

TEGCO ENGINEERING DIVISION	INSTRUCTION	REVISION	ISSUE DATE	PAGE
FOR INFORMATION ONLY	CP-EI-4.0-71	1	05-06-85	1 of 21
CABLE TRAY HANGER AS-BUILT "BOLT HOLE VERIFICATION" UNIT NO. 2	PREPARED BY <u>O. B. Jones 5/3/85</u> <u>Baker</u> APPROVED BY <u>[Signature]</u>			

1.0

REFERENCES

- 1-A CP-EI-4.5-23 Cable Tray Hanger Engineering Walkdown
- 1-B CP-CPM-6.3 "Preparation, Approval and Control of Operation Travelers
- 1-C CP-EI-4.0-68 Cable Tray Hanger As-Designed and As-Built Drawing Development
- 1-D CP-EP-16.3 Control of Reportable Deficiencies

2.0

GENERAL

2.1

PURPOSE

This instruction outlines basic responsibilities and tasks for the development of "Bolt Hole Verification" for Cable Tray Hangers (CTH) for Unit #2, and provides the verification criteria that shall be used to document bolt holes in attachment to concrete, structural steel, tray supports and clamps (plate or angle).

2.2

SCOPE

The two hundred and thirty (230) cable tray hangers of Unit #2 will be randomly selected from those which were installed before January 1984 (the same time period for Unit #1 CTH installations). These randomly selected cable tray hangers of Unit #2 will also be used for the "Bolt Hole Verification" for the bolt hole sizes in Unit #1 CTH.

8605300251 860523
PDR FOIA
GARDE86-A-55 PDR

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2.3 GENERAL PROGRAM DESCRIPTION

The "Bolt Hole Verification" drawing shall be prepared by the engineering walkdown team showing bolt size, bolt type, and bolt hole identification numbers for:

- (a) Attachment to concrete (bolt holes in plate, angle or channel for Hilti/Richmond bolts)
- (b) Attachment to structural steel (bolt hole in channel, angle, or plate)
- (c) Attachment of Cable Tray Clamps to support (bolt hole in channel, angle, or other structural member)
- (d) Splice plate, washer plates, and angles attached to tray (bolt hole in plate or angle)

2.4 RESPONSIBILITY

The CPP Project Civil Engineer is responsible for providing technical direction and administrative guidance to the CPP Civil Engineering Organization of which the Unit 1 CTH Special Analysis Group is a part.

The CTH Program Manager is responsible for ensuring activities within the purpose and scope of this instruction are completed in accordance with the measures described herein.

The CTH Supervisor is responsible for implementing this instruction. The CTH Supervisor shall coordinate the assembly and transmittal of "Bolt Hole Verification" packages, interface activities, and establish and maintain adequate tracking mechanisms or logs to assure positive control of all activities described within this instruction.

When specific individuals are designated by title in this instruction, it shall be assumed that a designee may act in that capacity. Documentation of such designation shall be maintained within the Cable Tray Hanger Group.

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3.0 INSTRUCTION

3.1 INITIATION

3.1.1 General

The Cable Tray Hanger Engineering group shall prepare and transmit approved "Bolt Hole Verification" drawings to DCC/Paper Flow Group (PFG) for assembling specific "Bolt Hole Verification" drawing and operation traveler in a package for QC inspections. The packages shall be controlled by Unit #2 PFG.

3.2 CTH "BOLT HOLE VERIFICATION" WALKDOWN

3.2.1 Documentation of Verification Activities

The CTH Supervisor shall maintain on a file, a list of individuals approved to coordinate and document field verification activities.

The QC shall document all inspection attributes per Construction Operation Traveler (Traveler) (Attachment 5) and shall be trained in use of Traveler and related attachment. The QA department will conduct the Traveler QC training.

3.2.2 Engineering Walkdown

The engineering walkdown team shall walkdown the CTH and prepare a drawing identifying each bolt hole with a unique number for each joint having bolted connections. The complete drawing will contain as a minimum information shown on Attachment 1 for each unique bolt hole. To facilitate QC documentation the bolt information will be summarized as shown on Attachment 2. The "Bolt Hole Verification" drawing for each specific support shall be reviewed by the "Bolt Hole Verification" Supervisor and approved. Upon approval, the drawing shall be transmitted to DCC for distribution.

3.2.3 Operational Traveler

The craft (construction) will remove the bolts and nuts in such a sequence that the hanger may remain in a safe condition including tie-offs to adjacent structures or prop up as necessary and document on the Traveler (Attachment 5).

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The QC Inspector shall perform inspections listed on the Traveler and complete documentation on Table A and Table D (Attachment 5). These tables will be used for complete verification and documentation of bolt holes of individual randomly selected Cable Tray Hangers and identified with suffix BH at the end of the drawing number (Attachment 1).

3.3 REMOVAL OF BOLTS AND NUTS

The field engineering or construction craft shall remove all bolts and nuts as specified on "Bolt Hole Verification" drawing for the specific cable tray hanger. Loose parts resulting from removal of the bolts shall be secured to the hanger.

3.4 THE AS-BUILT "BOLT HOLE VERIFICATION"

The QC inspector will document on Tables A & D (Attachment 5) all inspection attributes. Tables B & C (Attachment 5) are used for this inspection and are referenced in the Traveler. After completion of all QC documentation on the Traveler (Attachment 5) the package will then be returned to the Cable Tray Hanger Group.

3.5 ENGINEERING EVALUATION:

The Cable Tray Hanger Group shall evaluate each CTH package after completion of QC inspection on the basis of the following acceptance requirements.

3.5.1 Bolt Holes

3.5.1.1 Attachment to Concrete

(a) Bolt hole sizes for anchors (Hilti Super Kwik Bolts, Hilti Kwik Bolts and (Richmond) Screw Anchors shall be as follows:

- 1) 3/16" larger than nominal bolt diameter (max) for bolts up to and including 1 1/4" diameter.
- 2) 1/4" larger than nominal bolt diameter (max) for 1 1/2" diameter bolts.

3.5.1.2 Attachment to Structural Steel - (bolt holes on hanger and supporting structural steel)

Bolt hole sizes for bolts shall be 1/16" larger than the nominal bolt diameter.

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3.5.1.3 Attachment of Cable Tray Clamp (Angle) to support structure

- (a) Bolt hole size for 5/8" diameter H.S. bolt shall not exceed 3/4" diameter.
- (b) Bolt hole size for 5/8" diameter A307 bolt shall not exceed 11/16" diameter.

3.5.1.4 Attachment of Cable Tray Clamp (Plate or Angle) to Tray (bolt hole in plate or angle)

- (a) Bolt hole size for 1/2" diameter round head bolt shall not be larger than 9/16" diameter.
- (b) Bolt hole size for 3/8" diameter round head bolt shall not be larger than 7/16" diameter.

3.5.2 Washer and Washer Plate

- 3.5.2.1 Washers and washer plates shall be verified for proper selection and for tolerances per Attachment 3.

3.5.3 Edge Distance

- 3.5.3.1 For Engineering acceptance requirements of edge distance see Attachment 4.

3.6. DISCREPANCIES

All discrepancies resulting from QC inspection and documentation shall be transmitted to EBASCO Special Analysis Group (SAG) - New York - for engineering resolution.

3.6.1 Dimensions not in conformance with Engineering Acceptance Requirements:

The engineer (SAG) shall perform necessary calculation to determine the acceptance of dimension not conforming to minimum requirements: .

- A. If after calculation it is acceptable to "Use As Is" SAG will confirm that in writing to site CTH Group.
- B. If after calculation it is not acceptable SAG will revise the drawing to rework the affected unsatisfactory conditions.

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3.7 REINSTALLATION

3.7.1 The craft shall reinstall the nuts and bolts removed during QC inspection per the Traveler (Attachment 5).

3.7.2 The QC Inspector will perform installation inspection of bolts and nuts and sign off the Traveler (Attachment 5). Any unsatisfactory condition during reinstallation shall be recorded on Inspection Reports (Attachment 6).

3.8 DOCUMENTATION

The QC Inspector will document the inspection of bolt holes on the Traveler (Attachment 5).

Inspection Reports (Attachment 6) shall be used to document all unsatisfactory condition and a copy will be sent to CTH Group.

3.8.1 REPORTS AND SUMMARY

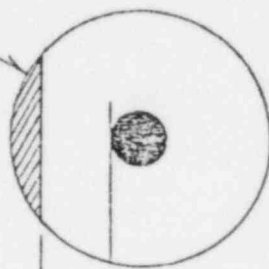
Final reports and summary shall be prepared by SAG to analyze the results and recommendation to site engineering. This report will be sent to Site Civil Engineering to transfer to the vault.

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ATTACHMENT 3

BOLT HOLE VERIFICATION WASHERS AND WASHER PLATES

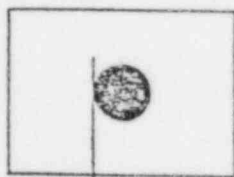
CLIP
WASHER



FOR 1/2 BOLT	1/2
FOR 3/4 BOLT	7/16
FOR 1 BOLT	3/8
FOR 3/4 BOLT	1/4
FOR 5/8 BOLT	1/4
FOR 1/2 BOLT	3/16
FOR 3/8 BOLT	1/8

*
MIN

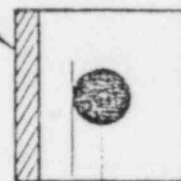
CIRCULAR WASHER



FOR 1/2" ϕ	5/8	MAY BE 1/4 MIN. *
FOR 5/8" ϕ	9/16	MAY BE 5/16 MIN. * (TYP)

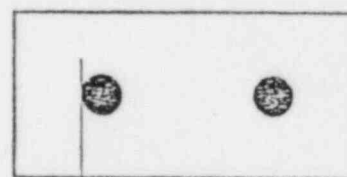
*: AN EDGE MAY BE
TRIMMED IF REQUIRED
TO CLEAR AN INTERFERENCE.

CLIP
WASHER



SAME AS
CIRCULAR WASHER

BEVELED WASHER



1/2" ϕ	5/8	MAY BE 1/4 MIN. * (TYP)
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WASHER PLATES

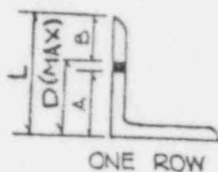
REQUIRED INSIDE TRAYS 24" AND OVER AT HEAVY DUTY CLAMPS

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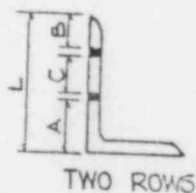
ATTACHMENT 4

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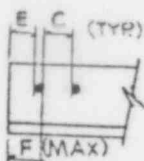
BOLT HOLE VERIFICATION BOLT HOLE GAGE AND EDGE DISTANCE FOR ANGLES



MINIMUM DIMENSION (IN)	L3 x 3/4		L6 x 3/4		L5 x 3/4								DIM E	
	A	B	A	B	A	B	A	B	A	B	A	B	MIN	MAX
1/2" # RICHMOND	1 7/8	3/8	1 7/8	1 5/8									1	3/8
1" # RICHMOND	1 11/16	3 1/16	1 11/16	1 11/16	1 11/16	1 1/16							1 1/16	3 1/16
1 1/4" # HILTI	1 13/16	3 1/16	1 13/16	1 11/16									1 1/16	3 1/16
1" # HILTI	1 11/16	3 1/16	1 11/16	1 11/16	1 11/16	1 1/16							1 1/16	3 1/16



MINIMUM DIMENSION	L5 x 3/8		L4 x 3/8		L3 1/2 x 3/8		L3 x 3/8		L2 1/2 x 3/8					
	A	B	A	B	A	B	A	B	A	B	A	B	MIN	MAX
5/8" #	1 1/16	1 3/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16						
1/2" #	(6" TRAY)		(4" & 6" TRAYS)		(4" TRAY)									
3/8" # (TWO ROWS)	1 1/8	5/16	1 1/16	5/16										
5/8" # AT TS	1 3/16	1 1/16	1 3/16	1 1/16	1 3/16	1 1/16								



MINIMUM DIMENSION	L5 x 5/16		L4 x 5/16		L3 1/2 x 5/16		L3 x 5/16		L2 1/2 x 5/16		BOLT TO 4" TRAY		BOLT TO 6" TRAY		ALL L		DIM C	
	A	B	A	B	A	B	A	B	A	B	A	D	A	D	E	F	MIN	MAX
5/8" #	1 1/16	1 3/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	1 1/16	5/8	1 1/16	2 1/16	1 1/16	2 1/16	1 1/16	1 1/16			
1/2" #	(6" TRAY)		(4" & 6" TRAYS)		(4" TRAY)													
3/8" # (TWO ROWS)	1 1/16	5/16	1 1/16	5/16														
5/8" # AT TS	1 3/16	1 1/16	1 3/16	1 1/16	1 3/16	1 1/16												

L = LENGTH OF ANGLE
= L3 1/2 ONLY # 1/16 FOR 1/2 L
= LG ONLY 4 1/16 FOR 3/8 L
3 5/16 FOR 5/16 L

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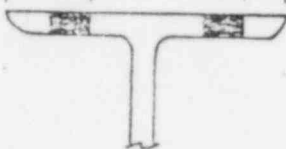
ATTACHMENT 4

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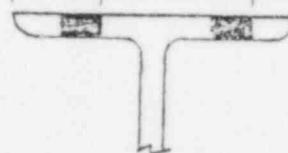
BOLT HOLE VERIFICATION

HS
A307 BOLT, BOLT

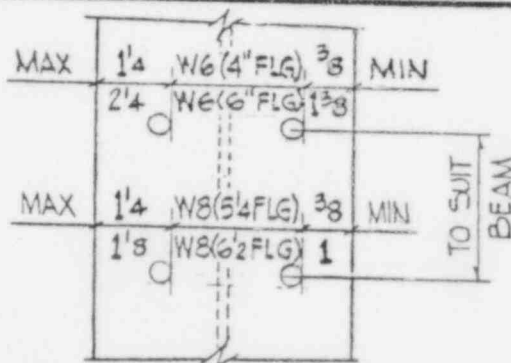
$\frac{1}{16}$	$\frac{1}{2}$	MAX	MIN	$\frac{3}{16}$ W6x16
$\frac{1}{16}$	2	MAX	MIN	$\frac{3}{16}$ W5x13.5
$\frac{1}{16}$	$\frac{1}{2}$	MAX	MIN	$\frac{3}{16}$ W4x13



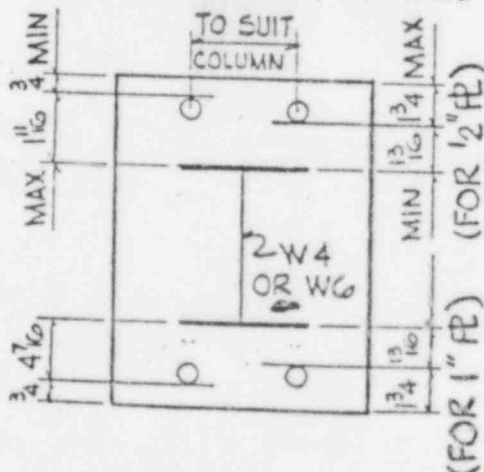
W6x16	$\frac{1}{2}$	MAX	MIN	$\frac{5}{16}$
W5x13.5	2	MAX	MIN	$\frac{5}{16}$
W4x13	$\frac{1}{2}$	MAX	MIN	$\frac{5}{16}$



$\frac{5}{8}$ " ϕ BOLT IN TRANSVERSE SUPT. $\frac{5}{8}$ " ϕ BOLT IN LONGITUDINAL SUPT.
TRAY CLAMPS IN WIDE FLANGE BEAMS

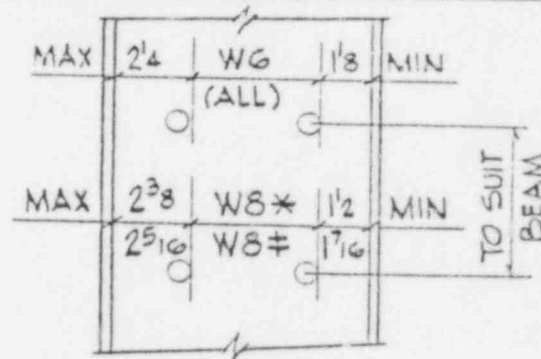


CONN. TO MEMBER FLANGE



MEMBER END CONN. PLATE

FRAMING MEMBER CONNECTIONS



CONN. TO MEMBER WEB

*: ALL W8 EXCEPT W8x10, W8x13, & W8x15
 #: ONLY W8x10, W8x13, & W8x15

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ATTACHMENT 5

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CONSTRUCTION OPERATION TRAVELER 35-1195					
1. TRAVELER NO.	2. EQUIPMENT NO. CTH-	3. UNIT NO.	4. QUANTITY	5. PAGE 1 of 7	
6. ACTIVITY DESCRIPTION			7. REFERENCE DRAWINGS		
8. SPEC/PROC/ENGR INST.		9. LOCATION	10. SYSTEM		
PREPARED BY _____ DATE _____ DEPT _____ REVIEWED BY _____ DATE _____ ANI REVIEW _____ N/A _____ DATE _____ N/A _____					
OP. NO	DEPT	OPERATION	CONST	QA/QC ENG.	ANI
		<p>SCOPE: This traveler is being used to remove and re-install the bolts and nuts as required for all verification of the bolt holes, edge distance and washer plates. This traveler will also document hole sizes.</p> <p>NOTE: Inaccessible bolt holes need not be inspected. The bolt number, size and type columns in Table A shall be completed. The other columns shall be lined through and labelled "inaccessible".</p> <p><u>Removal of Bolts and Nuts:</u></p>			
1	Craft	Remove bolts and nuts shown on the referenced "Bolt Hole Verification" drawing. Bolts and nuts should be removed in such a sequence that the hanger may remain in a safe condition, including tie-off to adjacent structures as necessary.			
	QC (V)	The QC Inspector shall sign off individual bolt removal on Table A (page 4). Operation 1 to be signed off by Inspector verifying last bolt/nut removal.			
2	QC (V)	<p>The QC Inspector shall document and sign off individual bolt hole edge distance on Table A (page 4).</p> <p>Bolt types shall be identified per Table B (page 5). Edge distances "A" & "B" to be oriented as shown on the "Bolt Hole Verification" drawing. Washer and washer plate edge distance shall be documented per Table C (page 6).</p>			

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1. TRAVELER NO.	2. EQUIPMENT NO. Cm-	3. UNIT NO.	4. QUANTITY	5. PAGE 2 of 7																	
6. ACTIVITY DESCRIPTION		7. REFERENCE DRAWINGS																			
8. SPEC/PROC/ENGR INST.		9. LOCATION	10. SYSTEM																		
PREPARED BY _____ DATE _____ DEPT _____ REVIEWED BY _____ DATE _____ ANI REVIEW _____ N/A _____ DATE _____ N/A _____																					
OP. NO	DEPT	OPERATION	CONST	QA/QC ENG.	ANI																
3	QC (V)	<p>Reinstallation of Bolts and Nuts:</p> <p>The QC to sign off installation of individual bolts and nuts on Table D (page 7). Document unsat conditions on the attached IR, and list the IR numbers in the applicable section below. Tensioning criteria is given below for each type of attachment. Operation 3 to be signed off by QC inspector verifying last bolt/nut reinstallation.</p> <p>A. Attachment to Concrete</p> <p>I. Screw Anchor Install to a "Snug-Tight" condition Unsatisfactory conditions listed on IR: _____</p> <p>II. Hilti Bolt Nuts Install to a "Torque" condition Unsatisfactory conditions listed on IR: _____</p> <p>Torque Requirements:</p> <table> <thead> <tr> <th>Bolt Diameter (Inches)</th> <th>Torque (Ft-Lbs)</th> </tr> </thead> <tbody> <tr><td>1/4</td><td>8</td></tr> <tr><td>3/8</td><td>17</td></tr> <tr><td>1/2</td><td>70</td></tr> <tr><td>5/8</td><td>120</td></tr> <tr><td>3/4</td><td>150</td></tr> <tr><td>1</td><td>230</td></tr> <tr><td>1 1/4</td><td>400</td></tr> </tbody> </table>	Bolt Diameter (Inches)	Torque (Ft-Lbs)	1/4	8	3/8	17	1/2	70	5/8	120	3/4	150	1	230	1 1/4	400			
Bolt Diameter (Inches)	Torque (Ft-Lbs)																				
1/4	8																				
3/8	17																				
1/2	70																				
5/8	120																				
3/4	150																				
1	230																				
1 1/4	400																				

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


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1. TRAVELER NO.		2. EQUIPMENT NO. CTH-		3. UNIT NO.	4. QUANTITY
6. ACTIVITY DESCRIPTION				7. REFERENCE DRAWINGS	
8. SPEC/PROC/ENGR INST.		9. LOCATION		10. SYSTEM	
PREPARED BY _____ DATE _____ DEPT _____ REVIEWED BY _____ DATE _____ ANI REVIEW _____ N/A _____ DATE _____ N/A _____					
OP. NO	DEPT	OPERATION	CONST	QA/QC ENG.	ANI
3 cont.	QC (V)	B. Attachment to Structural Steel Install to a "Torque" condition Unsatisfactory Conditions Listed on IR _____ (Torque Value Requirements) 5/8"Ø H.S. Bolt - Torque Value 228 Ft-# 3/4"Ø H.S. Bolt - Torque Value 387 Ft-# 7/8"Ø H.S. Bolt - Torque Value 518 Ft-# 1"Ø H.S. Bolt - Torque Value 725 Ft-# C. Attachment (Clamps) to Tray I) Attachment to Structure Install to "Snug-Tight" condition for A307 bolts Install to "Torque" condition for H.S. bolts Unsatisfactory condition listed on IR: _____ Torque requirements for H.S. bolts _____ (For 5/8"Ø H.S. Bolt Torque 228 Ft-Lbs) II) Attachment to Tray Install to a "Snug-Tight" condition Unsatisfactory condition listed on IR: _____			
4	CE QC (V)	Verify completion of all operations, and review traveler and attachments.			

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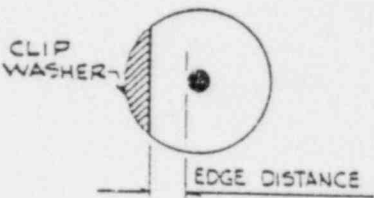
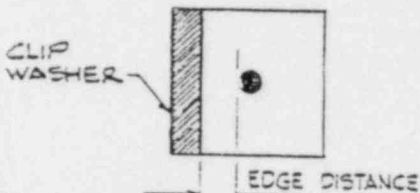
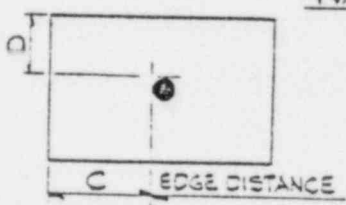
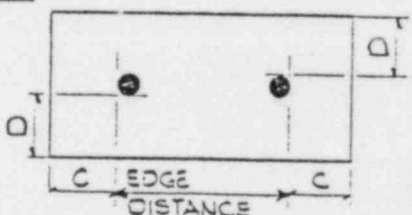
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TABLE B BOLT IDENTIFICATION MARKINGS		1. TRAVELER NO.	5. Sheet 5 of 7
		2. EQUIPMENT NO. OTH -	3. UNIT NO.
<u>ASTM AND SAE GRADE MARKINGS FOR STEEL BOLTS AND SCREWS</u>			
GRADE MARKINGS	SPECIFICATION	MATERIAL	
	SAE - GRADE 4	LOW OR MEDIUM CARBON STEEL	
	ASTM - A 307	LOW CARBON STEEL	
NO MARK	SAE - GRADE 6	LOW OR MEDIUM CARBON STEEL	
	SAE - GRADE 5	MEDIUM CARBON STEEL, QUENCHED AND TEMPERED	
	ASTM - A 449		
	SAE - GRADE 8	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 (WATHERING STEEL), QUENCHED AND TEMPERED	
	ASTM - A 354 GRADE A5	LOW ALLOY STEEL, QUENCHED AND TEMPERED	
	ASTM - A 354 GRADE A5	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 A5	ALLOY STEEL, QUENCHED AND TEMPERED	
	ASTM - A 390	ALLOY STEEL, QUENCHED AND TEMPERED	

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TABLE C WASHER AND WASHER PLATE		1. TRAVELER NO.	5. Sheet 6 of 7
		2. EQUIPMENT NO. CTH -	3. UNIT NO.
<div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  <p>CIRCULAR</p> </div> <div style="text-align: center;">  <p>BEVELED</p> </div> </div> <p style="margin: 10px 0;"><u>WASHER</u></p> <div style="display: flex; justify-content: space-around; align-items: flex-start;"> <div style="text-align: center;">  </div> <div style="text-align: center;">  </div> </div> <p style="margin: 10px 0;"><u>PLATE WASHER</u></p>			
<p><u>NOTE</u></p> <p>If no washer is present indicate "NA" in the washer type column of Table A.</p> <p>Standard or hardened circular washers do not have to be verified unless clipped. Indicate "STD" in the washer type column of Table A. If the washer has been clipped document the edge distance as shown above.</p> <p>If a beveled washer has been used, indicate "BEV" in the washer type column on Table A. If the beveled washer has been clipped document the edge distance as shown above.</p> <p>If a washer plate is present indicate this on Table A and document minimum edge distance C and minimum adjacent edge distance D as shown above.</p>			

