	11/16	½	7½	28⅝	2 5/16	1⅝	3¼	9/16	5½
W 33×152	33½	11⅝	1 1/16	½	5/16	5½	29¼	1⅞	1⅛	3¼	½	5½
×141	33¼	11½	15/16	½	5/16	5½	29¼	1⅞	1 1/16	3	½	5½
×130	33⅛	11½	⅞	7/16	5/16	5½	29¼	1 13/16	1 1/16	3	½	5½
×118	32⅞	11½	¾	7/16	¼	5½	29¼	1 9/16	1 1/16	2⅝	9/16	5½
W 30×210	30⅛	15⅛	1 9/16	¾	½	7⅛	25¼	2 5/16	1 9/16	3½	9/16	5½
×190	29⅞	15	1 5/16	15/16	½	7⅛	25¼	2 5/16	1 9/16	3¼	11/16	5½
×172	29⅝	15	1 1/16	⅝	5/16	7⅛	25¼	2 1/16	1⅛	3¼	½	5½
W 30×132	30¼	10½	1	⅝	5/16	5	26¼	1⅝	1 1/16	3	½	5½
×124	30⅛	10½	15/16	9/16	5/16	5	26¼	1 13/16	1	3	½	5½
×116	30	10½	¾	7/16	5/16	5	26¼	1⅝	1	3	½	5½
×108	29⅞	10½	⅝	7/16	¼	5	26¼	1 9/16	1	3	9/16	5½
× 99	29¾	10½	7/16	½	¼	5	26¼	1 5/16	1	2¾	9/16	5½

ATTACHMENT 9 (Cont)

1-13



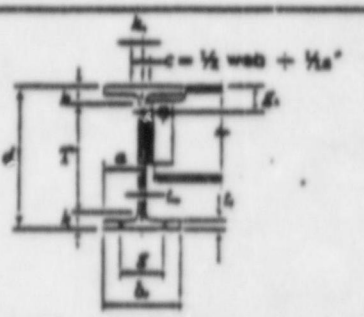
W SHAPES
Dimensions for detailing

Designation	Depth d	Flange Width b_f	Flange Thickness t_f	Web Thickness t_w	$\frac{t_w}{2}$	Distance a	Distance T	Distance k	Distance k_1	Distance g_1	Distance c	Usual Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W 27×177	27¼	14½	1 9/16	⅝	5/16	6⅝	23	2⅛	1¼	3¼	1/16	5½
×160	27⅛	14	1 9/16	9/16	5/16	6⅝	23	2 1/16	1¼	3¼	⅝	5½
×146	26⅞	14	1	⅝	5/16	6⅝	23	1 15/16	1 1/16	3	⅝	5½
W 27×114	27¼	10⅛	15/16	9/16	5/16	4⅝	23⅛	1 11/16	15/16	3	⅝	5½
×102	27⅛	10	15/16	½	¼	4⅝	23⅛	1⅝	15/16	3	9/16	5½
× 94	26⅞	10	⅞	½	¼	4⅝	23⅛	1½	15/16	2⅞	9/16	5½
× 84	26¾	10	⅝	5/16	¼	4⅝	23⅛	1 5/16	15/16	2⅞	9/16	5½
W 24×160	24⅝	14⅛	1¼	⅝	5/16	6¼	20⅛	1 15/16	1 1/16	3¼	⅝	5½
×145	24½	14	1	⅝	5/16	6¼	20⅛	1 15/16	1 1/16	3¼	⅝	5½
×130	24¼	14	⅞	9/16	5/16	6¼	20⅛	1 5/16	1	3	⅝	5½
W 24×120	24¼	12⅛	15/16	9/16	¼	5¼	20⅛	1 5/16	1	3	9/16	5½
×110	24⅛	12	⅞	½	¼	5¼	20⅛	1⅝	1	3	9/16	5½
×100	24	12	¾	5/16	¼	5¼	20⅛	1 9/16	15/16	3	9/16	5½
W 24× 94	24¼	9	⅞	½	¼	4¼	21	1⅝	1	3	9/16	5½
× 84	24⅛	9	¾	½	¼	4¼	21	1 9/16	15/16	3	9/16	5½
× 76	23⅞	9	13/16	7/16	¼	4¼	21	1 7/16	15/16	2⅝	9/16	5½
× 68	23¾	9	9/16	7/16	5/16	4¼	21	1⅜	15/16	2⅝	¼	5½
W 24× 61	23¾	7	9/16	7/16	5/16	3¼	21	1⅜	15/16	2⅝	¼	3½
× 55	23½	7	½	⅜	5/16	3¼	21	1¼	15/16	2⅝	¼	3½
W 21×142	21½	13⅛	1⅛	11/16	5/16	6¼	17⅝	1⅞	1	3	⅝	5½
×127	21⅛	13	1	9/16	5/16	6¼	17⅝	1⅝	1	3	⅝	5½
×112	21	13	⅞	½	¼	6¼	17⅝	1⅜	15/16	2⅝	9/16	5½
W 21× 96	21⅛	9	15/16	9/16	5/16	4¼	17⅝	1 11/16	15/16	3	⅝	5½
× 82	20⅞	9	13/16	½	¼	4¼	17⅝	1 9/16	15/16	2⅝	9/16	5½
W 21× 73	21¼	8¼	¾	7/16	¼	3⅞	18½	1⅝	15/16	2⅝	9/16	5½
× 68	21⅛	8¼	11/16	7/16	5/16	3⅞	18½	1 9/16	15/16	2⅝	¼	5½
× 62	21	8¼	⅝	⅜	5/16	3⅞	18½	1¼	¾	2½	¼	5½
× 55	20¾	8¼	½	⅜	5/16	3⅞	18½	1⅛	¾	2½	¼	5½
W 21× 49	20⅞	6½	9/16	⅜	5/16	3⅛	18½	1 5/16	¾	2½	¼	3½
× 44	20⅝	6½	7/16	⅜	5/16	3⅛	18½	1 1/16	¾	2½	¼	3½

ATTACHMENT 9 (Cont)

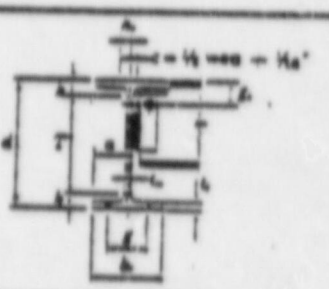
1-14

W SHAPES
Dimensions for detailing



Designation	Depth d	Flange Width b_f	Flange Thickness t_f	Web Thickness t_w	$\frac{t_w}{t}$	Distances a	T	k	k_1	g	c	Usual Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W 18×114	18 1/2	11 7/8	1	9/16	9/16	5 5/8	13 1/4	1 1/16	1 9/16	3	1/8	5 1/2
×105	18 3/8	11 3/4	15/16	9/16	1/4	5 5/8	13 1/4	1 1/16	1 5/16	3	1/16	5 1/2
× 96	18 1/4	11 3/4	13/16	1/2	1/4	5 5/8	13 1/4	1 1/16	1	2 7/8	9/16	5 1/2
W 18× 85	18 1/4	8 7/8	15/16	1/2	1/4	4 1/8	13 1/4	1 1/16	1	3	9/16	5 1/2
× 77	18 1/4	8 3/4	13/16	1/2	1/4	4 1/8	13 1/4	1 1/16	1	2 7/8	9/16	5 1/2
× 70	18	8 3/4	11/16	7/16	1/4	4 1/8	13 1/4	1 1/16	1	2 7/8	9/16	5 1/2
× 64	17 7/8	8 3/4	1 1/16	7/16	1/4	4 1/8	13 1/4	1 1/16	15/16	2 7/8	1/4	5 1/2
W 18× 60	18 1/4	7 1/2	1 1/16	7/16	1/4	3 1/8	13 7/8	1 1/16	1 1/16	2 7/8	1/4	3 1/2
× 55	18 1/8	7 1/2	15/16	7/16	1/4	3 1/8	13 7/8	1 1/16	15/16	2 7/8	1/4	3 1/2
× 50	18	7 1/2	13/16	7/16	1/4	3 1/8	13 7/8	1 1/16	15/16	2 1/2	1/4	3 1/2
× 45	17 7/8	7 1/2	1/2	7/16	1/4	3 1/8	13 7/8	1	15/16	2 1/2	1/4	3 1/2
W 18× 40	17 7/8	6	1/2	5/16	1/4	2 1/8	13 7/8	1 1/16	15/16	2 1/2	1/4	3 1/2
× 35	17 3/4	6	7/16	5/16	1/8	2 1/8	13 7/8	1	15/16	2 1/2	9/16	3 1/2
W 16× 96	16 3/4	11 1/2	15/16	9/16	1/4	5 1/2	13 1/2	1 1/16	15/16	2 7/8	9/16	5 1/2
× 88	16 5/8	11 1/2	1 1/16	1/2	1/4	5 1/2	13 1/2	1 1/16	15/16	2 7/8	9/16	5 1/2
W 16× 78	16 3/4	8 1/8	15/16	1/2	1/4	4	13 1/2	1 1/16	15/16	2 7/8	9/16	5 1/2
× 71	16 5/8	8 1/8	1 1/16	1/2	1/4	4	13 1/2	1 1/16	15/16	2 7/8	9/16	5 1/2
× 64	16	8 1/8	1 1/16	7/16	1/4	4	13 1/2	1 1/16	15/16	2 7/8	9/16	5 1/2
× 58	15 7/8	8 1/8	15/16	7/16	1/4	4	13 1/2	1 1/16	1 1/16	2 7/8	1/4	5 1/2
W 16× 50	16 1/4	7 1/8	13/16	7/16	1/4	3 1/8	13 1/2	1 1/16	1	2 7/8	1/4	3 1/2
× 45	16 1/8	7	11/16	7/16	1/4	3 1/8	13 1/2	1 1/16	1 1/16	2 1/2	1/4	3 1/2
× 40	16	7	1/2	5/16	1/8	3 1/8	13 1/2	1 1/16	1 1/16	2 1/2	9/16	3 1/2
× 36	15 7/8	7	15/16	5/16	1/8	3 1/8	13 1/2	1 1/16	1 1/16	2 1/2	9/16	3 1/2
W 16× 31	15 7/8	5 1/2	7/16	1/4	1/8	2 1/8	13 1/2	1 1/16	1 1/16	2 1/2	9/16	2 1/2
× 26	15 3/4	5 1/2	5/16	1/4	1/8	2 1/8	13 1/2	15/16	1/8	2 1/2	9/16	2 1/2

ATTACHMENT 9 (Cont)



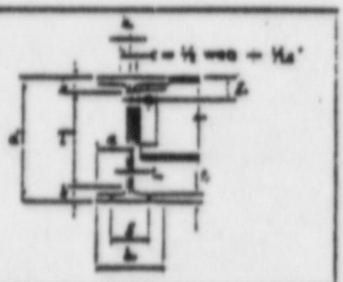
W SHAPES
· Dimensions for detailing

Designation	Depth d	Flange: Width b_f	Flange: Thickness t_f	Web Thickness t_w	$\frac{k_{det}}{d}$	d	T	k	k_1	k_3	r	Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W 14×730	22½	17⅞	4⁹⁄₁₆	2¼	1¹⁵⁄₁₆	7⅞	13¼	5¼	2⁹⁄₁₆	7	1⅞	
×665	22⅜	17⅛	4¼	2⁹⁄₁₆	1¹⁵⁄₁₆	7⅞	13¼	5⅛	2⁵⁄₁₆	6¼	1½	
×605	22	17⅛	4⅛	2⅜	1¹⁵⁄₁₆	7⅞	13¼	4⅞	1¹³⁄₁₆	6¼	1⅜	
×550	21¾	17¼	3¹³⁄₁₆	2⅛	1⁹⁄₁₆	7⅞	13¼	4½	1¹³⁄₁₆	5⅝	1¼	
×500	21½	17	3½	2⁹⁄₁₆	1⅜	7⅞	13¼	4⁹⁄₁₆	1⅜	5½	1⁹⁄₁₆	
×455	21	16⅞	3⅜	2	1	7⅞	13¼	4⅛	1⅜	5¼	1⁵⁄₁₆	
W 14×426	18¾	12⅞	2½	1⅞	⁹⁄₁₆	7⅞	11⅝	3⅝	1⁵⁄₁₆	5	1	
×398	18¼	18⅜	2¹⁵⁄₁₆	1¾	⅝	7⅞	11¼	3½	1½	4⅞	⁹⁄₁₆	
×370	18	18½	2¹³⁄₁₆	1½	⁹⁄₁₆	7⅞	11¼	3⅜	1⁵⁄₁₆	4⅝	⅝	
×342	17½	18¼	2⅝	1⁵⁄₁₆	⅝	7⅞	11¼	3⅛	1⅜	4½	⁹⁄₁₆	
×314	17¼	18¼	2½	1⅛	⁹⁄₁₆	7⅞	11¼	3	1⁵⁄₁₆	4¼	½	
×287	16⅞	18¼	2⅛	1⁵⁄₁₆	⅝	7⅞	11¼	2⅞	1⁵⁄₁₆	4	⁹⁄₁₆	
×264	16½	18	1¹³⁄₁₆	1⅜	⅝	7⅞	11¼	2¾	1⅛	4	⁹⁄₁₆	
×246	16¼	18	1¹³⁄₁₆	1⅛	⁹⁄₁₆	7⅞	11¼	2½	1⅛	4	⁹⁄₁₆	
W 14×233	16⅛	15⅞	1⅝	1⁵⁄₁₆	⁹⁄₁₆	7⅞	11¼	2⁵⁄₁₆	1⁵⁄₁₆	3⅝	½	
×211	15⅞	15⅝	1⅝	1⅛	⁹⁄₁₆	7⅞	11¼	2⅛	1⅛	3⅝	⁹⁄₁₆	
×193	15½	15¾	1⅜	1	½	7⅞	11¼	1⅞	1⅛	3½	⁹⁄₁₆	
×176	15¼	15¾	1¼	¹⁵⁄₁₆	½	7⅞	11¼	1¾	1⅛	3½	½	
×159	15	15⅛	1⅛	¹³⁄₁₆	½	7⅞	11¼	1⅝	1	3½	½	
×145	14⅞	15⅛	1	¾	½	7⅞	11¼	1½	1	3½	½	
×132	14⅝	15⅛	1	¾	½	7⅞	11¼	1⅜	1	3½	½	
W 14×120	14¾	14¾	1⅝	⅝	½	7⅞	11¼	2⅛	1⅝	4	½	

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

ATTACHMENT 9 (Cont)

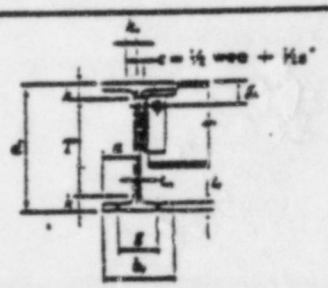
W SHAPES
Dimensions for detailing



Designation	Depth d	Flange Width b_f	Flange Thickness t_f	Web Thickness t_w	$\frac{t_w}{T}$	Distances a	T	k	k_1	k_3	c	Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W 14×136	14⅛	14⅝	1⅜	15/16	15/16	7	11¼	1⅞	9/16	3	⅛	5½
×127	14⅛	14⅝	1	⅞	15/16	7	11¼	1 11/16	9/16	3	⅛	5½
×119	14¼	14⅝	15/16	13/16	15/16	7	11¼	1⅞	9/16	3	⅛	5½
×111	14⅛	14⅝	⅞	11/16	¼	7	11¼	1 13/16	½	2⅝	9/16	5½
×103	14¼	14⅝	15/16	⅝	¼	7	11¼	1⅞	½	2⅝	9/16	5½
× 95	14½	14⅛	¾	9/16	¼	7	11¼	1 13/16	½	2⅝	9/16	5½
× 87	14	14⅛	13/16	½	9/16	7	11¼	1⅞	9/16	2⅝	¼	5½
W 14× 84	14⅛	12	¾	9/16	¼	5⅝	11¼	1 13/16	½	2⅝	9/16	5½
× 78	14	12	11/16	½	9/16	5⅝	11¼	1⅞	½	2⅝	¼	5½
W 14× 74	14¼	10	13/16	½	¼	4⅞	11¼	1½	½	2⅝	9/16	5½
× 68	14	10	11/16	9/16	9/16	4⅞	11¼	1⅝	9/16	2⅝	¼	5½
× 61	13⅞	10	⅝	½	9/16	4⅞	11¼	1 13/16	9/16	2⅝	¼	5½
W 14× 53	14	8	13/16	½	9/16	3⅝	11¼	1⅝	9/16	2⅝	¼	5½
× 48	13¾	8	11/16	9/16	9/16	3⅝	11¼	1⅜	9/16	2½	¼	5½
× 43	13⅞	8	½	7/16	¼	3⅝	11¼	1 13/16	9/16	2½	9/16	5½
W 14× 38	14⅛	6¾	½	7/16	9/16	3¼	11⅝	1⅜	7/16	2½	¼	3½
× 34	14	6¾	7/16	7/16	⅜	3¼	11⅝	1 5/16	7/16	2½	9/16	3½
× 30	13⅞	6¾	⅜	⅜	⅜	3¼	11⅝	1	7/16	2½	9/16	3½
W 14× 26	13⅞	5	7/16	⅜	⅜	2⅝	11⅝	1	7/16	2½	9/16	2⅝
× 22	13¾	5	5/16	¼	⅜	2⅝	11⅝	15/16	⅜	2½	9/16	2⅝

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

ATTACHMENT 9 (Cont)



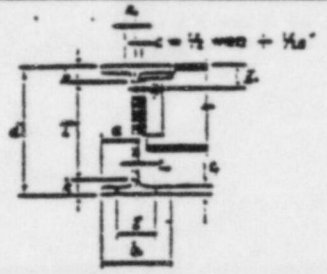
W SHAPES
Dimensions for detailing

Designation	Depth d	Flange: Width b_f	Flange: Thickness t_f	Web Thickness t_w	$\frac{t_w}{2}$	Distances: a	T	k	k_1	g_1	c	Usual Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W 12×190	14⅜	12⅝	1¾	1⅜₁₆	½	5⅜	9½	2⅞₁₆	1⅜₁₆	3¼	⅝₁₆	5½
×161	13⅞	12½	1½	⅞	⅝₁₆	5⅜	9½	2⅝₁₆	1⅛₁₆	3½	½	5½
×133	13⅜	12⅜	1⅛	¾	⅜	5⅜	9½	1¹⁵⁄₁₆	1	3⅛	⅝₁₆	5½
×120	13⅛	12⅜	1⅛	¹¹⁄₁₆	⅜	5⅜	9½	1¹⁵⁄₁₆	1	3	⅝₁₆	5½
×106	12⅞	12⅛	1	⅝	⅜₁₆	5⅜	9½	1¹¹⁄₁₆	¹³⁄₁₆	3	⅜	5½
× 99	12¾	12⅛	¹⁵⁄₁₆	⅝	⅜₁₆	5⅜	9½	1⅜	¹³⁄₁₆	3	⅜	5½
× 92	12⅝	12⅛	⅞	⅝	⅛	5⅜	9½	1⅜₁₆	⅞	2⅞	⅝₁₆	5½
× 85	12½	12⅛	¹³⁄₁₆	½	⅛	5⅜	9½	1½	⅞	2⅞	⅝₁₆	5½
× 79	12⅜	12⅛	¾	½	⅛	5⅜	9½	1⅞₁₆	⅞	2⅞	⅝₁₆	5½
× 72	12⅛	12	¹¹⁄₁₆	⅞₁₆	⅜₁₆	5⅜	9½	1⅜	⅞	2½	½	5½
× 65	12⅛	12	⅝	⅜	⅜₁₆	5⅜	9½	1⅜₁₆	¹³⁄₁₆	2½	½	5½
W 12× 58	12⅛	10	⅝	⅜	⅜₁₆	4⅝	9½	1⅜	¹³⁄₁₆	2⅝	½	5½
× 53	12	10	⅝₁₆	⅜	⅜₁₆	4⅝	9½	1⅛	¹³⁄₁₆	2½	½	5½
W 12× 50	12⅛	8⅛	⅝	⅜	⅜₁₆	3⅝	9½	1⅜	¹³⁄₁₆	2⅝	½	5½
× 45	12	8	⅝₁₆	⅜₁₆	⅜₁₆	3⅝	9½	1⅛	¹³⁄₁₆	2½	½	5½
× 40	12	8	½	⅝₁₆	⅛	3⅝	9½	1⅛	¹³⁄₁₆	2½	⅜₁₆	5½
W 12× 36	12⅛	6⅝	⅝₁₆	⅜₁₆	⅛	3⅛	10½	1⅛₁₆	⅝	2½	⅜₁₆	3½
× 31	12⅛	6½	⅜₁₆	¼	⅛	3⅛	10⅝	1	⅝	2½	⅜₁₆	3½
× 27	12	6½	⅜	¼	⅛	3⅛	10⅝	¹⁵⁄₁₆	⅝₁₆	2½	⅜₁₆	3½
W 12× 22	12⅛	4	⅜₁₆	¼	⅛	1⅞	10⅛	¹³⁄₁₆	⅝	2½	⅜₁₆	2⅛
× 19	12⅛	4	⅜	¼	⅛	1⅞	10⅛	⅞	⅝₁₆	2⅛	⅜₁₆	2⅛
× 16.5	12	4	¼	¼	⅛	1⅞	10⅛	¹³⁄₁₆	⅝₁₆	2⅛	⅜₁₆	2⅛
× 14	11⅞	4	¼	⅜₁₆	⅛	1⅞	10⅛	¾	⅝₁₆	2⅛	⅜₁₆	2⅛

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

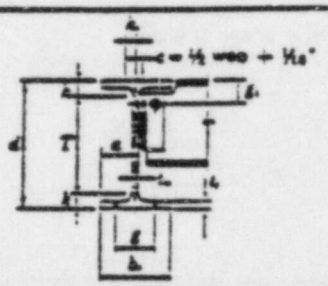
ATTACHMENT 9 (Cont)

W SHAPES
Dimensions for detailing



Designation	Depth d	Flange Width b_f	Flange Thickness t_f	Web Thickness t_w	$\frac{t_w}{2}$	Clearance a	Clearance T	Clearance k	Clearance k_1	Clearance g	Clearance e	Usual Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W 18X117	11⅞	10⅜	1¼	⅝	⅜	4⅜	7⅜	1 29/32	15/16	3	3/4	5½
X106	11½	10⅜	1⅛	11/16	5/16	4⅜	7⅜	1 13/16	⅞	3	⅜	5½
X 97	11⅜	10¼	1	⅝	5/16	4⅜	7⅜	1 3/16	29/32	2½	⅜	5½
X 86	11⅛	10⅛	⅞	9/16	¼	4⅜	7⅜	1 5/16	13/16	2½	5/16	5½
X 77	10⅞	10¼	¾	7/16	¼	4⅜	7⅜	1 1/16	11/16	2½	5/16	5½
X 72	10½	10⅛	11/16	½	¼	4⅜	7⅜	1	11/16	2½	5/16	5½
X 65	10⅜	10⅛	¾	7/16	⅛	4⅜	7⅜	15/16	⅝	2½	5/16	5½
X 60	10⅜	10⅛	11/16	7/16	3/16	4⅜	7⅜	1	⅝	2½	¼	5½
X 54	10⅛	10	⅝	⅜	3/16	4⅜	7⅜	15/16	9/16	2½	¼	5½
X 49	10	10	9/16	5/16	3/16	4⅜	7⅜	1	9/16	2½	¼	5½
W 18X 46	10⅛	8	⅝	⅜	3/16	3⅜	7⅜	1 3/16	11/16	2½	¼	5½
X 40	10	8	½	5/16	3/16	3⅜	7⅜	1 1/16	11/16	2½	¼	5½
X 35	9⅞	8	7/16	5/16	⅛	3⅜	7⅜	1	11/16	2½	5/16	5½
W 18X 29	10⅛	5¾	½	5/16	⅛	2⅝	5⅛	1 1/16	⅝	2½	5/16	2¾
X 25	10⅛	5¼	5/16	¼	⅛	2⅝	5⅛	1	⅝	2½	5/16	2¾
X 21	9⅞	5¼	5/16	¼	⅛	2⅝	5⅛	⅞	9/16	2½	5/16	2¾
W 18X 19	10¼	4	5/16	¼	⅛	1⅞	5⅜	15/16	½	2½	5/16	2½
X 17	10⅛	4	5/16	¼	⅛	1⅞	5⅜	⅞	9/16	2½	5/16	2½
X 15	10	4	¼	¼	⅛	1⅞	5⅜	13/16	9/16	2½	5/16	2½
X 11.5	9⅞	4	5/16	5/16	3/16	1⅞	5⅜	¾	9/16	2	⅛	2½

ATTACHMENT 9 (Cont)

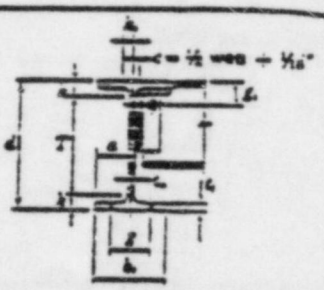


W SHAPES
Dimensions for detailing

Designation	Depth d	Flange Width b_f	Flange Thickness t_f	Web Thickness t_w	$\frac{t_w}{2}$	Distances k	Distances T	Distances k_1	Distances k_{det}	Distances g	Distances c	Usual Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
W 8X67	9	8¼	9/16	9/16	9/16	1⅜	6½	1 5/16	⅝	2¾	⅜	5½
X58	8¾	8¼	9/16	½	½	1⅜	6½	1 5/16	11/16	2¾	5/16	5½
X48	8½	8⅛	11/16	⅜	7/16	1⅜	6⅛	1 3/16	⅝	2½	¼	5½
X40	8¼	8⅛	9/16	⅜	7/16	1⅜	6⅛	1 1/16	⅝	2½	¼	5½
X35	8⅛	8	½	5/16	5/16	1⅜	6⅛	1	⅝	2¼	¼	5½
X31	8	8	5/16	5/16	⅛	1⅜	6⅛	15/16	⅝	2¼	5/16	5½
W 8X28	8	6½	7/16	5/16	⅛	1⅛	6⅛	15/16	⅝	2¼	5/16	3½
X24	7⅞	6½	⅜	¼	⅛	1⅛	6⅛	⅞	9/16	2¼	5/16	3½
W 8	8⅛	5¼	⅜	¼	⅛	2½	6⅛	⅞	9/16	2¼	5/16	2½
	8	5¼	5/16	¼	⅛	2½	6⅛	15/16	½	2¼	5/16	2½
W 8X15	8⅛	4	5/16	¼	⅛	1⅜	6½	15/16	9/16	2¼	5/16	2½
X13	8	4	¼	¼	⅛	1⅜	6½	⅝	½	2¼	5/16	2½
X10	7⅞	4	5/16	5/16	5/16	1⅜	6½	11/16	½	2	⅛	2¼
W 6X25	6⅜	6⅛	5/16	5/16	5/16	2⅜	4½	15/16	9/16	2¼	¼	3½
X20	6¼	6	⅜	¼	⅛	2⅜	4½	⅞	9/16	2¼	5/16	3½
X15.5	6	6	¼	¼	⅛	2⅜	4½	¾	½	2¼	5/16	3½
W 6X16	6¼	4	⅜	¼	⅛	1⅜	4½	⅞	9/16	2¼	5/16	2½
X12	6	4	¼	¼	⅛	1⅜	4½	⅝	½	2¼	5/16	2½
X 8.5	5⅞	4	5/16	5/16	1/16	1⅜	4½	11/16	½	2	⅛	2½
W 5X18.5	5⅛	5	7/16	¼	⅛	2⅜	3½	15/16	½	2¼	5/16	2½
X16	5	5	⅜	¼	⅛	2⅜	3½	¾	7/16	2¼	5/16	2½
W 4X13	4¼	4	⅜	¼	⅛	1⅜	2½	15/16	9/16	2	5/16	2½

ATTACHMENT 9 (Cont)

M SHAPES
Dimensions for detailing

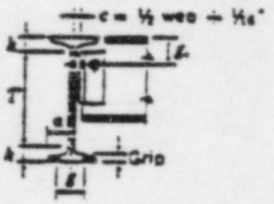


Designation	Depth d	Flange Width b_f	Flange Thickness t_f	Web Thickness t_w	$\frac{t_w}{T}$	Distance k	Distance T	Distance k_1	Distance k_{det}	Distance k_{des}	Distance c	Grip	Max. Fillet Radius	Min. Flange Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
M 14X17.2	14	4	¼	5/16	⅛	1⅜	12⅛	⅝	⅜	2⅛	5/16	¼	⅛	2¼
M 12X11.8	12	3⅛	¼	5/16	⅛	1½	10⅜	5/16	⅜	2⅛	⅛	¼	—	—
M 10X25.1	9⅞	5⅛	⅜	7/16	3/16	2⅜	8⅛	⅞	½	2½	¼	7/16	⅜	2⅛
X22.9	9⅞	5¼	⅜	¼	⅛	2⅜	8⅛	⅞	7/16	2½	3/16	⅜	⅜	2⅛
M 10X 9	10	2⅝	5/16	5/16	⅛	1¼	9	½	5/16	2	⅛	3/16	—	—
M 8X24.3	8	8	7/16	⅜	3/16	3⅛	5⅞	1 1/16	⅝	2½	¼	7/16	⅜	5½
X22.8	8	8	7/16	5/16	3/16	3⅛	5⅞	1 1/16	⅝	2½	¼	7/16	⅜	5½
M 8X22.5	8	5⅞	⅜	⅜	3/16	2½	6¼	⅞	½	2⅛	¼	⅜	⅜	2⅛
X18.5	8	5¼	⅜	¼	⅛	2½	6¼	⅞	7/16	2⅛	3/16	⅜	⅜	2⅛
M 8X 6.5	8	2⅛	5/16	⅛	1/16	1⅛	7	⅛	¼	2	⅛	3/16	—	—
M 7X 5.5	7	2⅛	5/16	⅛	1/16	1	6⅛	7/16	¼	2	⅛	3/16	—	—
M 6X22.5	6	6	⅝	⅜	3/16	2⅜	4⅝	13/16	½	2⅛	¼	⅜	⅝	3½
X20	6	6	⅝	¼	⅛	2⅜	4⅝	13/16	7/16	2⅛	3/16	⅜	⅝	3½
M 6X 4.4	6	1⅞	5/16	⅛	1/16	⅞	5⅛	½	¼	2	⅛	3/16	—	—
M 5X12.9	5	5	7/16	5/16	3/16	2⅜	3¼	⅞	½	2½	¼	7/16	⅜	2⅛
M 4X13.8	4	4	⅜	5/16	3/16	1⅞	2⅝	11/16	½	2	¼	⅜	¼	2¼
X13	4	4	⅜	¼	⅛	1⅞	2⅝	11/16	7/16	2	3/16	⅛	¼	2¼

Gage g [illegible] Specification Sect. 1.18.3 may require reduction in fastener size.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

ATTACHMENT 9 (Cont)



S SHAPES
Dimensions for detailing

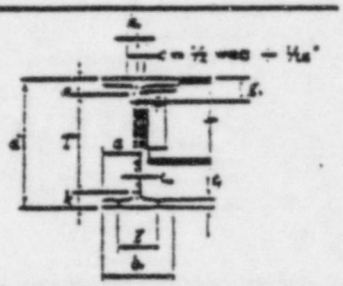
Designation	Depth d	Flange: Width b_f	Flange: Thickness t_f	Web Thickness t_w	$\frac{t_w}{2}$	Distance: a	Distance: T	Distance: k	Distance: k_1	Distance: c	Grip	Max. Flange Fastener	Usual Flange Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
S 24×120	24	8	1 1/16	27/32	3/8	3 5/16	20	2	3 1/4	7/16	1 1/16	1	4
×105.9	24	7 7/8	1 1/16	3/4	5/16	3 5/16	20	2	3 1/4	3/8	1 1/16	1	4
S 24×100	24	7 1/4	7/8	5/8	5/16	3 1/4	20 1/2	1 3/4	3	3/16	7/8	1	4
× 90	24	7 1/8	7/8	5/8	5/16	3 1/4	20 1/2	1 3/4	3	3/8	7/8	1	4
× 79.9	24	7	7/8	1/2	1/4	3 1/4	20 1/2	1 3/4	3	9/16	7/8	1	4
S 20×95	20	7 1/4	1 1/16	27/32	3/8	3 1/4	16 5/8	1 3/8	3	7/16	1 1/16	1	4
× 85	20	7	1 1/16	7/8	5/16	3 1/4	16 5/8	1 3/8	3	3/8	7/8	1	4
S 20×75	20	6 1/4	15/16	7/8	5/16	2 7/8	16 5/8	1 3/8	3	3/8	15/16	7/8	3 1/2
× 66.4	20	6 1/4	15/16	1/2	1/4	2 7/8	16 5/8	1 3/8	3	9/16	1/8	7/8	3 1/2
S 18×70	18	6 1/4	1 1/16	11/16	3/8	2 3/4	15	1 1/2	2 3/4	7/16	1 1/16	7/8	3 1/2
× 54.7	18	6	1 1/16	7/16	1/4	2 3/4	15	1 1/2	2 3/4	9/16	1 1/16	7/8	3 1/2
S 15×50	15	5 5/8	5/8	9/16	1/4	2 1/2	12 1/8	1 3/8	2 3/4	9/16	9/16	1/2	3 1/2
× 42.9	15	5 1/2	5/8	7/16	5/16	2 1/2	12 1/8	1 3/8	2 3/4	1/4	9/16	1/2	3 1/2
S 12×50	12	5 1/2	1 1/16	11/16	5/16	2 3/8	9 1/8	1 7/16	2 3/4	3/8	1 1/16	1/2	3
× 40.8	12	5 1/4	1 1/16	7/16	1/4	2 3/8	9 1/8	1 7/16	2 3/4	9/16	1/8	1/2	3
S 12×35	12	5 1/8	9/16	7/16	3/16	2 3/8	9 1/8	1 3/16	2 1/2	1/4	1/2	1/2	3
× 31.8	12	5	9/16	3/8	3/16	2 3/8	9 1/8	1 3/16	2 1/2	1/4	1/2	1/2	3
S 10×35	10	5	1/2	5/8	5/16	2 1/8	7 1/8	1 1/8	2 1/2	3/8	1/2	1/2	2 1/2
× 25.4	10	4 7/8	1/2	5/16	1/8	2 1/8	7 1/8	1 1/8	2 1/2	3/16	1/2	1/2	2 1/2
S 8×23	8	4 1/8	7/16	7/16	1/4	1 7/8	6	1	2 1/2	5/16	7/16	1/2	2 1/2
× 18.4	8	4	7/16	1/4	1/8	1 7/8	6	1	2 1/2	3/16	7/16	1/2	2 1/2
S 7×20	7	3 7/8	7/8	7/16	1/4	1 5/8	5 1/4	7/8	2 1/2	5/16	3/8	1/2	2 1/2
× 15.3	7	3 1/8	3/8	1/4	1/8	1 5/8	5 1/4	7/8	2 1/2	3/16	3/8	1/2	2 1/2
S 6×17.25	6	3 5/8	1/2	7/16	1/4	1 1/2	4 3/8	1 5/16	2 1/2	5/16	3/8	1/2	2
× 12.5	6	3 1/8	3/8	1/4	1/8	1 1/2	4 3/8	1 5/16	2 1/2	3/16	5/16	—	—
S 5×14.75	5	3 1/4	5/16	1/2	1/4	1 3/8	3 1/2	1/2	2 1/2	5/16	5/16	—	—
× 10	5	3	5/16	5/16	1/8	1 3/8	3 1/2	1/4	2 1/2	3/16	5/16	—	—
S 4×9.5	4	2 5/8	5/16	5/16	5/16	1 1/4	2 5/8	1 5/16	2	1/4	5/16	—	—
× 7.7	4	2 5/8	5/16	5/16	1/8	1 1/4	2 5/8	1 5/16	2	3/16	5/16	—	—
S 3×7.5	3	2 1/2	1/4	3/8	3/16	1 1/16	1 3/4	5/8	—	1/4	1/2	—	—
× 5.7	3	2 3/8	1/4	5/16	1/16	1 1/16	1 3/4	5/8	—	1/8	1/2	—	—

Gage g permissible near beam ends elsewhere specification Sect. 1.18.3 may require reduction in fastener size.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

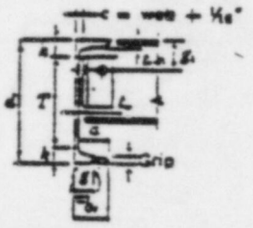
ATTACHMENT 9 (Cont)

HP SHAPES
Dimensions for detailing



Designation	Depth d	Flange Width b_f	Flange Thickness t_f	Web Thickness t_w	$\frac{t_w}{2}$	Clearance a	Clearance T	Clearance k	Clearance k_1	Clearance g_1	Clearance c	Usual Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
HP 14×117	14¼	14⅞	13/16	13/16	½	7	11¼	1½	1 1/16	2⅝	7/16	5½
" ×102	14	14⅝	11/16	11/16	½	7	11¼	1⅜	1	2⅝	7/16	5½
× 89	13⅞	14⅝	⅞	⅞	9/16	7	11¼	1 3/16	15/16	2½	⅜	5½
× 73	13⅝	14⅝	½	½	¼	7	11¼	1 3/16	⅞	2½	5/16	5½
HP 12× 74	12⅛	12¼	⅞	⅞	9/16	5⅜	9½	1 3/16	15/16	2½	⅜	5½
× 53	11⅞	12	7/16	7/16	5/16	5⅜	9½	1⅛	⅞	2½	¼	5½
HP 10× 57	10	10¼	9/16	9/16	5/16	4⅝	7⅞	1⅛	15/16	2½	⅜	5½
× 42	9⅞	10¼	7/16	7/16	5/16	4⅝	7⅞	1	⅞	2½	¼	5½
HP 8× 36	8	8⅛	7/16	7/16	¼	3⅞	6⅛	15/16	⅛	2½	5/16	5½

ATTACHMENT 9 (Cont)



AMERICAN STANDARD CHANNELS
Dimensions for detailing

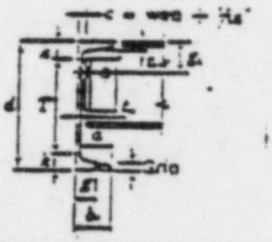
Designation	Depth of Section, d	Flange: Width b_f	Flange: Avg. Thickness t_f	Web Thickness t_w	$\frac{t_w}{2}$	Distances: a	Distances: T	Distances: k	Distances: k_1	Distances: c	Grip	Max. Flange Fastener	Usual Flange Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
C 15×50	15	3⅜	⅝	11/16	⅜	3	12⅛	1 7/16	2⅝	⅜	⅝	1	2½
×40	15	3½	⅝	½	¼	3	12⅛	1 7/16	2⅝	9/16	⅝	1	2
×33.9	15	3⅜	⅝	⅜	5/16	3	12⅛	1 7/16	2⅝	7/16	⅝	1	2
C 12×30	12	3⅛	½	½	¼	2⅞	9⅝	1⅛	2½	9/16	½	⅞	1¾
×25	12	3	½	⅜	3/16	2⅞	9⅝	1⅛	2½	7/16	½	⅞	1¾
×20.7	12	3	½	5/16	⅛	2⅞	9⅝	1⅛	2½	⅜	½	⅞	1¾
C 10×30	10	3	7/16	11/16	5/16	2⅝	8	1	2½	⅜	7/16	¾	1¾
×25	10	2⅞	7/16	½	¼	2⅝	8	1	2½	9/16	7/16	¾	1¾
×20	10	2¾	7/16	⅜	3/16	2⅝	8	1	2½	7/16	7/16	¾	1½
×15.3	10	2⅝	7/16	¼	⅛	2⅝	8	1	2½	9/16	7/16	¾	1½
C 9×20	9	2⅝	7/16	7/16	¼	2¼	7 1/16	15/16	2½	½	7/16	¾	1½
×15	9	2½	7/16	9/16	⅛	2¼	7 1/16	15/16	2½	⅜	7/16	⅝	1⅜
×13.4	9	2⅜	7/16	¼	⅛	2¼	7 1/16	15/16	2½	5/16	7/16	⅝	1⅜
C 8×18.75	8	2½	⅜	½	¼	2	6 1/16	15/16	2½	9/16	⅜	¾	1½
×13.75	8	2⅜	⅜	5/16	⅛	2	6 1/16	15/16	2½	⅜	⅜	⅝	1⅜
×11.5	8	2¼	⅜	¼	⅛	2	6 1/16	15/16	2½	5/16	⅜	⅝	1⅜
C 7×14.75	7	2¼	⅜	7/16	3/16	1⅞	5¼	⅞	2½	½	⅜	⅝	1½
×12.25	7	2⅛	⅜	5/16	3/16	1⅞	5¼	⅞	2½	⅜	⅜	⅝	1¼
× 9.8	7	2⅛	⅜	3/16	⅛	1⅞	5¼	⅞	2½	¼	⅜	⅝	1¼
C 6×13	6	2⅛	5/16	7/16	3/16	1⅝	4 3/16	13/16	2½	½	5/16	⅝	1⅜
×10.5	6	2	5/16	5/16	3/16	1⅝	4 3/16	13/16	2½	⅜	⅜	⅝	1⅛
× 8.2	6	1⅞	5/16	3/16	⅛	1⅝	4 3/16	13/16	2½	¼	5/16	½	1½
C 5× 9	5	1⅞	5/16	5/16	3/16	1½	3½	¾	2½	⅜	5/16	⅝	1⅛
× 6.7	5	1¾	5/16	3/16	⅛	1½	3½	¾	2½	¼	5/16	—	—
C 4× 7.25	4	1⅝	5/16	5/16	3/16	1⅜	2 15/16	11/16	2	⅜	5/16	⅝	1
× 5.4	4	1½	5/16	3/16	1/16	1⅜	2 15/16	11/16	2	¼	¼	—	—
C 3× 6	3	1⅝	½	⅜	3/16	1⅛	1⅞	11/16	—	7/16	5/16	—	—
× 5	3	1½	½	½	⅛	1⅛	1⅞	11/16	—	5/16	½	—	—
× 4.1	3	1⅜	½	3/16	1/16	1⅛	1⅞	11/16	—	½	¼	—	—

Gage g permissible near beam ends; elsewhere Specification Sect. L4.3 may require reduction in fastener size

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

ATTACHMENT 9 (Cont)

MISCELLANEOUS CHANNELS
Dimensions for detailing

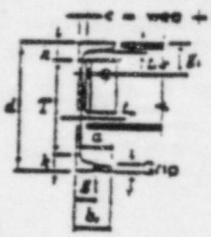


Designation	Depth of Section, d	Flange Width b_f	Flange Average Thickness t_f	Web Thickness t_w	$\frac{t_w}{t}$	x	$\bar{x}$	h	$\bar{h}$	e	Grip	Max. Fastener	Usual Flange Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
MC 18x58	18	4 1/16	5/8	11/16	5/8	3 1/2	15 7/16	1 3/8	2 1/2	3/4	5/8	1	2 1/2
x51.9	18	4 1/16	5/8	5/8	9/16	3 1/2	15 7/16	1 3/8	2 1/2	11/16	5/8	1	2 1/2
x45.8	18	4	9/16	1/2	1/2	3 1/2	15 7/16	1 3/8	2 1/2	9/16	5/8	1	2 1/2
x42.7	18	4	1/2	7/16	1/2	3 1/2	15 7/16	1 3/8	2 1/2	1/2	5/8	1	2 1/2
MC 13x50	13	4 1/16	5/8	13/16	5/8	3 1/8	10 1/16	1 3/8	2 1/2	3/4	5/8	1	2 1/2
x40	13	4 1/16	1/2	9/16	1/2	3 1/8	10 1/16	1 3/8	2 1/2	1/2	9/16	1	2 1/2
x35	13	4 1/16	7/16	7/16	1/2	3 1/8	10 1/16	1 3/8	2 1/2	1/2	9/16	1	2 1/2
x31.8	13	4	3/8	3/8	9/16	3 1/8	10 1/16	1 3/8	2 1/2	7/16	9/16	1	2 1/2
MC 12x50	12	4 1/16	13/16	13/16	7/16	3 1/4	9 7/16	1 3/16	2 1/2	3/4	13/16	1	2 1/2
x45	12	4	13/16	13/16	3/8	3 1/4	9 7/16	1 3/16	2 1/2	3/4	13/16	1	2 1/2
x40	12	3 7/8	13/16	9/16	9/16	3 1/4	9 7/16	1 3/16	2 1/2	5/8	13/16	1	2 1/2
x35	12	3 7/8	11/16	7/16	1/2	3 1/4	9 7/16	1 3/16	2 1/2	1/2	11/16	1	2 1/2
MC 12x17	12	2 5/8	1/2	5/8	9/16	3	9 7/16	1 3/16	2 1/2	11/16	5/8	7/8	2 1/2
x12.9	12	2 1/2	1/2	1/2	1/2	3	9 7/16	1 3/16	2 1/2	9/16	9/16	7/8	2 1/2
x10.6	12	2 1/2	3/8	7/16	1/2	3	9 7/16	1 3/16	2 1/2	1/2	9/16	7/8	2 1/2
MC 12x10.6	12	1 1/2	9/16	1/16	1/8	1 1/2	10 1/16	11/16	2 1/2	1/2	1/2	—	—
MC 10x41.1	10	4 1/16	9/16	13/16	5/8	3 1/2	7 1/2	1 1/2	2 1/2	7/8	9/16	7/8	2 1/2
x33.6	10	4 1/16	9/16	9/16	9/16	3 1/2	7 1/2	1 1/2	2 1/2	5/8	9/16	7/8	2 1/2
x28.5	10	4	9/16	7/16	1/16	3 1/2	7 1/2	1 1/2	2 1/2	1/2	9/16	7/8	2 1/2
MC 10x22.1	10	3 1/2	9/16	1/2	1/2	3	7 1/2	1 1/2	2 1/2	9/16	9/16	7/8	2
x21.3	10	3 1/2	1/2	7/16	9/16	3 1/8	7 1/2	1 1/16	2 1/2	1/2	1/2	7/8	2
x19.9	10	3 7/8	9/16	3/8	5/16	3	7 1/2	1 1/2	2 1/2	7/16	9/16	7/8	2
x17.9	10	3 1/2	1/2	5/16	5/16	3 1/8	7 1/2	1 1/16	2 1/2	3/8	1/2	7/8	2
MC 10x 8.4	10	1 1/2	1/2	5/16	1/16	1 3/8	8 1/16	11/16	2 1/2	1/2	1/2	—	—
MC 10x 6.5	10	1 1/16	1/16	1/8	1/16	1	9 1/16	7/16	2 1/2	3/16	1/16	—	—

Gage g permissible near beam ends; elsewhere Specification Sect. J3.5 may require reduction in fastener size.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

ATTACHMENT 9 (Cont)



MISCELLANEOUS CHANNELS
Dimensions for detailing

Designation	Depth of Section d	Flange Width b_f	Flange Avg. Thickness t_f	Web Thickness t_w	$\frac{t_w}{2}$	Dimension a	Dimension T	Dimension k	Dimension k_1	Dimension e	Grip	Max. Flange Fillet r	Usual Flange Gage g
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
MC 9X25.4	9	3½	9/16	7/16	1/4	3	6⅝	1 3/16	2½	½	9/16	⅜	2
9X23.9	9	3½	9/16	⅜	3/16	3	6⅝	1 3/16	2½	7/16	9/16	⅜	2
MC 8X22.8	8	3½	½	7/16	3/16	3⅛	5⅝	1 3/16	2½	½	½	⅜	2
X21.4	8	3½	½	⅜	3/16	3⅛	5⅝	1 3/16	2½	7/16	½	⅜	2
MC 8X20	8	3	½	⅜	3/16	2⅝	5¼	1⅛	2½	7/16	½	⅜	2
X18.7	8	3	½	⅜	3/16	2⅝	5¼	1⅛	2½	7/16	½	⅜	2
MC 8X 8.5	8	1⅞	9/16	5/16	1/8	1⅜	6½	⅜	2¼	¼	9/16	⅜	1⅛
MC 7X22.7	7	3⅝	½	½	¼	3⅛	4⅜	1⅛	2½	9/16	½	⅜	2
X19.1	7	3½	½	⅜	3/16	3⅛	4⅜	1⅛	2½	7/16	½	⅜	2
MC 7X17.6	7	3	½	⅜	3/16	2⅝	4⅜	1 1/16	2½	7/16	½	⅜	1⅝
MC 6X18	6	3½	½	⅜	3/16	3⅛	3⅝	1 1/16	2½	7/16	½	⅜	2
X15.3	6	3½	⅜	5/16	3/16	3⅛	4¼	⅝	2¼	⅜	⅜	⅜	2
MC 6X16.3	6	3	½	⅜	3/16	2⅝	3⅝	1 1/16	2½	7/16	½	⅜	1⅝
X15.1	6	3	½	5/16	3/16	2⅝	3⅝	1 1/16	2½	⅜	½	⅜	1⅝
MC 6X12	6	2½	⅜	5/16	⅛	2⅛	4⅛	1 5/16	2¼	⅜	⅜	⅛	1½
MC 3X 9	3	2⅛	⅜	½	¼	1⅝	1½	⅛	—	5/16	—	—	—
X 7.1	3	2	⅜	5/16	⅛	1⅝	1½	⅛	—	⅜	—	—	—

Gage g permissible near beam ends; elsewhere Specification Sect. 1.18.5 may require reduction in fastener size.