APPLICATION FOR OSHPD PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM)

OFFICE USE ONLY
APPLICATION #: OPM-0062-13

OSHPD Preapproval of Manufacturer's Certification (OPM)

Type: ☐ New ☒ Renewal ☐ Update to Pre-CBC 2013 OPA Number: _____

Manufacturer Information

Manufacturer: ERICO International Corporation

Manufacturer's Technical Representative: Ward Judson, Ph.D.

Mailing Address: 34600 Solon Road, Solon, Ohio 44139

Telephone: 440-528-3788 Email: ward.judson@pentair.com

Product Information

Product Name: Seismic Sway Bracing for Fire Sprinkler Systems

Product Type: Seismic Sway Bracing

Product Model Number: CSBQIKCL,CSBQG,CSBSTU,CSBEZU,CSBBRP,CSBUNIV,CSBMA,CSBBRS3,CSBIB CSBBC075,CSBBARJ,CSBBRS1, CSBU1, CSBU2, CSBS1, CSBS1A, CSBS2, CSBS3, CSBS4, CSBS5, CSB

General Description: The product consists of pipe clamps with brace pipes that are used for transverse, longitudinal, and vertical bracing of fire sprinkler service pipes. The products are attached to various support structures such as the underside of concrete floors or roofs.

Applicant Information

Applicant Company Name: ERICO International Corporation

Contact Person: Ward Judson, Ph.D.

Mailing Address: 34600 Solon Road, Solon, Ohio 44139

Telephone: 440-528-3788 Email: ward.judson@pentair.com

I hereby agree to reimburse the Office of Statewide Health Planning and Development review fees in accordance with the California Administrative Code, 2013.

Signature of Applicant: Ward Judson Date: 12/19/16

Title: Engineering Manager, Product Certifications Company Name: ERICO International Corporation

Registered Design Professional Preparing Engineering Recommendations

Company Name: CYS Structural Engineers, Inc.

Name: Dieter T. Siebald California License Number: SE4346

Mailing Address: 2495 Natomas Park Drive, Suite 650, Sacramento, CA 95833

Telephone: 916-920-2020 Email: dieters@cyseng.com

OSHPD Special Seismic Certification Preapproval (OSP)

☐ Special Seismic Certification is preapproved under OSP-
(Separate application for OSP is required)

☐ Special Seismic Certification is not preapproved

Certification Method(s)

☐ Testing in accordance with: ☐ ICC-ES AC156 ☐ FM 1950-16

☒ Other* (Please Specify): FM 1950-10

*Use of criteria other than those adopted by the California Building Standards Code, 2013 (CBSC 2013) for component supports and attachments are not permitted. For distribution system, interior partition wall, and suspended ceiling seismic bracings, test criteria other than those adopted in the CBSC 2013 maybe used when approved by OSHPD prior to testing.

☒ Analysis

☐ Experience Data

☒ Combination of Testing, Analysis, and/or Experience Data (Please Specify): Testing per FM 1950-10 and Analysis per pertinent chapters of 2013 CBC.

List of Attachments Supporting the Manufacturer's Certification

☒ Test Report ☒ Drawings ☒ Calculations ☐ Manufacturer's Catalog

☐ Other(s) (Please Specify):

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Signature: Date: 09-11-2017

Print Name: Jeffrey Kikumoto

Title: SSE

Condition of Approval (if applicable):

ADDENDUM #1 – SUMMARY

THE FOLLOWING PRODUCTS WILL BE PHASED OUT WITH A CORRESPONDING NEW REPLACEMENT. CONTACT THE MANUFACTURER FOR SPECIFIC DETAILS ABOUT THE PHASE-OUT PLAN. WE RECOMMEND USING THE NEW REPLACEMENT PRODUCTS TO REDUCE DELAYS & PROJECT RESUBMITTALS.

PHASED OUT PRODUCT	CORRESPONDING REPLACEMENT
CSBSTU	CSB
CSBEZU	CSB
CSBBARJ	CSBS1
CSBBC075	CSBS1 OR CSBS2
CSBIB075085	CSBS3
CSBIB075145	CSBS4
CSBIB125180	CSBS5
CSBUNIV	CSBU

NEW PRODUCT

CSBT – TELESCOPING TRANSVERSE SWAY BRACE & VERTICAL SEISMIC BRACE

NEW CASE

CASE 4 – UNDERSIDE OF CIP CONCRETE FLOOR OR ROOF

NOTES

1. A PHASED OUT OR OTHER CURRENT (E) PRODUCT, SUCH AS THE CSBSTU OR CSBQG, MAY BE USED W/ A REPLACEMENT PRODUCT, SUCH AS THE CSBS1.
2. A REPLACEMENT PRODUCT, SUCH AS THE CSB, MAY BE USED W/ A PHASED OUT OR OTHER CURRENT (E) PRODUCT, SUCH AS THE CSBUNIV.

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SHEET TITLE: ADDENDUM #1 - SUMMARY

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CSBSTU WITH BRACE PIPE FOR 1"ø TO 10"ø SERVICE PIPES 2.3
CSBEZU WITH BRACE PIPE FOR 1"ø TO 6"ø SERVICE PIPES 2.4
CSBBRP WITH RESTRAINT ROD 1"ø TO 2"ø SERVICE PIPES 2.5
CSB WITH BRACE PIPE FOR 1"ø TO 10"ø SERVICE PIPES 2.6
CSBT TELESCOPING ASSEMBLY FOR 1"ø TO 4"ø SERVICE PIPES 2.7

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CONDITIONS OF USE:

1. THIS OSHPD PRE-APPROVAL OF MANUFACTURER'S CERTIFICATION (OPM) IS BASED ON THE CBC 2013. THE DEMAND (DESIGN FORCES) FOR USE W/ THIS OPM SHALL BE BASED ON THE CBC 2013.
2. THIS PRE-APPROVAL IS FOR THE SEISMIC BRCG OF INTERIOR PIPES. IT DOES NOT ADDRESS OTHER LOADS SUCH AS, BUT NOT LIMITED TO, THOSE GENERATED BY THERMAL EXPANSION, PRESSURE, FLUID DYNAMICS, PIPE RUPTURE OR MOVEMENTS OF EQUIPMENT TO WHICH BRACE COMPONENTS ARE ATTACHED. IT DOES NOT ADDRESS COMPONENTS THAT CROSS SEISMIC SEPARATIONS OF BLDGS. NOR DOES IT ADDRESS COMPONENTS (OTHER THAN PIPE RISERS) ATTACHED TO PORTIONS OF THE STRUCTURE OR EQUIPMENT THAT WILL EXPERIENCE RELATIVE SEISMIC DISPLACEMENT. THE RANGE OF COMPONENT SIZES AND MATERIAL INCLUDED IN THE PRE-APPROVAL ARE AS FOLLOWS:
   A. FIRE SPRINKLER SERVICE PIPE DIAMETERS:
      - STEEL: SCHEDULE 10 UP TO 8 INCHES (INCLUDES 0.188, REFER TO PG C6 FOOTNOTES p & v)
      - STEEL: SCHEDULE 40 UP TO 10 INCHES
      - STEEL: SCHEDULE LW (i.e., SCHEDULE 7, REFER TO C5 FOOTNOTE c) UP TO 6 INCHES
      - COPPER: NOT INCLUDED IN THIS OPM
   B. BRACE PIPES:
      - STEEL: ASTM® A53 GR B, MIN NPS 1"ø TO MAX NPS 2"ø.
   C. TELESCOPIC BRACE ASSEMBLY FOR TRANSVERSE & VERT BRCG ONLY OF 1"ø TO 4"ø SERVICE PIPES.

   THE SUBSTRATES INCLUDED IN THIS PRE-APPROVAL ARE AS FOLLOWS: CONC, CONC/MTL DECK, & STL.
3. THESE DRAWINGS ARE PREPARED FOR ERICO INTERNATIONAL CORPORATION, SOLON, OHIO 44139.
4. THE CONTRACTOR AND THE INSPECTOR OF RECORD SHALL OBTAIN A COPY OF THIS PRE-APPROVAL FROM THE OSHPD PRE-APPROVAL PROGRAMS WEBSITE.
5. THIS PRE-APPROVAL IS FOR DESIGN AND ANCHORAGE OF FIRE SUPPRESSION SYSTEM SEISMIC SWAY BRACING ONLY.
6. THIS PRE-APPROVAL IS LIMITED TO INDOOR USE.

SCOPE:

1. THIS PRE-APPROVAL MAY BE USED FOR SEISMIC BRACING OF 1"ø TO 10"ø SERVICE (RUN) PIPES.

2. IN ADDITION, THIS PRE-APPROVAL MAY BE USED FOR SEISMIC BRACE ATTACHMENTS TO THE UNDERSIDE OF CONC FLRS OR ROOF W/ OR WITHOUT MTL DECK, TO THE FACE OF CONC WALLS, TO WF STL BMS, TO OPEN WEB STL JOISTS, OR TO STL PURLINS (RESTRAINTS ONLY).

CONSTRUCTION TOLERANCES:

1. CONSTRUCTION TOLERANCES SHALL BE AS NOTED ON THE DRAWING ATTACHMENT DTLS AND APPENDIX 'C' TABLE.

2. CONSTRUCTION TOLERANCE FOR ANGLES OF ALL BRACES FROM HORIZ SHALL BE LIMITED TO ±5 DEGREES.

3. CONSTRUCTION TOLERANCE FOR VERT SEISMIC BRACES FROM VERT SHALL BE LIMITED TO ±5 DEGREES.

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SHEET TITLE: OVERVIEW
CONDITIONS OF USE: SCOPE; CONSTRUCTION TOLERANCES

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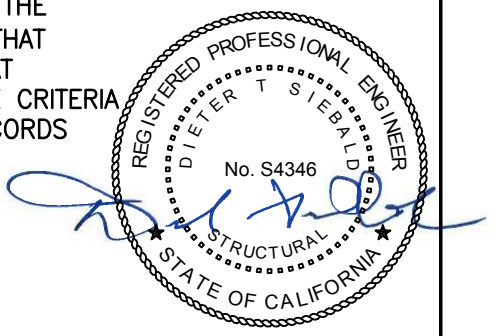
HOW TO USE THIS PRE-APPROVAL:

1. THIS PRE-APPROVAL MAY BE USED FOR THE DESIGN OF SEISMIC SWAY BRCG OF FIRE SPRINKLER SYSTEMS. A CALIFORNIA LICENSED STRUCTURAL ENGINEER (CLSE) HAS DESIGNED THIS PRE-APPROVAL, ALONG W/ SUPPORTING CALCULATIONS. THEREFORE, THE PRE-APPROVED DTLS AND CALCULATIONS ARE NOT TO BE RE-REVIEWED BY REGIONAL STAFF. HOWEVER, EA FIRE SPRINKLER SYSTEM REQUIRES SUBMITTALS THAT MUST BE REVIEWED AND APPROVED BY OSHPD.
2. AS W/ ALL PRE-APPROVED DTLS, SYSTEMS, ETC., PLANS (i.e. LAYOUT DRAWINGS) ARE STILL REQ SHOWING HOW AND WHERE THIS PRE-APPROVED SUPPORTS, ATTACHMENTS AND BRCG SYSTEM WILL BE APPLIED TO THE FIRE SPRINKLER SYSTEM ON A PROJECT SPECIFIC BASIS. THIS PROCESS IS NEEDED TO VERIFY THAT THE APPROPRIATE DTL HAS BEEN SELECTED AND APPLIED FOR EA CONDITION AND FOR THE ACTUAL SUBSTRATE THAT IT WILL BE CONNECTED/ATTACHED TO. FOR THE FIRE SPRINKLER SYSTEM, THESE PLANS MUST BE PREPARED, STAMPED & SIGNED BY A CALIFORNIA REGISTERED DESIGN PROFESSIONAL (CRDP). SEE CAC SECTION 7-115.
   A. THE CRDP REVIEWING THE BRACE SYSTEM IS RESPONSIBLE FOR THE ADEQUACY OF THE DESIGN AND APPLICATION OF THIS OPM.
   B. THE CRDP SHALL ARRANGE AND DESIGN THE TRANSVERSE, LONGITUDINAL AND VERT SEISMIC BRACES SO THAT THERE IS A VERT SEISMIC BRACE NO MORE THAN 6" FROM EA TRANSVERSE AND EA LONGITUDINAL BRACE MEMBER. FOR VERT SEISMIC BRACES SEE SECTION 8. PLEASE NOTE THAT A TYP VERT SERVICE PIPE ROD HANGER IS NOT A VERT SEISMIC BRACE.
   C. THE CRDP SHALL CHECK THE VERT SEISMIC BRACE ASSEMBLY FOR BOTH TENSION AND COMPRESSION LOADS AND DETERMINE WHETHER THE VERT SEISMIC BRACE ASSEMBLY OF THE BRCG SYSTEM REQUIRES COMPRESSION STIFFENERS OR OTHER STRENGTHENING. THE TENSION LOADS ON THE VERT SEISMIC BRACE ASSEMBLY MUST INCLUDE THE MAX TRIBUTARY DEAD LOAD, THE VERT COMPONENTS OF THE TRANSVERSE AND/OR LONGITUDINAL BRACES, AND THE TRIBUTARY VERT SEISMIC LOAD. COMPRESSION LOADS ON THE VERT SEISMIC BRACE ASSEMBLY MUST INCLUDE THE VERT COMPONENTS OF THE TRANSVERSE AND/OR LONGITUDINAL BRACES, AND THE TRIBUTARY VERT SEISMIC LOAD, BUT MUST NOT BE OFFSET BY TRIBUTARY DEAD LOADS UNLESS IT CAN BE VERIFIED THAT THE DEAD LOADS WILL, IN FACT, BE APPLIED TO THE VERT SEISMIC BRACE ASSEMBLY IN QUESTION.
   D. THE CRDP SHALL ARRANGE THE ANCHORS TO ENSURE THAT THEY CAN BE INSTALLED IN ACCORDANCE W/ THE PRE-APPROVAL AND THAT THERE ARE NO SLAB EDGES, OPENINGS, OR OTHER ANCHORS NEAR ENOUGH TO THE ANCHORS TO REDUCE THEIR ALLOWABLE CAPACITIES. THE ALLOWABLE CAPACITIES INDICATED IN THE OPM ARE BASED ON A MIN DISTANCE TO EDGE OF CONC, AS SHOWN IN THE TABLE ON PG 1.8 AND APPLICABLE LOAD COMBINATIONS PER ASCE® SECTION 12.4 IN THE ANALYSIS. THE ALLOWABLE ANCHOR CAPACITIES ARE FOR USE IN THE INTERACTION EQUATION PER ACI 318-11 SECTION D.7.
3. THIS PRE-APPROVAL RELIES ON A PRESCRIPTIVE COOKBOOK APPROACH. THE PRE-APPROVED DTLS HAVE TABLES AND CHARTS ASSOCIATED W/ THEM THAT MUST BE USED TO SELECT THE APPROPRIATE DTL FOR EA LOCATION THAT AN ANCHOR OR BRACE IS TO BE INSTALLED. THE APPLICATION OF THESE CRITERIA SHOULD NEVER BECOME THE RESPONSIBILITY OF THE INSPECTOR OF RECORDS (IOR), WHOSE RESPONSIBILITY IS TO INSPECT ONLY, NOT DESIGN.



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HOW TO USE THIS PRE-APPROVAL

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HOW TO USE THIS PRE-APPROVAL (CONTINUED):

4. THE STRUCTURAL ENGINEER OF RECORD (SEOR) MUST REVIEW AND FORWARD THE SUPPORTS, ATTACHMENTS AND BRCG PLANS FOR PLAN CHECK W/ A NOTATION INDICATING THAT THE PLANS HAVE BEEN REVIEWED AND THEY HAVE BEEN FOUND TO BE IN GENERAL CONFORMANCE W/ THE DESIGN OF THE PROJECT; SEE CAC SECTION 7-126. A "SHOP DRAWING STAMP" IS USUALLY ACCEPTABLE FOR COMPLIANCE W/ THIS REQUIREMENT.
5. THE REGIONAL STAFF, ON A PROJECT SPECIFIC BASIS, MUST REVIEW SUPPORTS, ATTACHMENTS AND BRCG DTLS AND SUPPORTING CALCULATIONS THAT ARE NOT PART OF THIS PRE-APPROVAL. REVIEW OF SUPPORTS, ATTACHMENTS AND BRCG DTLS OF THIS NATURE DO NOT CONSTITUTE A PRE-APPROVAL THAT MAY BE USED ON OTHER PROJECTS WITHOUT THE BENEFIT OF PLAN REVIEW AND APPROVAL.
6. LAYOUT DRAWINGS:
   A. LAYOUT DRAWINGS OF THE SUPPORT AND BRCG SYSTEMS PER THIS PRE-APPROVAL SHALL BE SUBMITTED TO THE DISCIPLINE IN RESPONSIBLE CHARGE OF THE PROJECT FOR REVIEW TO VERIFY THAT THE DTLS ARE IN CONFORMANCE W/ ALL CODE REQUIREMENTS. THE LAYOUT DRAWINGS SHALL BE IN ACCORDANCE W/ ASCE® 7-10 SECTION 13.6 (INCLUDING SUPPLEMENTS #1 & #2) AS MODIFIED BY THE CBC 2013 SECTION 1616A.
      a) THE STRUCTURAL ENGINEER OF RECORD (SEOR) SHALL VERIFY THAT THE SUPPORTING STRUCTURE IS ADEQUATE FOR THE LOADS IMPOSED ON IT BY THE SUPPORTS AND BRACES INSTALLED PER THE PRE-APPROVAL IN ADDITION TO ALL OTHER LOADS.
      b) THE SEOR WILL FORWARD THE SUPPORTS, ATTACHMENTS AND BRCG PLANS (INCLUDING APPROVED CHANGE ORDERS FOR SUPPLEMENTARY FRAMING WHERE REQ) TO THE DISCIPLINE IN RESPONSIBLE CHARGE W/ A NOTATION INDICATING THAT THE PLANS HAVE BEEN REVIEWED AND ARE IN GENERAL CONFORMANCE W/ THIS PRE-APPROVAL, THE DESIGN OF THE PROJECT (CAC 2013, SECTION 7-153) AND NFPA® 13, 2013 EDITION.
      c) A "SHOP DRAWING STAMP" MAY BE USED TO INDICATE COMPLIANCE W/ THIS REQUIREMENT.
      d) THE CALIFORNIA REGISTERED DESIGN PROFESSIONAL (CRDP OTHER THAN SEOR) MAY PROVIDE THE SHOP DRAWING STAMP FOR SMALL INSTALLATIONS AT THE DISCRETION OF THE OSHPD DISTRICT STRUCTURAL ENGINEER.
   B. THE SEOR SHALL DESIGN ANY SUPPLEMENTARY FRAMING THAT IS NEEDED TO RESIST THE LOADS, MAINTAIN STABILITY AND/OR IS REQ FOR INSTALLATION OF THIS PRE-APPROVAL. THE SUPPLEMENTARY FRAMING SHALL BE SUBMITTED TO OSHPD AS AN "AMENDED CONSTRUCTION DOCUMENT" (ACD).
   C. THE LAYOUT DRAWINGS (W/ THE SHOP DRAWING STAMP) SHALL BE SUBMITTED TO OSHPD FOR REVIEW OF THE FOLLOWING:
      a) STRUCTURE SUPPORTING THE DISTRIBUTION SYSTEM HAS ADEQUATE CAPACITY.
      b) SEISMIC DESIGN FORCES (Fp) ARE IN ACCORDANCE W/ CBC 2013 AND Wp SHALL COMPLY W/ NFPA® 13 PROVISIONS.
      c) VERIFY THAT THE SUBMITTAL IS WITHIN THE SCOPE OF OSHPD PRE-APPROVAL OF MANUFACTURER'S CERTIFICATION (OPM):
         - SIZE AND DISTRIBUTION SYSTEM COMPONENTS
         - SPACING OF BRCG AND FLEX JOINTS, AND
         - SUBSTRATE FOR ATTACHMENTS

      FOR AN EXAMPLE PROBLEM SHOWING CALCULATIONS OF ELEMENTS AND SELECTION OF ELEMENTS TO SATISFY THE DEMANDS FROM THE OPM, SEE APPENDIX "A".

SHEET TITLE: OVERVIEW
HOW TO USE THIS PRE-APPROVAL (CONTINUED)

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HOW TO USE THIS PRE-APPROVAL (CONTINUED):

6. LAYOUT DRAWINGS (CONTINUED):
   - D. THE LAYOUT DRAWINGS (W/ THE SHOP DRAWING STAMP) SHALL BE KEPT ON THE JOB SITE AND CAN THEN BE USED FOR INSTALLATION OF THE SUPPORT AND BRCG. OSHPD FIELD STAFF WILL REVIEW THE INSTALLATION.
   - E. A COPY OF THIS PRE-APPROVAL SHALL BE ON THE JOB SITE PRIOR TO STARTING THE INSTALLATION OF HANGERS AND/OR BRACES. IT IS THE CONTRACTOR'S AND IOR'S RESPONSIBILITY TO OBTAIN COPIES OF OSHPD PRE-APPROVALS FROM THE OSHPD PRE-APPROVAL PROGRAMS WEBSITE.
   - F. COMPONENTS OF TWO OR MORE PRE-APPROVED BRCG SYSTEMS SHALL NOT BE MIXED. ONLY THIS PRE-APPROVAL MAY BE USED FOR THE FIRE SPRINKLER SYSTEM. ANY SUBSTITUTION OF COMPONENT OF THIS PRE-APPROVAL SHALL REQUIRE OSHPD REVIEW AND APPROVAL.

SHEET TITLE: OVERVIEW
HOW TO USE THIS PRE-APPROVAL (CONTINUED)

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GENERAL NOTES:

1. IT IS THE RESPONSIBILITY OF THE CRDP DESIGNING THE BRACE SYSTEM, TO VERIFY THAT THE SYSTEM DESIGN IS IN CONFORMANCE W/ THE 2013 CBC SECTION 1616A.1.25 AND W/ THE DTLS SHOWN IN THIS PRE-APPROVAL.
2. EXPANSION ANCHORS:
   - A. MECHANICAL ANCHORS INSTALLED IN NWC OR SLWC SHALL BE POWERS POWER-STUD+ SD2 AND SNAKE+ CONC ANCHORS AS NOTED ON THESE DRAWINGS, COMPLYING W/ ESR-2502, REISSUED MAY 1, 2012, REVISED JUNE 2013 AND ESR-2272 REISSUED DECEMBER 1, 2012 RESPECTIVELY. INSTALLATION SHALL COMPLY W/ SECTION 1616A.1.19 OF THE 2013 CBC. OTHER TYPES AND BRANDS OF CONC ANCHORS MAY BE USED PROVIDED THEIR CAPACITIES AND STRENGTHS ARE EQUAL OR BETTER THAN THE POWER-STUD+® AND SNAKE+™ AND ALL HAVE CURRENT ICC REPORTS W/ CRACKED CONC COMPLIANCE IN ACCORDANCE W/ AC193 ACCEPTANCE CRITERIA FOR MECHANICAL ANCHORS IN CONC ELEMENTS. AN OSHPD CHANGE ORDER IS REQ FOR ANY SUBSTITUTION OF A SPECIFIED MECHANICAL ANCHOR.
   - B. INSTALLATION: INSTALL THE CONC ANCHORS IN ACCORDANCE W/ THE REQUIREMENTS GIVEN IN THE ICC EVALUATION REPORT FOR THE SPECIFIC ANCHOR.
   - C. JOB TESTING: FOR VERIFYING SATISFACTORY INSTALLATION WORKMANSHIP, PERFORM JOB SITE TESTING IN ACCORDANCE W/ THE TENSION LOAD TABLE PROVIDED IN THIS DOCUMENT. TEST 50% OF THE INSTALLED ANCHORS. THE TEST LOAD MAY BE APPLIED BY ANY METHOD INCLUDING MFR'S TORQUE CRITERIA TESTING THAT WILL EFFECTIVELY MEASURE THE TENSION IN THE ANCHOR SUCH AS DIRECT PULL W/ A HYDRAULIC JACK OR CALIBRATED SPRING LOADING DEVICES. ALL TESTS SHALL BE CONDUCTED BY A TESTING LABORATORY CONTRACTED BY THE FACILITY IN THE PRESENCE OF THE SPECIAL INSPECTOR AND THE INSPECTOR OF RECORD. IF ANY ANCHOR FAILS TESTING, TEST ALL ANCHORS OF THE SAME TYPE INSTALLED BY THE SAME TRADE AND NOT PREVIOUSLY TESTED UNTIL TWENTY (20) CONSECUTIVE ANCHORS PASS, THEN RESUME THE INITIAL TEST FREQUENCY. THE TEST SHALL BE PERFORMED 24 HOURS OR MORE AFTER INSTALLATION. TESTING MAY BE DONE PRIOR TO SEISMIC BRACE INSTALLATION. ALSO REFER TO THE 2013 CBC SECTION 1913A.7, "TESTS FOR POST-INSTALLED ANCHORS IN CONCRETE" FOR DETERMINATION OF TENSION TEST LOAD.
   - D. FAILURE/ACCEPTANCE CRITERIA: THE FOLLOWING CRITERIA APPLY FOR THE ACCEPTANCE OF INSTALLED ANCHORS:
     - HYDRAULIC RAM METHOD: APPLY AND HOLD TEST LOAD FOR A MIN OF 15 SECONDS. THE ANCHOR SHOULD HAVE NO OBSERVABLE MOVEMENT AT THE APPLICABLE TEST LOAD WHERE WASHERS ARE USED. FOR WEDGE TYPE ANCHORS, SUCH AS POWER-STUD+, A PRACTICAL WAY TO DETERMINE OBSERVABLE MOVEMENT IS THAT THE WASHER UNDER THE NUT BECOMES LOOSE.
     - TORQUE WRENCH METHOD: THE APPLICABLE TEST TORQUE MUST BE REACHED WITHIN THE FOLLOWING LIMITS: WEDGE TYPE: ONE-HALF (1/2) TURN OF THE NUT.

SHEET TITLE: OVERVIEW
GENERAL NOTES

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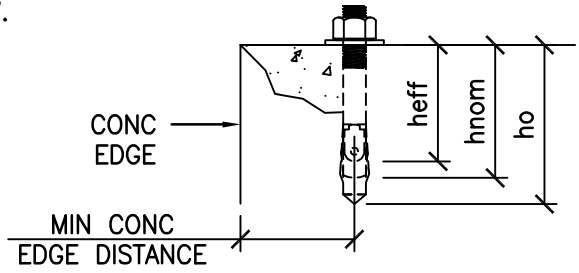
GENERAL NOTES CONTINUED:

2E. TEST VALUES: APPLY PROOF TEST LOADS TO ANCHORS WITHOUT REMOVING THE NUT IF POSSIBLE, SEE TABLE BLW.



MIN ANCHOR BOLT SPACING LISTED IS PER ICC REPORT, LARGER MIN SPACING MAY BE REQ AS SHOWN IN DTLS

ANCHOR TYPE	ANCHOR DIA (INCH)	EFFECTIVE EMBED (INCH) heff	HOLE DEPTH (INCH) ho	MIN MEMBER THICKNESS (INCH) h	MIN EDGE DISTANCE (INCH)	MIN ANCHOR BOLT SPACING (INCH)	TENSION TEST LOAD (LBS)	TORQUE TEST (FT-LBS)	COMMENTS
SNAKE+™	3/8	1.10	2	SEE PG 5.8	3	6 3/4	655	8	CASE 1
SNAKE+	3/8	1.10	2	4	3	3	655	8	CASE 2
POWER-STUD+® SD2	1/2	2	2 3/4	SEE PG 5.1	8	6 3/4	893	40	CASE 1
POWER-STUD+ SD2	1/2	2	2 3/4	4 1/2	8	6	1605	40	CASES 2 & 3
POWER-STUD+ SD2	3/4	3 3/4	5	SEE PG 5.1	12	11 1/4	2115	110	CASE 1
POWER-STUD+ SD2	3/4	3 3/4	5	7	12	6	4120	110	CASES 2 & 3

3. THREE (3) CONDITIONS OF POST-INSTALLED ANCHORAGE TO CONC ARE SPECIFIED & PRESENTED IN THIS PRE-APPROVAL:

CASE 1: THE SEISMIC BRACE IS ATTACHED TO THE UNDERSIDE OF A SUSPENDED FLR OR ROOF OF A BLDG. IT IS ASSUMED THE FLRS & ROOF ARE BUILT OF MIN 3¼" NWC OR SLWC TOPPING OVER 20 GAGE MIN MTL DECK (f'c = 3000 PSI, MIN & Fy= 36,000 PSI, MIN PER ICC-ES REPORTS).

CASE 2: THE SEISMIC BRACE IS ATTACHED TO THE UNDERSIDE OF A SUSPENDED FLR OR ROOF OF A BLDG. IT IS ASSUMED THE FLRS & ROOF ARE BUILT OF MIN 4½" OR 7" THK (PER TABLE ABV) NORMAL WT REINFORCED CONC (f'c = 3000 PSI, MIN).

CASE 3: THE SEISMIC BRACE IS ATTACHED TO A CONC WALL IN A BLDG. IT IS ASSUMED THE NWC WALL IS A MIN OF 4½" OR 7" THK (PER TABLE ABV, f'c= 3000 PSI, MIN).

ANCHORAGE DTLS TO CONC START ON PG 5.1.

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GENERAL NOTES (CONTINUED)

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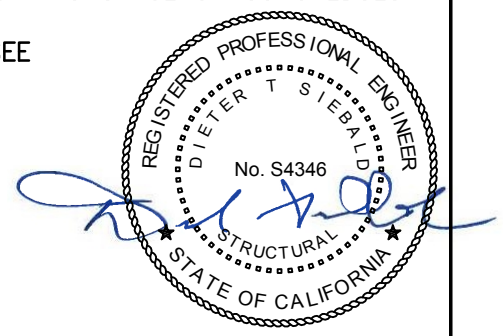
GENERAL NOTES CONTINUED:

4. ONE (1) CONDITION OF CAST-IN-PLACE (CIP) ANCHORAGE TO CONC IS SPECIFIED & PRESENTED IN THIS APPROVAL.
   CASE 4: THE SEISMIC BRACE IS ATTACHED TO THE UNDERSIDE OF A SUSPENDED FLR OR ROOF OF A BLDG. IT IS ASSUMED THE FLRS & ROOF ARE BUILT OF MIN 4½" NORMAL WT REINFORCED CONC (f'c = 3000 PSI MIN).

DESIGN PARAMETERS:

1. DESIGN AND INSTALLATION OF THE SEISMIC BRCG FOR THE FIRE SUPPRESSION DISTRIBUTION SYSTEM MUST CONFORM TO NFPA® 13, SECTION 9.3.
2. THE SPACING AND DTLS OF THE SUPPORT AND BRCG OF FIRE SPRINKLER PIPING SHALL COMPLY W/ THE NFPA 13-13 AS MODIFIED BY 2013 CBC SECTIONS 1613A/1616A AND STATE FIRE MARSHALL AMENDMENTS.
3. THE CRDP SHALL PROVIDE DTLS AND CALCULATIONS FOR THE SWAY BRCG AND THEIR ANCHORAGE TO THE STRUCTURE. WHERE APPLICABLE, DTLS FOR THE SUPPORT AND BRCG MAY BE REFERRED TO THIS OSHPD PRE-APPROVAL. ALL LAYOUT DRAWINGS OF THE SPRINKLER SYSTEM SHALL BE SUBMITTED TO OSHPD FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION.
4. THE CRDP SHALL DETERMINE THE CONFIGURATION OF THE PIPING SYSTEM AND THE DEMAND LOADS ON ALL PIPING COMPONENTS, BRCG, AND ANCHORAGE. SEE THE DESIGN PROCEDURE GIVEN IN NFPA® 13 SECTION A.9.3.5.9. THE CRDP SHALL DETERMINE THE GOVERNING CAPACITY FOR EACH DESIRED BRCG COMBINATION BASED ON THE CAPACITY OF THE INDIVIDUAL ELEMENTS BLW:
   A. THE ALLOWABLE HORIZ CAPACITY F_H OF THE BRACE COMPONENT ATTACHED TO THE SERVICE PIPE AS GIVEN IN APPENDIX C (BASED ON TESTING).
   B. THE ALLOWABLE AXIAL CAPACITY OF THE LATERAL SWAY BRACE PIPE OR BRANCH LINE RESTRAINT ROD AS GIVEN IN APPENDIX B.
   C. THE ALLOWABLE HORIZ CAPACITY F_H OF THE BRACE COMPONENT ATTACHED TO THE STRUCTURE AS GIVEN AT THE END OF THE TABLE IN APPENDIX C (BASED ON TESTING).
   D. THE CAPACITY OF THE ANCHORAGE TO CONC AS GIVEN ON PGS 5.1 TO 5.9. THESE TENSION AND SHEAR VALUES WERE DETERMINED USING ACI® 318-11 APPENDIX D, ESR-2502, AND THE VALUES IN THE TABLE ON PG 1.8. THE ANCHOR CAPACITIES LISTED ON PGS 5.1 TO 5.9 ARE AT LRFD FORCE LEVEL OF DESIGN AND CONSIDER A SINGLE ANCHOR ONLY. THE CRDP SHALL DETERMINE IF THE DEMAND LOADS EXCEED THE COMBINED FORCES CHECK PER ACI 318-11, SECTION D.7.
5. THE DEAD LOADS OF WATER FILLED PIPES MAY BE FOUND IN NFPA 13, TABLE A.9.3.5.9.
6. SWAY BRCG SHALL HAVE A MAX SPACING NOT EXCEEDING THAT SPECIFIED IN NFPA 13.
7. SWAY BRCG SHALL BE LIMITED TO AN L/R RATIO OF 300 PER NFPA 13, SECTION 9.3.5.11.3.
8. REFER TO NFPA 13, SECTIONS 9.3.5.5 TO 9.3.5.8 FOR ADDITIONAL BRCG REQUIREMENTS.
9. SWAY BRACE ANCHORAGE MUST BE AT LEAST 6" AWAY FROM ANY OTHER ANCHORAGE OR CONC EDGES UNO IN TABLE ON PG 1.8.
10. FOR AN EXAMPLE OF THE SEISMIC SWAY BRACE DESIGN PROCEDURE, SEE ATTACHED APPENDIX A.
11. IT IS THE RESPONSIBILITY OF THE CRDP TO DETERMINE THE GOVERNING SEISMIC LOADS.



SHEET TITLE: OVERVIEW
DESIGN PARAMETERS

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ABBREVIATIONS & TRADEMARK FOOTNOTES:

@	AT	f'c	SPECIFIED COMPRESSIVE STRENGTH OF CONCRETE	OPM	OSHPD PRE-APPROVAL OF MANUFACTURER'S CERTIFICATION
AB	ANCHOR BOLT	FLR	FLOOR	OSHPD	OFFICE OF STATEWIDE HEALTH PLANNING & DEVELOPMENT
ABV	ABOVE	FM®	FM APPROVALS (AKA FACTORY MUTUAL)	PERP	PERPENDICULAR
ACI®	AMERICAN CONCRETE INSTITUTE	Fpw	HORIZONTAL SEISMIC FORCE PER NFPA 13 2013 EDITION SEISMIC FORCE REQUIREMENTS	PG	PAGE
AISC®	AMERICAN INSTITUTE OF STEEL CONSTRUCTION	Fp	HORIZONTAL SEISMIC FORCE PER ASCE 7-10 SEISMIC FORCE REQUIREMENTS	R	RADIUS OF GYRATION
ALT	ALTERNATE	Fvnet	VERTICAL FORCE RESULTANT FROM Fpw	REQ	REQUIRED
ASCE®	AMERICAN SOCIETY OF CIVIL ENGINEERS	Fpv	VERTICAL SEISMIC FORCE PER ASCE 7-10 SEISMIC FORCE REQUIREMENTS	SEOR	STRUCTURAL ENGINEER OF RECORD
ASME®	AMERICAN SOCIETY OF MECHANICAL ENGINEERS	Fy	SPECIFIED MINIMUM YIELD STRESS OF STEEL, KSI	SIM	SIMILAR
ASD	ALLOWABLE STRENGTH DESIGN	GR	GRADE	SLWC	SAND LIGHTWEIGHT CONCRETE
ASTM®	AMERICAN SOCIETY FOR TESTING & MATERIALS	HORIZ	HORIZONTAL	STL	STEEL
BM	BEAM	IN (")	INCH	STRUC	STRUCTURAL
BLDG	BUILDING	L	LENGTH	T	ANCHORAGE TENSION REACTION DUE TO SEISMIC FORCE
BLW	BELOW	LRFD	LOAD & RESISTANCE FACTOR DESIGN	T/C	TENSION OR COMPRESSION
BOTT	BOTTOM	LWC	LIGHT WEIGHT CONCRETE	THK	THICK/THICKNESS
BRCG	BRACING	MAX	MAXIMUM	THRD	THREAD/THREADED
CAC	CALIFORNIA ADMINISTRATIVE CODE	MFR	MANUFACTURER	TYP	TYPICAL
CBC	CALIFORNIA BUILDING CODE	MIN	MINIMUM	UNO	UNLESS NOTED OTHERWISE
CG	CENTER OF GRAVITY	MTL	METAL	V	ANCHORAGE SHEAR REACTION DUE TO SEISMIC FORCE
CLSE	CALIFORNIA LICENSED STRUCTURAL ENGINEER	NA	NOT APPLICABLE	UL®	UNDERWRITERS' LABORATORIES
℄	CENTERLINE	NFPA®	NATIONAL FIRE PROTECTION ASSOCIATION	USD	ULTIMATE STRENGTH DESIGN
CONC	CONCRETE	NWC	NORMAL WEIGHT CONCRETE	VERT	VERTICAL
CRDP	CALIFORNIA REGISTERED DESIGN PROFESSIONAL			W/	WITH
DTL(S)	DETAIL(S)			WF	WIDE FLANGE
DIA (ø)	DIAMETER			Wp	WEIGHT OF WATER-FILLED PIPE x 1.15 AS PER NFPA 13 SECTION 9.3.5.9.2
(E)	EXISTING CONDITION			WT	WEIGHT
EA	EACH				
ELEV	ELEVATION				

FOOTNOTES:

ACI IS A REGISTERED TRADEMARK OF THE AMERICAN CONCRETE INSTITUTE
AISC IS A REGISTERED TRADEMARK OF THE AMERICAN INSTITUTE OF STEEL CONSTRUCTION
ASCE IS A REGISTERED TRADEMARK OF AMERICAN SOCIETY OF CIVIL ENGINEERS
ASME IS A REGISTERED TRADEMARK OF AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ASTM IS A REGISTERED TRADEMARK OF AMERICAN SOCIETY FOR TESTING AND MATERIALS
CADDY, CADWELD, CRITEC, ERICO, ERIFLEX, ERITECH, AND LENTON ARE REGISTERED TRADEMARKS OF ERICO INTERNATIONAL CORPORATION
ELCO IS A REGISTERED TRADEMARK OF INFASTECH INTELLECTURAL PROPERTIES Pte, LTD.
FM IS A REGISTERED CERTIFICATION MARK OF FM APPROVALS LLC, LTD
NFPA IS A REGISTERED TRADEMARK OF NATIONAL FIRE PROTECTION ASSOCIATION
POWER-STUD+ IS A REGISTERED TRADEMARK OF POWERS FASTENERS, INC
SNAKE+ IS A REGISTERED TRADEMARK OF POWERS FASTENERS, INC.
UL IS A REGISTERED TRADEMARK OF UL, LLC.

SHEET TITLE: OVERVIEW
ABBREVIATIONS & TRADEMARK FOOTNOTES

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SUPPORT AND ATTACHMENT MATERIAL STANDARDS:

SUPPORT	STANDARD	SUPPLEMENTARY SUPPORT & ATTACHMENT	STANDARD
CSBQIKCL	ASTM® A536, (PLATING) B633 & A123	CLAMP BRACKET	ASTM A36
		U-BOLT	ASTM A570 GR 33
		FLANGE NUT	GB699
		TWIST-OFF BOLT	ASTM A576
CSBSTU	ASTM A449 & A563, (PLATING) B633 & A123	CLAMP BRACKET	ASTM A570 GR 33
		CASTING	ASTM A536
		HEX BOLT	ASTM A449
		HEX NUT	ASTM A563
		TWIST-OFF BOLT	ASTM A449
CSBEZU	ASTM A449 & A563, (PLATING) B633 & A123	CLAMP BRACKET	ASTM A570 GR 33
		CASTING	ASTM A536
		HEX BOLT	ASTM A449
		HEX NUT	ASTM A563
		TWIST-OFF BOLT	ASTM A449
CSBQG	ASTM A449 & A563, (PLATING) B633 & A123	CLAMP BRACKET	ASTM A36
		U-BOLT	ASTM A570 GR 33
		FLANGE NUT	GB699
		HEX BOLT	ASTM A449
CSBBRP	ASTM A449 & A563, (PLATING) B633 & A123	CLAMP BRACKET	ASTM A570 GR 33
		CASTING	ASTM A536
		HEX BOLT	ASTM A449
CSBUNIV	ASTM A536, (PLATING) B633 & A123	CASTING	ASTM A536
		TWIST-OFF BOLT	ASTM A449

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SHEET TITLE: OVERVIEW
COMPONENT MATERIAL STANDARDS

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SUPPORT AND ATTACHMENT MATERIAL STANDARDS:

SUPPORT	STANDARD	SUPPLEMENTARY SUPPORT & ATTACHMENT	STANDARD
CSBMA	ASTM® A36, (PLATING) B633 & A123		
CSBIB	ASTM A449 & A563, (PLATING) B633 & A123	CASTING	ASTM A536
		THREADED ROD	ASTM A307 GR C
		½"ø BOLT THREADED STUD	ASTM A449
CSBBC075	ASTM A449 & A563, (PLATING) B633 & A123	CASTING	ASTM A536
		TWIST-OFF BOLT	ASTM A449
CSBBARJ	ASTM A449 & A563, (PLATING) B633 & A123	CASTING	ASTM A536
		TWIST-OFF BOLT	ASTM A449
CSBBRS	ASTM A536, (PLATING) B633 & A123		
BRACE PIPE, 1", 1¼", 1½", 2"	ASTM A53		
		THREADED ROD, ⅜", ½"	ASTM A36
		EXPANSION ANCHORS	REFER TO GENERAL NOTE 2
CSB	ASTM A1011 GR 36	BRACE & PIPE CLAMPS	
		SCREW	HRS GR 1045
		NUT	HRS GR 1045
		CARRIAGE BOLT	ASTM A307
CSBT (PG 8.8)	ASTM A36	TELESCOPING PIPES SCH 10	Fy= 28 KSI
		RIVETS	GR C1006
		V-BOLT	ASTM A307
		5/16"ø SELF-TAPPING SCREW	ELCO ECC720
		STAMPING & CSBTB1	ASTM A36
		NUTS ON THRD ROD	Fy= 55 KSI

FOR CONTINUATION, SEE PG 1.19.

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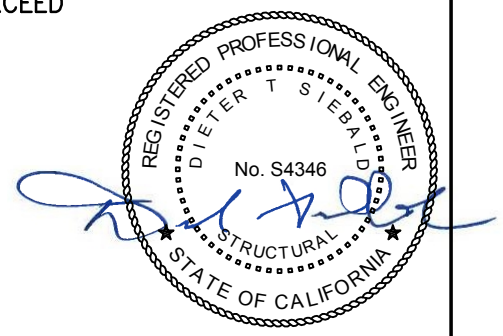
BRACING GUIDELINES PER NFPA 13:

1. A RUN OF PIPE IS CONSIDERED A CONTINUOUS RUN IF THE MAX OFFSET IS LESS THAN 24". IF THE OFFSET IS 24" OR GREATER, EA STRAIGHT SEGMENT SHALL BE TREATED AS AN INDEPENDENT RUN AND BRACED. REFER TO PARTIAL PLAN ON PG 1.15. PLEASE NOTE THAT RIGID GROOVED COUPLING LISTED FOR UL® STANDARD 213 SHALL BE PERMITTED IN HORIZ RUN OF SERVICE PIPE. FLEXIBLE GROOVED COUPLING LISTED FOR UL STANDARD 213 SHALL BE PERMITTED IN VERT RISERS (TO ACCOMMODATE DRIFT) AND OTHER LOCATION (e.g. SEISMIC SEPARATION, EQUIPMENT NOZZLE, ETC.) TO ACCOMMODATE SMALL MOVEMENT AND/OR ROTATION. NON-UL LISTED GROOVED COUPLINGS SHALL NOT BE USED UNLESS APPROVED ON PROJECT SPECIFIC BASIS.
2. TRANSVERSE BRCG:
   - A. TRANSVERSE BRCG IS TO PROTECT PIPING AGAINST MOVEMENT PERP TO THE RUN OF PIPE.
   - B. TRANSVERSE BRCG SHALL BE PROVIDED ON ALL FEED AND CROSS MAINS REGARDLESS OF SIZE AND ALL BRANCH LINES AND OTHER PIPING W/ A DIA OF 2½" AND LARGER. THE LAST LENGTH OF PIPE AT THE END OF A FEED OR CROSS MAIN SHALL BE PROVIDED W/ A TRANSVERSE BRACE.
   - C. TRANSVERSE BRCG MAX SPACING FOR PIPING CONSTRUCTED OF DUCTILE MATERIALS (E.G. STL) SHALL BE 40 FEET (PIPING LARGER THAN 2½" DIA); 30 FEET MAX SPAN (PIPING SMALLER THAN 2½" DIA). REFER TO PARTIAL PLAN ON PG 1.16.
   - D. A TRANSVERSE BRACE PLACED ON THE PIPE RUN SECTION AT THE OPPOSITE SIDE OF AN ELBOW WITHIN 24" MAY ACT AS A LONGITUDINAL BRACE. REFER TO PARTIAL PLAN ON PG 1.16.
   - E. THE MIN REQ BRCG FOR RUNS LONGER THAN 5 FEET IS A TRANSVERSE BRACE AT EA END, AND A LONGITUDINAL BRACE AT ONE OF THOSE TWO POSITIONS. REFER TO PARTIAL PLAN ON PG 1.17.
   - F. BRCG INSTALLED TO SMALLER PIPING SHALL NOT BE USED TO BRACE LARGER PIPING.
3. LONGITUDINAL BRCG:
   - A. LONGITUDINAL BRCG IS TO PROTECT PIPING AGAINST MOVEMENT PARALLEL TO THE RUN OF PIPE.
   - B. LONGITUDINAL BRCG MAX SPACING FOR PIPING CONSTRUCTED OF DUCTILE MATERIALS (E.G. STL) SHALL BE 80 FEET (PIPING LARGER THAN 2½" DIA); 60 FEET MAX SPAN (PIPING SMALLER THAN 2½" DIA). REFER TO PARTIAL PLAN ON PG 1.16.
   - C. EA PIPE RUN MUST HAVE AT LEAST ONE LONGITUDINAL BRACE. ADDITIONAL LONGITUDINAL BRACES ARE REQ WHEN THE MAX LONGITUDINAL SPACING IS EXCEEDED. REFER TO PARTIAL PLANS ON PGS 1.15, 1.16 AND 1.17.
4. VERT OFFSETS/RISERS:
   - A. TOPS OF VERT OFFSETS/RISERS EXCEEDING 3 FEET IN LENGTH SHALL BE PROVIDED W/ A FOUR-WAY BRACE. BRCG SHALL BE LOCATED WITHIN 24" OF THE END OF THE VERT RUN. REFER TO PARTIAL ISOMETRIC A ON PG 1.18.
   - B. DISTANCE BETWEEN FOUR-WAY BRACES FOR RISERS SHALL NOT EXCEED 25 FEET.



SHEET TITLE: OVERVIEW
BRACING GUIDELINES

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BRACING GUIDELINES (CONTINUED)

5. WHEN CALCULATING HORIZ LOAD REQUIREMENTS, USE TABLE A9.3.5.9 IN NFPA® 13 TO CALCULATE THE WT OF WATER FILLED PIPE.
6. FOR LATERAL SWAY BRACE PIPE AXIAL CAPACITY AND ALLOWABLE PIPE LENGTH, SEE TABLE ON PG B1.
7. DO NOT BRACE THE FIRE SPRINKLER SYSTEM TO TWO DIFFERENT PARTS OF A BLDG WHICH MAY ACT DIFFERENTLY IN RESPONSE TO AN EARTHQUAKE (i.e., SEPARATED BY A SEISMIC JOINT). ANY SYSTEM THAT CROSSES A BLDG SEPARATION OR SEISMIC JOINT MUST BE DESIGNED TO ACCOMMODATE THE SEISMIC RELATIVE DISPLACEMENT PER ASCE 7-10, SECTION 13.3.2 OR AS SPECIFIED BY THE STRUCTURAL ENGINEER OF RECORD ON THE OSHPD APPROVED CONSTRUCTION DOCUMENTS.

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SHEET TITLE: OVERVIEW
BRACING GUIDELINES (CONTINUED)

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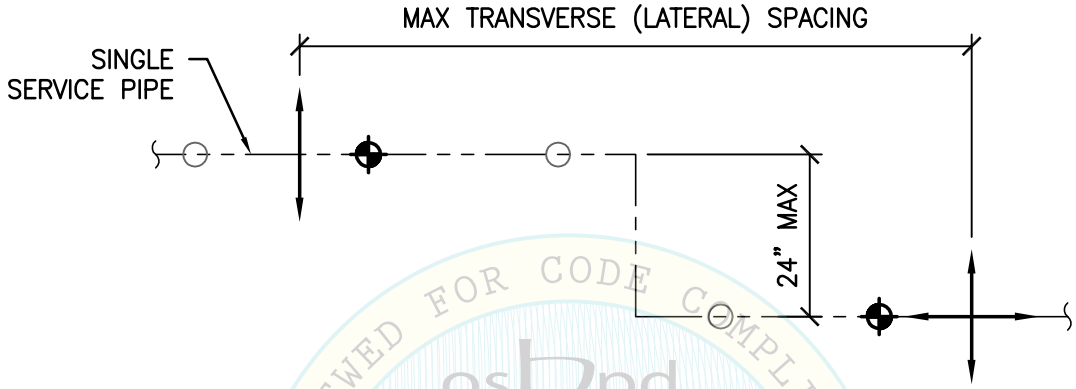
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



LEGEND:

TRANSVERSE (LATERAL) & LONGITUDINAL SEISMIC BRACES, SEE SECTIONS 2 & 3

TRANSVERSE (LATERAL) SEISMIC BRACE, SEE SECTION 2

VERT SEISMIC BRACE – MUST BE WITHIN 6" OF ALL TRANSVERSE AND LONGITUDINAL BRACES

VERT PIPE HANGER (NOT PART OF OPM) SHOWN FOR REFERENCE ONLY

NOTES:

1. FOR LOCATION OF VERT SEISMIC BRACES, SEE NOTE 2 ON PG 1.4.
2. A VERT PIPE HANGER IS NOT A VERT SEISMIC BRACE & IS NOT PART OF THIS OPM.

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SHEET TITLE: OVERVIEW
BRACING GUIDELINES PARTIAL PLAN

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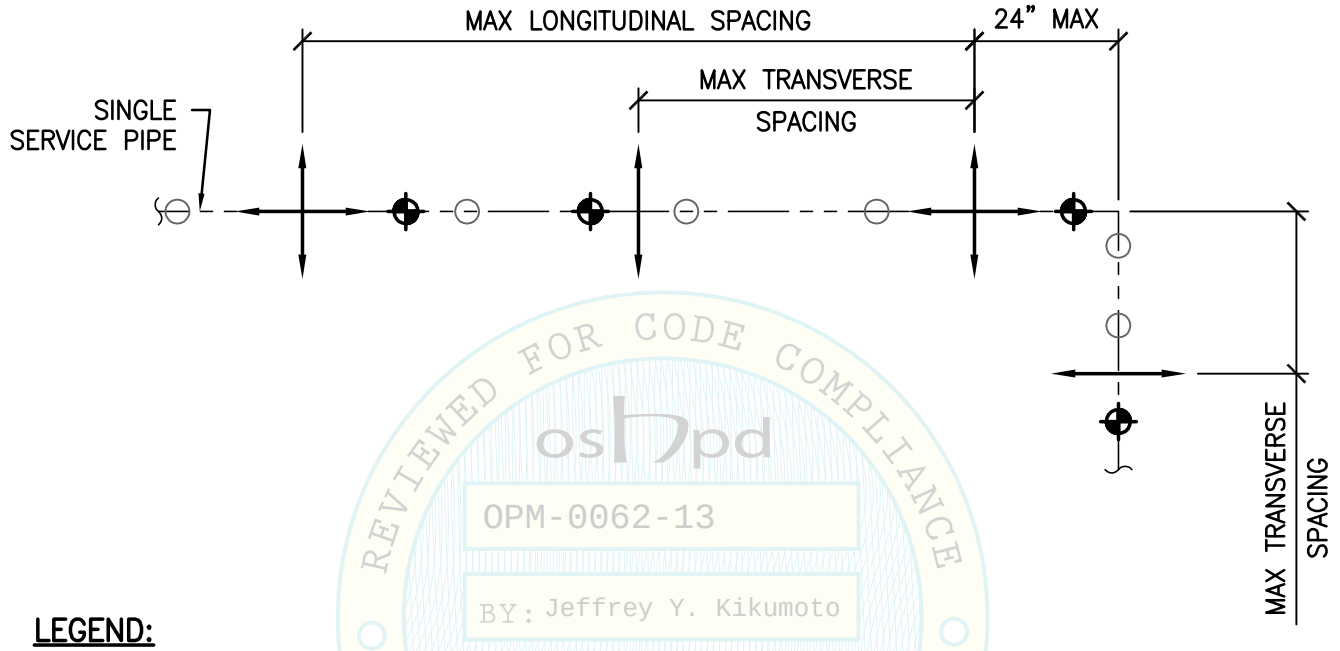
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



LEGEND:

- TRANSVERSE (LATERAL) & LONGITUDINAL SEISMIC BRACES, SEE SECTIONS 2 & 3
- TRANSVERSE (LATERAL) SEISMIC BRACE, SEE SECTION 2
- VERT SEISMIC BRACE – MUST BE WITHIN 6" OF ALL TRANSVERSE AND LONGITUDINAL BRACES
- VERT PIPE HANGER (NOT PART OF OPM) SHOWN FOR REFERENCE ONLY

NOTES:

1. FOR LOCATION OF VERT SEISMIC BRACES, SEE NOTE 2 ON PG 1.4.
2. A VERT PIPE HANGER IS NOT A VERT SEISMIC BRACE & IS NOT PART OF THIS OPM.

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BRACING GUIDELINES PARTIAL PLAN

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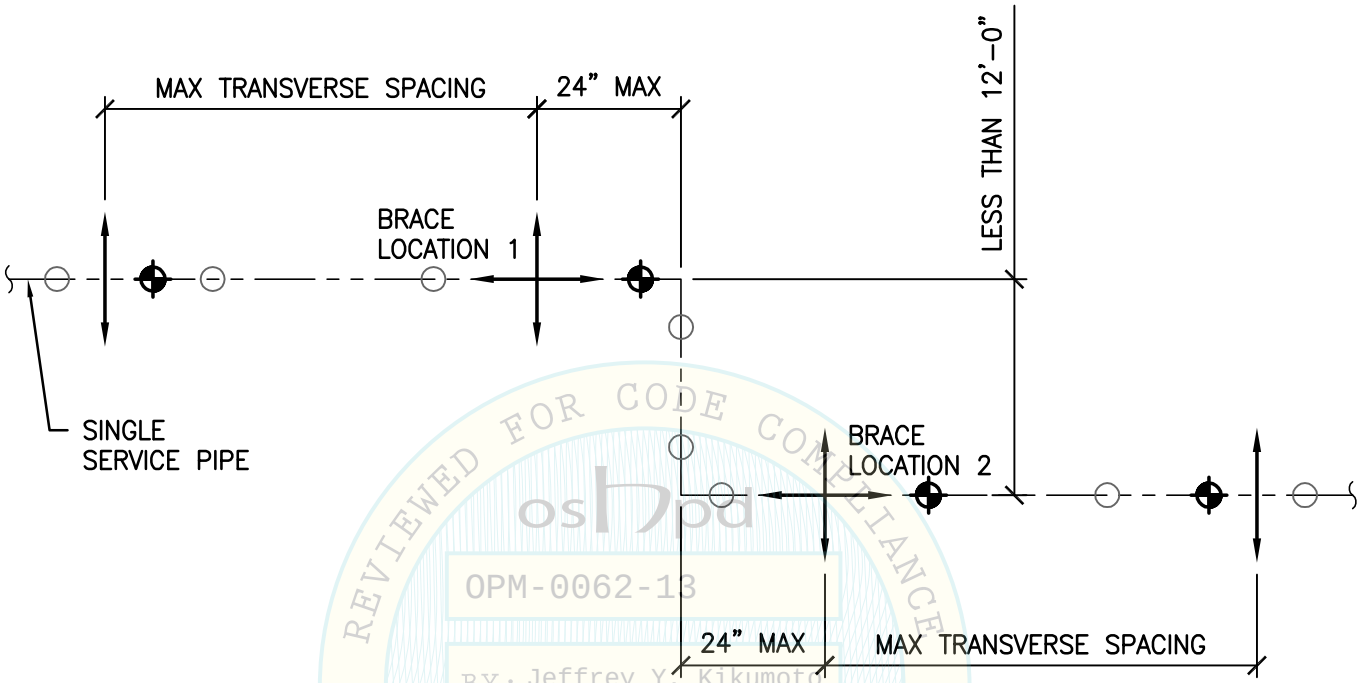
L:\Jobs17\17020 ERICO – Addendum to OPM-0062-13\STRU\S1.dwg Time:Aug18,2017-02:24pm Login:camachom Dimscale:1 LTScale:4

SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



LEGEND:

TRANSVERSE (LATERAL) & LONGITUDINAL SEISMIC BRACES, SEE SECTIONS 2 & 3

TRANSVERSE (LATERAL) SEISMIC BRACE, SEE SECTION 2

VERT SEISMIC BRACE – MUST BE WITHIN 6" OF ALL TRANSVERSE AND LONGITUDINAL BRACES

VERT PIPE HANGER (NOT PART OF OPM) SHOWN FOR REFERENCE ONLY

NOTES:

1. FOR LOCATION OF VERT SEISMIC BRACES, SEE NOTE 2 ON PG 1.4.
2. AT LEAST ONE LONGITUDINAL BRACE IS REQ. THE LONGITUDINAL BRACE SHALL BE LOCATED AT EITHER BRACE LOCATION 1 OR BRACE LOCATION 2.
3. A VERT PIPE HANGER IS NOT A VERT SEISMIC BRACE & IS NOT PART OF THIS OPM.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: OVERVIEW
BRACING GUIDELINES PARTIAL PLAN

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
www.cyseng.com

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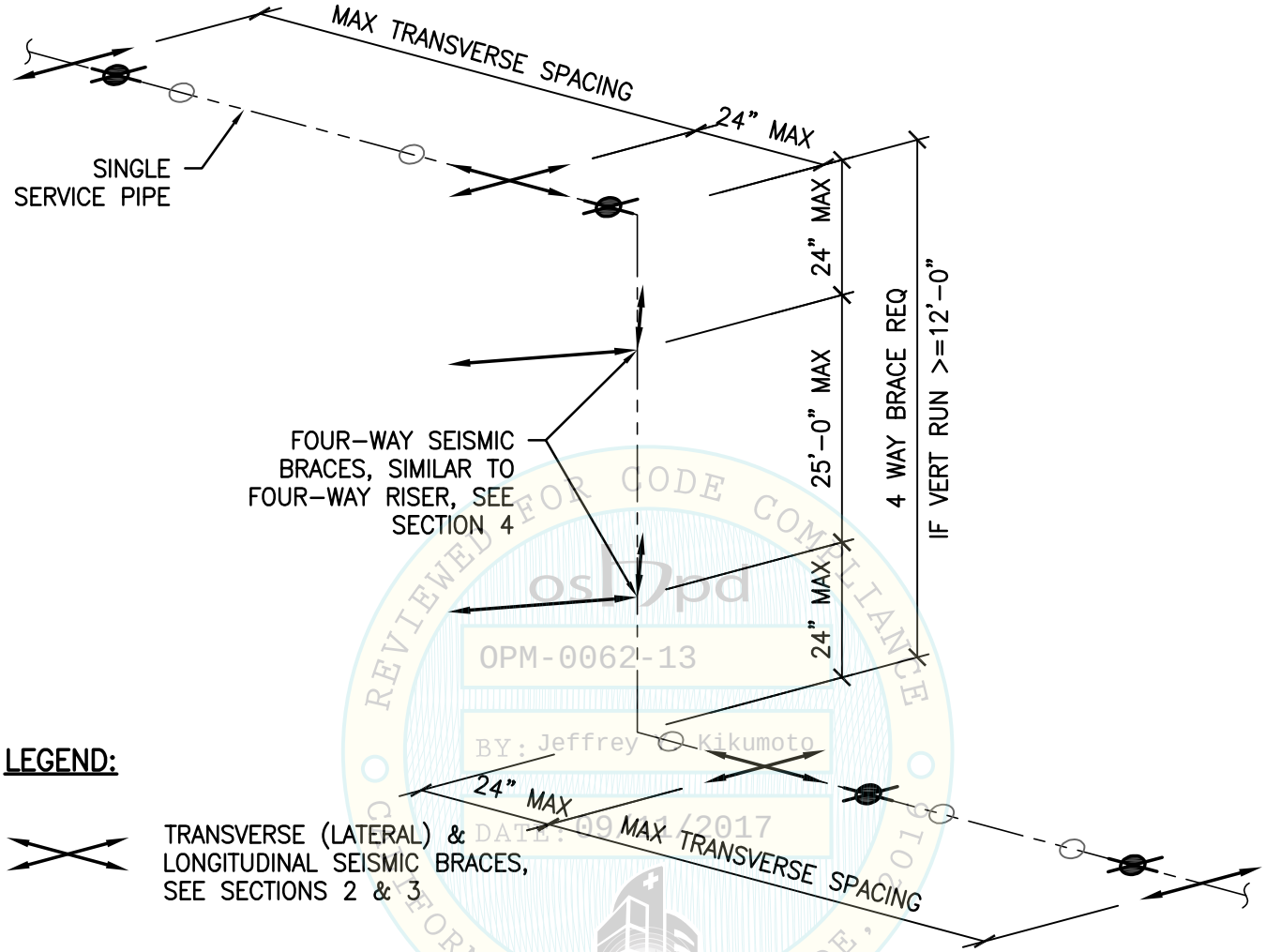
L:\Jobs17\17020 ERICO - Addendum to OPM-0062-13\STRU\S1.dwg Time:Aug18,2017-02:24pm Login:camachom Dimscale:1 LTScale:4

SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



LEGEND:

TRANSVERSE (LATERAL) & LONGITUDINAL SEISMIC BRACES, SEE SECTIONS 2 & 3

TRANSVERSE (LATERAL) SEISMIC BRACE, SEE SECTION 2

FOUR-WAY RISER SEISMIC BRACES, SEE SECTION 4

VERT SEISMIC BRACE – MUST BE WITHIN 6" OF ALL TRANSVERSE AND LONGITUDINAL BRACES

VERT PIPE HANGER (NOT PART OF OPM) SHOWN FOR REFERENCE ONLY

NOTE:
FOUR-WAY BRCG SHALL NOT BE REQ WHERE RISERS PENETRATE INTERMEDIATE FLRS IN MULTI-STORY BLDGS WHERE THE CLEARANCE DOES NOT EXCEED THE LIMITS SPECIFIED IN SECTION 9.3.4 OF NFPA® 13.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: OVERVIEW
BRACING GUIDELINES PARTIAL ISOMETRIC

CYS STRUCTURAL ENGINEERS, INC.
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SUPPORT AND ATTACHMENT MATERIAL STANDARDS:

SUPPORT	STANDARD	SUPPLEMENTARY SUPPORT & ATTACHMENT	STANDARD
CSBU BODY & BASE	ASTM A1011 GR 36	RIVET	CHS GR 1006
		CONE POINT SCREW	HRS GR 1045
CSBS1, CSBS1A, CSBS2, CSBS3, CSBS4, CSBS5	ASTM A1018 HSLA-F GR 50	CLAMP MAIN BODY	
		CONE POINT SCREW	HRS GR 1045
		CARRIAGE BOLT	ASTM A307
		SERRATED FLANGE NUT	GR 5
		SHEAR OFF NUT	GR 5

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: OVERVIEW
COMPONENT MATERIAL STANDARDS (CONTINUED)

CYS STRUCTURAL ENGINEERS, INC.
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Job No:	17020
Date:	08-18-2017
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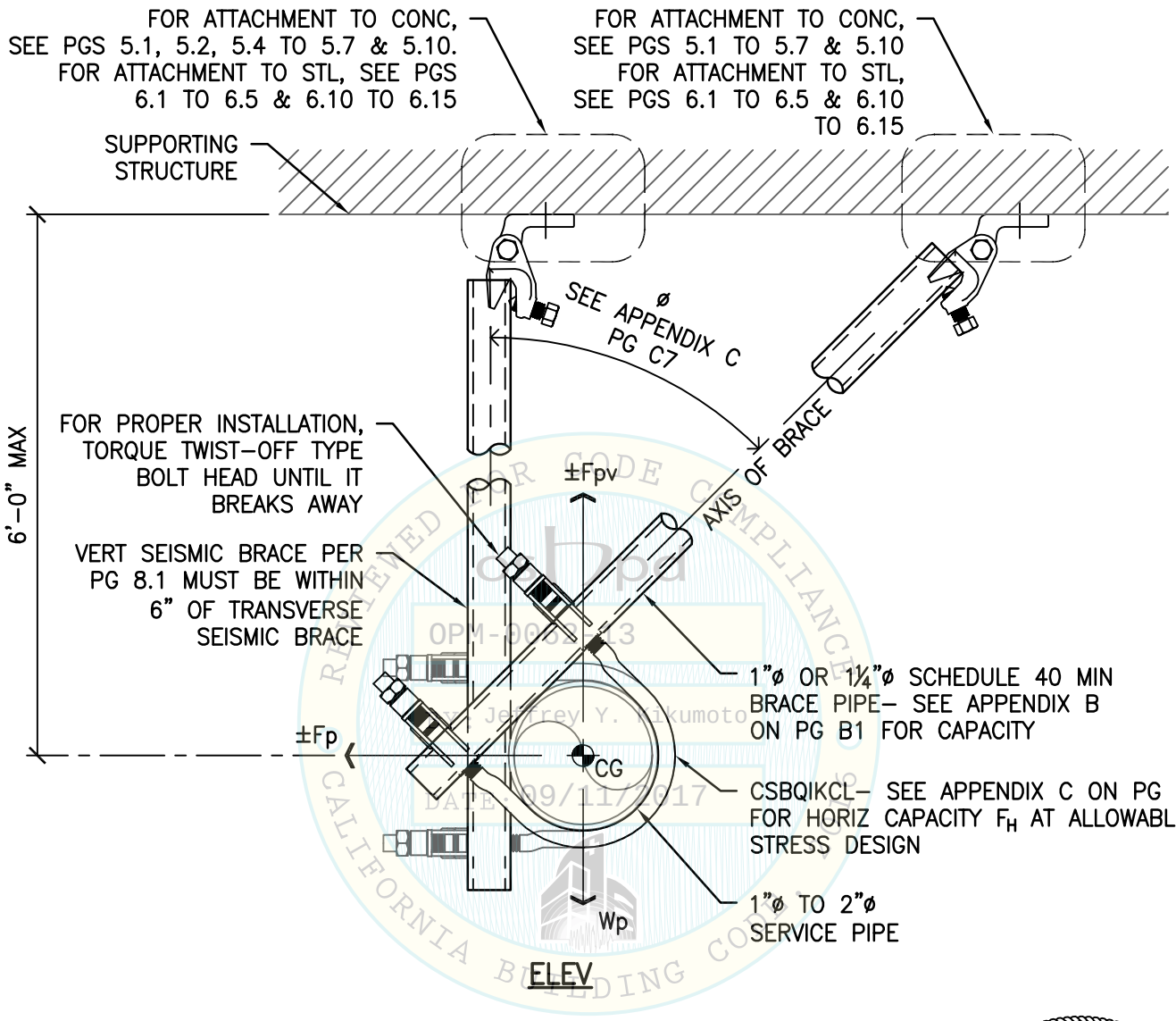
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: TRANSVERSE SEISMIC BRACE
CSBQIKCL WITH BRACE PIPE FOR 1"Ø TO 2"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
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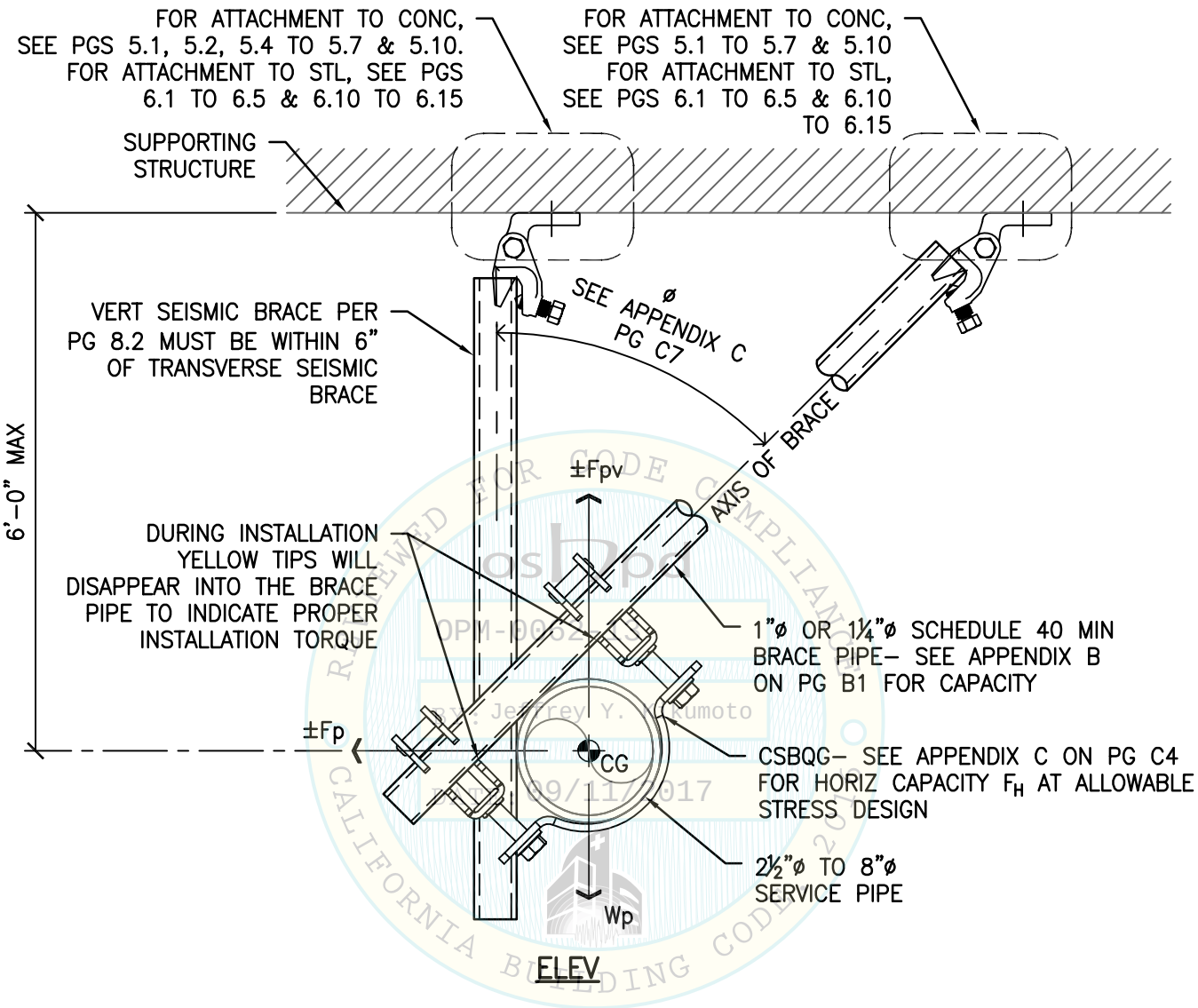
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



SHEET TITLE: TRANSVERSE SEISMIC BRACE
CSBQG WITH BRACE PIPE FOR 2½"Ø TO 8"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
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Job No:	17020
Date:	08-18-2017
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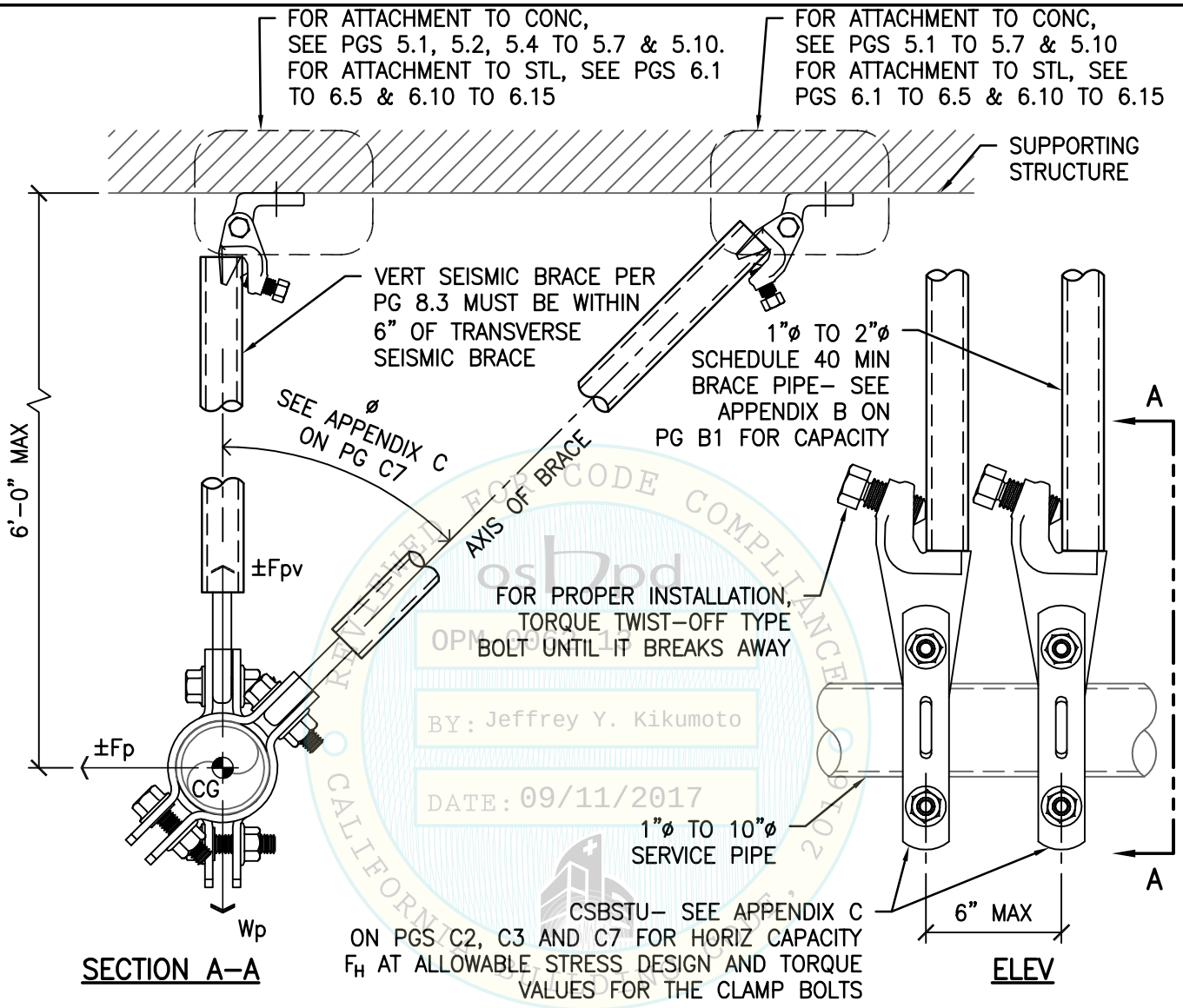
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED.
FOR CORRESPONDING REPLACEMENT, SEE PG 2.6.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: TRANSVERSE SEISMIC BRACE
CSBSTU WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
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Job No:	17020
Date:	08-18-2017
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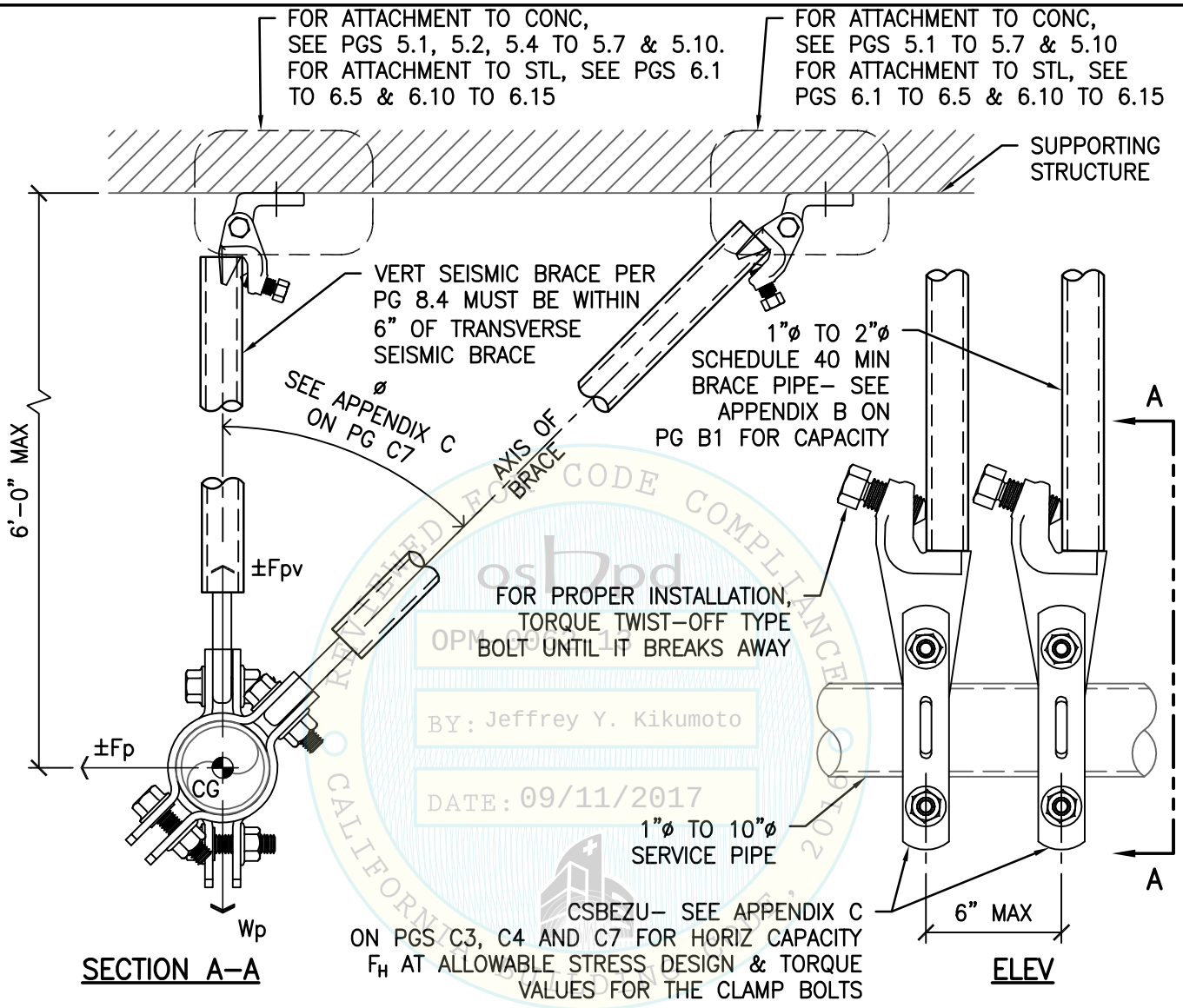
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED.
FOR CORRESPONDING REPLACEMENT, SEE PG 2.6.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: TRANSVERSE SEISMIC BRACE
CSBEZU WITH BRACE PIPE FOR 1"Ø TO 6"Ø SERVICE PIPE CONNECTION

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Job No:	17020
Date:	08-18-2017
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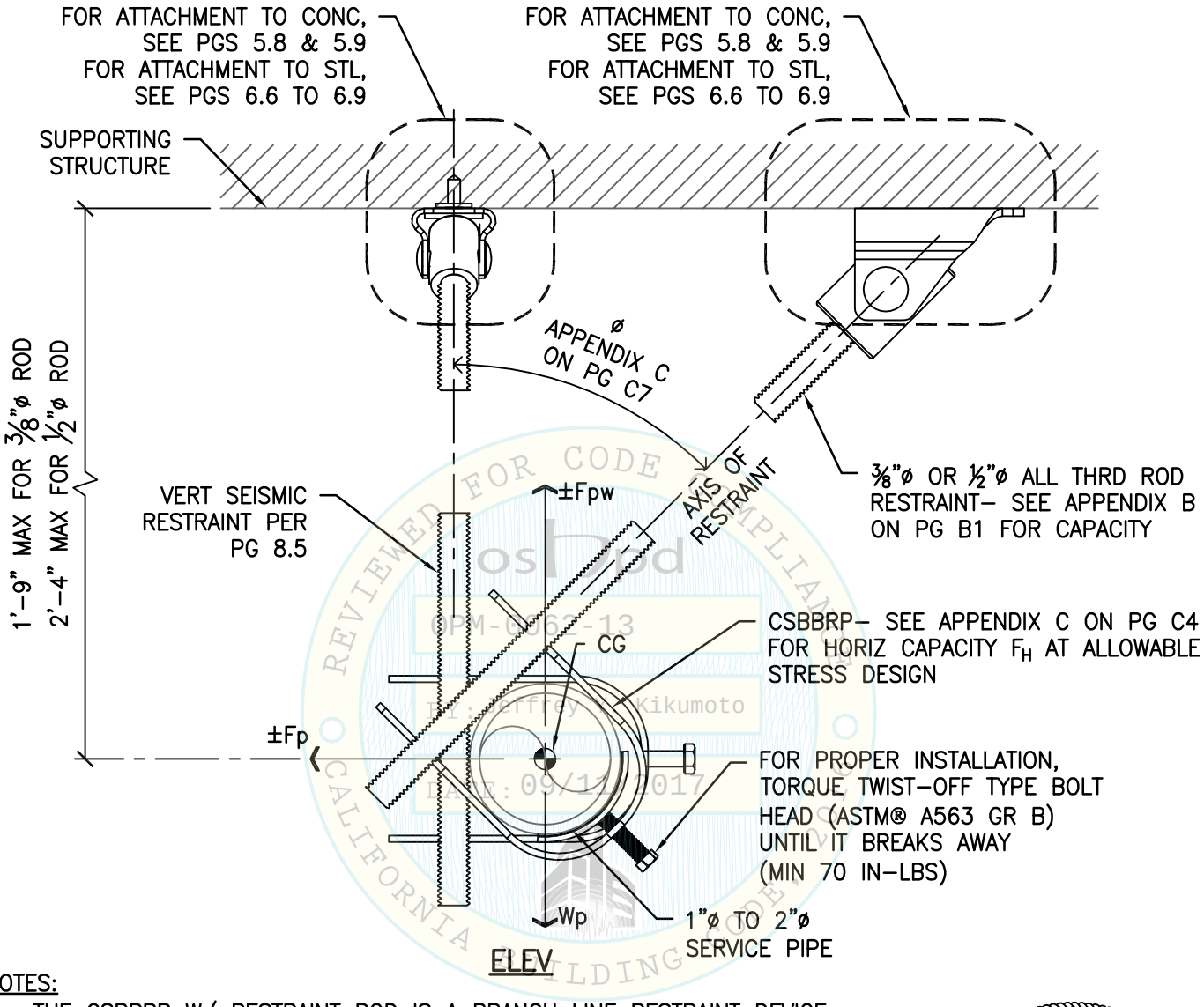
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

1. THE CSBBRP W/ RESTRAINT ROD IS A BRANCH LINE RESTRAINT DEVICE (NOT A BRACE). SEE NFPA® 13, SECTION 9.3.6.
2. BRANCH LINES SHALL BE LATERALLY RESTRAINED AT INTERVALS NOT EXCEEDING THOSE SPECIFIED IN NFPA 13 TABLE 9.3.6.4(a) BASED ON BRANCH LINE DIAM AND THE VALUE OF Cp.
3. PER NFPA 13 SECTION 9.3.6.6, SPRIGS ARE LIMITED TO LESS THAN 4'-0", OTHERWISE THEY SHALL BE RESTRAINED AGAINST LATERAL MOVEMENT. IF A SPRIG RISES 4'-0" OR MORE, A RESTRAINT DESIGN MUST BE SUBMITTED SEPARATELY FOR REVIEW BY OSHPD.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: TRANSVERSE SEISMIC BRACE
CSBBRP WITH RESTRAINT ROD FOR 1"Ø TO 2"Ø BRANCH LINE PIPE CONNECTION

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Job No:	17020
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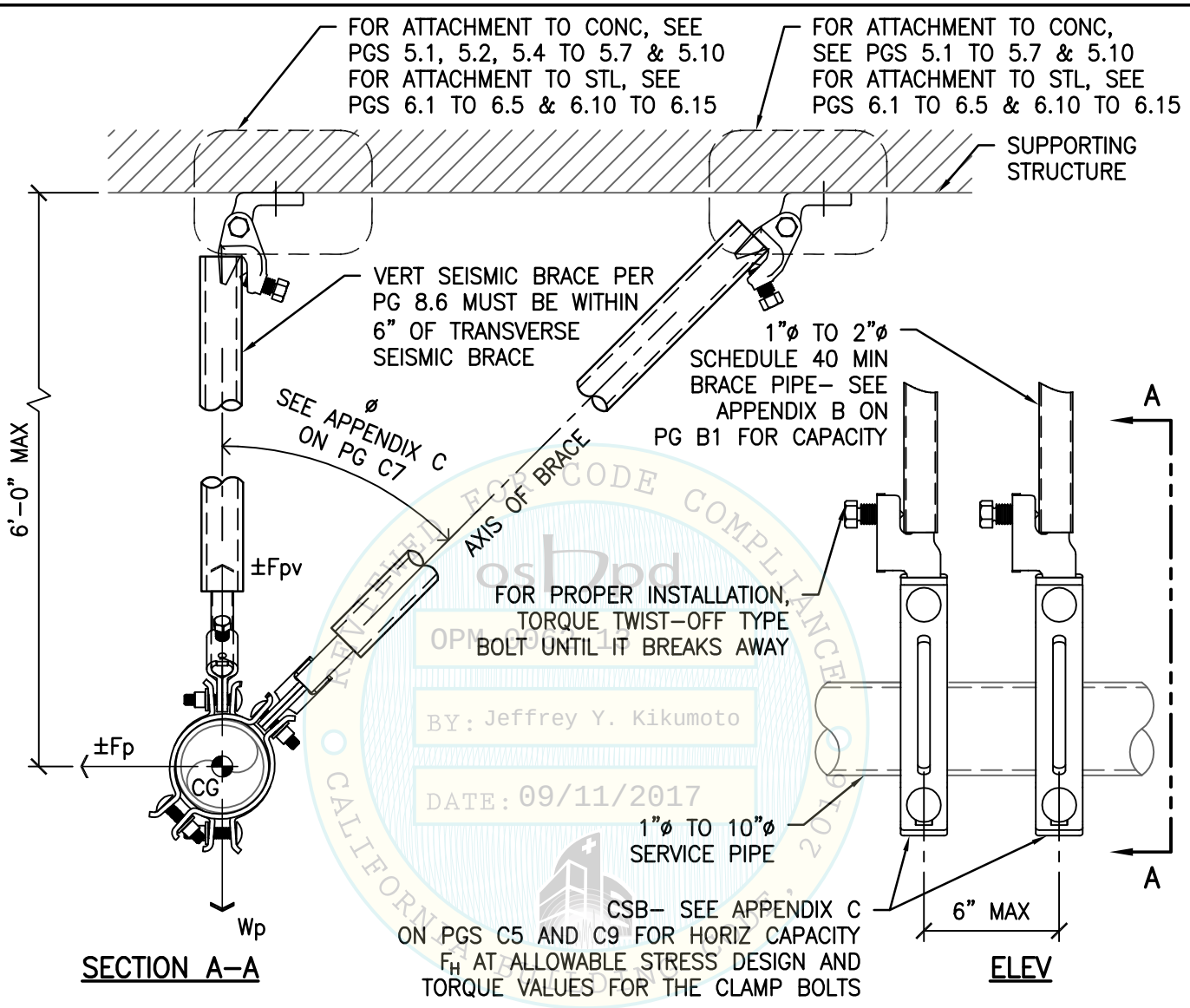
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A NEW PRODUCT

SHEET TITLE: TRANSVERSE SEISMIC BRACE
CSB WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

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Job No:	17020
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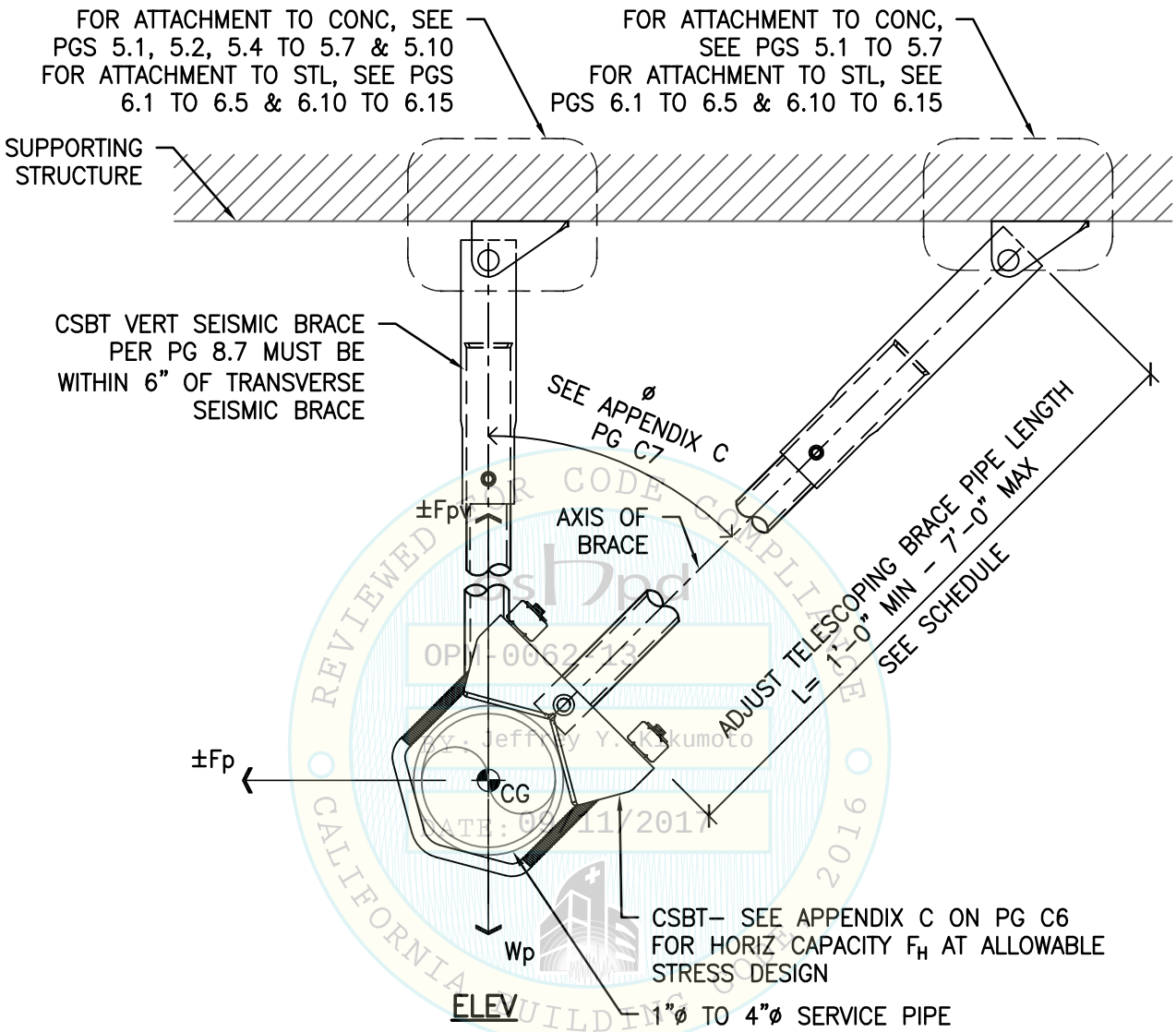
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



BRACE ASSEMBLY	"L" RANGE
CSBT1	1.0' TO <1.5'
CSBT2	1.5' TO <3.0'
CSBT3	3.0' TO <5.5'
CSBT4	5.5' TO <7.0'

NOTE:
SEE PG 8.8 FOR CSBT ASSEMBLY & INSTALLATION INSTRUCTIONS

THIS IS A NEW PRODUCT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: TRANSVERSE SEISMIC BRACE
CSBT TELESCOPING ASSEMBLY FOR 1"Ø TO 4"Ø SERVICE PIPE CONNECTION

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Job No:	17020
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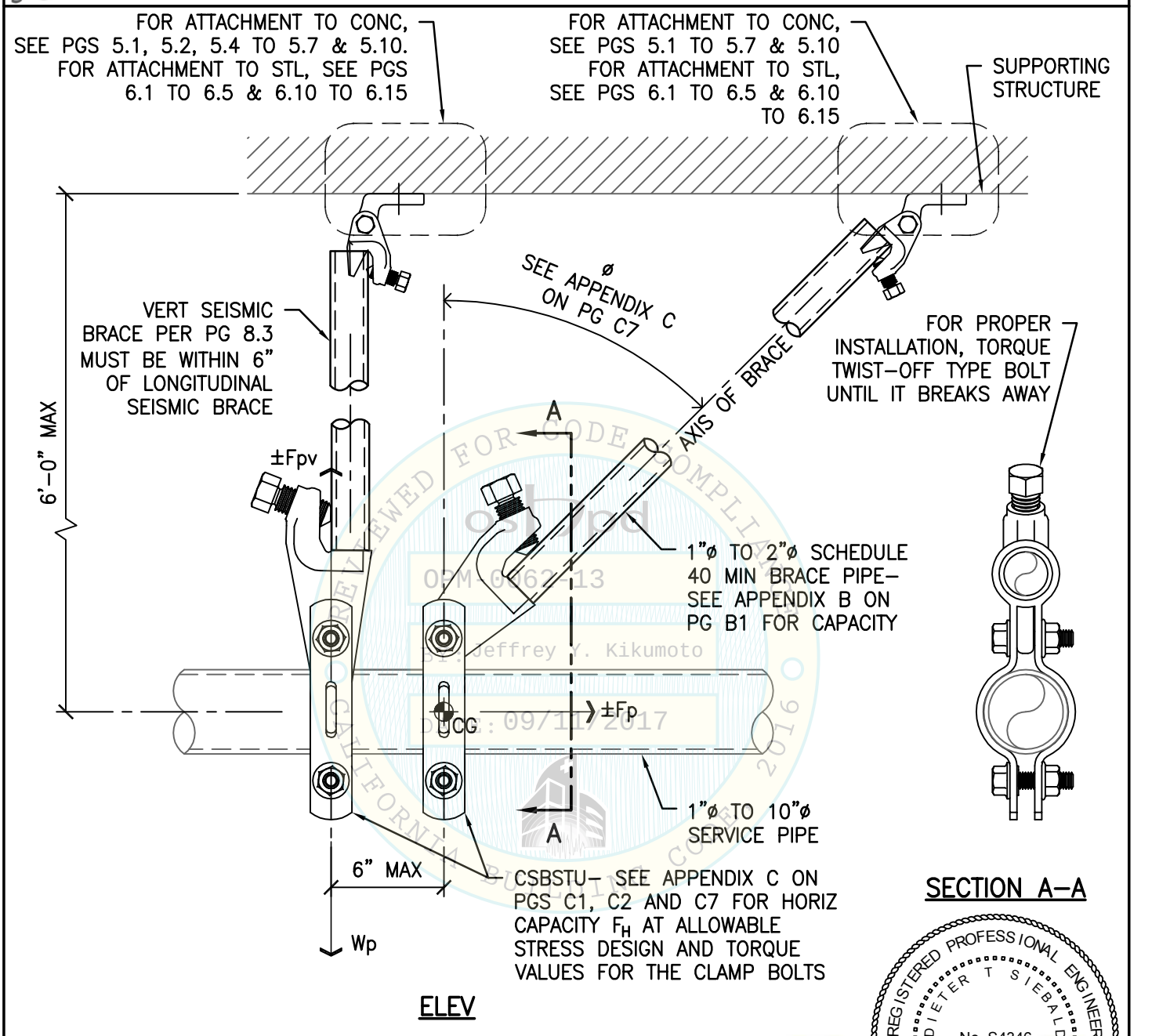
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 3.3.

REGISTERED PROFESSIONAL ENGINEER DIETER T SIEBALD No. S4346 STRUCTURAL STATE OF CALIFORNIA

SHEET TITLE: LONGITUDINAL SEISMIC BRACE
CSBSTU WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
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Job No:	17020
Date:	08-18-2017
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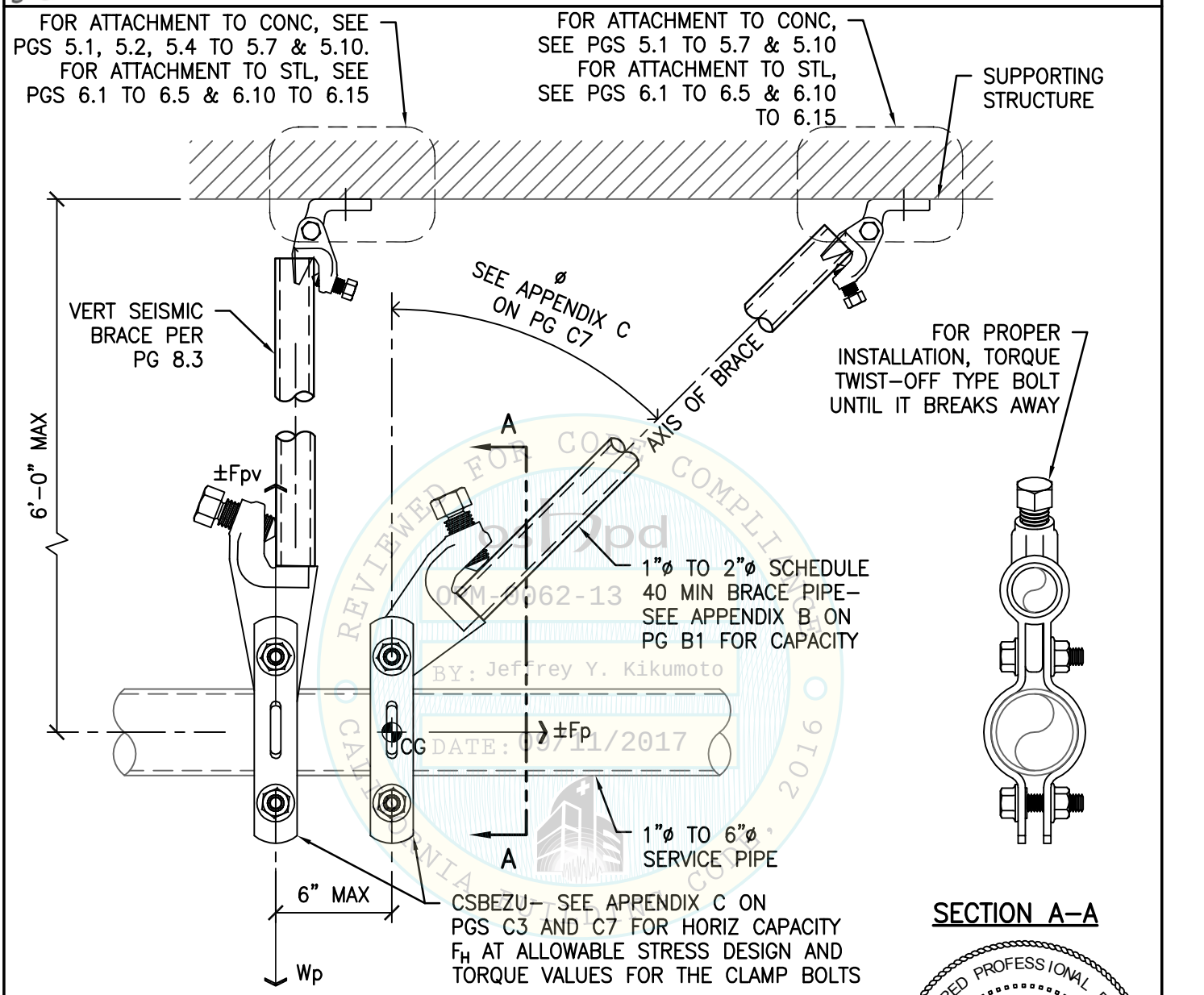
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 3.3.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: LONGITUDINAL SEISMIC BRACE
CSBEZU WITH BRACE PIPE FOR 1"Ø TO 6"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
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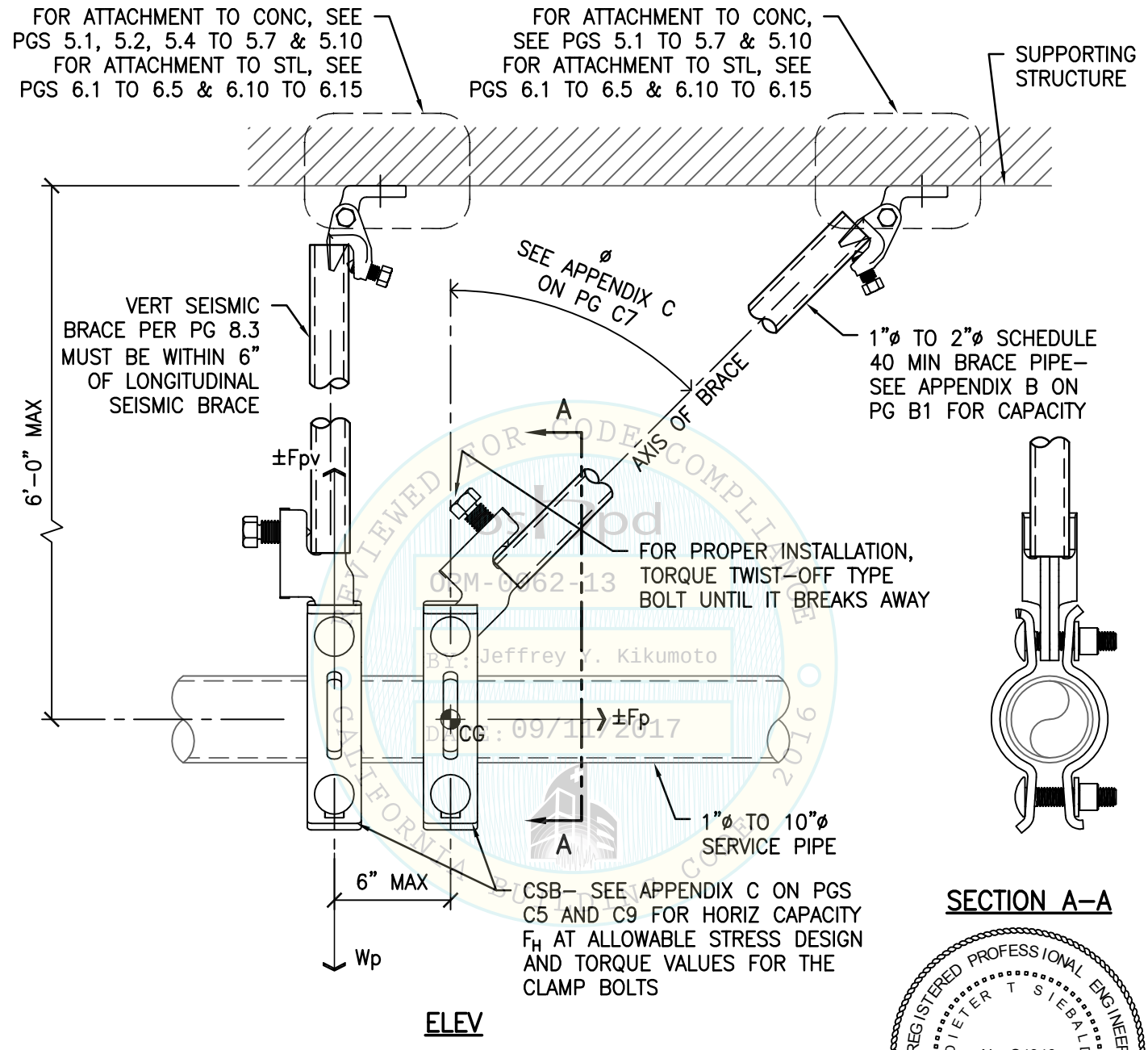
Job No:	17020
Date:	08-18-2017
Page:	3.2 of 87

SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



THIS IS A NEW PRODUCT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: LONGITUDINAL SEISMIC BRACE
CSB WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
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TEL (916) 920-2020
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Job No:	17020
Date:	08-18-2017
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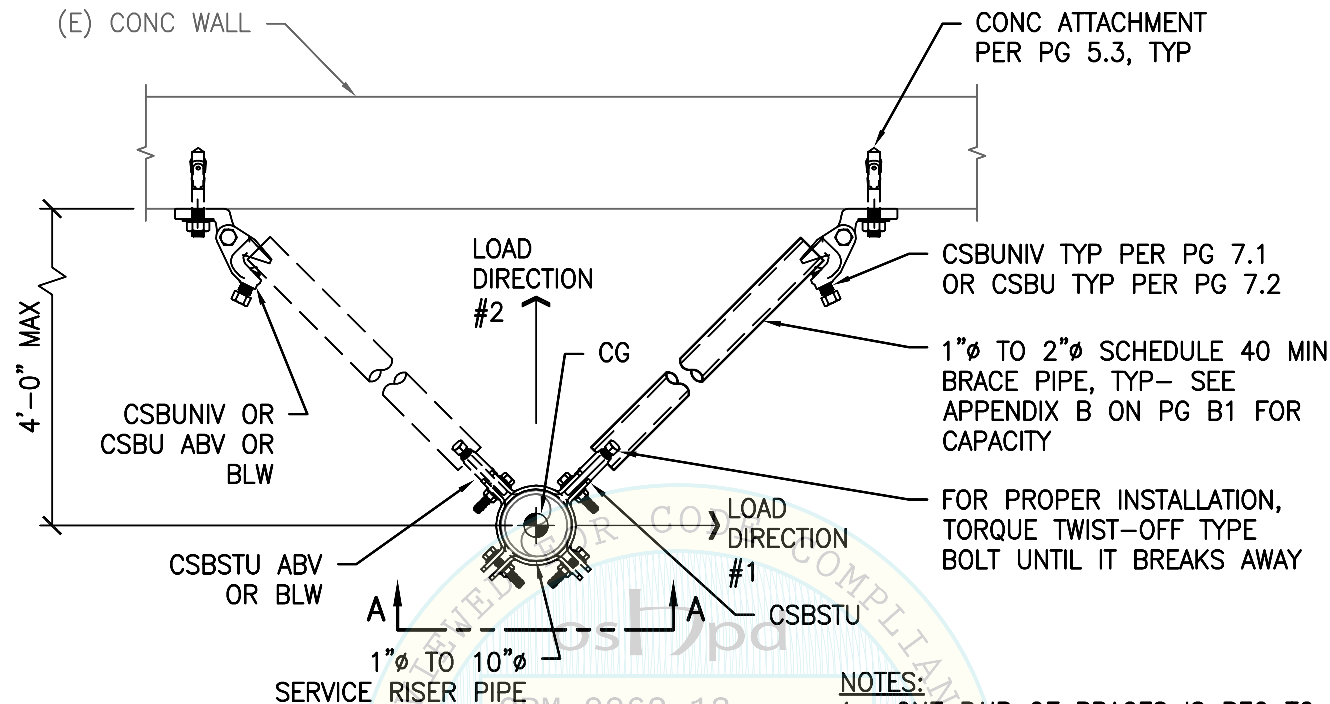
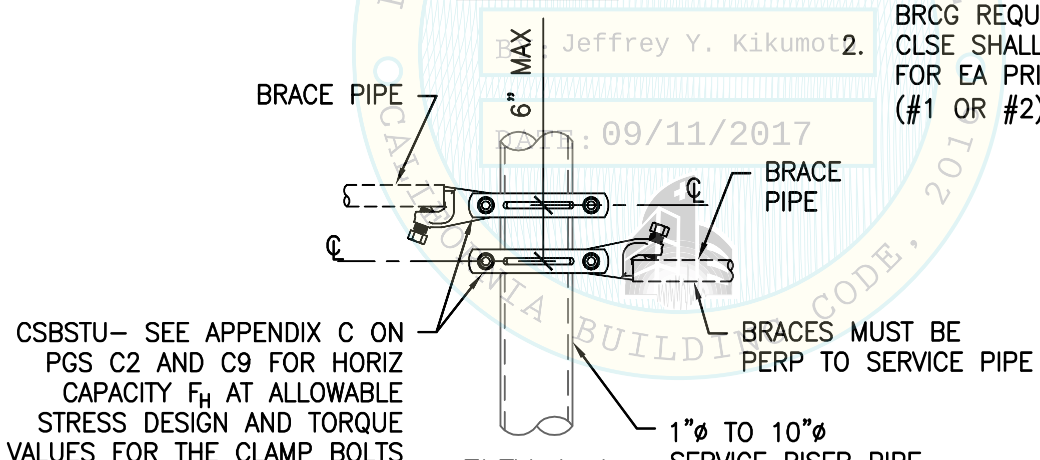
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



PLAN VIEW

NOTES:

1. ONE PAIR OF BRACES IS REQ TO SATISFY NFPA® 13, FOUR–WAY RISER BRCG REQUIREMENTS.
2. CLSE SHALL EVALUATE ±Fp OR ±Fpw FOR EA PRINCIPAL LOAD DIRECTION (#1 OR #2) AS SHOWN.



ELEV A–A

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 4.5.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: FOUR-WAY RISER SEISMIC BRACES
CSBSTU WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

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Job No:	17020
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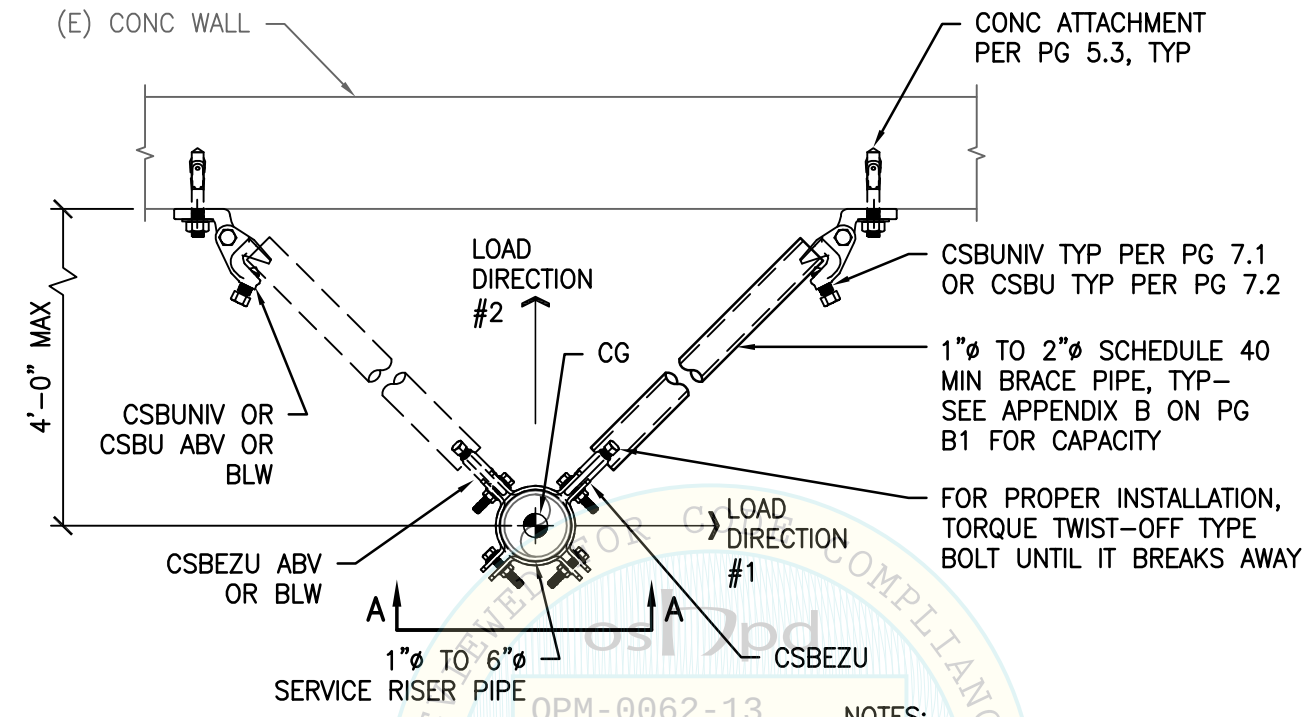
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



PLAN VIEW

NOTES:

1. ONE PAIR OF BRACES IS REQ TO SATISFY NFPA® 13, FOUR–WAY RISER BRCG REQUIREMENTS.
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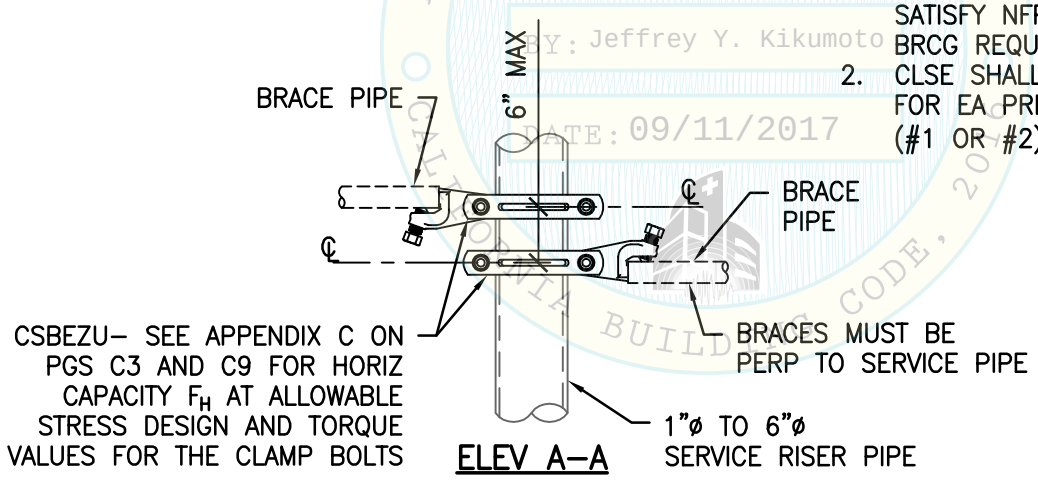

ELEV A–A

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 4.5.

SHEET TITLE: FOUR-WAY RISER SEISMIC BRACES
CSBEZU WITH BRACE PIPES FOR 1"Ø TO 6"Ø SERVICE PIPE CONNECTION

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Job No:	17020
Date:	08-18-2017
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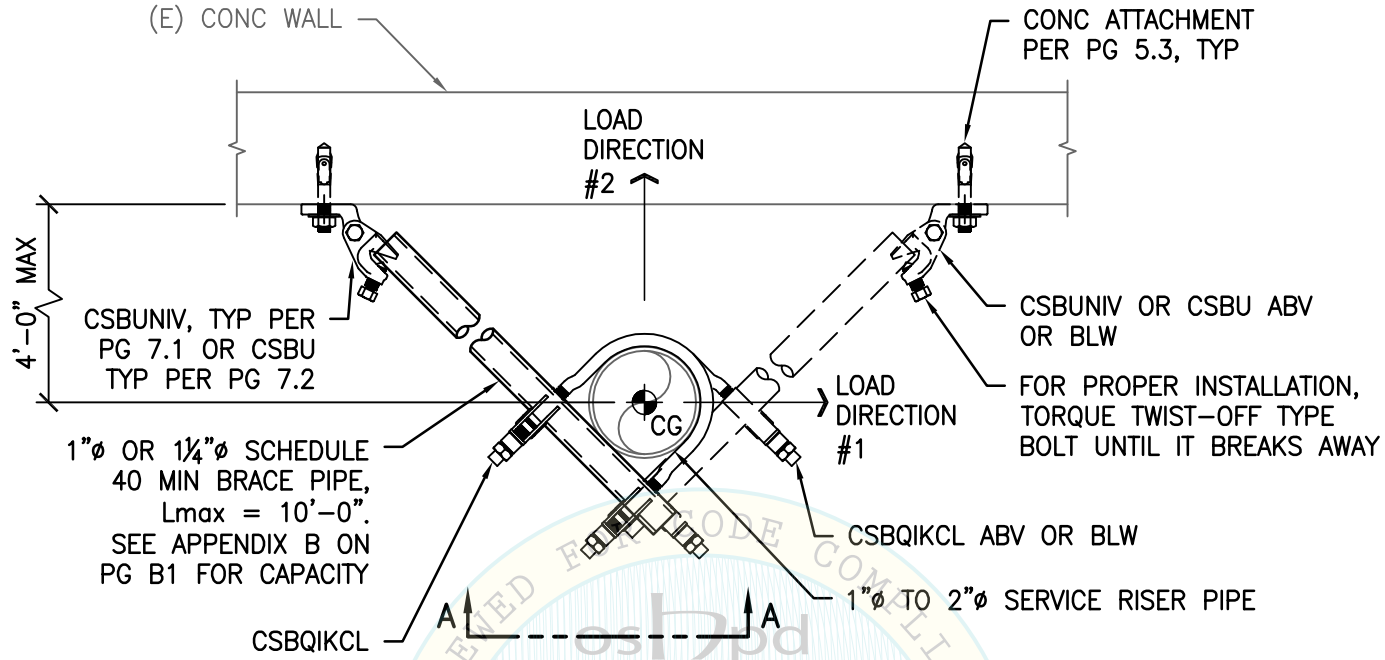
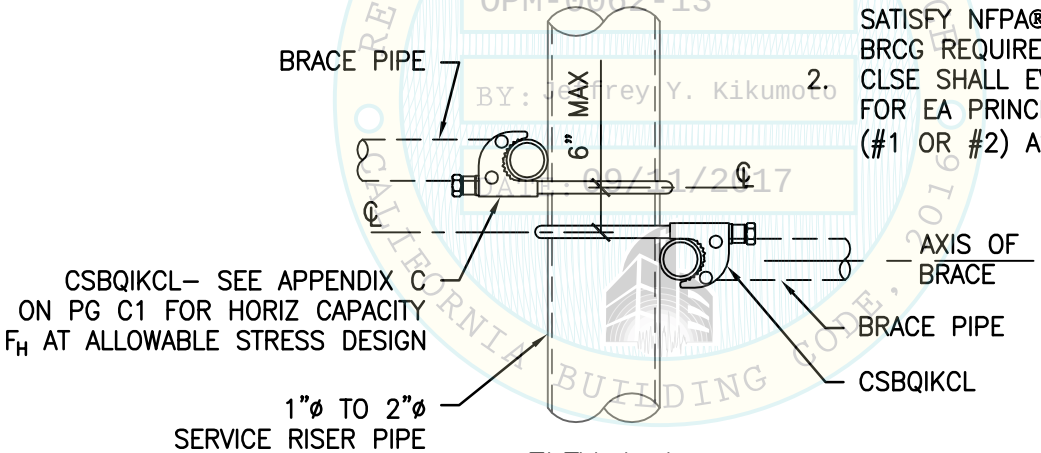
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



PLAN VIEW

NOTES:

1. ONE PAIR OF BRACES IS REQ TO SATISFY NFPA® 13 FOUR-WAY RISER BRCG REQUIREMENTS.
2. CLSE SHALL EVALUATE ±Fp OR ±Fpw FOR EA PRINCIPAL LOAD DIRECTION (#1 OR #2) AS SHOWN.



ELEV A-A

SHEET TITLE: FOUR-WAY RISER SEISMIC BRACES
CSBQIKCL WITH BRACE PIPES FOR 1"Ø TO 2"Ø SERVICE PIPE CONNECTION

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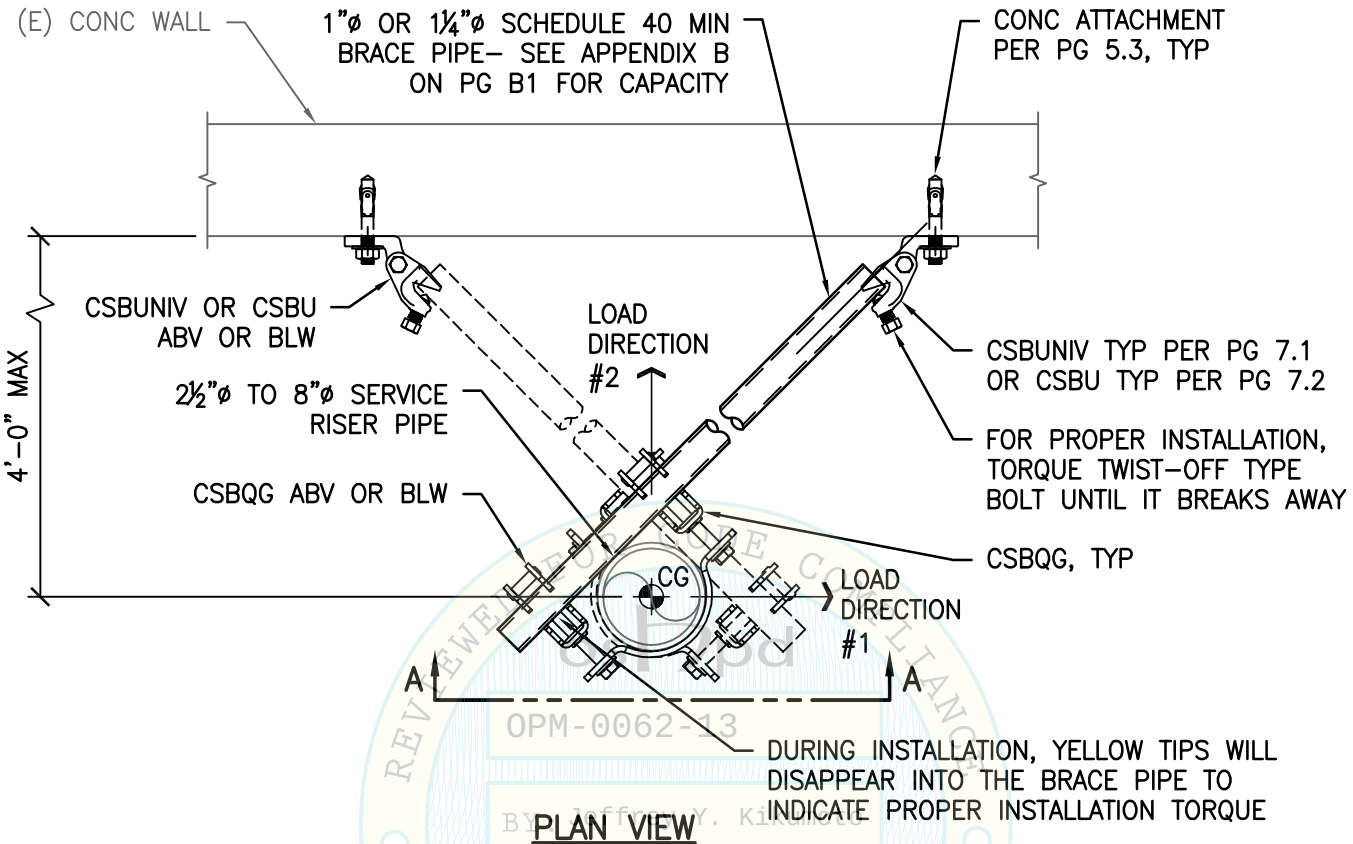
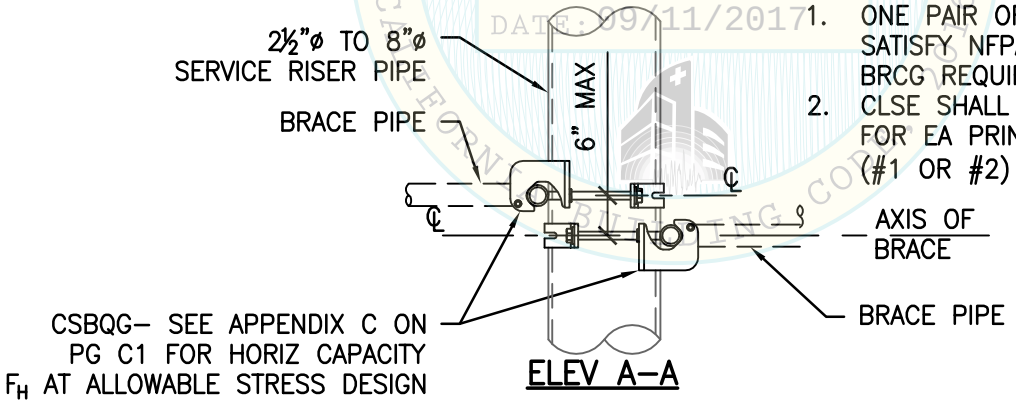
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



PLAN VIEW

NOTES:

1. ONE PAIR OF BRACES IS REQ TO SATISFY NFPA® 13, FOUR–WAY RISER BRCG REQUIREMENTS.
2. CLSE SHALL EVALUATE ±Fp OR ±Fpw FOR EA PRINCIPAL LOAD DIRECTION (#1 OR #2) AS SHOWN.



ELEV A–A

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: FOUR-WAY RISER BRACE SEISMIC BRACES
CSBQG WITH BRACE PIPES FOR 2½"Ø TO 8"Ø SERVICE PIPE CONNECTION

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Job No:	17020
Date:	08-18-2017
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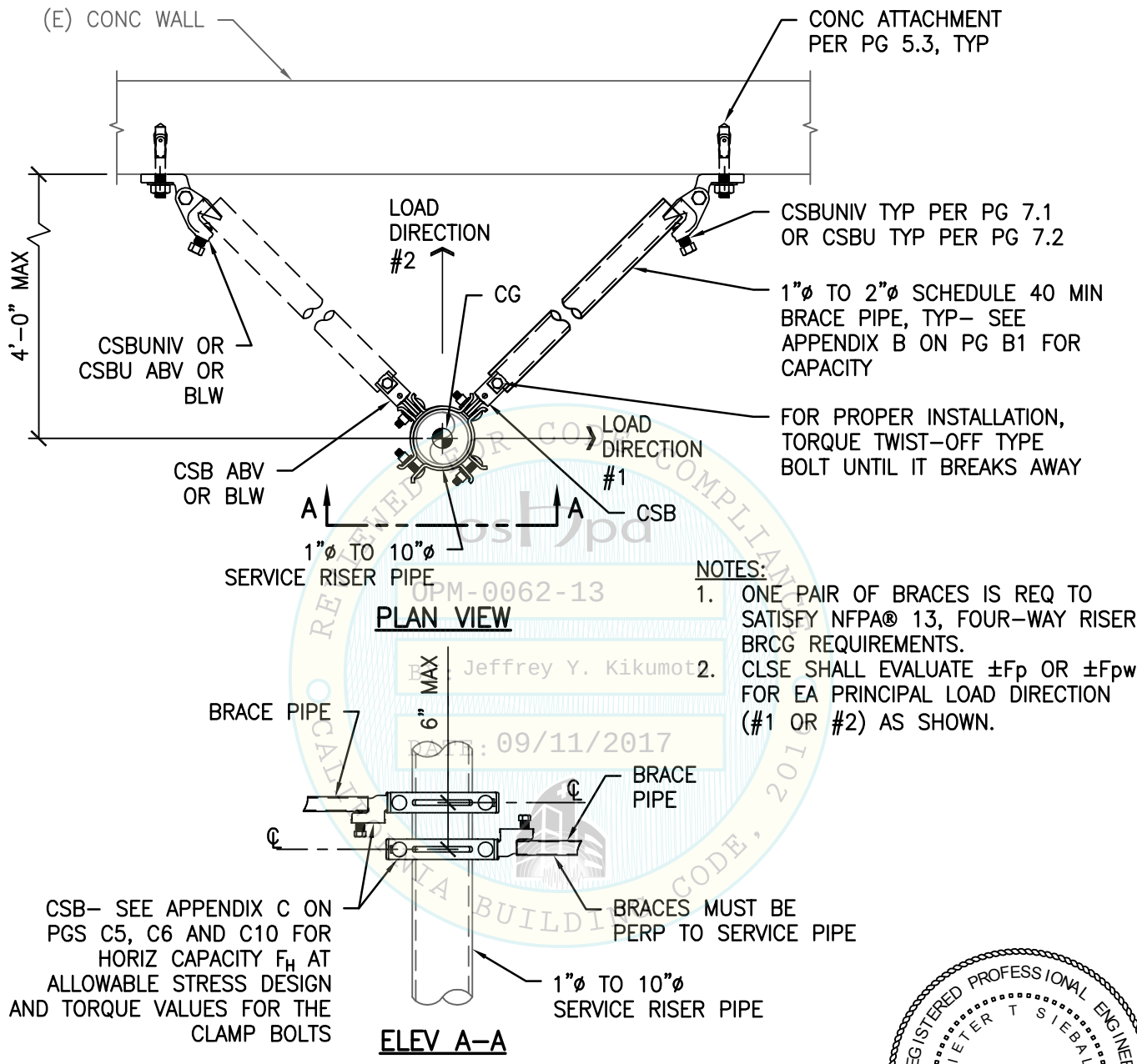
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

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2. CLSE SHALL EVALUATE ±Fp OR ±Fpw FOR EA PRINCIPAL LOAD DIRECTION (#1 OR #2) AS SHOWN.

REGISTERED PROFESSIONAL ENGINEER
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No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A NEW PRODUCT

SHEET TITLE: FOUR-WAY RISER SEISMIC BRACES
CSB WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

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Job No:	17020
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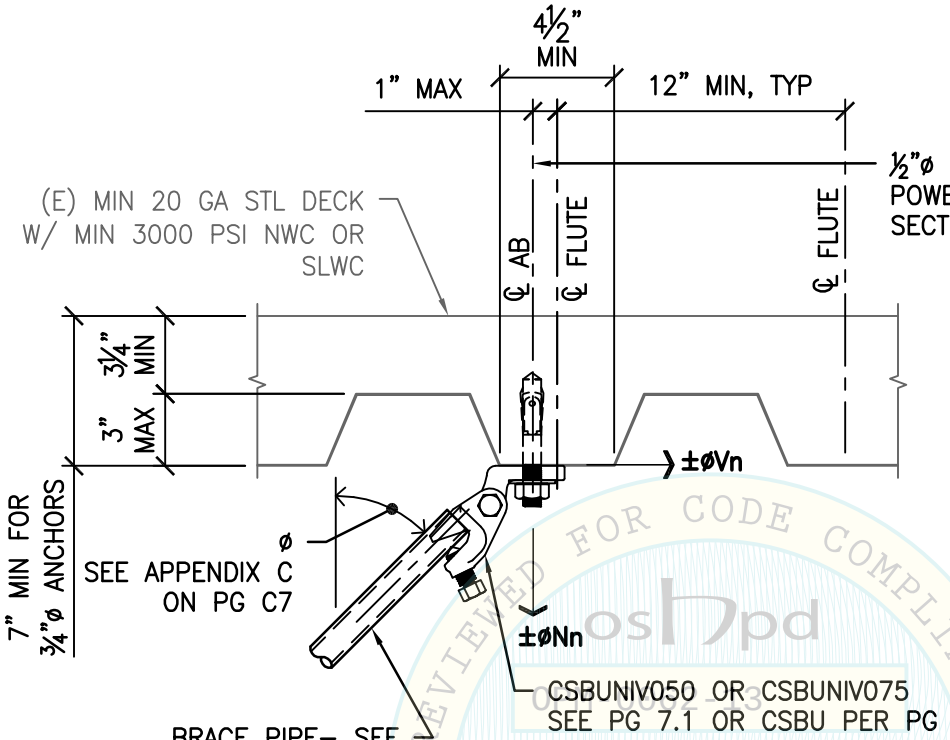
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTE:
WHEN ATTACHING TO CONC FILL OVER MTL DECK, POWER–STUD+ SD2 MUST BE INSTALLED IN LOWER FLUTE OF DECK.

CASE 1 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)		
	½"ø	¾"ø
SHEAR (øVn)	2480#	1833#
TENSION (øNn)	714#	1692#

CASE 1 TABLE NOTES:

1. VALUES ARE GIVEN FOR SLWC & ARE CONSERVATIVE FOR NWC.
2. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0).
3. SEE GENERAL NOTES & HOW TO USE THIS PRE–APPROVAL.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBUNIV/CSBU CASE 1 - UNDERSIDE OF METAL DECK W/ CONCRETE FILL

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
www.cyseng.com

Job No:	17020
Date:	08-18-2017
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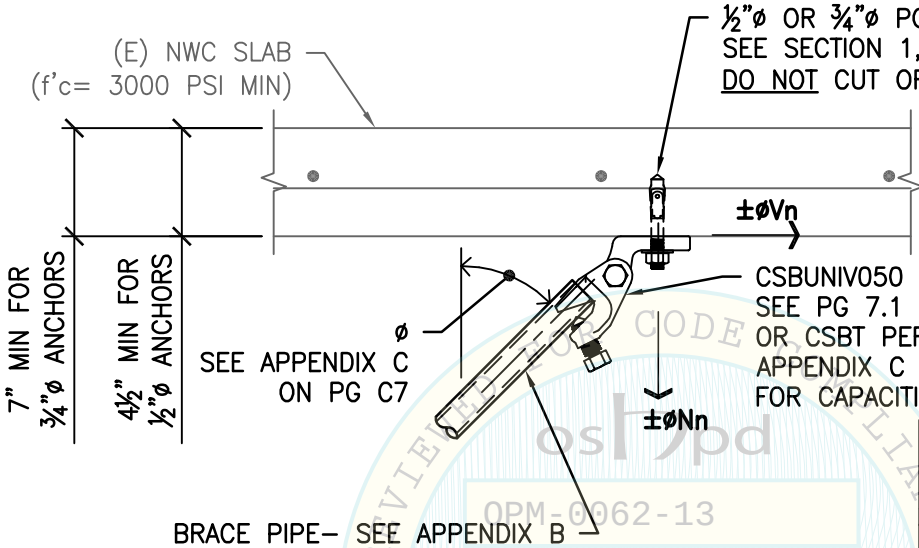
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



CASE 2 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)		
	½"ø	¾"ø
SHEAR (øVn)	1383#	4676#
TENSION (øNn)	1284#	3296#

CASE 2 TABLE NOTES:

1. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0)
2. SEE GENERAL NOTES & HOW TO USE THIS PRE–APPROVAL.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBUNIV/CSBU CASE 2 - UNDERSIDE OF CONCRETE FLOOR OR ROOF

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Job No:	17020
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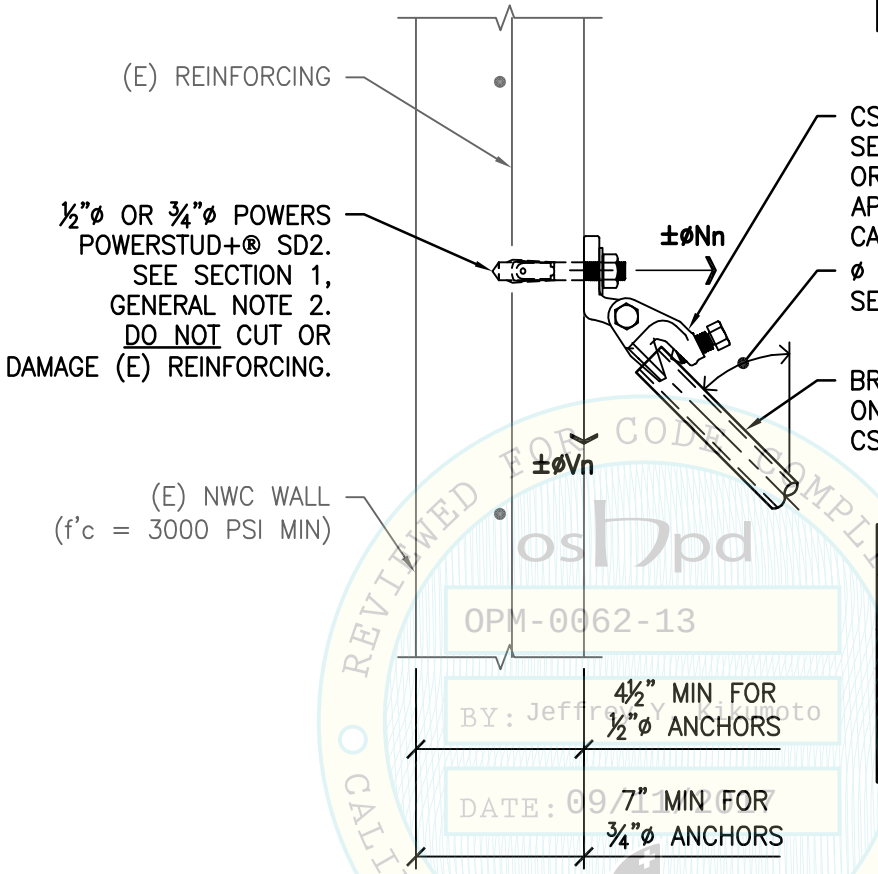
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

NOTE:
SERVICE PIPE MAY BE PERP OR PARALLEL TO THE WALL.



ELEV VIEW

CASE 3 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)		
	½"ø	¾"ø
SHEAR (øVn)	1383#	4676#
TENSION (øNn)	1284#	3296#

CASE 3 TABLE NOTES:
1. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0).
2. SEE GENERAL NOTES & HOW TO USE THIS PRE–APPROVAL.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBUNIV/CSBU CASE 3 - WALL MOUNTED

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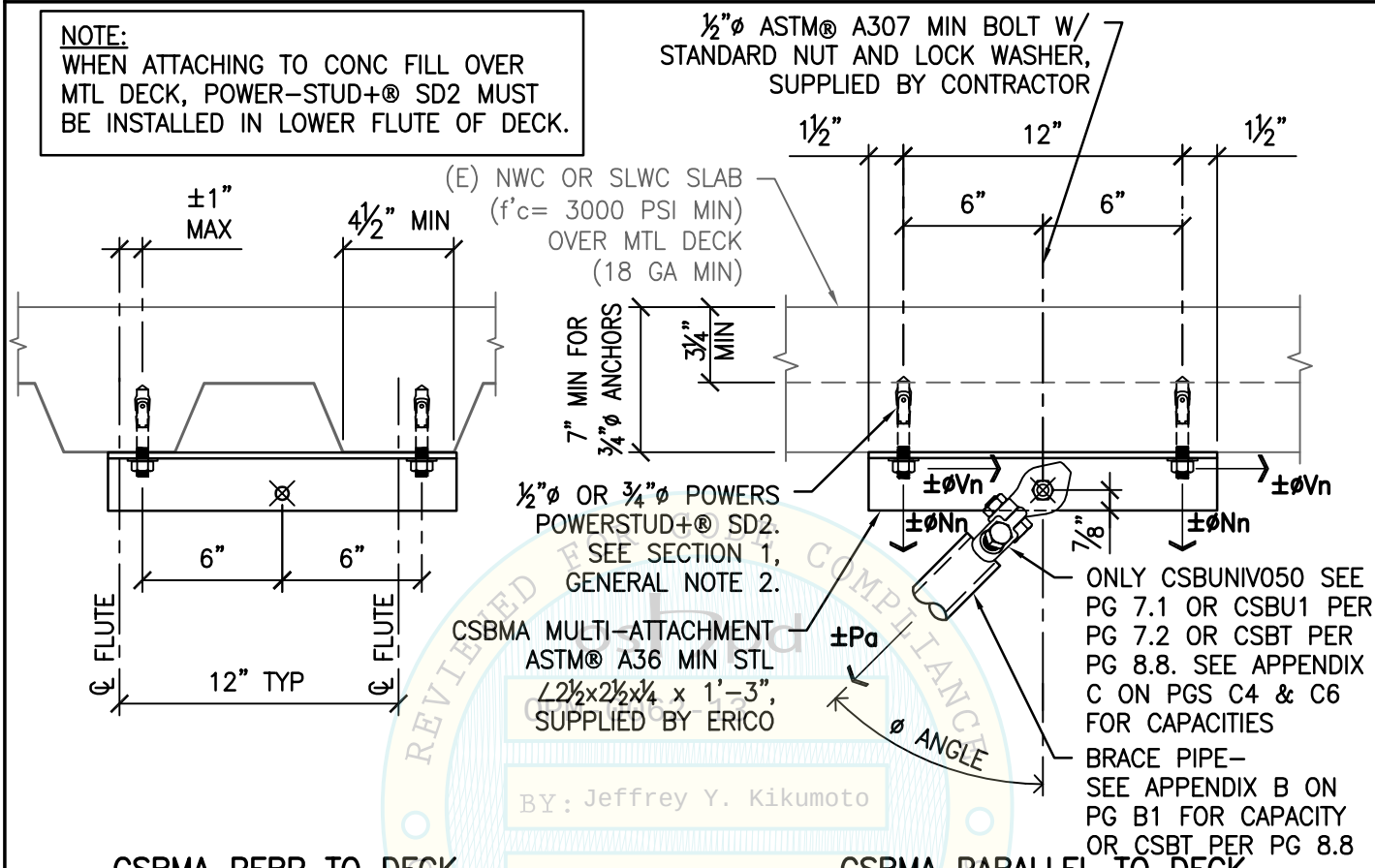
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

NOTE:
WHEN ATTACHING TO CONC FILL OVER MTL DECK, POWER-STUD+® SD2 MUST BE INSTALLED IN LOWER FLUTE OF DECK.



CSBMA PERP TO DECK BRACE PIPE HORIZ VECTOR LOAD PARALLEL TO CSBMA

CSBMA PARALLEL TO DECK

ALLOWABLE AXIAL BRACE FORCE, Pa AT ASD		
BRACE ANGLE ø	ANCHOR	
	½"ø	¾"ø
0 DEG	292#	688#
01 DEG – 15 DEG	287#	677#
16 DEG – 30 DEG	287#	636#
31 DEG – 45 DEG	303#	627#
46 DEG – 60 DEG	345#	627#
61 DEG – 90 DEG	411#	662#

CASE 1 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)		
	½"ø	¾"ø
SHEAR (øVn)	2480#	1833#
TENSION (øNn)	714#	1692#

CASE 1 TABLE NOTES:
1. VALUES ARE GIVEN FOR SLWC & ARE CONSERVATIVE FOR NWC.
2. VALUES ARE FOR EA ANCHOR.
3. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0).
4. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.

REGISTERED PROFESSIONAL ENGINEER DIETER T SIEBALD No. S4346 STRUCTURAL STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBMA CASE 1 - UNDERSIDE OF METAL DECK W/ CONCRETE FILL

CYS STRUCTURAL ENGINEERS, INC.
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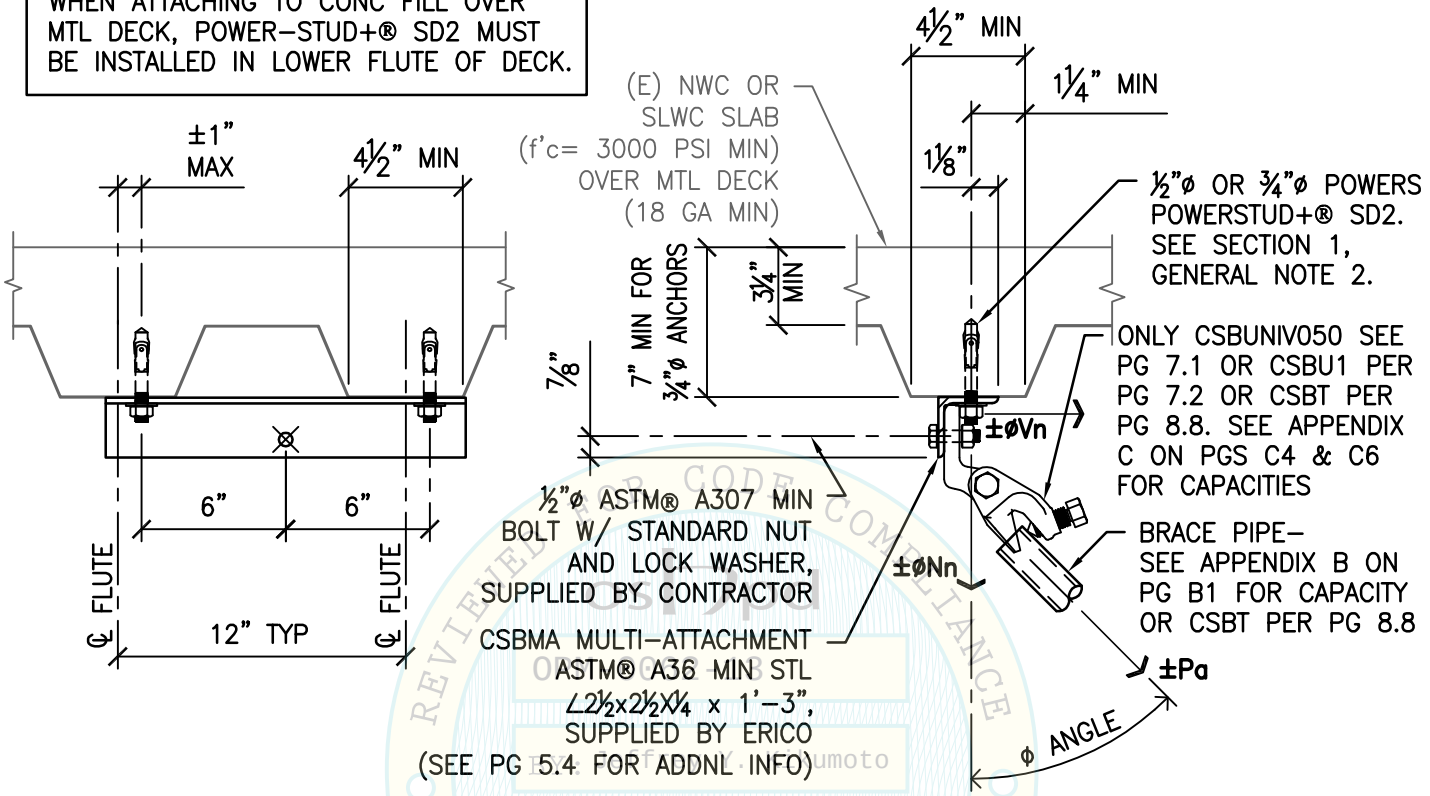
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

NOTE:
WHEN ATTACHING TO CONC FILL OVER MTL DECK, POWER-STUD+® SD2 MUST BE INSTALLED IN LOWER FLUTE OF DECK.



CSBMA PERP TO DECK **CSBMA PARALLEL TO DECK**

BRACE PIPE HORIZ VECTOR LOAD PERP TO CSBMA

ALLOWABLE AXIAL BRACE FORCE, Pa AT ASD		
BRACE ANGLE ø	ANCHOR	
	½"ø	¾"ø
0 DEG	292#	688#
01 DEG – 15 DEG	292#	688#
16 DEG – 30 DEG	199#	445#
31 DEG – 45 DEG	157#	337#
46 DEG – 60 DEG	137#	286#
61 DEG – 90 DEG	130#	260#

CASE 1 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)		
	½"ø	¾"ø
SHEAR (øVn)	2480#	1833#
TENSION (øNn)	714#	1692#

CASE 1 TABLE NOTES:

1. VALUES ARE GIVEN FOR SLWC & ARE CONSERVATIVE FOR NWC.
2. VALUES ARE FOR EA ANCHOR.
3. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0).
4. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBMA CASE 1 - UNDERSIDE OF METAL DECK W/ CONCRETE FILL

CYS STRUCTURAL ENGINEERS, INC.
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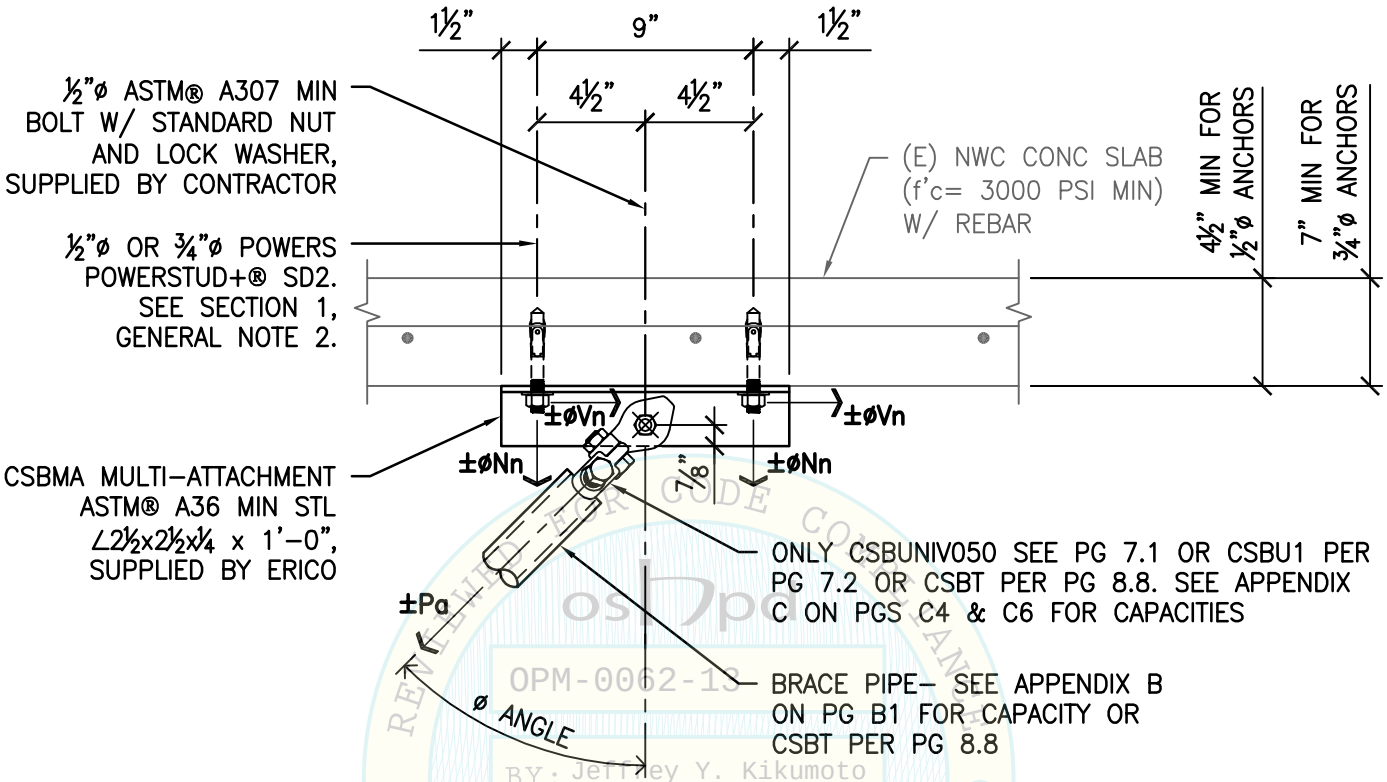


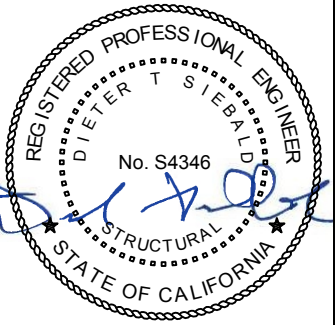
BRACE PIPE HORIZ VECTOR LOAD PARALLEL TO CSBMA

ALLOWABLE AXIAL BRACE FORCE, Pa AT ASD		
BRACE ANGLE ø	ANCHOR	
	½"ø	¾"ø
0 DEG	523#	1192#
01 DEG – 15 DEG	506#	1130#
16 DEG – 30 DEG	471#	991#
31 DEG – 45 DEG	459#	938#
46 DEG – 60 DEG	459#	938#
61 DEG – 90 DEG	479#	950#

CASE 2 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)		
	½"ø	¾"ø
SHEAR (øVn)	1383#	2338#
TENSION (øNn)	1284#	2967#

CASE 2 TABLE NOTES:

1. VALUES ARE FOR EA ANCHOR.
2. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_o).
3. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.



SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBMA CASE 2 - UNDERSIDE OF CONCRETE FLOOR OR ROOF

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
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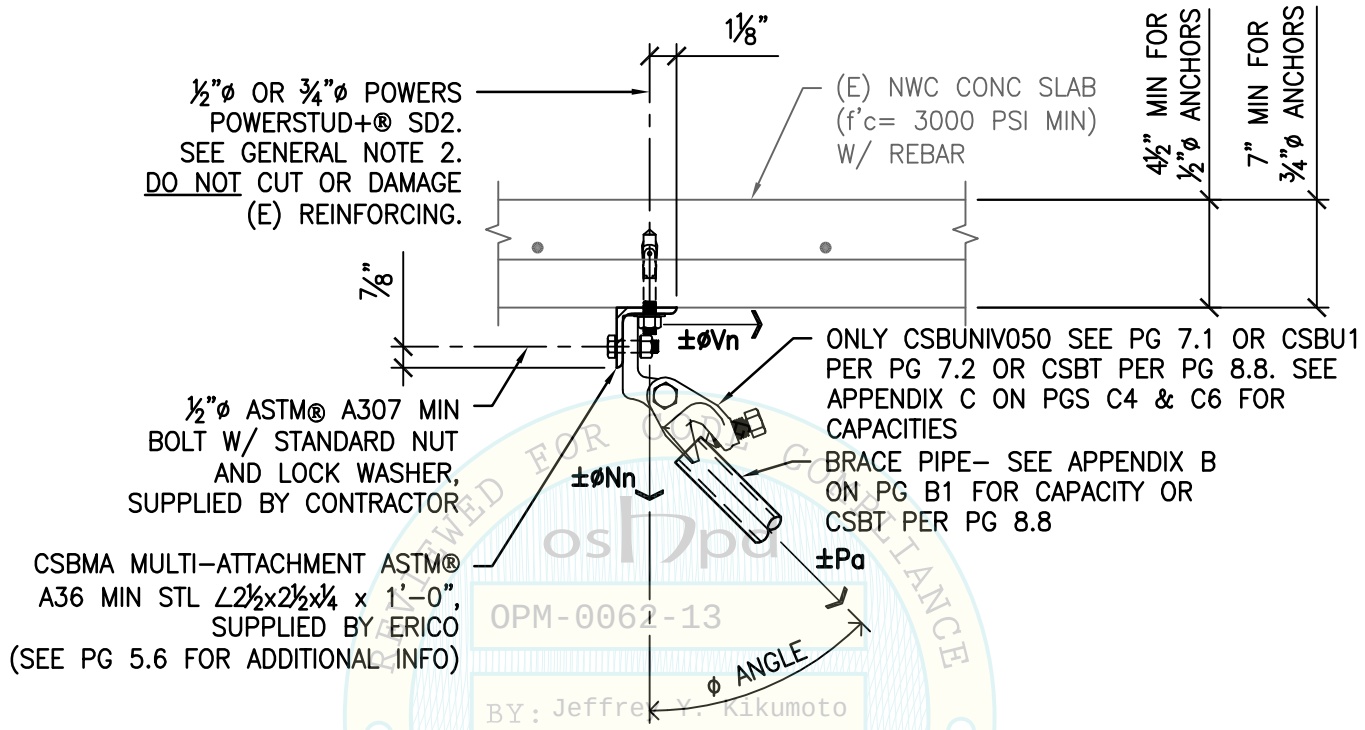

BRACE PIPE HORIZ VECTOR LOAD PERP TO CSBMA

ALLOWABLE AXIAL BRACE FORCE, Pa AT ASD		
BRACE ANGLE ø	ANCHOR	
	½"ø	¾"ø
0 DEG	523#	1192#
01 DEG – 15 DEG	523#	1163#
16 DEG – 30 DEG	341#	697#
31 DEG – 45 DEG	260#	511#
46 DEG – 60 DEG	222#	423#
61 DEG – 90 DEG	203#	369#

CASE 2 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)		
	½"ø	¾"ø
SHEAR (øVn)	1383#	2338#
TENSION (øNn)	1284#	2967#

CASE 2 TABLE NOTES:
1. VALUES ARE FOR EA ANCHOR.
2. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0).
3. SEE GENERAL NOTES & HOW TO USE THIS PRE–APPROVAL.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBMA CASE 2 - UNDERSIDE OF CONCRETE FLOOR OR ROOF

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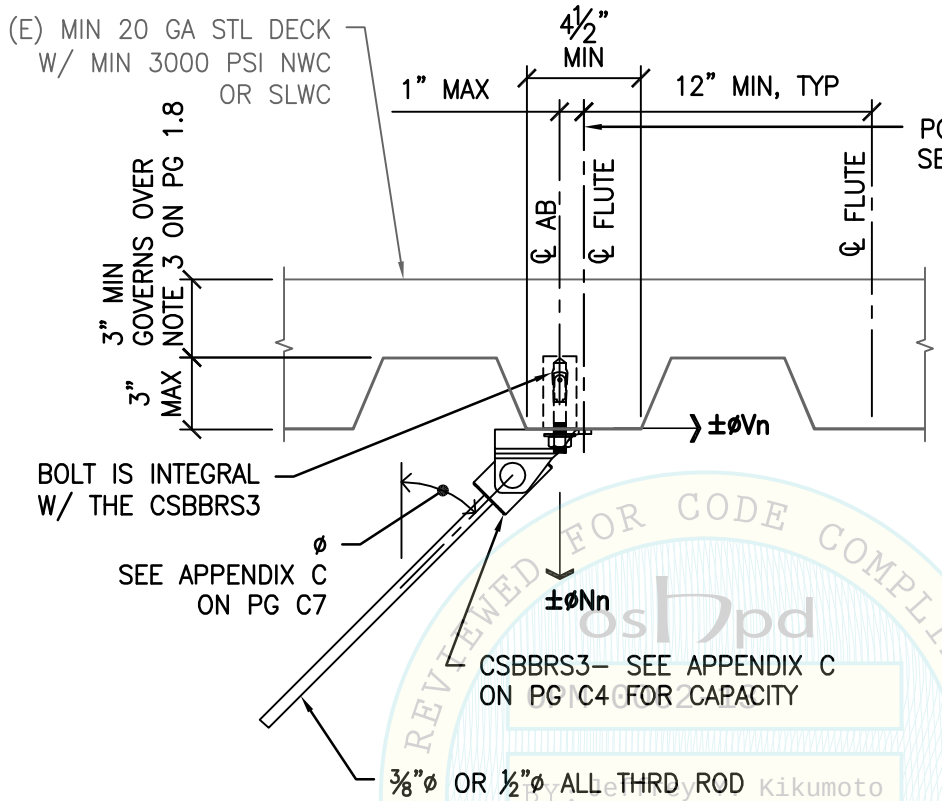
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTE:
WHEN ATTACHING TO CONC FILL OVER MTL DECK, POWER–SNAKE+™ MUST BE INSTALLED IN LOWER FLUTE OF DECK.

CASE 1 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)	
	⅜"ø
SHEAR (øVn)	462#
TENSION (øNn)	524#

CASE 1 TABLE NOTES:

1. VALUES ARE GIVEN FOR SLWC & ARE CONSERVATIVE FOR NWC.
2. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0).
3. SEE GENERAL NOTES & HOW TO USE THIS PRE–APPROVAL.
4. VALUES ARE GIVEN FOR ANCHORS. HOWEVER, ALL THRD ROD MAY CONTROL THE CAPACITY OF THE RESTRAINT ASSEMBLY.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBBRS3 CASE 1 - UNDERSIDE OF METAL DECK W/ CONCRETE FILL

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
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Job No:	17020
Date:	08-18-2017
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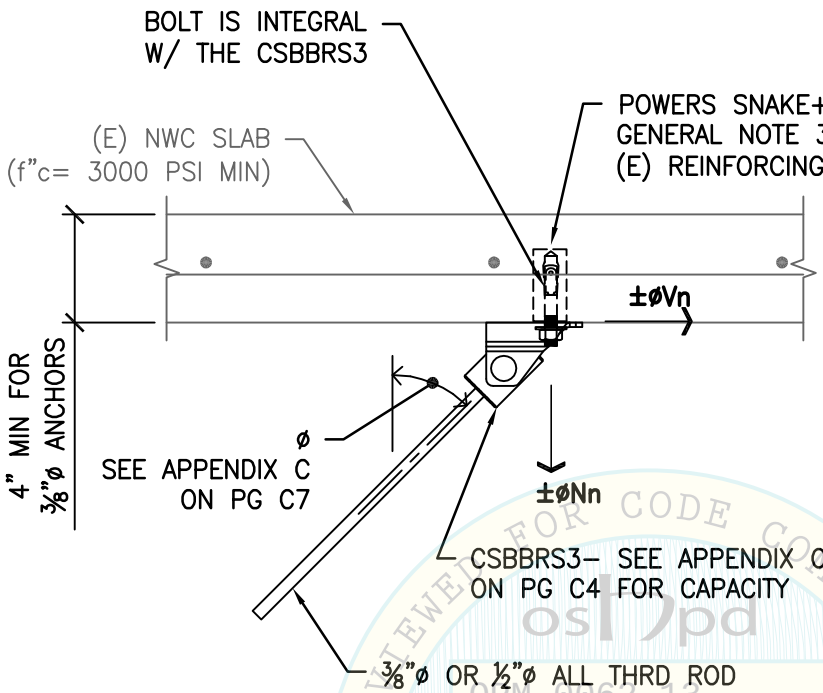
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



CASE 2 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)	
	⅜"ø
SHEAR (øVn)	462#
TENSION (øNn)	564#

CASE 2 TABLE NOTES:

1. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0).
2. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.
3. VALUES ARE GIVEN FOR ANCHORS. HOWEVER, ALL THRD ROD MAY CONTROL THE CAPACITY OF THE RESTRAINT ASSEMBLY.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBBRS3 CASE 2 - UNDERSIDE OF CONCRETE FLOOR OR ROOF

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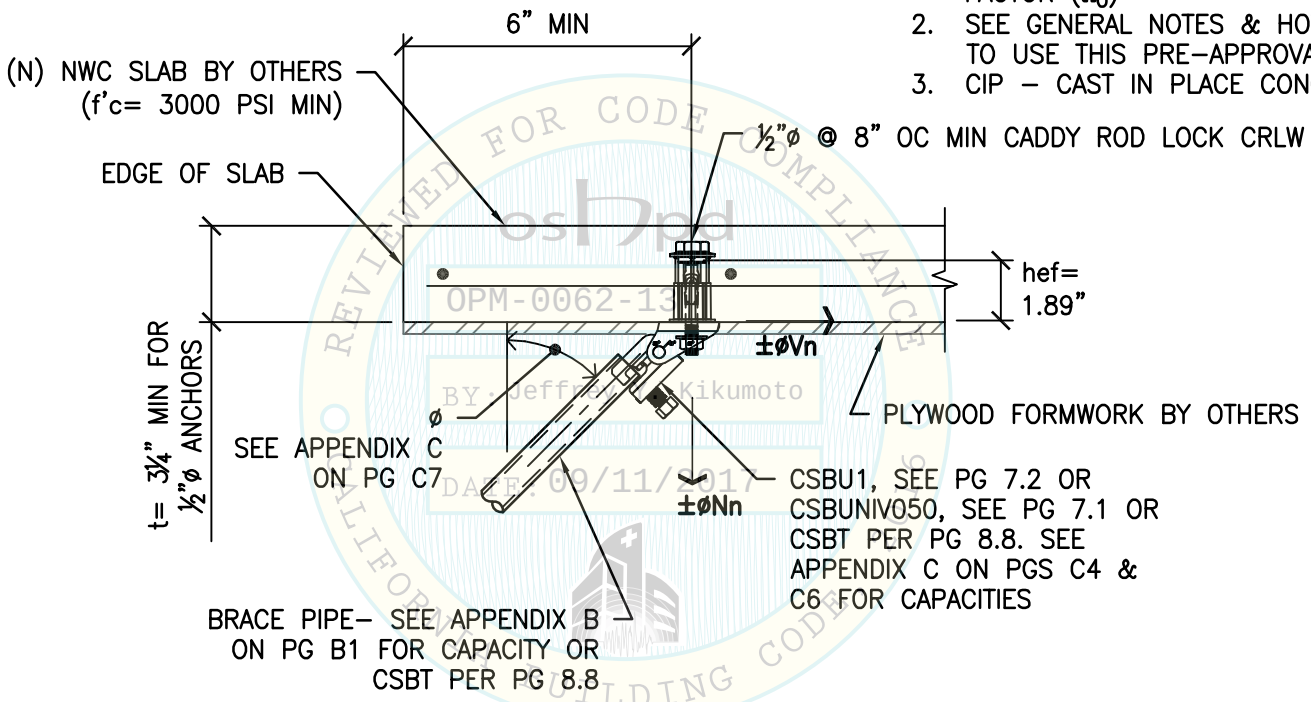
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

CASE 4 SINGLE INSERT CAPACITY AT LRFD (SEE NOTES)		
DIA	½"ø	
	t= 3¼"	t= 4½"
SHEAR (øVn)	1640#	1793#
TENSION (øNn)	1665#	1665#

CASE 4 TABLE NOTES:

1. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω_0)
2. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.
3. CIP – CAST IN PLACE CONC.



NOTES:

1. SPECIALTY INSERTS INSTALLED IN NWC SHALL BE CADDY ROD LOCK PLYWOOD FORM (CRLW) HEADED CAST-IN SPECIALTY INSERTS IN CRACKED CONCRETE AS NOTED ON THIS DWG, COMPLYING W/ ESR-3864 ISSUED MAY 2017.
2. INSTALLATION SHALL BE IN ACCORDANCE W/ THE REQUIREMENTS OF THE ICC-ES EVALUATION REPORT FOR THE SPECIFIED ANCHOR.

THIS IS A NEW CASE

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBU1 CASE 4 - UNDERSIDE OF CIP CONCRETE FLOOR OR ROOF

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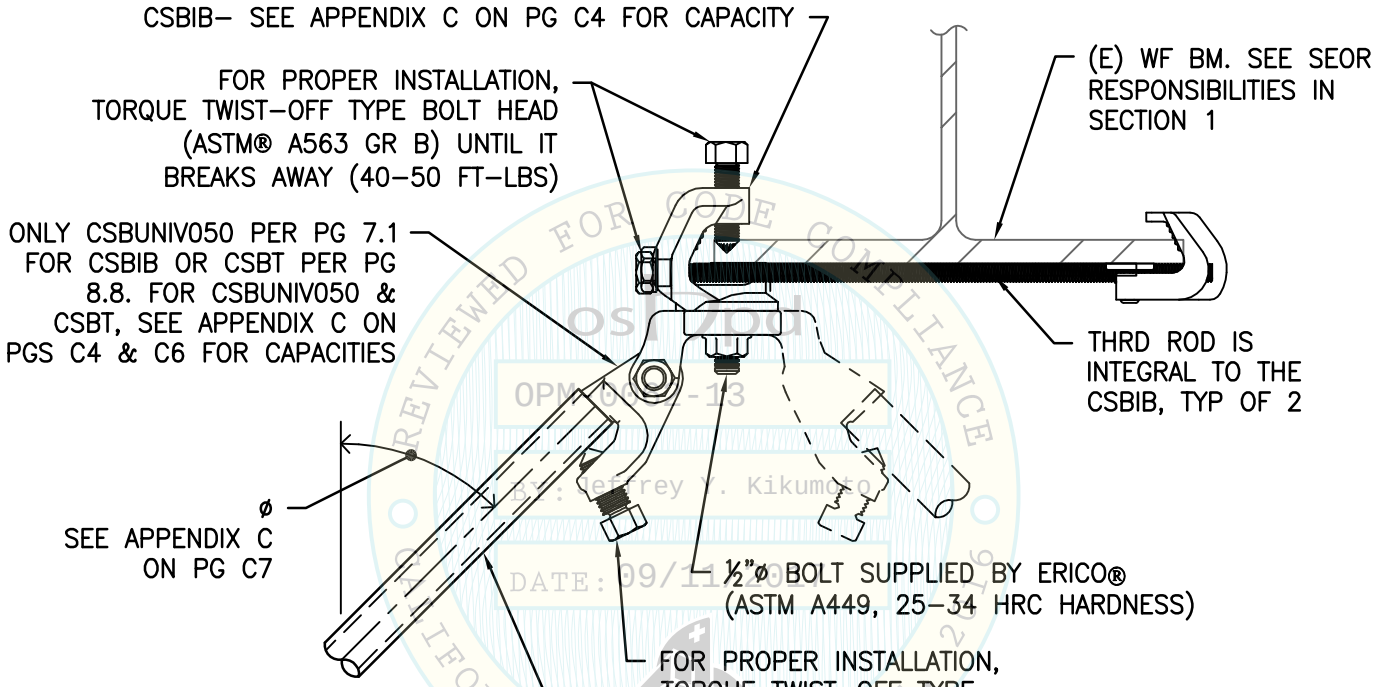
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

PART NUMBER	FLANGE THICKNESS	FLANGE WIDTH
CSBIB075085	¼" TO ¾"	4" TO 8½"
CSBIB075145	¼" TO ¾"	8½" TO 14½"
CSBIB125180	¾" TO 1¼"	4" TO 18"



NOTE:
SEE APPENDIX C FOR HORIZ CAPACITY F_H OF CSBIB AT ALLOWABLE STRESS DESIGN.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 6.15.

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBIB - BOTTOM FLANGE OF WIDE FLANGE BEAM

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Job No:	17020
Date:	08-18-2017
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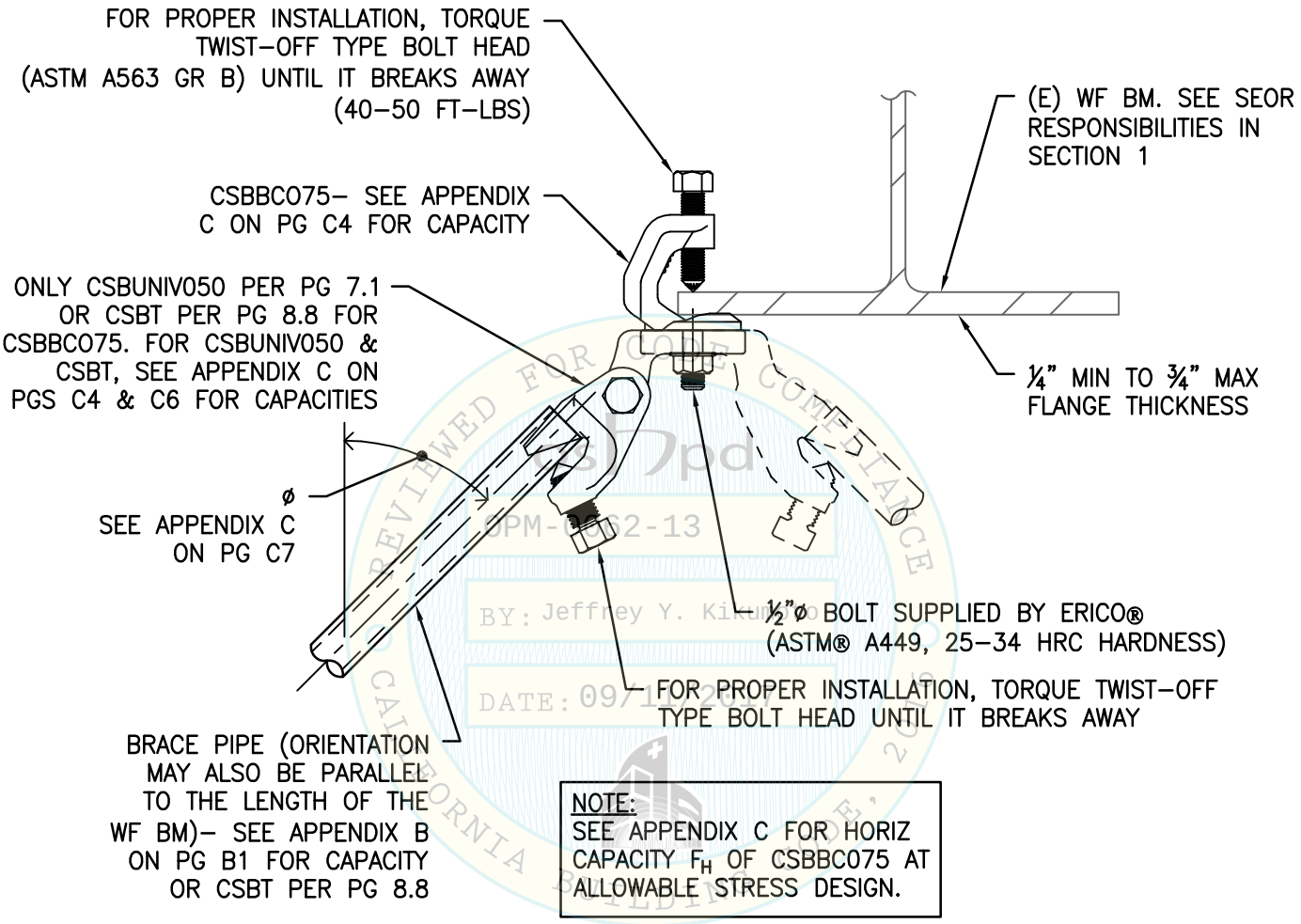
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTE:
SEE APPENDIX C FOR HORIZ CAPACITY F_H OF CSBBC075 AT ALLOWABLE STRESS DESIGN.

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 6.14.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBBC075 - BOTTOM FLANGE OF WIDE FLANGE BEAM

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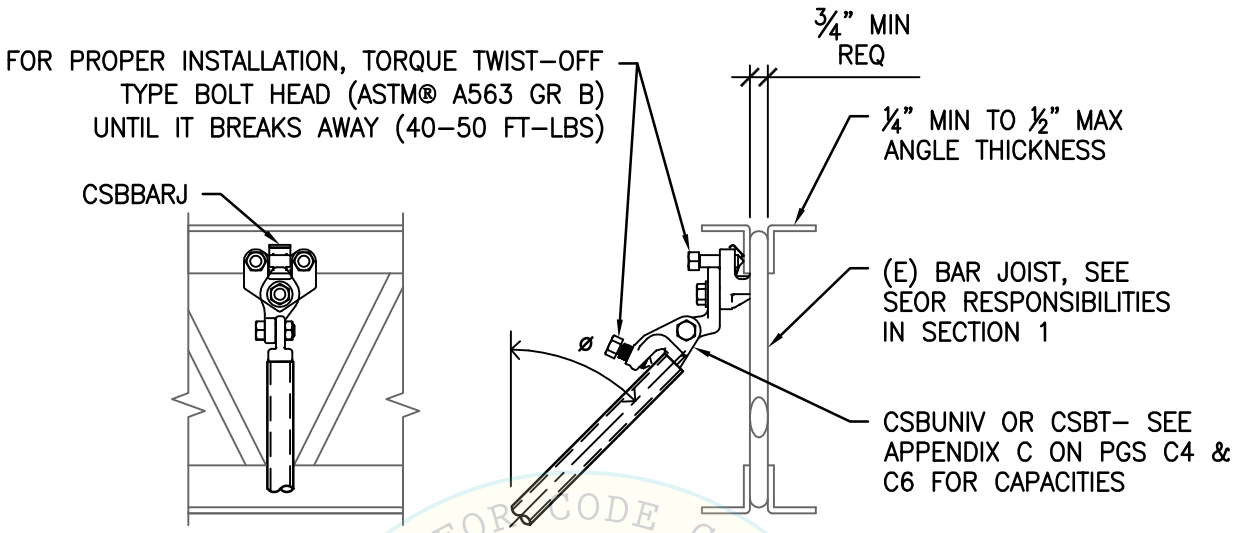
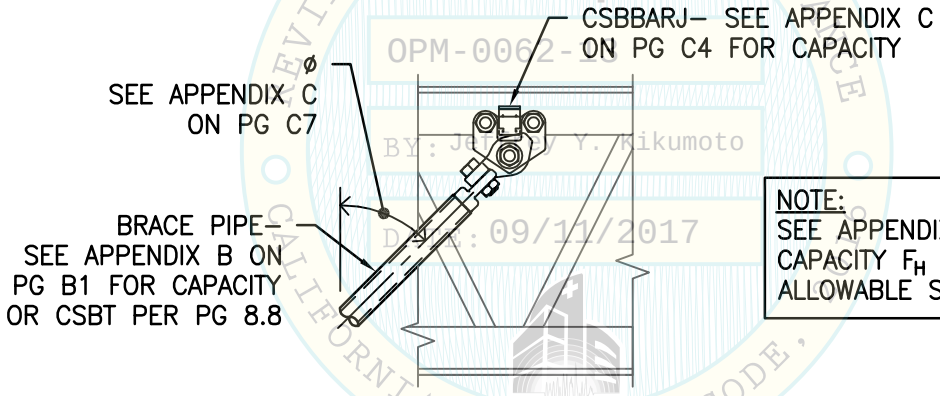
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



BRACE PERP TO JOIST

BRACE PERP TO JOIST



NOTE:
SEE APPENDIX C FOR HORIZ CAPACITY F_H OF CSBBARJ AT ALLOWABLE STRESS DESIGN.

BRACE PARALLEL TO JOIST

SIDE ATTACHMENT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 6.11.

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBBARJ - TOP CHORD OF OPEN WEB JOIST SIDE INSTALL

CYS STRUCTURAL ENGINEERS, INC.
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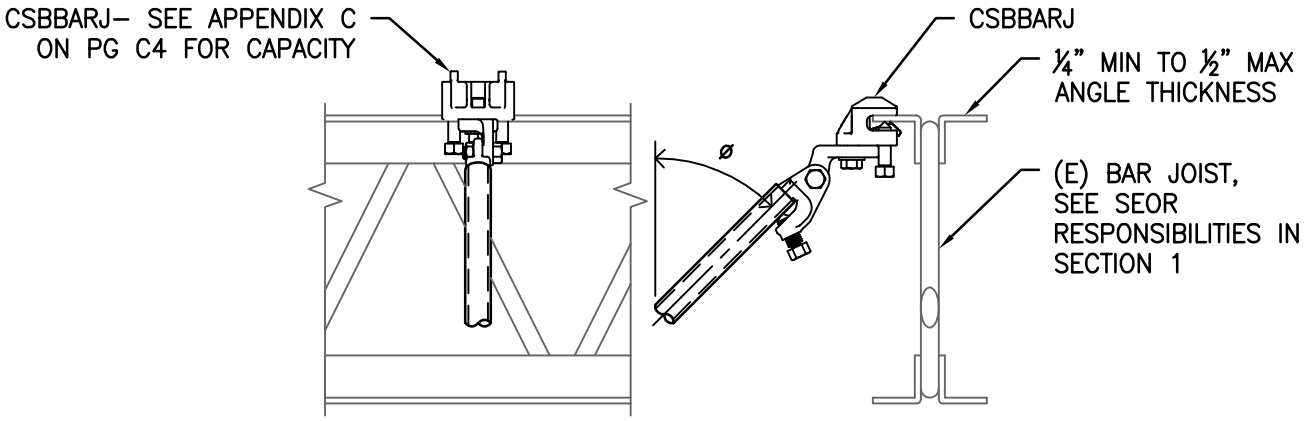
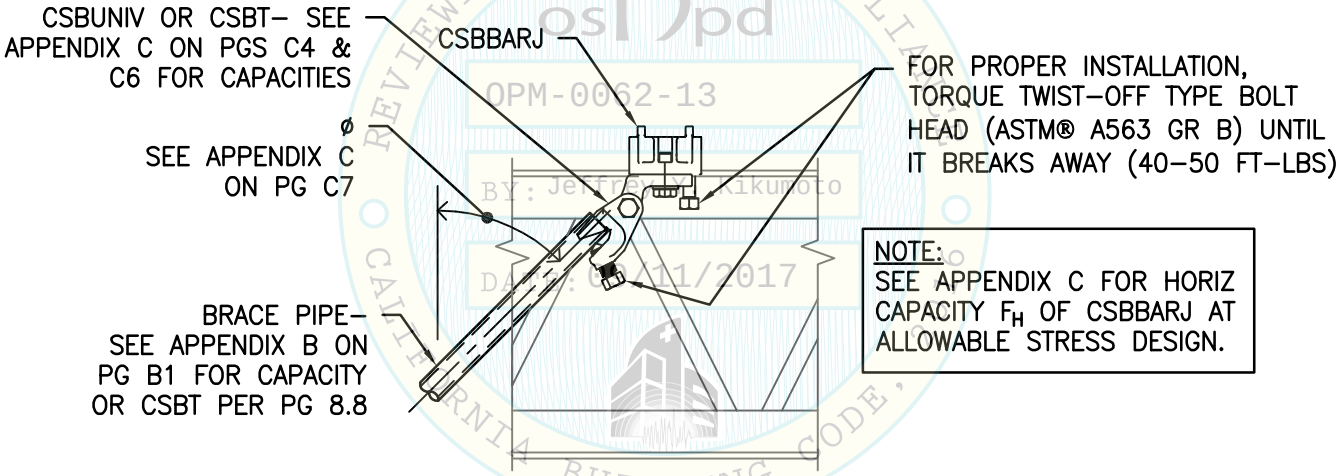
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



BRACE PERP TO JOIST **BRACE PERP TO JOIST**



NOTE:
SEE APPENDIX C FOR HORIZ CAPACITY F_H OF CSBBARJ AT ALLOWABLE STRESS DESIGN.

BRACE PARALLEL TO JOIST

TOP FLANGE ATTACHMENT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 6.12.

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBBARJ - TOP CHORD OF OPEN WEB JOIST TOP INSTALL

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2495 NATOMAS PARK DRIVE, SUITE 650
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Job No:	17020
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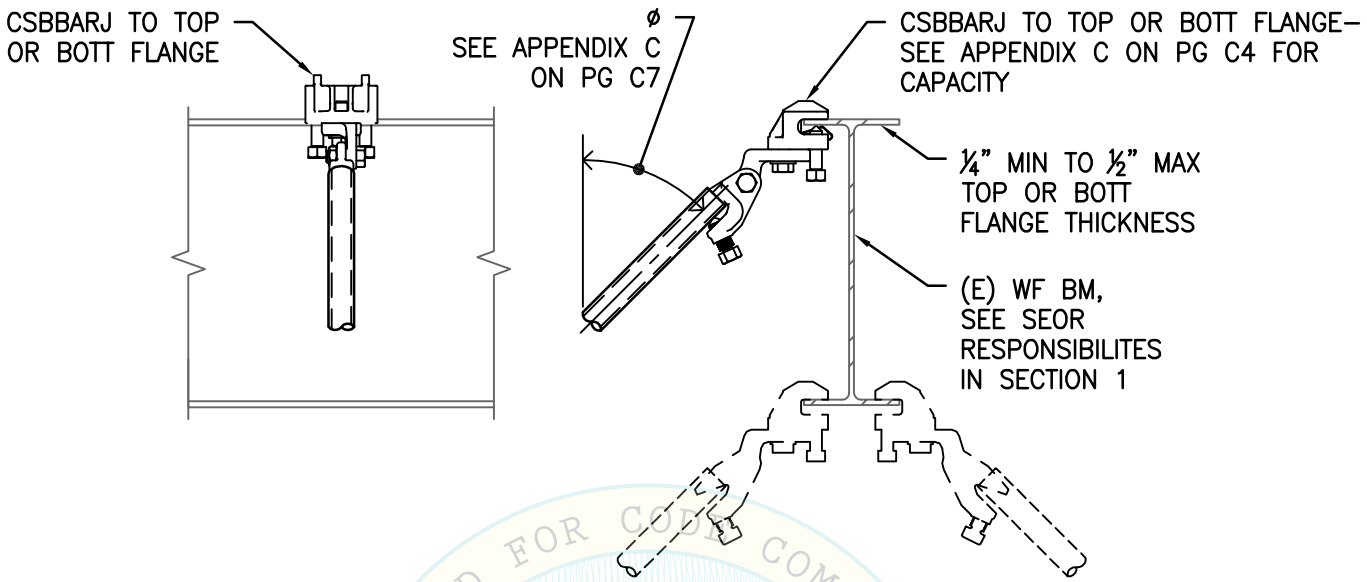
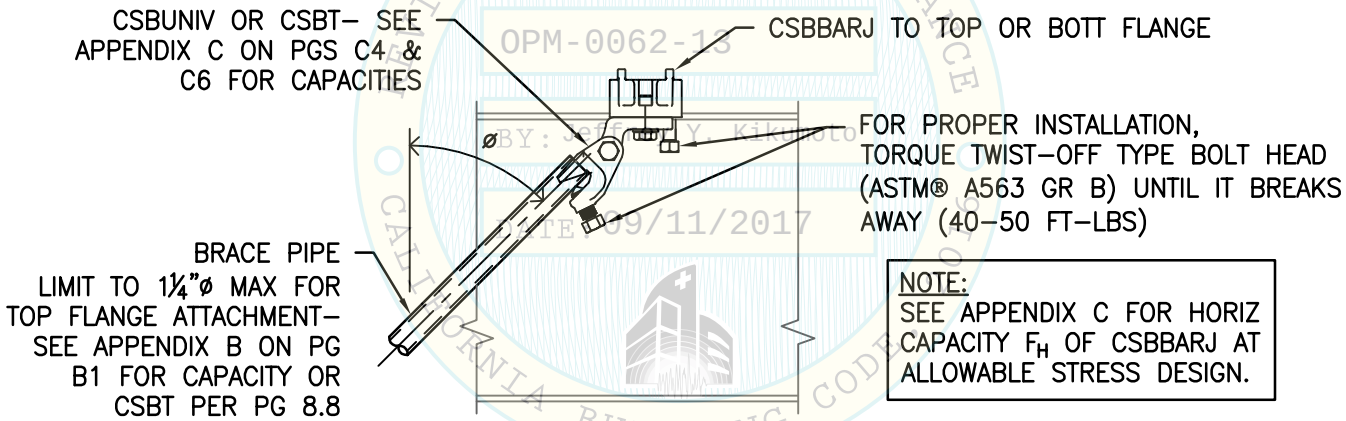
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



BRACE PERP TO BM **BRACE PERP TO BM**



NOTE:
SEE APPENDIX C FOR HORIZ CAPACITY F_H OF CSBBARJ AT ALLOWABLE STRESS DESIGN.

BRACE PARALLEL TO BM

REGISTERED PROFESSIONAL ENGINEER DIETER T SIEBALD No. S4346 STRUCTURAL STATE OF CALIFORNIA

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 6.10.

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBBARJ - TOP OR BOTTOM FLANGE OF WIDE FLANGE BEAM

CYS STRUCTURAL ENGINEERS, INC.
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SACRAMENTO, CA 95833
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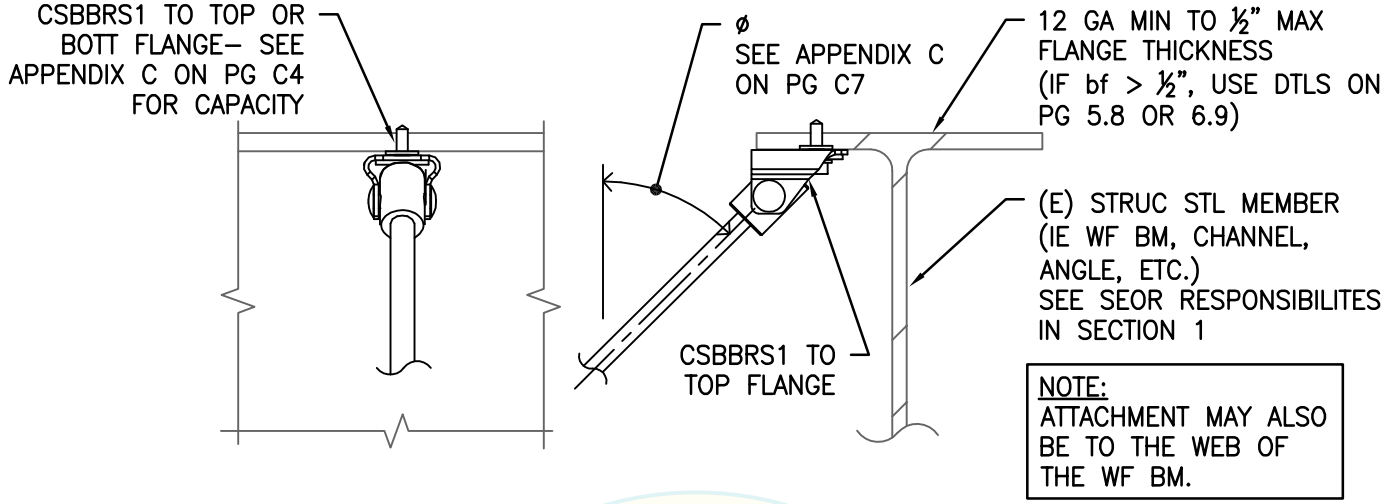
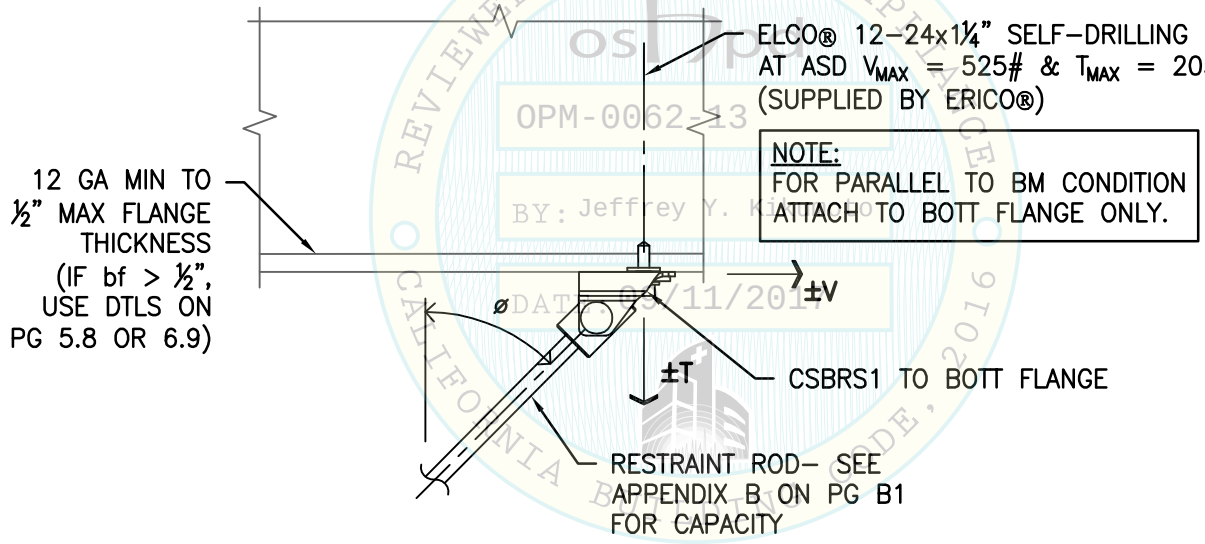
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



RESTRAINT PERP TO BM

RESTRAINT PERP TO BM



RESTRAINT PARALLEL TO BM

NOTE:
SEE APPENDIX C FOR HORIZ CAPACITY F_H OF CSBBRS1 AT ALLOWABLE STRESS DESIGN.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBBRS1 - TOP OR BOTTOM FLANGE OF WIDE FLANGE BEAM

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
www.cyseng.com

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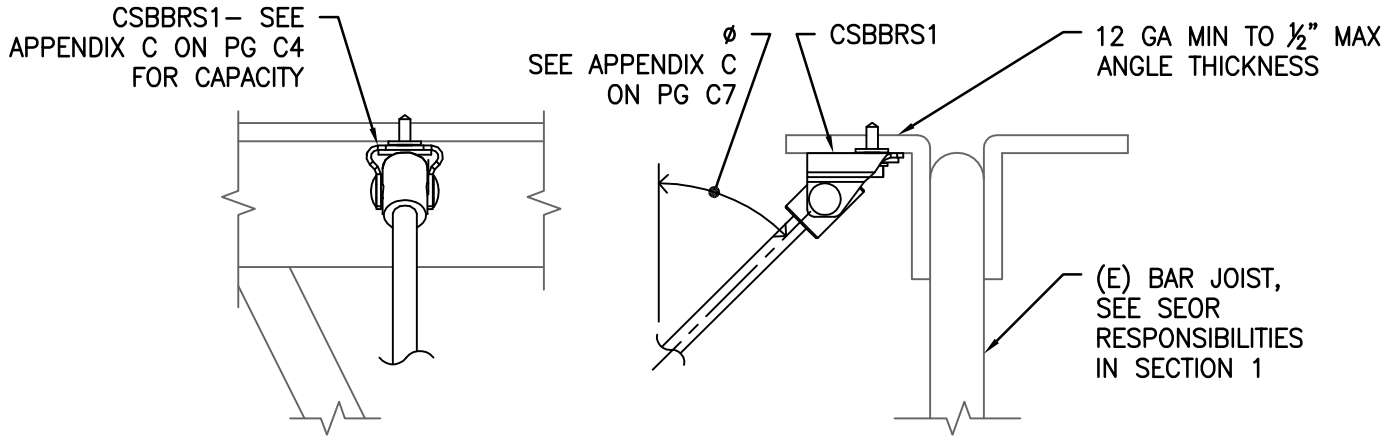
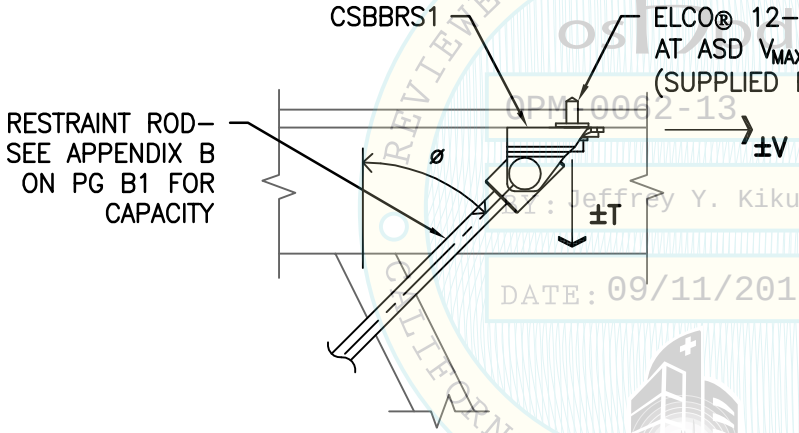
L:\Jobs17\17020 ERICO – Addendum to OPM-0062-13\STRU\S1.dwg Time:Aug18,2017-02:26pm Login:camachom Dimscale:1 LTScale:4

SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



RESTRAINT PERP TO JOIST

RESTRAINT PERP TO JOIST



NOTES:
1. SEE APPENDIX C FOR HORIZ CAPACITY F_H OF CSBBRS1 AT ALLOWABLE STRESS DESIGN.
2. THE CSBBRS1 MAY ALSO ATTACH TO THE VERT LEG OF THE JOIST TOP CHORD. DO NOT SCREW INTO JOIST WEB MEMBERS.
3. THE RESTRAINT ROD MAY GOVERN THE CAPACITY OF THE RESTRAINT ASSEMBLY.

RESTRAINT PARALLEL TO JOIST

TOP FLANGE ATTACHMENT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBBRS1 - TOP CHORD OF OPEN WEB JOIST

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
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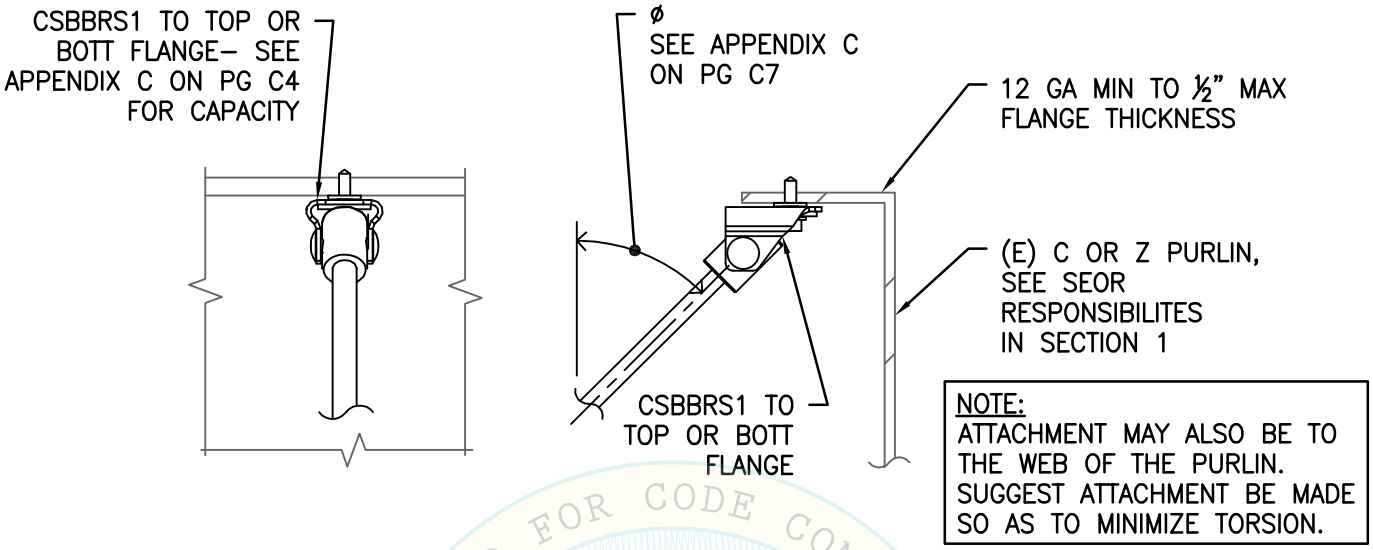
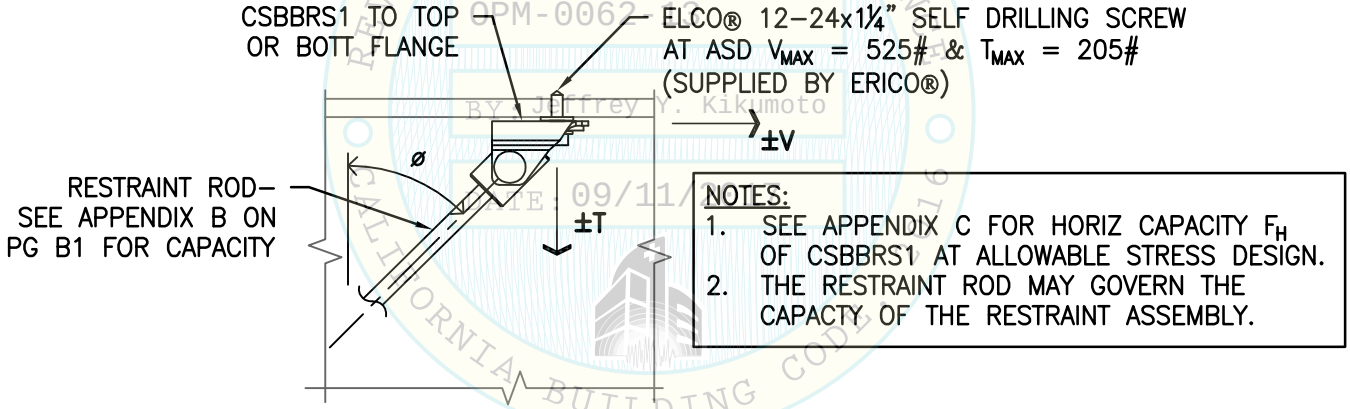
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



RESTRAINT PERP TO PURLIN

RESTRAINT PERP TO PURLIN



RESTRAINT PARALLEL TO PURLIN

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBBRS1 - PURLIN

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
www.cyseng.com

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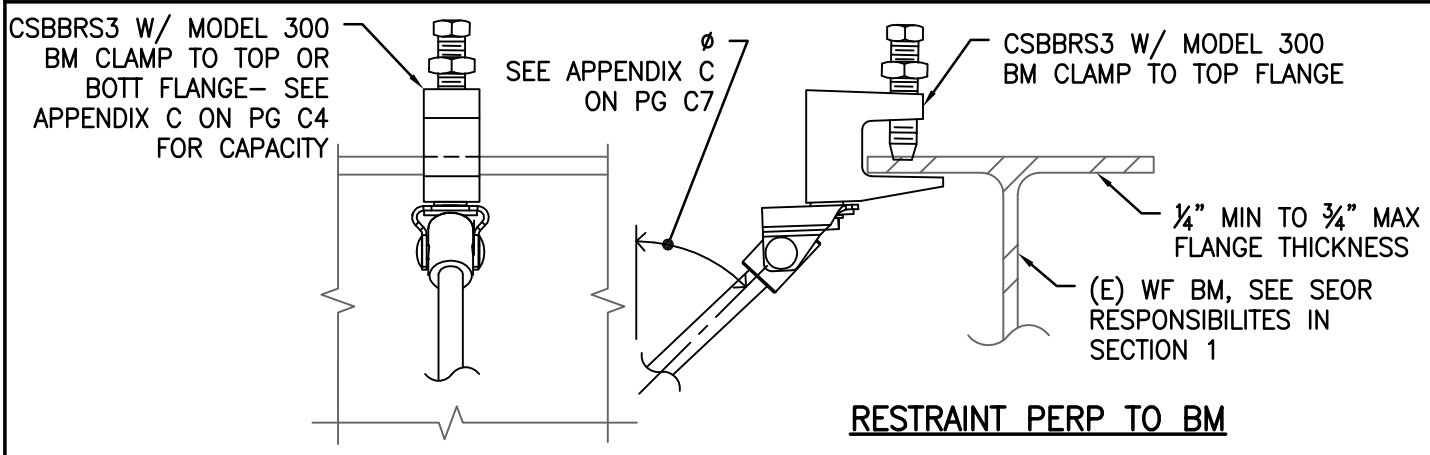
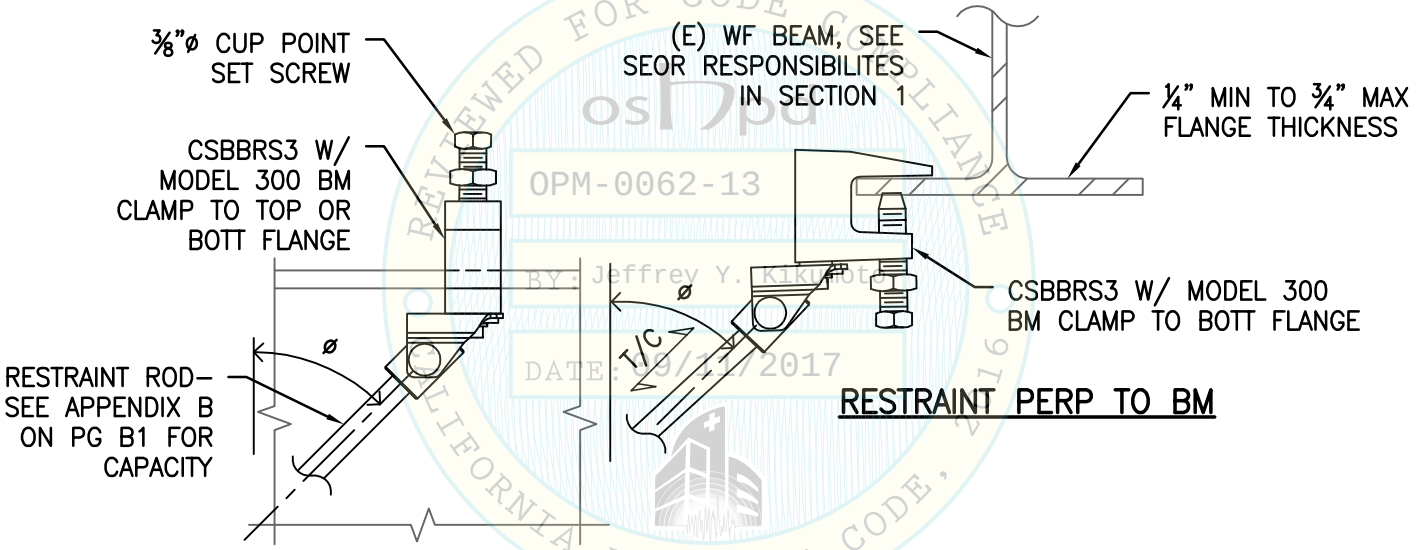
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



RESTRAINT PERP TO BM

RESTRAINT PERP TO BM



RESTRAINT PERP TO BM

RESTRAINT PARALLEL TO BEAM

NOTES:
1. SEE APPENDIX C FOR HORIZ CAPACITY F_H OF CSBBRS3 W/ MODEL 300 BM CLAMP AT ALLOWABLE STRESS DESIGN.
2. SET SCREW CAN BE EITHER UP OR DOWN ON TOP OR BOTT FLANGE.
3. THE RESTRAINT ROD MAY GOVERN THE CAPACITY OF THE RESTRAINT ASSEMBLY.
4. TORQUE SET SCREW TO 60 IN–LBS, TYP.

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBBRS3 - W/ MODEL 300 BM CLAMP TO TOP OR BOTT FLANGE OF WF BM

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
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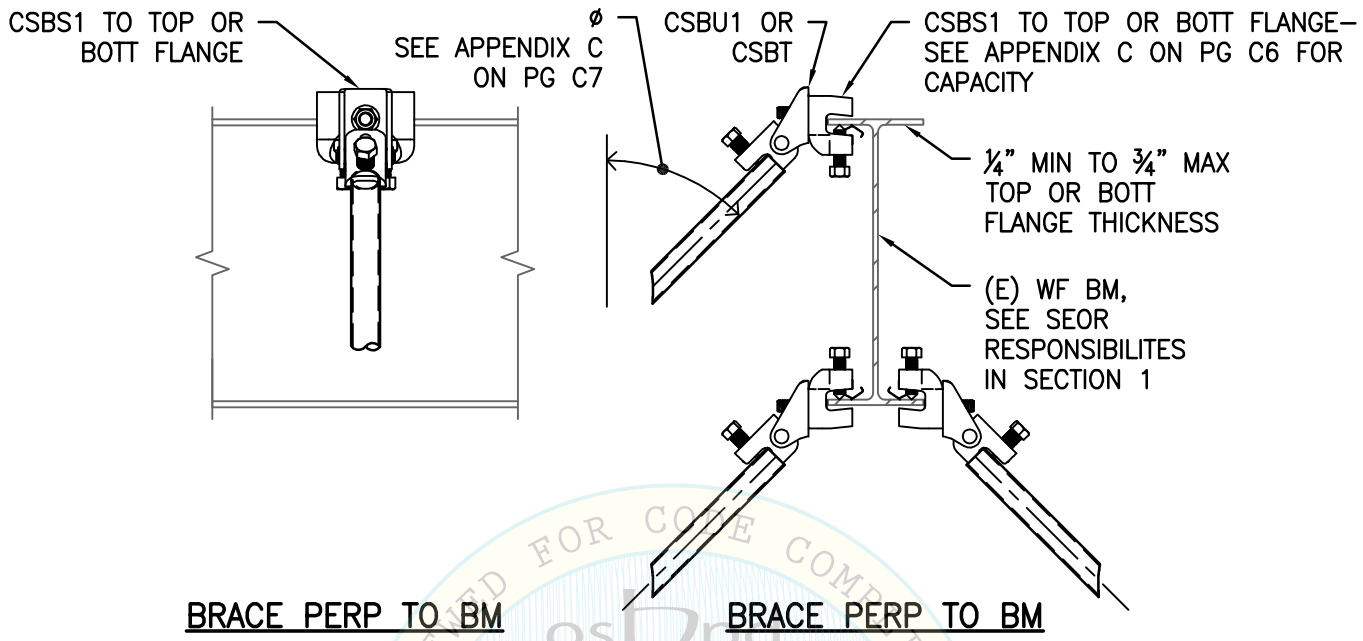
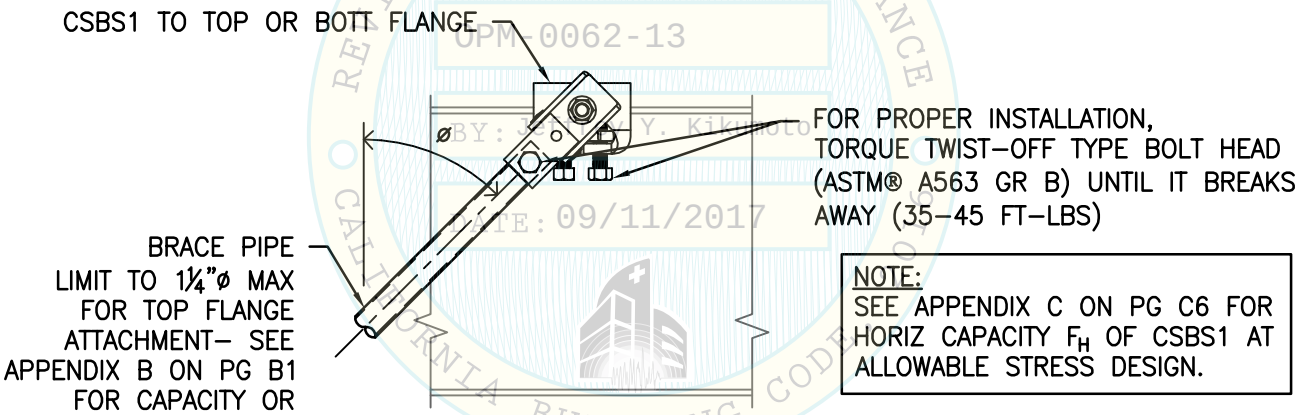
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



BRACE PERP TO BM

BRACE PERP TO BM



NOTE:
SEE APPENDIX C ON PG C6 FOR HORIZ CAPACITY F_H OF CSBS1 AT ALLOWABLE STRESS DESIGN.

BRACE PARALLEL TO BM

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A NEW PRODUCT

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBS1 - TOP OR BOTTOM FLANGE OF WIDE FLANGE BEAM

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
www.cyseng.com

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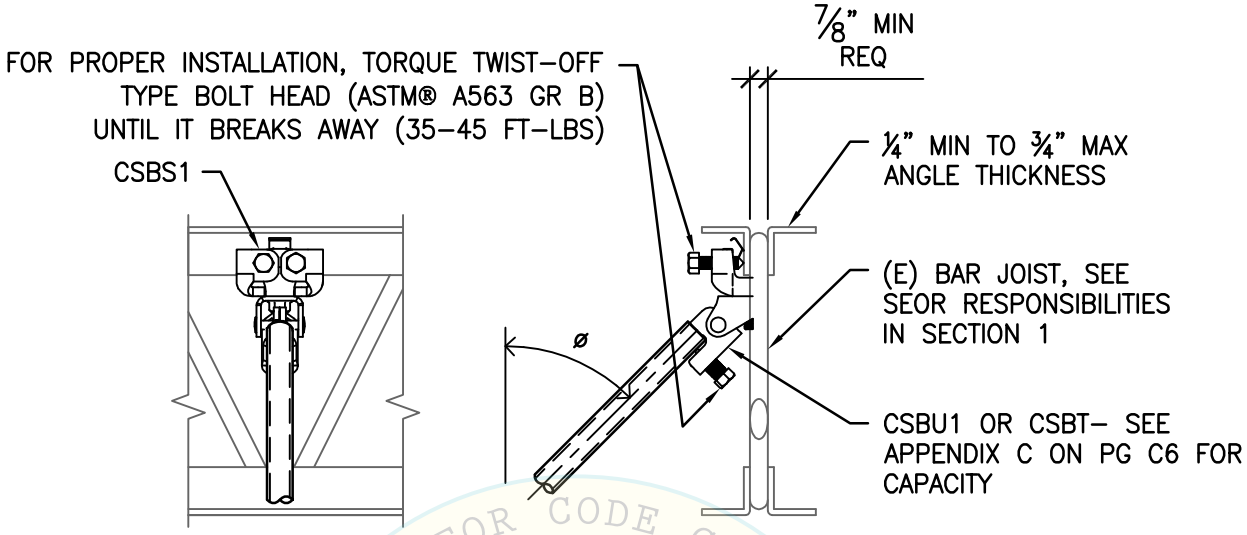
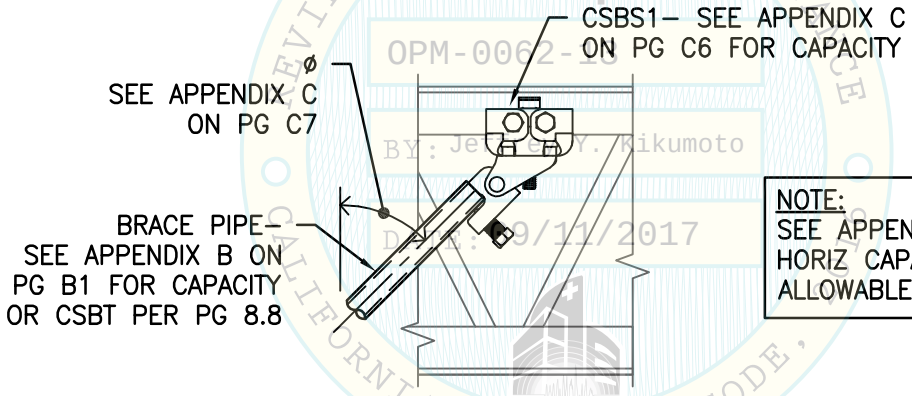
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



BRACE PERP TO JOIST

BRACE PERP TO JOIST



NOTE:
SEE APPENDIX C ON PG C6 FOR HORIZ CAPACITY F_H OF CSBS1 AT ALLOWABLE STRESS DESIGN.

BRACE PARALLEL TO JOIST

SIDE ATTACHMENT

THIS IS A NEW PRODUCT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBS1 - TOP CHORD OF OPEN WEB JOIST SIDE INSTALL

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
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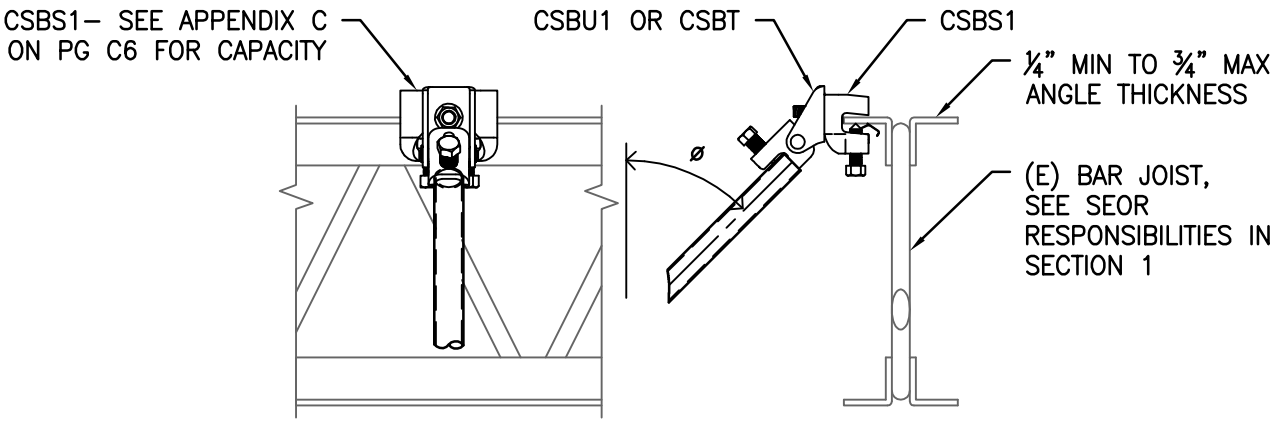
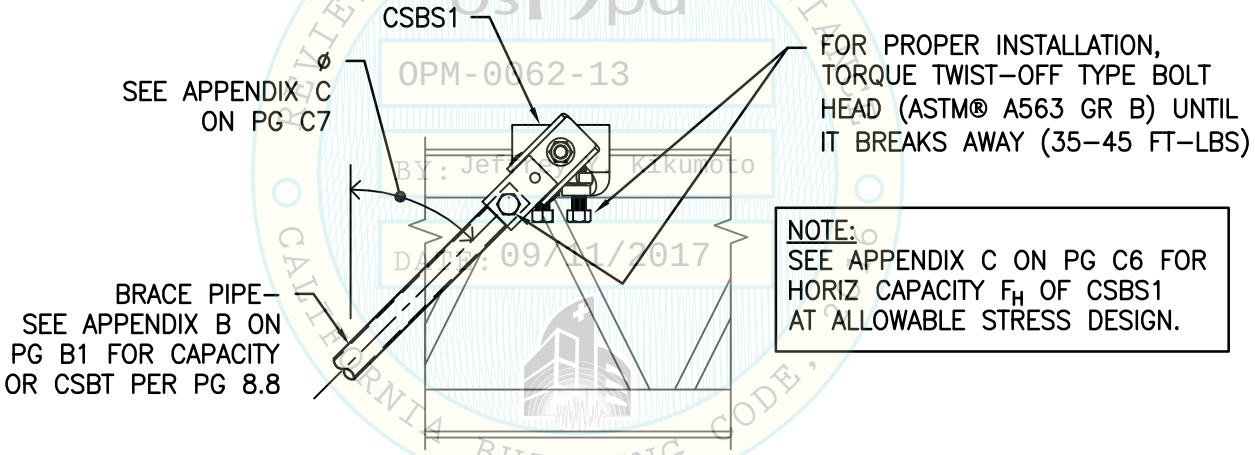
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



BRACE PERP TO JOIST BRACE PERP TO JOIST



BRACE PARALLEL TO JOIST

TOP FLANGE ATTACHMENT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A NEW PRODUCT

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBS1 - TOP CHORD OF OPEN WEB JOIST TOP INSTALL

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
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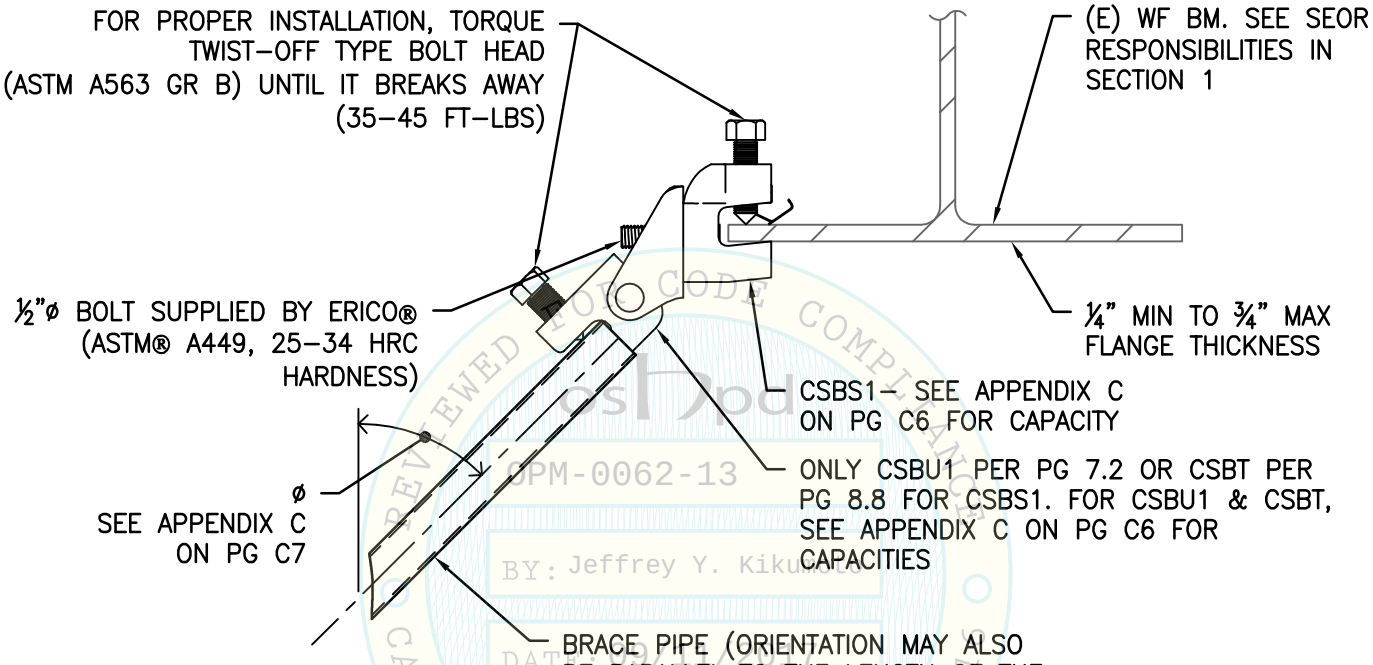
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:
1. SEE APPENDIX C ON PG C6 FOR HORIZ CAPACITY F_H OF CSBS1A AT ALLOWABLE STRESS DESIGN.
2. CSBS1A IS A PRE-ASSEMBLY OF CSBS1 & CSBU1.
3. PRE-ASSEMBLY CSBS1A CAN BE USED WHENEVER THE CSBS1 & CSBU1 ARE CALLED OUT.

THIS IS A NEW PRODUCT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBS1A - BOTTOM FLANGE OF WIDE FLANGE BEAM

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
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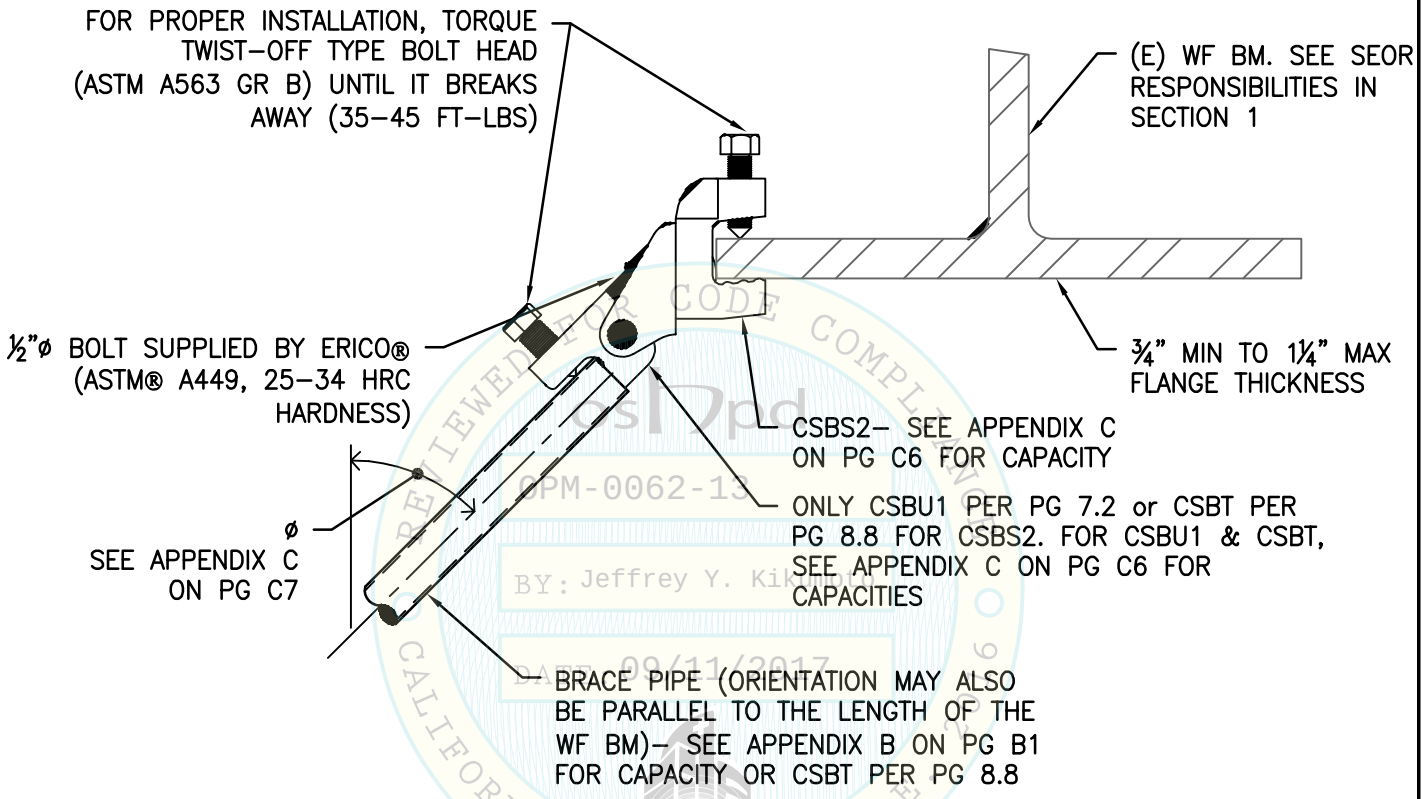
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTE:
SEE APPENDIX C ON PG C6 FOR HORIZ CAPACITY F_H OF CSBS2 AT ALLOWABLE STRESS DESIGN.

THIS IS A NEW PRODUCT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBS2 - BOTTOM FLANGE OF WIDE FLANGE BEAM

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
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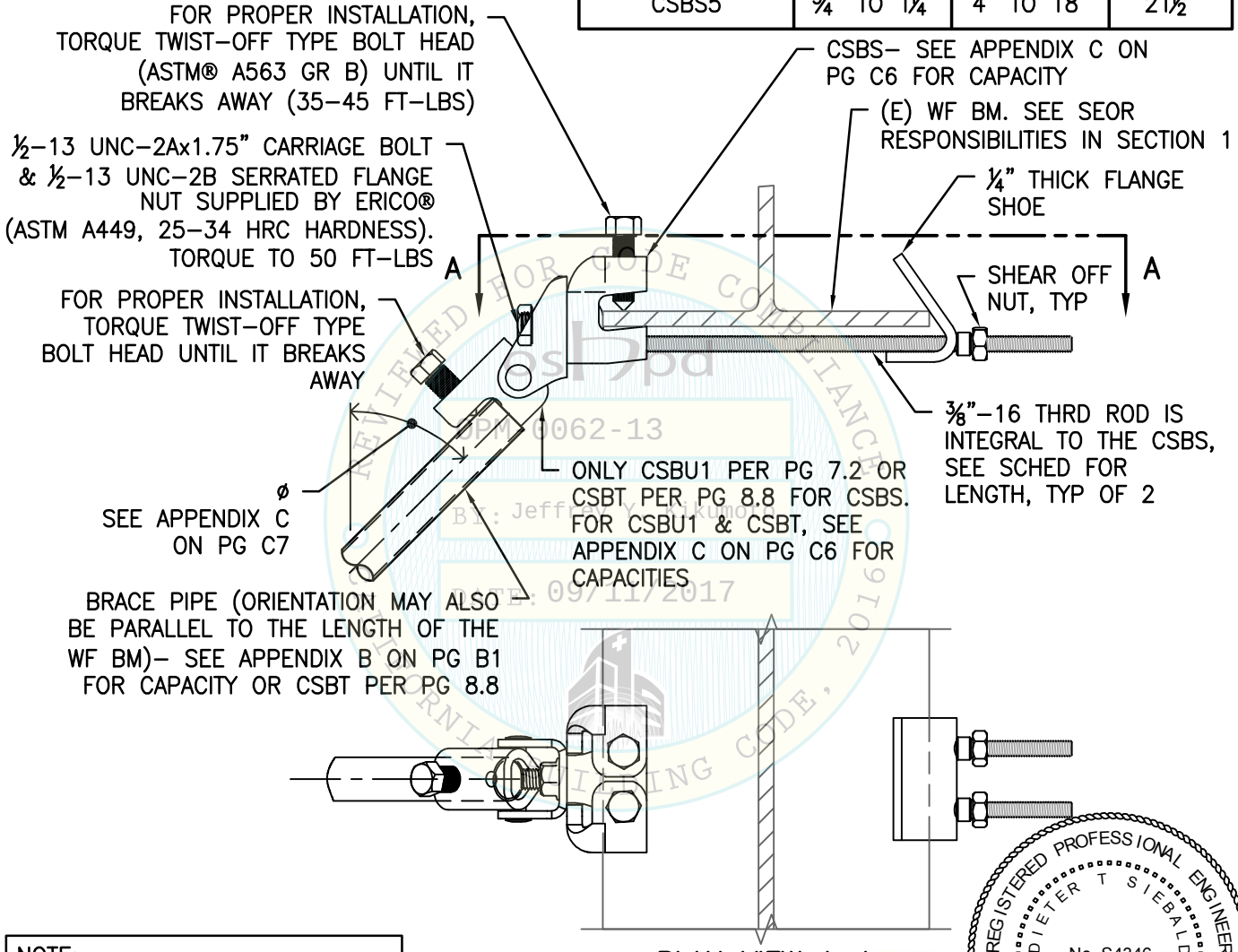
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

PART NUMBER	FLANGE THICKNESS	FLANGE WIDTH	THRD ROD
CSBS3	¼" TO ¾"	4" TO 8½"	12"
CSBS4	¼" TO ¾"	4" TO 14½"	17"
CSBS5	¾" TO 1¼"	4" TO 18"	21½"



PLAN VIEW A-A

NOTE:
SEE APPENDIX C ON PG C6 FOR HORIZ CAPACITY F_H OF CSBS AT ALLOWABLE STRESS DESIGN.

THIS IS A NEW PRODUCT

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBS3, 4 & 5 - BOTTOM FLANGE OF WIDE FLANGE BEAM

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
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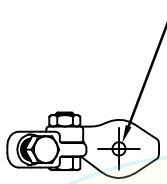
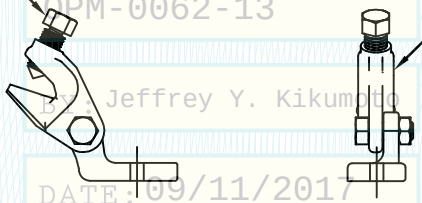


TOP VIEW

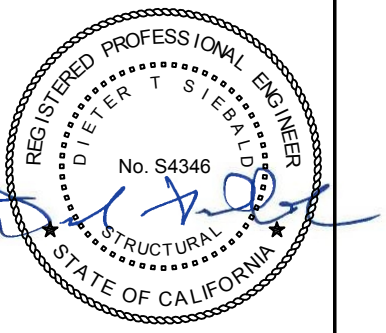
	BOLT HOLE DIA
CSBUNIV050	0.56"
CSBUNIV075	0.80"

FOR PROPER INSTALLATION, TORQUE TWIST-OFF TYPE BOLT HEAD UNTIL IT BREAKS AWAY



SIDE VIEWS

NOTE:
SEE APPENDIX C ON PG C4 FOR HORIZ CAPACITY F_H OF CSBUNIV AT ALLOWABLE STRESS DESIGN.



THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED.
FOR CORRESPONDING REPLACEMENT, SEE PG 7.2.

SHEET TITLE: SEISMIC BRACE SUPPORT DETAILS
CSBUNIV050 & CSBUNIV075 FOR ½" AND ¾" BOLTS

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
www.cyseng.com

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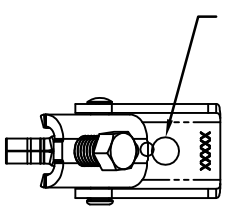
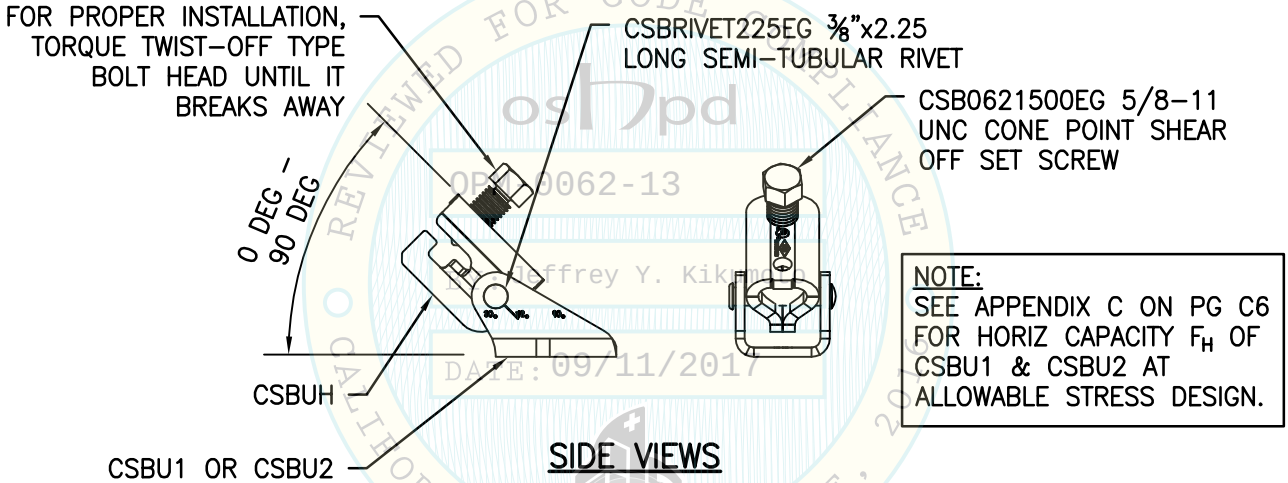


TOP VIEW

	BOLT HOLE DIA
CSBU1	0.56"
CSBU2	0.81"



SIDE VIEWS

NOTE:
SEE APPENDIX C ON PG C6 FOR HORIZ CAPACITY F_H OF CSBU1 & CSBU2 AT ALLOWABLE STRESS DESIGN.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

THIS IS A NEW PRODUCT

SHEET TITLE: SEISMIC BRACE SUPPORT DETAILS
CSBU1 & CSBU2 FOR ½" AND ¾" BOLTS

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
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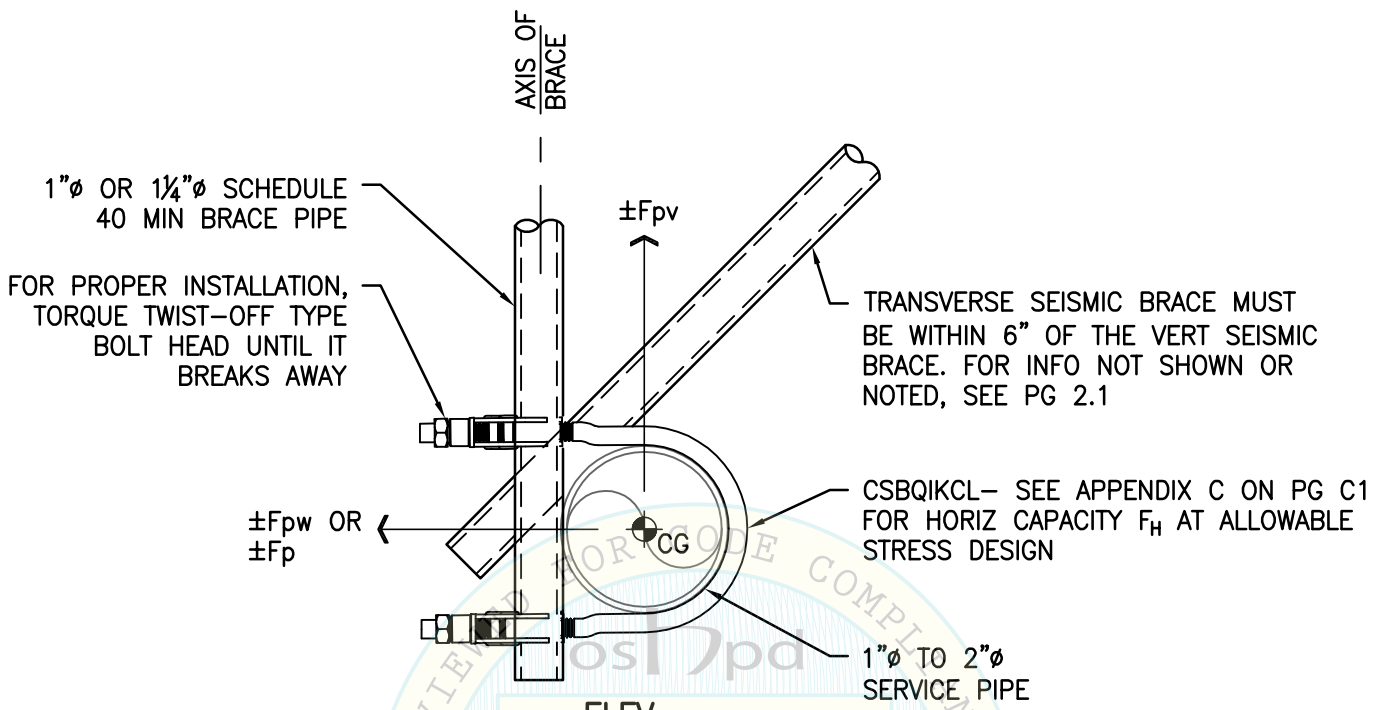
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

1. THE BRACE PIPE MAY BE ATTACHED TO THE SUPPORTING STRUCTURE W/ THE FOLLOWING ASSEMBLIES:
   A. CSBUNIV PER PGS 5.1 & 5.2
   B. CSBMA PER PGS 5.4 & 5.5
   C. CSBIB PER PG 6.1
   D. CSBBC075 PER PG 6.2
   E. CSBBARJ PER PGS 6.3, 6.4 & 6.5
2. FOR CONSTRUCTION TOLERANCE, SEE NOTE 3 ON PG 1.3.
3. USE ø=90° OF TRANSVERSE MODE (SEE APPENDIX "C" ON PG C7) FOR AXIAL CAPACITY OF COMPONENT.
4. FOR BRACE PIPE AXIAL CAPACITY, SEE APPENDIX "B" ON PG B1.
5. THIS VERT SEISMIC BRACE SHALL NOT BE USED AS A TYP SERVICE PIPE HANGER FOR LONG TERM GRAVITY LOADS.

SHEET TITLE: VERTICAL SEISMIC BRACE
CSBQIKCL WITH BRACE PIPE FOR 1"Ø TO 2"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
www.cyseng.com

Job No:	17020
Date:	08-18-2017
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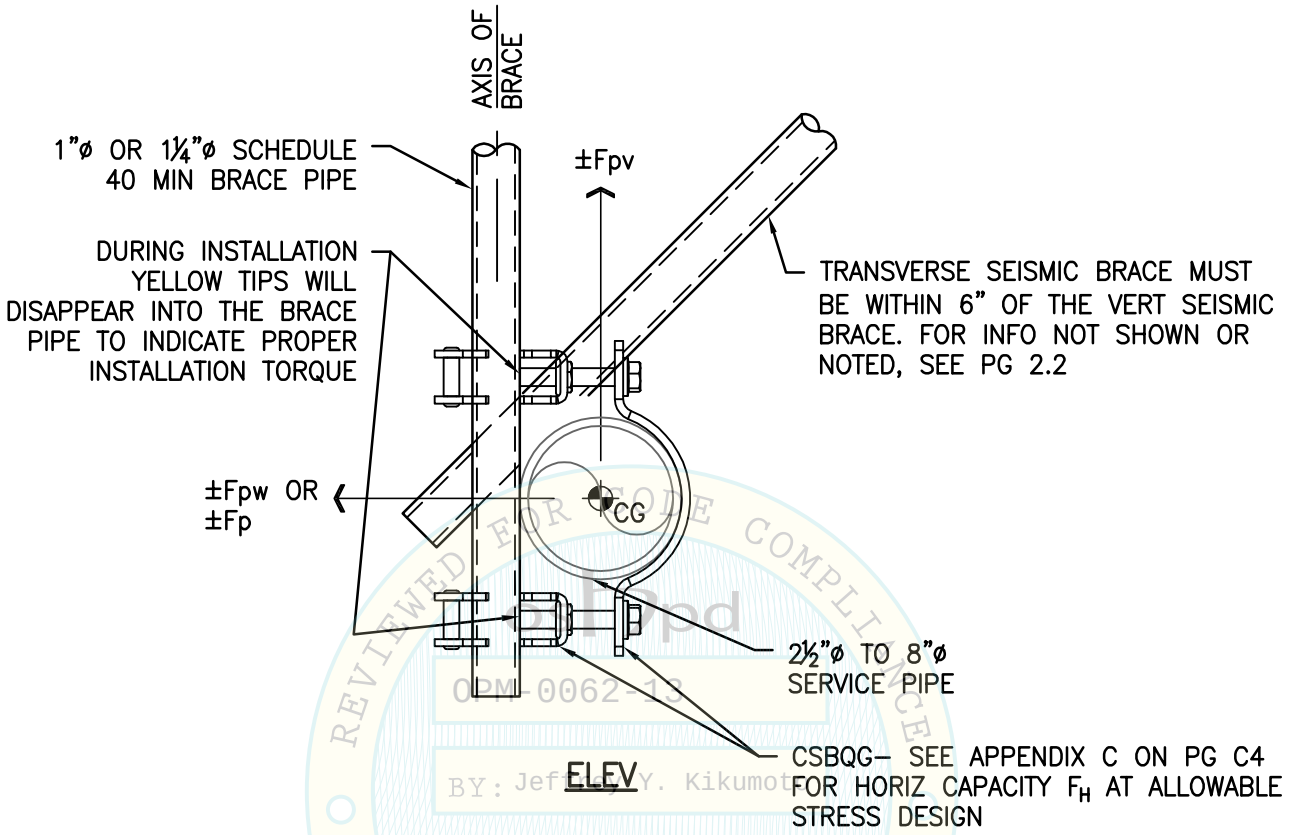
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

1. THE BRACE PIPE MAY BE ATTACHED TO THE SUPPORTING STRUCTURE W/ THE FOLLOWING ASSEMBLIES:
   A. CSBUNIV PER PGS 5.1 & 5.2
   B. CSBMA PER PGS 5.4 & 5.5
   C. CSBIB PER PG 6.1
   D. CSBBC075 PER PG 6.2
   E. CSBBARJ PER PGS 6.3, 6.4 & 6.5
2. FOR CONSTRUCTION TOLERANCE, SEE NOTE 3 ON PG 1.3.
3. USE ø=90° OF TRANSVERSE MODE (SEE APPENDIX "C" ON PG C7) FOR AXIAL CAPACITY OF COMPONENT.
4. FOR BRACE PIPE AXIAL CAPACITY, SEE APPENDIX "B" ON PG B1.
5. THIS VERT SEISMIC BRACE SHALL NOT BE USED AS A TYP SERVICE PIPE HANGER FOR LONG TERM GRAVITY LOADS.

SHEET TITLE: VERTICAL SEISMIC BRACE
CSBQG WITH BRACE PIPE FOR 2½"Ø TO 8"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
www.cyseng.com

Job No:	17020
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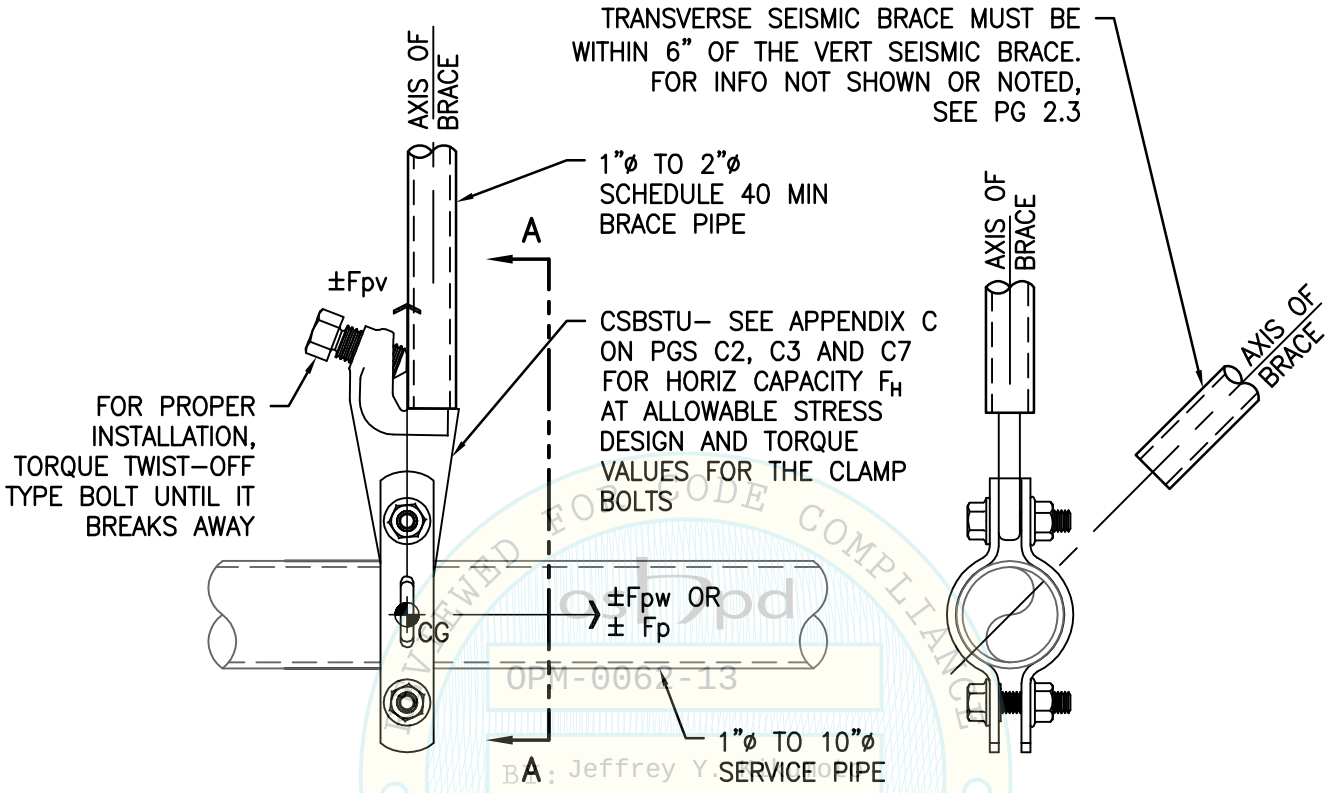
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

1. THE BRACE PIPE MAY BE ATTACHED TO THE SUPPORTING STRUCTURE W/ THE FOLLOWING ASSEMBLIES:
   - A. CSBUNIV PER PGS 5.1 & 5.2
   - B. CSBMA PER PGS 5.4 & 5.5
   - C. CSBIB PER PG 6.1
   - D. CSBBC075 PER PG 6.2
   - E. CSBBARJ PER PGS 6.3, 6.4 & 6.5
2. FOR CONSTRUCTION TOLERANCE, SEE NOTE 3 ON PG 1.3.
3. USE ø=90° OF TRANSVERSE MODE (SEE APPENDIX "C" ON PG C7) FOR AXIAL CAPACITY OF COMPONENT.
4. FOR BRACE PIPE AXIAL CAPACITY, SEE APPENDIX "B" ON PG B1.
5. THIS VERT SEISMIC BRACE MAY ALSO BE USED AS A TYP SERVICE PIPE HANGER FOR LONG TERM GRAVITY LOADS.

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 8.6.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: VERTICAL SEISMIC BRACE
CSBSTU WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833
TEL (916) 920-2020
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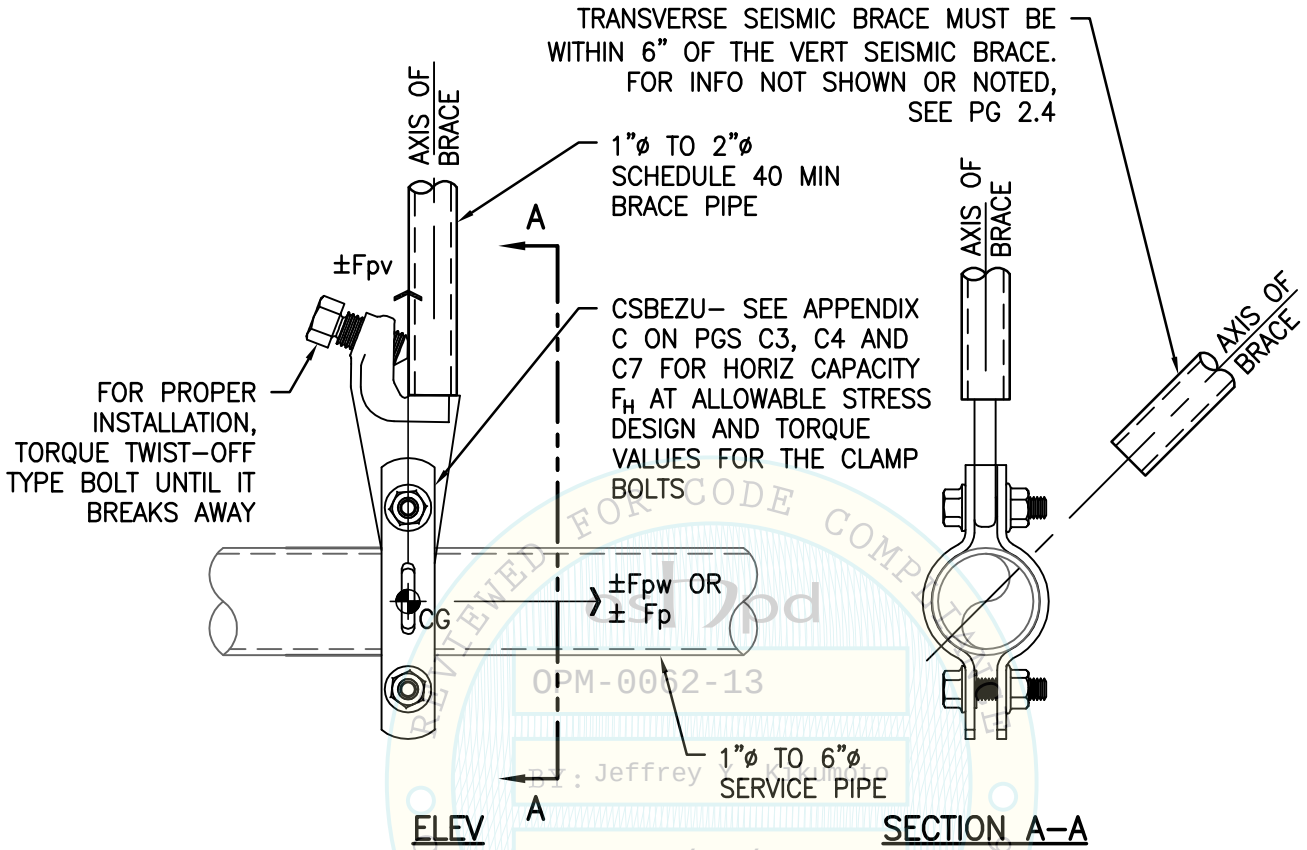
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

1. THE BRACE PIPE MAY BE ATTACHED TO THE SUPPORTING STRUCTURE W/ THE FOLLOWING ASSEMBLIES:
   A. CSBUNIV PER PGS 5.1 & 5.2
   B. CSBMA PER PGS 5.4 & 5.5
   C. CSBIB PER PG 6.1
   D. CSBBC075 PER PG 6.2
   E. CSBBARJ PER PGS 6.3, 6.4 & 6.5
2. FOR CONSTRUCTION TOLERANCE, SEE NOTE 3 ON PG 1.3.
3. USE ø=90° OF TRANSVERSE MODE (SEE APPENDIX "C" ON PG C7) FOR AXIAL CAPACITY OF COMPONENT.
4. FOR BRACE PIPE AXIAL CAPACITY, SEE APPENDIX "B" ON PG B1.
5. THIS VERT SEISMIC BRACE MAY ALSO BE USED AS A TYP SERVICE PIPE HANGER FOR LONG TERM GRAVITY LOADS.

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 8.6.

REGISTERED PROFESSIONAL ENGINEER
DIETER T SIEBALD
No. S4346
STRUCTURAL
STATE OF CALIFORNIA

SHEET TITLE: VERTICAL SEISMIC BRACE
CSBEZU WITH BRACE PIPE FOR 1"Ø TO 6"Ø SERVICE PIPE CONNECTION

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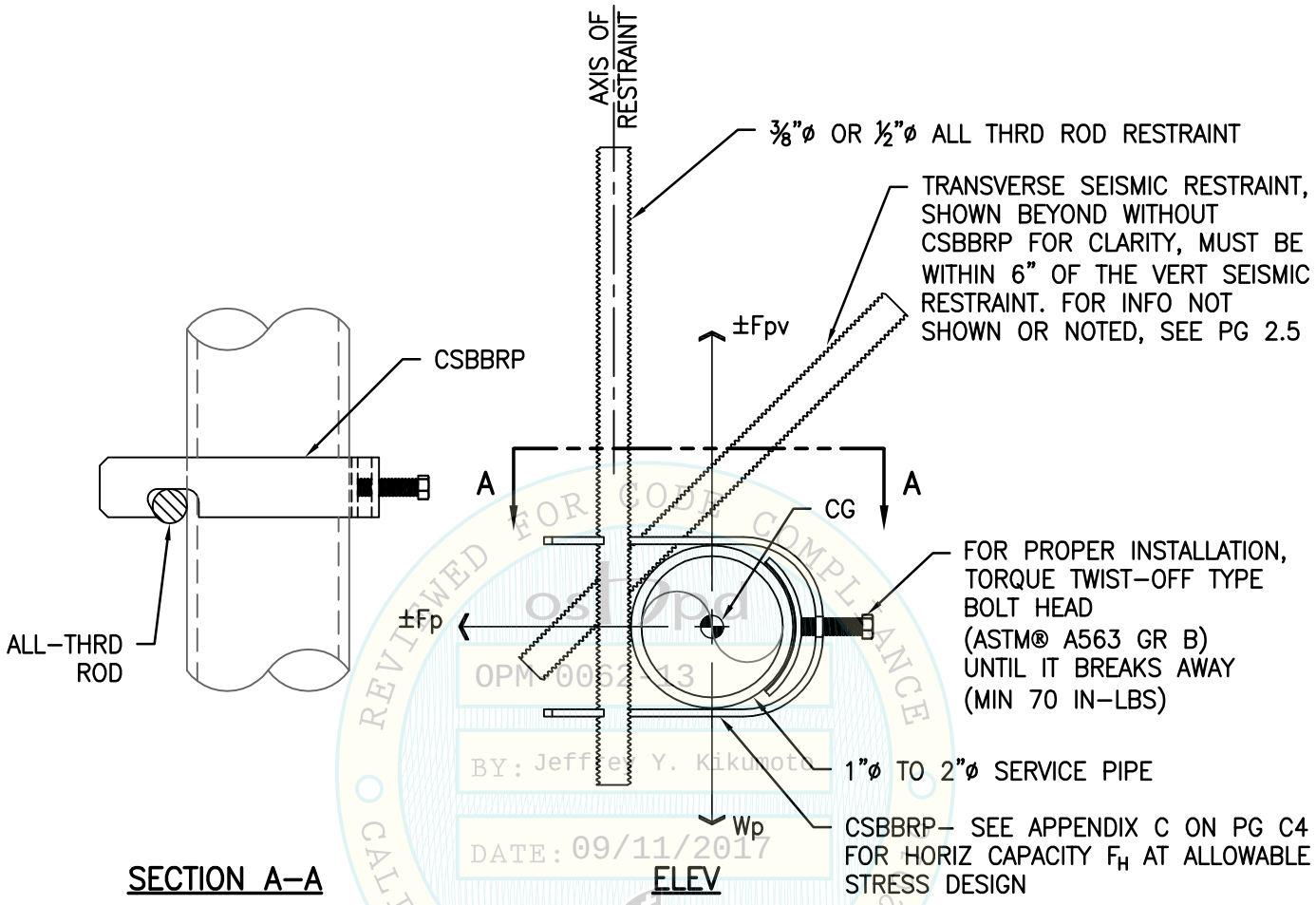
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

1. THE RESTRAINT ROD MAY BE ATTACHED TO THE SUPPORTING STRUCTURE W/ THE FOLLOWING ASSEMBLIES:
   A. CSBBRS1EG PER PGS 6.6, 6.7 & 6.8
   B. CSBBRS3EG PER PGS 5.6, 5.7
   C. CSBBRS3EG W/ MODEL 300 BM CLAMP PER PG 6.9
2. THE CSBBRP W/ RESTRAINT ROD IS A BRANCH LINE RESTRAINT DEVICE (NOT A BRACE). SEE NFPA® 13, SECTION 9.3.6.
3. FOR CONSTRUCTION TOLERANCE, SEE NOTE 3 ON PG 1.3.
4. USE ø=90° OF TRANSVERSE MODE (SEE APPENDIX "C" ON PG C7) FOR AXIAL CAPACITY OF COMPONENT.
5. FOR ROD RESTRAINT AXIAL CAPACITY, SEE APPENDIX "B" ON PG B1.
6. THIS VERT SEISMIC RESTRAINT MAY ALSO BE USED AS A TYP SERVICE PIPE HANGER FOR LONG TERM GRAVITY LOADS, HOWEVER NOT IN COMBINATION AS A SEISMIC RESTRAINT AND GRAVITY HANGER.

SHEET TITLE: VERTICAL SEISMIC RESTRAINT
CSBBRP WITH RESTRAINT ROD FOR 1"Ø TO 2"Ø SERVICE PIPE CONNECTION

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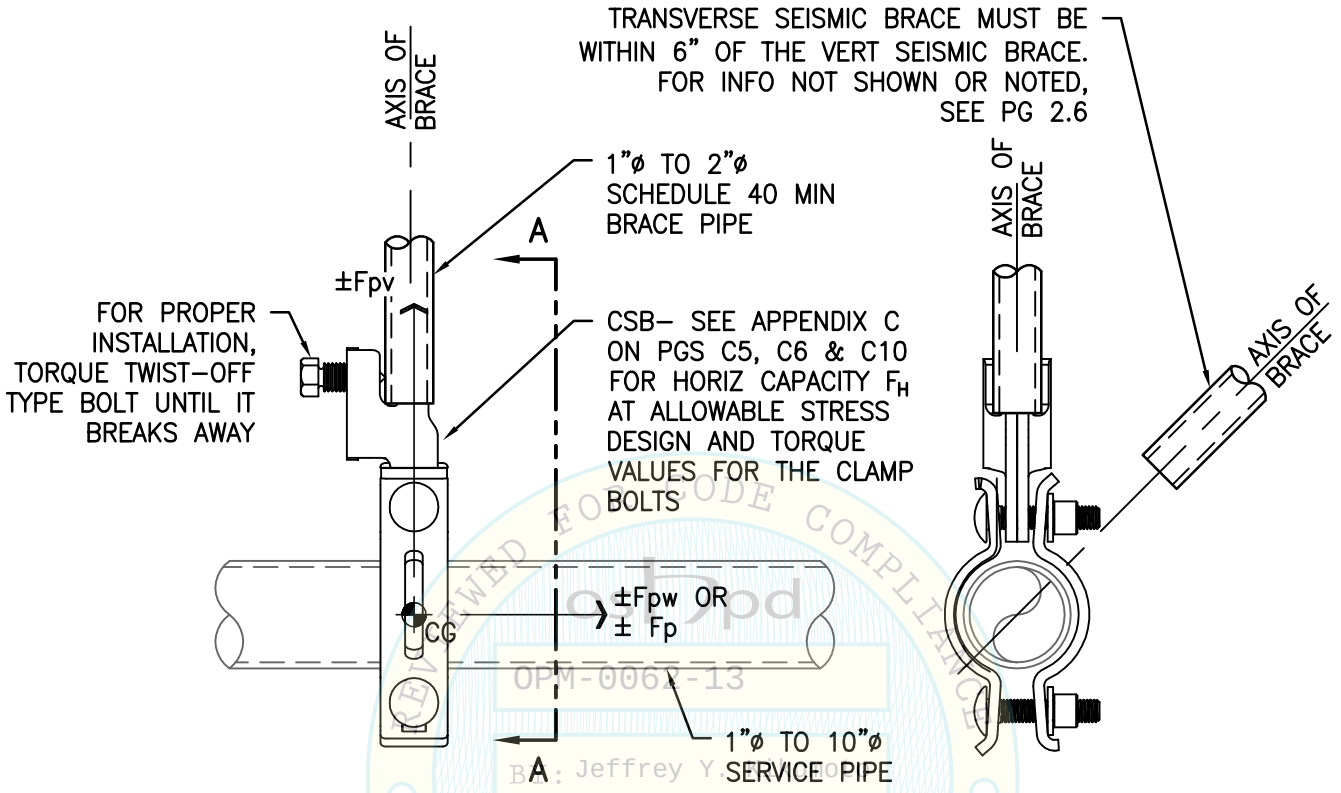
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

1. THE BRACE PIPE MAY BE ATTACHED TO THE SUPPORTING STRUCTURE W/ THE FOLLOWING ASSEMBLIES:
   A. CSBUNIV PER PGS 5.1 & 5.2
   B. CSBMA PER PGS 5.4 & 5.5
   C. CSBIB PER PG 6.1
   D. CSBBC075 PER PG 6.2
   E. CSBBARJ PER PGS 6.3, 6.4 & 6.5
2. FOR CONSTRUCTION TOLERANCE, SEE NOTE 3 ON PG 1.3.
3. USE ø=90° OF TRANSVERSE MODE (SEE APPENDIX "C" ON PG C7) FOR AXIAL CAPACITY OF COMPONENT.
4. FOR BRACE PIPE AXIAL CAPACITY, SEE APPENDIX "B" ON PG B1.
5. THIS VERT SEISMIC BRACE MAY ALSO BE USED AS A TYP SERVICE PIPE HANGER FOR LONG TERM GRAVITY LOADS.

THIS IS A NEW PRODUCT

REGISTERED PROFESSIONAL ENGINEER
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SHEET TITLE: VERTICAL SEISMIC BRACE
CSB WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

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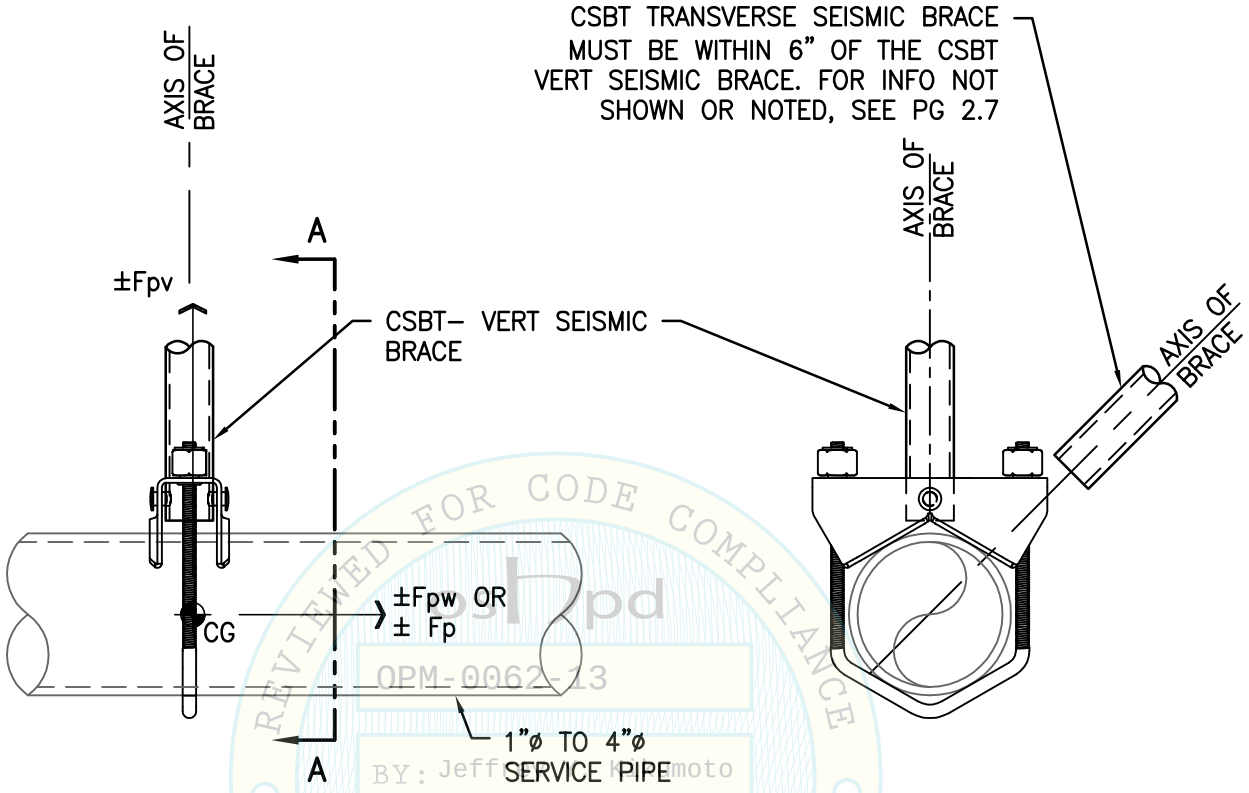

ELEV SECTION A–A

NOTES:

1. THE CSBT TELESCOPING BRACE PIPE ASSEMBLY MAY BE ATTACHED TO THE SUPPORTING STRUCTURE W/ THE FOLLOWING ASSEMBLIES:
   A. CSBMA PER PGS 5.4 & 5.5
   B. CSBIB PER PG 6.1
   C. CSBBC075 PER PG 6.2
   D. CSBBARJ PER PGS 6.3, 6.4 & 6.5
2. FOR CONSTRUCTION TOLERANCE, SEE NOTE 3 ON PG 1.3.
3. THE CSBT TELESCOPING BRACE PIPE ASSEMBLY AXIAL CAPACITY IS 890#.
4. THE CSBT TESCOPING BRACE PIPE ASSEMBLY COMPONENTS & INSTALLATION INSTRUCTIONS ARE SHOWN ON PG 8.8.
5. THIS VERT SEISMIC BRACE MAY ALSO BE USED AS A TYP SERVICE PIPE HANGER FOR LONG TERM GRAVITY LOADS.

THIS IS A NEW PRODUCT

SHEET TITLE: VERTICAL SEISMIC BRACE
CSBT TELESCOPING ASSEMBLY FOR 1"Ø TO 4"Ø SERVICE PIPE CONNECTION

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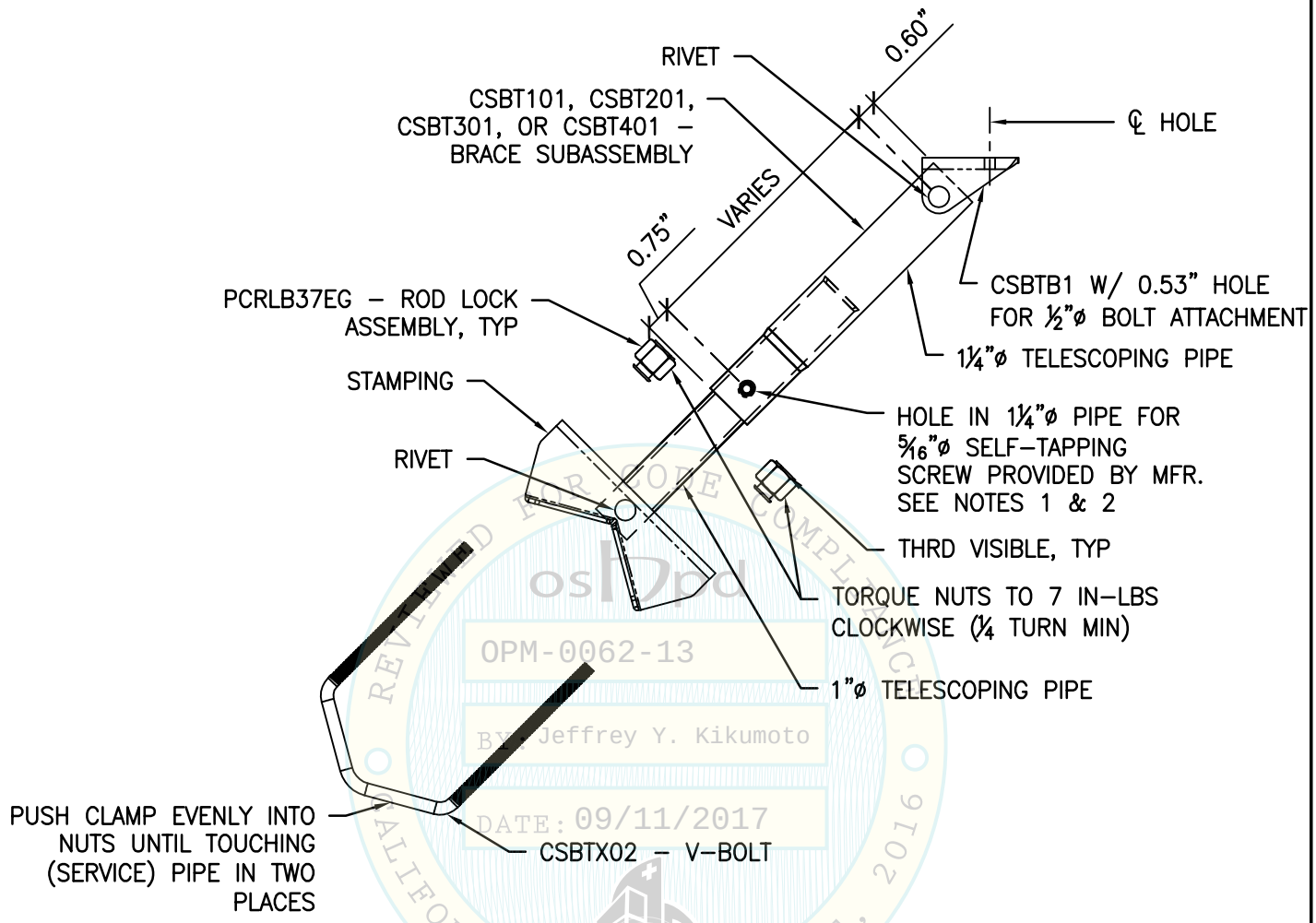
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS



NOTES:

1. INSTALL W/ A STD SCREW GUN W/ A SIZE OF 5⁄16" (8mm) HEX HEAD TOOL AT RECOMMENDED 1010 RPM INSTALLATION SPEED. HEX HEAD SHOULD BE SEATED (NO THREAD VISIBLE)

2. STD SCREW GUN NEEDS CLUTCH SET OR A DEPTH SENSITIVE NOSEPIECE FOR CORRECT SEATING OF FASTENER. NOT FOLLOWING INSTRUCTION COULD RESULT IN SHEARING HEAD OFF OF FASTENER

3. SEE APPENDIX C PG C6 FOR CAPACITY OF SHOWN ASSEMBLY.

4. THE CSBT TELESCOPING ASSEMBLY IS A COMPLETE MANUFACTURED BRACE ASSEMBLY & IS REFERENCED AS SUCH IN THIS OPM.

REGISTERED PROFESSIONAL ENGINEER
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SHEET TITLE: VERTICAL SEISMIC BRACE
CSBT TELESCOPING ASSEMBLY FOR 1"Ø TO 4"Ø SERVICE PIPE CONNECTION

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APPENDIX 'A':
SUMMARY OF TYP DESIGN EXAMPLE

A. GENERAL
1. THE CALIFORNIA REGISTERED DESIGN PROFESSIONAL (CRDP) REVIEWS SECTION 1 – OVERVIEW OF THIS OPM.

B. DEMAND
1. THE CRDP DETERMINES THE LATERAL ACCELERATION AND VERT ACCELERATION "G" (Cp IN NFPA® 13) FOR THE SEISMIC FORCES Fp AND Fpv USING INFORMATION PROVIDED IN THE PROJECT DOCUMENTS. FOR SIMPLICITY, THE HORIZ SEISMIC FORCE, Fpw, MAY BE DETERMINED USING NFPA TABLE 9.3.5.9.3 OR THE EXPANDED SEISMIC COEFFICIENT TABLE ON THE FOLLOWING PG TO FIND THE Cp DIRECTLY FROM Ss. (SEE NOTE BLW FOR APPLICABILITY OF THESE TABLES.)
   a. IN THE EXAMPLE BLW, THE MAX HORIZ AND VERT FORCES ON THE BRACES ARE CALCULATED FOR USE ANYWHERE WITHIN THE STATE OF CALIFORNIA. THE SEISMIC LOAD IS ALSO DETERMINED BY THE SIMPLIFIED METHOD: LOOK UP THE VALUE OF Ss = 3.75 (MAX IN CALIFORNIA) IN THE SEISMIC COEFFICIENT TABLE, THIS VALUE COORDINATES TO A Cp = 1.75. PLEASE NOTE THAT THESE MAX VALUES MAY BE REDUCED FOR THE SITE SPECIFIC PROJECT LOCATION AS WELL AS FOR THE LOCATION WITHIN THE HT OF A BLDG IN ORDER TO OBTAIN LOWER DEMAND VALUES IF SO REQ TO MEET BRACE SPACING CRITERIA. NOTE THAT OSHPD PIN #62 ALLOWS THE USE OF 2.0 FOR OMEGA (Ω_o) FOR 2013 CBC PROJECTS, 2.5 IS USED IN THIS DESIGN EXAMPLE.

ASCE 7-10 AS AMENDED BY CBC 2013

SECTION 13.3 FORCES AT LRFD, UNO

SECTION 13.3.1 $Fp = \frac{0.4 a_p S_{DS} W_p}{R_p/I_p} (1+2\ z/h) = 2.5\ W_p$

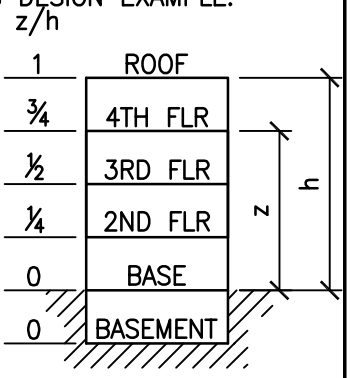
TABLE 13.6.1
- $a_p = 2.5$ (NOT ASME® B31)
- $R_p = 4.5$ (NOT ASME B31)
- $\Omega_o = 2.50$ (FOR ANCHORAGE TO CONC, ALSO SEE B.1.a)
- $S_{DS} = 2.5$ (MAX STATE OF CALIFORNIA VALUE)

SECTION 13.1.3
- $I_p = 1.5$ (EMERGENCY SYSTEM)
- $z = h$ $\quad z/h \leq 1.0$
- $\Omega_o\ Fp = 6.25\ W_p$ (FOR LRFD ANCHORAGE TO CONC)

SECTION 13.3.1
- $Fp\ (MAX) = 1.6\ S_{DS}\ I_p\ W_p = 6.0\ W_p$
- $Fp\ (MIN) = 0.3\ S_{DS}\ I_p\ W_p = 1.125\ W_p$
- $1.125\ W_p \leq 2.5\ W_p \leq 6.0\ W_p$

SECTION 13.3.1 $Fpv = 0.20\ S_{DS}\ W_p = 0.50\ W_p$

FORCES AT ASD
- $Fp = 0.7\ Fp = 0.7\ (2.5\ W_p) = 1.75\ W_p = Cp\ W_p$
- $Fpv = 0.7\ Fpv = 0.7\ (0.50\ W_p) = 0.35\ W_p$



SAMPLE BLDG ELEV

NOTE: NFPA 13 uses a simplified seismic factor, Cp, which combines ground shaking S_{DS}, dynamic amplification ap, component response Rp/Ip, and location in the building (z/h) into a single variable. S_{DS} = ⅔ Fa S_S where S_S is the mapped short-period spectral acceleration for the project location and Fa is the amplification factor based on soil conditions. Cp is calculated using the maximum tabulated Fa values given in ASCE 7 Table 11.4-1 and z/h = 1.0.
CRDP SHOULD USE THE Cp TABLES ONLY WHEN APPLICABLE.

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SHEET TITLE: APPENDIX 'A'
EXAMPLE OF SEISMIC SWAY BRACE DESIGN PROCEDURE

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APPENDIX 'A':

SUMMARY OF TYP DESIGN EXAMPLE (CONTINUED)

B. DEMAND (CONTINUED):

2. THE CRDP USES THE NFPA® 13 GUIDELINES TO PREPARE THE FIRE SPRINKLER LAYOUT DRAWINGS.
3. THE CRDP DETERMINES THE BRACE LOCATIONS AND SHOWS THEM ON THE LAYOUT DRAWINGS.
4. THE CRDP DETERMINES THE BRANCH LINE WT PLUS TRIBUTARY MAIN LINE WT (W) FOR EA SEISMIC BRACE USING THE NFPA 13 ZONE OF INFLUENCE (ZOI) METHOD. FOR THIS EXAMPLE ASSUME THAT W = 500 LBS FOR A 4" DIA SCHEDULE 10 MAIN LINE SERVICE PIPE.
5. THE CRDP COMPARES THE CALCULATED 500 LBS WT TO THE ALLOWABLE WT (W) SHOWN IN PERMISSIBLE WT TABLES FOR SERVICE PIPES. SEE THE THREE SCHEDULE LW, 10 & 40 TABLES BLW. THE 500 LBS WILL ALLOW A LATERAL TRANSVERSE BRACE SPACING OF 25 FEET FOR THE 4" DIA MAIN LINE SERVICE PIPE (i.e. 601 LBS > 500 LBS). PLEASE NOTE THAT THE THREE SCHEDULE TABLES DO NOT MATCH THE NFPA 13 PUBLISHED VALUES BECAUSE THEY CONSIDER VERT PLUS LATERAL LOAD DEMAND AND USE t_{design} = 0.96 t_{nom} AS PER TABLE FOOTNOTE 2.

IN ADDITION, THE SEISMIC ACCELERATION VALUES ARE HIGHER IN CALIFORNIA THAN THE CURRENT PUBLISHED NFPA 13 VALUES.

Seismic Coefficient Table

S_s [1]	S_{DS}	C_p (ASD)	
2.80	1.87	1.31	
2.90	1.93	1.35	
3.00	2.00	1.40	
3.10	2.07	1.45	
3.20	2.13	1.49	
3.30	2.20	1.54	
3.40	2.27	1.59	
3.50	2.33	1.63	
3.60	2.40	1.68	
3.70	2.47	1.73	
3.75	2.50	1.75	← California Maximum

[1] See NFPA Table 9.3.5.9.3 for S_s values less than 2.80.

MAX LOAD IN ZONE OF INFLUENCE (ZOI) OF A LATERAL SWAY BRACE

Schedule LW Steel Pipe (Light-Wall Schedule 7)

Fy = 30 ksi					Water-Filled Pipe Wt	$w_v = W_p + F_{pv}$	L_v = Hanger Spacing[3]	$M_v = 0.10\ w_v L_v^2$	M_h	HORIZONTAL SEISMIC FORCE $F_{pw} = C_p W_p = 1.75\ W_p$									
Pipe [1]	OD [1]	t_{nom} [1]	S [2]	M_{cap}						Max Permissible ZOI Load, F_{pw} (lbs)					Max Permissible ZOI Weight, W $W = F_{pw} / 1.15\ C_p$ (lbs)				
										Lateral Sway Brace Spacing, L (ft)					Lateral Sway Brace Spacing, L (ft)				
(in)	(in)	(in)	(in^3)	(ft-lb)	(plf)	(plf)	(ft)	(ft-lb)	(ft-lb)	20	25	30	35	40	20	25	30	35	40
1 1/4	1.660	0.062	0.11	183	1.9	2.8	12	40	178	102	81	67			51	40	33		
1 1/2	1.900	0.080	0.19	305	2.6	3.9	12	56	299	171	137	112			85	68	56		
2	2.375	0.080	0.30	487	3.6	5.4	12	78	481	275	220	180			137	109	90		
2 1/2	2.875	0.083	0.46	751	5.0	7.5	12	107	743	425	340	278			211	169	138		
3	3.500	0.083	0.69	1129	6.8	10.2	12	147	1120	640	512	419	359	301	318	254	208	179	150
4	4.500	0.092	1.29	2088	10.7	16.0	12	231	2076	1186	949	777	666	558	589	471	386	331	277
6	6.625	0.115	3.51	5707	21.9	32.9	12	474	5687	3250	2600	2130	1826	1529	1615	1292	1058	907	760

[1] Steel pipe dimension as provided by ERICO.

[2] $S = [\pi (OD)^4 - (OD - 2 * t_{design})^4] / 32\ (OD)$ where $t_{design} = 0.93\ t_{nom}$ (per AISC 360).

[3] Maximum distance between hangers per NFPA Table 9.2.2.1 (a).

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STATE OF CALIFORNIA

SHEET TITLE: APPENDIX 'A'
EXAMPLE OF SEISMIC SWAY BRACE DESIGN PROCEDURE

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APPENDIX 'A':

SUMMARY OF TYP DESIGN EXAMPLE (CONTINUED)

B. DEMAND (CONTINUED):

5. (CONTINUED):

MAX LOAD IN ZONE OF INFLUENCE (ZOI) OF A LATERAL SWAY BRACE

Schedule 10 Steel Pipe

Fy = 30 ksi										HORIZONTAL SEISMIC FORCE $F_{pw} = C_p W_p =$ 1.75 W_p									
Pipe [1]	OD [1]	t_{nom} [1]	S [2]	M_{cap}	Water-Filled Pipe Wt	$w_v = W_p + F_{pv}$	L_v = Hanger Spacing [3]	$M_v = 0.10\ w_v L_v^2$	M_h	Max Permissible ZOI Load, F_{pw} (lbs)					Max Permissible ZOI Weight, W $W = F_{pw} / 1.15\ C_p$ (lbs)				
										Lateral Sway Brace Spacing, L (ft)					Lateral Sway Brace Spacing, L (ft)				
(in)	(in)	(in)	(in^3)	(ft-lb)	(plf)	(plf)	(ft)	(ft-lb)	(ft-lb)	20	25	30	35	40	20	25	30	35	40
1	1.315	0.109	0.11	177	1.8	2.7	12	39	173	99	79	65			49	39	32		
1 1/4	1.660	0.109	0.18	296	2.5	3.8	12	54	291	166	133	109			83	66	54		
1 1/2	1.900	0.109	0.24	397	3.0	4.6	15	103	384	219	176	144			109	87	71		
2	2.375	0.109	0.39	642	4.2	6.3	15	143	625	357	286	234			178	142	116		
2 1/2	2.875	0.120	0.64	1047	5.9	8.8	15	199	1028	587	470	385			292	234	191		
3	3.500	0.120	0.98	1585	8.0	11.9	15	268	1562	893	714	585	501	420	444	355	291	249	209
3 1/2	4.000	0.120	1.29	2095	9.8	14.7	15	330	2069	1182	946	775	664	556	587	470	385	330	276
4	4.500	0.120	1.65	2677	11.8	17.7	15	398	2647	1513	1210	991	850	712	752	601	493	422	354
5	5.563	0.134	2.83	4601	17.3	26.0	15	585	4564	2608	2086	1709	1465	1227	1296	1037	849	728	610
6	6.625	0.134	4.06	6597	23.1	34.6	15	778	6551	3743	2995	2453	2103	1761	1860	1488	1219	1045	875
8	8.625	0.188*	9.61	15617	40.1	60.2	15	1354	15558	8891	7112	5827	4995	4182	4418	3534	2895	2482	2078
10	10.75	0.188*	15.1	24556	57.9	86.8	15	1953	24478	13987	11190	9168	7858	6580	6950	5560	4555	3905	3270

[1] Steel pipe dimension per NFPA Table A.6.3.2.

[2] $S = [\ \pi\ (OD)^4 - (OD - 2 * t_{design})^4\ ] / 32\ (OD)$ where $t_{design} = 0.93\ t_{nom}$ (per AISC 360).

[3] Maximum distance between hangers per NFPA Table 9.2.2.1 (a).

* Wall thickness specified in NFPA Section 6.3.2.

Schedule 40 Steel Pipe

Fy = 30 ksi										HORIZONTAL SEISMIC FORCE $F_{pw} = C_p W_p =$ 1.75 W_p									
Pipe [1]	OD [1]	t_{nom} [1]	S [2]	M_{cap}	Water-Filled Pipe Wt	$w_v = W_p + F_{pv}$	L_v = Hanger Spacing [3]	$M_v = 0.10\ w_v L_v^2$	M_h	Max Permissible ZOI Load, F_{pw} (lbs)					Max Permissible ZOI Weight, W $W = F_{pw} / 1.15\ C_p$ (lbs)				
										Lateral Sway Brace Spacing, L (ft)					Lateral Sway Brace Spacing, L (ft)				
(in)	(in)	(in)	(in^3)	(ft-lb)	(plf)	(plf)	(ft)	(ft-lb)	(ft-lb)	20	25	30	35	40	20	25	30	35	40
1	1.315	0.133	0.13	205	2.1	3.1	12	44	200	114	92	75			57	45	37		
1 1/4	1.660	0.140	0.22	361	2.9	4.4	12	63	355	203	162	133			101	81	66		
1 1/2	1.900	0.145	0.31	501	3.6	5.4	15	122	486	278	222	182			138	110	90		
2	2.375	0.154	0.53	859	5.1	7.7	15	172	842	481	385	315			239	191	157		
2 1/2	2.875	0.203	1.00	1632	7.9	11.8	15	266	1611	920	736	603			457	366	300		
3	3.500	0.216	1.62	2640	10.8	16.2	15	364	2615	1494	1195	979	839	703	742	594	487	417	349
3 1/2	4.000	0.226	2.25	3662	13.4	20.1	15	452	3633	2076	1661	1361	1166	977	1032	825	676	580	485
4	4.500	0.237	3.02	4913	16.3	24.5	15	551	4882	2790	2232	1828	1567	1312	1386	1109	909	779	652
5	5.563	0.258	5.12	8320	23.3	35.0	15	786	8282	4733	3786	3102	2659	2226	2352	1881	1541	1321	1106
6	6.625	0.280	7.97	12955	31.5	47.3	15	1064	12911	7378	5902	4836	4145	3471	3666	2933	2403	2060	1725
8	8.625	0.322	15.8	25605	50.3	75.4	15	1696	25549	14599	11679	9569	8202	6868	7254	5803	4755	4075	3413
10	10.75	0.365	28.0	45519	74.7	112.0	15	2521	45449	25971	20777	17022	14590	12218	12905	10324	8458	7250	6071

[1] Steel pipe dimension per NFPA Table A.6.3.2.

[2] $S = [\ \pi\ (OD)^4 - (OD - 2 * t_{design})^4\ ] / 32\ (OD)$ where $t_{design} = 0.93\ t_{nom}$ (per AISC 360).

[3] Maximum distance between hangers per NFPA Table 9.2.2.1 (a).

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SHEET TITLE: APPENDIX 'A'
EXAMPLE OF SEISMIC SWAY BRACE DESIGN PROCEDURE

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APPENDIX 'A':

SUMMARY OF TYP DESIGN EXAMPLE (CONTINUED)

B. DEMAND (CONTINUED):

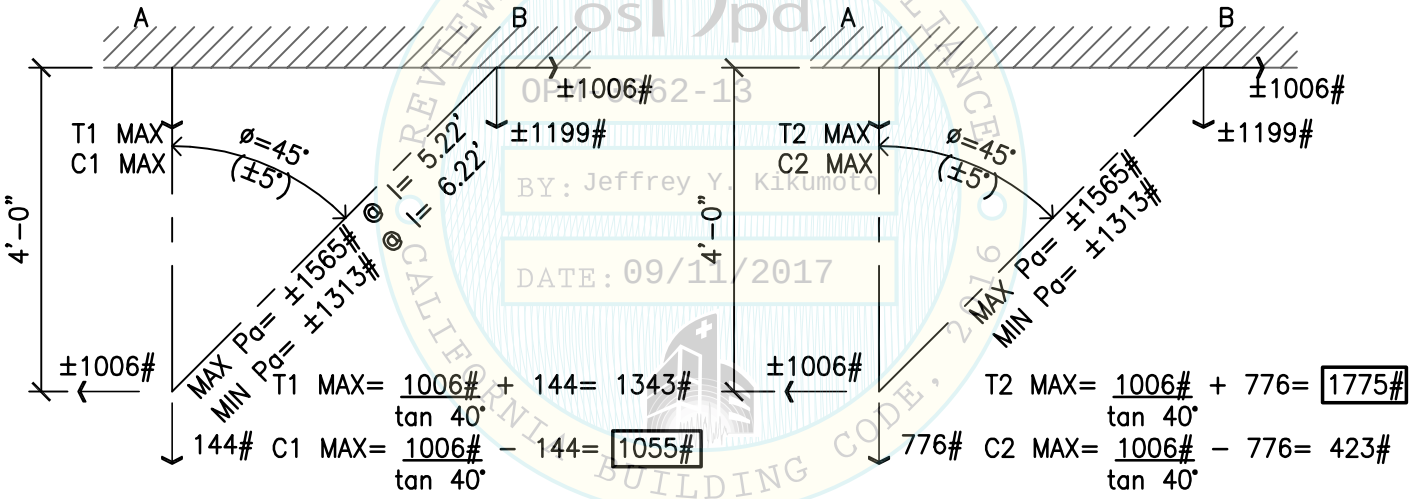
6. THE CRDP MAKES ADJUSTMENTS TO THE LATERAL TRANSVERSE BRACE SPACING ON THE LAYOUT DRAWINGS AND RECALCULATES W IF SO REQ.
7. THE CRDP DETERMINES THE OPERATING WT (Wp = 1.15W) BY APPLYING THE 1.15 FACTOR AS PER NFPA® 13 SECTION 9.3.5.9.2. IN THIS EXAMPLE Wp = 1.15 (500 LBS) = 575 LBS.
8. THE CRDP CALCULATES THE LATERAL FORCE Fp AND VERT FORCE Fpv ON THE SEISMIC BRACE USING THE Wp PROVIDED BY THE RDP. NOTE THAT IN THE EXAMPLE, IT IS CONSERVATIVELY ASSUMED THAT THE VERT GRAVITY LOAD IS BASED ON THE MAX ALLOWABLE VERT HANGER SPACING FOR THE MAIN SERVICE PIPE LINE PER NFPA 13. FOR THIS EXAMPLE, AT ASD LEVEL OF DESIGN.

Wp = 575 LBS

Fp = ±1.75 (575 LBS) = ±1,006 LBS

Fpv = ±0.35 (575 LBS) = ±201 LBS

LOAD COMBINATION 1. (0.6Wp−Fpv)= 345−201= 144# **LOAD COMBINATION 2.** (Wp+Fpv)= 575+201= 776#



9. THE CRDP VERIFIES THAT THERE IS A VERT SEISMIC BRACE WITHIN SIX INCHES OF EA TRANSVERSE AND LONGITUDINAL BRACE.
10. THE CRDP CHOOSES APPROPRIATE SEISMIC BRACE SUPPORT ELEMENTS PER SECTIONS 2, 3, 4 AND 8 OF THE OPM. FOR THIS EXAMPLE THE ERICO CSBQG SERVICE PIPE CONNECTION IS CHOSEN FOR BOTH THE TRANSVERSE AND VERT SEISMIC BRACE. REFER TO PGS 2.2 AND 8.2.
11. THE CRDP CHOOSES APPROPRIATE SEISMIC ATTACHMENT ELEMENTS TO STRUCTURE AS PER SECTIONS 5 AND 6 OF THE OPM.

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SHEET TITLE: APPENDIX 'A'
EXAMPLE OF SEISMIC SWAY BRACE DESIGN PROCEDURE

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APPENDIX 'A':
SUMMARY OF TYP DESIGN EXAMPLE (CONTINUED)

C. CAPACITY

1. THE CRDP DETERMINES THE GOVERNING CAPACITY OF THE ASSEMBLED SUPPORTS AND ATTACHMENT.
   a. DETERMINE CAPACITY OF SUPPORT ELEMENT FOR SERVICE PIPE PER TESTED VALUES ON PAGES C1 TO C6 OF APPENDIX C. PER PG C4, THE CSBQG CAPACITY FOR A 4" DIA, SCHEDULE 10 SERVICE PIPE IS 1190 LBS FOR ANY BRACE ANGLE BETWEEN 30 TO 90 DEGREES. THE CAPACITY IS 2300 LBS AT 90 DEGREES IF USED AS A VERT BRACE. THIS IS HIGHER THAN THE DEMAND AND THE CSBQG CAN BE USED AS PART OF THE BRACE ASSEMBLY IN THIS EXAMPLE.
   b. DETERMINE CAPACITY OF BRACE PIPE SUPPORT AS PER CALCULATED ALLOWABLE VALUES IN TABLE PROVIDED ON PG B1 OF APPENDIX B. FOR THIS EXAMPLE, IT IS ASSUMED THE BRACE PIPE IS NO LONGER THAN 6 FEET. A 1" DIA BRACE PIPE HAS AN AXIAL CAPACITY OF 1850 LBS AND CAN BE USED AS PART OF THE TRANSVERSE AND VERT BRACE ASSEMBLIES IN THIS EXAMPLE.
   c. DETERMINE CAPACITY OF CSBUNIV SUPPORT BETWEEN BRACE PIPE AND SEISMIC ATTACHMENT ELEMENT. PER PG C4 IN APPENDIX C, THE CSBUNIV050 HAS A CAPACITY OF 1620 LBS FOR ANY BRACE ANGLE BETWEEN 30 TO 90 DEGREES AND CAN BE USED AS PART OF THE BRACE ASSEMBLY IN THIS EXAMPLE.
   d. DETERMINE CAPACITY OF SEISMIC ATTACHMENT ELEMENTS TO SUPPORTING STRUCTURE AS PER CALCULATED ALLOWABLE VALUES IN TABLES PROVIDED IN SECTION 5, "ANCHORAGE DETAILS TO CONCRETE", OF THIS OPM. FOR THIS EXAMPLE, CHOOSE ERICO® CSBMA MOUNTED TO UNDERSIDE OF CONC FLR (CASE 2). PER PG 5.6, FOR CSBMA W/ 2– ¾"ø ANCHORS, THE ALLOWABLE AXIAL BRACE FORCE IS 938 LBS FOR A BRACE ANGLE OF 45 (±5) DEGREES. THIS IS MUCH LESS THAN THE CALCULATED DEMAND OF 1565 LBS.
   NOTE:
   - A STRENGTH–LEVEL AXIAL BRACE FORCE WAS EVALUATED BASED ON THE INTERACTION OF SHEAR AND TENSION CAPACITIES OF THE ANCHORS IN CONC. THE CONC ANCHOR CAPACITIES WERE CALCULATED ACCORDING TO ACI® 318–11 APPENDIX D. AS PER SUPPLEMENT #1 OF ASCE® 7–10, THE OVERSTRENGTH FACTOR Ωo APPLIES TO CONC ANCHORAGE. THEREFORE, THE ALLOWABLE AXIAL BRACE FORCE, Pa, LISTED ON PGS 5.4 TO 5.7 WAS DETERMINED FROM THE STRENGTH–LEVEL AXIAL BRACE FORCE, Pu, USING THE RELATIONSHIP Pa = 0.7 Pu/Ωo.
2. THE CRDP DETERMINES WHETHER THE DEMAND ON THE BRACE IS LESS THAN THE CAPACITY OF THE ASSEMBLY. IN THIS EXAMPLE, THE ATTACHMENT CAPACITY OF 938 LBS IS FOUND TO BE MUCH LESS THAN THE CALCULATED DEMAND OF 1565 LBS. THUS, THE BRACE SPACING (i.e. W BASED ON ZOI) WILL NEED TO BE REDUCED.
3. THE CRDP DETERMINES VIA DIRECT DEMAND VS CAPACITY RATIO THE APPROXIMATE REVISED ALLOWABLE BRACE SPACING. FOR THIS EXAMPLE, (938 LBS/1565 LBS) (25 FEET) = 15 FEET. THE REVISED SPACING & NEW ZONE OF INFLUENCE LOADS CAN THEN BE DETERMINED.

SHEET TITLE: APPENDIX 'A'
EXAMPLE OF SEISMIC SWAY BRACE DESIGN PROCEDURE

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APPENDIX 'B':

LATERAL SWAY BRACE PIPE AXIAL CAPACITY (POUNDS)										
NOMINAL DIA	OUTSIDE DIA	NOMIMAL WALL THK	DESIGN WALL THK	AREA Ag (in^2)	D/t	r (in)	PIPE LENGTH			
							4'	6'	8'	10'
1.00"	1.32"	0.133"	0.124"	0.46	10.6	0.423	3082	1850	1158	782
1.25"	1.66"	0.140"	0.130"	0.62	12.8	0.543	4764	3523	2332	1623
1.50"	1.90"	0.145"	0.135"	0.75	14.1	0.626	5983	4843	3447	2452
2.00"	2.38"	0.154"	0.143"	1.00	16.6	0.791	8409	7452	6149	4667

NOTES:
1. BRACE PIPE AXIAL CAPACITY SHOWN IS AT ASD LEVEL DESIGN. FOR LRFD–LEVEL DESIGN PER AISC® 360–10 SECTION E3, MULTIPLY BY 1.5.
2. BRACE DIAMETERS AND THICKNESSES ARE GIVEN FOR SCHEDULE 40 PIPE AS PER AISC® 360–10 TABLE 1–14, AND $kl/r < 300$.

ROD RESTRAINT AXIAL CAPACITY						
NOMINAL DIA	ROD LENGTH					
	3'–4"	3'–0"	2'–6"	2'–0"	1'–10"	1'–6"
3/8"	–	–	73#	114#	136#	202#
1/2"	140#	172#	248#	387#	463#	689#

NOTES:
1. ROD RESTRAINT AXIAL CAPACITY SHOWN IS AT ASD LEVEL DESIGN. FOR LRFD–LEVEL DESIGN PER AISC 360–10 SECTION E3, MULTIPLY BY 1.5.
2. ROD DIAMETERS ARE BASED ON ALL THREAD ROD, CAPACITY IS BASED ON ASTM® A36 AND $kl/r \leq 400$. INTERPOLATION IS ACCEPTABLE.

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SHEET TITLE: APPENDIX 'B'
CAPACITY TABLES OF BRACE PIPES & RODS

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SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

APPENDIX 'C'

ALSO SEE NOTES AT END OF TABLE (NOTES 'a' THRU 'd' AND t, u ARE TYP)

MODE	COMPONENT DESCRIPTION	RUN PIPE NOMINAL DIA (INCHES)	RUN PIPE REFERENCE	HORIZ CAPACITY F_H (POUNDS) PER INSTALLATION ANGLE ø				NOTES
				30° – 44°	45° – 59°	60° – 74°	75° – 90°	
T	CSBQIKCL	1	LW	290	410	495	550	s
T	CSBQIKCL	1¼	LW	290	410	495	550	s
T	CSBQIKCL	1½	LW	290	410	495	550	s
T	CSBQIKCL	2	LW	390	550	670	750	s
R	CSBQIKCL	1	LW	550	550	550	550	s
R	CSBQIKCL	1¼	LW	550	550	550	550	s
R	CSBQIKCL	1½	LW	550	550	550	550	s
R	CSBQIKCL	2	LW	750	750	750	750	s
T	CSBQIKCL	1	10	150	210	280	315	s
T	CSBQIKCL	1¼	10	150	210	280	315	s
T	CSBQIKCL	1½	10	150	210	280	315	s
T	CSBQIKCL	2	10	350	500	620	690	s
R	CSBQIKCL	1	10	315	315	315	315	s
R	CSBQIKCL	1¼	10	315	315	315	315	s
R	CSBQIKCL	1½	10	315	315	315	315	s
R	CSBQIKCL	2	10	690	690	690	690	s
T	CSBQIKCL	1	40	475	665	825	925	s
T	CSBQIKCL	1¼	40	475	665	825	925	s
T	CSBQIKCL	1½	40	475	665	825	925	s
T	CSBQIKCL	2	40	490	690	850	950	s
R	CSBQIKCL	1	40	925	925	925	925	s
R	CSBQIKCL	1¼	40	925	925	925	925	s
R	CSBQIKCL	1½	40	925	925	925	925	s
R	CSBQIKCL	2	40	950	950	950	950	s
L	CSBSTU	1	LW,10,40	970	720	860	960	r,w
L	CSBSTU	1¼	LW,10,40	970	720	860	960	r,w

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SHEET TITLE: APPENDIX 'C'
CAPACITY TABLE OF BRACE SUPPORTS

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SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

APPENDIX 'C'

ALSO SEE NOTES AT END OF TABLE (NOTES 'a' THRU 'd' AND t, u ARE TYP)

MODE	COMPONENT DESCRIPTION	RUN PIPE NOMINAL DIA (INCHES)	RUN PIPE REFERENCE	HORIZ CAPACITY F_H (POUNDS) PER INSTALLATION ANGLE ø				NOTES
				30° – 44°	45° – 59°	60° – 74°	75° – 90°	
L	CSBSTU	1½	LW,10,40	970	720	860	960	r,w
L	CSBSTU	2	LW,10,40	870	690	830	930	r,w
L	CSBSTU	2½	LW,10,40	870	690	830	930	r,w
L	CSBSTU	3	LW,10,40	870	690	830	930	r,w
L	CSBSTU	4	LW,10,40	1550	1390	1680	1870	r,w
L	CSBSTU	5	LW,10,40	1550	1390	1680	1870	r,w
L	CSBSTU	6	LW,10,40	1470	1170	1410	1570	r,w
L	CSBSTU	8,10	0.188,40	1200	1700	2090	2330	p,r,w
R	CSBSTU	1	LW,10,40	1670	1670	1670	1670	r,w
R	CSBSTU	1¼	LW,10,40	1670	1670	1670	1670	r,w
R	CSBSTU	1½	LW,10,40	1670	1670	1670	1670	r,w
R	CSBSTU	2	LW,10,40	2960	2960	2960	2960	r,w
R	CSBSTU	2½	LW,10,40	2960	2960	2960	2960	r,w
R	CSBSTU	3	LW,10,40	2960	2960	2960	2960	r,w
R	CSBSTU	4	LW,10,40	3030	3030	3030	3030	r,w
R	CSBSTU	5	LW,10,40	3030	3030	3030	3030	r,w
R	CSBSTU	6	LW,10,40	3840	3840	3840	3840	r,w
R	CSBSTU	8,10	0.188,40	3950	3950	3950	3950	p,r,w
T	CSBSTU	1	LW,10,40	860	1220	1500	1670	r,w
T	CSBSTU	1¼	LW,10,40	860	1220	1500	1670	r,w
T	CSBSTU	1½	LW,10,40	860	1220	1500	1670	r,w
T	CSBSTU	2	LW,10,40	1530	2160	2650	2960	r,w
T	CSBSTU	2½	LW,10,40	1530	2160	2650	2960	r,w
T	CSBSTU	3	LW,10,40	1530	2160	2650	2960	r,w
T	CSBSTU	4	LW,10,40	1570	2220	2720	3030	r,w
T	CSBSTU	5	LW,10,40	1570	2220	2720	3030	r,w

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SHEET TITLE: APPENDIX 'C' (CONTINUED)
CAPACITY TABLE OF BRACE SUPPORTS

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SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

APPENDIX 'C'

ALSO SEE NOTES AT END OF TABLE (NOTES 'a' THRU 'd' AND t, u ARE TYP)

MODE	COMPONENT DESCRIPTION	RUN PIPE NOMINAL DIA (INCHES)	RUN PIPE REFERENCE	HORIZ CAPACITY F_H (POUNDS) PER INSTALLATION ANGLE ø				NOTES
				30° – 44°	45° – 59°	60° – 74°	75° – 90°	
T	CSBSTU	6	LW,10,40	1980	2810	3440	3840	r,w
T	CSBSTU	8,10	0.188,40	2040	2890	3540	3950	p,r,w
L	CSBEZU	1	LW,10,40	390	550	670	750	r,x
L	CSBEZU	1¼	LW,10,40	390	550	670	750	r,x
L	CSBEZU	1½	LW,10,40	390	550	670	750	r,x
L	CSBEZU	2	LW,10,40	520	690	830	930	r,x
L	CSBEZU	2½	LW,10,40	520	690	830	930	r,x
L	CSBEZU	3	LW,10,40	520	690	830	930	r,x
L	CSBEZU	4	LW,10,40	630	900	1100	1230	r,x
L	CSBEZU	5	LW,10,40	630	900	1100	1230	r,x
L	CSBEZU	6	LW,10,40	730	1000	1230	1370	r,x
R	CSBEZU	1	LW,10,40	1670	1670	1670	1670	r,x
R	CSBEZU	1¼	LW,10,40	1670	1670	1670	1670	r,x
R	CSBEZU	1½	LW,10,40	1670	1670	1670	1670	r,x
R	CSBEZU	2	LW,10,40	2960	2960	2960	2960	r,x
R	CSBEZU	2½	LW,10,40	2960	2960	2960	2960	r,x
R	CSBEZU	3	LW,10,40	2960	2960	2960	2960	r,x
R	CSBEZU	4	LW,10,40	3030	3030	3030	3030	r,x
R	CSBEZU	5	LW,10,40	3030	3030	3030	3030	r,x
R	CSBEZU	6	LW,10,40	3030	3030	3030	3840	r,x
T	CSBEZU	1	LW,10,40	860	1220	1500	1670	r,x
T	CSBEZU	1¼	LW,10,40	860	1220	1500	1670	r,x
T	CSBEZU	1½	LW,10,40	860	1220	1500	1670	r,x
T	CSBEZU	2	LW,10,40	1530	2160	2650	2960	r,x
T	CSBEZU	2½	LW,10,40	1530	2160	2650	2960	r,x
T	CSBEZU	3	LW,10,40	1530	2160	2650	2960	r,x

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SHEET TITLE: APPENDIX 'C' (CONTINUED)
CAPACITY TABLE OF BRACE SUPPORTS

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SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

APPENDIX 'C'

ALSO SEE NOTES AT END OF TABLE (NOTES 'a' THRU 'd' AND t, u ARE TYP)

MODE	COMPONENT DESCRIPTION	RUN PIPE NOMINAL DIA (INCHES)	RUN PIPE REFERENCE	HORIZ CAPACITY F_H (POUNDS) PER INSTALLATION ANGLE ø				NOTES
				30° – 44°	45° – 59°	60° – 74°	75° – 90°	
T	CSBEZU	4	LW,10,40	1570	2220	2720	3030	r,x
T	CSBEZU	5	LW,10,40	1570	2220	2720	3030	r,x
T	CSBEZU	6	LW,10,40	1980	2810	3440	3840	r,x
T	CSBBRP	1 AND 1¼	LW,10,40	120	170	210	230	e
T	CSBBRP	1 AND 1¼	LW,10,40	140	190	240	270	f
T	CSBBRP	1½ AND 2	LW,10,40	140	190	240	270	e
T	CSBBRP	1½ AND 2	LW,10,40	110	150	190	210	f
T	CSBQG	2½	LW,10,40	1410	2000	2450	2740	s
T	CSBQG	3	LW,10,40	1190	1680	2060	2300	s
T	CSBQG	4	LW,10,40	1190	1680	2060	2300	s
T	CSBQG	5,6	LW,10	870	1230	1510	1690	s
T	CSBQG	5,6	40	970	1370	1680	1870	s
T	CSBQG	8	0.188,40	790	1110	1360	1520	p,s
–	CSBUNIV050	NA	NA	1620	2300	2820	3140	r
–	CSBUNIV075	NA	NA	1620	2300	2820	3140	r
–	CSBBC075	NA	NA	1190	1680	1160	1280	m,r
–	CSBBC075	NA	NA	1620	1710	1010	1110	k,r
–	CSBBARJ	NA	NA	1740	1710	2060	2300	m,r
–	CSBBARJ	NA	NA	1410	2110	2540	2830	k,r
–	CSBBIB	NA	NA	1620	2300	2820	3140	m,r
–	CSBBIB	NA	NA	1620	1710	1010	1110	k,r
–	CSBBRS1	NA	NA	220	310	210	210	e,k,m
–	CSBBRS1	NA	NA	210	290	200	220	f,k,m
–	CSBBRS3	NA	NA	120	170	210	230	e,f,g,m
–	CSBBRS3	NA	NA	140	200	230	260	e,f,g,k
–	CSBBRS3	NA	NA	320	310	190	210	e,f,h

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SHEET TITLE: APPENDIX 'C' (CONTINUED)
CAPACITY TABLE OF BRACE SUPPORTS

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APPENDIX 'C'

ALSO SEE NOTES AT END OF TABLE (NOTES 'a' THRU 'd' AND t, u ARE TYP)

MODE	COMPONENT DESCRIPTION	RUN PIPE NOMINAL DIA (INCHES)	RUN PIPE REFERENCE	HORIZ CAPACITY F_H (POUNDS) PER INSTALLATION ANGLE ø				NOTES
				30° – 44°	45° – 59°	60° – 74°	75° – 90°	
L	CSB	1	LW,10,40	1290	1240	1260	1400	r
L	CSB	1¼	LW,10,40	1290	1240	1260	1400	r
L	CSB	1½	LW,10,40	1200	1860	2180	2250	r
L	CSB	2	LW,10,40	1200	1820	2180	2250	r
L	CSB	2½	LW,10,40	1320	1820	2190	2500	r
L	CSB	3	LW,10,40	1300	1790	2190	2500	r
L	CSB	4	LW,10,40	1300	1790	2190	2500	r
L	CSB	5	LW,10,40	1300	1790	2190	2500	r
L	CSB	6	LW,10,40	1410	1950	2350	2680	r
L	CSB	8,10	0.188,40	1400	1920	2350	2640	p,r
T	CSB	1	LW,10,40	1490	2110	2580	2900	r
T	CSB	1¼	LW,10,40	1380	1960	2400	2690	r
T	CSB	1½	LW,10,40	1380	1960	2400	2690	r
T	CSB	2	LW,10,40	1380	1960	2400	2690	r
T	CSB	2½	LW,10,40	1440	2030	2490	2790	r
T	CSB	3	LW,10,40	1390	1970	2420	2710	r
T	CSB	4	LW,10,40	1390	1970	2420	2710	r
T	CSB	5	LW,10,40	1390	1970	2420	2710	r
T	CSB	6	LW,10,40	1460	2060	2520	2830	r
T	CSB	8,10	0.188,40	1330	1880	2300	2580	p,r
R	CSB	1	LW,10,40	2900	2900	2900	2900	r
R	CSB	1¼	LW,10,40	2690	2690	2690	2690	r
R	CSB	1½	LW,10,40	2690	2690	2690	2690	r
R	CSB	2	LW,10,40	2690	2690	2690	2690	r

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SHEET TITLE: APPENDIX 'C' (CONTINUED)
CAPACITY TABLE OF BRACE SUPPORTS

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MODE	COMPONENT DESCRIPTION	RUN PIPE NOMINAL DIA (INCHES)	RUN PIPE REFERENCE	HORIZ CAPACITY F_H (POUNDS) PER INSTALLATION ANGLE ø				NOTES
				30° – 44°	45° – 59°	60° – 74°	75° – 90°	
R	CSB	2½	LW,10,40	2790	2790	2790	2790	r
R	CSB	3	LW,10,40	2710	2710	2710	2710	r
R	CSB	4	LW,10,40	2710	2710	2710	2710	r
R	CSB	5	LW,10,40	2710	2710	2710	2710	r
R	CSB	6	LW,10,40	2830	2830	2830	2830	r
R	CSB	8, 10	0.188,40	2580	2580	2580	2580	p,r
T	CSBT	1 – 4	LW,10,40	475	790	790	890	y
–	CSBU1	N/A	N/A	1690	2210	2660	3090	r
–	CSBU2	N/A	N/A	1480	2290	2860	3090	r
–	CSBS1	N/A	N/A	850	1780	2770	2840	m,r
–	CSBS1	N/A	N/A	880	1430	2020	2410	k,r
–	CSBS1A	N/A	N/A	850	1780	2770	2840	m,r
–	CSBS1A	N/A	N/A	880	1430	2020	2410	k,r
–	CSBS2	N/A	N/A	1220	2140	2580	2870	m,r
–	CSBS2	N/A	N/A	1100	1820	2190	2680	k,r
–	CSBS3	N/A	N/A	1180	2210	2830	2940	m,r
–	CSBS3	N/A	N/A	820	1380	2080	3010	k,r
–	CSBS4	N/A	N/A	1180	2210	2830	2940	m,r
–	CSBS4	N/A	N/A	820	1380	2080	3010	k,r
–	CSBS5	N/A	N/A	1220	2140	2580	2870	m,r
–	CSBS5	N/A	N/A	1100	1820	2190	2680	k,r

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CAPACITY TABLE OF BRACE SUPPORTS

CYS STRUCTURAL ENGINEERS, INC.
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APPENDIX 'C'

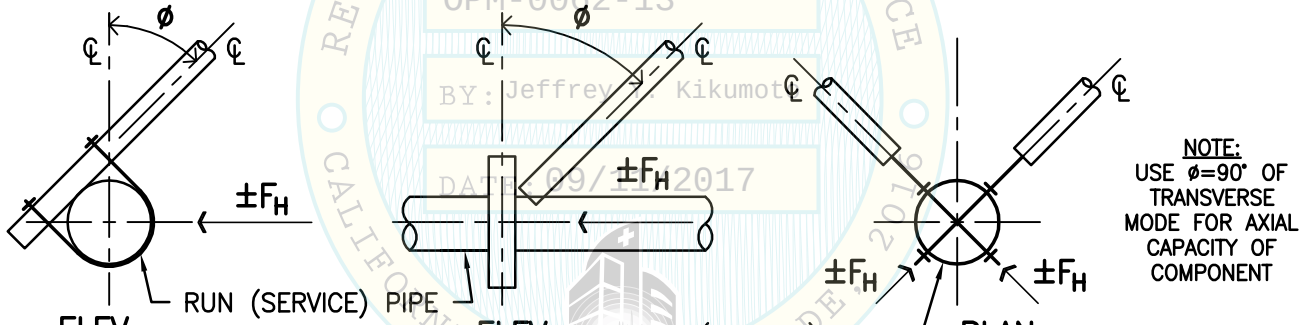
NOTES:

a. ALLOWABLE HORIZ CAPACITIES AT ALLOWABLE STRESS DESIGN OF BRACE COMPONENTS, F_H IN THE TABLE, ARE BASED ON TESTING PER FM® APPROVAL STANDARD FOR SEISMIC SWAY BRACES FOR AUTOMATIC SPRINKLER SYSTEMS, CLASS NUMBER 1950, MARCH 2010, AND EFFECTIVE DATE OF JUNE 30, 2010. THE FM CERTIFICATES OF COMPLIANCE (APPROVAL IDENTIFICATION NUMBERS 3042360 SIGNED AND DATED 02/03/2012 AND 3044398 SIGNED AND DATED 12/23/2011) AND FM APPROVAL REPORTS SIGNED AND DATED 02/03/2012 AND 06/02/2017 AND FM SPECIFICATION TESTED DATED 05/10/2016 HAVE BEEN FILED W/ OSHPD. ALLOWABLE HORIZ CAPACITY, F_H IN THE TABLE, OF BRACE SUB-ASSEMBLIES HAVE BEEN DETERMINED BY RESOLVING THE LOAD RATING (i.e. THE LOAD RESULTING IN FAILURE OR EXCEEDANCE OF DEFORMATION LIMITS) TO THE HORIZ DIRECTION AND DIVIDING BY A SAFETY FACTOR OF 1.5 TO ALLOW THE VALUES TO BE USED DIRECTLY FOR ALLOWABLE STRESS DESIGN (ASD). FOR LOAD AND RESISTANCE FACTOR DESIGN (LRFD) CAPACITIES, THE ABV VALUES WILL NEED TO BE MULTIPLIED BY 1.5.

b. ALLOWABLE HORIZ CAPACITY, F_H AT ASD, FOR THINNER WALLED SERVICE PIPES MAY BE USED FOR THICKER WALLED PIPES BUT NOT VICE VERSA (i.e. SCHEDULE LW CAPACITIES F_H AT ASD MAY BE USED FOR SCHEDULE 10).

c. LOAD RATINGS FOR LW ABV REFERS TO FM APPROVED LIGHTWALL PIPE, COMMONLY REFERRED TO AS "SCHEDULE 7". THESE RATINGS MAY ALSO BE APPLIED TO EN10220, AND GB/T 8163 PIPE, UNLESS OTHERWISE SPECIFIED.

d. :



e. LOAD RATINGS BASED ON THE USE OF A ⅜"ø-16 UNC (M10x1.5) THRD ROD AS THE BRACE MEMBER.

f. LOAD RATINGS BASED ON THE USE OF A ½"ø-13 UNC (M12x1.75) THRD ROD AS THE BRACE MEMBER.

g. LOAD RATINGS BASED ON THE USE OF A MODEL 300 BM CLAMP (⅜"ø-16 UNC/M10x1.5 BOLT) AS MEANS FOR ATTACHMENT TO STRUC MEMBER.

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NOTES (CONTINUED):

h. LOAD RATINGS BASED ON THE USE OF A ⅜"ø–16 UNC (M10x1.5) THRD FASTENER AS THE ATTACHMENT FASTENER TO A CONC INSERT.

k. BRACE PIPE PARALLEL TO STRUC STL MEMBER.

m. BRACE PIPE PERP TO STRUC STL MEMBER.

p. LOAD RATINGS FOR "0.188 WALL" (i.e. SCHEDULE 10 PER NFPA 13–13 TABLE A.6.3.2) ABV MAY BE APPLIED TO ANY THICKER WALLED PIPE UNLESS OTHERWISE SPECIFIED.

r. FM® APPROVED WHEN USED W/ 1", 1¼", 1½" OR 2" (DN25, DN32, DN40, DN50) NPS SCHEDULE 40, GB/T 3091, EN 10255 (HEAVY), OR JIS G3454 BRACE PIPE.

s. FM APPROVED WHEN USED W/ 1" AND 1¼" (DN25 AND DN32) NPS SCHEDULE 40, GB/T 3091, EN 10255 (HEAVY), OR JIS G3454 BRACE PIPE.

t. LOAD RATINGS FOR SCHEDULE 40 ABV MAY ALSO BE APPLIED TO GB/T 3091, EN 10255 (HEAVY), AND JIS G3454 PIPE.

u. LOAD RATINGS FOR SCHEDULE 10 ABV MAY ALSO BE APPLIED TO GB/T 3091, EN 10255 (MEDIUM OR HEAVY), AND JIS G3452, FM APPROVED THINWALL, AND SCHEDULE 40 PIPES UNLESS OTHERWISE INDICATED.

v. FM APPROVALS DO NOT APPROVE SEISMIC BRCG PRODUCTS FOR USE W/ 8"ø AND 10"ø SERVICE PIPES (NPS PIPE) W/ A WALL THK LESS THAN 0.188". ASME® B36.10M–2004 DEFINES SCHEDULE 10 MIN WALL THK FOR 8"ø AND 10"ø SERVICE PIPES (NPS PIPE) AS 0.134" AND 0.159", RESPECTIVELY. THEREFORE, CERTIFICATES OF COMPLIANCE SPECIFY THE PIPE AS "0.188" RATHER THAN "SCHEDULE 10". IT IS TYP IN THE UNITED STATES THAT 8"ø AND 10"ø NPS PIPE THAT IS MARKETED AS "SCHEDULE 10" HAS A WALL THK OF 0.188", WHICH IS GREATER THAN THE MIN WALL THK SPECIFIED BY ASME B36.10M–2004.

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APPENDIX 'C'

NOTES (CONTINUED):

w. TORQUE VALUES FOR CSBSTU SERVICE PIPE CLAMP BOLTS:

PART NUMBER	TORQUE FT-LBS (N-m)
CSBSTU0100(XX)	25 (34)
CSBSTU0125(XX)	25 (34)
CSBSTU0150(XX)	25 (34)
CSBSTU0200(XX)	25 (34)
CSBSTU0250(XX)	25 (34)
CSBSTU0300(XX)	50 (68)
CSBSTU0400(XX)	50 (68)
CSBSTU0500(XX)	50 (68)
CSBSTU0600(XX)	50 (68)
CSBSTU0800(XX)	65 (88)
CSBSTU1000(XX)	65 (88)

x. TORQUE VALUES FOR CSBEZU SERVICE PIPE CLAMP BOLTS:

PART NUMBER	TORQUE FT-LBS (N-m)
CSBEZU0100(XX)	25 (34)
CSBEZU0125(XX)	25 (34)
CSBEZU0150(XX)	25 (34)
CSBEZU0200(XX)	25 (34)
CSBEZU0250(XX)	25 (34)
CSBEZU0300(XX)	50 (68)
CSBEZU0400(XX)	50 (68)
CSBEZU0500(XX)	50 (68)
CSBEZU0600(XX)	50 (68)

y. TESTING FOR THE CSBT IS FOR THE WHOLE TELESCOPING BRACE ASSEMBLY INCLUDING THE ATTACHMENT COMPONENTS TO THE SUPPORTING STRUCTURE AS SHOWN ON PG 8.8.

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NOTES (CONTINUED):

z. TORQUE VALUES FOR CSB SERVICE PIPE CLAMP BOLTS:

PART NUMBER	TORQUE FT-LBS (N-m)
CSB0100(XX)	40 (54)
CSB0125(XX)	40 (54)
CSB0150(XX)	40 (54)
CSB0200(XX)	40 (54)
CSB0250(XX)	40 (54)
CSB0300(XX)	40 (54)
CSB0400(XX)	40 (54)
CSB0500(XX)	45 (61)
CSB0600(XX)	45 (61)
CSB0800(XX)	45 (61)
CSB1000(XX)	45 (61)

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