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

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, CSBB
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):  

OFFICE USE ONLY – OSHPD APPROVAL VALID FOR CBC 2013

Signature:  ___________________________  Date:  09-11-2017
Print Name:  Jeffrey Kikumoto
Title:  SSE
Condition of Approval (if applicable):  

“Access to Safe, Quality Healthcare Environments that Meet California’s Diverse and Dynamic Needs”

STATE OF CALIFORNIA – HEALTH AND HUMAN SERVICES AGENCY
OSH-FD-700 (REV 12/16/15)
### 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.

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<td>CSBBC075</td>
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**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.
# SEISMIC SWAY BRACING FOR
# FIRE SPRINKLER SYSTEMS

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

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 SRCG 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® A 53 GR B, MIN NPS 1”Ø TO MAX NPS 2”Ø.

   C. TELESCOPIC BRACE ASSEMBLY FOR TRANSVERSE & VERT SRCG 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.
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

HOW TO USE THIS PRE-APPROVAL:

1. THIS PRE-APPROVAL MAY BE USED FOR THE DESIGN OF SEISMIC SWAY BRACING OF FIRE SPRINKLER SYSTEMS. A CALIFORNIA LICENSED STRUCTURAL ENGINEER (CLSE) HAS DESIGNED THIS PRE-APPROVAL ALONG WITH SUPPORTING CALCULATIONS. THEREFORE, THE PRE-APPROVED DTLS AND CALCULATIONS ARE NOT TO BE REVIEWED BY REGIONAL STAFF. HOWEVER, EA FIRE SPRINKLER SYSTEM REQUIRE SUBMITTALS THAT MUST BE REVIEWED AND APPROVED BY OSHPD.

2. AS WITH ALL PRE-APPROVED DTLS, SYSTEMS, ETC., PLANS (i.e. LAYOUT DRAWINGS) ARE STILL REQUIRED TO SHOW THE LOCATION AND DESIGN OF THE PRE-APPROVED SUPPORTS, ATTACHMENTS AND BRACING SYSTEM WILL BE APPLIED TO THE FIRE SPRINKLER SYSTEM ON A PROJECT SPECIFIC BASIS. THIS PROCESS IS NEEDED TO VERIFY THAT THE APPROPRIATE DTLS HAVE 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.


D. THE CRDP SHALL ARRANGE THE ANCHORS TO ENSURE THAT THEY CAN BE INSTALLED IN ACCORDANCE WITH 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 ON THE TABLES ON PG 18 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 WITH THEM THAT MUST BE USED TO SELECT THE APPROPRIATE DTLS FOR EA LOCATION. 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.
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

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)

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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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 BRACING. 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.

OPM-0062-13
BY: Jeffrey Y. Kikumoto
DATE: 09/11/2017

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

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.
GENERAL NOTES CONTINUED:

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

<table>
<thead>
<tr>
<th>ANCHOR TYPE</th>
<th>ANCHOR DIA (INCH)</th>
<th>EFFECTIVE EMBED (INCH)</th>
<th>HOLE DEPTH (INCH)</th>
<th>MIN MEMBER THICKNESS (INCH)</th>
<th>MIN EDGE DISTANCE (INCH)</th>
<th>MIN ANCHOR BOLT SPACING (INCH)</th>
<th>TENSION TEST LOAD (LBS)</th>
<th>TORQUE TEST (FT-LBS)</th>
<th>COMMENTS</th>
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<tr>
<td>SNAKE+™</td>
<td>¾</td>
<td>1.10</td>
<td>2</td>
<td>SEE PG 5.8</td>
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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 THEUNDERSIDE OF A SUSPENDED FLR OR ROOF OF A BLDG. IT IS ASSUMED THE FLRS & ROOF ARE BUILT OF MIN ¾" NWC OR SLWC TABBING OVER 20 GAGE MIN MTL DECK (f'c = 3000 PSI, MIN & f_y= 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, t'c= 3000 PSI, MIN). ANCHORAGE DTL'S TO CONC START ON PG 5.1.
GENERAL NOTES CONTINUED:

4. ONE (1) CONDITION OF CAST–IN–PLACE (CIP) ANCHORAGE TO CONC IS SPECIFIED & PRESENTED IN THIS APPROVAL.
   **CASE A:** 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 BRACING FOR THE FIRE SUPPRESSION DISTRIBUTION SYSTEM MUST CONFORM TO NFPA® 13, SECTION 9.3.


3. THE CRDP SHALL PROVIDE DETS AND CALCULATIONS FOR THE SWAY BRACING AND THEIR ANCHORAGE TO THE STRUCTURE. WHERE APPLICABLE, DETS FOR THE SUPPORT AND BRACING 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, BRACING, 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 BRACING COMBINATION BASED ON THE CAPACITY OF THE INDIVIDUAL ELEMENTS BLW:

   A. THE ALLOWABLE HORIZ CAPACITY FH 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 FH OF THE BRACE COMPONENT ATTACHED TO THE STRUCTURE AS GIVEN AT THE END OF THE TABLE IN APPENDIX C (BASED ON TESTING).


5. THE DEAD LOADS OF WATER FILLED PIPES MAY BE FOUND IN NFPA 13, TABLE A.9.3.5.9.

6. SWAY BRACING SHALL HAVE A MAX SPACING NOT EXCEEDING THAT SPECIFIED IN NFPA 13.

7. SWAY BRACING 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 BRACING REQUIREMENTS.

9. SWAY BRACE ANCHORAGE MUST BE AT LEAST 6" AWAY FROM ANY OTHER ANCHORAGE OR CONC EDGES UNO ON 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.
SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

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

ACI® AMERICAN CONCRETE INSTITUTE FM® FM APPROVALS (AKA FACTORY MUTUAL) PERP PERPENDICULAR

AISC® AMERICAN INSTITUTE OF STEEL CONSTRUCTION Fp HORIZONTAL SEISMIC FORCE PG PAGE

ALT ALTERNATE Fpw HORIZONTAL SEISMIC FORCE RADIUS OF GYRATION

ASCE® AMERICAN SOCIETY OF CIVIL ENGINEERS SEISMIC FORCE REQUIREMENTS REQ REQUIRED

ASME® AMERICAN SOCIETY OF MECHANICAL ENGINEERS Fp HORIZONTAL SEISMIC FORCE SEOR STRUCTURAL ENGINEER OF RECORD

ASD ALLOWABLE STRENGTH DESIGN Fvnet VERTICAL FORCE SIM SIMILAR

ASTM® AMERICAN SOCIETY FOR TESTING & MATERIALS Fpv RESULTANT FROM Fpw SLWC SAND LIGHTWEIGHT CONCRETE

BM BEAM STRUC STRUCTURAL

BLDG BUILDING SEISMIC FORCE REQUIREMENTS T ANCHORAGE TENSION REACTION DUE TO SEISMIC FORCE

BLW BELOW SEISMIC FORCE REQUIREMENTS DUE TO SEISMIC FORCE

BOTT BOTTOM Fy SPECIFIED MINIMUM YIELD STRESS OF STEEL, KSI T/C TENSION OR COMPRESSION

BRG BRACING THK THICKNESS

CAC CALIFORNIA ADMINISTRATIVE CODE UNO UNLESS NOTED OTHERWISE

CBC CALIFORNIA BUILDING CODE

CG CENTER OF GRAVITY UNO UNLESS NOTED OTHERWISE

CLSE CALIFORNIA LICENSED UNO UNLESS NOTED OTHERWISE

Q CENTERLINE UNO UNLESS NOTED OTHERWISE

CONC CONCRETE UL® UNDERWRITERS’ LABORATORIES

CRDP CALIFORNIA REGISTERED UL® UNDERWRITERS’ LABORATORIES

CSM CALIFORNIA REGISTERED DESIGN PROFESSIONAL UL® UNDERWRITERS’ LABORATORIES

DIA (Ø) DIAMETER W/ WITH

DET DETAIL(S) WIDE FLANGE

DIAMETRIC (Ø) DIAMETER WEIGHT OF WATER-FILLED PIPE

DIA (Ø) DIAMETER WEIGHT OF WATER-FILLED PIPE

DIAMETER WIDE FLANGE

EACH EACH X 1.15 AS PER NFPA 13

ELEV ELEVATION SECTION 9.3.5.9.2

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 INFATECH INTELLERTICAL 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.

SNAP® IS A REGISTERED TRADEMARK OF POWERS FASTENERS, INC.

UL IS A REGISTERED TRADEMARK OF UL, LLC.

SHEET TITLE: OVERVIEW

ABBREVIATIONS & TRADEMARK FOOTNOTES

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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## SUPPORT AND ATTACHMENT MATERIAL STANDARDS:

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For continuation, see PG 1.19.

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**SHEET TITLE:** OVERVIEW

**COMPONENT MATERIAL STANDARDS (CONTINUED)**

**CYS STRUCTURAL ENGINEERS, INC.**

2495 NATOMAS PARK DRIVE, SUITE 650

SACRAMENTO, CA 95833

**Job No:** 17020

**Date:** 08-18-2017

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

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.
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.
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.
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

LEGEND:

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

TRANVERSE (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.

OPEM-0062-13
BY: Jeffrey Y. Kikumoto
DATE: 09/11/2017

OPEM-0062-13: Reviewed for Code Compliance by Jeffrey Kikumoto
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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

MAX TRANSVERSE SPACING
24" MAX

BRACE LOCATION 1

SINGLE SERVICE PIPE

LESS THAN 12'-0"

BRACE LOCATION 2

24" MAX

MAX TRANSVERSE SPACING

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 REQUIRED. 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 AND IS NOT PART OF THIS OPM.

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

OVERVIEW

BRACING GUIDELINES PARTIAL ISOMETRIC

SHEET TITLE: OVERVIEW

BRACING GUIDELINES PARTIAL ISOMETRIC

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

NOTE:
FOUR-WAY BRACING SHALL NOT BE REQUIRED WHERE RISERS PENETRATE INTERMEDIATE FLOORS IN MULTI-STORY BUILDINGS WHERE THE CLEARANCE DOES NOT EXCEED THE LIMITS SPECIFIED IN SECTION 9.3.4 OF NFPA® 13.

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### SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

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<td>CLAMP MAIN BODY</td>
<td></td>
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<tr>
<td></td>
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<td>CONE POINT SCREW</td>
<td>HRS GR 1045</td>
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<td>CARRIAGE BOLT</td>
<td>ASTM A307</td>
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<td>SERRATED FLANGE NUT</td>
<td>GR 5</td>
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<tr>
<td></td>
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<td>SHEAR OFF NUT</td>
<td>GR 5</td>
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</table>
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

FOR ATTACHMENT TO CONC,
SEE PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10.
FOR ATTACHMENT TO STL, SEE PGS
6.1 TO 6.5 & 6.10 TO 6.15

SUPPORTING STRUCTURE

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

VERT SEISMIC BRACE PER
PG 8.1 MUST BE WITHIN
6" OF TRANSVERSE
SEISMIC BRACE

6'-0" MAX

±Fp

AXIS OF BRACE

CSBQIKCL - SEE APPENDIX C ON PG C1
FOR HORIZ CAPACITY FH AT ALLOWABLE
STRESS DESIGN

1"Ø TO 2"Ø SERVICE PIPE

Fp

±Fpv

ELEV

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

FOR ATTACHMENT TO CONC,
SEE PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10.
FOR ATTACHMENT TO STL, SEE PGS
6.1 TO 6.5 & 6.10 TO 6.15

SUPPORTING STRUCTURE

VERT SEISMIC BRACE PER
PG 8.2 MUST BE WITHIN 6" OF TRANSVERSE SEISMIC BRACE

DURING INSTALLATION
YELLOW TIPS WILL
DISAPPEAR INTO THE BRACE
PIPE TO INDICATE PROPER
INSTALLATION TORQUE

±Fp

1" Ø OR 1¼" Ø SCHEDULE 40 MIN
BRACE PIPE – SEE APPENDIX B
ON PG B1 FOR CAPACITY

CSBQG – SEE APPENDIX C ON PG C4
FOR HORIZ CAPACITY Fh AT ALLOWABLE
STRESS DESIGN

±Fpv

2½" Ø TO 8" Ø
SERVICE PIPE

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

FOR ATTACHMENT TO CONC,
SEE PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10.
FOR ATTACHMENT TO STL, SEE PGS 6.1
TO 6.5 & 6.10 TO 6.15

SUPPORTING STRUCTURE

VERT SEISMIC BRACE PER
PG 8.3 MUST BE WITHIN
6" OF TRANSVERSE
SEISMIC BRACE

SEE APPENDIX C
ON PG C7

AXIS OF BRACE

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

1\"Ø TO 2\"Ø
SCHEDULE 40 MIN
BRACE PIPE– SEE
APPENDIX B ON
PG B1 FOR CAPACITY

CSBSTU– SEE APPENDIX C
ON PGS C2, C3 AND C7 FOR HORIZ CAPACITY
FH AT ALLOWABLE STRESS DESIGN AND TORQUE
VALUES FOR THE CLAMP BOLTS

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

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

FOR ATTACHMENT TO CONC,
SEE PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10.
FOR ATTACHMENT TO STL, SEE PGS 6.1
TO 6.5 & 6.10 TO 6.15

SUPPORTING STRUCTURE

VERT SEISMIC BRACE PER
PG 8.4 MUST BE WITHIN
6" OF TRANSVERSE
SEISMIC BRACE

SEE APPENDIX C
ON PG C7

1"Ø TO 2"Ø
SCHEDULE 40 MIN
BRACE PIPE—SEE
APPENDIX B ON
PG B1 FOR CAPACITY

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

CSBEZU—SEE APPENDIX C
ON PGS C3, C4 AND C7 FOR HORIZ CAPACITY
Fh AT ALLOWABLE STRESS DESIGN & TORQUE
VALUES FOR THE CLAMP BOLTS

SECTION A–A

6" MAX

±Fp

±Fpv

Wp

A

A

1"Ø TO 10"Ø
SERVICE PIPE

6" MAX

ELEV

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

SHEET TITLE: TRANSVERSE 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

FOR ATTACHMENT TO CONC,
SEE PGS 5.8 & 5.9
FOR ATTACHMENT TO STL,
SEE PGS 6.6 TO 6.9

FOR ATTACHMENT TO CONC,
SEE PGS 5.8 & 5.9
FOR ATTACHMENT TO STL,
SEE PGS 6.6 TO 6.9

SUPPORTING STRUCTURE

1-9” MAX FOR 3/8” OD ROD
2-4” MAX FOR 1/2” OD ROD

VERT SEISMIC RESTRAINT PER
PG 8.5

CSBBRP—SEE APPENDIX C ON PG C4
FOR HORIZ CAPACITY FH AT ALLOWABLE
STRESS DESIGN

FOR PROPER INSTALLATION,
TORQUE TWIST-OFF TYPE BOLT
HEAD (ASTM® A563 GR B)
UNTIL IT BREAKS AWAY
(MIN 70 IN–LBS)

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
3. PER NFPA 13 SECTION 9.3.6.6, SPRINGS ARE LIMITED TO LESS THAN 4’–0”.
   OTHERWISE THEY SHALL BE RESTRAINED AGAINST LATERAL MOVEMENT. IF A
   SPRING RISES 4’–0” OR MORE, A RESTRAINT DESIGN MUST BE SUBMITTED
   SEPARATELY FOR REVIEW BY OSHPD.

CSBBRP WITH RESTRAINT ROD FOR 1”Ø TO 2”Ø BRANCH LINE PIPE CONNECTION

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

FOR ATTACHMENT TO CONC, SEE
PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10
FOR ATTACHMENT TO STL, SEE
PGS 6.1 TO 6.5 & 6.10 TO 6.15

SUPPORTING STRUCTURE

VERT SEISMIC BRACE PER
PG 8.6 MUST BE WITHIN
6" OF TRANSVERSE
SEISMIC BRACE

SEE APPENDIX C
ON PG C7

1"Ø TO 2"Ø
SCHEDULE 40 MIN
BRACE PIPE—SEE
APPENDIX B ON
PG B1 FOR CAPACITY

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

BY: Jeffrey Y. Kikumoto
DATE: 09/11/2017

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FOR ATTACHMENT TO CONC, SEE
PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10
FOR ATTACHMENT TO STL, SEE PGS
6.1 TO 6.5 & 6.10 TO 6.15

SUPPORTING
STRUCTURE

CSBT VERT SEISMIC BRACE
PER PG 8.7 MUST BE
WITHIN 6” OF TRANSVERSE
SEISMIC BRACE

SEE APPENDIX C
PG C7

±Fp

AXIS OF
BRACE

CSBT TELESCOPING BRACE PIPE LENGTH
L = 1.0’ MIN - 7.0’ MAX
SEE SCHEDULE

CSBT - SEE APPENDIX C ON PG C6
FOR HORIZ CAPACITY FH AT ALLOWABLE
STRESS DESIGN

ELEV

±Fp

Wp

1”Ø TO 4”Ø SERVICE PIPE

NOTE:
SEE PG 8.8 FOR CSBT
ASSEMBLY & INSTALLATION
INSTRUCTIONS

THIS IS A NEW PRODUCT

<table>
<thead>
<tr>
<th>BRACE ASSEMBLY</th>
<th>&quot;L&quot; RANGE</th>
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<tr>
<td>CSBT1</td>
<td>1.0’ TO &lt;1.5’</td>
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<tr>
<td>CSBT2</td>
<td>1.5’ TO &lt;3.0’</td>
</tr>
<tr>
<td>CSBT3</td>
<td>3.0’ TO &lt;5.5’</td>
</tr>
<tr>
<td>CSBT4</td>
<td>5.5’ TO &lt;7.0’</td>
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FOR ATTACHMENT TO CONC.
SEE PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10.
FOR ATTACHMENT TO STL, SEE PGS
6.1 TO 6.5 & 6.10 TO 6.15

SUPPORTING STRUCTURE

VERT SEISMIC
BRACE PER PG 8.3
MUST BE WITHIN 6"
OF LONGITUDINAL
SEISMIC BRACE

6’-0” MAX

1”Ø TO 2”Ø SCHEDULE
40 MIN BRACE PIPE—
SEE APPENDIX B ON
PG B1 FOR CAPACITY

1”Ø TO 10”Ø
SERVICE PIPE

CSBSTU—SEE APPENDIX C ON
PGS C1, C2 AND C7 FOR HORIZ
CAPACITY $F_{H}$ AT ALLOWABLE
STRESS DESIGN AND TORQUE
VALUES FOR THE CLAMP BOLTS

SECTION A—A

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

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

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

FOR ATTACHMENT TO CONC, SEE
PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10.
FOR ATTACHMENT TO STL, SEE
PGS 6.1 TO 6.5 & 6.10 TO 6.15

SUPPORTING STRUCTURE

FOR ATTACHMENT TO CONC,
SEE PGS 5.1 TO 5.7 & 5.10
FOR ATTACHMENT TO STL,
SEE PGS 6.1 TO 6.5 & 6.10 TO 6.15

VERT SEISMIC
BRACE PER
PG 8.3

SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

SEE APPENDIX C
ON PG C7

1"Ø TO 2"Ø SCHEDULE
40 MIN BRACE PIPE
SEE APPENDIX B ON
PG B1 FOR CAPACITY

1"Ø TO 6"Ø
SERVICE PIPE

CSBEZU—SEE APPENDIX C ON
PGS C3 AND C7 FOR HORIZ CAPACITY
Fp AT ALLOWABLE STRESS DESIGN AND
TORQUE VALUES FOR THE CLAMP BOLTS

ELEV

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

SECTION A–A

CSBEZU WITH BRACE PIPE FOR 1"Ø TO 6"Ø SERVICE PIPE CONNECTION

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

FOR ATTACHMENT TO CONC, SEE
PGS 5.1, 5.2, 5.4 TO 5.7 & 5.10
FOR ATTACHMENT TO STL, SEE
PGS 6.1 TO 6.5 & 6.10 TO 6.15

SUPPORTING STRUCTURE

VERT SEISMIC
BRACE PER PG 8.3
MUST BE WITHIN 6"
OF LONGITUDINAL
SEISMIC BRACE

SEE APPENDIX C
ON PG C7

1" Ø TO 2" Ø SCHEDULE
40 MIN BRACE PIPE—
SEE APPENDIX B ON
PG B1 FOR CAPACITY

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

CSB—SEE APPENDIX C ON PGS
C5 AND C9 FOR HORIZ CAPACITY
\( F_H \) AT ALLOWABLE STRESS DESIGN
AND TORQUE VALUES FOR THE
CLAMP BOLTS

1"Ø TO 10"Ø
SERVICE PIPE

6" MAX

Wp

\( \pm F_p \)

A

A

\( A \)

\( \phi \)

SEE APPENDIX C ON PG C7

6'-0" MAX

\( \pm F_p \)

CSB—SEE APPENDIX C ON PGS
C5 AND C9 FOR HORIZ CAPACITY
\( F_H \) AT ALLOWABLE STRESS DESIGN
AND TORQUE VALUES FOR THE
CLAMP BOLTS

SECTION A-A

THIS IS A NEW PRODUCT

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

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SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

(E) CONC WALL

CONC ATTACHMENT PER PG 5.3, TYP

CSBUNIV TYP PER PG 7.1 OR CSBU TYP PER PG 7.2

LOAD DIRECTION #2

1"Ø TO 2"Ø SCHEDULE 40 MIN BRACE PIPE, TYP- SEE APPENDIX B ON PG B1 FOR CAPACITY

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

PLAN VIEW

Load Direction #2

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

CSBUNIV OR CSBU ABV OR BLW

CSBUNIV OR CSBU ABV OR BLW

CSBSTRU ABV OR BLW

CSBSTRU ABV OR BLW

1"Ø TO 10"Ø SERVICE RISER PIPE

10"Ø SERVICE RISER PIPE

LOAD DIRECTION #1

LOAD DIRECTION #1

1"Ø TO 10"Ø SERVICE RISER PIPE

4'-0" MAX

6" MAX

118x147

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Sheet Title: FOUR-WAY RISER SEISMIC BRACES
CSBSTRU WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

CONC ATTACHMENT PER PG 5.3, TYP

CSBUNIV TYP PER PG 7.1
OR CSBU TYP PER PG 7.2

1"Ø TO 2"Ø SCHEDULE 40
MIN BRACE PIPE, TYP—
SEE APPENDIX B ON PG
B1 FOR CAPACITY

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

LOAD DIRECTION #2

LOAD DIRECTION #1

CSBEZU

PLAN VIEW

ELEV A-A

1"Ø TO 6"Ø
SERVICE RISER PIPE

CSBEZU—SEE APPENDIX C ON
PGS C3 AND C9 FOR HORIZ
CAPACITY Fh AT ALLOWABLE
STRESS DESIGN AND TORQUE
VALUES FOR THE CLAMP BOLTS

BRACES MUST BE
PERP TO SERVICE PIPE

CSBEZU ABV
OR BLW

CSBUNIV OR
CSBU ABV OR
BLW

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.

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

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SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

1"Ø OR ½"Ø SCHEDULE 40 MIN BRACE PIPE, L_max = 10’-0". SEE APPENDIX B ON PG B1 FOR CAPACITY

1"Ø TO 2"Ø SERVICE RISER PIPE

PLAN VIEW

NOTES:

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

ELEV A- A

1"Ø TO 2"Ø SERVICE RISER PIPE

CSBUNIV, TYP PER PG 7.1 OR CSBU TYP PER PG 7.2

LOAD DIRECTION #2

LOAD DIRECTION #1

CSBUNIV OR CSBU ABV OR BLW

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

CSBQIKCL ABV OR BLW

1"Ø TO 2"Ø SERVICE RISER PIPE

PLAN VIEW

NOTES:

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

ELEV A- A

1"Ø TO 2"Ø SERVICE RISER PIPE

CSBQIKCL - SEE APPENDIX C ON PG C1 FOR HORIZ CAPACITY F_h AT ALLOWABLE STRESS DESIGN
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

1"Ø OR 1½"Ø SCHEDULE 40 MIN
BRACE PIPE—SEE APPENDIX B
ON PG B1 FOR CAPACITY

CONC ATTACHMENT
PER PG 5.3, TYP

CSBUNIV OR CSBU
ABV OR BLW

4'-0" MAX

LOAD DIRECTION

CSBUNIV TYP PER PG 7.1
OR CSBU TYP PER PG 7.2

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

CSBQG, TYP

DURING INSTALLATION, YELLOW TIPS WILL
DISAPPEAR INTO THE BRACE PIPE TO
INDICATE PROPER INSTALLATION TORQUE

LOAD DIRECTION
#1

2½"Ø TO 8"Ø SERVICE
RISER PIPE

CSBQG ABV OR BLW

LOAD DIRECTION
#2

2½"Ø TO 8"Ø SERVICE
RISER PIPE

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SACRAMENTO, CA 95833

JOE F. COOK
SENIOR STRUCTURAL ENGINEER

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

PLAN VIEW

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

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

AXIS OF
BRACE

ELEV A-A

Fm AT ALLOWABLE STRESS DESIGN
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

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

CSB UNIV OR
CSBU ABV OR
BLW

CSB UNIV OR
CSBU ABV OR
BLW

CSB ABV
OR BLW

CSB ABV
OR BLW

LOAD DIRECTION
#2

LOAD DIRECTION
#1

CONC ATTACHMENT
PER PG 5.3, TYP

CSBUNIV TYP PER PG 7.1
OR CSBU TYP PER PG 7.2

1"Ø TO 2"Ø SCHEDULE 40 MIN
BRACE PIPE, TYP—SEE
APPENDIX B ON PG B1 FOR
CAPACITY

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

PLAN VIEW

1"Ø TO 10"Ø
SERVICE RISER PIPE

ELEV A-A

THIS IS A NEW PRODUCT

FEATURING THE COMPLIANCE TO THE CODE

CSB—SEE APPENDIX C ON
PGS C5, C6 AND C10 FOR
HORIZ CAPACITY Fh AT
ALLOWABLE STRESS DESIGN
AND TORQUE VALUES FOR THE
CLAMP BOLTS

1"Ø TO 10"Ø
SERVICE RISER PIPE

STRENGTHENS THE EFFICIENCY
OF THE FIRE SPRINKLER SYSTEM

CSB WITH BRACE PIPE FOR 1"Ø TO 10"Ø SERVICE PIPE CONNECTION

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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)

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<th>C</th>
<th>1/2&quot;</th>
<th>3/4&quot;</th>
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<td>1833#</td>
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<tr>
<td>TENSION (φN₀)</td>
<td>714#</td>
<td>1692#</td>
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CASE 1 TABLE NOTES:
1. VALUES ARE GIVEN FOR SLWC & ARE CONSERVATIVE FOR NWC.
2. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Ω₁).
3. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.

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

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

\( \frac{1}{2}'' \) OR \( \frac{3}{4}'' \) POWERS POWERSTUD® SD2.
SEE SECTION 1, GENERAL NOTE 2.
DO NOT CUT OR DAMAGE (E) REINFORCING.

7'' MIN FOR
\( \frac{3}{4}'' \) ANCHORS

4\( \frac{1}{2}'' \) MIN FOR
\( \frac{1}{2}'' \) ANCHORS

\( f'c = 3000 \) PSI
MIN

CSBUNIV050 OR CSBUNIV075
SEE PG 7.1 OR CSBU PER PG 7.2
OR CSBT PER PG 8.8. SEE
APPENDIX C ON PGS C4 & C6
FOR CAPACITIES

CASE 2
SINGLE ANCHOR CAPACITY
AT LRFD (SEE NOTES)

| SHEAR (\( \phi \),\n|  |  |  | \( \phi \n|  |  |  | ) |  |  | \( \phi \n|  |  |  | ) |  |  | \( \phi \n|  |  |  | ) |  |  | \( \phi \n|  |  |  | ) |
|---|---|---|---|---|---|---|---|
| \( \frac{1}{2}'' \) | \( \frac{3}{4}'' \) | 1383# | 4676# | 1284# | 3296# |

CASE 2 TABLE NOTES:
1. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (\( \phi_0 \))
2. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.

Jeffrey Y. Kikumoto
OPM-0062-13
09/11/2017

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

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

$\frac{1}{2}"$ OR $\frac{3}{4}"$ POWERS
POWERSTUD+® SD2.
SEE SECTION 1,
GENERAL NOTE 2.
DO NOT CUT OR
DAMAGE (E) REINFORCING.

(E) REINFORCING

CSBUNIV050 OR CSBUNIV075
SEE PG 7.1 OR CSBU PER PG 7.2
OR CSBT PER PG 8.8. SEE
APPENDIX C ON PGS C4 & C6 FOR
CAPACITIES

$\phi$
SEE APPENDIX C ON PG C7

BRACE PIPE-- SEE APPENDIX B
ON PG B1 FOR CAPACITY OR
CSBT PER PG 8.8

(E) NWC WALL
($f'c = 3000$ PSI MIN)

CASE 3
SINGLE ANCHOR CAPACITY
AT LRFD (SEE NOTES)

<table>
<thead>
<tr>
<th></th>
<th>$\frac{1}{2}&quot;$</th>
<th>$\frac{3}{4}&quot;$</th>
</tr>
</thead>
<tbody>
<tr>
<td>SHEAR ($\phi V_n$)</td>
<td>1383#</td>
<td>4676#</td>
</tr>
<tr>
<td>TENSION ($\phi N_n$)</td>
<td>1284#</td>
<td>3296#</td>
</tr>
</tbody>
</table>

CASE 3 TABLE NOTES:
1. DEMAND FORCES SHALL
INCLUDE OVERSTRENGTH
FACTOR ($\phi_0$).
2. SEE GENERAL NOTES & HOW
TO USE THIS PRE-APPROVAL.

ELEV VIEW

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

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

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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.

½" Ø ASTM A307 MIN BOLT W/ STANDARD NUT AND LOCK WASHER,
SUPPLIED BY CONTRACTOR

1½" 12"
6" 6"

±Ωn

1½" 12"
6" 6"

±Ωn

±Ωn

±Ωn

(3) NWC OR SLWC SLAB
(f'c= 3000 PSI MIN)
OVER MTL DECK
(18 GA MIN)

CSBMA MULTI-ATTACHMENT
ASTM® A36 MIN STL
L2½x2½x½ x 1’-3”
SUPPLIED BY ERICO

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

CSBMA PERP TO DECK

ALLOWABLE AXIAL BRACE FORCE, Pa
AT ASD

<table>
<thead>
<tr>
<th>BRACE ANGLE Ø</th>
<th>ANCHOR</th>
<th>½&quot; ø</th>
<th>¼&quot; ø</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 DEG</td>
<td>292#</td>
<td>688#</td>
<td></td>
</tr>
<tr>
<td>01 DEG – 15 DEG</td>
<td>287#</td>
<td>677#</td>
<td></td>
</tr>
<tr>
<td>16 DEG – 30 DEG</td>
<td>287#</td>
<td>636#</td>
<td></td>
</tr>
<tr>
<td>31 DEG – 45 DEG</td>
<td>303#</td>
<td>627#</td>
<td></td>
</tr>
<tr>
<td>46 DEG – 60 DEG</td>
<td>345#</td>
<td>627#</td>
<td></td>
</tr>
<tr>
<td>61 DEG – 90 DEG</td>
<td>411#</td>
<td>662#</td>
<td></td>
</tr>
</tbody>
</table>

CASE 1 SINGLE ANCHOR CAPACITY
AT LRFD (SEE NOTES)

| SHEAR (ΩvN) | 2480# | 1833# |
| TENSION (ΩnN) | 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 (ΩD).
4. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO CONCRETE
CSBMA 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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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.

(E) NWC OR
SLWC SLAB
(f'c= 3000 PSI MIN)
OVER MTL DECK
(18 GA MIN)

\( \frac{1}{2}'' \times \frac{1}{2}'' \) OR \( \frac{3}{4}'' \times \frac{1}{4}'' \) POWERS
POWER-STUD+® SD2.
SEE SECTION 1,
GENERAL NOTE 2.

ONLY CSBUNIV050 SEE
PG 7.1 OR CSBU1 PER
PG 7.2 OR CSBT PER
PG 8.8. SEE APPENDIX
C ON PGS C4 & C6
FOR CAPACITIES

CSBMA PERP TO DECK
CSBMA PARALLEL TO DECK

BRACE PIPE HORIZ VECTOR LOAD PERP TO CSBMA

<table>
<thead>
<tr>
<th>ALLOWABLE AXIAL BRACE FORCE, Pa</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT ASD</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>BRACE ANGLE ( \phi )</td>
</tr>
<tr>
<td>ANCHOR</td>
</tr>
<tr>
<td>( \frac{1}{2}'' )</td>
</tr>
<tr>
<td>( \frac{3}{4}'' )</td>
</tr>
<tr>
<td>0 DEG</td>
</tr>
<tr>
<td>292#</td>
</tr>
<tr>
<td>688#</td>
</tr>
<tr>
<td>01 DEG – 15 DEG</td>
</tr>
<tr>
<td>292#</td>
</tr>
<tr>
<td>688#</td>
</tr>
<tr>
<td>16 DEG – 30 DEG</td>
</tr>
<tr>
<td>199#</td>
</tr>
<tr>
<td>445#</td>
</tr>
<tr>
<td>31 DEG – 45 DEG</td>
</tr>
<tr>
<td>157#</td>
</tr>
<tr>
<td>337#</td>
</tr>
<tr>
<td>46 DEG – 60 DEG</td>
</tr>
<tr>
<td>137#</td>
</tr>
<tr>
<td>286#</td>
</tr>
<tr>
<td>61 DEG – 90 DEG</td>
</tr>
<tr>
<td>130#</td>
</tr>
<tr>
<td>260#</td>
</tr>
</tbody>
</table>

| CASE 1 SINGLE ANCHOR CAPACITY |
| AT LRFD (SEE NOTES)           |
| \( \frac{1}{2}'' \)            |
| \( \frac{3}{4}'' \)            |
| SHEAR \( (\phi_{Vn}) \)        |
| 2480#                           |
| 1833#                           |
| TENSION \( (\phi_{Nn}) \)       |
| 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 \( (\Omega_o) \).
4. SEE GENERAL NOTES & HOW TO
USE THIS PRE-APPROVAL.

CSBMA CASE 1 - UNDERSIDE OF METAL DECK W/ CONCRETE FILL

CYS STRUCTURAL ENGINEERS, INC.

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SEISMIC SWAY BRACING FOR
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\[ \frac{1}{2}'' \text{ ASTM A307 MIN BOLT w/ STANDARD NUT AND LOCK WASHER, SUPPLIED BY CONTRACTOR} \]

\[ \frac{1}{2}'' \text{ OR } \frac{3}{4}'' \text{ POWERS POWERSTUD+® SD2. SEE SECTION 1, GENERAL NOTE 2.} \]

CSBMA MULTI-ATTACHMENT
ASTM® A36 MIN STL
\[ \angle 2\frac{1}{2}'' \times 2\frac{1}{2}'' \times 4'' \times 1'-' 0'', SUPPLIED BY ERICO \]

BRACE PIPE - SEE APPENDIX B
ON PG B1 FOR CAPACITY OR CSBT PER PG 8.8

<table>
<thead>
<tr>
<th>ALLOWABLE AXIAL BRACE FORCE, Pa AT ASD</th>
<th>CASE 2 SINGLE ANCHOR CAPACITY AT LRFD (SEE NOTES)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BRACE ANGLE °</td>
<td>ANCHOR</td>
</tr>
<tr>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td>0 DEG</td>
<td>( \frac{1}{2}'' )</td>
</tr>
<tr>
<td>01 DEG - 15 DEG</td>
<td>( \frac{3}{4}'' )</td>
</tr>
<tr>
<td>16 DEG - 30 DEG</td>
<td>( \frac{1}{2}'' )</td>
</tr>
<tr>
<td>31 DEG - 45 DEG</td>
<td>( \frac{3}{4}'' )</td>
</tr>
<tr>
<td>46 DEG - 60 DEG</td>
<td>( \frac{1}{2}'' )</td>
</tr>
<tr>
<td>61 DEG - 90 DEG</td>
<td>( \frac{3}{4}'' )</td>
</tr>
</tbody>
</table>

CASE 2 TABLE NOTES:
1. VALUES ARE FOR EA ANCHOR.
2. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR (Qo).
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
SACRAMENTO, CA 95833

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

$\frac{1}{2}"$ or $\frac{3}{4}"$ POWERS
POWERSTUD® SD2.
SEE GENERAL NOTE 2.
DO NOT CUT OR DAMAGE
(E) REINFORCING.

$\frac{1}{2}"$ ASTM® A307 MIN
BOLT W/ STANDARD NUT
AND LOCK WASHER,
SUPPLIED BY CONTRACTOR

CSBMA MULTI-ATTACHMENT ASTM®
A36 MIN STL L2\frac{1}{2}\times2\frac{1}{2}\times\frac{3}{4} \times 1\frac{1}{6} - 0",
SUPPLIED BY ERICO
(SEE PG 5.6 FOR ADDITIONAL INFO)

BRACE PIPE HORIZ VECTOR LOAD PERP TO CSBMA

ALLOWABLE AXIAL BRACE FORCE, Pa
AT ASD

| BRACE ANGLE $\phi$ | ANCHOR | $\frac{1}{2}"$ | $\frac{3}{4}"$
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 DEG</td>
<td>523#</td>
<td>1192#</td>
<td></td>
</tr>
<tr>
<td>01 DEG - 15 DEG</td>
<td>523#</td>
<td>1163#</td>
<td></td>
</tr>
<tr>
<td>16 DEG - 30 DEG</td>
<td>341#</td>
<td>697#</td>
<td></td>
</tr>
<tr>
<td>31 DEG - 45 DEG</td>
<td>260#</td>
<td>511#</td>
<td></td>
</tr>
<tr>
<td>46 DEG - 60 DEG</td>
<td>222#</td>
<td>423#</td>
<td></td>
</tr>
<tr>
<td>61 DEG - 90 DEG</td>
<td>203#</td>
<td>369#</td>
<td></td>
</tr>
</tbody>
</table>

CASE 2
SINGLE ANCHOR CAPACITY
AT LRFD (SEE NOTES)

| SHEAR ($\pm Vn$) | 1383#   | 2338#       |
| TENSION ($\pm Nn$) | 1284#   | 2967#       |

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

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

(E) MIN 20 GA STL DECK
W/ MIN 3000 PSI NWC
OR SLWC

 Ürün details:

POWERS SNAKE+™ 3/8" ø ANCHOR.
SEE SECTION 1, GENERAL NOTE 3.

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)

<table>
<thead>
<tr>
<th>( \phi )</th>
<th>( \phi )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>524#</td>
</tr>
<tr>
<td>462#</td>
<td></td>
</tr>
</tbody>
</table>

CASE 1 TABLE NOTES:
1. VALUES ARE GIVEN FOR SLWC &
   ARE CONSERVATIVE FOR NWC.
2. DEMAND FORCES SHALL INCLUDE
   OVERSTRENGTH FACTOR (\( Q_o \)).
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.
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

BOLT IS INTEGRAL W/ THE CSBBRS3

POWERS SNAKE+™ 3/8”φ ANCHOR. SEE SECTION 1,
GENERAL NOTE 3. DO NOT CUT OR DAMAGE
(E) REINFORCING.

(E) NWC SLAB
(f"c= 3000 PSI MIN)

SEE APPENDIX C
ON PG C7

±φVn

CSBBRS3— SEE APPENDIX C
ON PG C4
FOR CAPACITY

4" φ ANCHORS

3/8” φ OR 5/8” φ ALL THRD ROD
RESTRAINT— SEE APPENDIX B
ON PG B1 FOR CAPACITY

CASE 2 TABLE NOTES:
1. DEMAND FORCES SHALL INCLUDE
OVERSTRENGTH FACTOR (α₀).
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.

CASE 2 SINGLE ANCHOR CAPACITY
AT LRFD (SEE NOTES)

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>φ Vn</td>
<td>462#</td>
</tr>
<tr>
<td>φ Nn</td>
<td>564#</td>
</tr>
</tbody>
</table>

BY: Jeffrey Y. Kikumoto

DATE: 09/11/2017

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

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

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09/11/2017
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

CASE 4
SINGLE INSERT CAPACITY
AT LRFD (SEE NOTES)

<table>
<thead>
<tr>
<th>DIA</th>
<th>$\frac{1}{2}'' \phi$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$t=\frac{3}{4}''$, $t=4\frac{1}{2}''$</td>
</tr>
</tbody>
</table>

SHEAR ($\phi_{n}$) 1640# 1793#
TENSION ($\phi_{n}$) 1665# 1665#

CASE 4 TABLE NOTES:
1. DEMAND FORCES SHALL INCLUDE OVERSTRENGTH FACTOR ($\phi$)
2. SEE GENERAL NOTES & HOW TO USE THIS PRE-APPROVAL.
3. CIP = CAST IN PLACE CONC.

5.10 Jeffrey Y. Kikumoto
OPM-0062-13
09/11/2017

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

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

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FLANGE THICKNESS</th>
<th>FLANGE WIDTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSBIB075085</td>
<td>¼&quot; TO ¾&quot;</td>
<td>4&quot; TO 8½&quot;</td>
</tr>
<tr>
<td>CSBIB075145</td>
<td>¼&quot; TO ¾&quot;</td>
<td>8½&quot; TO 14½&quot;</td>
</tr>
<tr>
<td>CSBIB125180</td>
<td>¾&quot; TO 1¼&quot;</td>
<td>4&quot; TO 18&quot;</td>
</tr>
</tbody>
</table>

CSBIB—SEE APPENDIX C ON PG C4 FOR CAPACITY

FOR PROPER INSTALLATION, TORQUE TWIST-OFF TYPE BOLT HEAD (ASTM® A563 GR B) UNTIL IT BREAKS AWAY (40–50 FT-LBS)

ONLY CSBUNIV050 PER PG 7.1 FOR CSBIB OR CSBT PER PG 8.8. FOR CSBUNIV050 & CSBT, SEE APPENDIX C ON PGS C4 & C6 FOR CAPACITIES

SEE APPENDIX C ON PG C7

THRD ROD IS INTEGRAL TO THE CSBIB, TYP OF 2

½" BOLT SUPPLIED BY ERICO® (ASTM A449, 25–34 HRC HARDNESS)

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

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

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

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

FOR PROPER INSTALLATION, TORQUE
TWIST-OFF TYPE BOLT HEAD
(ASTM A563 GR B) UNTIL IT BREAKS AWAY
(40–50 FT-LBS)

CSBBC075—SEE APPENDIX
C ON PG C4 FOR CAPACITY

ONLY CSBUNV050 PER PG 7.1
OR CSBT PER PG 8.8 FOR
CSBBC075. FOR CSBUNV050 &
CSBT, SEE APPENDIX C ON
PGS C4 & C6 FOR CAPACITIES

(E) WF BM. SEE SEOR
RESPONSIBILITIES IN
SECTION 1

1/4" MIN TO 3/8" MAX
FLANGE THICKNESS

SEE APPENDIX C
ON PG C7

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

1/2" BOLT SUPPLIED BY ERICO®
(ASTM® A499, 25–34 HRC HARDNESS)

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

BRACE PIPE (ORIENTATION
MAY ALSO BE PARALLEL
TO THE LENGTH OF THE
WF BM)—SEE APPENDIX B
ON PG B1 FOR CAPACITY
OR CSBT PER PG 8.8

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED.

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

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OPM-0062-13: Reviewed for Code Compliance by Jeffrey Kikumoto
FOR PROPER INSTALLATION, TORQUE TWIST-OFF TYPE BOLT HEAD (ASTM A563 GR B) UNTIL IT BREAKS AWAY (40–50 FT-LBS)

CSBBARJ

3/4" MIN REQ

1/4" MIN TO 1/2" MAX ANGLE THICKNESS

(E) BAR JOIST, SEE SEOR RESPONSIBILITIES IN SECTION 1

CSBUNIV OR CSBT—SEE APPENDIX C ON PGS C4 & C6 FOR CAPACITIES

BRACE PERP TO JOIST

BRACE PERP TO JOIST

CSBBARJ—SEE APPENDIX C ON PG C4 FOR CAPACITY

SEE APPENDIX C ON PG C7

BRACE PIPE SEE APPENDIX B ON PG B1 FOR CAPACITY OR CSBT PER PG 8.8

BRACE PARALLEL TO JOIST

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

SIDE ATTACHMENT

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 6.11.
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

CSBBARJ – SEE APPENDIX C
ON PG C4 FOR CAPACITY

CSBBARJ

¼" MIN TO ½" MAX ANGLE THICKNESS

(E) BAR JOIST,
SEE SEOR RESPONSIBILITIES IN
SECTION 1

BRACE PERP TO JOIST

BRACE PERP TO JOIST

CSBUNIV OR CSBT – SEE
APPENDIX C ON PG C4 &
C6 FOR CAPACITIES

SEE APPENDIX C
ON PG C7

CSBBARJ

BRACE PIPE –
SEE APPENDIX B ON
PG B1 FOR CAPACITY
OR CSBT PER PG 8.8

FOR PROPER INSTALLATION,
TORQUE TWIST-OFF TYPE BOLT
HEAD (ASTM® A563 GR B) UNTIL
IT BREAKS AWAY (40–50 FT–LBS)

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

BRACE PARALLEL
TO JOIST

TOP FLANGE ATTACHMENT

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED.
FOR CORRESPONDING REPLACEMENT, SEE PG 6.12.
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

CSBBARJ TO TOP OR BOTT FLANGE

SEE APPENDIX C ON PG C7

CSBBARJ TO TOP OR BOTT FLANGE—SEE APPENDIX C ON PG C4 FOR
CAPACITY

½" MIN TO ½" MAX
TOP OR BOTT
FLANGE THICKNESS

(E) WF BM,
SEE SEOR
RESPONSIBILITIES
IN SECTION 1

BRACE PERP TO BM

CSBUNIV OR CSBT—SEE
APPENDIX C ON PGs C4 &
C6 FOR CAPACITIES

CSBBARJ TO TOP OR BOTT FLANGE

FOR PROPER INSTALLATION,
TORQUE TWIST-OFF TYPE BOLT HEAD
(ASTM® A563 GR B) UNTIL IT BREAKS
AWAY (40–50 FT-LBS)

BRACE PIPE
LIMIT TO 1½" MAX FOR
TOP FLANGE ATTACHMENT—
SEE APPENDIX B ON PG
B1 FOR CAPACITY OR
CSBT PER PG 8.8

BRACE PARALLEL TO BM

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

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

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CSBBRS1 TO TOP OR BOTT FLANGE—SEE APPENDIX C ON PG C4 FOR CAPACITY

12 GA MIN TO $\frac{3}{8}"$ MAX FLANGE THICKNESS
(IF bf > $\frac{3}{8}"$, USE DTLs ON PG 5.8 OR 6.9)

SEE APPENDIX C ON PG C7

(E) STRUC STL MEMBER
(IE WF BM, CHANNEL, ANGLE, ETC.)
SEE SEOR RESPONSIBILITIES IN SECTION 1

NOTE:
ATTACHMENT MAY ALSO BE TO THE WEB OF THE WF BM.

RESTRAINT PERP TO BM

ELCO® 12–24x1\(\frac{1}{2}\)" SELF–DRILLING SCREW
AT ASD $V_{\text{max}} = 525\#$ & $T_{\text{max}} = 205\#$
(SUPPLIED BY ERICO®)

NOTE:
FOR PARALLEL TO BM CONDITION
ATTACH TO BOTT FLANGE ONLY.

RESTRAINT ROD—SEE APPENDIX B ON PG B1
FOR CAPACITY

RESTRAINT PARALLEL TO BM

NOTE:
SEE APPENDIX C FOR HORIZ CAPACITY $F_{\text{h}}$
OF CSBBRS1 AT ALLOWABLE STRESS DESIGN.

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CSBRS1 - SEE APPENDIX C ON PG C4 FOR CAPACITY

SEE APPENDIX C ON PG C7

CSBRS1

12 GA MIN TO ½" MAX ANGLE THICKNESS

(E) BAR JOIST, SEE SEOR RESPONSIBILITIES IN SECTION 1

RESTRAINT PERP TO JOIST

RESTRAINT PERP TO JOIST

CSBRS1

ELCO® 12–24x1½" SELF DRILLING SCREW AT ASD VMAX = 525# & TMAX = 205#
(SUPPLIED BY ERICO®)

NOTES:

1. SEE APPENDIX C FOR HORIZ CAPACITY FH OF CSBRS1 AT ALLOWABLE STRESS DESIGN.

2. THE CSBRS1 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

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBRS1 - TOP CHORD OF OPEN WEB JOIST

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CSBRS1 TO TOP OR BOTT FLANGE - SEE APPENDIX C ON PG C4 FOR CAPACITY

12 GA MIN TO 1/2" MAX FLANGE THICKNESS

(E) C OR Z PURLIN, SEE SEOR RESPONSIBILITIES IN SECTION 1

NOTE:
ATTACHMENT MAY ALSO BE TO THE WEB OF THE PURLIN.
SUGGEST ATTACHMENT BE MADE SO AS TO MINIMIZE TORSION.

RERAINT PERP TO PURLIN

CSBRS1 TO TOP OR BOTT FLANGE

ELCO® 12-24x1 1/4" SELF DRILLING SCREW AT ASD \( V_{\text{max}} = 525# \) & \( T_{\text{max}} = 205# \)
(SUPPLIED BY ERICO®)

\[ \pm V \]

\[ \pm T \]

RERAINT PARALLEL TO PURLIN

RERAINT ROD - SEE APPENDIX B ON PG B1 FOR CAPACITY

NOTES:
1. SEE APPENDIX C FOR HORIZ CAPACITY \( F_h \) OF CSBRS1 AT ALLOWABLE STRESS DESIGN.
2. THE RERAINT ROD MAY GOVERN THE CAPACITY OF THE RERAINT ASSEMBLY.

SHEET TITLE: SUPPORTS & ATTACHMENT DETAIL TO STEEL
CSBRS1 - PURLIN

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CSBBRS3 W/ MODEL 300 BM CLAMP TO TOP OR BOTT FLANGE—SEE APPENDIX C ON PG C4 FOR CAPACITY

CSBBRS3 W/ MODEL 300 BM CLAMP TO TOP FLANGE

\( \frac{\pi}{4}'' \) MIN TO \( \frac{\pi}{4}'' \) MAX FLANGE THICKNESS

(E) WF BM, SEE SEOR RESPONSIBILITES IN SECTION 1

RERAINT PERP TO BM

\( \frac{\pi}{6}'' \) CUP POINT SET SCREW

CSBBRS3 W/ MODEL 300 BM CLAMP TO TOP OR BOTT FLANGE

CSBBRS3 W/ MODEL 300 BM CLAMP TO BOTT FLANGE

RERAINT PARALLEL TO BEAM

RERAINT PERP TO BM

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

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

THIS IS A NEW PRODUCT
FOR PROPER INSTALLATION, TORQUE TWIST-OFF TYPE BOLT HEAD (ASTM® A563 GR B) UNTIL IT BREAKS AWAY (35–45 FT-LBS)

CSBS1

7/8" MIN REQ

1/4" MIN TO 3/4" MAX ANGLE THICKNESS

(E) BAR JOIST, SEE SEOR RESPONSIBILITIES IN SECTION 1

CSBU1 OR CSBT—SEE APPENDIX C ON PG C6 FOR CAPACITY

BRACE PERP TO JOIST

BRACE PERP TO JOIST

CSBS1—SEE APPENDIX C ON PG C6 FOR CAPACITY

SEE APPENDIX C ON PG C7

BRACE PIPE—SEE APPENDIX B ON PG B1 FOR CAPACITY OR CSBT PER PG B.8

BRACE PARALLEL TO JOIST

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

SIDE ATTACHMENT

THIS IS A NEW PRODUCT

Sheets Title: Supports & Attachment Detail to Steel
CSBS1 - Top Chord of Open Web Joist Side Install

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CSBS1 - SEE APPENDIX C
ON PG C6 FOR CAPACITY

CSBU1 OR CSBT

1/4" MIN TO 3/8" MAX
ANGLE THICKNESS

(E) BAR JOIST,
SEE SEOR
RESPONSIBILITIES IN
SECTION 1

BRACE PERP TO JOIST
BRACE PARALLEL TO JOIST
TOP FLANGE ATTACHMENT

THIS IS A NEW PRODUCT

NOTE:
SEE APPENDIX C ON PG C6 FOR
HORIZ CAPACITY \( F_h \) OF CSBS1
AT ALLOWABLE STRESS DESIGN.

FOR PROPER INSTALLATION,
TORQUE TWIST-OFF TYPE BOLT
HEAD (ASTM® A563 GR B) UNTIL
IT BREAKS AWAY (35–45 FT–LBS)

CSBS1

SEE APPENDIX C ON PG C7

BRACE PIPE–
SEE APPENDIX B ON
PG B1 FOR CAPACITY
OR CSBT PER PG 8.8

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FOR PROPER INSTALLATION, TORQUE
TWIST-OFF TYPE BOLT HEAD
(ASTM A563 GR B) UNTIL IT BREAKS AWAY
(35–45 FT-LBS)

\(\frac{3}{8}\)" BOLT SUPPLIED BY ERICO®
(ASTM® A449, 25–34 HRC
HARDNESS)

SEE APPENDIX C
ON PG C7

\(\phi\) BOLT SUPPLIED BY ERICO®
(ASTM® A449, 25–34 HRC
HARDNESS)

\(\frac{3}{4}\)" MIN TO \(\frac{3}{4}\)" MAX
FLANGE THICKNESS

CSBS1 – SEE APPENDIX C
ON PG C6 FOR CAPACITY
ONLY CSBU1 PER PG 7.2 OR CSBT PER
PG 8.8 FOR CSBS1. FOR CSBU1 & CSBT,
SEE APPENDIX C ON PG C6 FOR
CAPACITIES

BRACE PIPE (ORIENTATION MAY ALSO
BE PARALLEL TO THE LENGTH OF THE
WF BM) – SEE APPENDIX B ON PG B1
FOR CAPACITY OR CSBT PER PG 8.8

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

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<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>FLANGE THICKNESS</th>
<th>FLANGE WIDTH</th>
<th>THRD ROD</th>
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<td>CSBS3</td>
<td>⅛” TO ⅜”</td>
<td>4” TO 8½”</td>
<td>12”</td>
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<td>CSBS4</td>
<td>⅛” TO ⅜”</td>
<td>4” TO 14½”</td>
<td>17”</td>
</tr>
<tr>
<td>CSBS5</td>
<td>⅛” TO ⅜”</td>
<td>4” TO 18”</td>
<td>21½”</td>
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FOR PROPER INSTALLATION,
TORQUE TWIST-OFF TYPE BOLT HEAD
(ASTM® A563 GR B) UNTIL IT
BREAKS AWAY (35-45 FT-LBS)

⅛-13 UNC-2A x 1.75” CARRIAGE BOLT
& ⅛-13 UNC-2B SERRATED FLANGE
NUT SUPPLIED BY ERICO®
TORQUE TO 50 FT-LBS

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

⅜” THICK FLANGE SHOE

CSBS – SEE APPENDIX C ON
PG C6 FOR CAPACITY

(E) WF BM. SEE SEOR
RESPONSIBILITIES IN SECTION 1

⅜”-16 THRD ROD IS
INTEGRAL TO THE CSBS,
SEE SCHEM FOR
LENGTH, TYP OF 2

SEE APPENDIX C
ON PG C7

BRACE PIPE (ORIENTATION MAY ALSO
BE PARALLEL TO THE LENGTH OF THE
WF BM) – SEE APPENDIX B ON PG B1
FOR CAPACITY OR CSBT PER PG 8.8

ONLY CSBU1 PER PG 7.2 OR
CSBT PER PG 8.8 FOR CSBS.
FOR CSBU1 & CSBT, SEE
APPENDIX C ON PG C6 FOR
CAPACITIES

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

PLAN VIEW A-A

THIS IS A NEW PRODUCT

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### Sheet Title: Seismic Brace Support Details

**CSBUNIV050 & CSBUNIV075 for ⅜" and ¾" Bolts**

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#### Bolt Hole Details

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<th>Bolt Number</th>
<th>Diameter</th>
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<tr>
<td>CSBUNIV050</td>
<td>0.56&quot;</td>
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<tr>
<td>CSBUNIV075</td>
<td>0.80&quot;</td>
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---

**For Proper Installation, Torque Twist-Off Type Bolt Head Until It Breaks Away**

**Top View**

**Side Views**

**Note:**
See Appendix C on pg C4 for Horiz Capacity $F_h$ of CSBUNIV at Allowable Stress Design.

---

**For Bolt Hole See Schedule**

---

**This is a Phased Out Product and May Still Be Used. For Corresponding Replacement, See Pg 7.2.**
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

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

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

FOR BOLT HOLE
SEE SCHEDULE

BOLT HOLE
DIA

CSBU1
0.56"

CSBU2
0.81"

TOP VIEW

CSBRIVET225EG 3/8"x2.25
LONG SEMI-TUBULAR RIVET

CSB0621500EG 5/8–11
UNC CONE POINT SHEAR
OFF SET SCREW

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

THIS IS A NEW PRODUCT

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SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

1"Ø OR 1½"Ø SCHEDULE
40 MIN BRACE PIPE

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

±Fpv

TRANSVERSE SEISMIC BRACE MUST
BE WITHIN 6" OF THE VERT SEISMIC
BRACE. FOR INFO NOT SHOWN OR
NOTED, SEE PG 2.1

CSBQIKCL – SEE APPENDIX C ON PG C1
FOR HORIZ CAPACITY Fh AT ALLOWABLE
STRESS DESIGN

1"Ø TO 2"Ø
SERVICE PIPE

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.
NOTES:
1. THE BRACE PIPE MAY BE ATTACHED TO THE SUPPORTING STRUCTURE W/ THE FOLLOWING ASSEMBLIES:
   A. CSBUNIV PER PG5 5.1 & 5.2
   B. CSBMA PER PG5 5.4 & 5.5
   C. CSBIB PER PG 6.1
   D. CSBBC075 PER PG 6.2
   E. CSBBARJ PER PG5 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.

SEE SHEET TITLE: VERTICAL SEISMIC BRACE
CSBQG WITH BRACE PIPE FOR 2½"Ø TO 8"Ø SERVICE PIPE CONNECTION
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. CSBBC75 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 $\theta=90^\circ$ 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.

ELEV

SECTION A-A

CSBSTU-- SEE APPENDIX C ON PGS C2, C3 AND C7 FOR HORIZ CAPACITY $F_H$ AT ALLOWABLE STRESS DESIGN AND TORQUE VALUES FOR THE CLAMP BOLTS.

TRANSVERSE SEISMIC BRACE MUST BE WITHIN 6" OF THE VERT SEISMIC BRACE. FOR INFO NOT SHOWN OR NOTED, SEE PG 2.3

1"Ø TO 2"Ø SCHEDULE 40 MIN BRACE PIPE

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

±Fpv

±Fpw OR ± Fp

A

1"Ø TO 10"Ø SERVICE PIPE

A

THIS IS A PHASED OUT PRODUCT AND MAY STILL BE USED. FOR CORRESPONDING REPLACEMENT, SEE PG 8.6.
**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 $=90^\circ$ 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.**

---

**SECTION A–A**

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

---

**SHEET TITLE:** VERTICAL SEISMIC BRACE

**CSBEZU WITH BRACE PIPE FOR 1"Ø TO 6"Ø SERVICE PIPE CONNECTION**

---

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SECTION A–A

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


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.

CSBBRP– SEE APPENDIX C ON PG C4 FOR HORIZ CAPACITY $F_h$ AT ALLOWABLE STRESS DESIGN

CSBBRP WITH RESTRAINT ROD FOR 1"Ø TO 2"Ø SERVICE PIPE CONNECTION

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NOTES:

1. THE BRACE PIPE MAY BE ATTACHED TO THE SUPPORTING STRUCTURE WITH 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 $\theta=90^\circ$ 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.
SEISMIC SWAY BRACING FOR
FIRE SPRINKLER SYSTEMS

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. CSBBCO75 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 TESCOPIING 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.

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CSBT101, CSBT201, CSBT301, OR CSBT401 — BRACE SUBASSEMBLY

PCRLB37EG — ROD LOCK ASSEMBLY, TYP

CSBTB1 W/ 0.53" HOLE FOR 5/16" BOLT ATTACHMENT

1/4" Ø TELESCOPING PIPE

HOLE IN 1/2" Ø PIPE FOR 5/16" SELF-TAPPING SCREW PROVIDED BY MFR. SEE NOTES 1 & 2

THIRD VISIBLE, TYP

TORQUE NUTS TO 7 IN-LBS CLOCKWISE (1/4 TURN MIN)

1" Ø TELESCOPING PIPE

PUSH CLAMP EVENLY INTO NUTS UNTIL TOUCHING (SERVICE) PIPE IN TWO PLACES

CSBTX02 — V-BOLT

RIVET

RI

E T

V HOLE

V E R I S

E L

G I M M E R

STAMPING

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 NOSEPICE 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.

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

Job No: 17020
Date: 08-18-2017
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09/11/2017
OPM-0062-13: Reviewed for Code Compliance by Jeffrey Kikumoto
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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, Fp, 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 APPICABILITY 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) 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 = 0.4 ap Sdp Wp (1+ 2 z/h) = 2.5 Wp

TABLE 13.6.1

<table>
<thead>
<tr>
<th>z/h</th>
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<tr>
<td>3/4</td>
<td>4TH FLR</td>
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<tr>
<td>3/2</td>
<td>3RD FLR</td>
<td></td>
</tr>
<tr>
<td>3/4</td>
<td>2ND FLR</td>
<td></td>
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<tr>
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<td>BASE</td>
<td></td>
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<td>0</td>
<td>BASEMENT</td>
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SAMPLE BLDG ELEV

SECTION 13.1.3 Ip = 1.5 (EMERGENCY SYSTEM)

SECTION 13.3.1

| Fp (MAX) = 1.6 Sdp Ip Wp = 6.0 Wp |
| Fp (MIN) = 0.3 Sdp Ip Wp = 1.125 Wp |
| 1.125 Wp ≤ 2.5 Wp ≤ 6.0 Wp |

SECTION 13.3.1

| Fpv = 0.20 Sdp Wp = 0.50 Wp |

FORCES AT ASD

| Fp = 0.7 Fp = 0.7 (2.5 Wp) = 1.75 Wp = Cp Wp |
| Fpv = 0.7 Fpv = 0.7 (5.0 Wp) = 3.5 Wp |

NOTE: NFPA 13 uses a simplified seismic factor, Cp, which combines ground shaking Ss, dynamic amplification ap, component response Rp/ip, and location in the building (z/h) into a single variable. Sds = 2/3 Fa Ss where Ss 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.

EXAMPLE OF SEISMIC SWAY BRACE DESIGN PROCEDURE

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Job No: 17020
Date: 08-18-2017
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### APPENDIX 'A':
#### SUMMARY OF TYP DESIGN EXAMPLE (CONTINUED)

**B. DEMAND (CONTINUED):**
1. The CRDP uses the NFPA® 13 guidelines to prepare the fire sprinkler layout drawings.
2. The CRDP determines the brace locations and shows them on the layout drawings.
3. 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.
4. 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.
5. In addition, the seismic acceleration values are higher in California than the current published NFPA 13 values.

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

**Schedule LW Steel Pipe (Light-Wall Schedule 7)**

<table>
<thead>
<tr>
<th>Pipe Size (in)</th>
<th>( \bar{C} )</th>
<th>( \bar{C}_{w} )</th>
<th>( M_{n} )</th>
<th>( M_{s} )</th>
<th>Max Permissible ZOI Load, ( F_{zoi} ) (lbs)</th>
<th>Max Permissible ZOI Weight, W (lbs)</th>
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</thead>
<tbody>
<tr>
<td>1 1/4</td>
<td>0.002</td>
<td>0.11</td>
<td>103</td>
<td>1.8</td>
<td>2.8</td>
<td>12</td>
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<tr>
<td>1 1/2</td>
<td>0.030</td>
<td>0.30</td>
<td>407</td>
<td>3.6</td>
<td>5.4</td>
<td>12</td>
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<tr>
<td>2</td>
<td>0.040</td>
<td>0.75</td>
<td>426</td>
<td>5.0</td>
<td>7.5</td>
<td>12</td>
</tr>
<tr>
<td>2 1/2</td>
<td>0.050</td>
<td>1.00</td>
<td>471</td>
<td>6.8</td>
<td>10.2</td>
<td>12</td>
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<tr>
<td>3</td>
<td>0.060</td>
<td>0.69</td>
<td>471</td>
<td>6.8</td>
<td>10.2</td>
<td>12</td>
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<tr>
<td>4</td>
<td>0.090</td>
<td>1.20</td>
<td>700</td>
<td>10.7</td>
<td>16.0</td>
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<tr>
<td>6</td>
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<td>3.51</td>
<td>700</td>
<td>21.9</td>
<td>32.9</td>
<td>12</td>
</tr>
</tbody>
</table>

1. Steel pipe dimension as provided by ERICO.
2. \( S = \left( \frac{\bar{C} - \bar{C}_{w}}{\bar{C}_{w}} \right) \) where \( t_{nom} \). \( \times 0.93 t_{nom} \) (per ASC 360).

#### Seismic Coefficient Table

<table>
<thead>
<tr>
<th>( S_{s} )</th>
<th>( S_{t} )</th>
<th>( C_{s} ) (ASD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.80</td>
<td>1.87</td>
<td>1.31</td>
</tr>
<tr>
<td>2.50</td>
<td>1.93</td>
<td>1.35</td>
</tr>
<tr>
<td>3.00</td>
<td>2.00</td>
<td>1.40</td>
</tr>
<tr>
<td>3.10</td>
<td>2.07</td>
<td>1.45</td>
</tr>
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<td>3.20</td>
<td>2.13</td>
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<td>1.63</td>
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<tr>
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<td>3.75</td>
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</table>

1. See NFPA Table 9.3.6.9.3 for \( S_{s} \) values less than 2.80.
### Schedule 10 Steel Pipe

<table>
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<tr>
<th>Pipe (a)</th>
<th>OD (in)</th>
<th>Schedule (S)</th>
<th>W (lb)</th>
<th>( W_{he} )</th>
<th>( L_{he} )</th>
<th>( M_{he} )</th>
<th>( M_{max} )</th>
<th>Max. Permissible ZOI Load, ( F_{max} )</th>
<th>Max. Permissible ZOI Weight, ( W_{he} )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>(lbs)</td>
<td>(lbs)</td>
</tr>
<tr>
<td>1</td>
<td>0.150</td>
<td>0.109</td>
<td>0.11</td>
<td>0.87</td>
<td>0.017</td>
<td>0.042</td>
<td>0.26</td>
<td>96</td>
<td>39.1</td>
</tr>
<tr>
<td>1 1/4</td>
<td>0.156</td>
<td>0.109</td>
<td>0.10</td>
<td>0.87</td>
<td>0.017</td>
<td>0.042</td>
<td>0.26</td>
<td>96</td>
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</tr>
<tr>
<td>1 1/2</td>
<td>0.160</td>
<td>0.109</td>
<td>0.09</td>
<td>0.87</td>
<td>0.017</td>
<td>0.042</td>
<td>0.26</td>
<td>96</td>
<td>39.1</td>
</tr>
<tr>
<td>2</td>
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<td>0.109</td>
<td>0.08</td>
<td>0.87</td>
<td>0.017</td>
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<td>0.26</td>
<td>96</td>
<td>39.1</td>
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<td>0.109</td>
<td>0.06</td>
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<td>96</td>
<td>39.1</td>
</tr>
<tr>
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<td>0.220</td>
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<td>0.042</td>
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<td>39.1</td>
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<tr>
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<td>0.03</td>
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<td>0.017</td>
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<td>96</td>
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<tr>
<td>6</td>
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<td>0.017</td>
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<td>0.26</td>
<td>96</td>
<td>39.1</td>
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<table>
<thead>
<tr>
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<th>Lateral Sway Brace Spacing, L (ft)</th>
</tr>
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<td>10</td>
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<tr>
<td>35</td>
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<tr>
<td>40</td>
<td>40</td>
</tr>
</tbody>
</table>

1. Steel pipe dimension per NFPA, Table A 6.3.2.
2. \( S = \frac{4}{(2 \cdot CD)^2} \) (AISC 9.2.2.1 (c))
3. Maximum distance between hangers per NFPA Table 9.2.2.1 (a).

### Schedule 40 Steel Pipe

<table>
<thead>
<tr>
<th>Pipe (a)</th>
<th>OD (in)</th>
<th>Schedule (S)</th>
<th>W (lb)</th>
<th>( W_{he} )</th>
<th>( L_{he} )</th>
<th>( M_{he} )</th>
<th>( M_{max} )</th>
<th>Max. Permissible ZOI Load, ( F_{max} )</th>
<th>Max. Permissible ZOI Weight, ( W_{he} )</th>
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<tbody>
<tr>
<td></td>
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<td></td>
<td></td>
<td></td>
<td>(lbs)</td>
<td>(lbs)</td>
</tr>
<tr>
<td>1</td>
<td>0.150</td>
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<td>0.11</td>
<td>0.87</td>
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<td>0.042</td>
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<td>96</td>
<td>39.1</td>
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<tr>
<td>1 1/4</td>
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<td>0.042</td>
<td>0.26</td>
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<tr>
<td>1 1/2</td>
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<td>0.042</td>
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<td>96</td>
<td>39.1</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Lateral Sway Brace Spacing, L (ft)</th>
<th>Lateral Sway Brace Spacing, L (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
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</tbody>
</table>

1. Steel pipe dimension per NFPA, Table A 6.3.2.
2. \( S = \frac{4}{(2 \cdot CD)^2} \) (AISC 9.2.2.1 (c))
3. Maximum distance between hangers per NFPA Table 9.2.2.1 (a).
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,

\[ Wp = 575 \text{ LBS} \]

\[ Fp = \pm 1.75 \times (575 \text{ LBS}) = \pm 1006 \text{ LBS} \]

\[ Fpv = \pm 0.35 \times (575 \text{ LBS}) = \pm 201 \text{ LBS} \]

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 CSBOG 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.
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 CSBDG 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 CSBDG 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 CSBUNIV50 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" 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 Ə₀ 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 Ə₀ = 0.7 Pu/Ə₀.

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. THEREFORE, THE BRACE SPACING (i.e. W BASED ON Z0) 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.
# APPENDIX 'B':

## Lateral Sway Brace Pipe Axial Capacity (Pounds)

<table>
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<tr>
<th>NOMINAL DIA</th>
<th>OUTSIDE DIA</th>
<th>NOMINAL WALL THK</th>
<th>DESIGN WALL THK</th>
<th>AREA $A_g$ (in²)</th>
<th>D/t</th>
<th>r (in)</th>
<th>PIPE LENGTH</th>
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<td>1.00&quot;</td>
<td>1.32&quot;</td>
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<td>0.130&quot;</td>
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<tr>
<td>1.50&quot;</td>
<td>1.90&quot;</td>
<td>0.145&quot;</td>
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<td>2.00&quot;</td>
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<td>0.791</td>
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### 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 $k/r < 300$.

## Rod Restraint Axial Capacity

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<tr>
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<td>–</td>
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<tr>
<td>⅜”</td>
<td>140#</td>
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### 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 $k/r \leq 400$. Interpolation is acceptable.
## 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)

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<tr>
<th>MODE</th>
<th>COMPONENT DESCRIPTION</th>
<th>RUN PIPE NOMINAL DIA (INCHES)</th>
<th>RUN PIPE REFERENCE</th>
<th>HORIZ CAPACITY $F_h$ (POUNDS) PER INSTALLATION ANGLE $\theta$</th>
<th>NOTES</th>
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<td>LW</td>
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### SHEET TITLE: APPENDIX 'C'

CAPACITY TABLE OF BRACE SUPPORTS

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

Job No: 17020
Date: 08-18-2017
Page: C1 of 87
# 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)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Component Description</th>
<th>Run Pipe Nominal Dia (Inches)</th>
<th>Run Pipe Reference</th>
<th>Horiz Capacity $F_h$ (Pounds) Per Installation Angle $\theta$</th>
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### APPENDIX 'C' (CONTINUED)

#### CAPACITY TABLE OF BRACE SUPPORTS

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<tr>
<th>MODE</th>
<th>COMPONENT DESCRIPTION</th>
<th>RUN PIPE NOMINAL DIA (INCHES)</th>
<th>RUN PIPE REFERENCE</th>
<th>HORIZ CAPACITY $F_h$ (POUNDS) PER INSTALLATION ANGLE $\theta$</th>
<th>NOTES</th>
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<td>$30^\circ$ – $44^\circ$</td>
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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)**

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<th>MODE</th>
<th>COMPONENT DESCRIPTION</th>
<th>RUN PIPE NOMINAL DIA (INCHES)</th>
<th>RUN PIPE REFERENCE</th>
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### Capacity Table of Brace Supports

**CYS Structural Engineers, Inc.**

2495 NATOMAS PARK DRIVE, SUITE 650

SACRAMENTO, CA 95833

**Job No:** 17020

**Date:** 08-18-2017

**Page:** C4 of 87
### APPENDIX 'C'

**ALSO SEE NOTES AT END OF TABLE**

(NOTES 'a' THRU 'd' AND t, u ARE TYP)

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*Sheet Title: APPENDIX 'C' (CONTINUED)*

**CAPACITY TABLE OF BRACE SUPPORTS**

**CYS STRUCTURAL ENGINEERS, INC.**

2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

Job No: 17020
Date: 08-18-2017
Page: C5 of 87
### APPENDIX 'C' (CONTINUED)

**CAPACITY TABLE OF BRACE SUPPORTS**

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APPENDIX 'C' (CONTINUED)

CAPACITY TABLE OF BRACE SUPPORTS

CYS STRUCTURAL ENGINEERS, INC.
2495 NATOMAS PARK DRIVE, SUITE 650
SACRAMENTO, CA 95833

Job No: 17020
Date: 08-18-2017
Page: C7 of 87

APPLENDIX ‘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/O SHPD. 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.

![Diagram](image_url)

**ELEV**
- **MODE T**
  - TRANSVERSE (LATERAL) BRACE

**ELEV**
- **MODE L**
  - LONGITUDINAL BRACE

**PLAN**
- **MODE R**
  - FOUR-WAY RISER BRACE

**NOTE:**
- USE \( \varphi=90^\circ \) OF TRANSVERSE MODE FOR AXIAL CAPACITY OF COMPONENT

\[ \pm F_H \]

- RUN (SERVICE) PIPE

\[ \pm F_H \]

- LOAD RATINGS FOR USE OF A \( \frac{3}{8}''\)–16 UNC (M10x1.5) THRD ROD AS THE BRACE MEMBER.

\[ \pm F_H \]

- LOAD RATINGS FOR USE OF A \( \frac{3}{8}''\)–13 UNC (M12x1.75) THRD ROD AS THE BRACE MEMBER.

\[ \pm F_H \]

- LOAD RATINGS FOR USE OF A MODEL 300 BM CLAMP (%\(\varphi\)-16 UNC/M10x1.5 BOLT) AS MEANS FOR ATTACHMENT TO STRUC MEMBER.
## SEISMIC SWAY BRACING FOR FIRE SPRINKLER SYSTEMS

### APPENDIX 'C'

**NOTES (CONTINUED):**

**h.** LOAD RATINGS BASED ON THE USE OF A 3⁄8"-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", 1 1⁄4", 1 1⁄2" 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 1 1⁄4" (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 BRACG 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.

---

### CAPACITY TABLE OF BRACE SUPPORTS

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APPENDIX 'C’ (CONTINUED):

w. TORQUE VALUES FOR CSBSTRU SERVICE PIPE CLAMP BOLTS:

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<td>25 (34)</td>
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<tr>
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<td>CSBEZU0400(XX)</td>
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<td>50 (68)</td>
</tr>
<tr>
<td>CSBEZU0600(XX)</td>
<td>50 (68)</td>
</tr>
</tbody>
</table>

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.
## SEISMIC SWAY BRACING FOR
### FIRE SPRINKLER SYSTEMS

### APPENDIX 'C'

NOTES (CONTINUED):

z. TORQUE VALUES FOR CSB SERVICE PIPE CLAMP BOLTS:

<table>
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<tr>
<th>PART NUMBER</th>
<th>TORQUE FT-LBS (N-m)</th>
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<td>CSB0100(XX)</td>
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<tr>
<td>CSB0500(XX)</td>
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</tr>
<tr>
<td>CSB0600(XX)</td>
<td>45 (61)</td>
</tr>
<tr>
<td>CSB0800(XX)</td>
<td>45 (61)</td>
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<tr>
<td>CSB1000(XX)</td>
<td>45 (61)</td>
</tr>
</tbody>
</table>

OPM-0062-13: Reviewed for Code Compliance by Jeffrey Kikumoto

BY: Jeffrey Y. Kikumoto

DATE: 09/11/2017