# APPLICATION FOR HCAI PREAPPROVAL OF MANUFACTURER'S CERTIFICATION (OPM)

OFFICE USE ONLY

**APPLICATION #: OPM-0203**

## HCAI Preapproval of Manufacturer's Certification (OPM)

**Type:** ☐ New ☒ Renewal/Update

## Manufacturer Information

Manufacturer: M. W. Sausse & Co Inc

Manufacturer's Technical Representative: Nathan Tremblay

Mailing Address: 28744 Witherspoon Parkway, Valencia, CA 91355

Telephone: (661) 425-8061 Email: ntremblay@vibrex.net

## Product Information

Product Name: Hanger Box Model PRMXA-1C, SLH-34 & SLW Cable Bracing Kit, HLSH-34/HSLH-1 & SLW Rigid Bracing Kit

Product Type: Seismic support and bracing systems

Product Model Number: PRMXA-1C (spring hanger), SLH-34 (cable bracing bracket), HSLH-34 & HSLH-1 (rigid bracing bracket), Vibrex Cable Clamp, SLW-38 thru SLW-1 (slotted washers for brackets)

General Description: Seismic support and bracing system for suspended mechanical & electrical equipment & Suspended distribution systems (mechanical/plumbing pipe, ductwork, conduit, & cable trays)

## Applicant Information

Applicant Company Name: M. W. Saussé & Co., Inc.

Contact Person: Nathan Tremblay

Mailing Address: 28744 Witherspoon Parkway, Valencia, CA 91355

Telephone: (661) 425-8061 Email: ntremblay@vibrex.net

Title: Principal Engineer

## Registered Design Professonal Preparing Engineering Recommendations

Company Name: M.W. SAUSSÉ & COMPANY, INC.

Name: Pankaj Kumar Sachdeva California License Number: CE59644

Mailing Address: 28744 Witherspoon Pkwy, Valencia, CA 91355

Telephone: (661) 433-3433 Email: llawson@vibrex.net

## Certification Method

Testing in accordance with: ☐ ICC-ES AC156 ☐ FM 1950 ☐ ASHRAE 171 ☐ FEMA 461

☐ Other(s) (Please Specify):

*Use of criteria other than those adopted by the California Building Standards Code, 2019 (CBSC 2019) 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 2019 may be used when approved by HCAI prior to testing.

☐ Analysis

☐ Experience Data

☒ Combination of Testing, Analysis, and/or Experience Data (Please Specify): FM 1950-10 (testing was performed during the

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BY: Roy Lobo
DATE: 07/19/2025

## HCAI Approval

Date: 7/19/2025

Name: Roy Lobo Title: Principal Structural Engineer

Condition of Approval (if applicable):

M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050

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# SEISMIC RESTRAINT GUIDELINES FOR SUSPENDED DISTRIBUTION SYSTEMS AND EQUIPMENT

**2nd EDITION, 2025**

# OPM-0203-22

07/21/2025

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# SECTION 1

# GENERAL INFORMATION

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# 1. PREFACE

This OSHPD Pre-approval of Manufacturer's Certification (OPM) is based on the 2022 edition of the California Building Code (2022 CBC).
The demand/design forces for use with this OPM must be based on the 2022 CBC.
The maximum $S_{DS}$ for this OPM is less than or equal to 2.5g.

**I. Scope & Limitations:**

This pre-approval is for the seismic bracing of interior suspended equipment and mechanical pipe & duct systems as well as electrical cable trays/raceways. It does not address other loads such as, but not limited to, those generated by thermal growth, pressure or pressure thrust, & fluid dynamics. It does not address components that cross seismic separations of buildings or components attached to portions of the structure or equipment that will experience relative seismic drifts other than pipe & duct risers.

**II. The ranges of component sizes and material included in the pre-approval are listed as follows:**

a) Mechanical Pipe:
   Schedule 40 Steel Pipe – 1-1/4", 1-1/2", 2", 2-1/2", 3", 3-1/2", 4", 5", 6", 8", 10"
   Schedule STD Steel Pipe – 12"
b) Mechanical Duct – steel sheet metal ductwork up 72" diameter round or 184" perimeter rectangular, all galvanized. See full list of sizes and gages.
c) Electrical Distribution Systems –Cable Trays/Raceways
d) Suspended Equipment – fan coils, distribution boxes, VAV's, pumps, air handlers, heaters, tanks, and any other types of equipment of metal construction.

**III. The support/attachment substrates included in this pre-approval are as follows:**

a) Concrete
b) Metal Deck
c) Composite Deck (concrete cast over metal deck)
d) Steel
e) Wood

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**IV. Construction Tolerances:**

a) Construction tolerances shall be as noted on the drawing details and appendices.

b) Construction Tolerance for angles of all braces shall be limited to ±5°, out of plan & elevation as shown in the details of section 2.

c) The recommended brace angle is 45° for the diagonal brace, or 1:1 slope brace ratio. The cable brace shall be installed between 30° to 70° from the vertical. See details in Section 2.

d) Construction tolerance for the angle of the hanger rod from the vertical when using the PRMXA-1C spring hanger box is limited to ±10° from the vertical.

**V. Definitions:**

a) Snug Tight: Tightness required to bring the connected plies into firm contact and that the nuts could not be removed without the use of a wrench.

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# 2. INTRODUCTION

I. This Manual is a guideline for seismic bracing design for interior equipment and mechanical piping and duct systems, & electrical cable trays/raceways. The following is an outline of the manual:

**Section 1 – General Information:** Lists general notes and requirements for seismic bracing systems of mechanical systems, electrical systems, and equipment as well as a general guided procedure for seismic bracing design for attachment/support to steel, concrete, and wood structural members using this manual.

**Section 2 –Cable Brace Details:** Includes seismic bracing details for individually hung and trapeze supported pipe, cable trays/raceways, and duct as well as suspended equipment.

**Section 3 – Structural Attachments:** Shows structural attachment details and design strengths for attaching the seismic bracing cable to the supporting structure. This includes attachments to concrete slabs/walls/beams, steel deck with minimum sand lightweight concrete, bare steel deck, structural steel members, and structural wood members.

**Section 4 – Seismic Brace Components:** Includes details and design strengths for seismic bracing components used in the seismic bracing design as well as the brace attachment fittings.

**Section D – Design Tables:** Tables that utilize either pipe size or distribution system linear weight as well as the calculated "g" value to determine the required cable bracing detail, bracing attachment detail(s), maximum bracing kit spacing, and hanger/rod attachment detail(s). Refer to section D and the examples in pages 1.32 to 1.41 for instructions on use of these tables.

**Appendix A:** Includes a metric conversion chart and weight charts for pipe, duct, and electrical distribution systems. Utility weights are for reference only and are not within the scope of work of the OPM approval.

II. This pre-approval may be used for the design of seismic sway bracing of interior equipment, pipe, cable tray/raceways and duct systems. A California Licensed Civil Engineer has designed this pre-approval, along with supporting calculations. Therefore, the pre-approved details and calculations are not to be re-reviewed by regional staff. However each system and equipment design requires submittals that must be reviewed and approved by OSHPD.

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III. Seismic bracing design and layout drawings shall be either prepared by Registered Design Professional licensed in California with experience in the design of seismic bracing for equipment, piping, and duct or prepared by a qualified designer (under the supervision of a Registered Design Professional) with experience in the design of seismic bracing for equipment, pipe, cable trays/raceways and duct, stamped and signed by a Registered Civil or Structural Engineer licensed in California with the same applicable experience. This is the definition of "user".

IV. Modifications and/or changes to the designs shown in this guideline shall be performed or reviewed by a qualified Registered Civil Engineer and approved by OSHPD.

V. When more than one criterion is presented, the more stringent shall be used.

VI. It is the responsibility of the user of this manual to be familiar with all requirements for seismic bracing and shall be proficient in determining and applying utility loads for their application.

VII. The user of this manual shall determine the spacing and layout for the required bracing. The user shall determine the maximum horizontal, vertical and axial force component of the earthquake demand loads. The user's calculations must take into consideration the increases in loads caused by construction tolerances. For use of the **simplified design procedure** the tolerance of the cable angle from the vertical must remain within the values equal to and greater than 45° and less than 60°.

VIII. As with all pre-approved details, systems, etc., construction documents are still required showing how and where this pre-approved support, attachment and bracing system will be applied on a project specific basis. This process is needed to verify that the appropriate detail has been selected and applied for each condition and for the actual substrate that it will be connected/attached to.

IX. The Structural Engineer of Record (SEOR) must review and forward the support, attachment and bracing plans for plan check with a notation indicating that the plans have been reviewed and they have been found to be in general conformance with the design of the project. A "shop drawing stamp" is usually acceptable for compliance with this requirement. The regional staff, on a project specific basis, must review support, attachment, and bracing details and supporting calculations that are not part of this pre-approval. Review of support, attachment and bracing details of this nature does not constitute a pre-approval that may be used on other projects without the benefit of plan review. The Structural Engineer of Record shall verify the adequacy of the supporting structure and its components for the loads applied to the supporting structure and

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its components by the seismic bracing systems, and compliance with the applicable codes and standards, as well as performing the following tasks:

a) Verify that the nonstructural components and/or systems are seismically qualified in accordance with the 2022 California Building Code.
b) Verify that the installation is in conformance with the 2022 California Building Code & with the details shown in this OPM.
c) Verify that the structure to which the M. W. Saussé & Co., Inc. seismic brace is anchored to meets the requirements of the applicable ICC-ES Report (ICC ESR).

X. Layout Drawings:

a. Layout drawings of the support and bracing systems per this pre-approval shall be submitted to the discipline in responsible charge of the project for review to verify that the details are in conformance with all code requirements. The layout drawings shall be accordance with ASCE 7-16 (including supplement number 1 & batch 2 errata) as modified by the 2022 CBC Section 1617A.
    i. 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.
    ii. The SEOR will forward the supports, attachments, and bracing plans (including approved change order for supplementary framing where required) to the discipline in charge with a notation indicating that the plans have been reviewed and are in general conformance with this pre-approval & the design of the project.
    iii. A “shop drawing stamp” may be used to indicate compliance with this requirement.
    iv. The Registered Design Professional (other than the SEOR) may provide the shop drawing stamp for small installations at the discretion of the District Structural Engineer.

b. The SEOR must design any supplementary framing that is needed to resist the loads, maintain stability and/or is required for installation of this pre-approval. The supplementary framing shall be submitted to OSHPD as an Amended Construction Document (ACD).

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c. The layout drawings (with the shop drawing stamp) shall be submitted to OSHPD to review:
    i. Structure supporting the distribution system has adequate capacity.
    ii. Seismic Design Forces ($F_p$) are in accordance with the 2022 CBC.
    iii. Verify that the submittal is within the scope of the OSHPD Pre-approval of Manufacturer's Certification (OPM):
        1. Size of distribution system components or equipment.
        2. Spacing of bracing and flex joints.
        3. Substrate for attachments.
        4. Review of those parts not approved through the OPM.

d. The layout drawings (with the shop drawing stamp) shall be kept on the jobsite and can then be used for installation for the support and bracing. OSHPD field will review the installation.
e. A copy of this pre-approval shall be on the jobsite prior to starting 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 Program's website.

XI. The bracing components of this pre-approved bracing system may not be substituted with components of another pre-approved bracing system for any single run of pipe, duct, or for a piece of equipment. Any substitution of a component shall require OSHPD review and approval.

XII. Post-installed Anchors:

a. All post-installed concrete anchors shall meet requirements of 2022 CBC Section 1617A.1.19, and be installed per their ICC ESR report; see Section 3 for specified ICC ESR listing for each anchor.
b. The special inspector shall be on the jobsite continuously during anchor installation, unless otherwise noted in the ICC ESR.
c. Expansion anchors shall be torque tested per the requirements specified in Section 1910A.5.2 of the 2022 CBC. See page 3.0.1 for details.
d. Screw-type anchors shall be tension tested as specified in Section 1910A.5.2 of the 2022 CBC. See page 3.0.1 for details.

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## 3. Building Codes, Standards, & Guidelines

I. The Vibrex Seismic Restraint Guidelines are designed to meet or exceed the requirements of the following:

2022 California Building Code (2022 CBC)
AISI Standard for Cold Formed Structural Members (S100-16)
ANSI / AWC NDS-2018
American Concrete Institute (ACI 318-14)
American Institute of Steel Construction (AISC 360-16)
American Society of Civil Engineers (ASCE 7-16)
American Welding Society (AWS D1.1-15)
American Society of Mechanical Engineers (ASME B31Ea-2010)
ESR-4266 (Hilti KB-TZ2, Reissued December 2023)
ESR-2502 (Dewalt Powers SD2, Reissued May 2023)
ESR-3889 (Dewalt Screw-Bolt+ & Hangermate+ Rod Hanger Screw, Reissued November 2023)
ESR-2713 (Simpson Titen HD, Reissued September 2023)
ESR-2818 (Powers SD1, Reissued December 2022)
ESR-3027 (Hilti KH-EZ, Revised April 2022)
ESR-3037 (Simpson Strong-Bolt 2, Reissued August 2023)
ESR-1976 (ITW Buildex TEKS, Revised July 2023)
Note: ESR's for post-installed anchor bolts into concrete & self-tapping screws to steel are in compliance with the 2022 California Building Code.

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These guidelines are intended to describe seismic restraints for the HVAC industry's most commonly utilized pipe sizes, duct sizes, cable trays/raceways and equipment.

Determine bracing design utilizing the applicable factors and their specific values listed in Table 13.6-1 of the ASCE 7-16 based on the equipment, pipe, cable tray/raceway or duct construction, material composition and type, as well as proper utilization of the $\Omega_o$ factor (note c. from table 13.6-1 of ASCE 7-16) for anchorage to concrete substrates. See Section 6 for the required equations and factors on page 1.26.

# 4. SEISMIC BRACING GENERAL REQUIREMENTS

I. Transverse & Longitudinal Seismic Bracing is required for single hung pipe suspended more than 12” from the substrate above under the following parameters:

a. For Seismic Design Categories D, E, or F where Ip is equal to 1.0 and Rp is 4.5 or greater, all pipe larger than 3” in diameter.
b. For Seismic Design Category D, E, or F where Ip is *greater* than 1.0 and Rp is 4.5 or greater, all pipe larger than 1” in diameter.
c. For Seismic Design Category C where Ip is *greater* than 1.0 and Rp is 4.5 or greater, all pipe larger than 2” in diameter.

II. Transverse & Longitudinal Seismic Bracing is required for trapeze supported pipe systems under the following parameters.

a. The total weight supported by any single trapeze is greater than 100lbs, or where the hangers are greater than 12” in length from the substrate to the top of the trapeze member (trapeze supported pipe is not part of this OPM, design will be required on a project-by-project basis using M.W. Saussé cable bracing kit and attachments).
b. The total weight supported by any single rod is greater than 50 lbs.

III. Transverse & Longitudinal Seismic Bracing is required for cable trays, and other electrical distribution systems (raceways) under the following parameters:

a. The total weight supported by any single trapeze is greater than 100lbs, or where the hangers are greater than 12” in length from the substrate to top of trapeze member.
b. The total weight supported by any single rod is greater than 50 lbs.

IV. Transverse & Longitudinal Seismic Bracing is required for duct under the following parameters:

a. The total weight supported by any single trapeze is 10lb/ft or greater, or greater than 100 lbs, or where the each hanger in the duct run is greater than 12” in length from the substrate to the duct support point.
b. A singly supported duct that has a cross-sectional area greater than or equal to 6ft$^2$ or weighs more than 20lb/ft.
c. The total weight supported by any single rod is greater than 50 lbs.

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V. All directional Seismic Bracing is required for suspended equipment where the Seismic Design Category is C with Ip greater than 1.0, and for Seismic Design Category D, E, & F and any value of Ip, as well as under the following parameters:

a. Equipment in-line and rigidly attached to duct weighing more than 75 lbs shall be laterally braced independent of duct the duct system.
b. Equipment weighing more than 20lbs and connected to the ductwork or piping with flexible connections, or independently suspended.
c. Actual connection of equipment to support will have to be done on a project-by-project basis.

VI. A pipe systems shall not be braced to different parts of the building that may respond differently during seismic activity.

VII. Refer to the appropriate codes and standards for additional information and requirements.

VIII. Vertical Offsets / Risers:

a. Tops of vertical offsets/risers exceeding 3' in length shall be provided with a four-way brace. Bracing shall be located within 24" of the end of the vertical run. Refer to partial isometric A on page 1.16.
b. Distance between four-way braces for risers shall not exceed 25'.
c. Vertical ductwork systems supported at each floor shall be considered seismically braced if the penetration through each floor is tightly packed and the floor-to-floor spacing is not in excess of 30 feet. Tops of risers exceeding 3 feet shall be provided with a 4-way brace. Where the 4-way brace is attached on the horizontal ductwork, it shall be installed within 2 feet of the centerline of the riser.
d. Vertical duct risers in an open shaft must be attached to steel supports with both steel supports and connections sized to accept the combined gravity and seismic loads. Thermal loads shall be considered where applicable. Transverse seismic restraint spacing shall not exceed 30 feet. Supports and connections must be engineered on a job by job basis subject to approval by OSHPD. Seismic relative displacement between floors shall be considered in the design.

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IX. 12” Exception Rule for Pipe and Duct supports:

Pipe and duct need not be seismically braced when the following exceptions apply:

- The pipe is supported by hangers and each hanger in the piping run is 12 in. (305 mm) or less in length from the top of the pipe to the supporting structure, & the total weight supported by any single hanger is less than or equal to 50 lbs. In addition, where $I_p > 1.0$, pipe size is limited to 1” diameter in structures assigned to SDC D, E, or F. For SDC D, E, or F where $I_p = 1.0$, pipe size shall be 3” diameter or less.

- The ductwork is supported by hangers and each hanger in the duct run is 12 in. (305 mm) or less in length from the duct support point to the supporting structure, & total weight support by any single rod is less than or equal to 50 lbs.

NOTE:
Ductwork designed to carry toxic, highly toxic or flammable gases, or used for smoke control shall be designed and braced without consideration of the above exceptions.

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# 5. SEISMIC BRACING LAYOUT – GENERAL REQUIREMENTS – DUCT, PIPE, CABLE TRAY/RACEWAYS, AND EQUIPMENT

I. The Vibrex Seismic Restraint Guidelines provide for the protection of suspended pipe, duct, cable trays/raceways, & equipment against excessive movement due to seismic forces.

II. The seismic restraint assemblies in this guideline are designed to simultaneously resist vertical loads due to the weight of the component and its contents and both horizontal and vertical seismic loads.

III. Horizontal loads are braced with two types of seismic restraints:

a. Transverse bracing to protect pipe, duct, & cable tray/raceway against movement perpendicular to its run.

b. Longitudinal bracing to protect pipe, duct, & cable tray/raceway against movement parallel to its run.

- Spacing must not exceed the values listed in the tables of Section D.

**IV. Pipe System bracing distances and requirements:**

a. A run of pipe is defined as a continuous straight length, or one with allowable offsets, that are less than 24". If the offset is 24" or greater, each straight segment shall be treated as an independent run and shall be braced. Refer to partial plan under item "f" on page 1.12.

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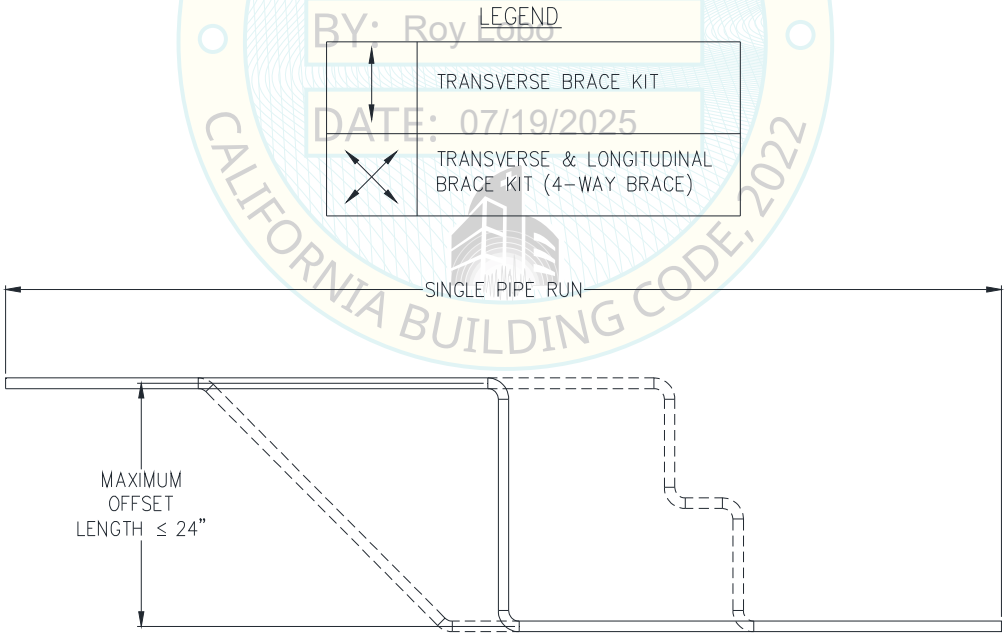
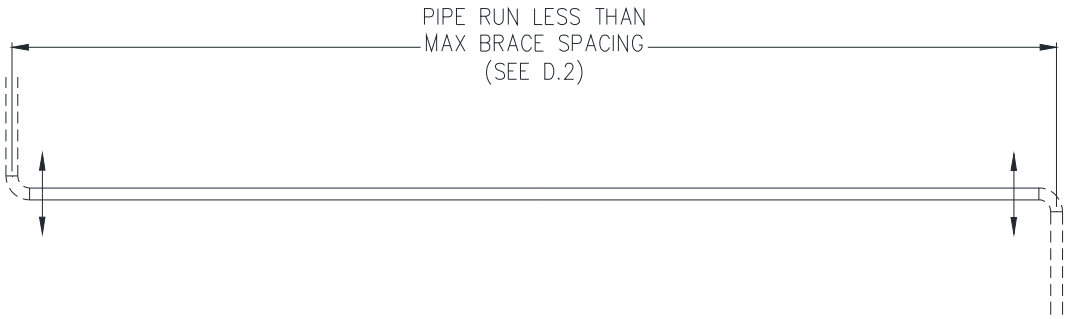
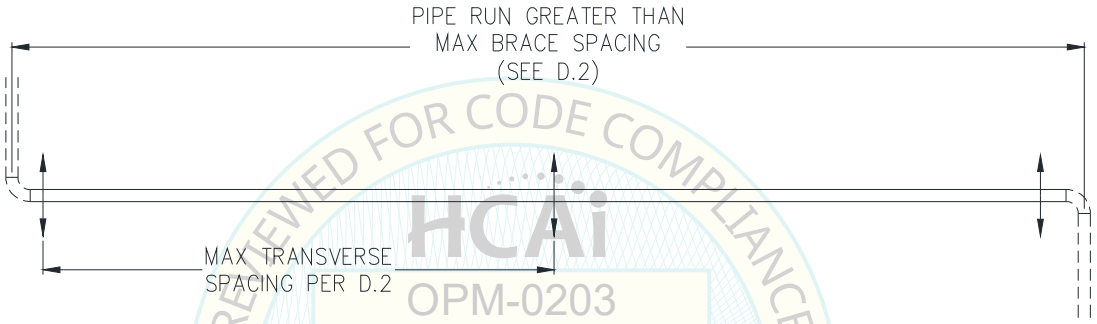



Note: When a run of pipe that requires bracing transitions down to a size that does not, the point of transition is considered the end of the run and will require a transverse brace. For an offset less than 24", this is still considered a single run of pipe.

b. Each run of pipe requires a minimum of two transverse (lateral) bracing kits (perpendicular to the run), one at each end of the run.




c. If the distance between the two transverse bracing kits exceeds the maximum allowable spacing, add transverse bracing kits as needed.

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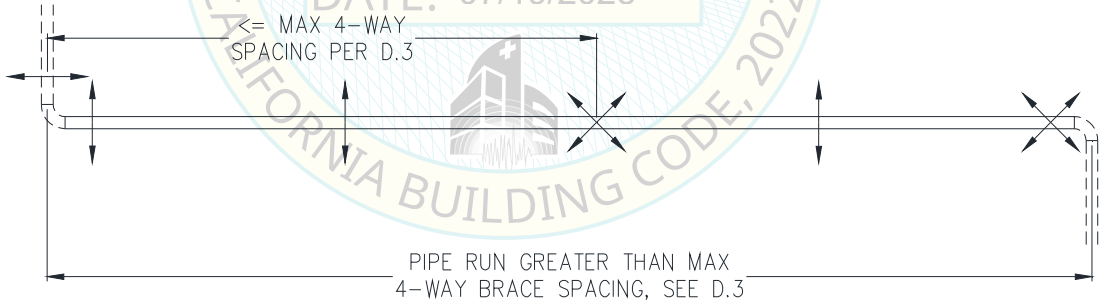
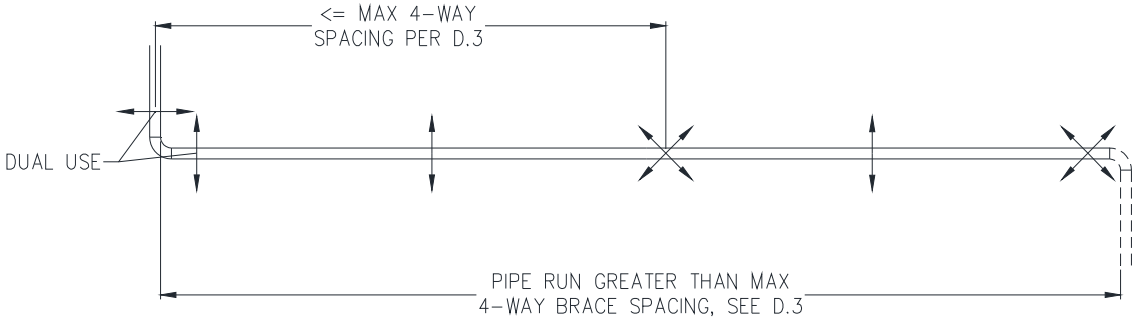
d. Each pipe run must have at least one transverse and longitudinal (4-way) bracing kit. If the maximum allowable longitudinal spacing is exceeded then add longitudinal bracing kits to meet the spacing requirement.



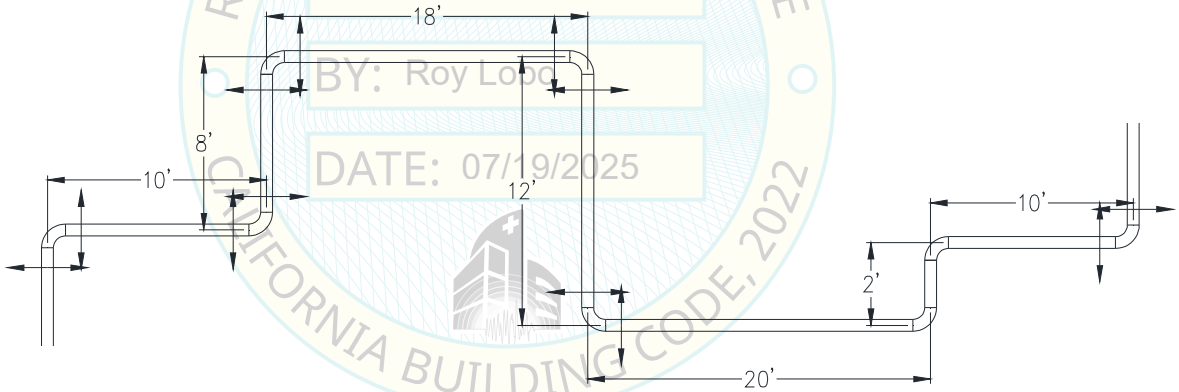

e. Each run of pipe requires a minimum of one longitudinal bracing kit. However, a transverse bracing kit placed on the run section at the opposite side of an elbow or tee within 24" may act as a longitudinal bracing kit, and is labeled as "DUAL USE" bracing kit. See layout example under ii. on page 1.13.

i. Longitudinal and longitudinal “DUAL USE” bracing kits on single support pipe shall be attached directly to the pipe.

ii. Bracing installed to smaller piping shall not be used to brace larger piping.




f. In some cases several short runs may occur in close proximity. By following the preceding guidelines each run should have longitudinal and transverse bracing. Transverse bracing may be used as longitudinal bracing and vice versa on runs adjacent to each other as long as the total length of pipe tributary to the brace does not exceed the maximum design spacing. In cases where it does, additional bracing kits are required.

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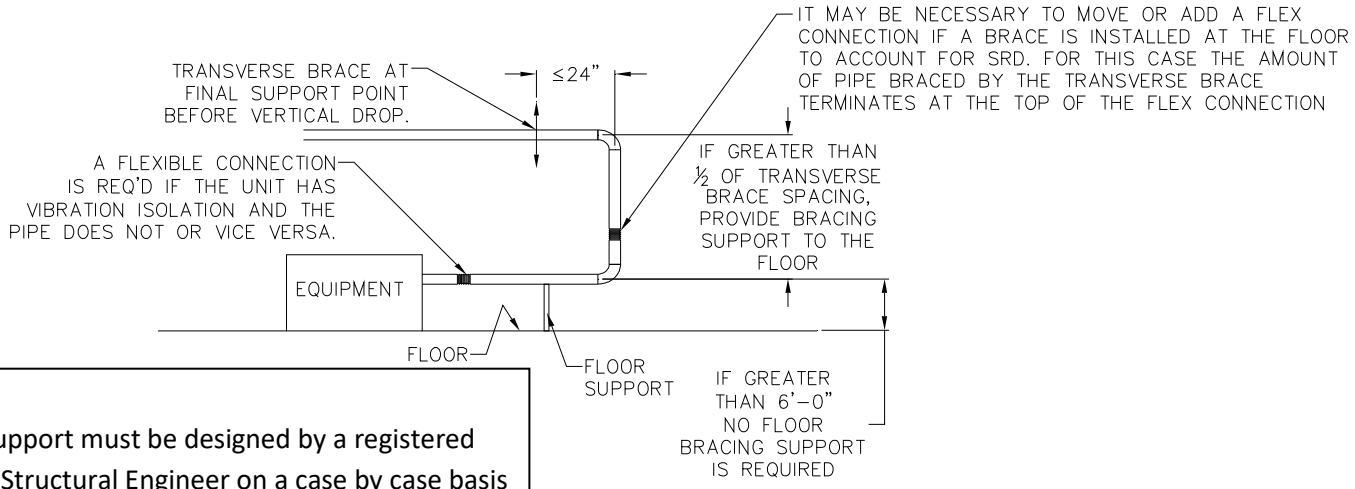
g. At vertical pipe drop to equipment, where pipe is connected to the equipment using a flexible connection, provide transverse bracing before the vertical drop. The total length from the transverse brace to the vertical drop should not be more than the design offset previously determined. Provide transverse bracing at the floor after the vertical drop if the total length of the pipe from the transverse brace before the vertical drop to the flexible connection is greater than ½ the maximum transverse brace spacing.




NOTE:
Floor support must be designed by a registered Civil or Structural Engineer on a case by case basis to meet the existing or planned field conditions.

h. When pipe crosses a building seismic separation or seismic joint it must be capable of accommodating the joint displacements as specified by the engineer of record.

i. A rigid pipe shall not be braced to dissimilar parts of a building structure or two dissimilar building systems that may move different from one another during an earthquake. Bracing should be attached to the part of the building structure that is vertically supporting the pipe.

j. Transverse and longitudinal braces shall be installed as shown in this guideline up to 30°-70° from the vertical. However, the recommended brace angle range is 45° to 60° from the vertical, or a 1:1 and up to but not including a 1:1.7 brace ratio which conforms to the **simplified design procedure**

k. The seismic brace assemblies in this guideline consist of three important components: supports and connections to building structure including the A36 threaded rod with rod stiffeners as occurring, diagonal bracing members consisting of 7x19 cable, and seismic brace attachments. For details of cable brace assemblies see Section 2. For details and load information of structural attachments & spring hanger or rod attachments, see Section 3. The vertical hanger (A36 threaded rod) must be within 6" of the diagonal components to be considered part of the brace assembly.

l. Transverse bracing kit locations are required to be at or within 6 inches of a vertical component of the seismic brace assembly to protect against vertical movement (typically a stiffened hanger rod). The M.W. Saussé & Co., Inc. seismic brace attachment may be connected directly to the threaded vertical hanger rod not used for supporting system gravity loads.

m. Steel bolt connections to structural steel members or components shall not have a diameter less than 1/16" than that of the mounting hole. Steel bolt connections to concrete structure shall not have a diameter less than 1/8" than that of the mounting hole.

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n. Bracing may be omitted for short runs of pipe if its tributary seismic load can be transferred to an adjacent run of pipe that is braced and can properly restrain the additional seismic loads.

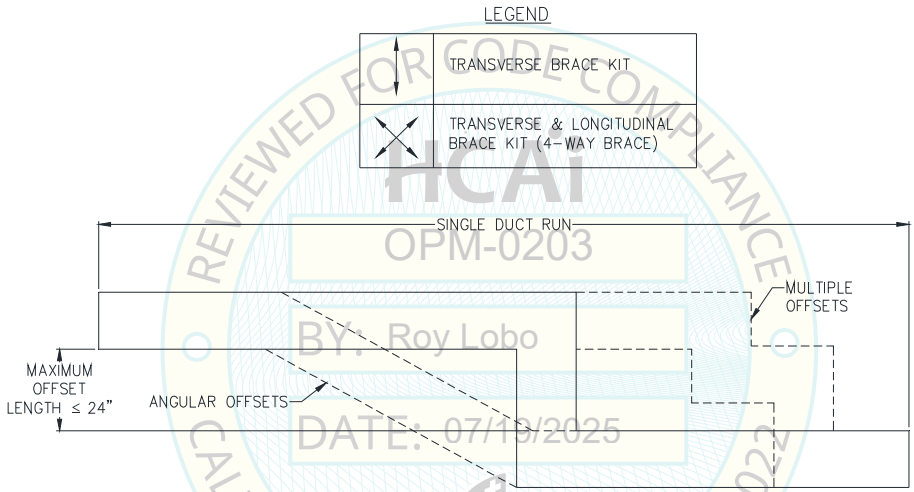
o. Splicing of the pipe may be achieved with the following methods:

i. UL Listed rigid grooved couplings for horizontal runs and flexible grooved couplings in vertical risers (to accommodate inter-story drift movement of the surrounding structure). Couplings must meet UL Standard 213. Non-listed couplings are not permitted.

ii. Welding of pipe must conform to the ASME B31 and AWS D1.1 standards.

**V. Duct Systems bracing distances and requirements:**

a. A run of duct is defined as a continuous straight length, or one with allowable offsets, that are less than 24". If the offset is 24" or greater, each straight segment shall be treated as an independent run and shall be braced. Refer to partial plan under item "f" on page 1.16.

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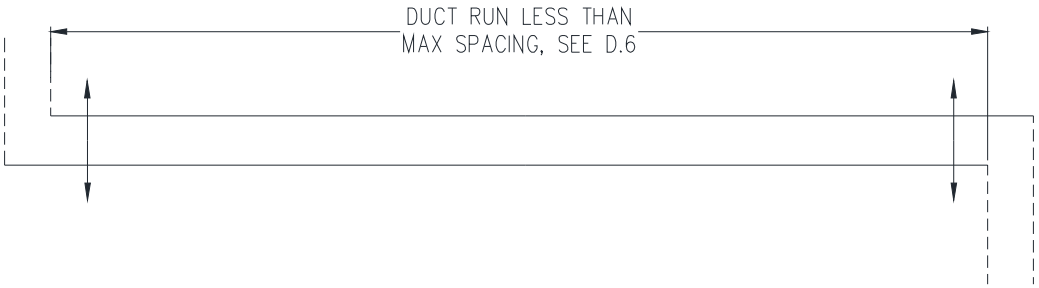
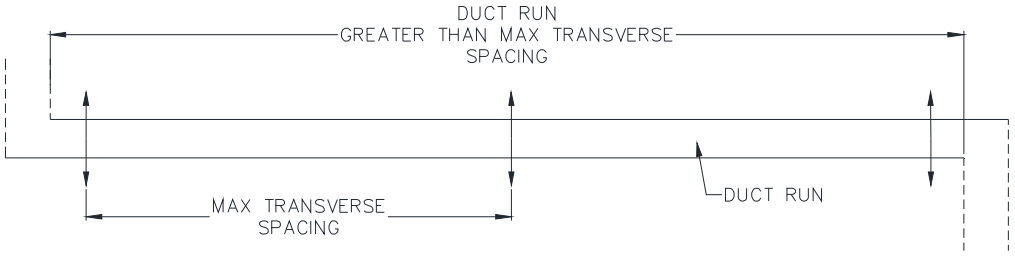
Note: When a run of duct that requires bracing transitions down to a size that does not, the point of transition is considered the end of the run and will require a transverse brace. For an offset less than 24", this is still considered a single run of duct.

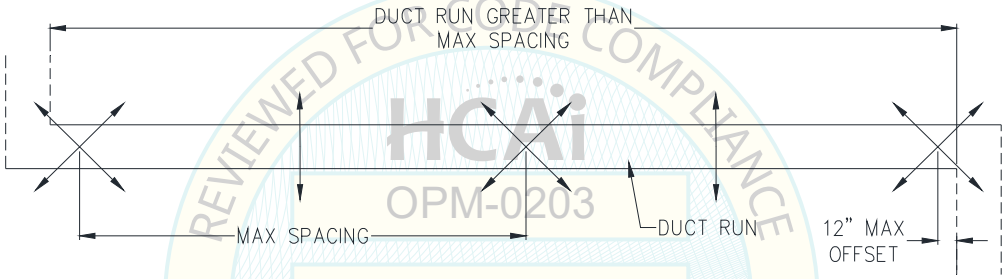
b. Each run of duct requires a minimum of two transverse bracing kits, one at each end of the run.



c. If the distance between the two transverse bracing kits exceeds the maximum allowable spacing, add lateral bracing kits as needed.




d. Each duct run must have at least one longitudinal bracing kit. If the maximum allowable longitudinal spacing is exceeded then add longitudinal bracing kits to meet the spacing requirement.

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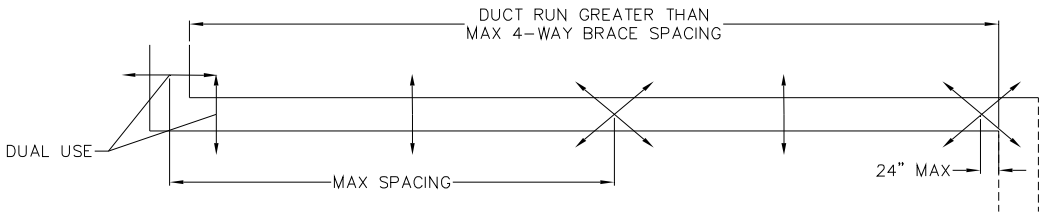
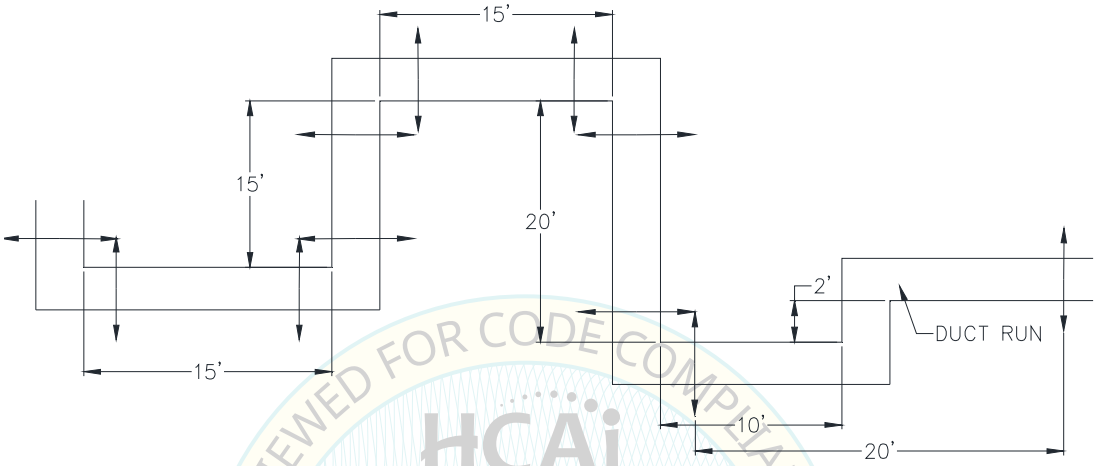
e. Each run of duct requires a minimum of one transverse & longitudinal (4-way ) bracing kit parallel to the run. However, a transverse bracing kit placed on the run section at the opposite side of an elbow or tee within 24" may act as a longitudinal bracing kit, and is labeled as "DUAL USE" bracing kit. See layout example below.

iii. Transverse "DUAL USE" bracing kits on a duct support shall be attached directly to the duct.

iv. Bracing installed to smaller duct shall not be used to brace larger duct.



f. In some cases several short runs may occur in close proximity. By following the preceding guidelines, each run should have longitudinal and transverse bracing. Transverse bracing may be used as longitudinal bracing and vice versa on runs adjacent to each other as long as the total length of duct tributary to the brace does not exceed the maximum design spacing. In cases where it does, additional bracing kits are required.

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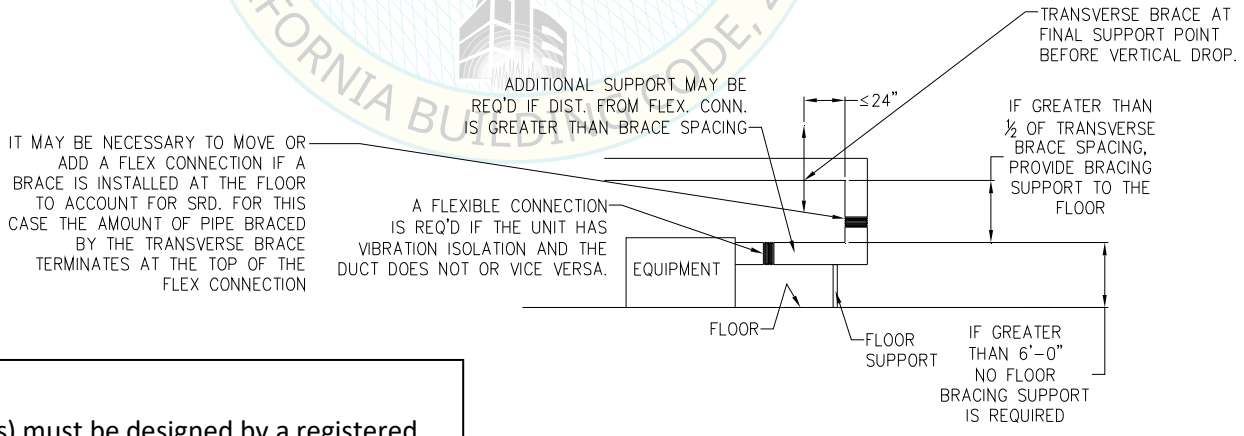
g. At vertical pipe drop to equipment, where duct is connected to the equipment using a flexible connection, provide transverse bracing before the vertical drop. The total length from the transverse brace to the vertical drop should not be more than the design offset previously determined. Provide transverse bracing at the floor after the vertical drop if the total length of the duct from the transverse brace before the vertical drop to the flexible connection is greater than ½ the maximum transverse brace spacing.




NOTE:
Floor support(s) must be designed by a registered Civil or Structural Engineer on a case by case basis to meet the existing or planned field conditions.

h. When duct crosses a building seismic separation or seismic joint it must be capable of accommodating the joint displacements as specified by the engineer of record.
i. A rigid duct shall not be braced to dissimilar parts of a building structure or two dissimilar building systems that may move different from one another during an earthquake. Bracing should be attached to the part of the building structure that is supporting the duct.
j. Transverse and longitudinal braces that project up to the structure above shall be installed as shown in this guideline up to 30°-70° from the vertical. However, the recommended brace angle range is equal to or greater than 45° & less than 60° from the vertical, or a 1:1 and up to but not including a 1:1.7 brace ratio which conforms to the **simplified design procedure.**
k. The seismic brace assemblies in this guideline consist of three important components; supports and connections to building structure including the A36 threaded rod with rod stiffeners as occurring, diagonal bracing members consisting of 7x19 cable, and seismic brace attachments. For details of cable brace assemblies see Section 2. For details and load information of structural attachments & spring hanger or rod attachments, see Section 3. The vertical hanger (A36 threaded rod) must be within 6" of the diagonal components to be considered part of the brace assembly.
l. Transverse bracing kit locations are required to be at or within 6 inches of a stiffened hanger rod to protect against vertical movement.
m. Steel bolt connections to structural steel members or components shall not have a diameter less than 1/16" than that of the mounting hole. Steel bolt connections to concrete structure shall not have a diameter less than 1/8" than that of the mounting hole.
n. Bracing may be omitted for short runs of duct if its tributary seismic load can be transferred to an adjacent run of duct that is braced and can properly restrain the additional seismic loads.
o. Wall penetrations may be considered transverse brace locations where duct is tightly blocked unless smoke dampers are installed in the wall, subject to approval by the SEOR.
p. Floor penetrations of vertical duct may be considered transverse and longitudinal brace locations where duct is tightly blocked, no smoke dampers are installed, and the distance from the floor penetration to the inside of the 90 degree turn horizontal is less than 2 feet.

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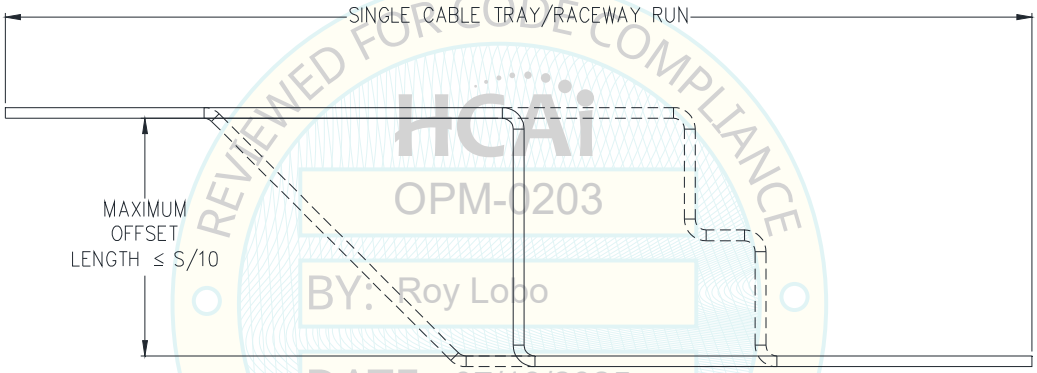
VI. For bracing distances and requirements of trapeze suspended cable tray/raceway systems:

a. A run of cable tray/raceway is defined as a continuous straight length, or one with design offsets, that are less than S/10 (w/ S = maximum transverse brace spacing, see page D.8 for spacing limits). If the offset is S/10 or greater, each straight segment shall be treated as an independent run and shall be braced. Refer to partial plan under item "f" on page 1.21.

LEGEND

| | |
|---|---|
| | TRANSVERSE BRACE KIT |
| | TRANSVERSE & LONGITUDINAL BRACE KIT (4-WAY BRACE) |

CRITICAL BRACE SPACING NOTE:
Cable tray must be approved on a project specific basis or preapproved by OSHPD. The spacing limits shown on D.8 are based solely on the strength of the cable kits as shown in Section 2. The maximum spacing limits of the specific cable tray itself shall not be exceeded.

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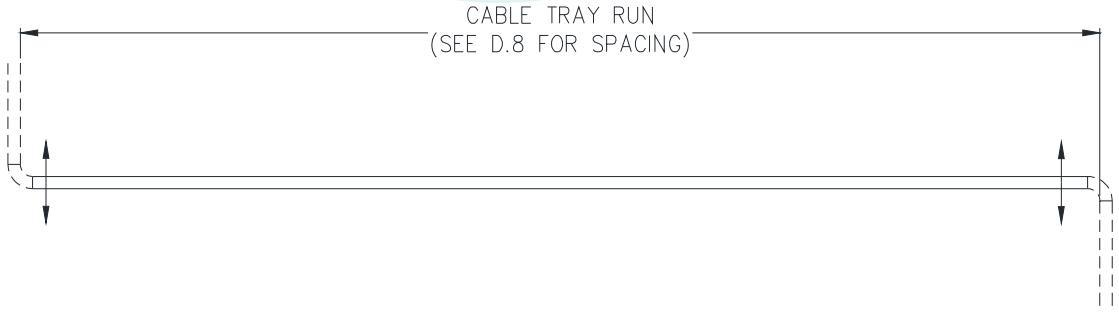
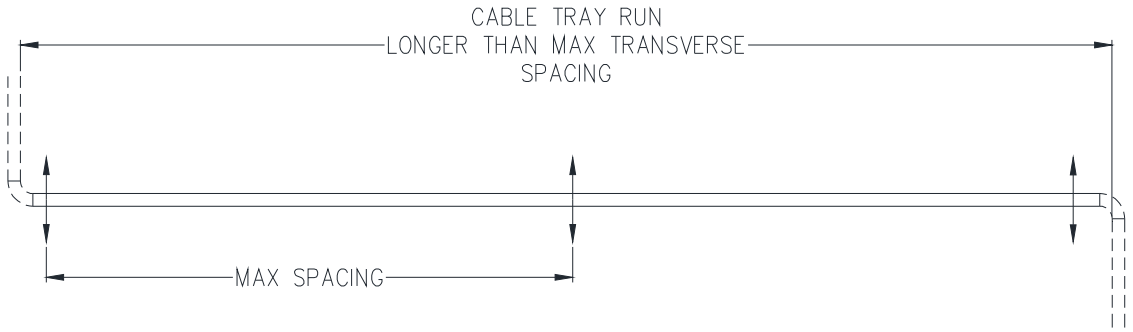
Note: When a run of a cable tray/raceway that requires bracing transitions down to a size that does not, the point of transition is considered the end of the run and will require a transverse brace. For an offset less than S/10, this is still considered a single run of cable tray/raceway.

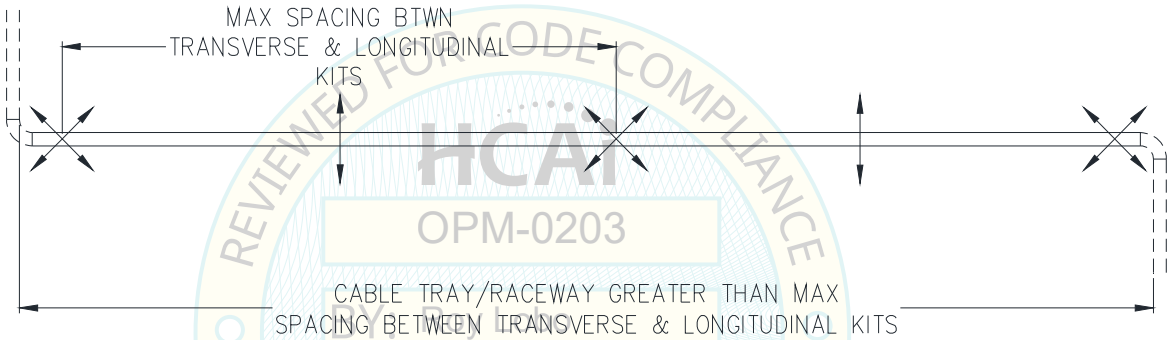
b. Each run of cable tray/raceway requires a minimum of two transverse bracing kits, one at each end of the run.



c. If the distance between the two transverse bracing kits exceeds the maximum design spacing, add lateral bracing kits as needed.




d. Each cable tray/raceway run must have at least one longitudinal bracing kit. If the maximum design transverse & longitudinal (4-way) spacing is exceeded then add transverse & longitudinal bracing kits to meet the spacing requirement.

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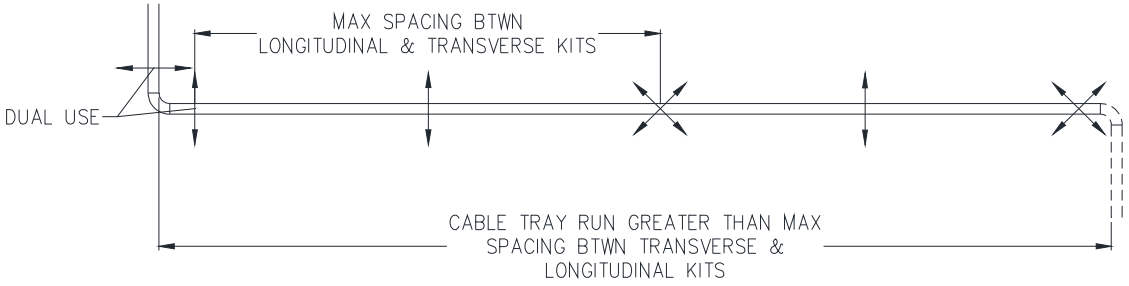
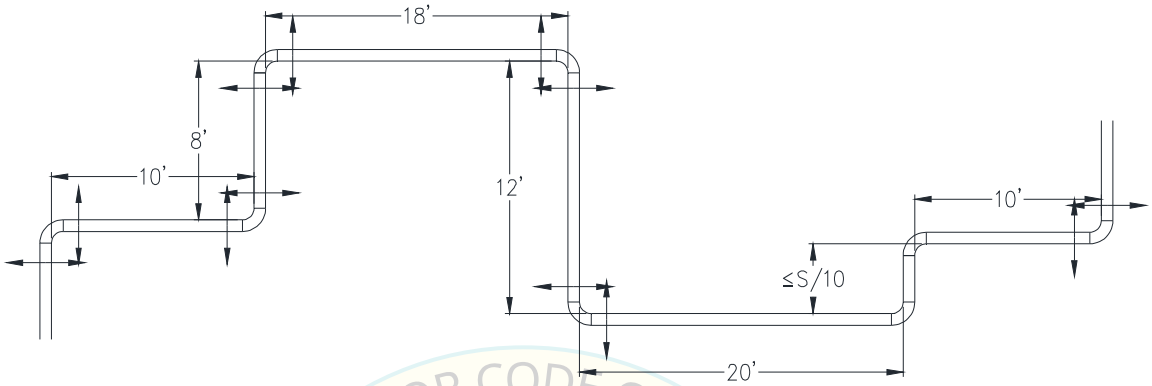
Each run of cable tray/raceway requires a minimum of one longitudinal bracing kit. However, a transverse bracing kit placed on the run section at the opposite side of an elbow or tee within 24" may act as a longitudinal bracing kit, and is labeled as "DUAL USE" bracing kit. See layout example below.

i. Longitudinal and longitudinal "DUAL USE" bracing kits on single support cable tray/raceway shall be attached directly to the cable tray or raceway.

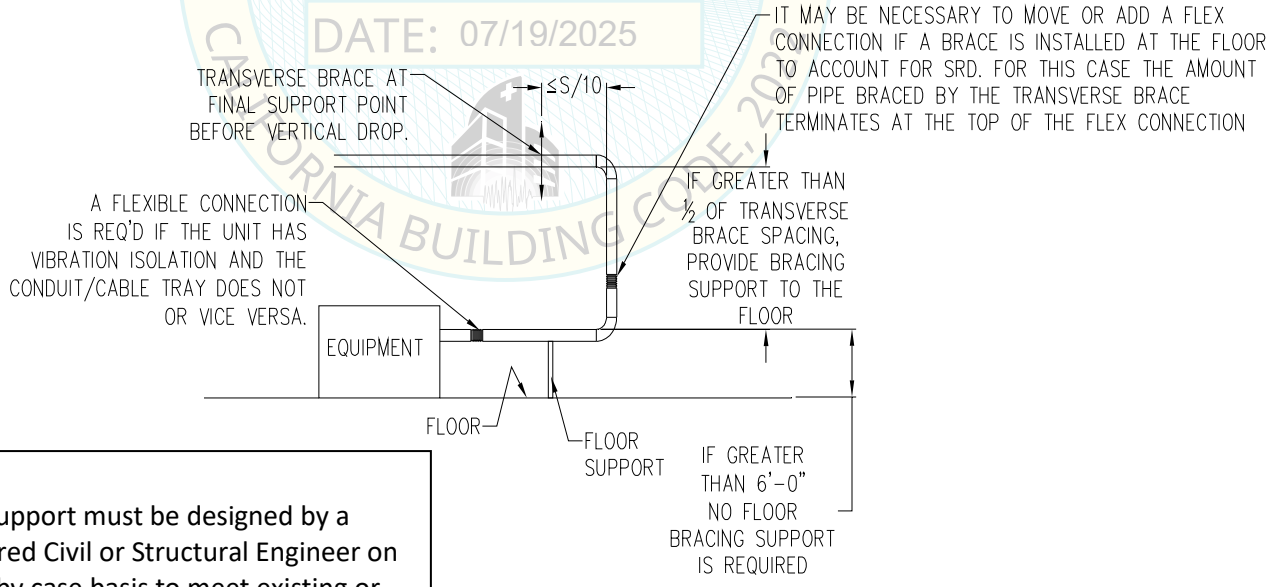
ii. Bracing installed to smaller cable tray/raceway shall not be used to brace a larger cable tray/raceway.



e. In some cases several short runs may occur in close proximity. By following the preceding guidelines each run should have longitudinal and transverse bracing. Transverse bracing may be used as longitudinal bracing and vice versa on runs adjacent to each other as long as the total length of cable tray/raceway tributary to the brace does not exceed the maximum design spacing. In cases where it does, additional bracing kits are required.




f. At vertical pipe drop to equipment, where cable tray/raceway is connected to the equipment using a flexible connection, provide transverse bracing before the vertical drop. The total length from the transverse brace to the vertical drop should not be more than the design offset previously determined. Provide transverse bracing at the floor after the vertical drop if the total length of the pipe from the transverse brace before the vertical drop to the flexible connection is greater than ½ the maximum transverse brace spacing.




NOTE:
Floor support must be designed by a registered Civil or Structural Engineer on a case by case basis to meet existing or planned field conditions.

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g. When pipe crosses a building seismic separation or seismic joint it must be capable of accommodating the joint displacements as specified by the engineer of record.
h. A rigid pipe shall not be braced to dissimilar parts of a building structure or two dissimilar building systems that may move different from one another during an earthquake. Bracing should be attached to the part of the building structure that is vertically supporting the pipe.
i. Transverse and longitudinal braces shall be installed as shown in this guideline up to 30° to 70° from the vertical. However, the recommended brace angle range is equal to or greater than 45° & less than 60° from the vertical, or a 1:1 and up to but not including a 1:1.7 brace ratio, which conforms to the **simplified design procedure.**
j. The seismic brace assemblies in this guideline consist of three important components; supports and connections to building structure, bracing members consisting of 7x19 cable, and seismic brace attachments. For details of cable brace assemblies see Section 2. For details and load information of structural attachments & spring hanger or rod attachments, see Section 3. The vertical hanger (A36 threaded rod) must be within 6” of the diagonal components to be considered part of the brace assembly.
k. Transverse bracing kit locations are required to be at or within 6 inches of a vertical seismic brace assembly to protect against vertical movement (typically a stiffened hanger rod).
l. Steel bolt connections to structural steel members or components shall not have a diameter less than 1/16” than that of the mounting hole. Steel bolt connections to concrete structure shall not have a diameter less than 1/8” than that of the mounting hole.
m. Bracing may be omitted for short runs of cable tray if its tributary seismic load can be transferred to an adjacent run of cable tray that is braced and can properly restrain the additional seismic loads.
n. Final brace spacing must not exceed the maximum design spacing permitted for the cable tray itself as stated in the critical spacing note on page 1.19.

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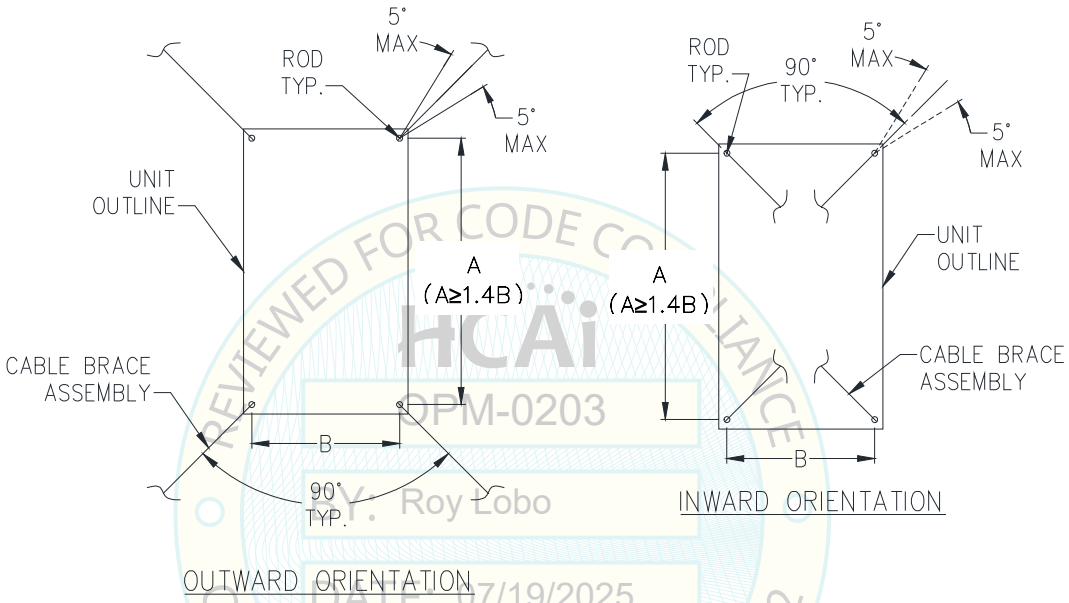
## VII. Suspended Equipment Bracing Requirements:

a. Suspended equipment is defined as a unit of any kind that is supported by and attached to the structure above using threaded rod. The rod is connected directly to the unit or to a steel trapeze member that the unit is attached to.

b. Each piece of equipment requires (4) cable brace assemblies, (1) in each orthogonal direction in the plan view. The cables must be splayed outward (or inward) from each corner of the unit. A variance of ±5° of the plan view angle of the cable is permitted for installation purposes.

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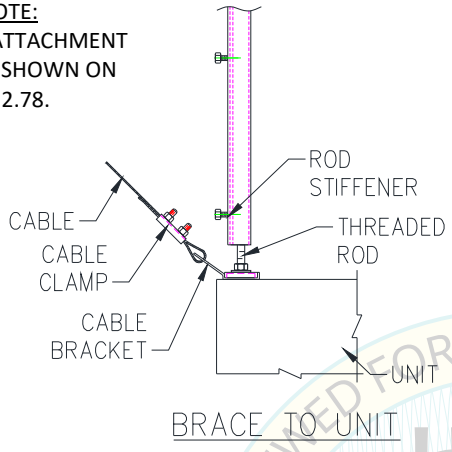
c. Transverse and longitudinal braces shall be installed as shown in this guideline up to 90° from the vertical. However, the recommended brace angle range is equal to or greater than 45° & less than 60° from the vertical, or a 1:1 and up to but not including a 1:1.7 brace ratio.

d. The seismic brace assemblies in this guideline consist of three important components: anchorage and connections to the building structure, bracing members consisting of 7x19 cable, and seismic brace attachments. For details of cable brace assemblies see Section 2. For details and load information of structural attachments & spring hanger or rod attachments, see Section 3. The vertical hanger (A36 threaded rod) must be within 6" of the diagonal components to be considered part of the brace assembly.

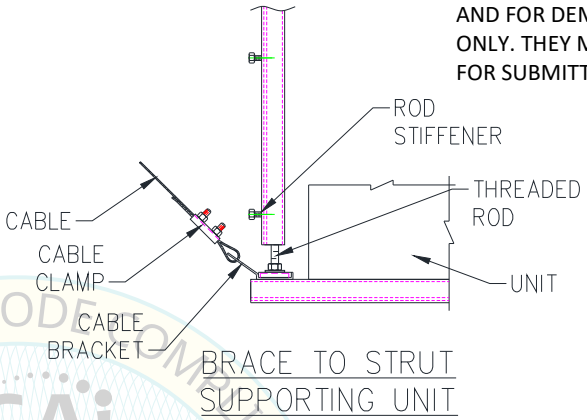
e. The cable bracing assemblies must be attached at the same location where the threaded rods are attached to the equipment. The unit connection point to either the rod or the supporting member must be verified to ensure failure will not occur on a case by case basis (either via equipment OSP # or through project specific analysis of the attachment point).

IMPORTANT NOTE:
ALTERNATIVE ATTACHMENT METHODS ARE SHOWN ON PAGES 2.73 TO 2.78.



BRACE TO UNIT

IMPORTANT NOTE:
THESE DETAILS ARE GENERIC AND FOR DEMONSTRATION ONLY. THEY MAY NOT BE USED FOR SUBMITTAL PURPOSES.



BRACE TO STRUT SUPPORTING UNIT

f. Connection point to the unit must be of steel construction with a tapped hole or welded nut that is internally attached to the unit and part of the structural elements of the unit itself. See drawings on pages 2.73 to 2.78 for more detail.

g. Steel bolt connections to structural steel members or components shall not have a diameter less than 1/16" than that of the mounting hole. Steel bolt connections to concrete structure shall not have a diameter less than 1/8" than that of the mounting hole.

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# 6. GENERAL DESIGN PROCEDURE

The following is a general procedure for the design of seismic bracing and assumes that a piping, duct or electrical distribution system has been provided.The following also assumes that seismic bracing has been determined to be required.

**I. Seismic Force Coefficient**

Determine the total design lateral seismic force coefficient based on the applicable code, project drawings, and specifications. This coefficient is commonly referred to as the "G-factor"; i.e. $F_p$ = 0.5g * Wp. In case of a conflict, use the more stringent criteria. The total design horizontal seismic force coefficient, when multiplied by the weight of the piping, duct, or electrical distribution systems, represents the total design lateral seismic force. To utilize the design tables in section D, use the value of "g" along with the specific pipe size or duct/cable tray linear weight to find the required cable bracing kit detail, cable brace attachment detail, and rod or hanger attachment detail. To calculate the value of "g" use the equations below less the value of Wp.

According to the 2022 CBC the total design lateral seismic force, $F_p$, and the total vertical seismic force $F_{pv}$, shall be determined from the following formulas. The final $F_p$ and $F_{pv}$ will be utilized at either 100% value for LRFD (Load Resistance Factored Design) or SD (Strength Design). This is necessary as the brace design, spacing, and anchorage methods are based on these design methods.

Per Section 13.3.1 of the ASCE 7-16, the horizontal seismic force is:

$$F_p = \frac{0.4 a_p S_{DS} Wp}{R_p/I_p}\left(1+2\frac{Z}{h_r}\right)$$

But is not required to be taken greater than:

$$F_p = 1.6 S_{DS} I_p Wp$$

And shall not be taken as less than:

$$F_p = 0.3 S_{DS} I_p Wp$$

The additional vertical seismic force shall be:

$$F_p = \pm 0.2 S_{DS} Wp$$

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Where:

$F_p$ = the horizontal seismic force

$S_{DS}$ = spectral acceleration, short period. This is either provided within the structural plans of the project through the SEOR or can be determined using the project address at the following URL -https://seismicmaps.org/

For additional information, see section 1613A.2 of the 2022 CBC.

$a_p$ = component amplification factor. See the table below for all applicable values.

$R_p$ = component response modification factor. See the table below for all applicable values.

$I_p$ = component importance factor. Use 1.0 for a building I value of 1.0 or 1.25, and 1.5 for a building I value of 1.5, when the system is critical to life safety and operation after a seismic event, or the system contains materials/chemicals that are hazardous.

Wp = the operating weight of the component.

z = vertical location from grade of the component or system where it is supported by the structure.

$h_r$ = height of the roof of the structure from grade.

**SUMMARY OF TABLE 13.6-1 OF ASCE 7-16 (including Supplement Number 1 & Errata):**

| **MECHANICAL & ELECTRICAL COMPONENTS** | $a_p$[a] | $R_p$[b] | $\Omega_0$[c] |
|---|---|---|---|
| Air-side HVACR, fans, air handlers, air conditioning units, cabinet heaters, air distribution boxes, & other mechanical components constructed of sheet metal framing. | 2½ | 6 | 2 |
| Wet-side HVACR, atmospheric tanks & bins, air separators, pumps, pressure vessels, & other mechanical components constructed of high deformability materials. | 1 | 2½ | 2 |
| Lighting Fixtures | 1 | 1½ | 1½ |
| Other Mechanical or electrical components | 1 | 1½ | 1½ |
| **VIBRATION ISOLATED COMPONENTS & SYSTEMS**[b] | | | |
| Suspended vibration isolated equipment including in-line duct devices and suspended internally isolated components. | 2½ | 2½ | 2 |
| **DISTRIBUTION SYSTEMS** | | | |
| Piping in accordance with ASME B31 (2001, 2002, 2008, 2010) including in-line components with joints made by welding or brazing. | 2½ | 9[d] | 2 |
| Piping in accordance with ASME B31, including in-line components, constructed of high or limited deformability materials, with joints made by threading, bonding, compression couplings, or grooved couplings. | 2½ | 6 | 2 |
| Piping and tubing not in accordance with ASME B31, including in-line components, constructed of high-deformability materials, with joints made by welding or brazing. | 2½ | 6 | 2 |

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| | | | |
|---|---|---|---|
| Piping and tubing not in accordance with ASME B31, including in-line components, constructed of high- or limited-deformability materials, with joints made by threading, bonding, compression couplings, or grooved couplings. | 2½ | 4½ | 2 |
| Piping and tubing constructed of low-deformability materials, such as cast iron, glass, and non-ductile plastics. | 2½ | 3 | 2 |
| Duct systems, including in-line components, constructed of high-deformability materials, with joints made by welding or brazing. | 2½ | 6 | 2 |
| Duct systems, including in-line components, constructed of high- or limited-deformability materials with joints made by means other than welding or brazing. | 2½ | 6 | 2 |
| Duct systems, including in-line components, constructed of low-deformability materials, such as cast iron, glass, and non-ductile plastics. | 2½ | 3 | 2 |
| Electrical conduit, cable trays, & raceways | 2½ | 6 | 2 |
| Bus Ducts | 1 | 2½ | 2 |
| Plumbing | 1 | 2½ | 2 |
| Pneumatic tube transport systems | 2½ | 6 | 2 |

Table Notes:

a. A lower value for $a_p$ is permitted where justified by detailed dynamic analysis. The value for $a_p$ shall not be less than 1. The value of $a_p$ equal to 1 is for rigid components and rigidly attached components. The value of $a_p$ equal to 2½ is for flexible components and flexibly attached components.

b. Components mounted on vibration isolators shall have a bumper restraint or snubber in each horizontal direction. The design force shall be taken as $2F_p$ if the nominal clearance (air gap) between the equipment support frame and restraint is greater than 0.25in. If the nominal clearance specified on the construction documents in not greater than 0.25in the design force is permitted to be taken as $F_p$.

c. Overstrength for anchorage to concrete & masonry required for anchorage to concrete regardless. See sections 2.3.6 & 12.4.3 of the ASCE 7-16 & Chapter 17 of the ACI 318-14 for inclusion of the overstrength factor in the horizontal seismic load effect ($F_p$).

d. $R_p$ must not exceed 6.0 for design of the force in the attachments of the pipe bracing.

**II. Seismic Bracing Detail**

Select a seismic bracing detail. For example, if a cable transverse brace is required for installation, go to page 2.1 through 2.78 in Section 2 “Cable Brace Details” for all applicable transverse and longitudinal brace details. For quick detail selection use the tables on pages D.1.1, D.1.2, D.4.1, D.4.2, D.5.1, D.5.2, and D.7.1 & D.7.2.



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### III. Structural Attachment Details

Select a structural attachment detail. For example, if a Hilti KB-TZ2 wedge anchor into normal weight (NW) concrete slab is required for installation at a seismic brace location, go to page 3.11 in Section 3 “Structural Attachments”. All types of concrete, steel, and wood supports & attachments are covered with various fastener types in pages 3.1 through 3.42 for the cable brace, rod & spring hanger box attachment to the structure. For quick detail selection utilize the tables on pages D.2.1, D.2.2, D.3.1, D.3.2, D.6.1, D.6.2, D.8.1 and D.8.2 to determine the required minimum. Attachment Designation (i.e. load category). From there, find a corresponding Attachment Type listed in the tables on pages D.9 to D.12 that meets the requirements to attach to the surrounding building structure. For the same quick detail selection method of the required rod or hanger, use the same tables on pages D.2.1, D.2.2, D.3.1, D.3.2, D.6.1, D.6.2, D.8.1 & D.8.2 to obtain a Hanger/Rod Attachment Designation and select the subsequent Hanger/Rod Attachment Type in the tables on pages D.13.1 to D.16.1 that meets the requirements to attach to the surrounding building structure.

### IV. Brace Spacing

Determine the maximum transverse and longitudinal brace spacing from the Section 3 “Structural Attachments”. This brace spacing is based on the allowable loads for the specific structural attachment detail previously selected.

The brace spacing shall not exceed the maximum allowable brace spacings listed on the tables on pages D.2, D.3, D.6, and D.8.

For pipe distribution systems, the pipe may not deflect from the at rest position more than 6” or L/60 with L equal to the spacing between the transverse/lateral braces. Design strength for seismic loads in combination with service loads must be based on the following mechanical properties:

a. For mechanical components constructed of ductile materials (e.g., steel, aluminum, or copper), 90% of the minimum specified yield strength.
b. For threaded or coupled connections in piping constructed of ductile materials, 70% of the minimum specified yield strength.

For threaded and bonded connections the maximum spacing of the lateral braces must be reduced by a factor of 1.7 per ASME B31Ea-2010, “Design by Rule” method, section 3.3.2s. For pre-calculated maximum brace spacing based on the stress and deflection limits of the pipe itself, see the top table on page D.3.1.

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**V. Brace Cable**

Select a cable kit size. The horizontal bracing capacity as well as the maximum cable kit tension are listed on the bracing kit details in Section 2. The maximum applied horizontal seismic load shall be equal to or less than the maximum design horizontal seismic loads. If the design tables in Section D are utilized, the cable size is specified accordingly in the preselected detail pages.

**VI. Bracing Layout**

Layout the seismic bracing as explained in part 5 of Section 1 “Seismic Bracing Layout – General Requirements – Duct, Pipe, & Equipment”.

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# 7. GENERAL INSTALLATION NOTES:

**I. Single Hanger Cable Brace Installation Guideline**

a. The design of all gravity hangers is included in the scope of this pre-approval for both use of threaded rod alone or use of the Vibrex type PRMXA-1C spring hanger box.

b. All rod hangers that correspond with a bracing cable must be stiffened. In some instances rod stiffeners will not be required and will be indicated accordingly.

c. For **simplified design approach**, the brace angle range from the vertical is equal to or greater than 45° & less than 60° for the diagonal brace, or a 1:1 and up to but not including a 1:1.7 brace ratio. However, the brace may be installed between 30° to 70° degrees from the vertical. Note, when angle "x" is outside the **simplified design approach** angle range the design requires analysis as the tables in section D will not be applicable.

d. All lateral and longitudinal braces have an in-plane alignment tolerance of 5° from center in both plan and elevation without adversely affecting the given capacities. See Section 2 for more information.

e. All stiffened rods suspended from the PRMXA-1C hanger have an alignment tolerance of 10° without adversely affecting the given capacities. See page 4.1 for more information.

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## 8. COMPONENT PART NUMBER REFERENCE:

| PART NAME | PART NUMBER | DESCRIPTION |
|---|---|---|
| SLH-34 | 315-1002 | Attachment bracket for 1/8" & 3/16" cable |
| HSLH-34 | 315-1072 | Attachment bracket for rigid brace, up to ¾" rod |
| HSLH-1 | 315-1073 | Attachment bracket for rigid brace, up to 1" rod |
| SLW-38 | 315-1039 | Slotted Washer for 3/8" dia. rod and anchors |
| SLW-12 | 315-1003 | Slotted Washer for 1/2" dia. rod and anchors |
| SLW-58 | 315-1040 | Slotted Washer for 5/8" dia. rod and anchors |
| SLW-34 | 315-1004 | Slotted Washer for 3/4" dia. rod & anchors |
| SLW-78 | 315-1031 | Slotted Washer for 7/8" dia. rod & anchors |
| SLW-1 | 315-1075 | Slotted Washer for 1" dia. rod & anchors |
| RS-1 | 315-1037 | Rod Stiffener Clamp |
| 1/8" DIA. CABLE | 313-1800 | 7x19 Steel Cable, 1/8" dia., ASTM 1023 |
| 1/8" VIBREX CABLE CLAMP | 315-1042 | Cable clamp for 1/8" dia. cable with integrated fastening system. |
| 3/16" DIA. CABLE | 313-3600 | 7x19 Steel Cable, 3/16" dia., ASTM 1023 |
| 3/16" VIBREX CABLE CLAMP | 315-1043 | Cable clamp for 3/16" dia. cable with integrated fastening system. |
| PL-38 PIPE LUG | 315-1101 | Welded pipe lug for 3/8" A36 ATR from A500 Gr. B 46ksi HSS STEEL |
| PL-12 PIPE LUG | 315-1102 | Welded pipe lug for 1/2" A36 ATR from A500 Gr. B 46ksi HSS STEEL |
| PL-58 PIPE LUG | 315-1103 | Welded pipe lug for 5/8" A36 ATR from A500 Gr. B 46ksi HSS STEEL |
| PL-34 PIPE LUG | 315-1104 | Welded pipe lug for 3/4" A36 ATR from A500 Gr. B 46ksi HSS STEEL |
| PL-78 PIPE LUG | 315-1105 | Welded pipe lug for 7/8" A36 ATR from A500 Gr. B 46ksi HSS STEEL |
| PL-1 PIPE LUG | 315-1106 | Welded pipe lug for 1" A36 ATR from A500 Gr. B 46ksi HSS STEEL |
| PRMXA-1C | 203-3001 | Spring hanger box with vertical limit stops with allowable 10° angularity of the hanger rod. Maximum spring load: 225# |
| DSSN STRUT NUT | 315-1038 | Double Strut Nut for HSLH-34 & HSLH-1 |

-See Section 4 for details of all parts listed above.

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# TYPICAL SUSPENDED EQUIPMENT DESIGN EXAMPLE (NON-RIGID BRACING)

A. GENERAL

1. The Registered Design Professional (RDP) reviews Section 1 – overview of this OPM.

B. DEMAND

1. The RDP determines the lateral and vertical acceleration "g" for the seismic forces $F_p$ and $F_{pv}$ using information provided in the project documents. In the example below, the maximum factors utilized to determine horizontal and vertical forces on the seismic braces are calculated for use anywhere within the State of California where $z/h_r \leq 0.434$. Please note that these maximum factor values may be reduced for the site specific project location as well as for the location within the height of a building in order to obtain lower demand values if so required to meet bracing criteria.

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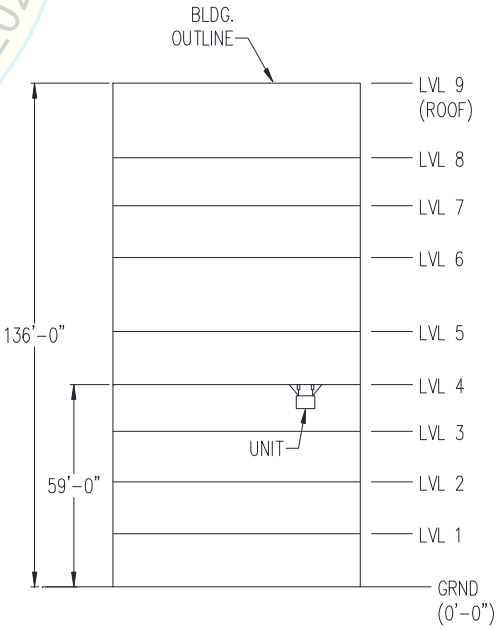
The equipment being suspended is a unit weighing 265 lbs. It is a fan coil (containing a fan with coils) with min. 18 gage steel housing and internal fully threaded connection points suspended using threaded rod and the PRMXA-1C spring hanger. The hangers are attached to the underside of structural sand light weight concrete over 3" metal deck on the 4th floor of 9 floors total at the elevation provided in the figure.

Determine the horizontal and vertical seismic forces of the unit to design the cable bracing and attachment requirements to the structure.

→ ALL FORCES ARE IN LBS & LENGTHS ARE IN INCHES

| | | |
|---|---|---|
| SECTION | 13.3 | HORIZONTAL SEISMIC FORCES FOR NON-STRUCTURAL COMPONENTS IN LRFD, UNO |
| EQUATION | 13.3.1 | $F_p = \frac{0.4 a_p S_{DS} Wp}{R_p/I_p}\left(1+2\frac{Z}{h_r}\right) = 742.4$ |
| TABLE | 13.6.1 | $a_p = 2.5$ (unit w/ vib. isolation) |
| | | $R_p = 2.5$ (unit w/ vib. isolation) |
| | | $\Omega_0 = 2.0$ (for anchorage to conc.) |
| | | $S_{DS} = 2.5$ (short period design value) |
| | | $Wp = 265$ |
| SECTION | 13.1.3 | $I_p = 1.5$ (Located in a Hosp.) |
| | | $z/h_r = 59/136$ (Attached to flr shown) |
| EQUATION | 13.3.2 | Max $F_p = 1.6 S_{DS} I_p Wp = 1590.0$ |
| EQUATION | 13.3.3 | Min $F_p = 0.3 S_{DS} I_p Wp = 298.13$ |
| SECTION | 13.3.1.2B | $Fpv = +/- 0.2 S_{DS} Wp = +/- 132.5$ |

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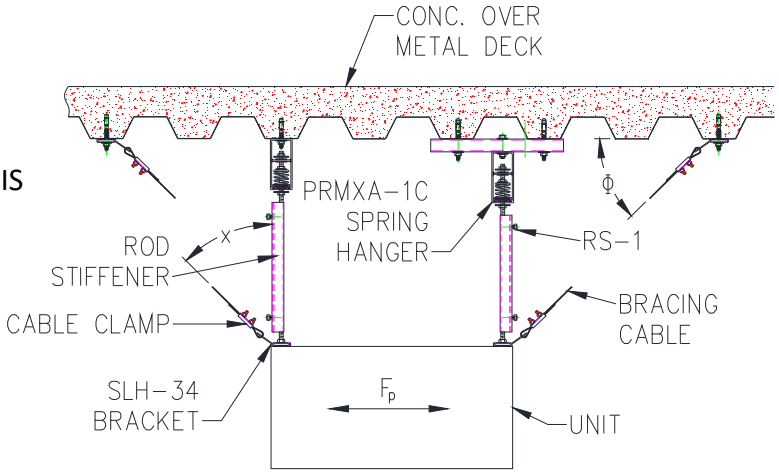
GOVERNING EQN. IS 13.3.1, THEREFORE

$F_p = 742.4$

AND THE SUPPLEMENTAL VERTICAL FORCE IS

$F_{pv} = +/-132.5$




→ DETERMINE THE CABLE FORCE TO SIZE THE CABLE:

x = 45°

$T_{cable} = F_p/(SIN\ x) = 742.4/0.707 = 1050.1$

USE 1/8" CABLE, LRFD KIT CAPACITY = 1411 (SEE PG. 2.13.1)

*$F_p$ IS LESS THAN TABULATED CAPACITY VALUE OF 1001 lbs ON 2.13.1 FOR X = 45°

→ DESIGN THE ANCHORAGE OF THE CABLE:

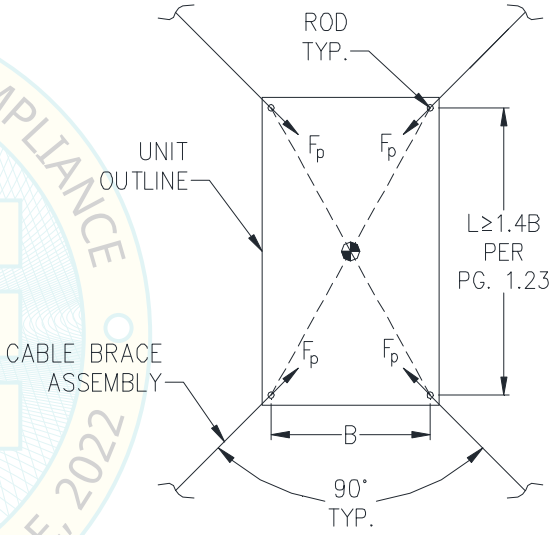
USING THE VALUE OF $T_{cable}$, SELECT AN APPLICABLE ATTACHMENT DETAIL IN SECTION 3. FIND THE VALUE OF Φ TO SELECT THE CORRECT ATTACHMENT TYPE

FOR 3" DECK W/ SAND LIGHTWEIGHT CONCRETE FILL:

FOR THIS EXAMPLE $\Phi = 45^o$ ($\Phi = 90^o - x = 45^o$)

USE ATTACHMENT TYPE 2TZ2D35 ON PAGE 3.1.1

(FOR ATTACHMENT MAX $T_{cable}$ = 1648lbs FOR THE SELECTED CABLE ANGLE & > 1411 CAPACITY OF CABLE KIT. OKAY!)




→ DESIGN THE ANCHORAGE OF THE HANGERS TO THE STRUCTURE:

OVERTURNING OF THE UNIT MUST BE TAKEN INTO ACCOUNT, UNITS ARE IN INCHES…

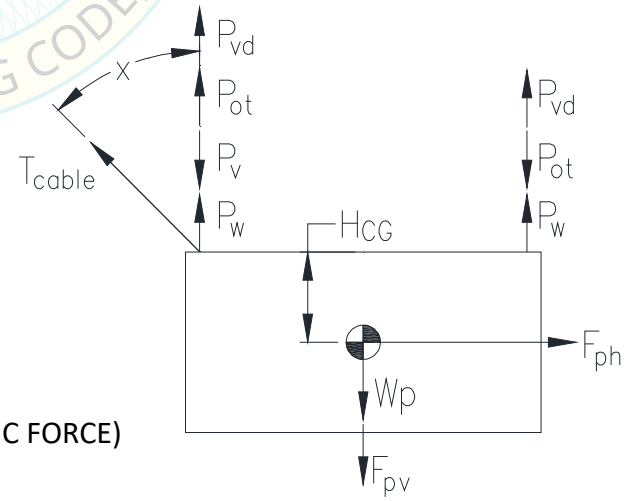
B = 20 (SHORT DIM. BTWN RODS)

L = 42 (LONG DIM. BTWN RODS) –

CHECK → 1.4B = 1.4*20 = 28 < 42 = L OK!

$H_{CG}$ = 10 (DIST. TO C.G. FROM TOP[1] OF UNIT)

NOTE 1.: $H_{CG}$ MUST BE TAKEN FROM THE THE HORIZONTAL PLANE IN WHICH THE RODS & CABLE ARE ATTACHED TO THE UNIT




$P_{ot} = \Omega_0 F_p H/[(L^2+B^2)^{1/2}] = 319.2$

$P_{vd} = F_{pv}/4 = 33.13$ ($\Omega_0$ DOESN'T APPLY TO VERT. SEISMIC FORCE)

$P_w = Wp/4 = 66.25$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APPLYING EQUATIONS FROM §2.3.6 OF THE ASCE 7-16
6. $U = (1.2 + 0.2S_{DS})D + Q_E$ ~~$+ 0.2S$~~
7. $U = (0.9-0.2S_{DS})D + Q_E$ ~~$+ 1.6H$~~

$P\ MIN = P_{ot} + P_{vd} + 1.2P_w = 511.63$

USE AN EXPANSION ANCHOR TO INSTALL TO THE DECK. USE ATTACHMENT TYPE HDE31 ON PAGE 3.28 IN SECTION 3. $P_{capacity}$ = 1041 lbs > P MIN = 511.63 lbs

CHECK THE ROD STIFFENER CLAMP RS-1 SPACING BASED ON THE MAXIMUM COMPRESSION IN THE ROD (TOTAL ROD LENGTH NOT TO EXCEED VALUES LISTED ON PAGE 4.2):

$P_v = T_{cable}COS\ x = 742.4$ ($\Omega_0$ EXCLUDED, FORCE IS UPWARD)

$P\ MAX = P_{ot}/\Omega_0 + P_v + P_{vd} - 0.9P_w = 875.5$

$d_r = 0.417$ (DIAMETER OF THREADED ROD FOR ½" DIA. ALL THREAD ROD)
$r = d_r/4 = 0.1043$
L = 21 (STD. THREADED ROD RS-1 SPACING)
K = 1.0 (SET AS 1 FOR SIMPLIFIED ANALYSIS)
KL/r = 201.3
E = 29,000,000psi
$F_y$ = 36,000psi
USING THE AISC 360-16, CHAPTER E
$4.71(E/F_y)^{1/2} = 134 < KL/r \rightarrow$ EQN. E3-3 OF AISC GOVERNS…
$F_{cr} = 0.877F_e = 6191.9psi$
WITH $F_e = \pi^2E / (KL/r)^2 = 7060.4psi$

$P_{cr} = 0.9F_{cr}d_r^2\pi/4 = 757.2 < P\ MAX = 875.5 \rightarrow$ STD. ROD RS-1 SPACING OF 21" IS INADEQUATE
TRY ABOVE ANALYSIS WITH RS-1 SPACING OF 19"…
$KL/r = 182.2,\ F_{cr} = 0.877\pi^2E / (KL/r)^2 = 7564.1psi$
$P_{cr} = 0.9F_{cr}d_r^2\pi/4 = 925.8 > P\ MAX \rightarrow$ USE A MAX. 19" RS-1 SPACING

CHECK THE CAPACITY OF THE CONNECTION OF THE UNIT TO THE ROD:

INTERNALLY THERE IS A NUT WELDED TO SHEET METAL THAT THE ROD CONNECTS TO. THE TENSION CAPACITY IS THE PUNCHING SHEAR OF THE SHEET METAL AND THE SHEAR CAPACITY IS THE BEARING STRENGTH OF THE HOLE IN THE SHEET METAL…

FIND THE PUNCHING SHEAR STRENGTH OF THE SHEET METAL (J6.1 OF AISI S100-16)
$P_{nt} = V_n = \phi 0.6F_uA_{nv}$
$A_{nv} = L*t$

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t = 0.048” (SHEET METAL THICKNESS – 18 GAGE)

L = 3.04” (PERIMETER LENGTH AROUND STD. HVY NUT)

$F_u$ = 45ksi (TENSILE STRENGTH OF Gr. 33 SHEET METAL)

$\phi$ = 0.65

$P_{nt} = V_n$ = 2560.9 lbs

FIND THE BEARING STRENGTH OF THE HOLE w/ CONSIDERATION OF DEFORMATION (J3.3.2-1)

$P_{nv} = \phi(4.64\alpha t+1.53)d_r t F_u$

$d_r$ = 0.5” (ROD DIA.)

$\alpha$ = 1.0

$\phi$ = 0.65

$P_{nv}$ = 1230.4 lbs

CHECK COMBINED LOADING OF CONNECTION:

$T_u$ = P MIN = 511.63 lbs

$V_u = F_p$ = 742.4 lbs

$1.0 \geq V_u/P_{nv} + T_u/P_{nt}$ = 0.803 CONNECTION OKAY

C. CAPACITY

1. The RDP must select the necessary hardware based on the determined loads in part B of this example. See Section 3 for attachment details (i.e. concrete anchor bolt to deck) and Section 4 for component pieces of the cable kit.
2. The RDP must specify on the drawing the maximum design cable load specific to each unit so that the SEOR can verify the capacity of the local structure that the equipment is braced to and supported by.

D. DESIGN OF DISTRIBUTION SYSTEMS GOING TO AND FROM THE UNIT AS WELL AS THROUGHOUT THE STRUCTURE

1. The RDP must layout the bracing locations per Section 1 Part 5 in the relevant mechanical plans showing the systems (pipe, duct, and cable tray or raceways).
2. Based on the brace locations shown, the RDP must determine the linear weight of the system and calculate the maximum tributary seismic weight to a single transverse kit and a single transverse/longitudinal kit (or more depending on the variety of distribution system sizes or levels of the structure as the seismic forces can vary greatly).
3. Using the design equations and methods specified for the equipment the RDP must apply the tributary weight(s) determined in item 2 and design the cable kit and attachment methods accordingly. Geometric considerations (height to center of gravity, L, B, etc) need not be considered since there is only a single threaded rod per kit location for pipe, but should be accounted for with duct. See pages 1.36 through 1.41 for distribution system design examples.

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# TYPICAL SUSPENDED PIPE DESIGN EXAMPLE (NON-RIGID BRACING)

A. GENERAL

1. The Registered Design Professional (RDP) reviews Section 1 – overview of this OPM.

B. DEMAND

1. The RDP determines the lateral and vertical acceleration "g" for the seismic forces $F_p$ and $F_{pv}$ using information provided in the project documents. In the example below, the maximum horizontal and vertical forces on the seismic braces are calculated for use anywhere within the State of California $z/h_r = 0.434$. Please note that these maximum values may be reduced for the site specific project location as well as for the location within the height of a building in order to obtain lower demand values if so required to meet bracing criteria.

## ASCE 7-16 AS AMENDED BY THE 2022 CBC

The pipe being suspended is 5" diameter schedule 40 steel pipe filled with water and wrapped in insulation (Wp = 24.83plf). Pipe is assembled in accordance with ASME B31 and the joints are made by welding. The pipe system being braced is located in the same structure and level on page 1.32 as the equipment being suspended on the same page. Note: demand loads will increase at higher levels of the structure.

For simplified design, determine the maximum horizontal "g" value and select the necessary details for the cable kit and attachment to the structure for the cable and the rod. Cable must be at an angle range of $45^o \leq x < 60^o$ for this simplified design method to be applied, with x measured from the vertical axis. For this example use a specific angle of 45°.

→ ALL FORCES ARE IN LBS & LENGTHS ARE IN INCHES

| | | |
|---|---|---|
| SECTION | 13.3 | HORIZONTAL SEISMIC FORCES FOR NON-STRUCTURAL COMPONENTS IN LRFD, UNO |
| EQUATION | 13.3.1 | $F_p = \frac{0.4 a_p S_{DS} Wp}{R_p/I_p}\left(1+2\frac{Z}{h_r}\right) = 1.17*Wp$ where g = 1.17 |
| TABLE | 13.6.1 | $a_p = 2.5$ (pipe w/ welded joints & ASME B31 compliant) |
| | | $R_p = 6.0$ (pipe w/ welded joints & ASME B31 compliant) |
| | | $\Omega_0 = 2.0$ (for anchorage to conc.) |
| | | $S_{DS} = 2.5$ (short period design value) |
| SECTION | 13.1.3 | $I_p = 1.5$ (Located in a Hosp.) |
| | | z = 59/136 (Same as equipment example on page 1.32) |
| EQUATION | 13.3.2 | Max $F_p = 1.6 S_{DS} I_p Wp = 6.0*Wp$ |
| EQUATION | 13.3.3 | Min $F_p = 0.3 S_{DS} I_p Wp = 1.13*Wp$ |
| SECTION | 13.3.1 | $Fpv = +/- 0.2 S_{DS} Wp = 0.5*Wp$ |

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GOVERNING EQN. IS 13.3.3 (THE LOWER BOUND), THEREFORE

$F_p = 1.17*Wp$ (LRFD)

AND THE SUPPLEMENTAL VERTICAL FORCE IS

$F_{pv} = 0.5*Wp$ (LRFD)

NOTE: PIPE VERTICAL SUPPORT (ROD HANGER) SPACING TO CONFORM TO CPC TABLE 313.3

*IN THIS EXAMPLE, ROD HANGER SPACING IS 11' DUE TO BRACE SPACING LIMITATION

→ SELECT THE CORRECT TRANSVERSE AND TRANSVERSE & LONGITUDINAL CABLE BRACING KIT DETAILS BASED ON THE ANGLE RANGE SELECTED ON PAGE 1.36:

g = 1.17, SO ROUND UP TO 1.5. FROM THE TABLES ON PAGE D.1.1, USE DETAIL PAGES 2.1.25 & 2.1.26.

→ SELECT THE CORRECT CABLE BRACING ATTACHMENT TO THE STRUCTURE:

AGAIN, g = 1.5…

FROM THE TABLES ON PAGE D.2.1 USING CABLE BRACING, USE ATTACHMENT DESIGNATION B7 AND SELECT A CORRESPONDING ATTACHMENT TYPE WITHIN THE TABLES ON PAGES D.9.1 TO D.12.2. FOR 3" CONCRETE FILLED DECK (PAGE D.9.2), USE 4TZ2D33 ON PAGE 3.1.2.

SEE PG. 4.3.1 FOR ROD LENGTH LIMITS AND RS-1 STIFFENER SPACING

→ DETERMINE THE MAXIMUM BRACING KIT SPACING (FOR TRANSVERSE AND TRANSVERSE/LONGITUDINAL KITS):

ON PAGE D.2.1 IN THE LOWER TABLE, THE MAXIMUM SPACING IN FEET FOR THE TRANSVERSE BRACING KITS OF THE PIPE IS 11.0' O.C.

ON PAGE D.3.1 IN THE LOWER TABLE, THE MAXIMUM SPACING IN FEET FOR THE TRANSVERSE & LONGITUDINAL BRACING KITS OF THE PIPE IS 26.7' O.C.

- THIS RESULTS IN (2) TRANSVERSE KITS BETWEEN EACH TRANSVERSE AND LONGITUDINAL KIT.
- MAXIMUM TRANSVERSE Fp = 24.83plf * 11' * 1.17g = 320lbs ≤ 329lbs
    - NOTE: TO DETERMINE THE CABLE TENSION, $F_p$ MUST BE MULTIPLIED BY THE η VALUE LISTED ON PAGE D.3.3. IN THIS CASE IT WOULD BE 6.04.

→ SELECT THE CORRESPONDING ROD ATTACHMENT DETAIL FOR THE TRANSVERSE KIT LOCATIONS:

ON PAGE D.2.1 FOR 5" PIPE TRANSVERSE KITS, USE A ROD DESIGNATION OF R2 AND SELECT A CORRESPONDING ROD ATTACHMENT TYPE IN THE TABLES ON PAGES D.14.1 TO D.16.1. FOR 3" CONCRETE FILLED DECK AND 5/8" DIAMETER ROD (STANDARD FOR 5" DIAMETER PIPE), USE RDE33 ON PAGE 3.33 (5/8" DIA. KB-TZ2 WITH ROD COUPLING).

THE SAME METHOD APPLIES FOR THE TRANSVERSE AND LONGITUDINAL KITS ON PAGE D.3.1.

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→<u>FOR MANUAL DESIGN OF PIPE BRACING:</u>

- THIS APPROACH IS FOR ANGLES OUTSIDE THE ANGLE RANGE OF THE SIMPLIFIED METHOD OR FOR DETERMINING MORE EXACT DESIGN VALUES FOR THE CABLE BRACING ASSEMBLY AND ATTACHMENTS.

1) CALCULATE THE EXACT FORCES PER KIT
   a. SELECT A TRIBUTARY SPACING FOR THE TRANSVERSE KIT WITH THE SPACING NOT TO EXCEED THE SPACING LIMITS LISTED IN THE LOWER TABLE ON PAGE D.3.1.
   b. SELECT THE DESIRED CABLE BRACING ANGLE RANGE (BETWEEN $30^o \leq x \leq 70^o$ MEASURED FROM VERTICAL PLANE).
   c. FIND $F_p$ USING THE EQUATIONS AND THE TRIBUTARY WEIGHT PER TRANSVERSE CABLE KIT. NOTE: THIS LOAD APPLIES TO THE TRANSVERSE COMPONENT OF THE TRANSVERSE AND LONGTIDUTINAL KITS.
   d. FIND THE $F_p$ FOR THE LONGITUDINAL PORTION OF THE TRANSVERSE AND LONGITUDINAL KITS USING A MAXIMUM SPACING OF 80'-0" O.C. (RECOMMENDED NOT TO EXCEED 2 TO 3 TIMES THE TRANSVERSE KIT SPACING).
2) APPLY THE η FACTOR LISTED ON D.3.3 FOR THE ANGLE RANGE TO GET THE CABLE TENSION $T_{cable}$ FOR THE TRANSVERSE BRACING:

   $T_{cable} = F_p\eta$
3) APPLY PYTHAGOREAN THEOREM TO OBTAIN THE CABLE TENSION $T_{cable}$ FOR THE LONGITDUINAL BRACING:

   $T_{cable} = F_p/SIN\ x$
4) SELECT THE APPROPRIATE BRACING KIT AND ATTACHMENT DETAILS FROM SECTIONS 2 & 3 RESPECTIVELY BASED ON THE VALUE OF $T_{cable}$.

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C. CAPACITY

1. The RDP must select the necessary hardware based on the determined loads in part B of this example. See Section 3 for attachment details (i.e. concrete anchor bolt to deck) and Section 4 for component pieces of the cable kit.
2. The RDP must specify on the drawing the maximum design cable load specific to each bracing kit so that the SEOR can verify the capacity of the local structure that the pipe is braced to and supported by.

# TYPICAL SUSPENDED DUCT (OR CABLE TRAY) DESIGN EXAMPLE

**(NON-RIGID BRACING)**

A. GENERAL

1. The Registered Design Professional (RDP) reviews Section 1 – overview of this OPM.

B. DEMAND

1. The RDP determines the lateral and vertical acceleration "g" for the seismic forces $F_p$ and $F_{pv}$ using information provided in the project documents. In the example below, the maximum horizontal and vertical forces on the seismic braces are calculated for use anywhere within the State of California & $z/h_r = 0.66$. Please note that these maximum values may be reduced for the site specific project location as well as for the location at a lower elevation within the height of a building in order to obtain lower demand values if so required to meet bracing criteria. Note: the demand loads in the example below will be even higher if the duct is at a higher elevation within the structure.

## ASCE 7-16 AS AMENDED BY THE 2022 CBC

*For this example, a duct system will be used, however the same method applies for cable trays (Min. 12 ga.).

The duct being suspended is 36x28 rectangular duct made of 20 gage sheet metal and is insulated, weighing 15.6lb/ft. The duct system being braced is located in the same structure on page 1.32, but on a higher level at 90' above grade (resulting in a $z/h_r = 0.66$). The ductwork has gravity supports at every 10'-0" o.c.

For simplified design, determine the maximum horizontal "g" value and select the necessary details for the cable kit and attachment to the structure for the cable and the rod. Cable must be at an angle range of $45^o \leq x < 60^o$ for this simplified design method to be applied. For this example, use 45° specifically.

→ ALL FORCES ARE IN LBS & LENGTHS ARE IN INCHES

| | | |
|---|---|---|
| SECTION | 13.3 | HORIZONTAL SEISMIC FORCES FOR NON-STRUCTURAL COMPONENTS IN LRFD, UNO |
| EQUATION | 13.3.1 | $F_p = \frac{0.4 a_p S_{DS} Wp}{R_p/I_p}\left(1+2\frac{Z}{h_r}\right) = 1.45*Wp$ where g = 1.45 |
| TABLE | 13.6.1 | $a_p = 2.5$ (suspended ductwork) |
| | | $R_p = 6.0$ (suspended ductwork) |
| | | $\Omega_0 = 2.0$ (for anchorage to conc.) |
| | | $S_{DS} = 2.5$ (highest design value) |
| SECTION | 13.1.3 | $I_p = 1.5$ (Located in a Hosp.) |
| | | z = 90/136 (Using same figure as equipment example on page 1.32) |
| EQUATION | 13.3.2 | Max $F_p = 1.6 S_{DS} I_p Wp = 6.0*Wp$ |
| EQUATION | 13.3.3 | Min $F_p = 0.3 S_{DS} I_p Wp = 1.13*Wp$ |
| SECTION | 13.3.1 | $Fpv = +/- 0.2 S_{DS} Wp = 0.5*Wp$ |

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GOVERNING EQN. IS 13.3.1, THEREFORE

$F_p$ = 1.45*Wp = 1.45*30*15.6plf = 679 lbs

= 1.45*60*15.6plf = 1357 lbs

AND THE SUPPLEMENTAL VERTICAL FORCE IS

$F_{pv}$ = 0.5*Wp = 0.5*10*15.6 = 62 lbs

→ SELECT THE CORRECT CABLE BRACING KIT DETAIL:

g = 1.45, SO ROUND UP TO 1.5 AND ROUND UP THE DUCT LINEAR WEIGHT TO 20lb/ft. FROM THE TABLES ON PAGE D.4.1, USE DETAIL PAGE 2.7.1 FOR TRANSVERSE BRACING AND 2.7.2 FOR TRANSVERSE AND LONGITUDINAL BRACING.

→ SELECT THE CORRECT CABLE BRACING ATTACHMENT TO THE STRUCTURE:

AGAIN, g = 1.5 & DUCT IS 20lb/ft…

FROM THE TABLES ON PAGE D.6.1, USE ATTACHMENT DESIGNATION B6 AND SELECT A CORRESPONDING ATTACHMENT TYPE WITHIN THE TABLES ON PAGES D.9.1 TO D.12.2. FOR 3" CONCRETE FILLED DECK, USE 4TZ2D33 ON PAGE 3.1.2.

→ DETERMINE THE MAXIMUM BRACING KIT SPACING FOR TRANSVERSE KITS:

ON PAGE D.6.1 IN THE MIDDLE TABLE, THE MAXIMUM SPACING IN FEET FOR THE BRACING KITS OF THE DUCT IS 30' O.C.

→ DETERMINE THE MAXIMUM BRACING KIT SPACING FOR TRANSVERSE & LONGITUDINAL KITS (4-WAY KITS):

ON PAGE D.6.1 IN THE LOWER TABLE, THE MAXIMUM SPACING IN FEET FOR THE BRACING KITS OF THE DUCT IS 60' O.C.

IMPORTANT NOTE: TRANSVERSE KITS MUST BE UTILIZED IN CONJUNCTION WITH THE TRANSVERSE/LONGIDTUDINAL KITS SO THAT THE DUCT IS BRACED TRANSVERSELY EVERY 30' O.C. (THE MAXIMUM TRANSVERSE KIT SPACING)

SEE PG. 4.3.1 FOR ROD LENGTH LIMITS AND RS-1 STIFFENER SPACING

→ SELECT THE CORRESPONDING ROD ATTACHMENT DETAIL:

$T_{ROD}$ = 15.6*10 + $F_{pv}$ = 218 lbs (MANUAL CALCULATION)

ON PAGES 2.7.1 & 2.7.2 FOR DUCT 30plf OR SMALLER THE ROD SIZE IS 3/8". USE A ROD DESIGNATION OF R1 AS LISTED ON PAGE D.6.1 AND SELECT A CORRESPONDING ROD ATTACHMENT TYPE IN THE TABLES ON PAGES D.14.1. FOR 3" CONCRETE FILLED DECK AND 3/8" DIAMETER ROD, USE RDE31 ON PAGE 3.33 (3/8" DIA. KB-TZ2 WITH ROD COUPLING). NOTE: THE MIN. REQ'D ATTACHMENT IS RDE37 FOR THE ROD LOAD, BUT RDE31 SELECTED TO USE THE SAME ANCHOR MANUFACTURER AS THE BRACE ATTACHMENT AND HAS GREATER CAPACITY.

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LOAD SUMMARY:

$z/h_r = 0.662$ $F_p = 679$ lbs (TRANSVERSE), 1357 lbs (LONG.) $T_{ROD} = 218$ lbs

→<u>FOR MANUAL DESIGN OF DUCT (OR CABLE TRAY) BRACING:</u>

- THIS APPROACH IS FOR ANGLES OUTSIDE THE ANGLE RANGE OF THE SIMPLIFIED METHOD OR FOR DETERMINING MORE EXACT DESIGN VALUES FOR THE CABLE BRACING ASSEMBLY AND ATTACHMENTS.

1) CALCULATE THE EXACT FORCES PER KIT
   a. SELECT A TRIBUTARY SPACING FOR THE TRANSVERSE KIT WITH THE SPACING NOT TO EXCEED 30'-0" FOR TRANSVERSE BRACING AND 60'-0" FOR TRANSVERSE & LONGITUDINAL BRACING, OR THE PREDETERMINED SPACING LIMITS OF THE PROJECT DEPENDING ON THE CAPACITY OF THE DUCT ITSELF.
   b. SELECT THE DESIRED CABLE BRACING ANGLE RANGE (BETWEEN $30^o \leq x \leq 70^o$).
   c. FIND $F_p$ USING THE EQUATIONS AND THE TRIBUTARY WEIGHT PER TRANSVERSE CABLE KIT. NOTE: THIS LOAD APPLIES TO THE TRANSVERSE COMPONENT OF THE TRANSVERSE AND LONGTIDUTINAL KITS.
   d. FIND THE $F_p$ FOR THE LONGITUDINAL PORTION OF THE TRANSVERSE AND LONGITUDINAL KITS USING A MAXIMUM SPACING OF 60'-0" O.C. (RECOMMENDED NOT TO EXCEED 2 TO 3 TIMES THE TRANSVERSE KIT SPACING).
2) APPLY PYTHAGOREAN THEOREM TO OBTAIN THE CABLE TENSION $T_{cable}$ FOR THE TRANSVERSE BRACING:
   $T_{cable} = F_p/SIN\ x$
3) APPLY PYTHAGOREAN THEOREM TO OBTAIN THE CABLE TENSION $T_{cable}$ FOR THE TRANSVERSE & LONGITDUINAL BRACING (IN THIS CASE x = 60 TO COVER THE RANGE):
   $T_{cable} = F_p/SIN\ x$
4) SELECT THE APPROPRIATE BRACING KIT AND ATTACHMENT DETAILS FROM SECTIONS 2 & 3 RESPECTIVELY BASED ON THE VALUE OF $T_{cable}$.

C. CAPACITY

1. The RDP must select the necessary hardware based on the determined loads in part B of this example. See Section 3 for attachment details (i.e. concrete anchor bolt to deck) and Section 4 for component pieces of the cable kit.
2. The RDP must specify on the drawing the maximum design cable load specific to each bracing kit so that the SEOR can verify the capacity of the local structure that the duct is braced to and supported by.

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# TYPICAL SUSPENDED EQUIPMENT DESIGN EXAMPLE (RIGID BRACING)

A. GENERAL

1. The Registered Design Professional (RDP) reviews Section 1 – overview of this OPM.

B. DEMAND

1. The RDP determines the lateral and vertical acceleration "g" for the seismic forces $F_p$ and $F_{pv}$ using information provided in the project documents. In the example below, the maximum factors utilized to determine horizontal and vertical forces on the seismic braces are calculated for use anywhere within the State of California where z/h ≤ 0.434. Please note that these maximum factor values may be reduced for the site specific project location as well as for the location within the height of a building in order to obtain lower demand values if so required to meet bracing criteria.

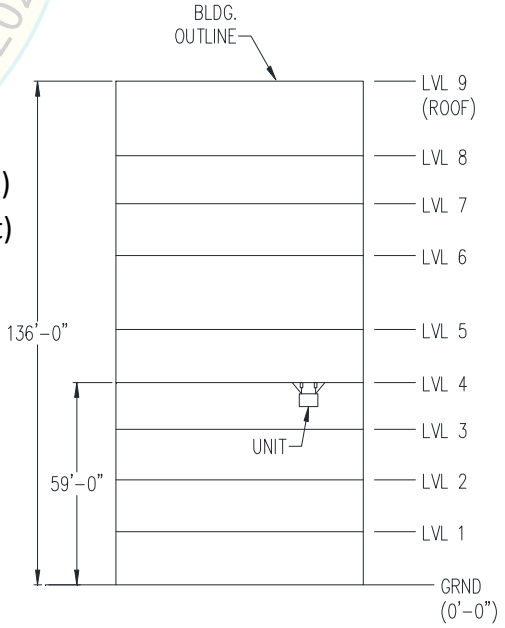
## ASCE 7-16 AS AMENDED BY THE 2022 CBC

The equipment being suspended is a unit weighing 320 lbs. It is a duct silencer (containing sheet metal baffling to reduce equipment noise) with min. 18 gage steel housing and internal fully threaded connection points suspended using 3/8" diameter threaded rod. The hangers are attached to the underside of structural sand light weight concrete over 3" metal deck on the 4th floor of 9 floors total at the elevation provided in the figure.

Determine the horizontal and vertical seismic forces of the unit to design the rigid bracing and attachment requirements to the structure.

→ ALL FORCES ARE IN LBS & LENGTHS ARE IN INCHES

| | | |
|---|---|---|
| SECTION | 13.3 | HORIZONTAL SEISMIC FORCES FOR NON-STRUCTURAL COMPONENTS IN LRFD, UNO |
| EQUATION | 13.3.1 | $F_p = \frac{0.4 a_p S_{DS} W_p}{R_p/I_p}\left(1+2\frac{Z}{h_r}\right) = 373.5$ |
| TABLE | 13.6.1 | $a_p = 2.5$ (Air-side HVACR Equipment) |
| | | $R_p = 6.0$ (Air-side HVACR Equipment) |
| | | $\Omega_0 = 2.0$ (for anchorage to conc.) |
| | | $S_{DS} = 2.5$ (short period design value) |
| | | $W_p = 320$ |
| SECTION | 13.1.3 | $I_p = 1.5$ (Located in a Hosp.) |
| | | z = 59/136 (Attached to flr shown) |
| EQUATION | 13.3.2 | Max $F_p = 1.6 S_{DS} I_p W_p = 1920.0$ |
| EQUATION | 13.3.3 | Min $F_p = 0.3 S_{DS} I_p W_p = 360.0$ |
| SECTION | 13.3.1.2B | $F_{pv} = +/- 0.2 S_{DS} W_p = +/- 160.0$ |

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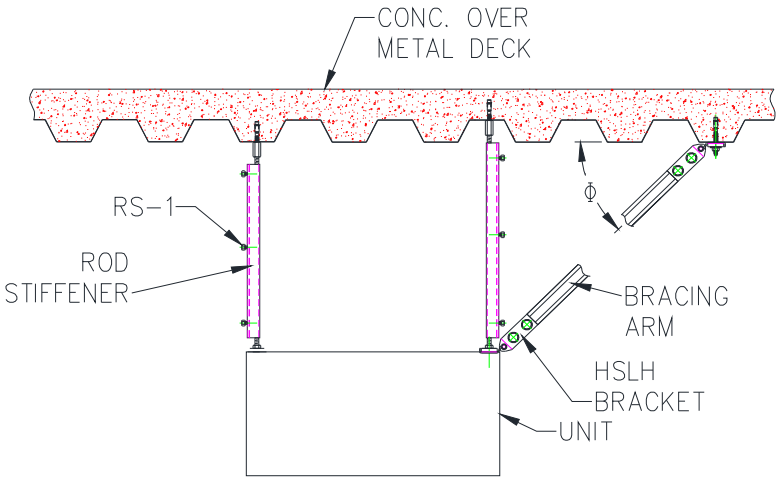
GOVERNING EQN. IS 13.3.1, THEREFORE

$F_p = 373.5$

AND THE SUPPLEMENTAL VERTICAL FORCE IS

$F_{pv} = +/-160.0$




→ DETERMINE THE BRACE FORCE TO SIZE THE BRACE. ROD LENGTH IS 36", MAKING THE BRACE ARM APPROXIMATELY 51" LONG:

x = 45°

$T_{brace} = 0.5*F_p/(SIN\ x) = 0.5*373.5/0.707 = 264.1$

PER PAGE 2.14.1, HSLH-34 WITH SLW-38 IS ADEQUATE WITH A CAPACITY OF 1776 LBS.

PER PAGE 2.15.2, USE 1 5/8 X 1 5/8 X 12 GA SLOTTED STRUT IS ADEQUATE WITH A CAPACITY OF 3652 LBS FOR A BRACE LENGTH OF 60".

→ DESIGN THE ANCHORAGE OF THE BRACE:

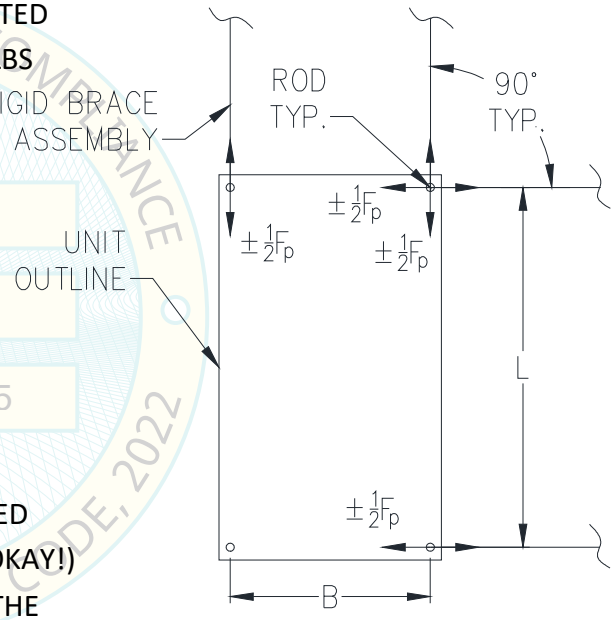
USING THE VALUE OF $T_{brace}$, SELECT AN APPLICABLE ATTACHMENT DETAIL IN SECTION 3. FIND THE VALUE OF Φ TO SELECT THE CORRECT ATTACHMENT TYPE

FOR 3" DECK W/ SAND LIGHTWEIGHT CONCRETE FILL:

FOR THIS EXAMPLE $\Phi = 45°$ $(\Phi = 90° - x = 45°)$

USE ATTACHMENT TYPE 2TZ2DR32 ON PAGE 3.1.3

(FOR ATTACHMENT MAX $T_{brace}$ = 353lbs FOR THE SELECTED BRACE ANGLE & < 1776 CAPACITY OF RIGID BRACE KIT. OKAY!)




→ DESIGN THE ANCHORAGE OF THE HANGER RODS TO THE STRUCTURE, & BRACE IS UNDER COMPRESSION:

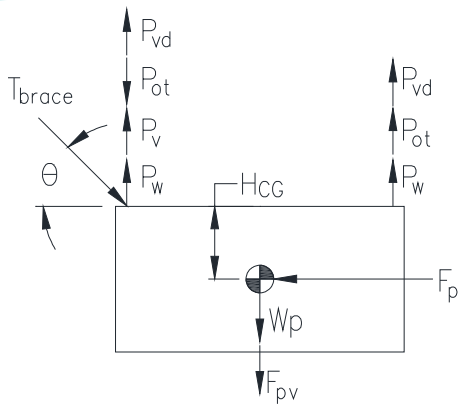
OVERTURNING OF THE UNIT MUST BE TAKEN INTO ACCOUNT, UNITS ARE IN INCHES…

B = 20 (SHORT DIM. BTWN RODS)

L = 42 (LONG DIM. BTWN RODS) –

$H_{CG}$ = 15 (DIST. TO C.G. FROM TOP[1] OF UNIT)

NOTE 1.: $H_{CG}$ MUST BE TAKEN FROM THE THE HORIZONTAL PLANE IN WHICH THE RODS & CABLE ARE ATTACHED TO THE UNIT

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Ph: (661) 257-3311 | Fax: (661) 257-6050
Structural Engineer: N. Tremblay
California PE No. S6481

$P_{ot} = 0.5*F_pH/[(L^2+B^2)^{1/2}] = 60.2$
$P_{vd} = F_{pv}/4 = 40.0$ ($\Omega_0$ DOESN'T APPLY TO VERT. SEISMIC FORCE)
$P_w = Wp/4 = 80.0$
$P_v = T_{brace}*0.707 = 186.7$

APPLYING EQUATIONS FROM §2.3.6 OF THE ASCE 7-16
5. $U = (1.2 + 0.2S_{DS})D + Q_E$ ~~$+ 0.2S$~~
7. $U = (0.9-0.2S_{DS})D + Q_E$ ~~$+ 1.6H$~~

P MIN = $-P_{ot} + P_{vd} + 1.2P_w + \Omega_0P_v = 449.2$ lbs (TENSION)
USE AN EXPANSION ANCHOR TO INSTALL TO THE DECK. USE ATTACHMENT TYPE RDE31 ON PAGE 3.33 IN SECTION 3. $P_{capacity} = 1038$ lbs > P MIN = 449.2 lbs

CHECK THE ROD STIFFENER CLAMP RS-1 SPACING BASED ON THE MAXIMUM COMPRESSION IN THE ROD:

$P_v = T_{brace}$COS x = 186.7

P MAX = $P_{ot} + P_v + P_{vd} – 0.9P_w = 214.9$

$d_r = 0.307$ (DIAMETER OF THREADED ROD)
$r = d_r/4 = 0.0768$
L = 15 (STD. THREADED ROD RS-1 SPACING)
K = 1.0 (SET AS 1 FOR SIMPLIFIED ANALYSIS)
KL/r = 195.3
E = 29,000,000psiG
$F_y$ = 36,000psi
USING THE AISC 360-16, CHAPTER E
$4.71(E/F_y)^{1/2} = 134 < KL/r \rightarrow$ EQN. E3-3 OF AISC GOVERNS…
$F_{cr} = 0.877F_e = 6581$psi
WITH $F_e = \pi^2E / (KL/r)^2 = 7504.0$psi

$P_{cr} = 0.9F_{cr}d_r^2\pi/4 = 438.4 >$ P MAX = 214.9 $\rightarrow$ STD. ROD RS-1 SPACING OF 15" IS ADEQUATE

CHECK THE CAPACITY OF THE CONNECTION OF THE UNIT TO THE ROD:

INTERNALLY THERE IS A NUT WELDED TO SHEET METAL THAT THE ROD CONNECTS TO. THE TENSION CAPACITY IS THE PUNCHING SHEAR OF THE SHEET METAL AND THE SHEAR CAPACITY IS THE BEARING STRENGTH OF THE HOLE IN THE SHEET METAL…

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FIND THE PUNCHING SHEAR STRENGTH OF THE SHEET METAL (J6.1 OF AISI S100-16)

$P_{nt} = V_n = \phi 0.6 F_u A_{nv}$

$A_{nv} = L*t$

t = 0.048" (SHEET METAL THICKNESS – 18 GAGE)

L = 3.04" (PERIMETER LENGTH AROUND STD. HVY NUT)

$F_u$ = 45ksi (TENSILE STRENGTH OF Gr. 33 SHEET METAL)

$\phi$ = 0.65

$P_{nt} = V_n$ = 2560.9 lbs

FIND THE BEARING STRENGTH OF THE HOLE w/ CONSIDERATION OF DEFORMATION (J3.3.2-1)

$P_{nv} = \phi(4.64\alpha t+1.53)d_r t F_u$

$d_r$ = 0.375" (ROD DIA.)

$\alpha$ = 1.0

$\phi$ = 0.65

$P_{nv}$ = 922.8 lbs

CHECK COMBINED LOADING OF CONNECTION:

$T_u$ = P MIN (WITHOUT $\Omega_0$)= 262.5 lbs

$V_u = 0.5*F_p$ = 186.75 lbs

$1.0 \geq V_u/P_{nv} + T_u/P_{nt} = 0.305$ <u>CONNECTION OKAY</u>

C. CAPACITY

1. The RDP must select the necessary hardware based on the determined loads in part B of this example. See Section 3 for attachment details (i.e. concrete anchor bolt to deck) and Section 4 for component pieces of the bracing kit.
2. The RDP must specify on the drawing the maximum design brace load specific to each unit so that the SEOR can verify the capacity of the local structure that the equipment is braced to and supported by. The RDP is responsible for all components including the method of attachment to the structure, and the SEOR is responsible for the adequacy of the supporting structure itself.

D. DESIGN OF DISTRIBUTION SYSTEMS GOING TO AND FROM THE UNIT AS WELL AS THROUGHOUT THE STRUCTURE

1. The RDP must layout the bracing locations per Section 1 Part 5 in the relevant mechanical plans showing the systems (pipe, duct, and cable tray or raceways).
2. Based on the brace locations shown, the RDP must determine the linear weight of the system and calculate the maximum tributary seismic weight to a single transverse kit and a single transverse/longitudinal kit (or more depending on the variety of distribution system sizes or levels of the structure as the seismic forces can vary greatly).

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3. Using the design equations and methods specified for the equipment the RDP must apply the tributary weight(s) determined in item 2 and design the bracing kit and attachment methods accordingly. Geometric considerations (height to center of gravity, L, B, etc) need not be considered since there is only a single threaded rod per kit location for pipe, but should be accounted for with duct. See pages 1.47 through 1.53 for distribution system design examples. For single hung pipe, depending upon the method of support, an additional design factor for determining the rigid brace load may be required per page D3.3.

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# TYPICAL SUSPENDED PIPE DESIGN EXAMPLE (RIGID BRACING)

A. GENERAL

1. The Registered Design Professional (RDP) reviews Section 1 – overview of this OPM.

B. DEMAND

1. The RDP determines the lateral and vertical acceleration "g" for the seismic forces $F_p$ and $F_{pv}$ using information provided in the project documents. In the example below, the maximum horizontal and vertical forces on the seismic braces are calculated for use anywhere within the State of California where z/h ≤ 0.434. Please note that these maximum values may be reduced for the site specific project location as well as for the location within the height of a building in order to obtain lower demand values if so required to meet bracing criteria.

## ASCE 7-16 AS AMENDED BY THE 2022 CBC

The pipe being suspended is 5" diameter schedule 40 steel pipe filled with water and wrapped in insulation (Wp = 24.83plf). Pipe is assembled in accordance with ASME B31 and the joints are made by welding. The pipe system being braced is located in the same structure and level on page 1.42 as the equipment being suspended on the same page. Note: demand loads will increase at higher levels of the structure.

For simplified design, determine the maximum horizontal "g" value and select the necessary details for the rigid bracing kit and attachment to the structure for the rigid brace hand the rod. Brace must be at an angle range of $45^o \leq x < 60^o$ for this simplified design method to be applied, with x measured from the vertical axis. For this example use a specific angle of 45°.

→ ALL FORCES ARE IN LBS & LENGTHS ARE IN INCHES

| | | |
|---|---|---|
| SECTION | 13.3 | HORIZONTAL SEISMIC FORCES FOR NON-STRUCTURAL COMPONENTS IN LRFD, UNO |
| EQUATION | 13.3.1 | $F_p = \frac{0.4 a_p S_{DS} Wp}{R_p/I_p}\left(1+2\frac{Z}{h_r}\right) = 1.17*Wp$ where g = 1.17 |
| TABLE | 13.6.1 | $a_p = 2.5$ (pipe w/ welded joints & ASME B31 compliant) |
| | | $R_p = 6.0$ (pipe w/ welded joints & ASME B31 compliant) |
| | | $\Omega_0 = 2.0$ (for anchorage to conc.) |
| | | $S_{DS} = 2.5$ (short period design value) |
| SECTION | 13.1.3 | $I_p = 1.5$ (Located in a Hosp.) |
| | | z = 59/136 (Same as equipment example on page 1.42) |
| EQUATION | 13.3.2 | Max $F_p = 1.6 S_{DS} I_p Wp = 6.0*Wp$ |
| EQUATION | 13.3.3 | Min $F_p = 0.3 S_{DS} I_p Wp = 1.125*Wp$ |
| SECTION | 13.3.1 | $Fpv = +/- 0.2 S_{DS} Wp = 0.5*Wp$ |

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GOVERNING EQN. IS 13.3.3 (THE LOWER BOUND), THEREFORE

$F_p = 1.17*Wp$ (LRFD)

AND THE SUPPLEMENTAL VERTICAL FORCE IS

$F_{pv} = 0.5*Wp$ (LRFD)

NOTE: PIPE VERTICAL SUPPORT (ROD HANGER) SPACING TO CONFORM TO CPC TABLE 313.3

*IN THIS EXAMPLE, ROD HANGER SPACING IS 12' PER TABLE 313.3 OF THE CALIFORNIA PLUMBING CODE

→ SELECT THE CORRECT TRANSVERSE AND TRANSVERSE & LONGITUDINAL RIGID BRACING KIT DETAILS BASED ON THE ANGLE RANGE SELECTED ON PAGE 1.47:

g = 1.17, SO ROUND UP TO 1.5. FROM THE TABLES ON PAGE D.1.2, USE DETAIL PAGES 2.2.15 & 2.2.16.

→ SELECT THE CORRECT RIGID BRACING ATTACHMENT TO THE STRUCTURE:

AGAIN, g = 1.5…

FROM THE TABLES ON PAGE D.2.2, USE ATTACHMENT DESIGNATION B7 AND SELECT A CORRESPONDING ATTACHMENT TYPE WITHIN THE TABLES ON PAGES D.9.3 TO D.12.2. FOR 3" CONCRETE FILLED DECK (PAGE D.9.4), USE 2TZ2DR37 ON PAGE 3.1.3.

→ DETERMINE THE MAXIMUM BRACING KIT SPACING (FOR TRANSVERSE AND TRANSVERSE/LONGITUDINAL KITS):

ON PAGE D.2.2 IN THE LOWER TABLE, THE MAXIMUM SPACING IN FEET FOR THE TRANSVERSE BRACING KITS OF THE PIPE IS 32.5' O.C.

ON PAGE D.3.2 IN THE LOWER TABLE, THE MAXIMUM SPACING IN FEET FOR THE TRANSVERSE & LONGITUDINAL BRACING KITS OF THE PIPE IS 64.0' O.C.

- THIS RESULTS IN (1) TRANSVERSE KIT BETWEEN EACH TRANSVERSE AND LONGITUDINAL KIT.
- MAXIMUM TRANSVERSE Fp = 24.83plf * 32.5' * 1.13g = 912lbs ≤ 1256 lbs
    - NOTE: TO DETERMINE THE BRACE TENSION, Fp MUST BE MULTIPLIED BY THE η VALUE LISTED ON PAGE D.3.3. IN THIS CASE IT WOULD BE 1.41.

SEE PG. 4.3.2 FOR ROD LENGTH LIMITS AND RS-1 STIFFENER SPACING

→ SELECT THE CORRESPONDING ROD ATTACHMENT DETAIL FOR THE TRANSVERSE KIT LOCATIONS:

ON PAGE D.2.2 FOR 5" PIPE TRANSERSE KITS, USE A ROD DESIGNATION OF R8 AND SELECT A CORRESPONDING ROD ATTACHMENT TYPE IN THE TABLES ON PAGE D.14.1. FOR 3" CONCRETE FILLED DECK AND 5/8" DIAMETER ROD (STANDARD FOR 5" DIAMETER PIPE), USE 4RDE31 ON PAGE 3.33.1 ((4) 5/8" DIA. KB-TZ2 WITH ROD COUPLING).

THE SAME METHOD APPLIES FOR THE TRANSVERSE AND LONGITUDINAL KITS ON PAGE D.3.2.

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→<u>FOR MANUAL DESIGN OF PIPE BRACING:</u>

- THIS APPROACH IS FOR ANGLES OUTSIDE THE ANGLE RANGE OF THE SIMPLIFIED METHOD OR FOR DETERMINING MORE EXACT DESIGN VALUES FOR THE RIGID BRACING ASSEMBLY AND ATTACHMENTS.

1) CALCULATE THE EXACT FORCES PER KIT
   a. SELECT A TRIBUTARY SPACING FOR THE TRANSVERSE KIT WITH THE SPACING NOT TO EXCEED THE SPACING LIMITS LISTED IN THE TOP TABLE ON PAGE D.3.2.
   b. SELECT THE DESIRED RIGID BRACING ANGLE RANGE (BETWEEN $30^o \leq x < 70^o$ & $60^o \leq x \leq 70^o$).
   c. FIND Fp USING THE EQUATIONS AND THE TRIBUTARY WEIGHT PER TRANSVERSE RIGID BRACING KIT. NOTE: THIS LOAD APPLIES TO THE TRANSVERSE COMPONENT OF THE TRANSVERSE AND LONGTIDUTINAL KITS.
   d. FIND THE Fp FOR THE LONGITUDINAL PORTION OF THE TRANSVERSE AND LONGITUDINAL KITS USING A MAXIMUM SPACING OF 80'-0" O.C. (RECOMMENDED NOT TO EXCEED 2 TO 3 TIMES THE TRANSVERSE KIT SPACING).
2) APPLY THE η FACTOR LISTED ON D.3.3 FOR THE ANGLE RANGE TO GET THE BRACE ARM TENSION $T_{brace}$ FOR THE TRANSVERSE BRACING:
   $T_{brace} = F_p\eta$
3) APPLY PYTHAGOREAN THEOREM TO OBTAIN THE BRACE ARM TENSION $T_{brace}$ FOR THE LONGITDUINAL BRACING:
   $T_{brace} = F_p/SIN\ x$
4) SELECT THE APPROPRIATE BRACING KIT AND ATTACHMENT DETAILS FROM SECTIONS 2 & 3 RESPECTIVELY BASED ON THE VALUE OF $T_{brace}$.

C. CAPACITY

1. The RDP must select the necessary hardware based on the determined loads in part B of this example. See Section 3 for attachment details (i.e. concrete anchor bolt to deck) and Section 4 for component pieces of the rigid bracing kit.
2. The RDP must specify on the drawing the maximum design rigid brace load specific to each bracing kit so that the SEOR can verify the capacity of the local structure that the pipe is braced to and supported by.

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# TYPICAL SUSPENDED DUCT (OR CABLE TRAY) DESIGN EXAMPLE (RIGID BRACING)

A. GENERAL

1. The Registered Design Professional (RDP) reviews Section 1 – overview of this OPM.

B. DEMAND

1. The RDP determines the lateral and vertical acceleration "g" for the seismic forces $F_p$ and $F_{pv}$ using information provided in the project documents. In the example below, the maximum horizontal and vertical forces on the seismic braces are calculated for use anywhere within the State of California & $z/h_r = 0.66$. Please note that these maximum values may be reduced for the site specific project location as well as for the location at a lower elevation within the height of a building in order to obtain lower demand values if so required to meet bracing criteria. Note: the demand loads in the example below will be even higher if the duct is at a higher elevation within the structure.

## ASCE 7-16 AS AMENDED BY THE 2022 CBC

*For this example, a duct system will be used, however the same method applies for cable trays. The duct being suspended is 36x28 rectangular duct made of 20 gage sheet metal and is insulated, weighing 15.6lb/ft. The duct system being braced is located in the same structure on page 1.32, but on a higher level at 90' above grade (resulting in a $z/h_r = 0.66$). The ductwork has gravity supports at every 10'-0" o.c.

For simplified design, determine the maximum horizontal "g" value and select the necessary details for the rigid brace kit and attachment to the structure for the rigid brace and the rod. Rigid brace must be at an angle range of $45^o \leq x < 60^o$ for this simplified design method to be applied.

For this example, use $45^o$ specifically.

→ ALL FORCES ARE IN LBS & LENGTHS ARE IN INCHES

| | | |
|---|---|---|
| SECTION | 13.3 | HORIZONTAL SEISMIC FORCES FOR NON-STRUCTURAL COMPONENTS IN LRFD, UNO |
| EQUATION | 13.3.1 | $F_p = \frac{0.4 a_p S_{DS} Wp}{R_p/I_p}\left(1+2\frac{Z}{h_r}\right) = 1.45*Wp$ where g = 1.45 |
| TABLE | 13.6.1 | $a_p = 2.5$ (suspended ductwork) |
| | | $R_p = 6.0$ (suspended ductwork) |
| | | $\Omega_0 = 2.0$ (for anchorage to conc.) |
| | | $S_{DS} = 2.5$ (highest design value) |
| SECTION | 13.1.3 | $I_p = 1.5$ (Located in a Hosp.) |
| | | z = 90/136 (Same as equipment example on page 1.32) |
| EQUATION | 13.3.2 | Max $F_p = 1.6 S_{DS} I_p Wp = 6.0*Wp$ |
| EQUATION | 13.3.3 | Min $F_p = 0.3 S_{DS} I_p Wp = 1.13*Wp$ |
| SECTION | 13.3.1 | $F_{pv} = +/- 0.2 S_{DS} Wp = 0.5*Wp$ |

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GOVERNING EQN. IS 13.3.1, THEREFORE

$F_p$ = 1.45*Wp = 1.45*30*15.6plf = 679 lbs

= 1.45*60*15.6plf = 1357 lbs

AND THE SUPPLEMENTAL VERTICAL FORCE IS

$F_{pv}$ = 0.5*Wp = 0.5*10*15.6 = 62 lbs

→ SELECT THE CORRECT RIGID BRACING KIT DETAIL:

g = 1.45, SO ROUND UP TO 1.5 AND ROUND UP THE DUCT LINEAR WEIGHT TO 20lb/ft. FROM THE TABLES ON PAGE D.4.2, USE DETAIL PAGE 2.8.1 FOR TRANSVERSE BRACING AND 2.8.2 FOR TRANSVERSE AND LONGITUDINAL BRACING.

→ SELECT THE CORRECT RIGID BRACING ATTACHMENT TO THE STRUCTURE:

AGAIN, g = 1.5 & DUCT IS 20lb/ft…

FROM THE TABLES ON PAGE D.6.2, USE ATTACHMENT DESIGNATION B6 AND SELECT A CORRESPONDING ATTACHMENT TYPE WITHIN THE TABLES ON PAGES D.9.3 TO D.12.2. FOR 3" CONCRETE FILLED DECK, USE 4TZ2DR33 ON PAGE 3.1.4.

→ DETERMINE THE MAXIMUM BRACING KIT SPACING FOR TRANSVERSE KITS:

ON PAGE D.6.2 IN THE LOWER LEFT TABLE, THE MAXIMUM SPACING IN FEET FOR THE BRACING KITS OF THE DUCT IS 30' O.C.

→ DETERMINE THE MAXIMUM BRACING KIT SPACING FOR TRANSVERSE & LONGITUDINAL KITS (4-WAY KITS):

ON PAGE D.6.2 IN THE LOWER RIGHT TABLE, THE MAXIMUM SPACING IN FEET FOR THE BRACING KITS OF THE DUCT IS 60' O.C.

IMPORTANT NOTE: TRANSVERSE KITS MUST BE UTILIZED IN CONJUNCTION WITH THE TRANSVERSE/LONGIDTUDINAL KITS SO THAT THE DUCT IS BRACED TRANSVERSELY EVERY 30' O.C. (THE MAXIMUM TRANSVERSE KIT SPACING)

SEE PG. 4.3.2 FOR ROD LENGTH LIMITS AND RS-1 STIFFENER SPACING

→ SELECT THE CORRESPONDING ROD ATTACHMENT DETAILS:

AT TRANSVERSE KITS: $T_{ROD,T}$ = 15.6*10 + $F_{pv}$ + Fp/SIN 45° * COS 45° = 897 lbs (MANUAL CALCULATION)

ON PAGES 2.8.1 & 2.8.2 FOR DUCT 30plf OR SMALLER THE ROD SIZE IS 3/8". USE A ROD DESIGNATION OF AT LEAST R5 (NOTE: R5 & R6 NOT AVAILABLE FOR 3" DECK, USE R7) AS LISTED ON PAGE D.6.2 AND SELECT A CORRESPONDING ROD ATTACHMENT TYPE IN THE TABLES ON PAGES D.14.1. FOR 3" CONCRETE FILLED DECK AND 3/8" DIAMETER ROD, USE 2RDE31 ON PAGE 3.33.

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AT TRANSVERSE & LONGITUDINAL KITS: $T_{ROD,T\&L}$ = 15.6*10 + $F_{pv}$ + Fp/SIN 45° * COS 45° = 1,575 lbs (MANUAL CALCULATION)

ON PAGES 2.8.1 & 2.8.2 FOR DUCT 30plf OR SMALLER THE ROD SIZE IS 3/8". USE A ROD DESIGNATION OF R6 (NOTE: IN THIS CASE R6 NOT AVAILABLE, GO TO R7) AS LISTED ON PAGE D.6.2 AND SELECT A CORRESPONDING ROD ATTACHMENT TYPE IN THE TABLES ON PAGES D.14.1. FOR 3" CONCRETE FILLED DECK AND 3/8" DIAMETER ROD, USE 2RDE31 ON PAGE 3.33 ((2) 5/8" DIA. KB-TZ2 W/ HSS SPANNING (2) FLUTES).

LOAD SUMMARY:

$z/h_r$ = 0.662 $F_p$ = 679 lbs (TRANSVERSE), 1357 lbs (LONG.)

$T_{ROD,T}$ = 897 lbs $T_{ROD,T\&L}$ = 1,575lbs

→<u>FOR MANUAL DESIGN OF DUCT (OR CABLE TRAY) BRACING:</u>

- THIS APPROACH IS FOR ANGLES OUTSIDE THE ANGLE RANGE OF THE SIMPLIFIED METHOD OR FOR DETERMINING MORE EXACT DESIGN VALUES FOR THE RIGID BRACING ASSEMBLY AND ATTACHMENTS.

1) CALCULATE THE EXACT FORCES PER KIT
   a. SELECT A TRIBUTARY SPACING FOR THE TRANSVERSE KIT WITH THE SPACING NOT TO EXCEED 30'-0" FOR TRANSVERSE BRACING AND 60'-0" FOR TRANSVERSE & LONGITUDINAL BRACING, OR THE PREDETERMINED SPACING LIMITS OF THE PROJECT DEPENDING ON THE CAPACITY OF THE DUCT ITSELF.
   b. SELECT THE DESIRED RIGID BRACING ANGLE RANGE (BETWEEN 30° ≤ x ≤ 70°).
   c. FIND $F_p$ USING THE EQUATIONS AND THE TRIBUTARY WEIGHT PER TRANSVERSE RIGID BRACING KIT. NOTE: THIS LOAD APPLIES TO THE TRANSVERSE COMPONENT OF THE TRANSVERSE AND LONGTIDUTINAL KITS.
   d. FIND THE $F_p$ FOR THE LONGITUDINAL PORTION OF THE TRANSVERSE AND LONGITUDINAL KITS USING A MAXIMUM SPACING OF 60'-0" O.C. (RECOMMENDED NOT TO EXCEED 2 TO 3 TIMES THE TRANSVERSE KIT SPACING).
2) APPLY PYTHAGOREAN THEOREM TO OBTAIN THE BRACE ARM TENSION $T_{brace}$ FOR THE TRANSVERSE BRACING:

   $T_{brace} = F_p/SIN\ x$

3) APPLY PYTHAGOREAN THEOREM TO OBTAIN THE BRACE ARM TENSION $T_{brace}$ FOR THE TRANSVERSE & LONGITDUINAL BRACING (IN THIS CASE x = 60 TO COVER THE RANGE):

   $T_{brace} = F_p/SIN\ x$

4) SELECT THE APPROPRIATE BRACING KIT AND ATTACHMENT DETAILS FROM SECTIONS 2 & 3 RESPECTIVELY BASED ON THE VALUE OF $T_{brace}$.

C. CAPACITY

1. The RDP must select the necessary hardware based on the determined loads in part B of this example. See Section 3 for attachment details (i.e. concrete anchor bolt to deck) and Section 4 for component pieces of the rigid brace kit.
2. The RDP must specify on the drawing the maximum design rigid brace load specific to each bracing kit so that the SEOR can verify the capacity of the local structure that the duct is braced to and supported by.

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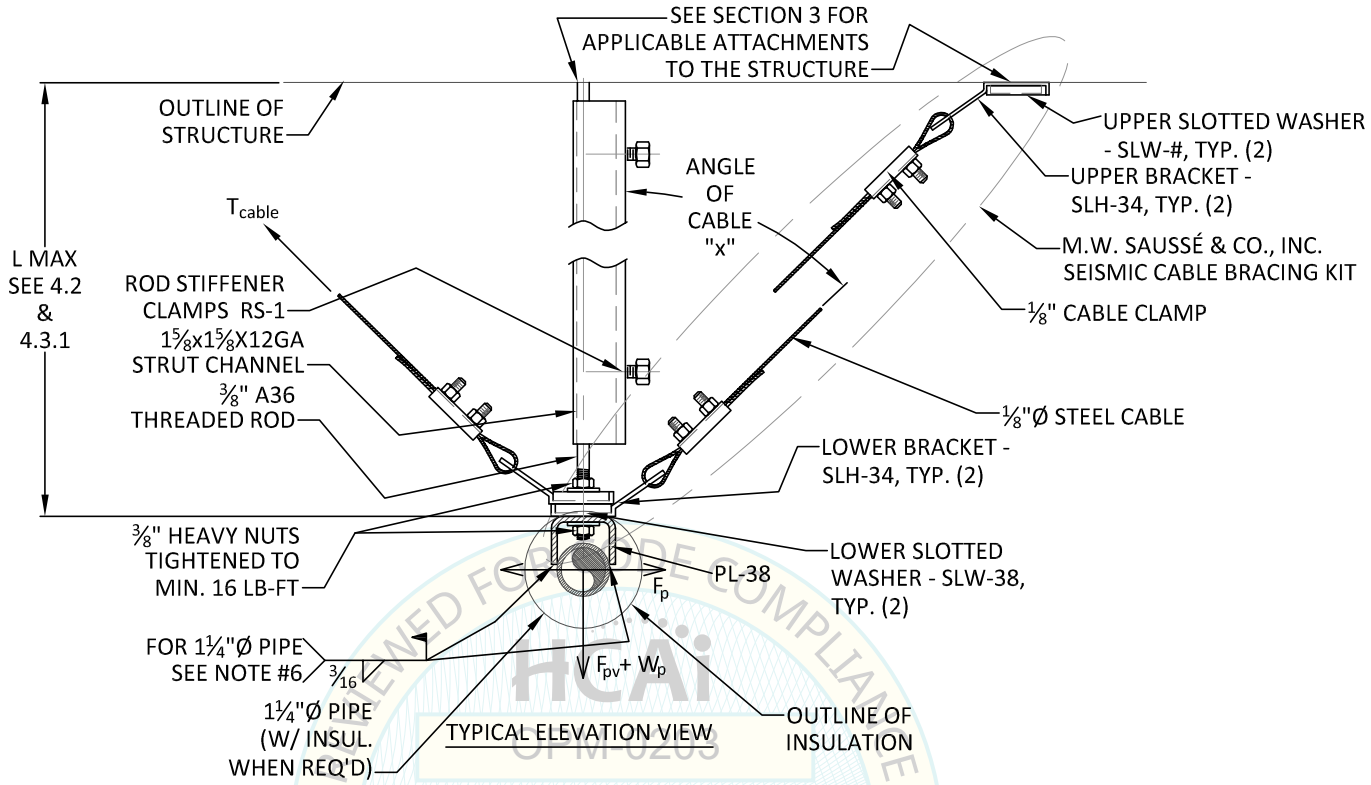
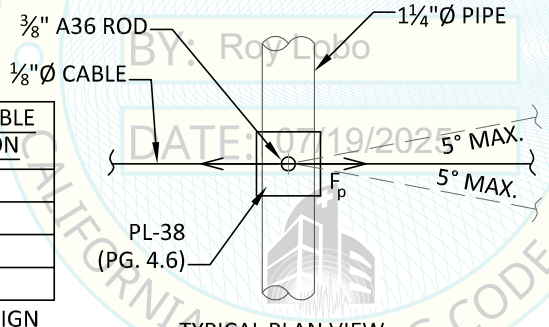
# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 1¼"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)




TYPICAL ELEVATION VIEW




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 422 | 1095 |
| [a]45°≤ x <60° | 500 | 1411 |
| 60°= x | 538 | 1520 |
| [c]60°< x ≤70° | 413 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-P18C-38R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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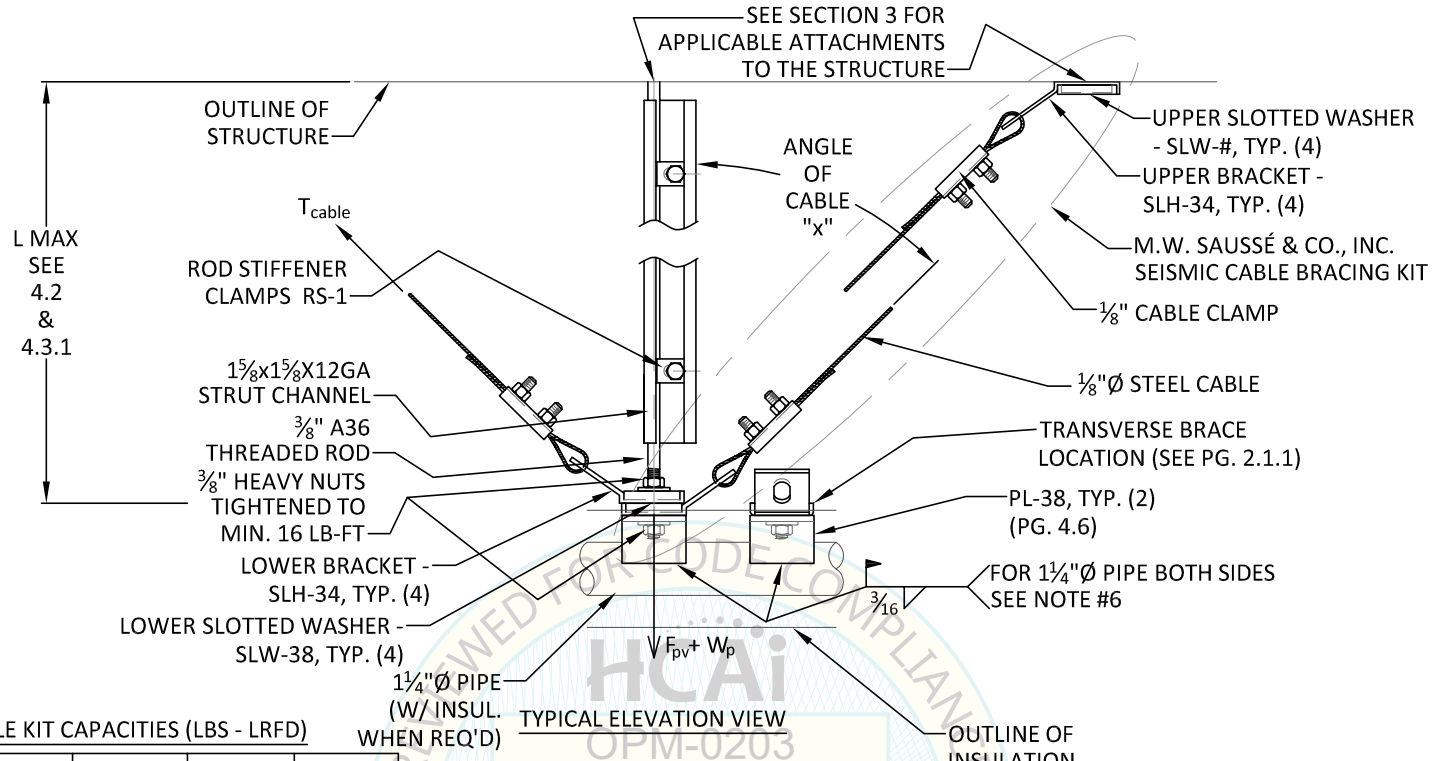
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 2.1.1
Date: February 5, 2025

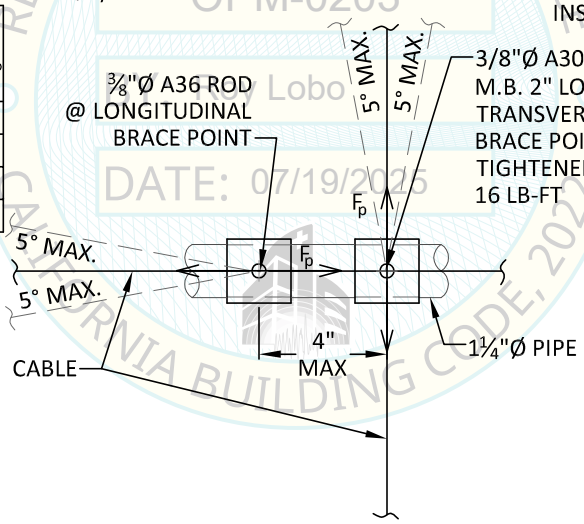
# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 1¼"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30° ≤ x < 45° | 422 | 547 | 1095 |
| [a]45° ≤ x < 60° | 500 | 1001 | 1411 |
| 60° = x | 538 | 1316 | 1520 |
| [c]60° < x ≤ 70° | 413 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-P18C-38R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-38
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(02) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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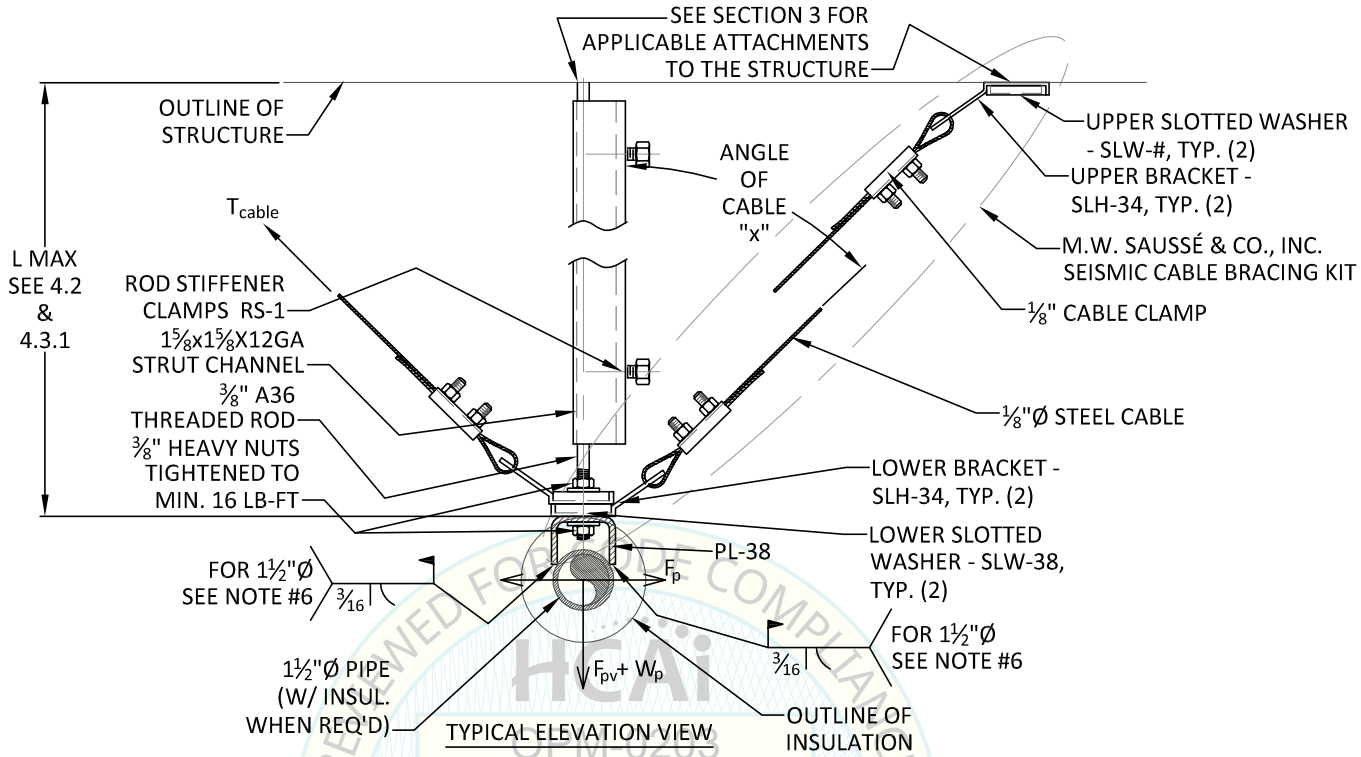
Structural Engineer: N. Tremblay
California PE No. S6481

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 1½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛" CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 376 | 1095 |
| [a]45°≤ x <60° | 431 | 1411 |
| 60°= x | 464 | 1520 |
| [c]60°< x ≤70° | 348 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-P18C-38R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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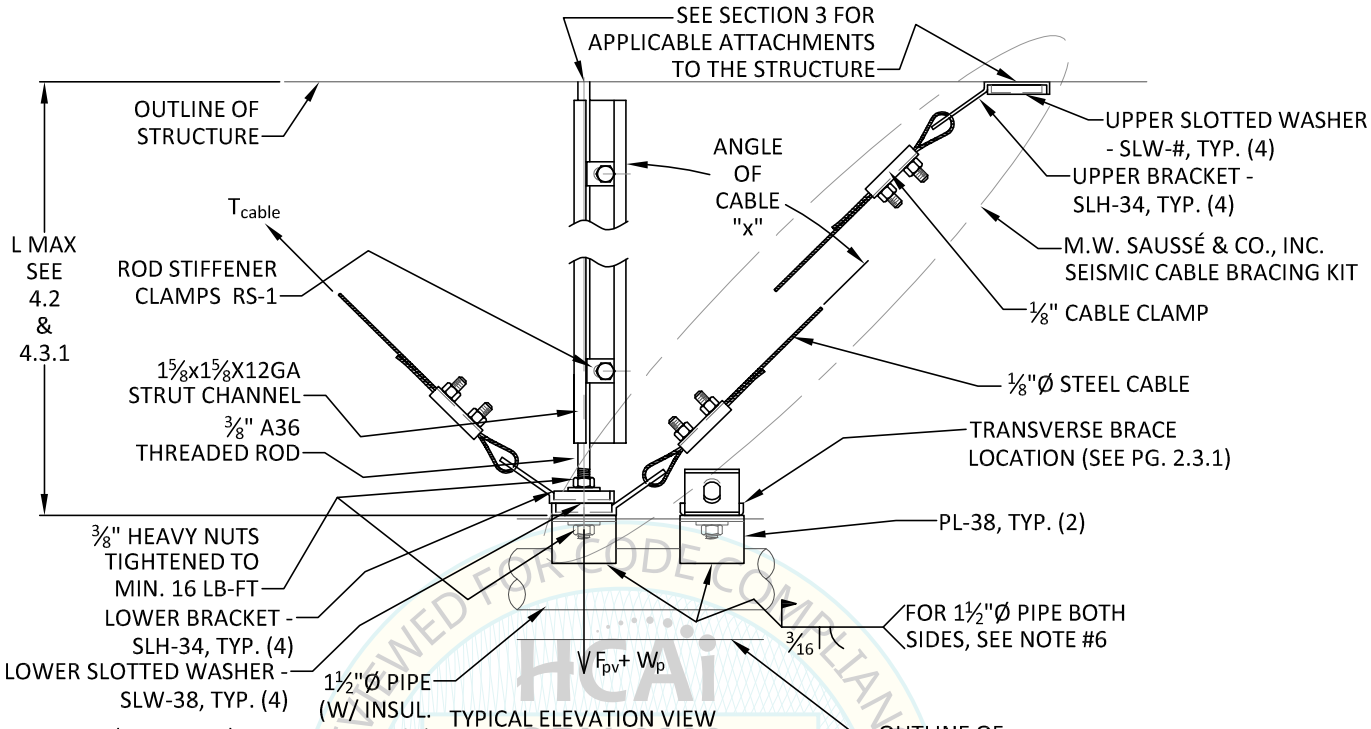
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.1.3**
Date: February 5, 2025

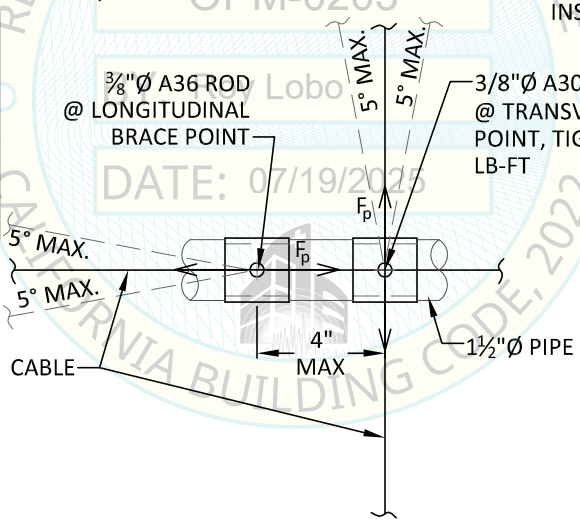
# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 1½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 376 | 547 | 1095 |
| [a]45°≤ x <60° | 431 | 1001 | 1411 |
| 60°= x | 464 | 1316 | 1520 |
| [c]60°< x ≤70° | 348 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-P18C-38R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-38
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(02) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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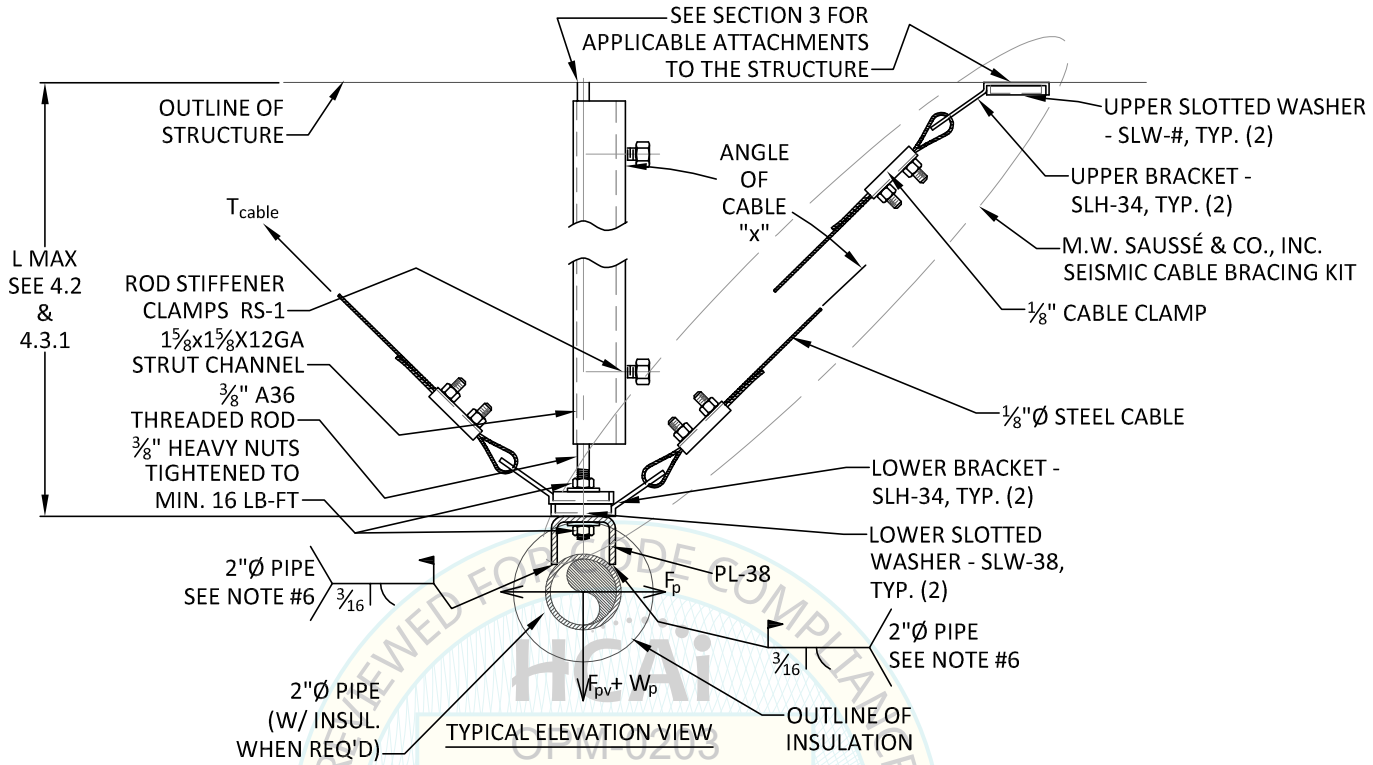
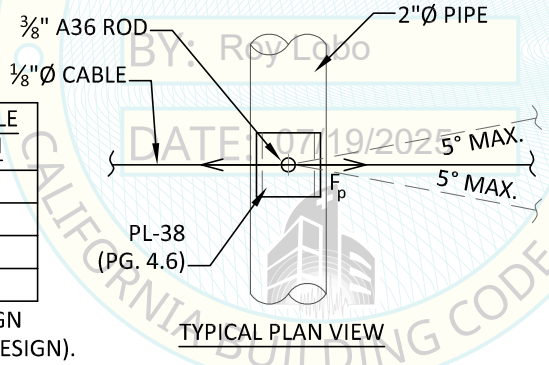
# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 2"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 354 | 1095 |
| [a]45°≤ x <60° | 400 | 1411 |
| 60°= x | 431 | 1520 |
| [c]60°< x ≤70° | 320 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-P18C-38R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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BY: Roy Lobo
DATE: 07/19/2025
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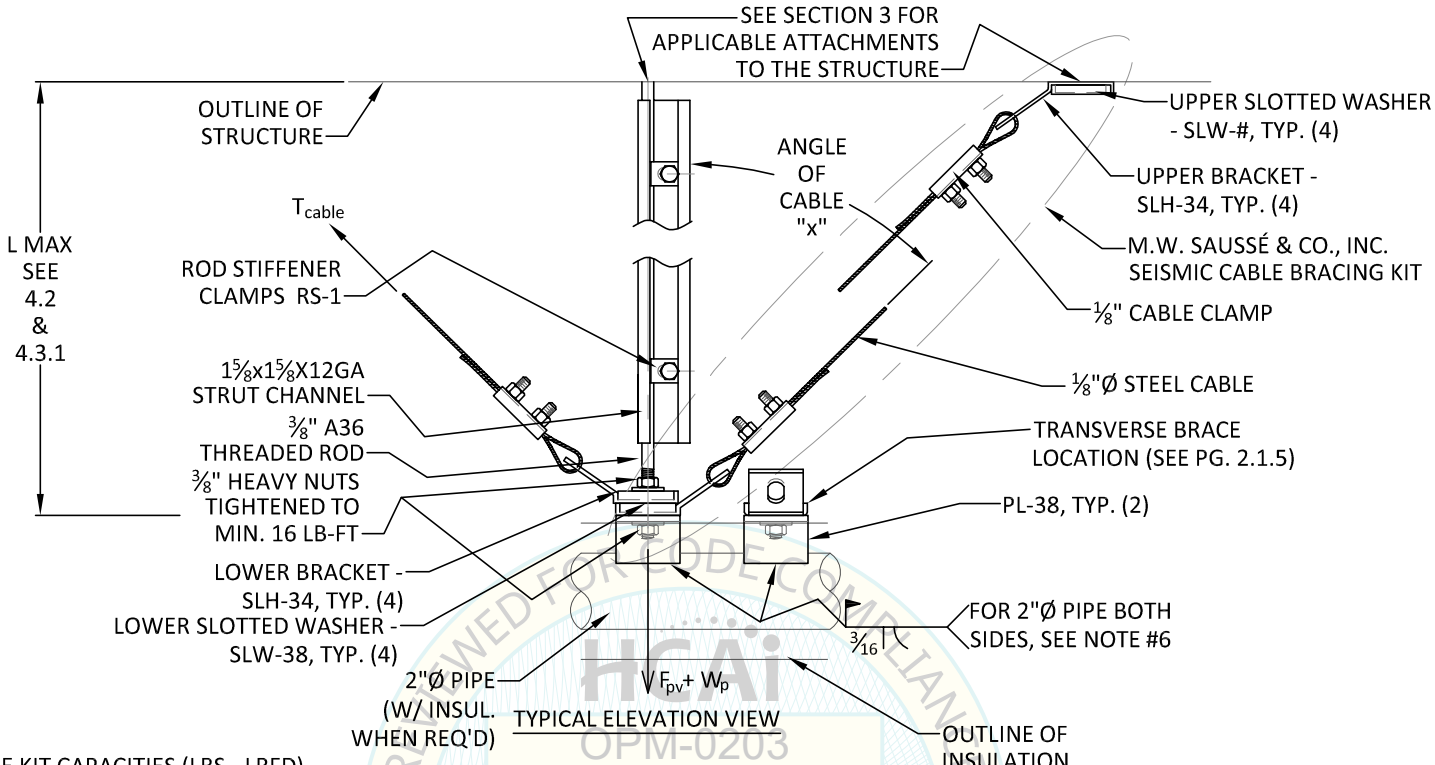
Page No.: **2.1.5**
Date: February 5, 2025

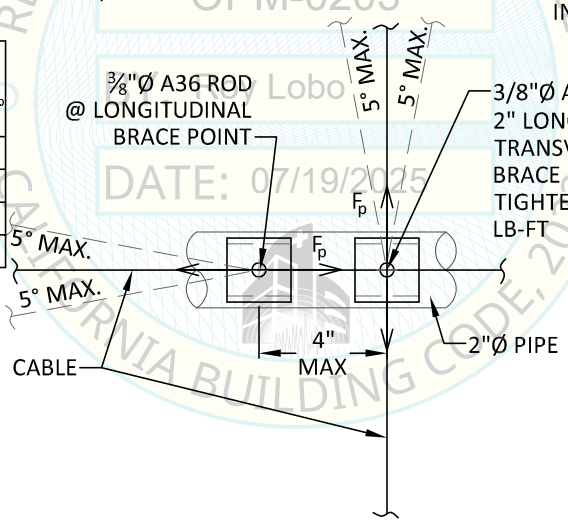
# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 2"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 354 | 547 | 1095 |
| [a]45°≤ x <60° | 400 | 1001 | 1411 |
| 60°= x | 431 | 1316 | 1520 |
| [c]60°< x ≤70° | 320 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




PIPE BRACING KIT 2-P18C-38R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-38
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(02) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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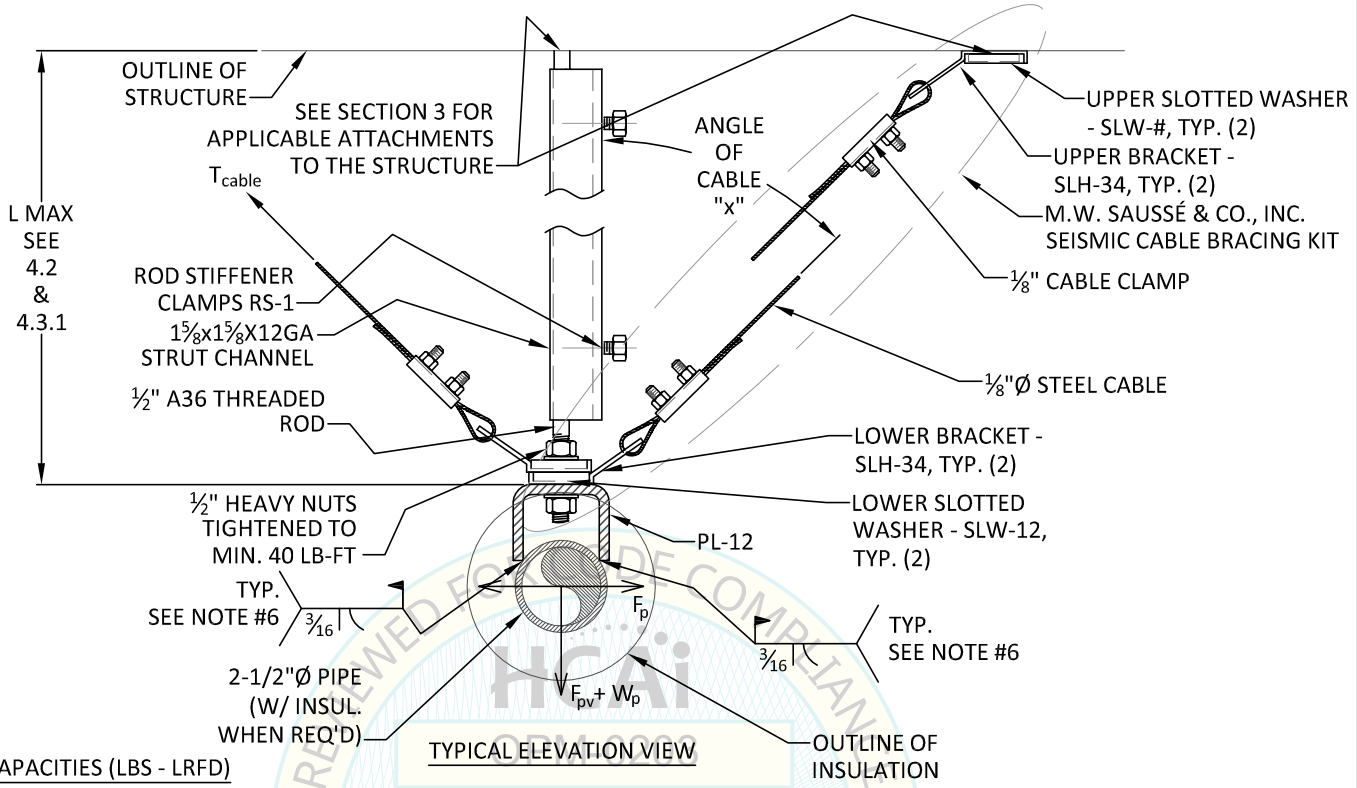
Page No.: **2.1.6**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 2½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

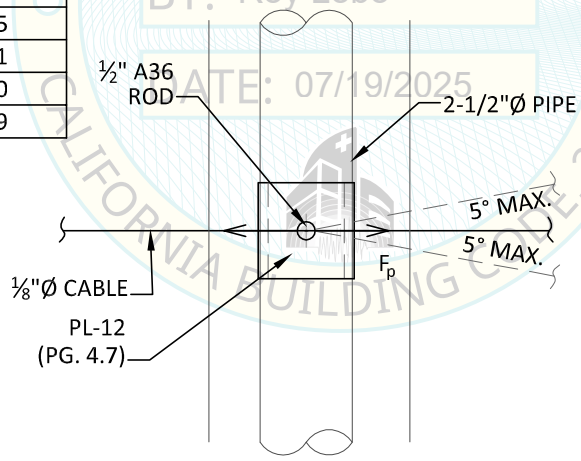



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 298 | 1095 |
| [a]45°≤ x <60° | 325 | 1411 |
| 60°= x | 350 | 1520 |
| [c]60°< x ≤70° | 253 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P18C-12R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.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BY: Roy Lobo
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CALIFORNIA BUILDING CODE, 2022



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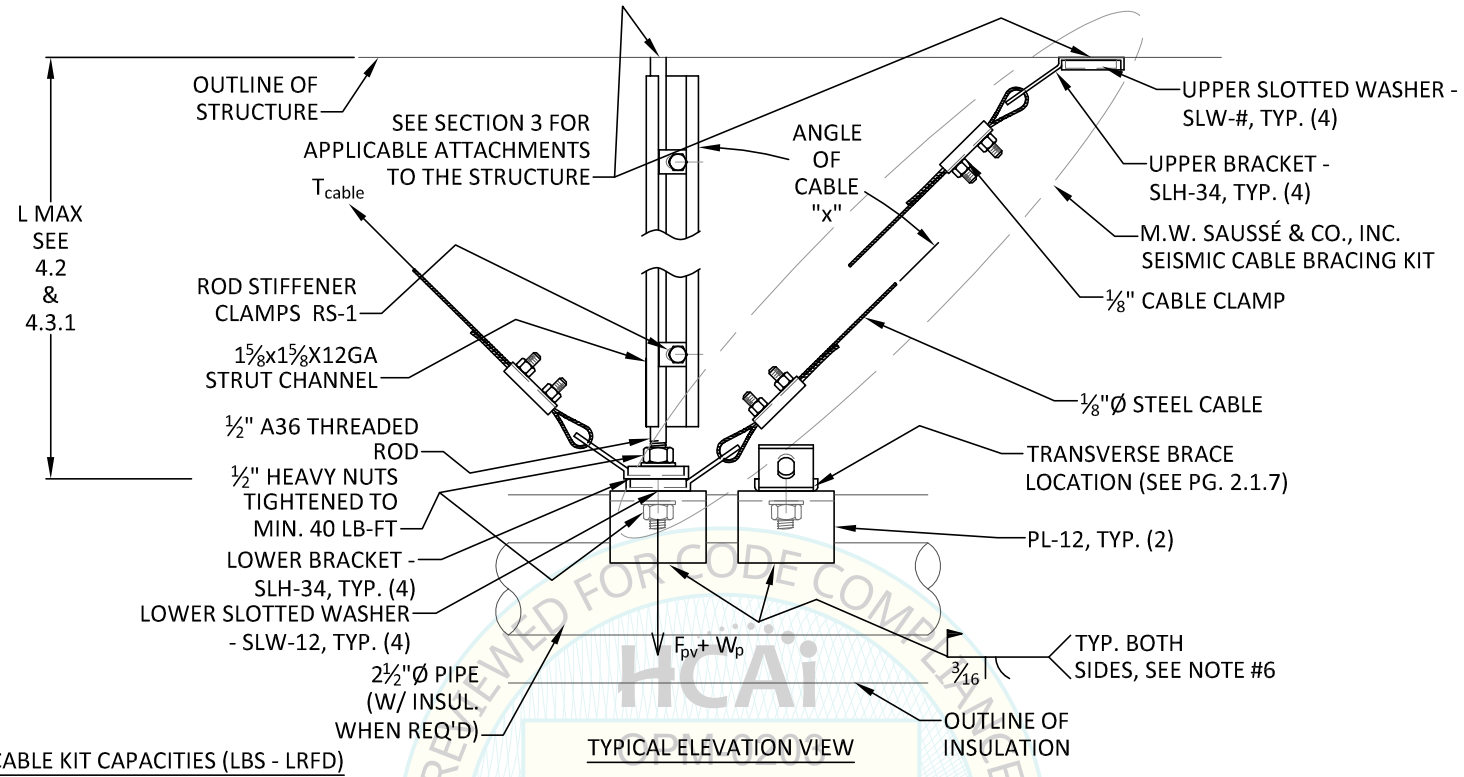
Page No.: **2.1.7**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 2½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

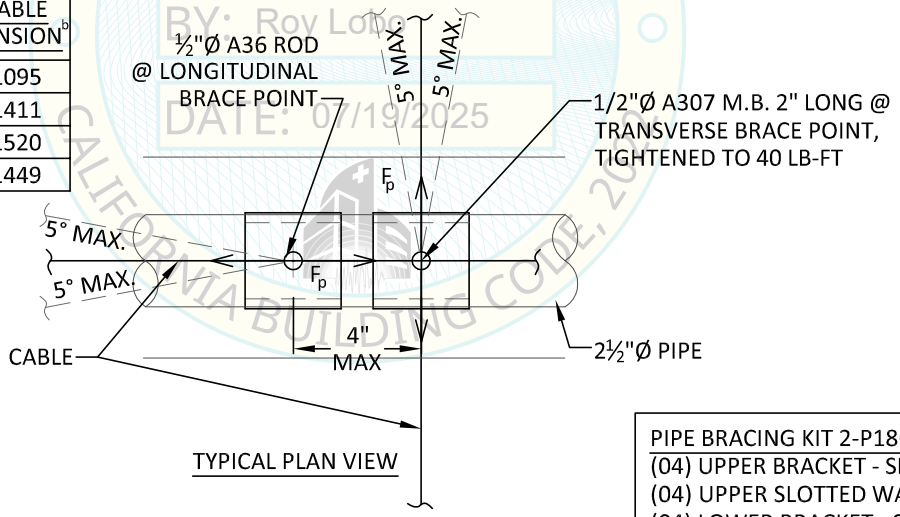



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 298 | 547 | 1095 |
| [a]45°≤ x <60° | 325 | 1001 | 1411 |
| 60°= x | 350 | 1316 | 1520 |
| [c]60°< x ≤70° | 253 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-P18C-12R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE, 2022

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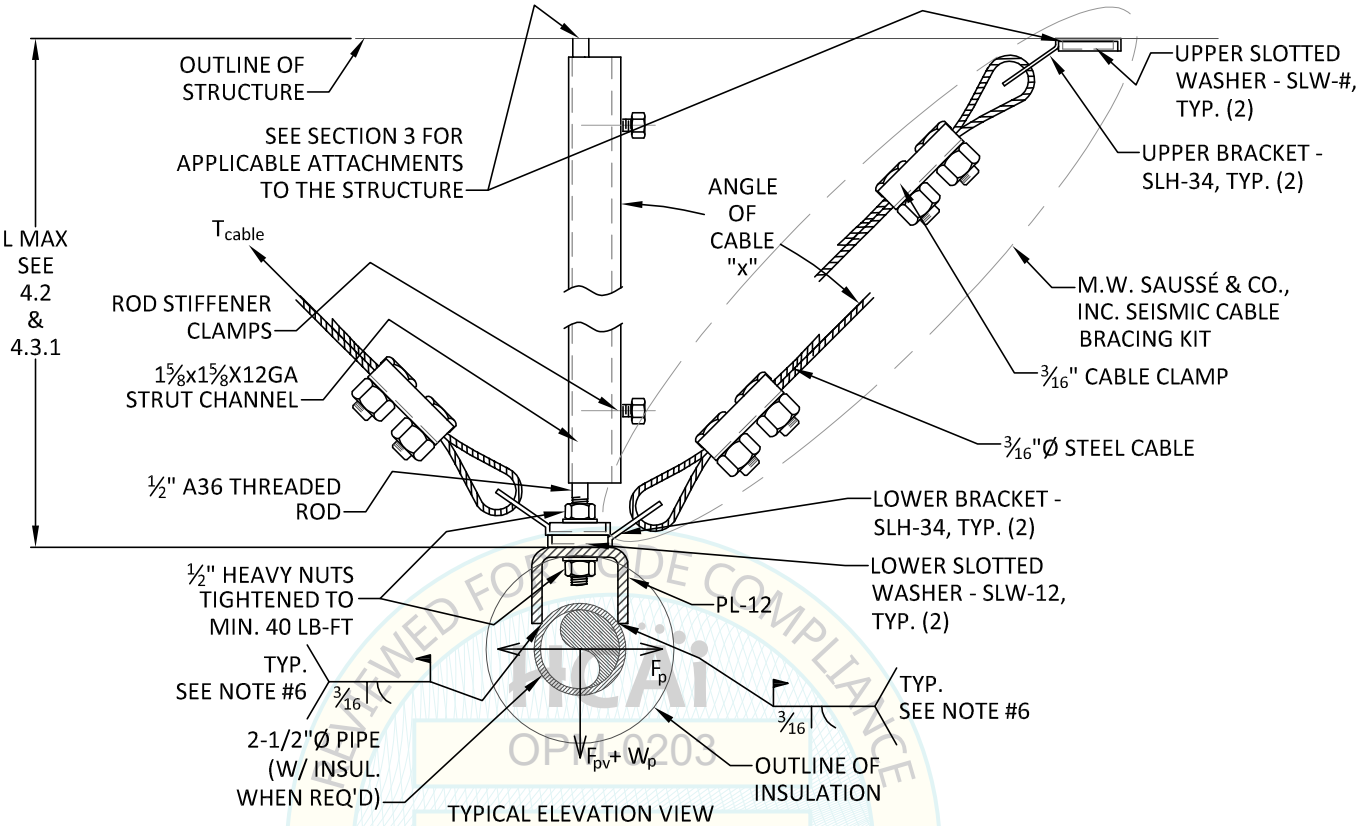
# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 2½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

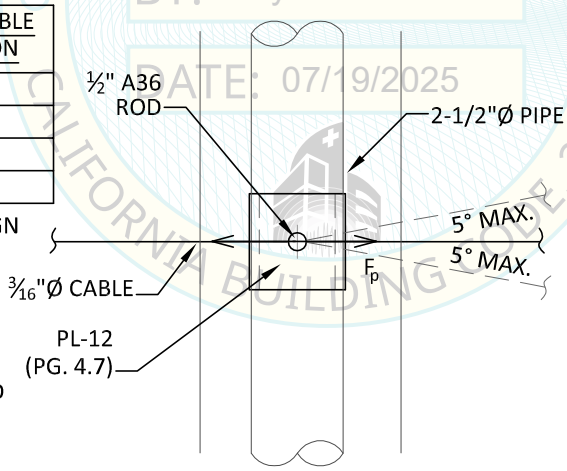



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 522 | 1915 |
| [a]45°≤ x <60° | 458 | 1988 |
| 60°= x | 646 | 2807 |
| [c]60°< x ≤70° | 449 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P316C-12R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
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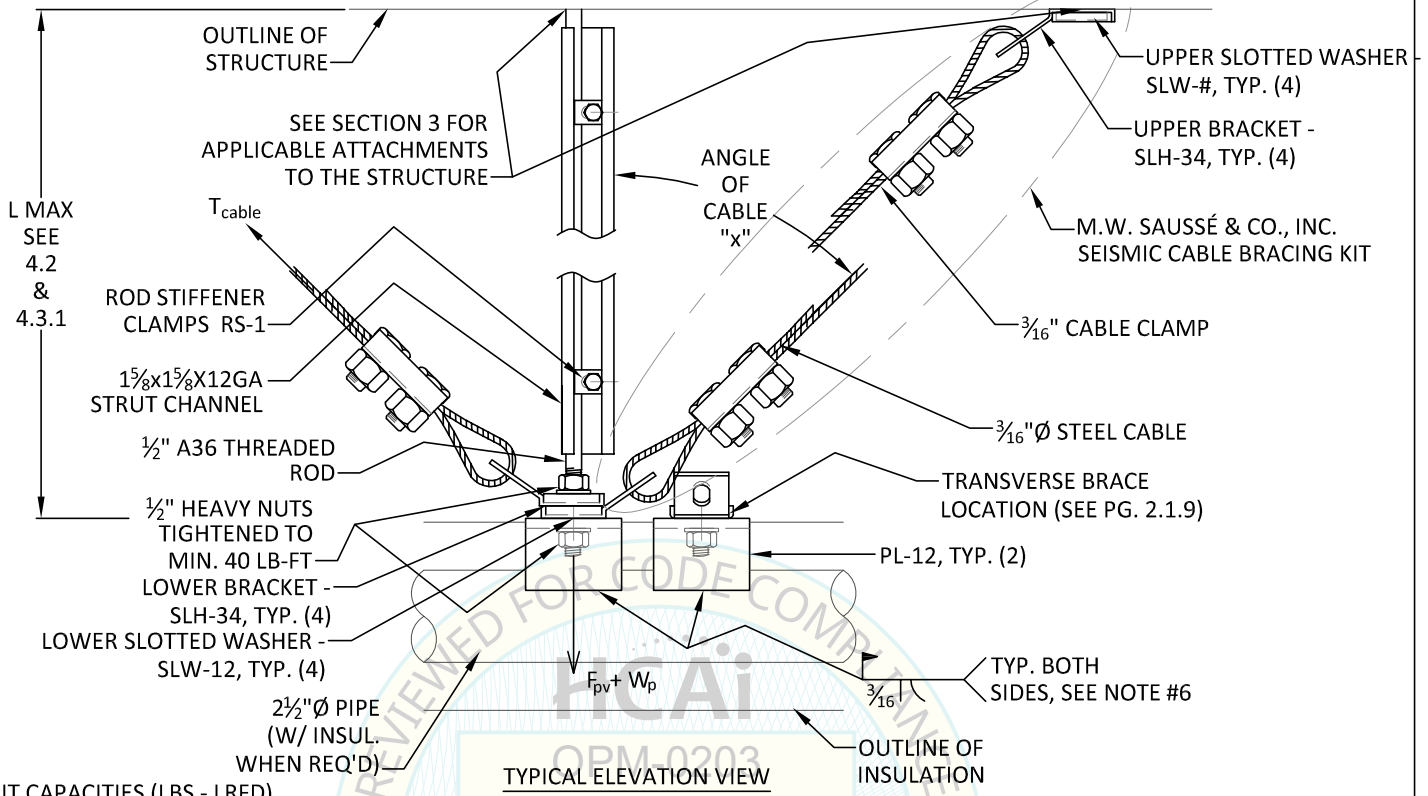
Page No.: **2.1.9**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 2½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16" Ø CABLE)

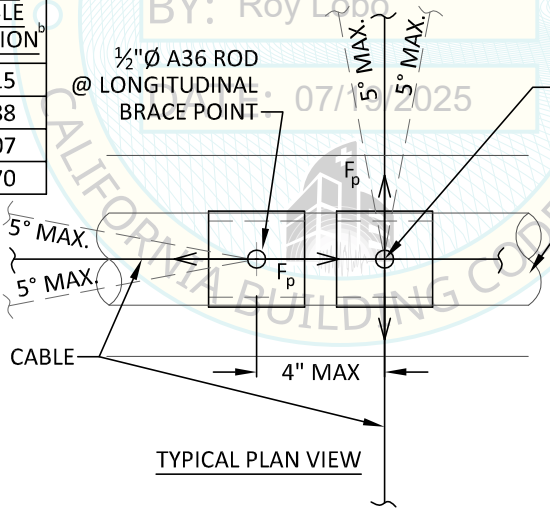



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 522 | 957 | 1915 |
| [a]45°≤ x <60° | 458 | 1411 | 1988 |
| 60°= x | 646 | 2442 | 2807 |
| [c]60°< x ≤70° | 449 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-P316C-12R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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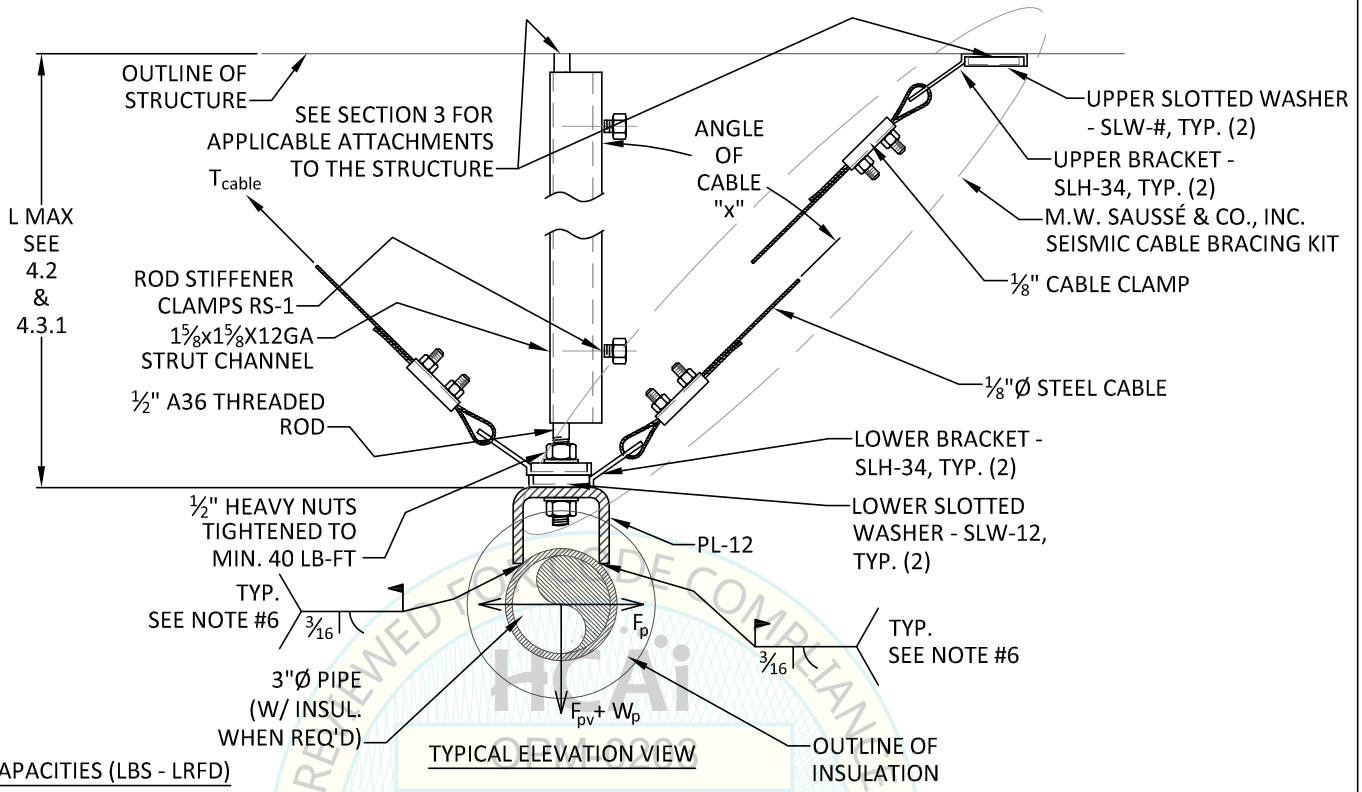
California PE No. S6481

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 3"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

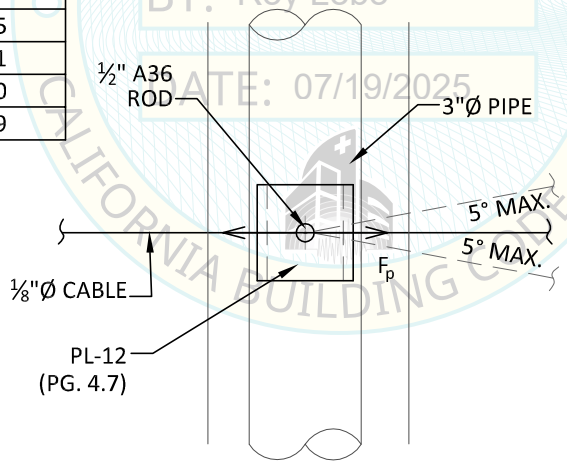



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 274 | 1095 |
| [a]45°≤ x <60° | 293 | 1411 |
| 60°= x | 316 | 1520 |
| [c]60°< x ≤70° | 226 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P18C-12R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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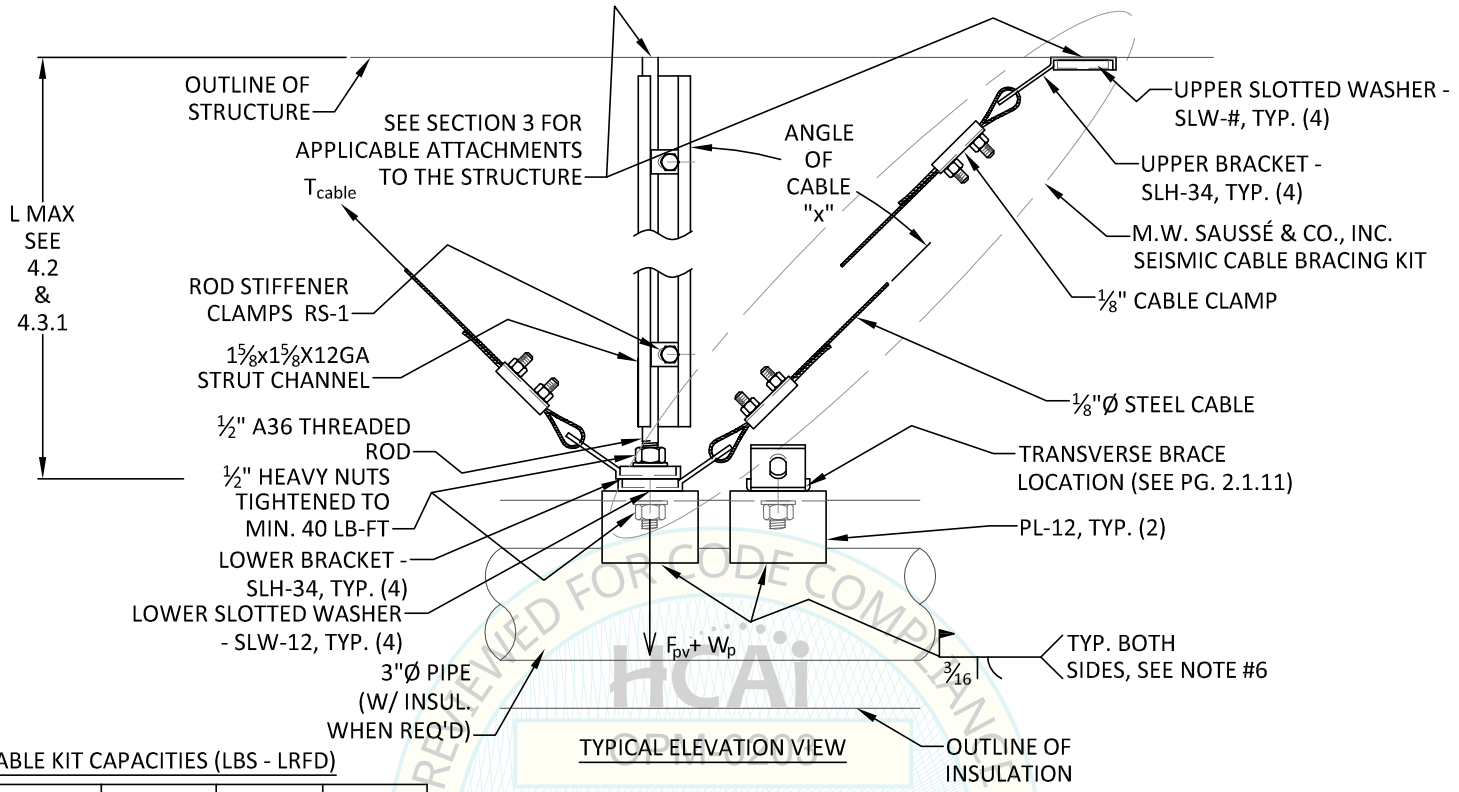
California PE No. S6481

Page No.: **2.1.11**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 3"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

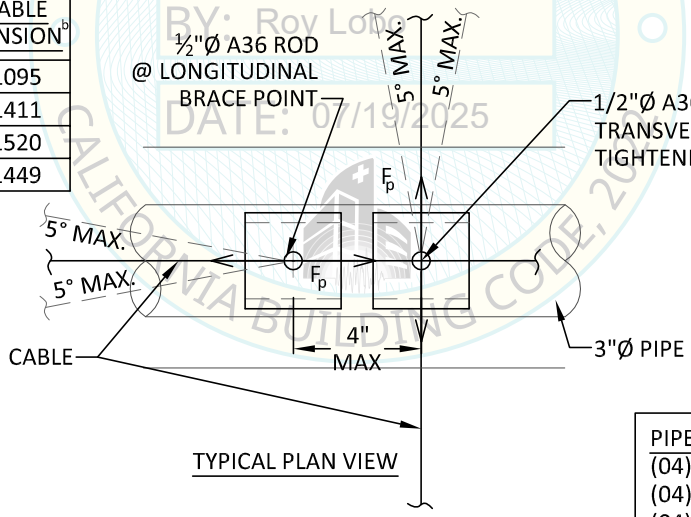



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 274 | 547 | 1095 |
| [a]45°≤ x <60° | 293 | 1001 | 1411 |
| 60°= x | 316 | 1316 | 1520 |
| [c]60°< x ≤70° | 226 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-P18C-12R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
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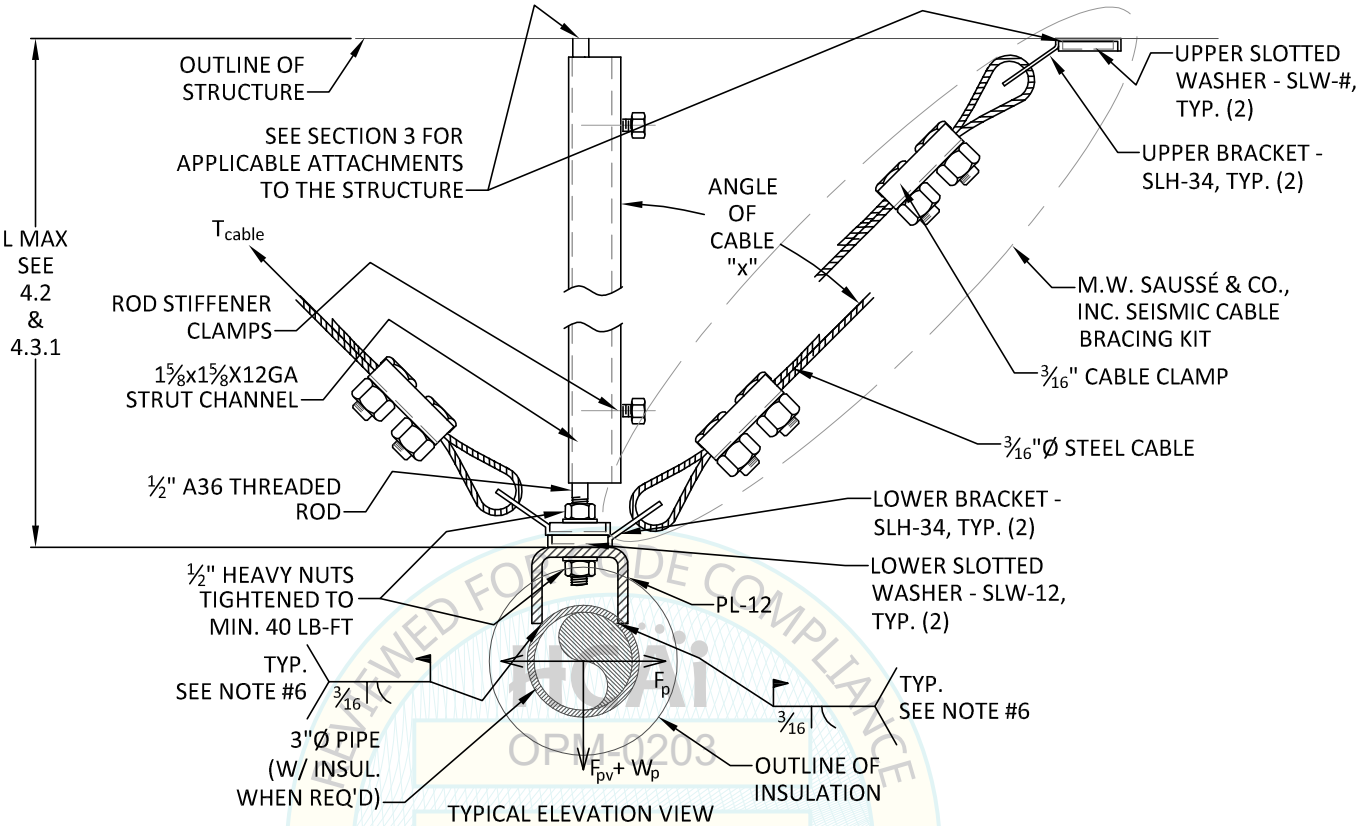
Page No.: **2.1.12**
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 3"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

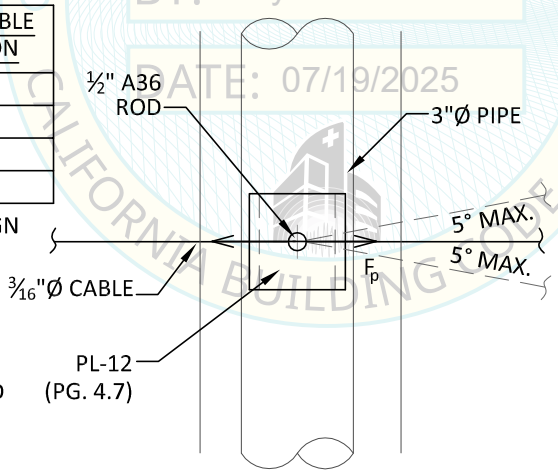



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 478 | 1915 |
| [a]45°≤ x <60° | 413 | 1988 |
| 60°= x | 583 | 2807 |
| [c]60°< x ≤70° | 401 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P316C-12R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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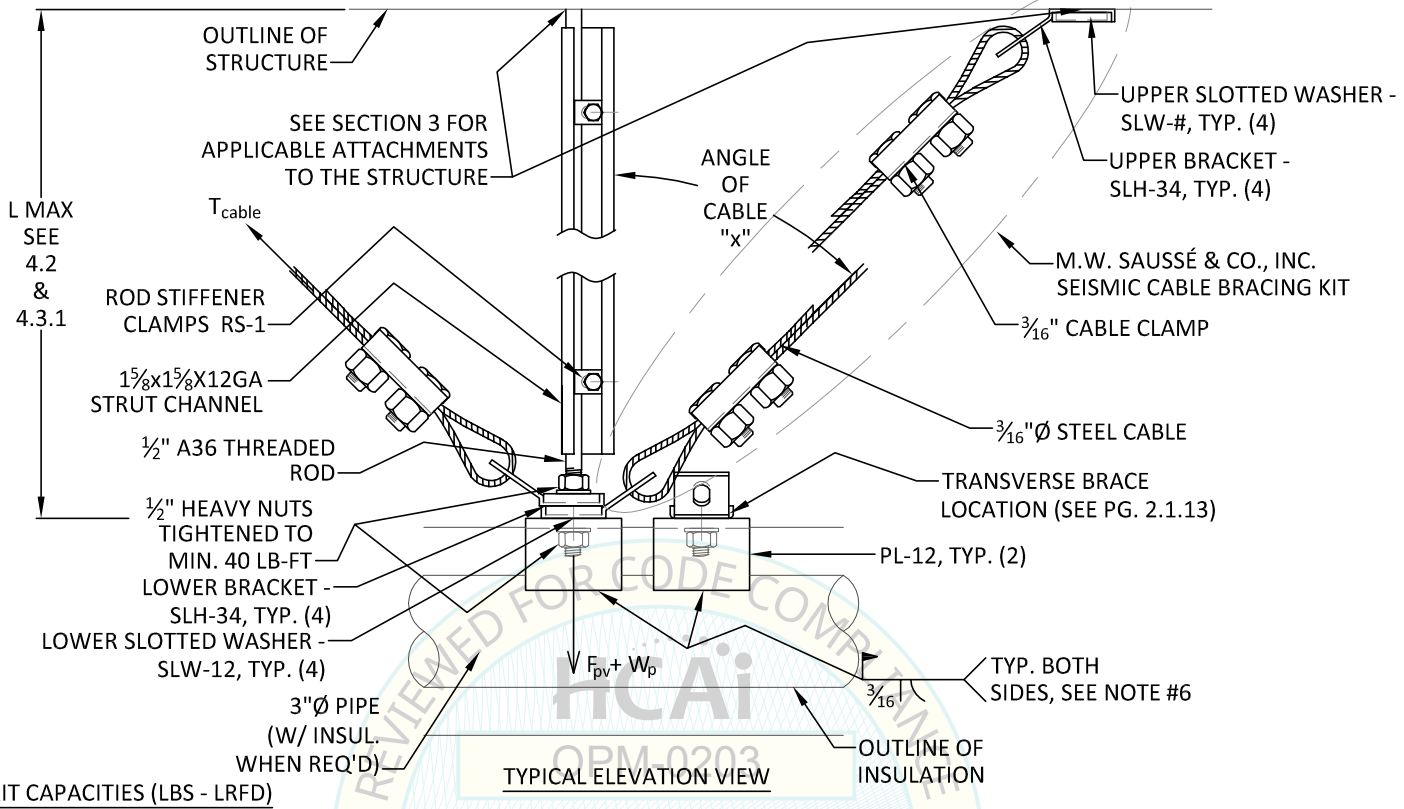
Page No.: **2.1.13**
Date: **February 5, 2025**

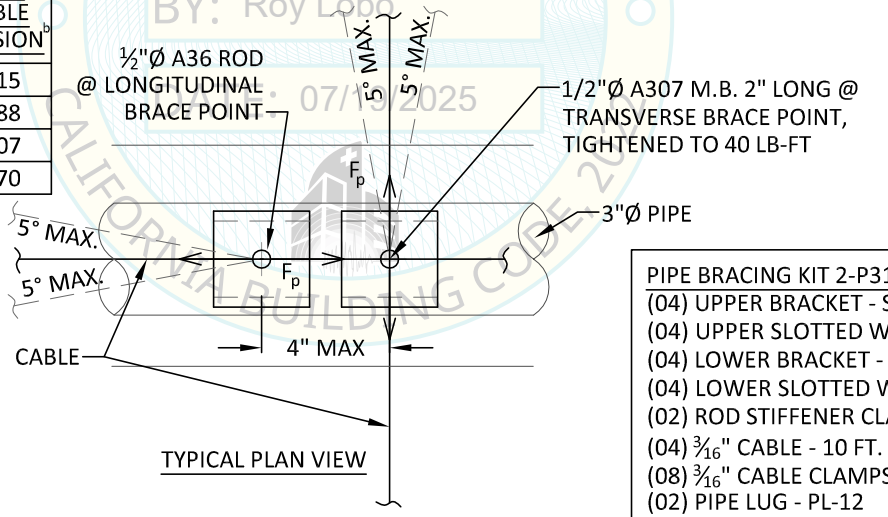
# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 3"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 478 | 957 | 1915 |
| [a]45°≤ x <60° | 413 | 1411 | 1988 |
| 60°= x | 583 | 2442 | 2807 |
| [c]60°< x ≤70° | 401 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




PIPE BRACING KIT 2-P316C-12R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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CALIFORNIA BUILDING CODE 2022

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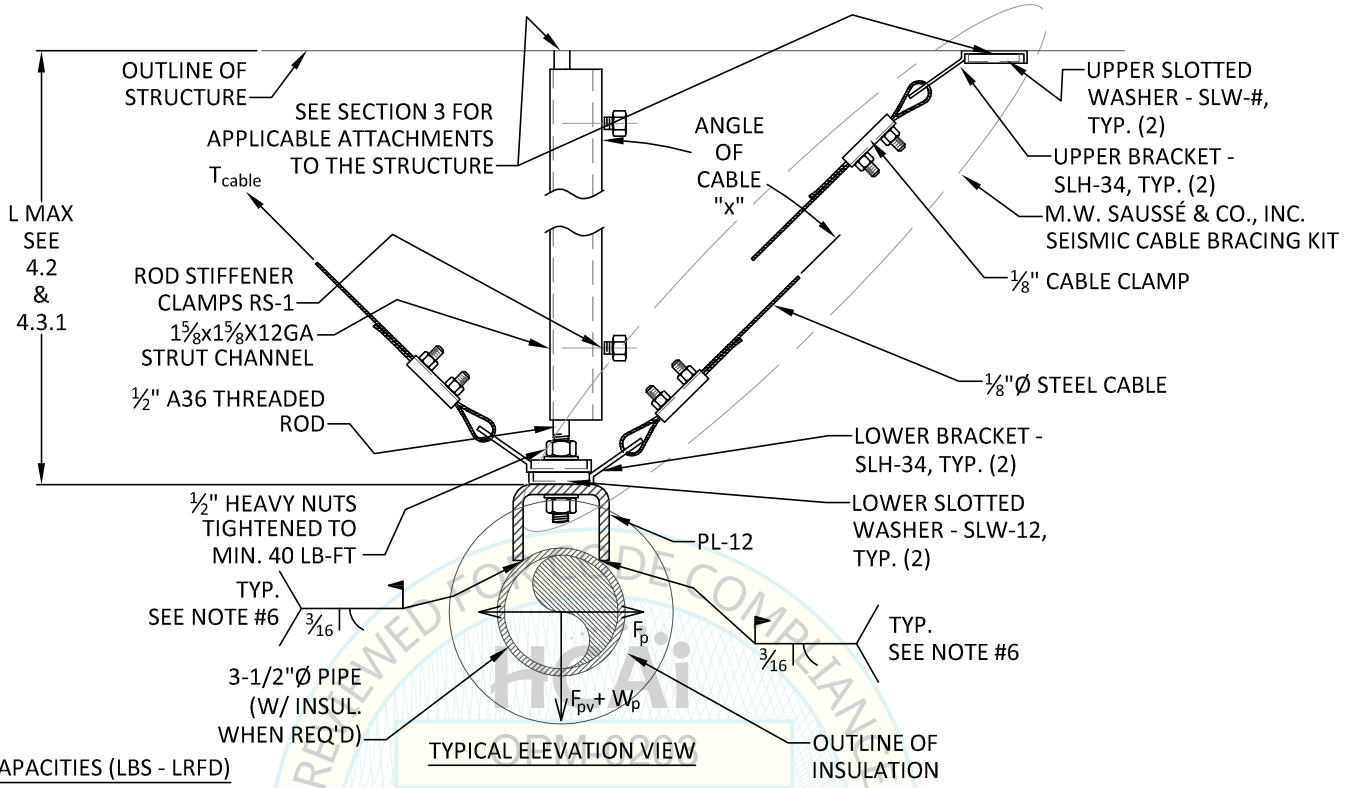
Page No.: 2.1.14
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 3½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

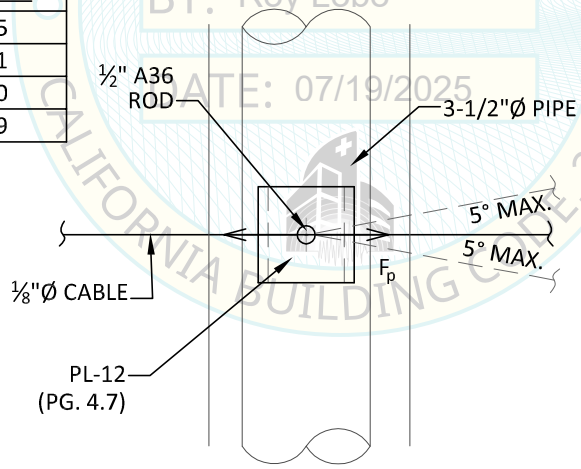



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 259 | 1095 |
| [a]45°≤ x <60° | 275 | 1411 |
| 60°= x | 296 | 1520 |
| [c]60°< x ≤70° | 211 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P18C-12R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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OPM-0203
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DATE: 07/19/2025
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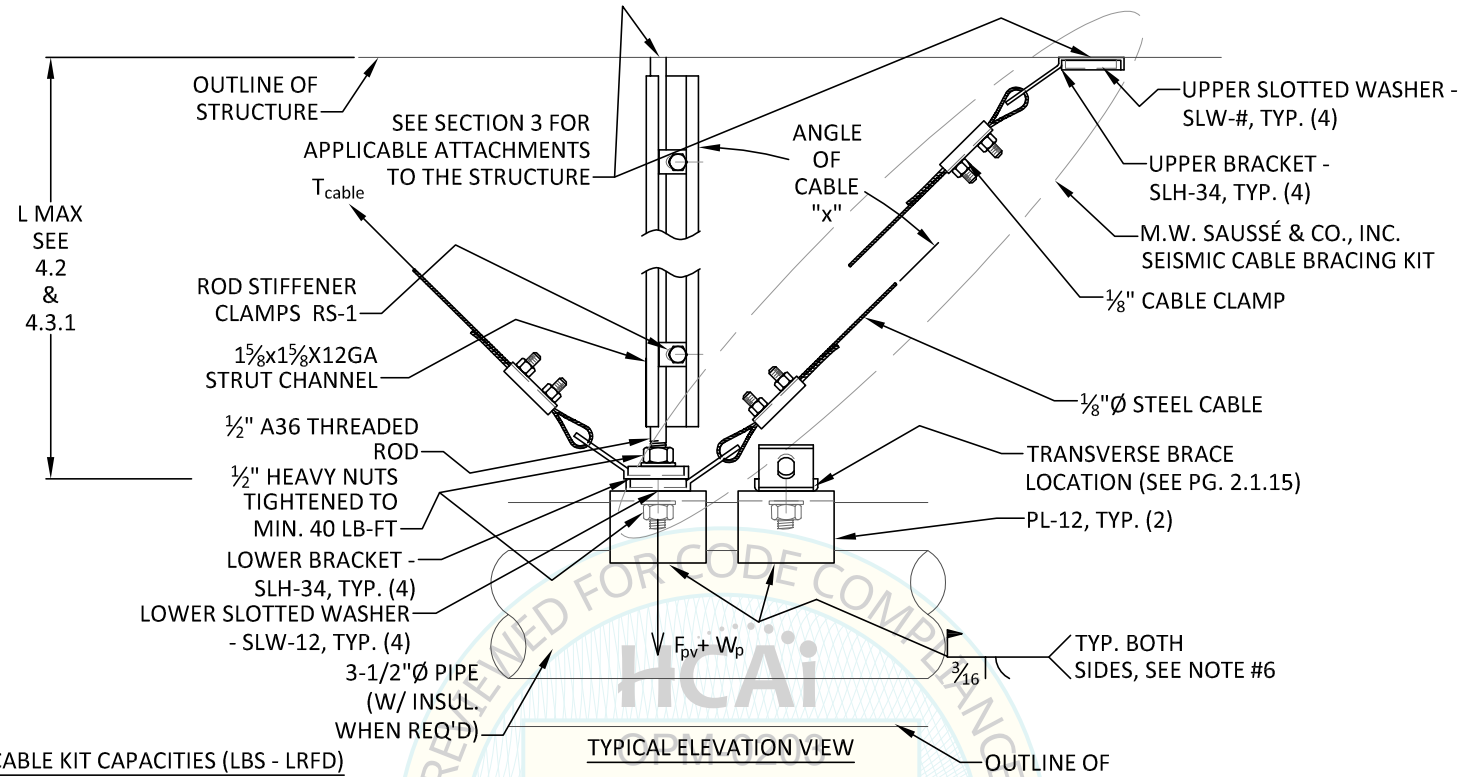
Page No.: **2.1.15**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 3½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

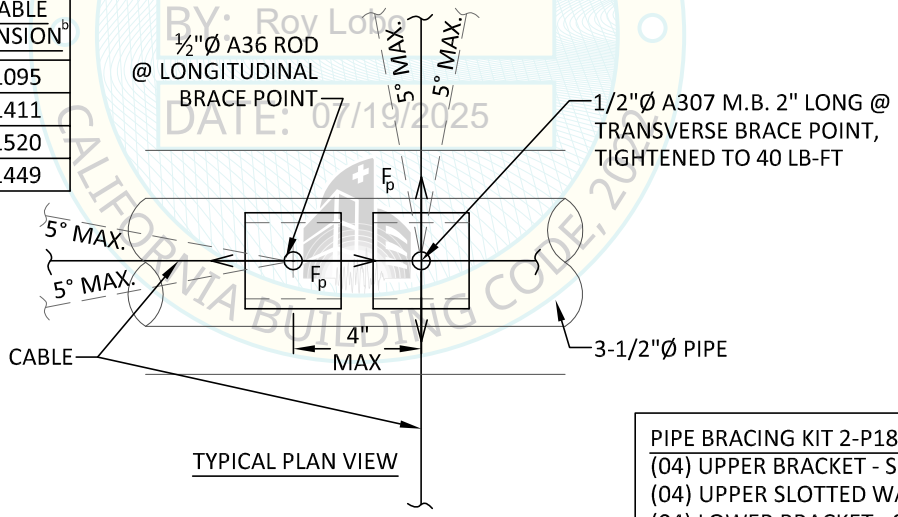



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 259 | 547 | 1095 |
| [a]45°≤ x <60° | 275 | 1001 | 1411 |
| 60°= x | 296 | 1316 | 1520 |
| [c]60°< x ≤70° | 211 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-P18C-12R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
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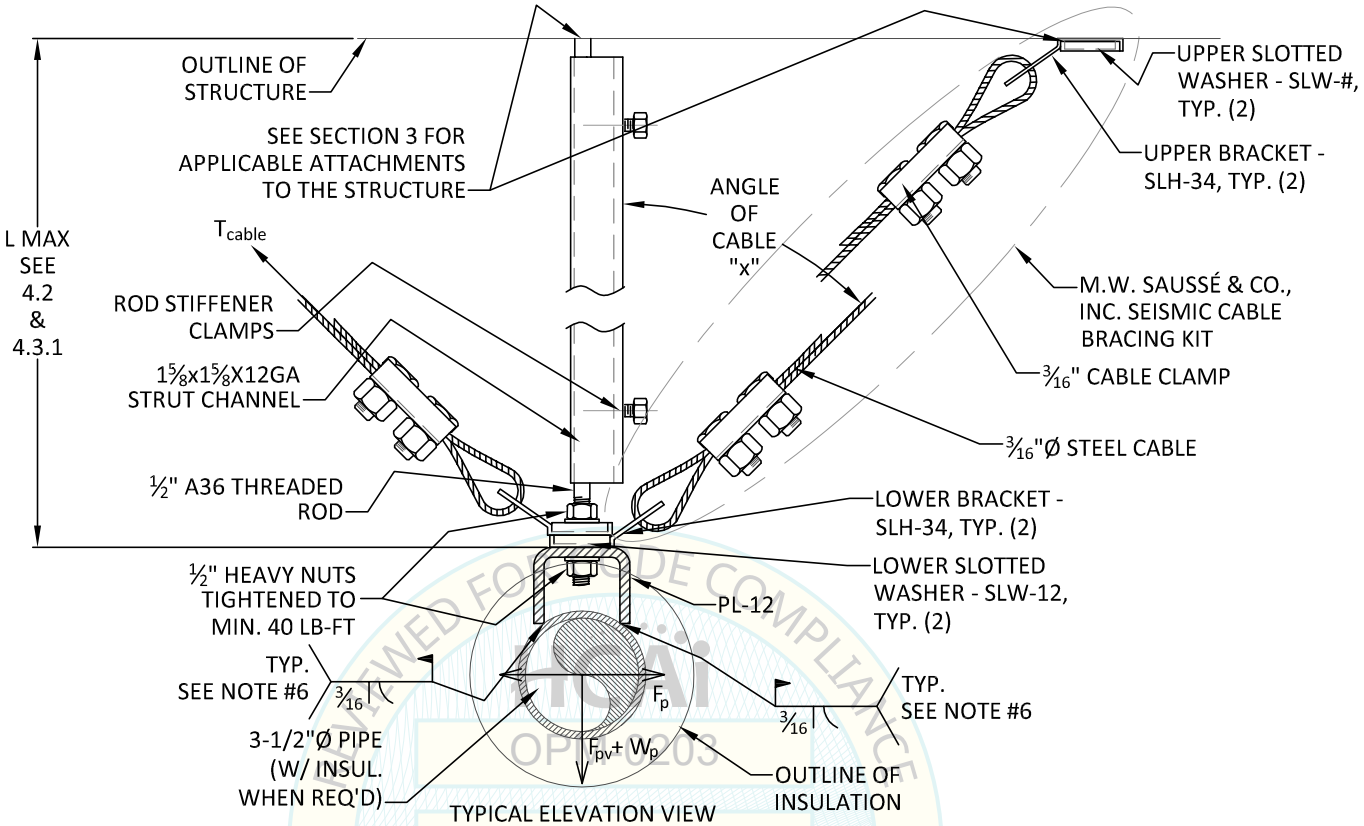
California PE No. S6481

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 3½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

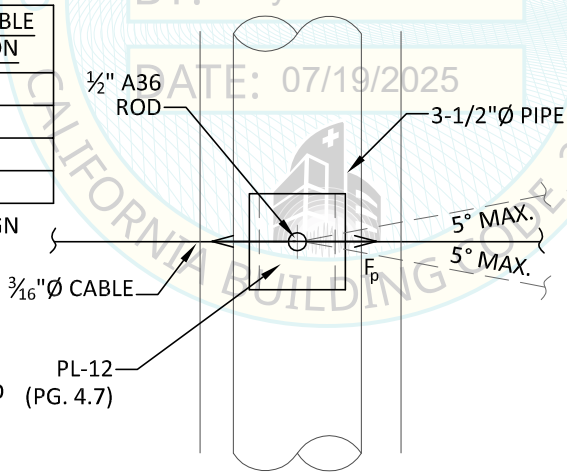



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 453 | 1915 |
| [a]45°≤ x <60° | 387 | 1988 |
| 60°= x | 547 | 2807 |
| [c]60°< x ≤70° | 373 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P316C-12R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
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6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.


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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022



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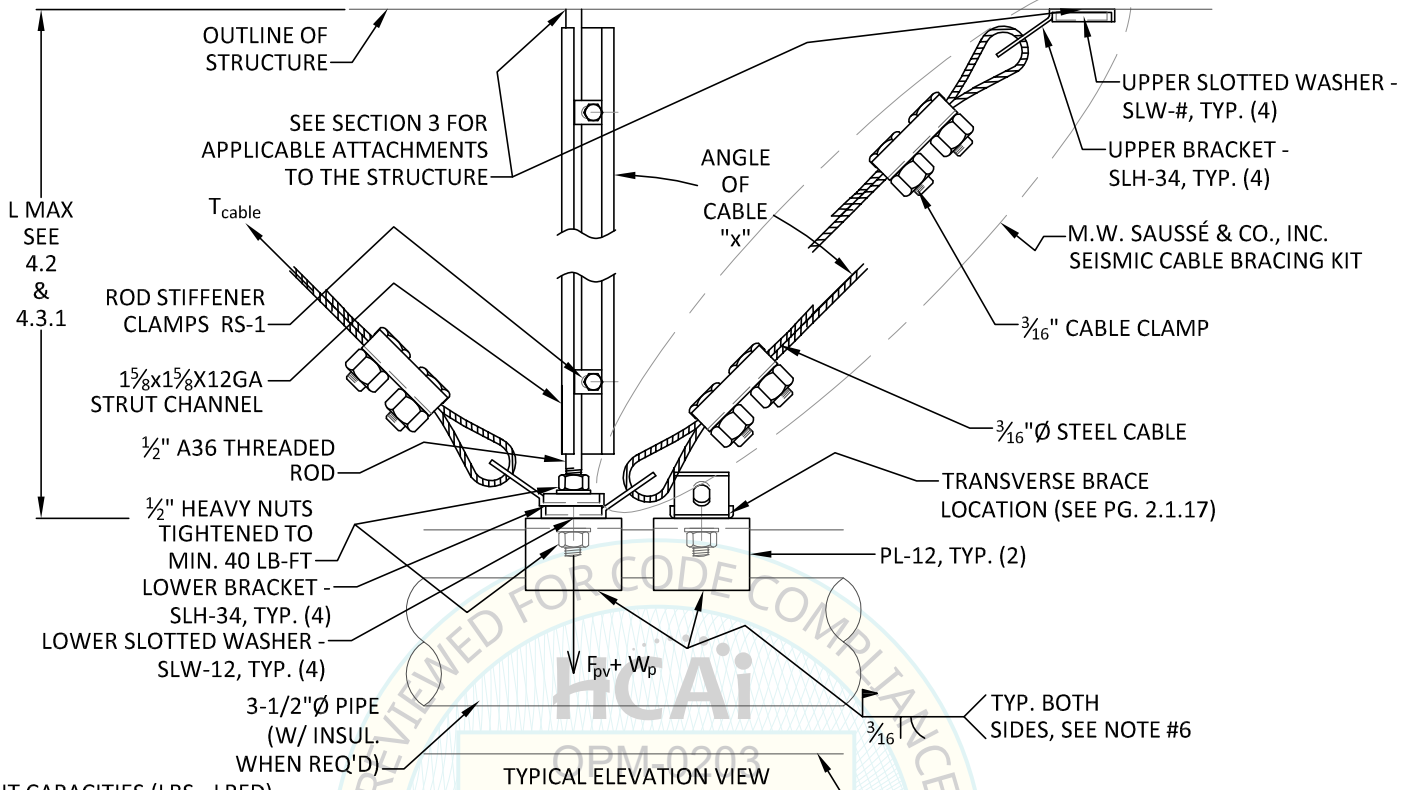
Page No.: **2.1.17**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 3½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16" CABLE)

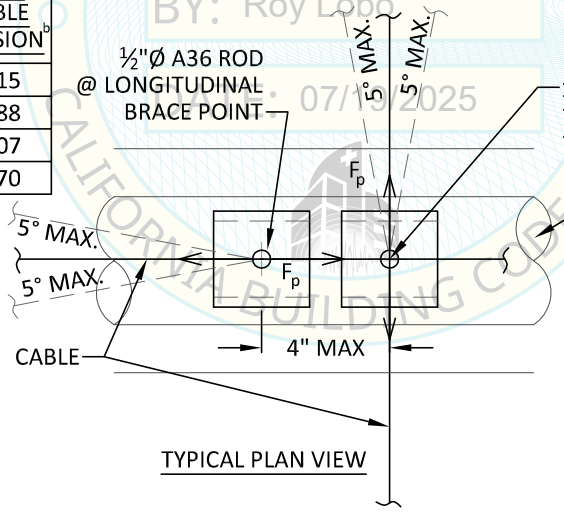



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 453 | 957 | 1915 |
| [a]45°≤ x <60° | 387 | 1411 | 1988 |
| 60°= x | 547 | 2442 | 2807 |
| [c]60°< x ≤70° | 373 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-P316C-12R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-12
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 REVIEWED FOR CODE COMPLIANCE CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
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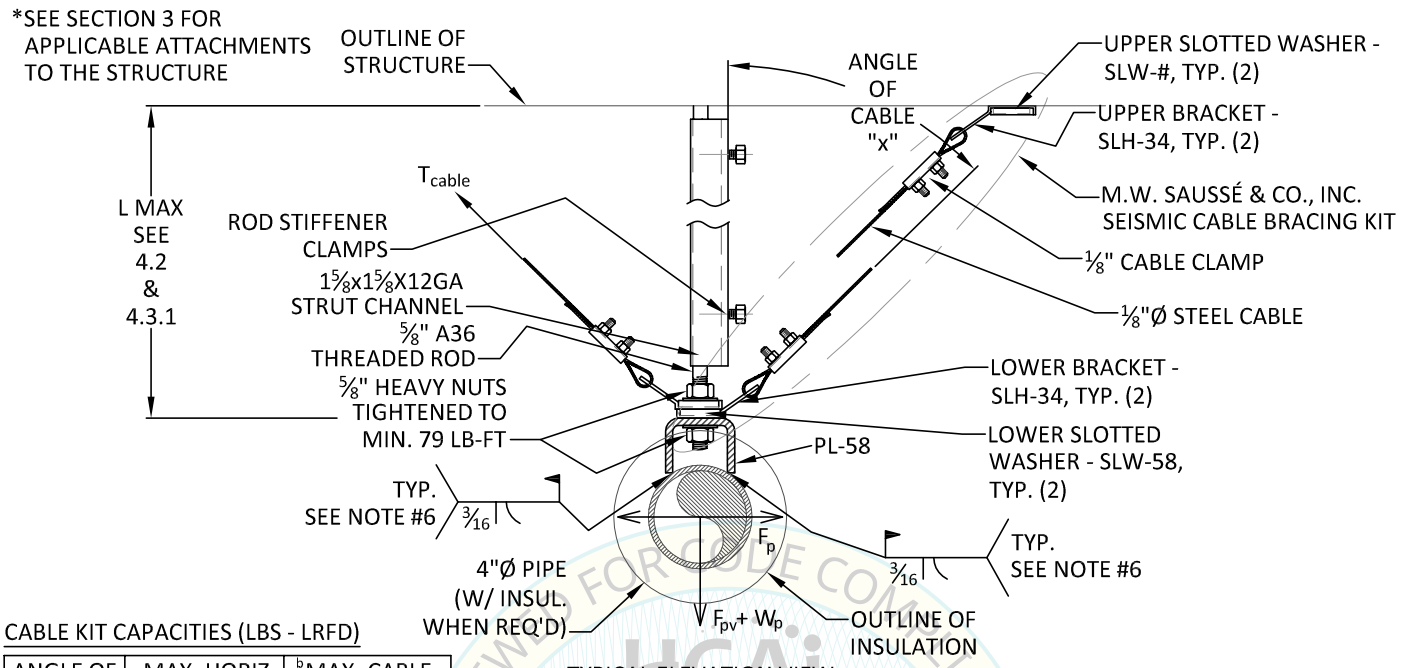
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 2.1.18
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 4"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

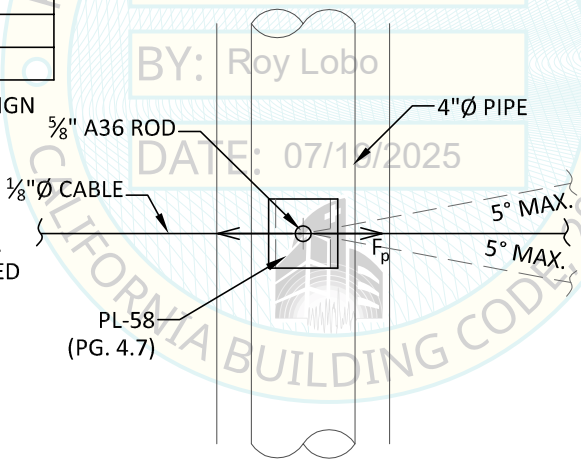



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 246 | 1095 |
| [a]45°≤ x <60° | 259 | 1411 |
| 60°= x | 279 | 1520 |
| [c]60°< x ≤70° | 198 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P18C-58R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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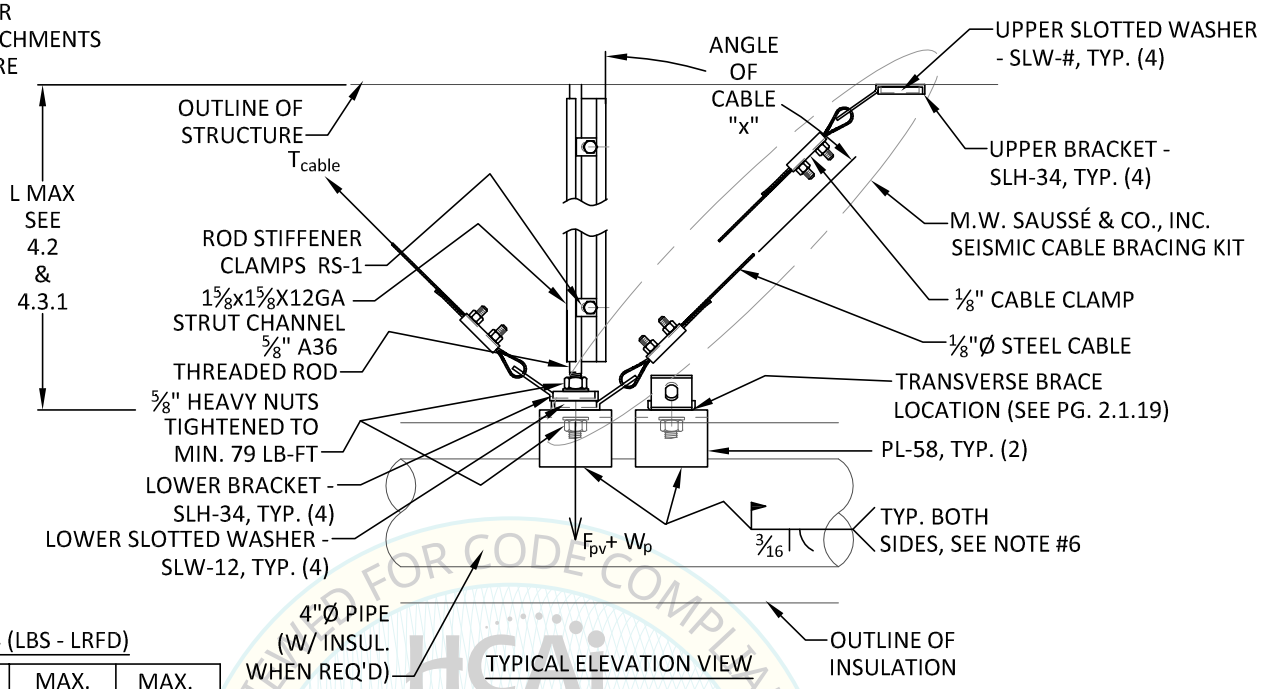
California PE No. S6481

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 4"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

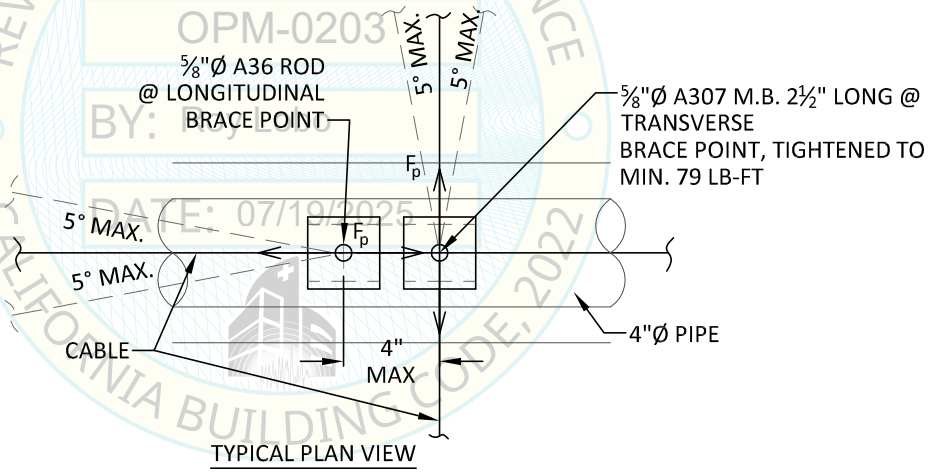
*SEE SECTION 3 FOR APPLICABLE ATTACHMENTS TO THE STRUCTURE




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 246 | 547 | 1095 |
| [a]45°≤ x <60° | 259 | 1001 | 1411 |
| 60°= x | 279 | 1316 | 1520 |
| [c]60°< x ≤70° | 198 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




PIPE BRACING KIT 2-P18C-58R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-58
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(02) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: ROY LOBO DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

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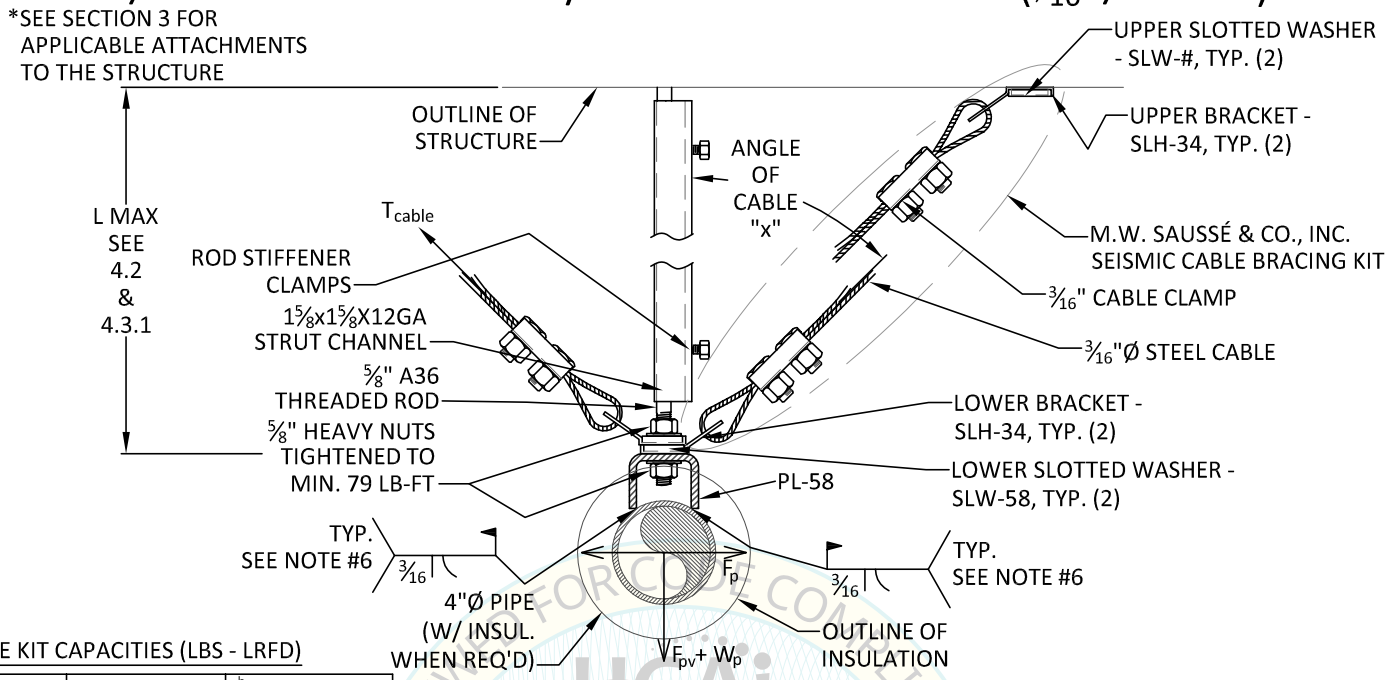
California PE No. S6481

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 4"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

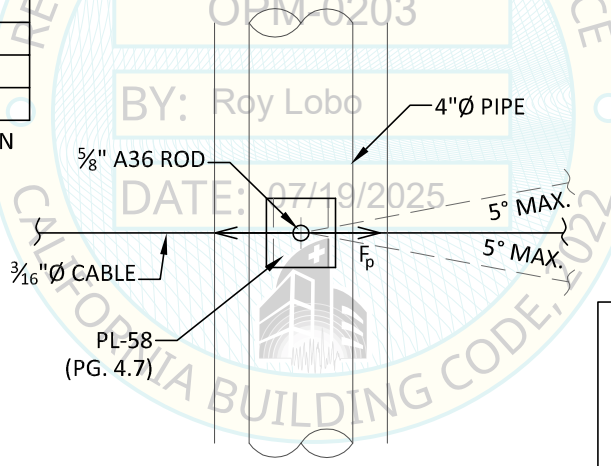



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 431 | 1915 |
| [a]45°≤ x <60° | 365 | 1988 |
| 60°= x | 516 | 2807 |
| [c]60°< x ≤70° | 350 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P316C-58R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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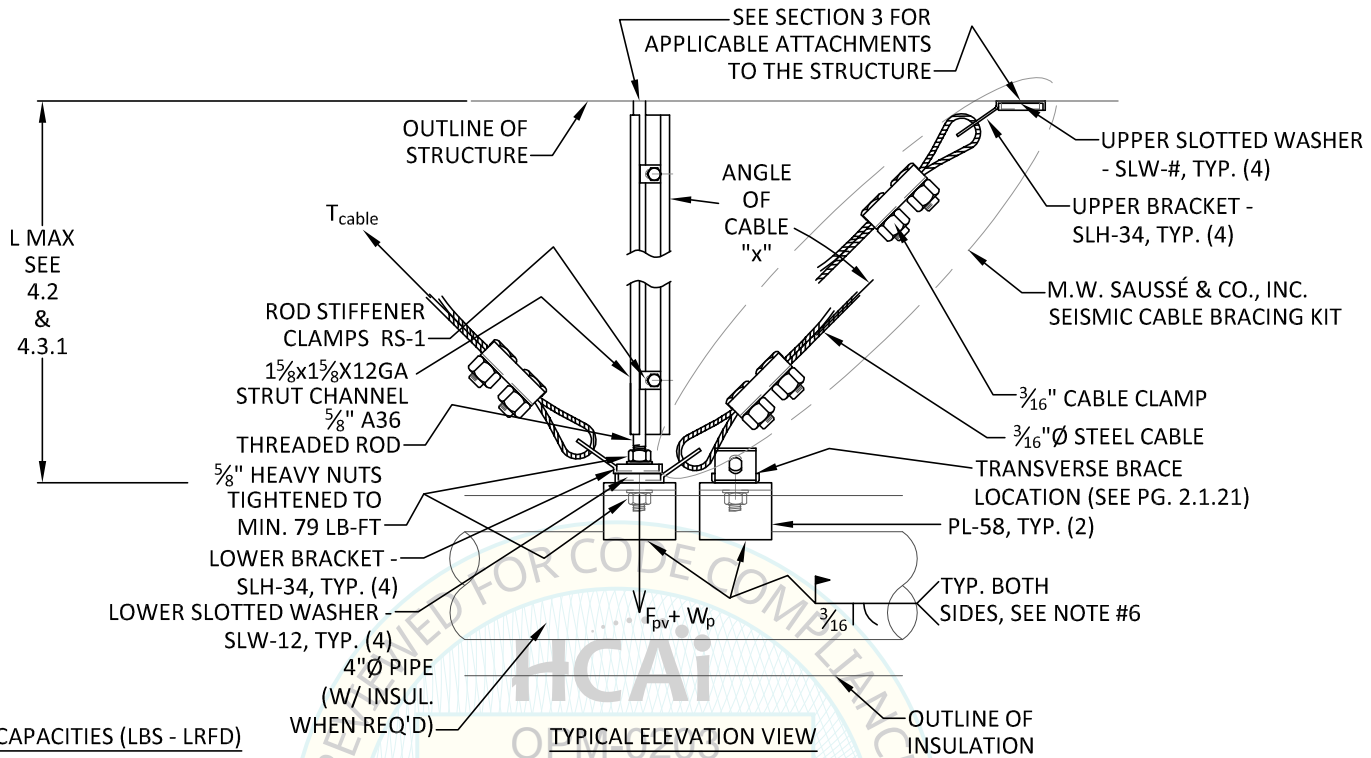
Page No.: **2.1.21**
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 4"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3⁄16"Ø CABLE)

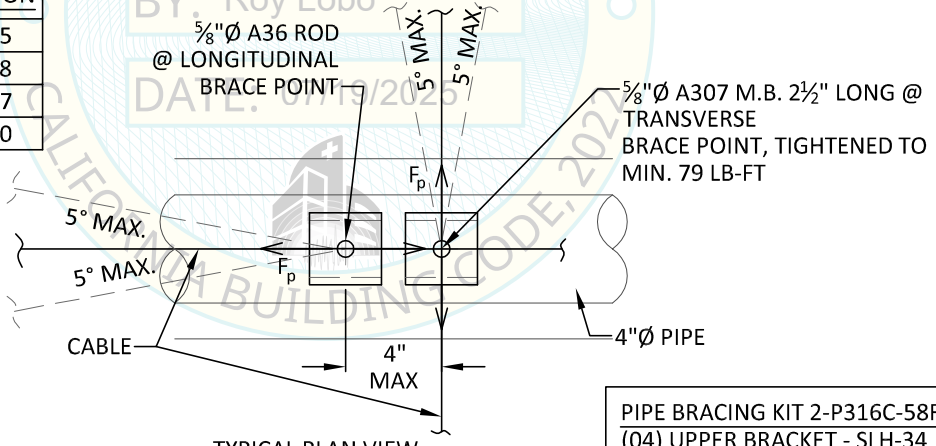



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 431 | 957 | 1915 |
| [a]45°≤ x <60° | 365 | 1411 | 1988 |
| 60°= x | 516 | 2442 | 2807 |
| [c]60°< x ≤70° | 350 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-P316C-58R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-58
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3⁄16" CABLE - 10 FT.
(08) 3⁄16" CABLE CLAMPS
(02) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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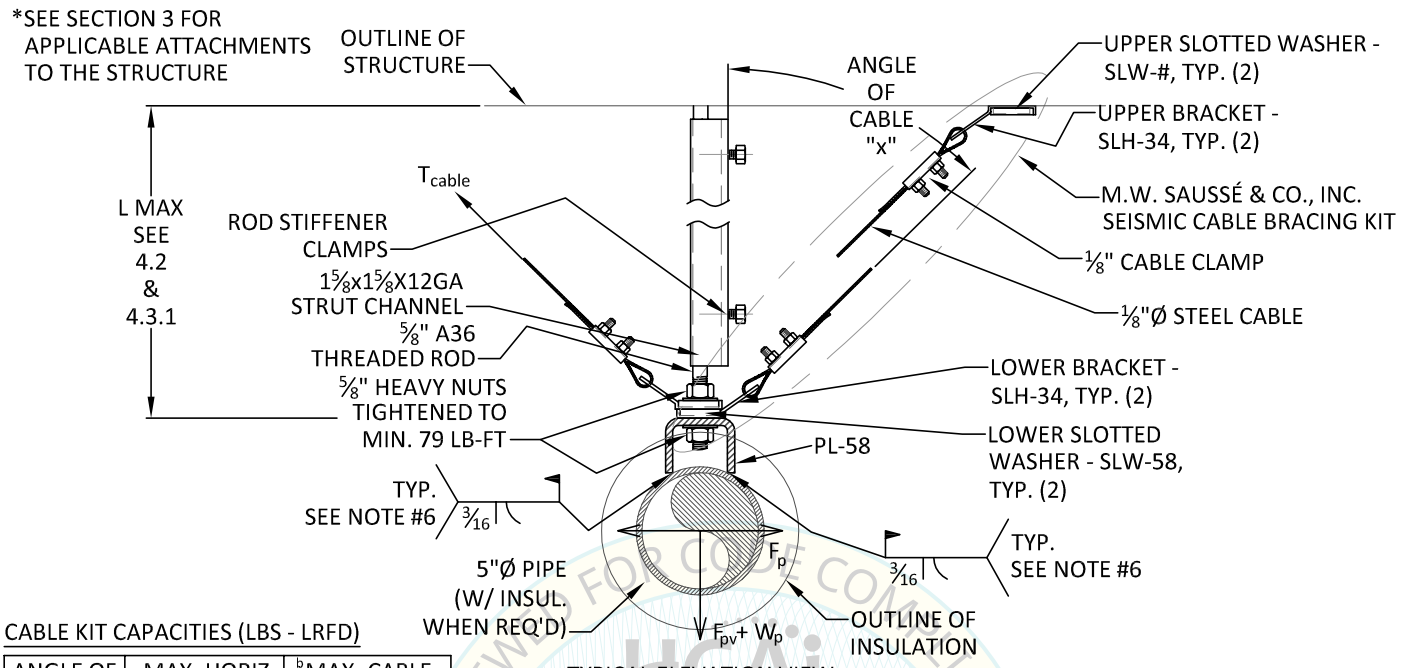
Page No.: **2.1.22**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 5"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

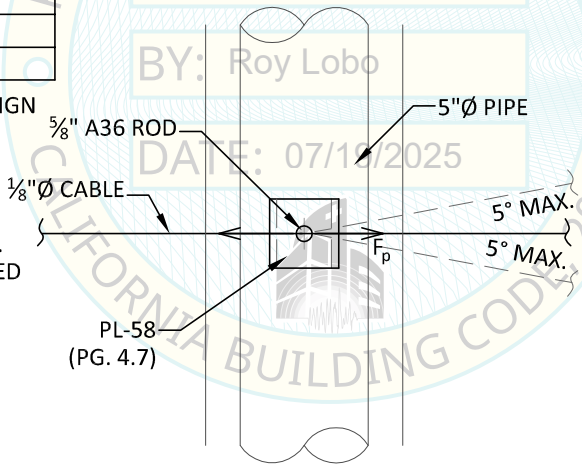



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 225 | 1095 |
| [a]45°≤ x <60° | 233 | 1411 |
| 60°= x | 251 | 1520 |
| [c]60°< x ≤70° | 176 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P18C-58R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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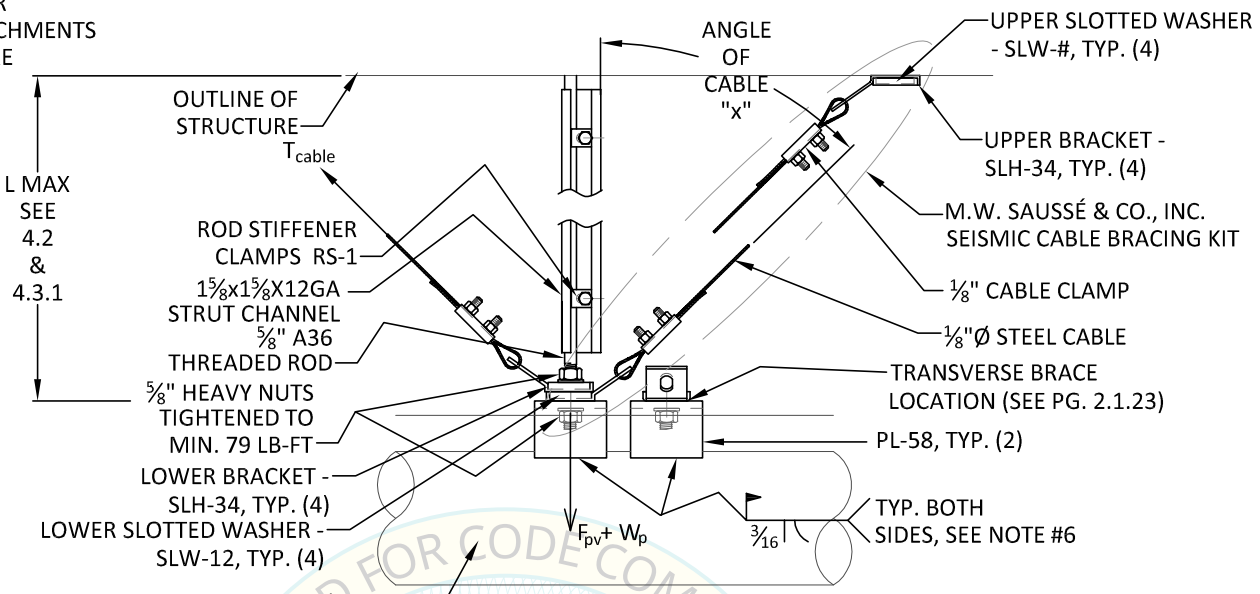
Page No.: **2.1.23**
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 5"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

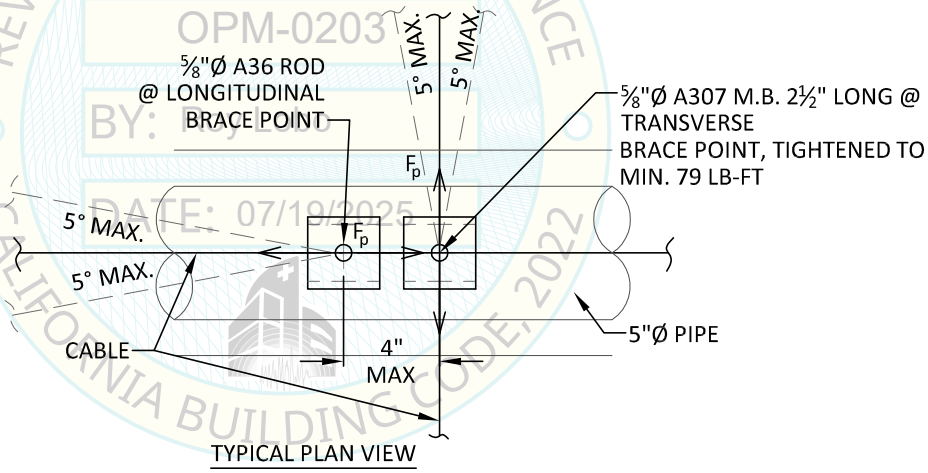
*SEE SECTION 3 FOR APPLICABLE ATTACHMENTS TO THE STRUCTURE




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 225 | 547 | 1095 |
| [a]45°≤ x <60° | 233 | 1001 | 1411 |
| 60°= x | 251 | 1316 | 1520 |
| [c]60°< x ≤70° | 176 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-P18C-58R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-58
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(02) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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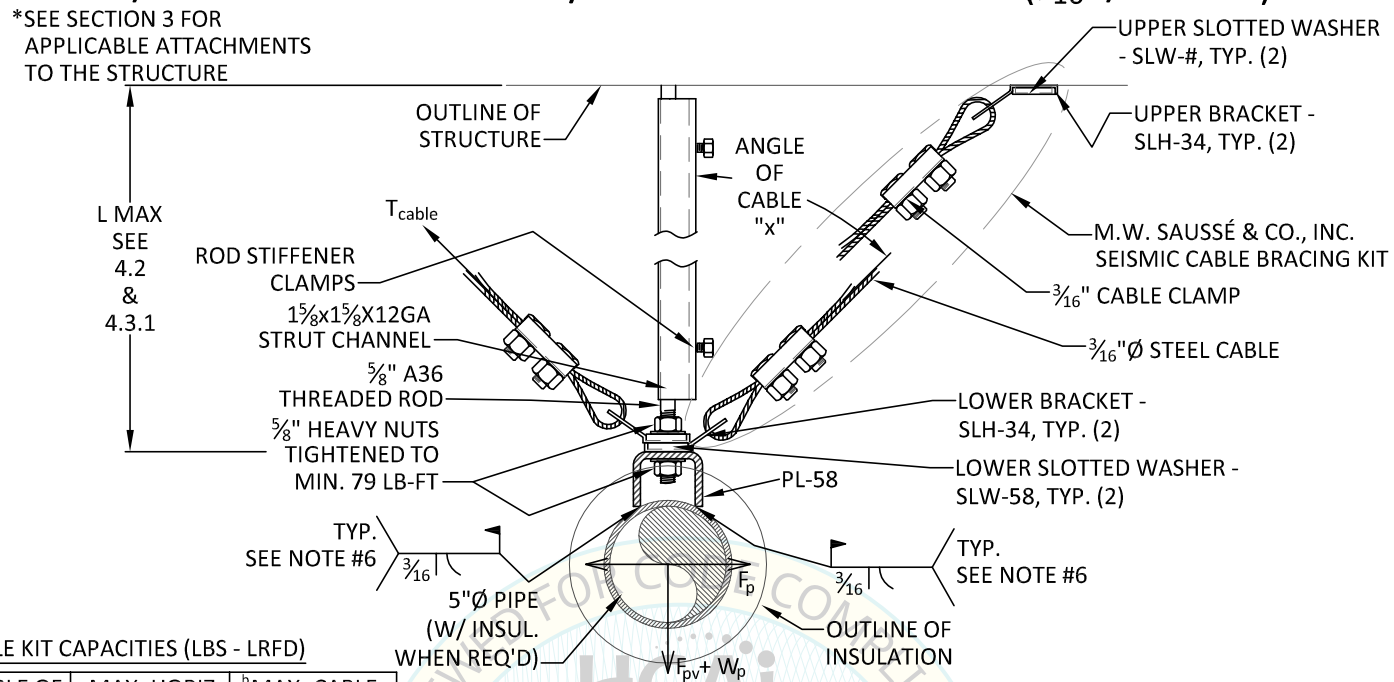
Page No.: **2.1.24**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 5"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

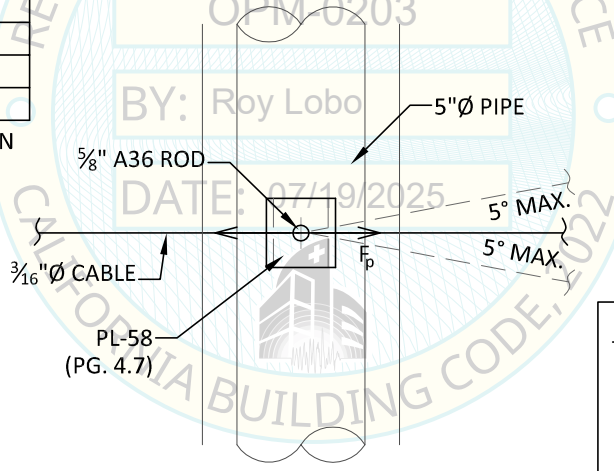



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 393 | 1915 |
| [a]45°≤ x <60° | 329 | 1988 |
| 60°= x | 464 | 2807 |
| [c]60°< x ≤70° | 313 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P316C-58R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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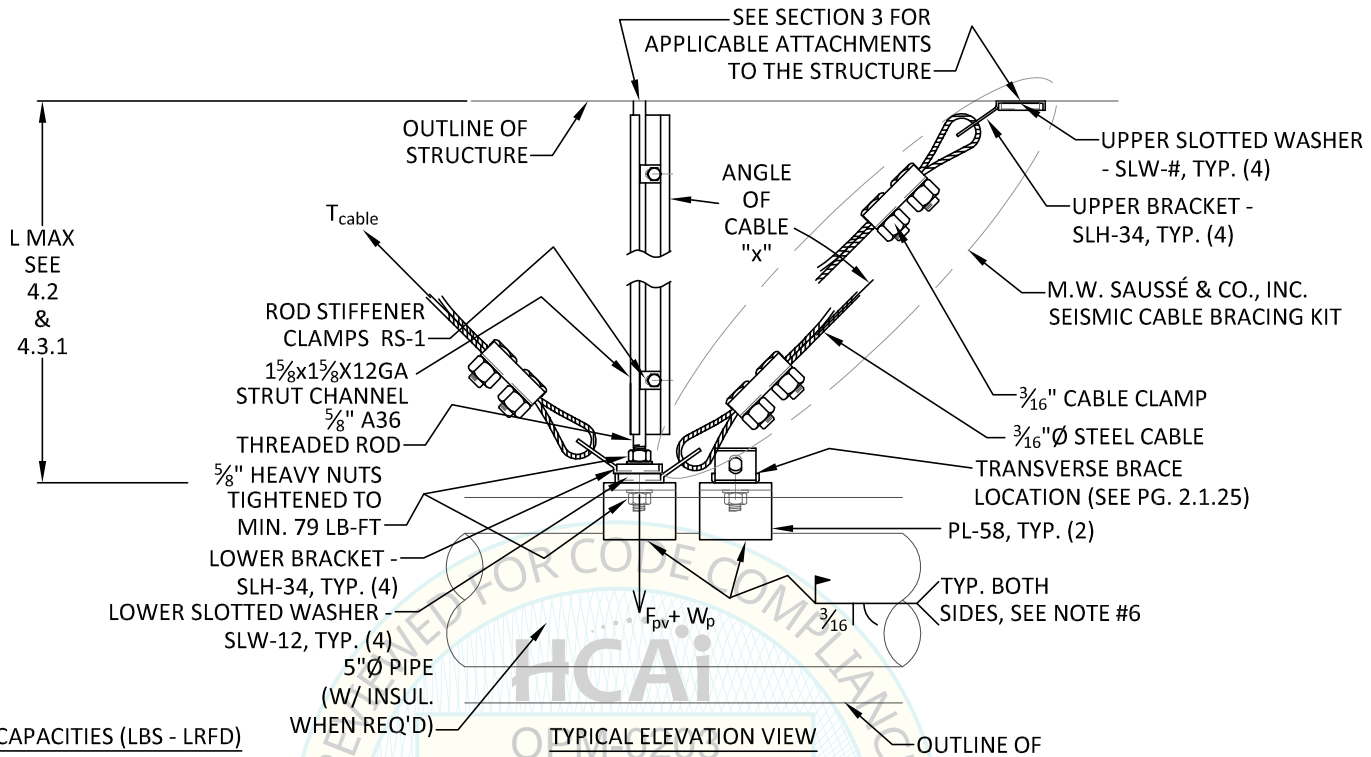
Page No.: **2.1.25**
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 5"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

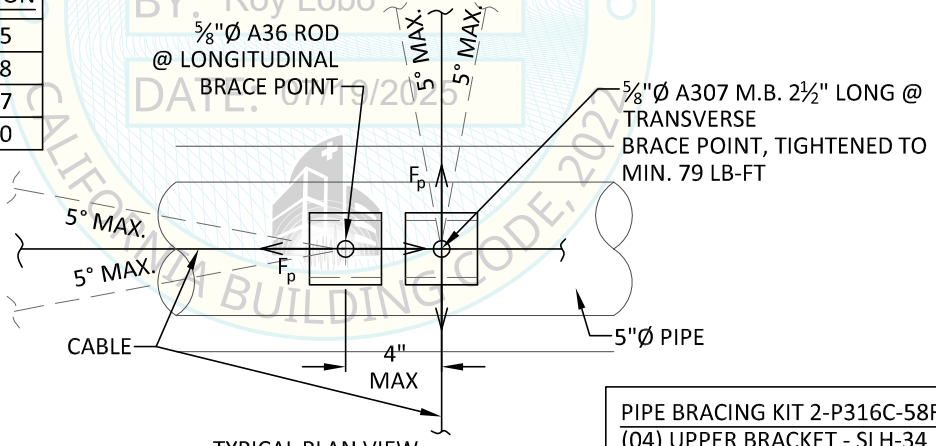



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 393 | 957 | 1915 |
| [a]45°≤ x <60° | 329 | 1411 | 1988 |
| 60°= x | 464 | 2442 | 2807 |
| [c]60°< x ≤70° | 313 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-P316C-58R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-58
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS
(02) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

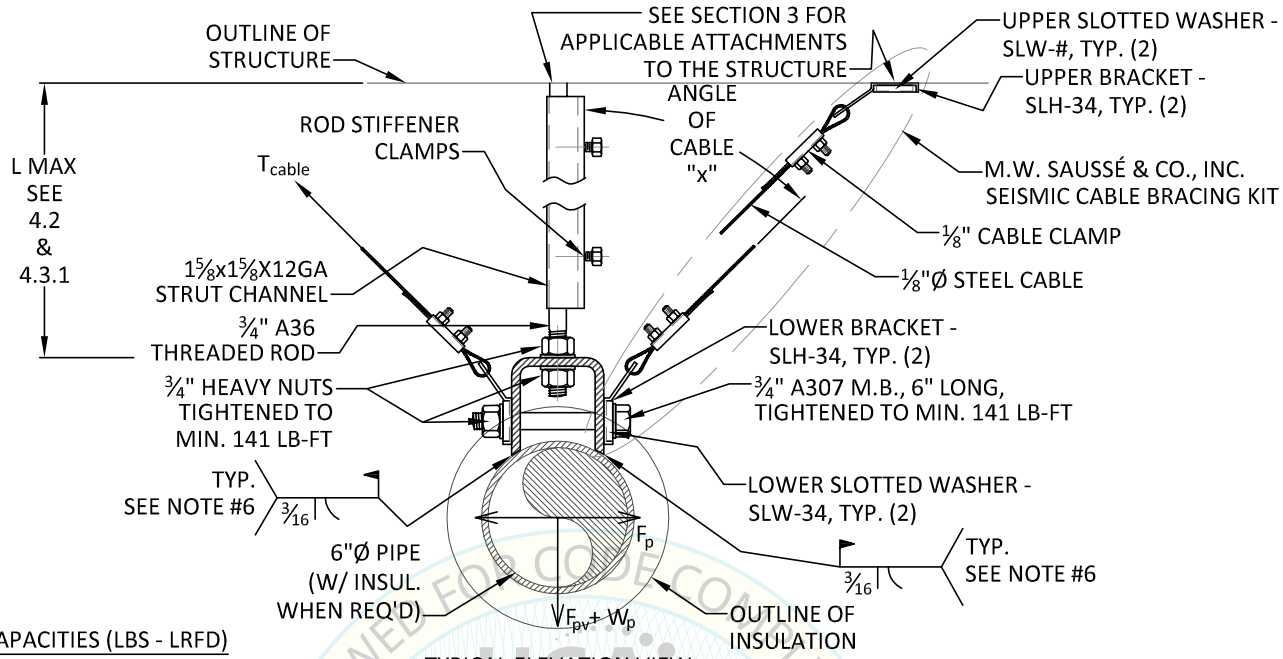
NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: 2.1.26
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 6"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)

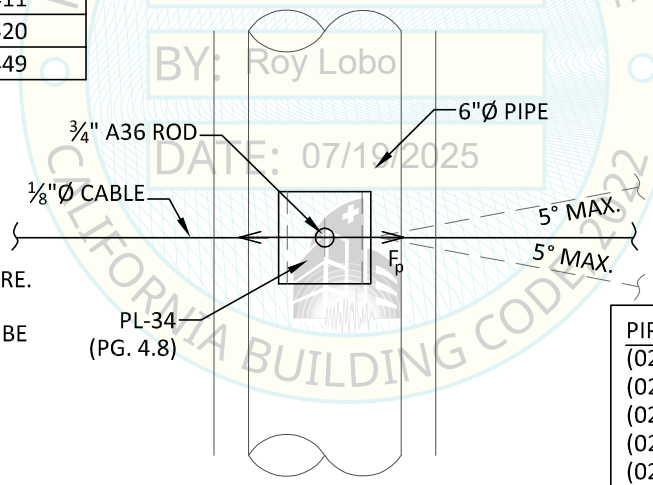



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 323 | 1095 |
| [a]45°≤ x <60° | 357 | 1411 |
| 60°= x | 385 | 1520 |
| [c]60°< x ≤70° | 281 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-P18C-34R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
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DATE: 07/19/2025
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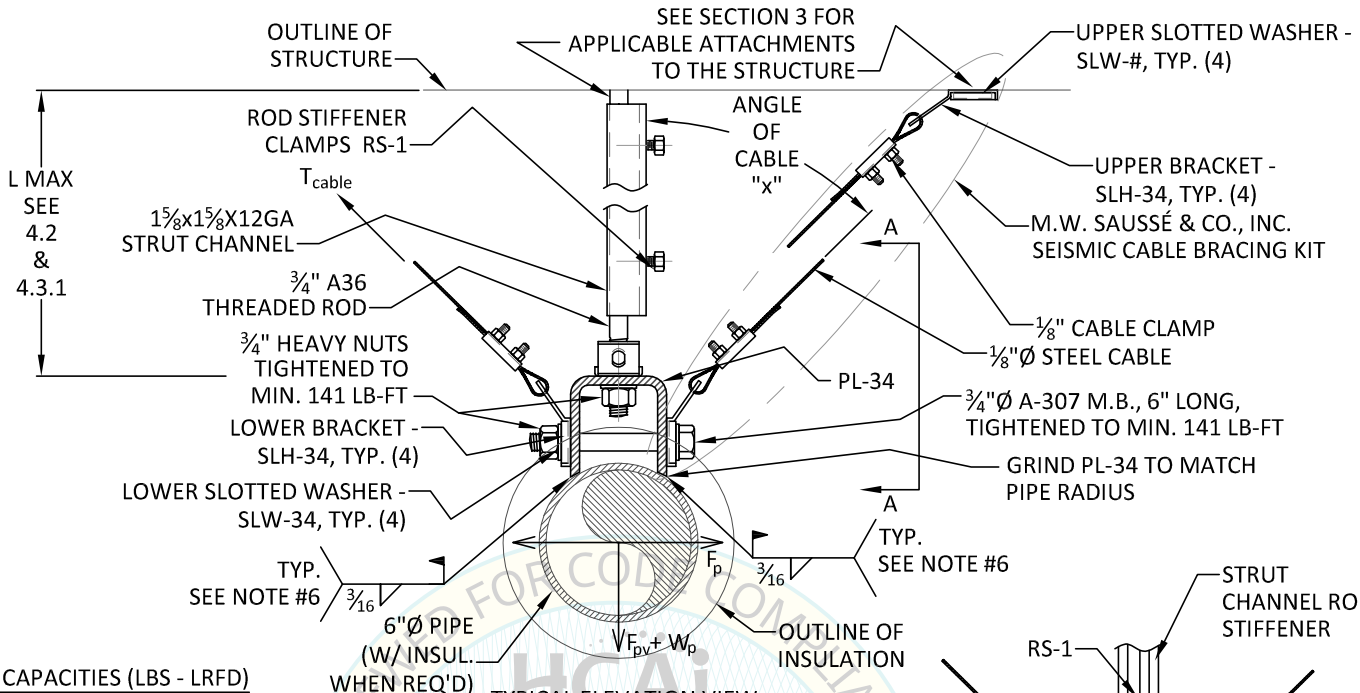
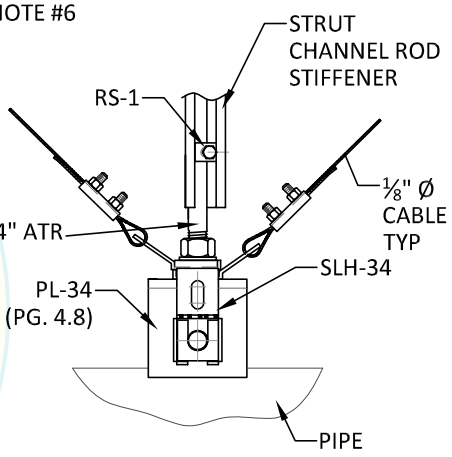
# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 6"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (⅛"Ø CABLE)




TYPICAL ELEVATION VIEW

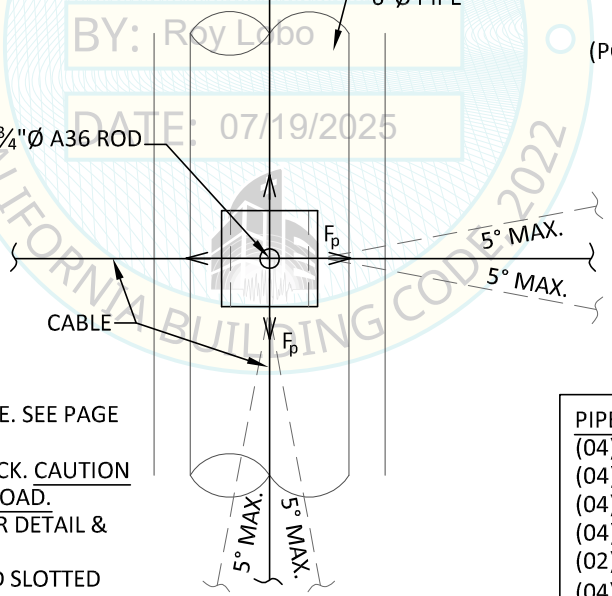



SECTION A-A

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 323 | 547 | 1095 |
| [a]45°≤ x <60° | 357 | 1001 | 1411 |
| 60°= x | 385 | 1316 | 1520 |
| [c]60°< x ≤70° | 281 | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-P18C-34R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

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REVIEWED FOR CODE COMPLIANCE
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Vibrex® vibration & seismic control systems
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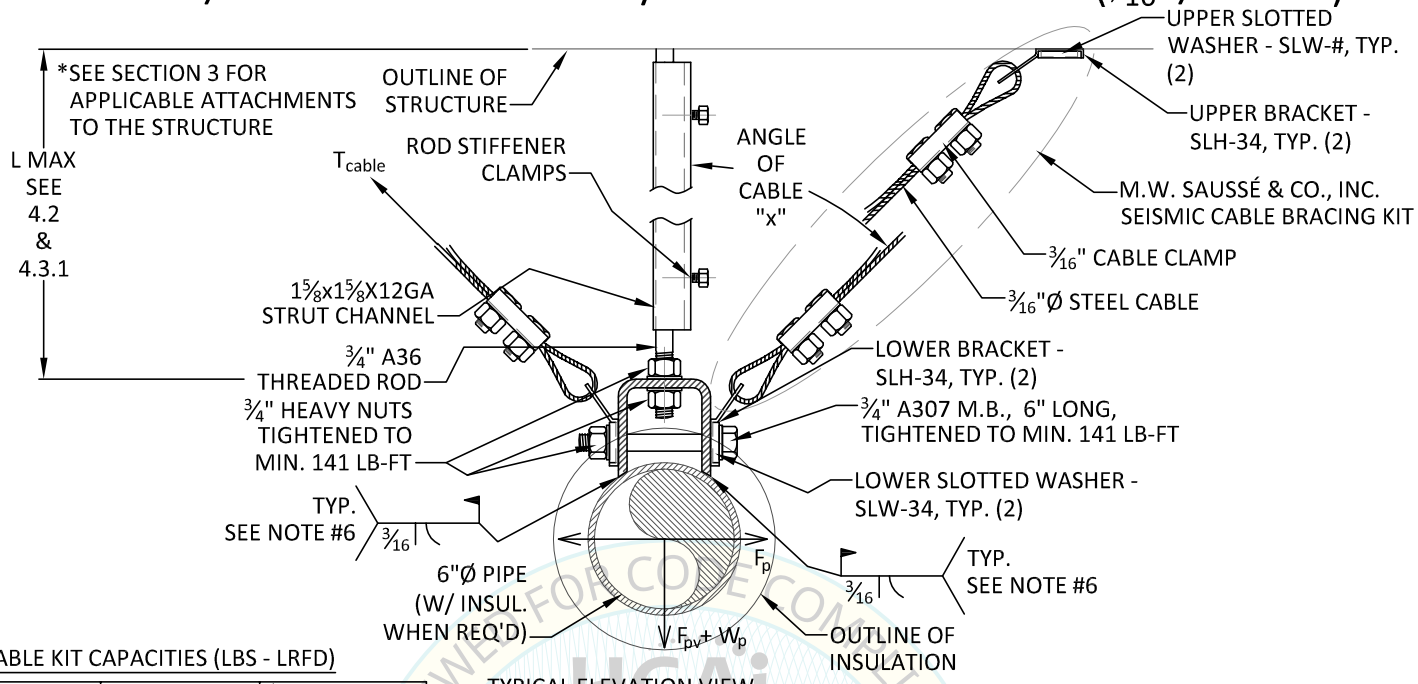
California PE No. S6481

Page No.: 2.1.28
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 6"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

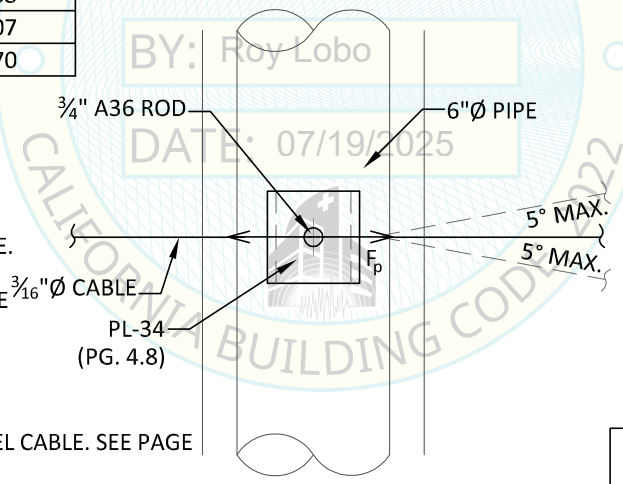



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 565 | 1915 |
| [a]45°≤ x <60° | 504 | 1988 |
| 60°= x | 711 | 2807 |
| [c]60°< x ≤70° | 499 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-P316C-34R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
REVIEWED FOR CODE COMPLIANCE
CALIFORNIA BUILDING CODE 2022

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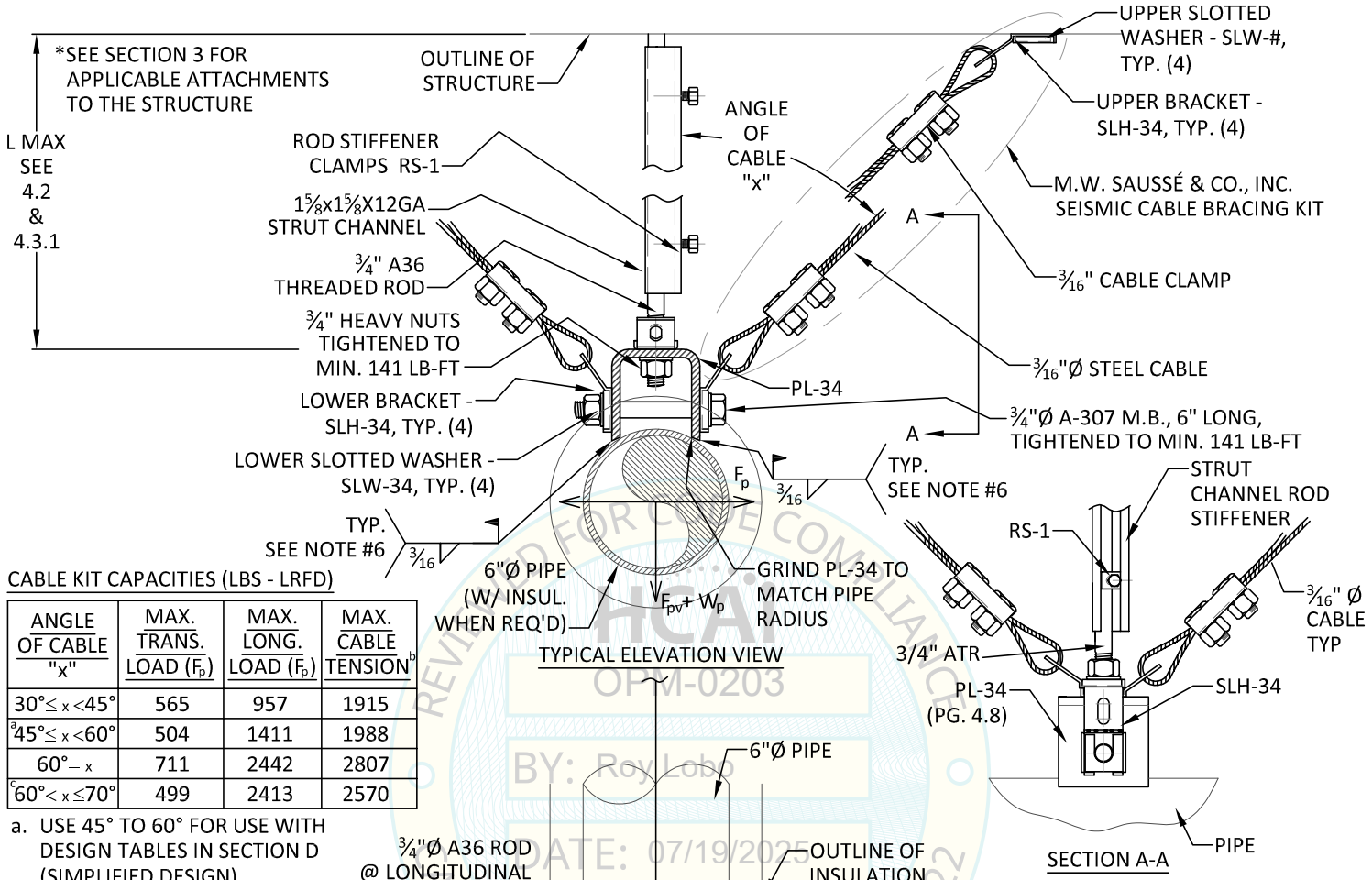
Page No.: 2.1.29
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 6"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 565 | 957 | 1915 |
| [a]45°≤ x <60° | 504 | 1411 | 1988 |
| 60°= x | 711 | 2442 | 2807 |
| [c]60°< x ≤70° | 499 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-P316C-34R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

HCAI REVIEWED FOR CODE COMPLIANCE OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

Vibrex vibration & seismic control systems
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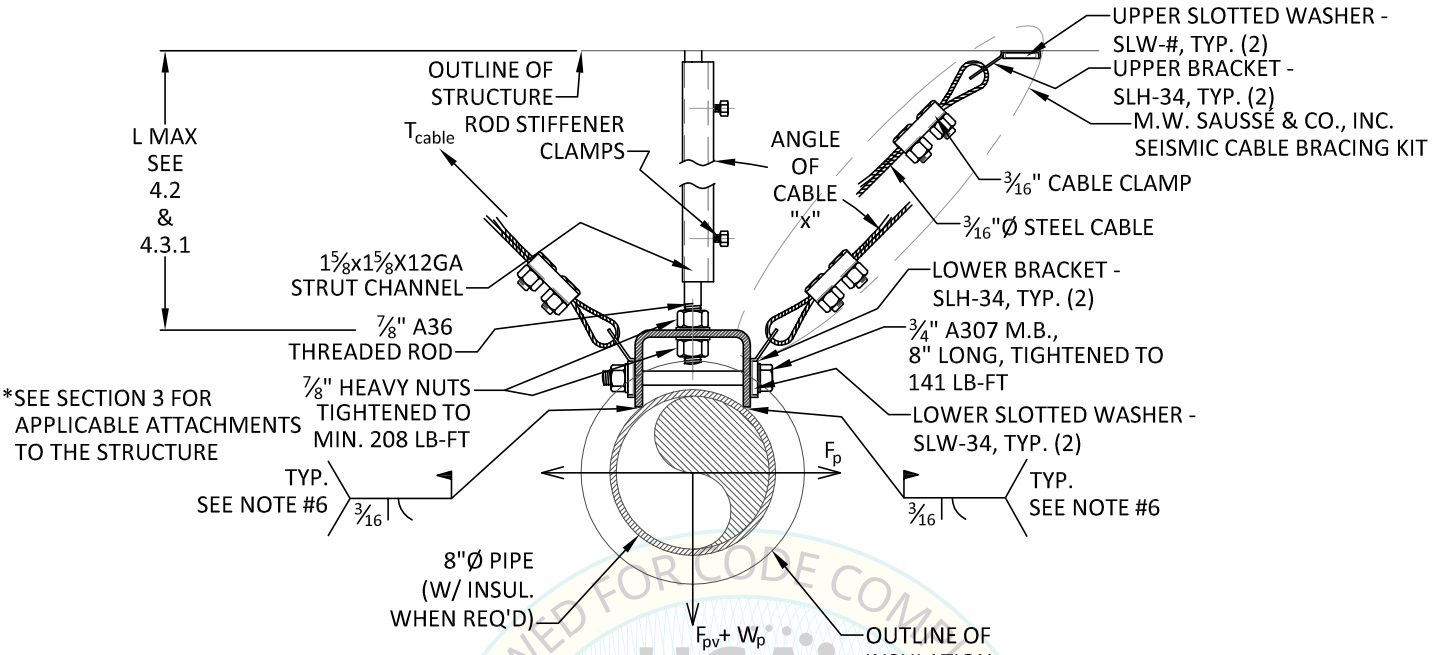
Structural Engineer: N. Tremblay
California PE No. S6481

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 8"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

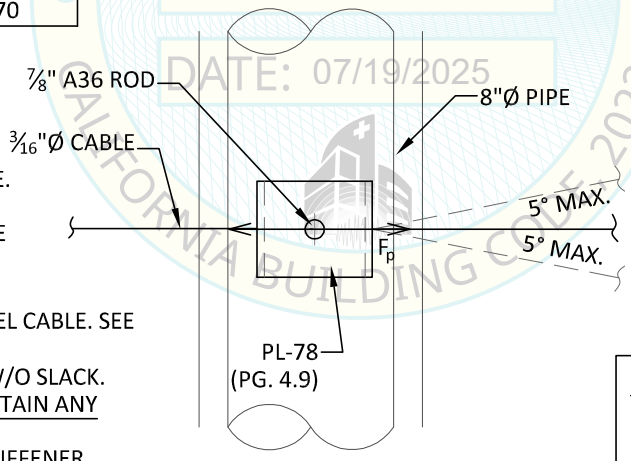



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 607 | 1915 |
| [a]45°≤ x <60° | 550 | 1988 |
| 60°= x | 777 | 2807 |
| [c]60°< x ≤70° | 551 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-P316C-78R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-78

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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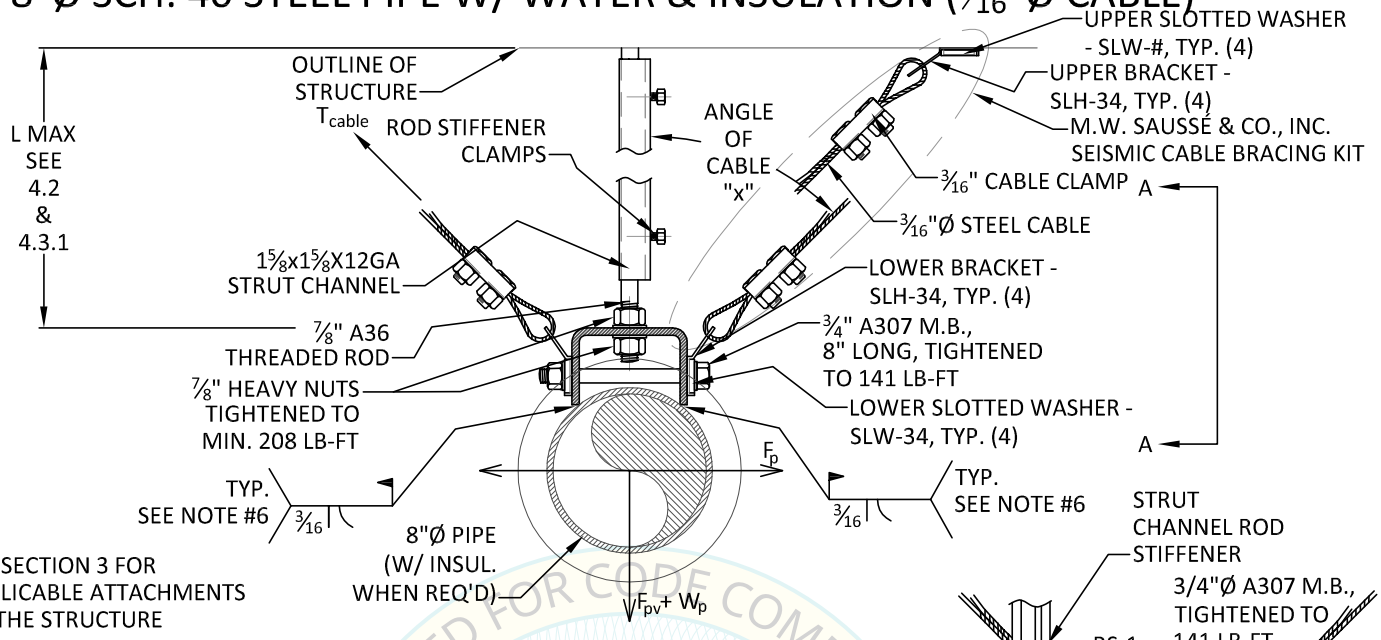
California PE No. S6481

Page No.: 2.1.31
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 8"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

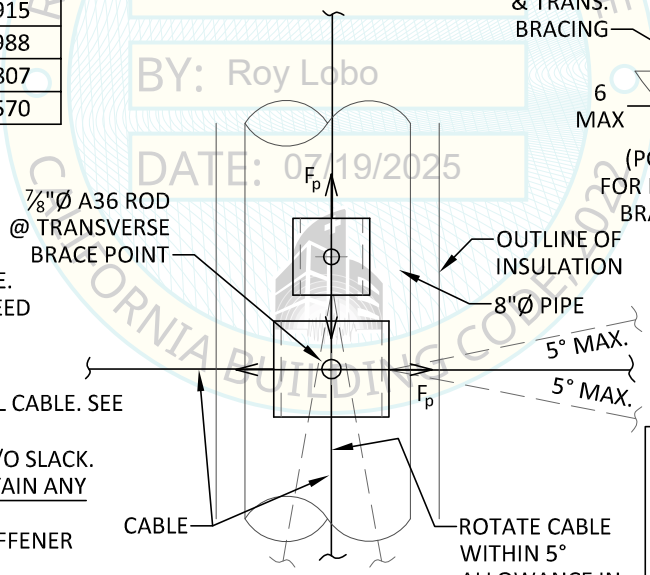



CABLE KIT CAPACITIES (LBS - LRFD)

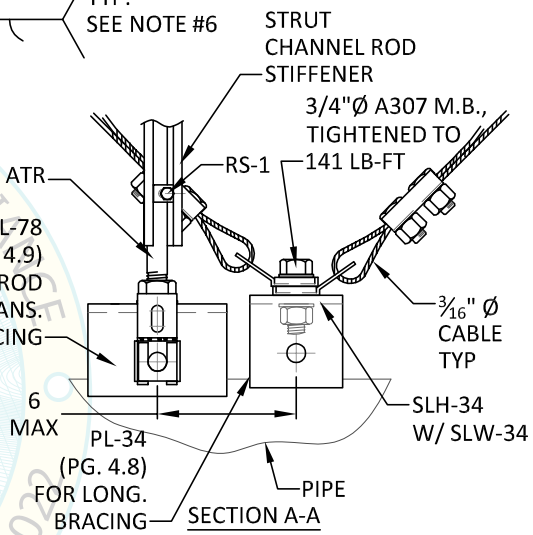
| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 607 | 957 | 1915 |
| [a]45°≤ x <60° | 550 | 1411 | 1988 |
| 60°= x | 777 | 2442 | 2807 |
| [c]60°< x ≤70° | 551 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

TYPICAL ELEVATION VIEW




TYPICAL PLAN VIEW




SECTION A-A

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-P316C-78R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-78
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE

Vibrex® vibration & seismic control systems
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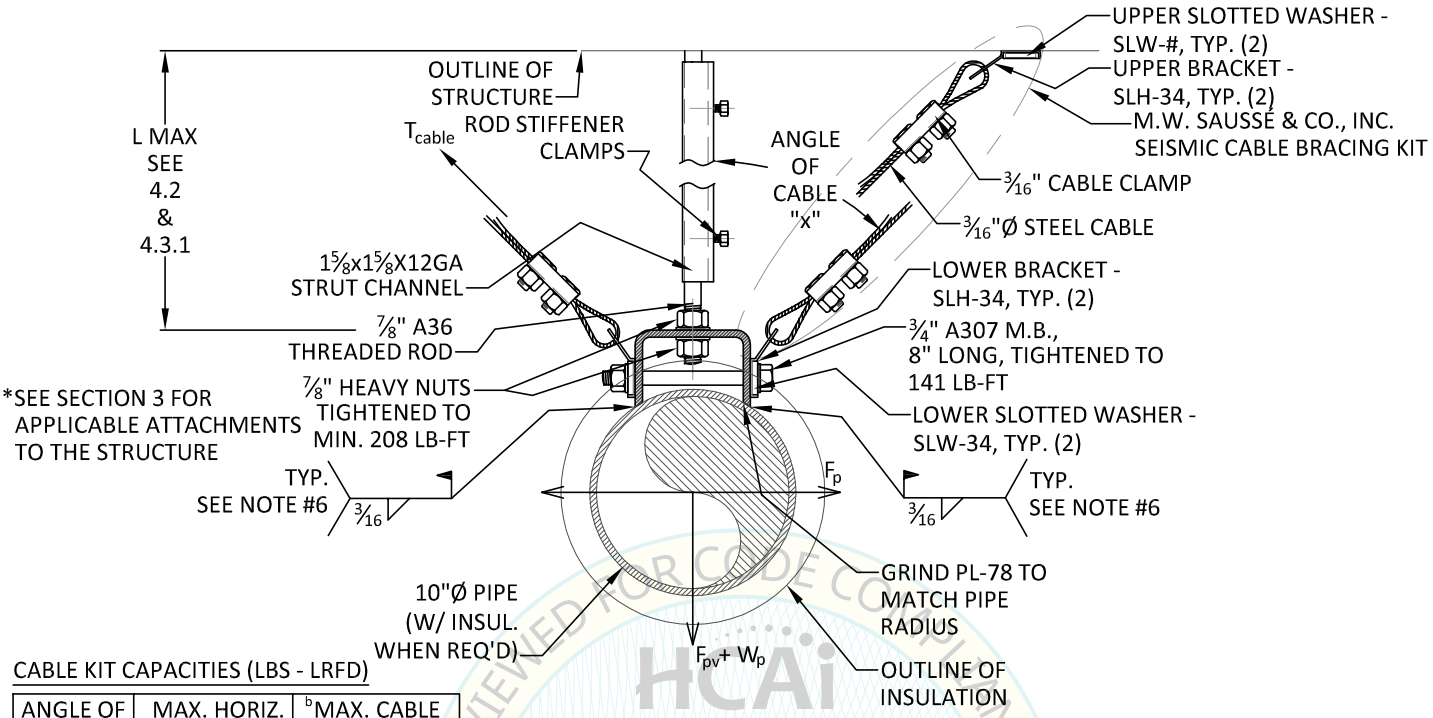
California PE No. S6481

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 10"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

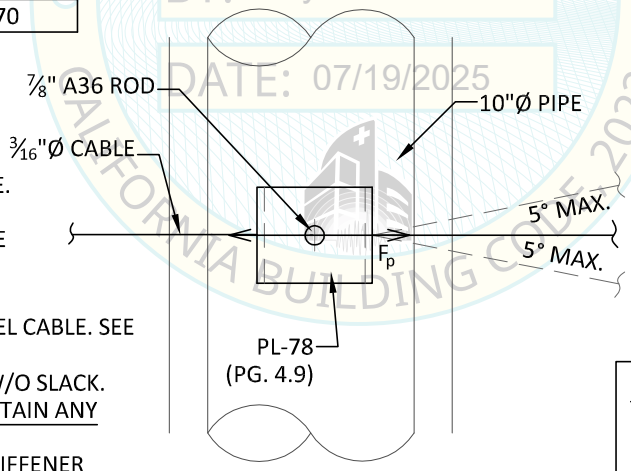



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 532 | 1915 |
| [a]45°≤ x <60° | 468 | 1988 |
| 60°= x | 661 | 2807 |
| [c]60°< x ≤70° | 460 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-P316C-78R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-78

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

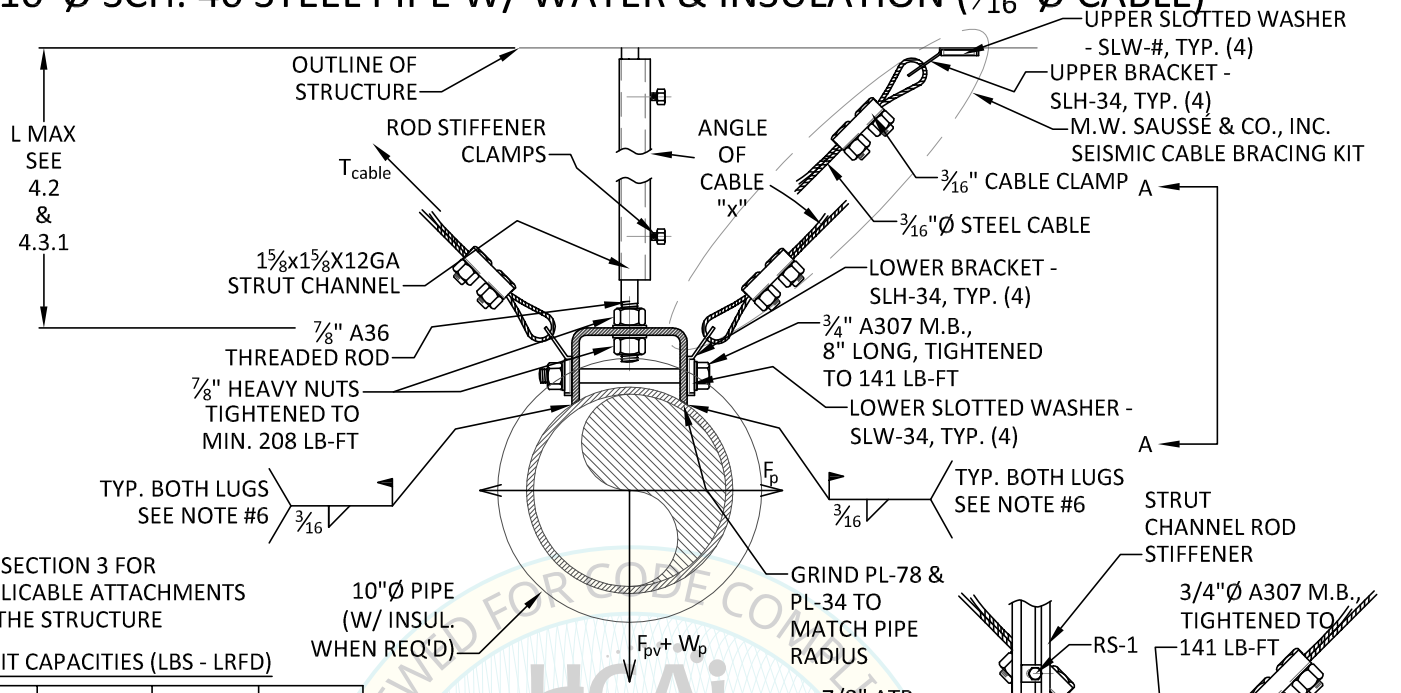
REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

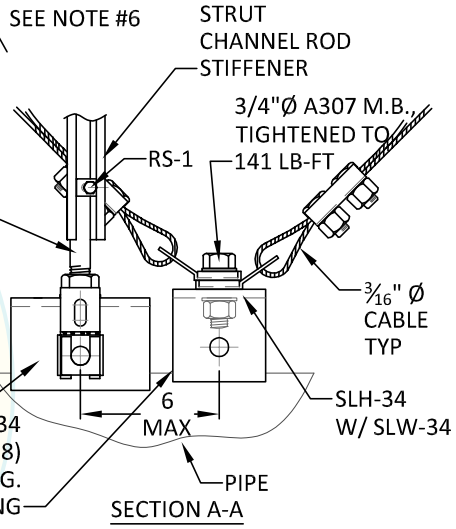
Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050

Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: 2.1.33
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 10"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

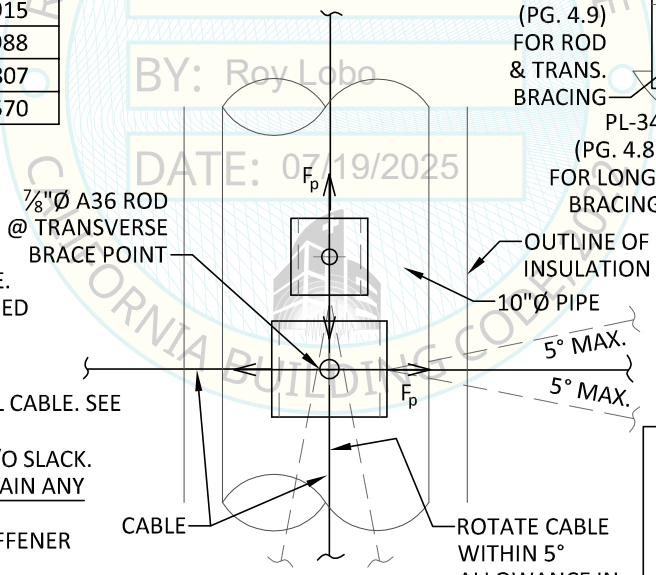



CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 532 | 957 | 1915 |
| [a]45°≤ x <60° | 468 | 1411 | 1988 |
| 60°= x | 661 | 2442 | 2807 |
| [c]60°< x ≤70° | 460 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-P316C-78R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-78
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODES

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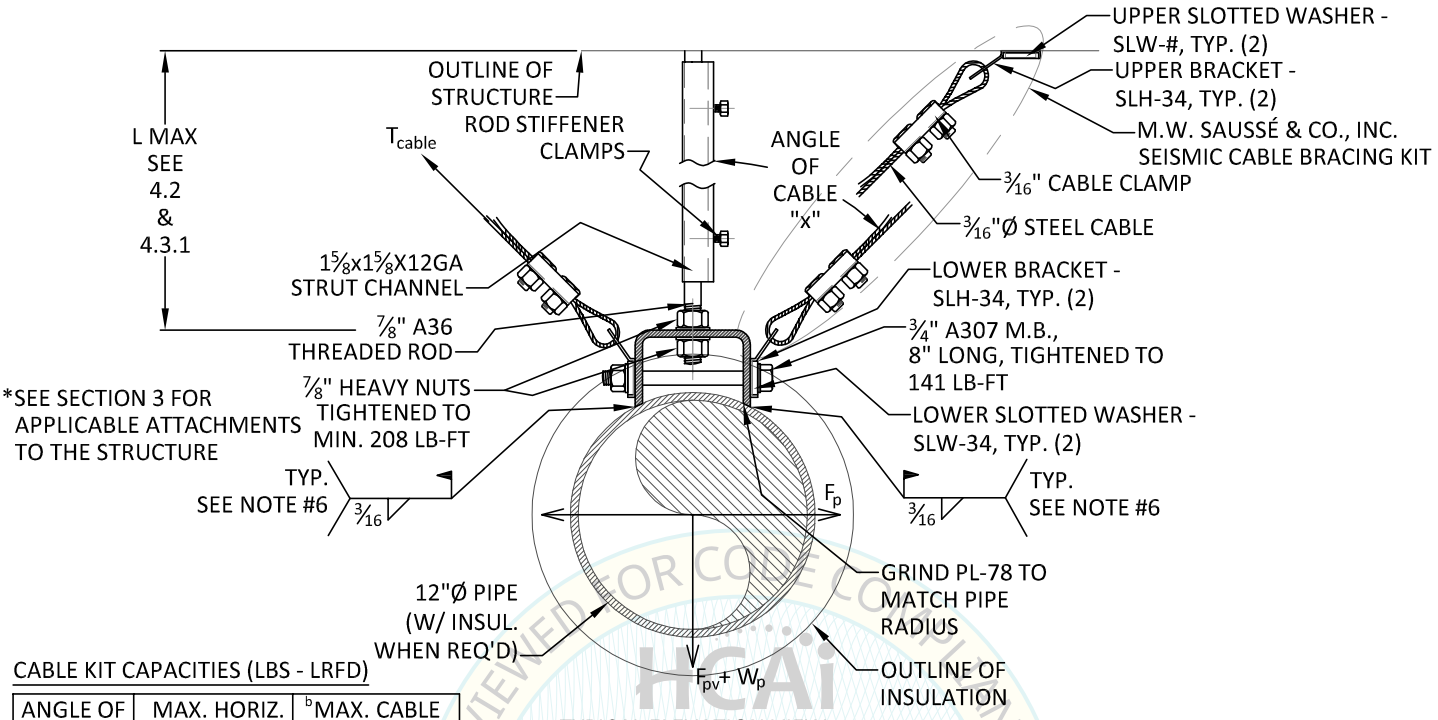
Page No.: 2.1.34
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 12"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)

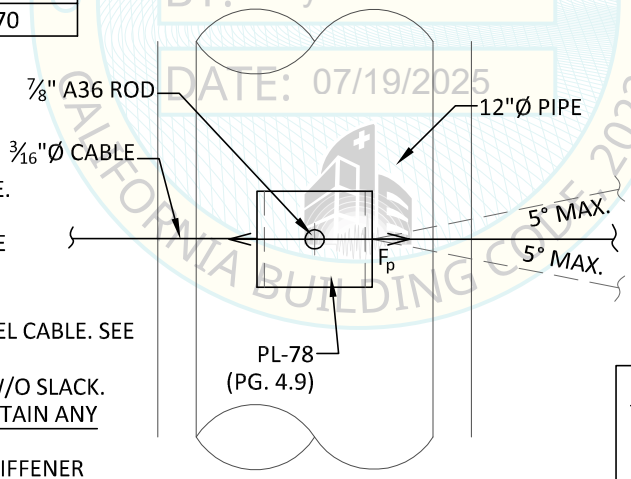



TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 479 | 1915 |
| [a]45°≤ x <60° | 413 | 1988 |
| 60°= x | 584 | 2807 |
| [c]60°< x ≤70° | 401 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-P316C-78R-1R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-78

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

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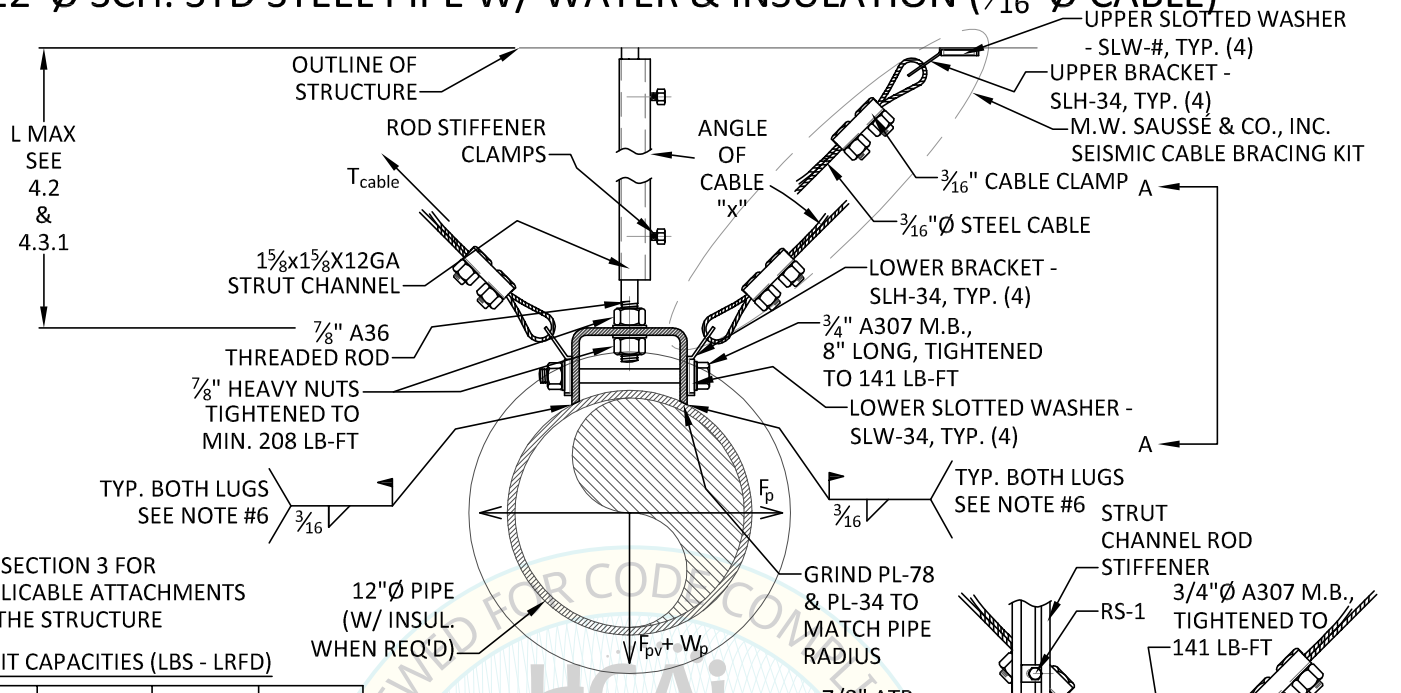
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: 2.1.35
Date: February 5, 2025

# CABLE BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 12"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION (3/16"Ø CABLE)



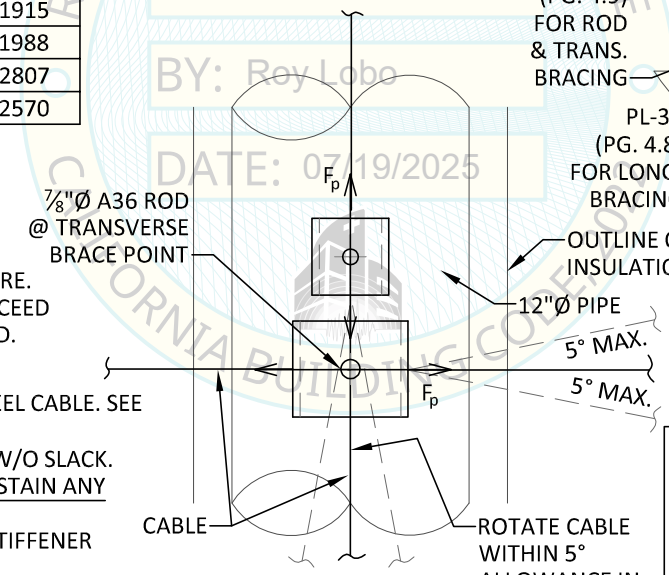

TYPICAL ELEVATION VIEW

*SEE SECTION 3 FOR APPLICABLE ATTACHMENTS TO THE STRUCTURE

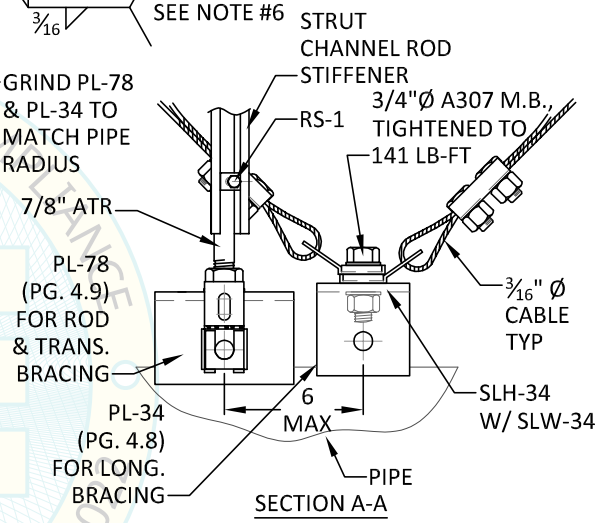
CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | MAX. CABLE TENSION[b] |
|---|---|---|---|
| 30°≤ x <45° | 479 | 957 | 1915 |
| [a]45°≤ x <60° | 413 | 1411 | 1988 |
| 60°= x | 584 | 2442 | 2807 |
| [c]60°< x ≤70° | 401 | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW




SECTION A-A

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-P316C-78R-1R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[d]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-34
(02) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS
(01) PIPE LUG - PL-78
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
REVIEWED FOR CODE COMPLIANCE
CALIFORNIA BUILDING CODE

Vibrex® vibration & seismic control systems
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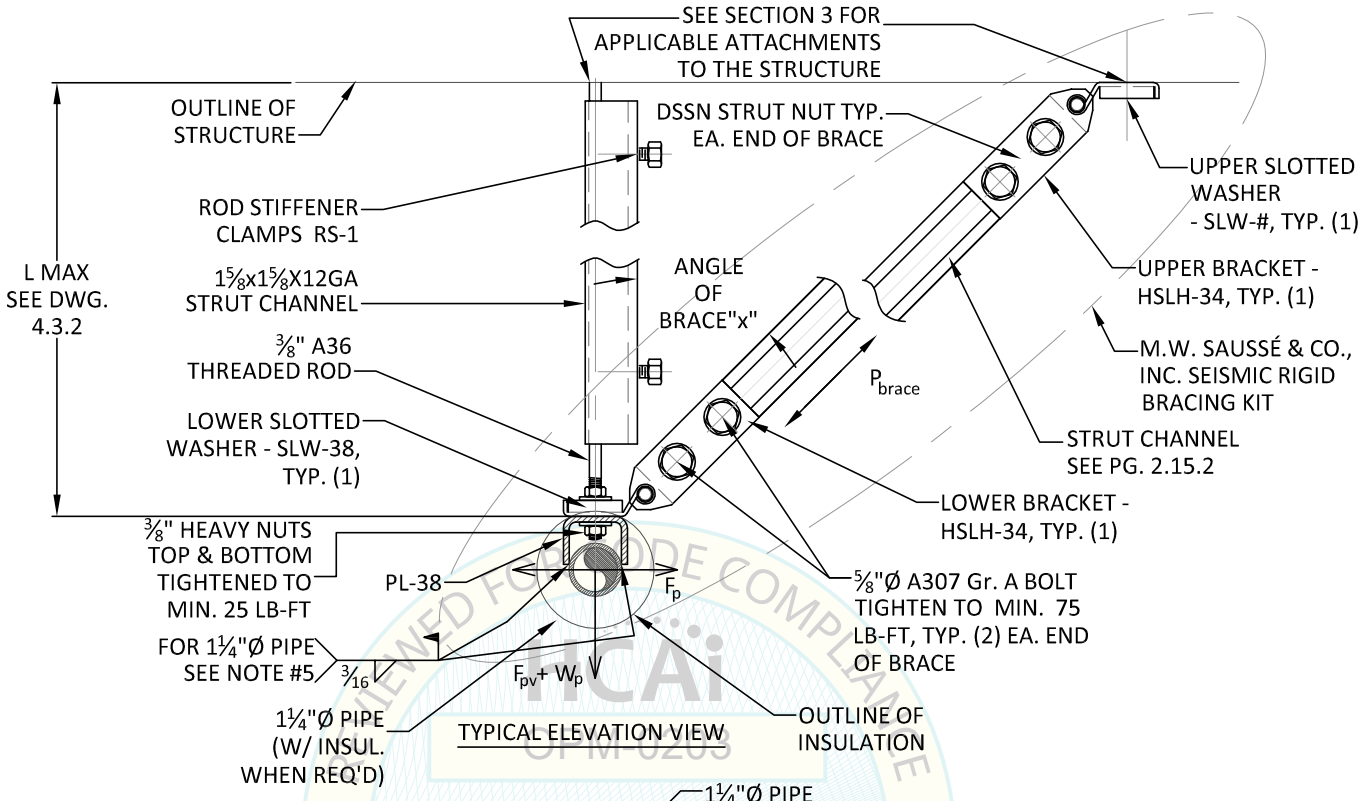
California PE No. S6481

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 1¼"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 391 | 1264 |
| [a]45°≤ x <60° | 607 | 1776 |
| 60°= x | 556 | 1830 |
| [c]60°< x ≤70° | 289 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-PR-38R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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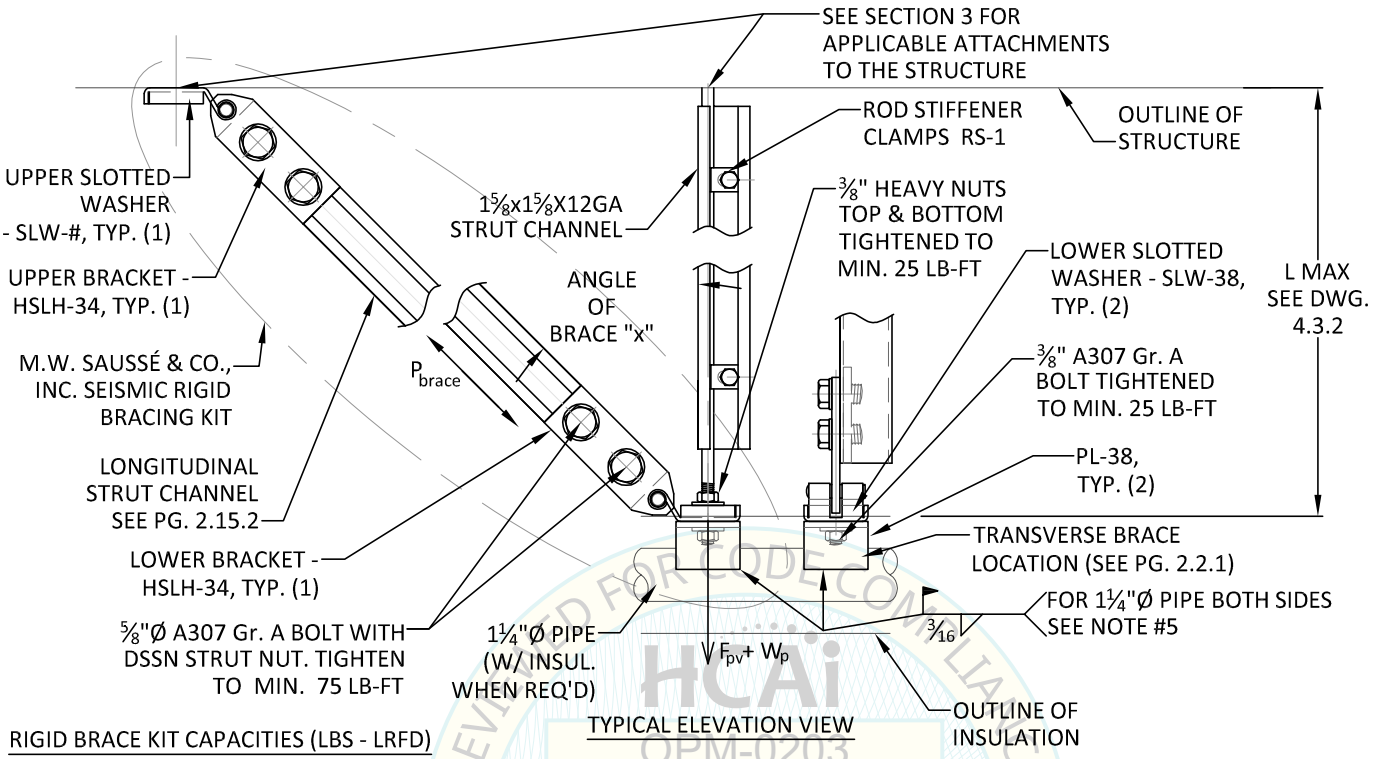
California PE No. S6481

Page No.: **2.2.1**
Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 1¼"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

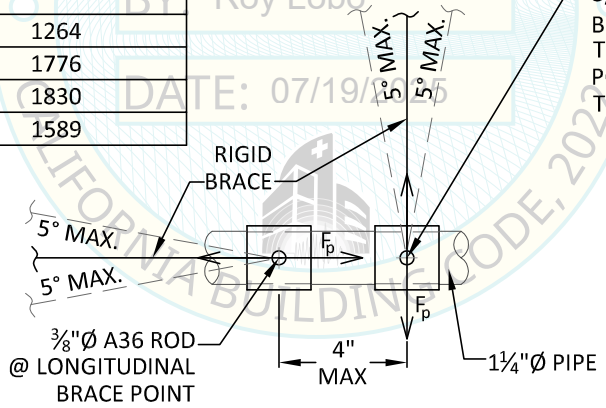



TYPICAL ELEVATION VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 391 | 632 | 1264 |
| [a]45°≤ x <60° | 607 | 1256 | 1776 |
| 60°= x | 556 | 1585 | 1830 |
| [c]60°< x ≤70° | 379 | 1493 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-PR-38R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(02) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

HCAi OPM-0203 REVIEWED FOR CODE COMPLIANCE BY: Roy Lobo DATE: 07/19/2025 OFFICE OF THE STATE ARCHITECT CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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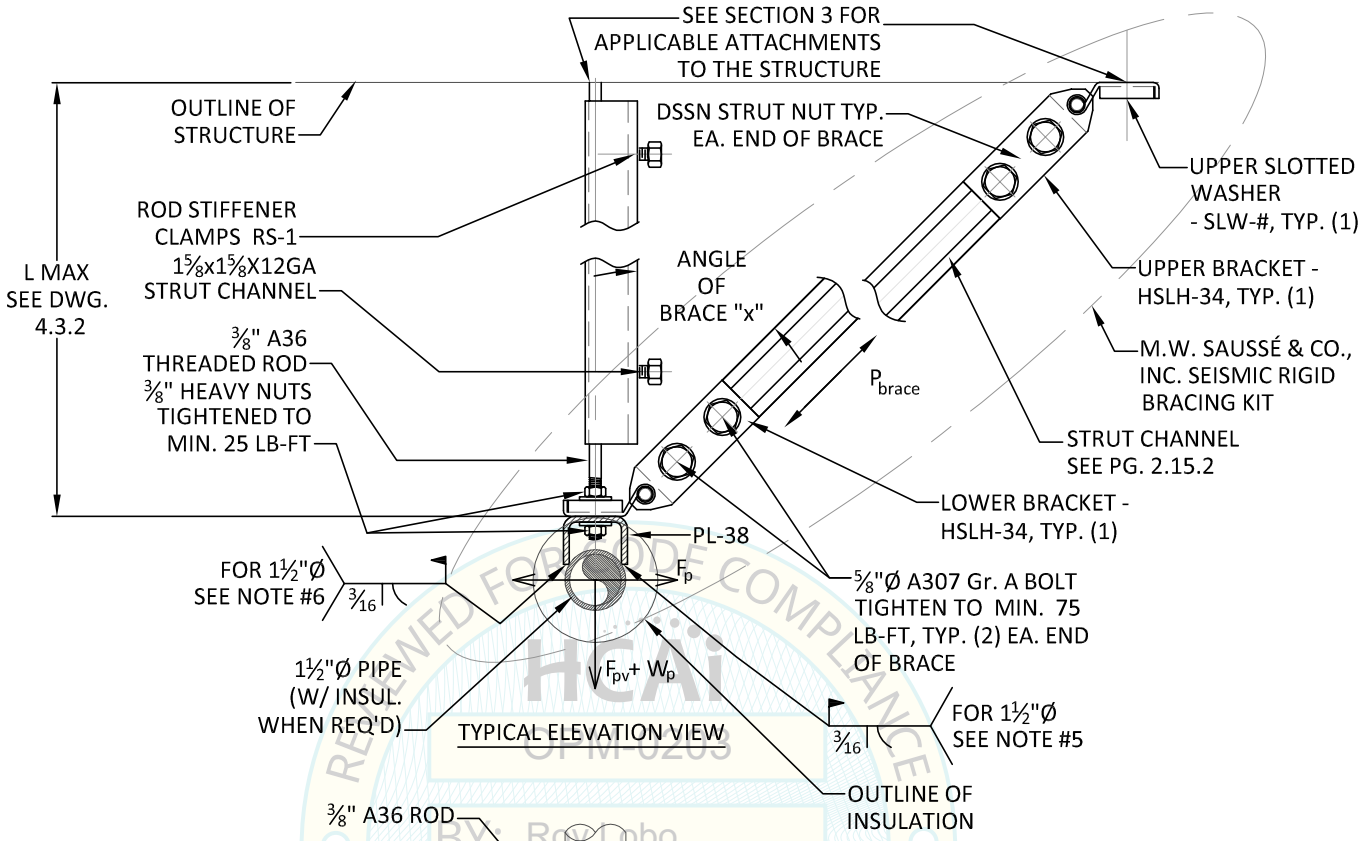
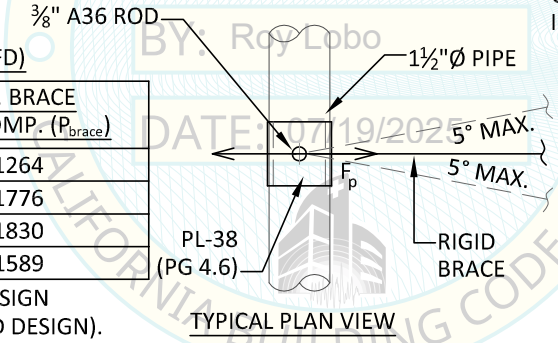
California PE No. S6481

Page No.: **2.2.2**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 1½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 354 | 1264 |
| [a]45°≤ x <60° | 533 | 1776 |
| 60°= x | 473 | 1830 |
| [c]60°< x ≤70° | 316 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-PR-38R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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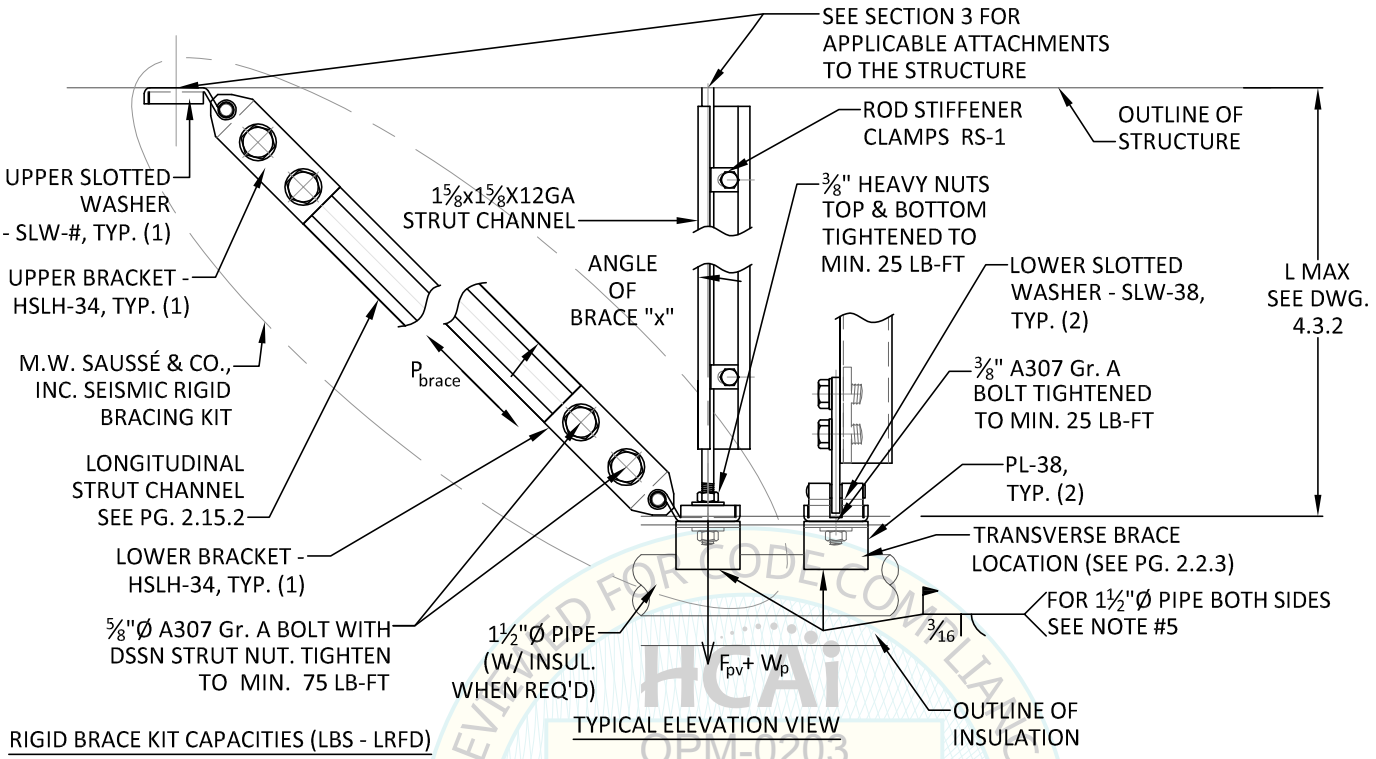
Page No.: **2.2.3**
Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 1½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

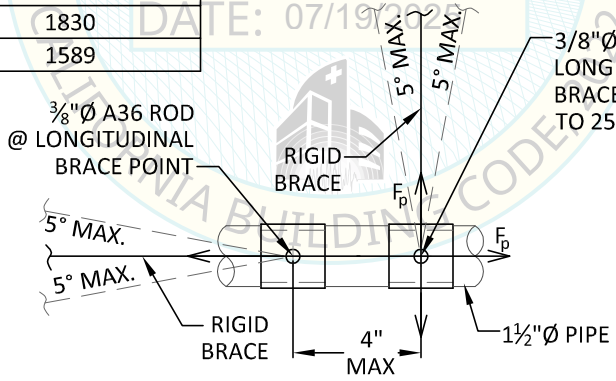



TYPICAL ELEVATION VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 354 | 632 | 1264 |
| [a]45°≤ x <60° | 533 | 1256 | 1776 |
| 60°= x | 473 | 1585 | 1830 |
| [c]60°< x ≤70° | 316 | 1493 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-PR-38R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(02) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
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Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
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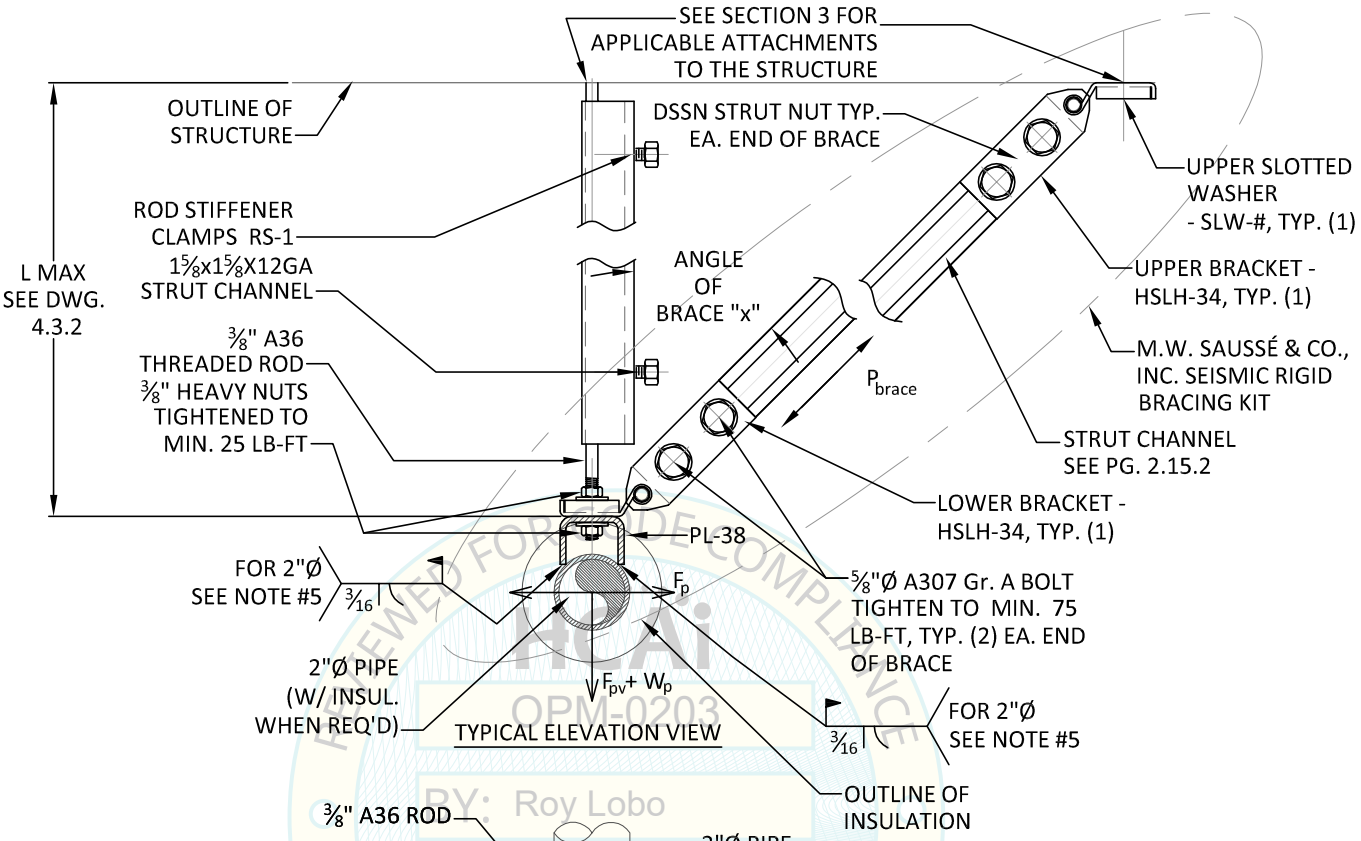
Ph: (661) 257-3311 | Fax: (661) 257-6050

Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.2.4**

Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 2"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 337 | 1264 |
| [a]45°≤ x <60° | 499 | 1776 |
| 60°= x | 437 | 1830 |
| [c]60°< x ≤70° | 289 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-PR-38R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 202

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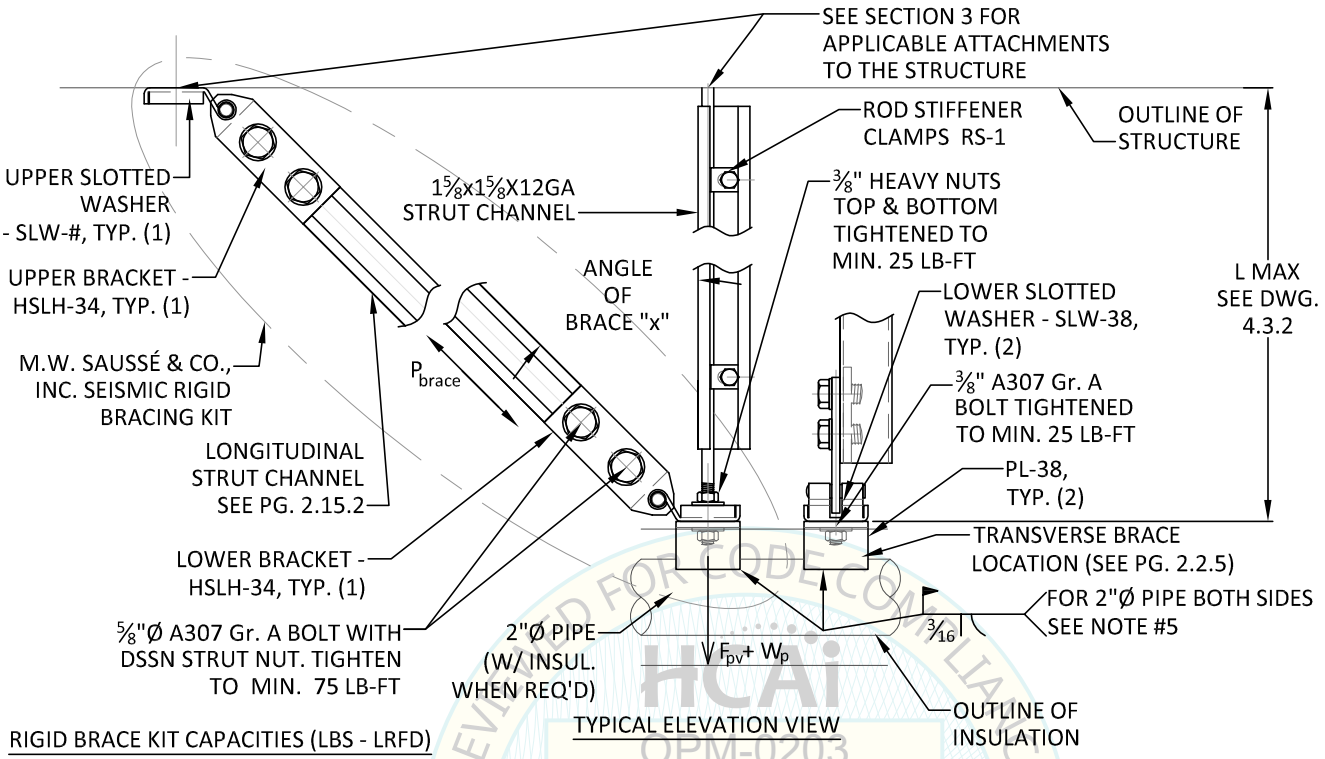
Page No.: 2.2.5
Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 2"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

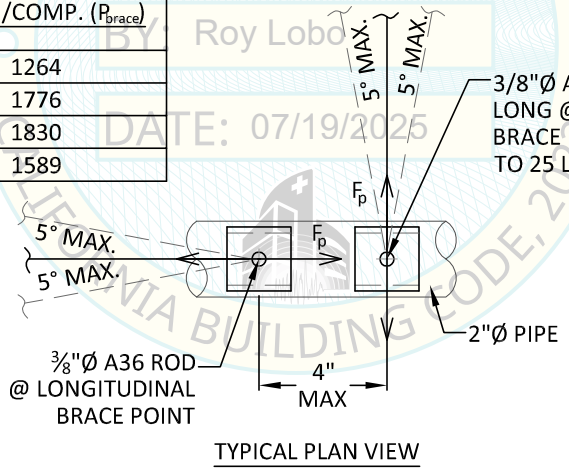



TYPICAL ELEVATION VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 337 | 632 | 1264 |
| [a]45°≤ x <60° | 499 | 1252 | 1776 |
| 60°= x | 437 | 1585 | 1830 |
| [c]60°< x ≤70° | 289 | 1493 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-PR-38R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(02) PIPE LUG - PL-38

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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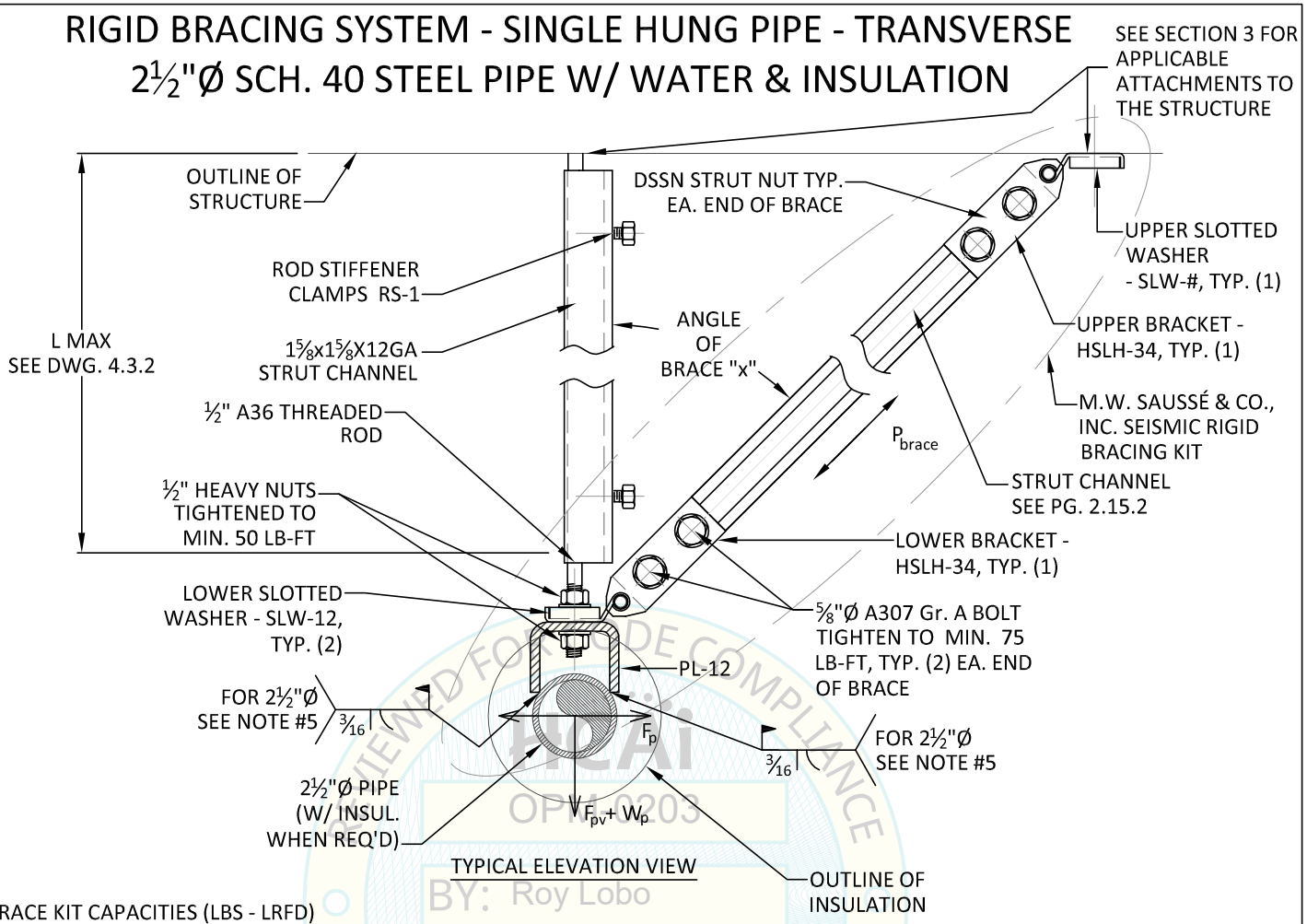
Page No.: **2.2.6**

Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 2½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

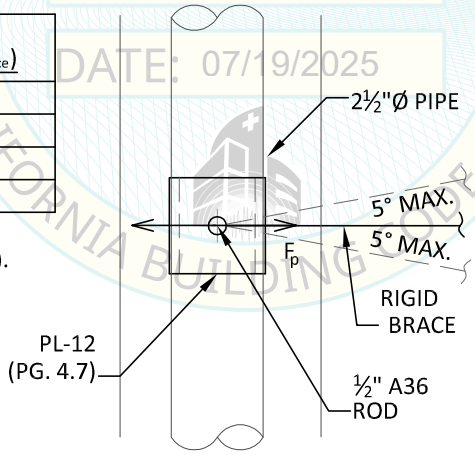



TYPICAL ELEVATION VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 508 | 2213 |
| [a]45°≤ x <60° | 772 | 3320 |
| 60°= x | 598 | 3130 |
| [c]60°< x ≤70° | 205 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-PR-12R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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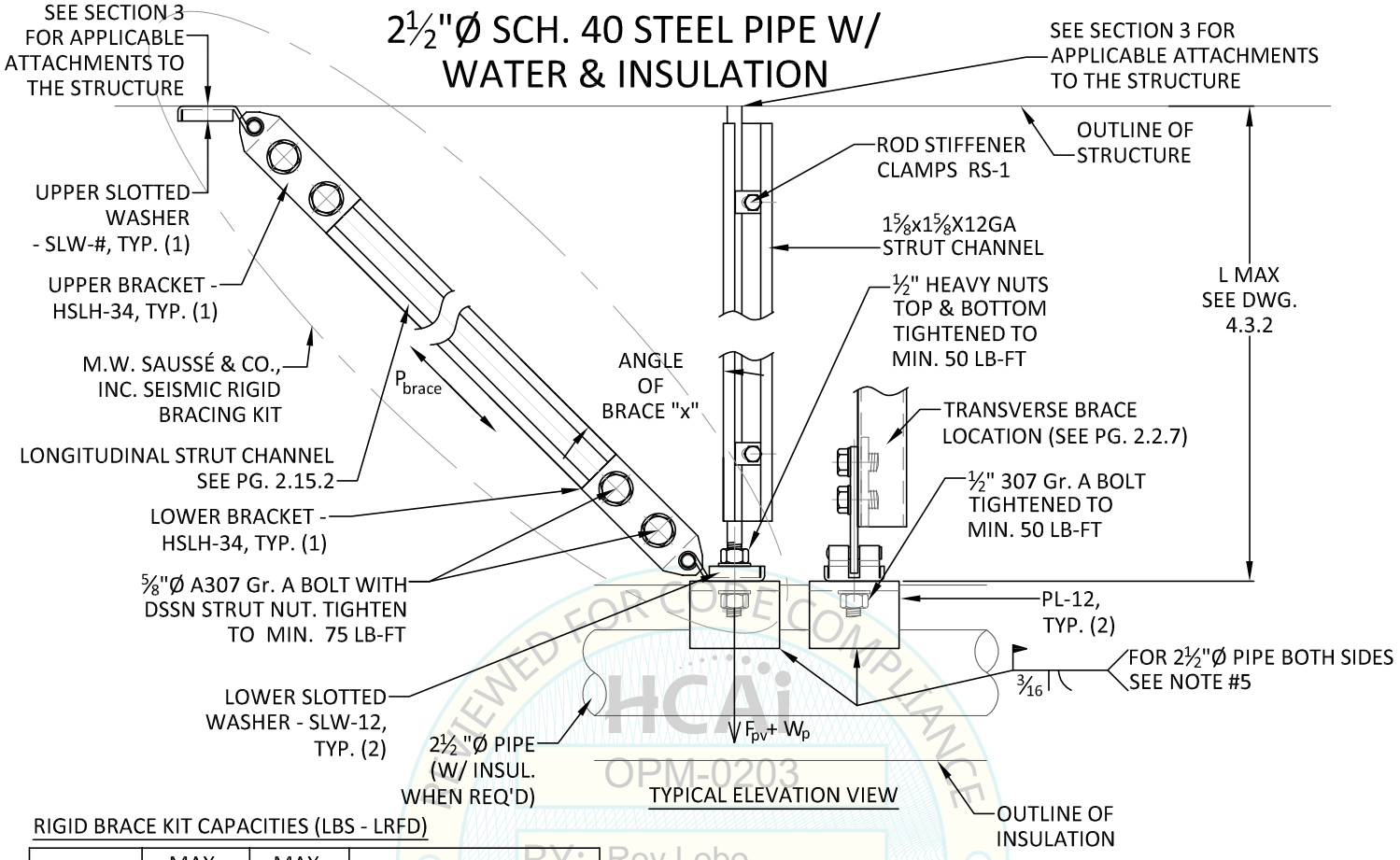
Page No.: **2.2.7**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE

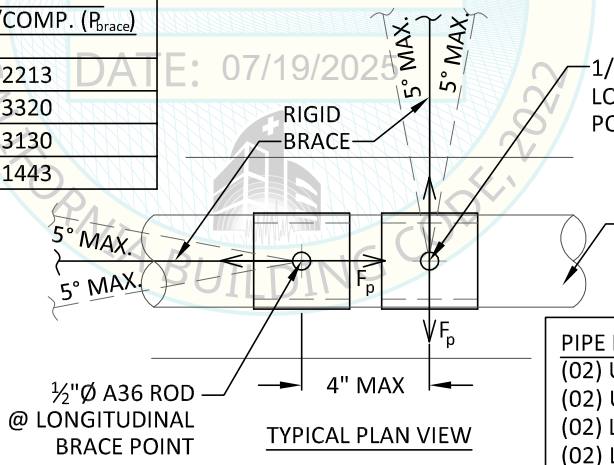
## 2½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 508 | 1107 | 2213 |
| [a]45°≤ x <60° | 772 | 2348 | 3320 |
| 60°= x | 598 | 2711 | 3130 |
| [c]60°< x ≤70° | 205 | 1356 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




PIPE BRACING KIT 2-PR-12R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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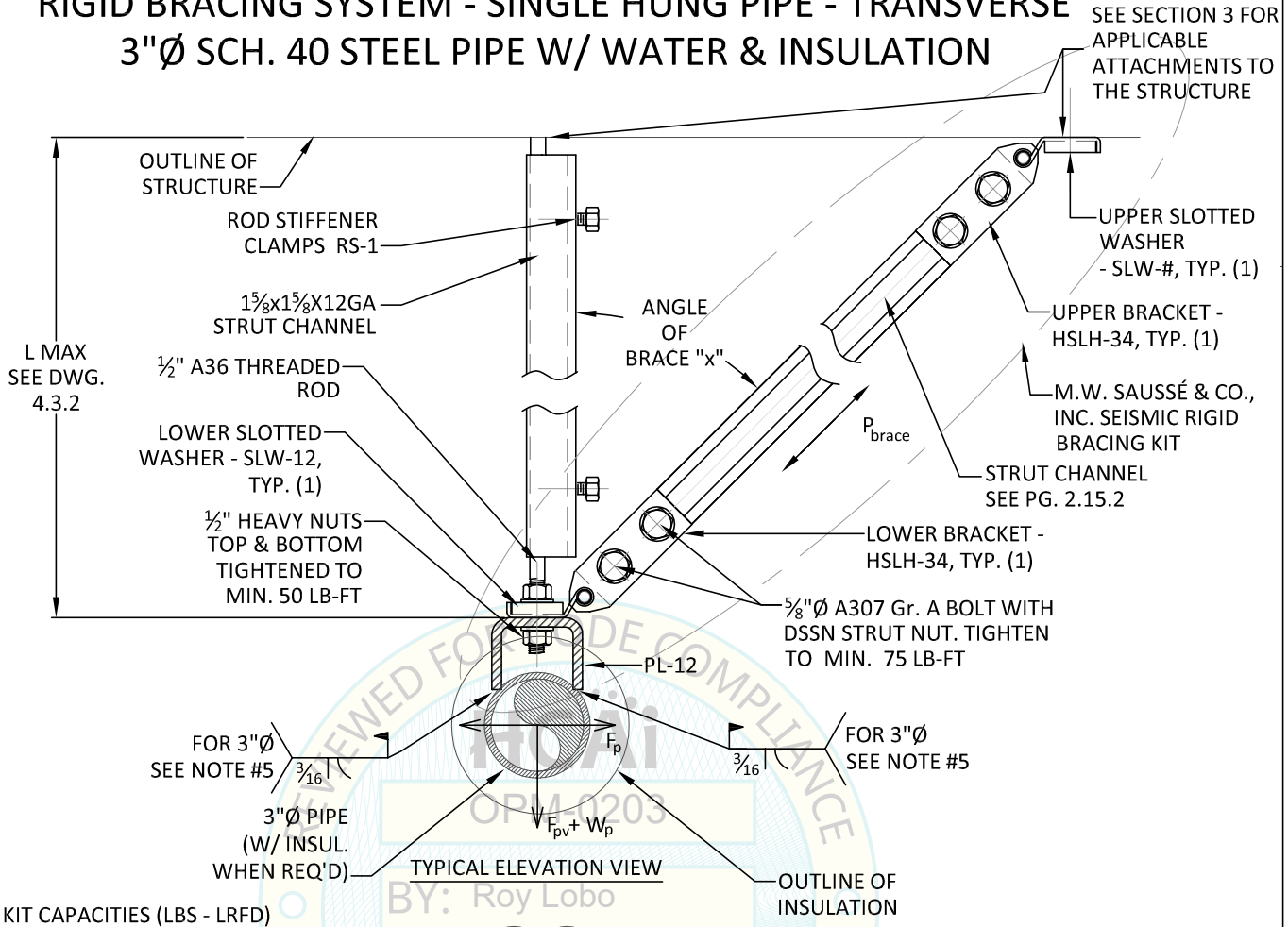
Page No.: **2.2.8**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 3"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

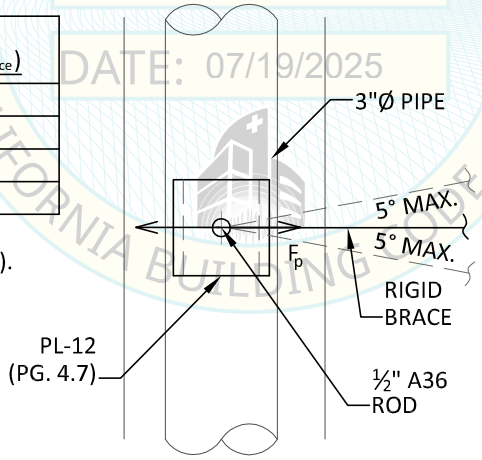



TYPICAL ELEVATION VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 470 | 2213 |
| [a]45°≤ x <60° | 702 | 3320 |
| 60°= x | 536 | 3130 |
| [c]60°< x ≤70° | 182 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-PR-12R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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CALIFORNIA BUILDING CODE, 2022

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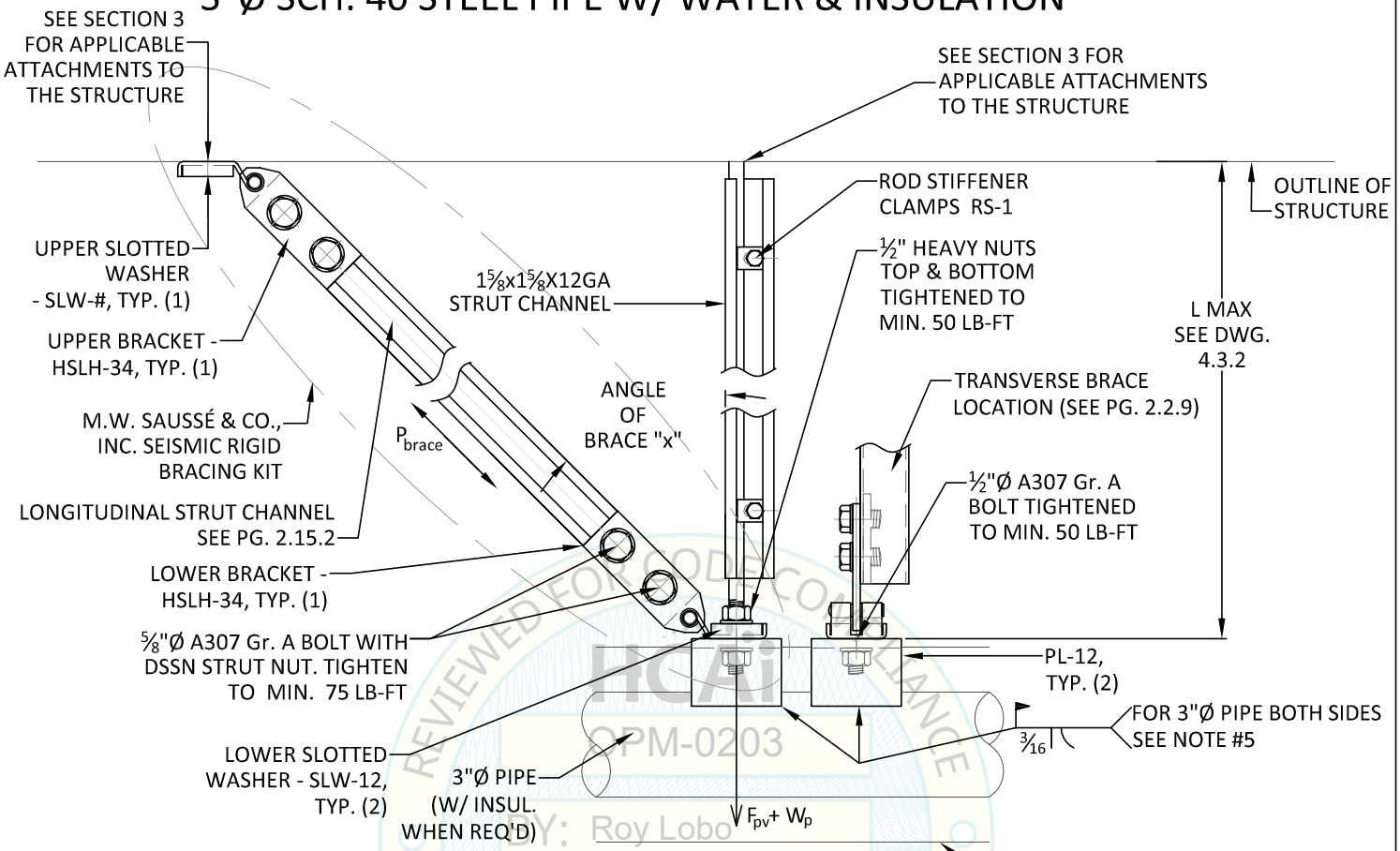
Page No.: **2.2.9**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 3"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

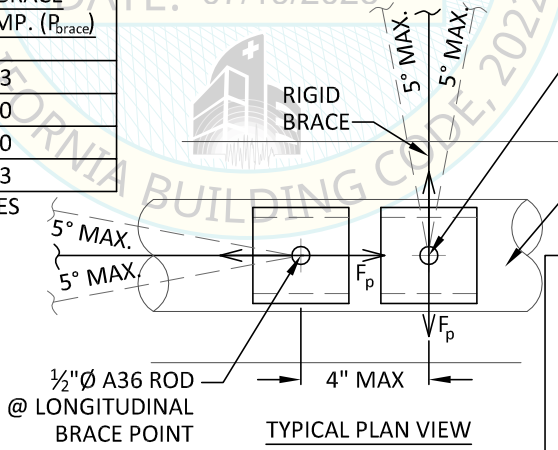



TYPICAL ELEVATION VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 470 | 1107 | 2213 |
| [a]45°≤ x <60° | 702 | 2348 | 3320 |
| 60°= x | 536 | 2711 | 3130 |
| [c]60°< x ≤70° | 182 | 1356 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-PR-12R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

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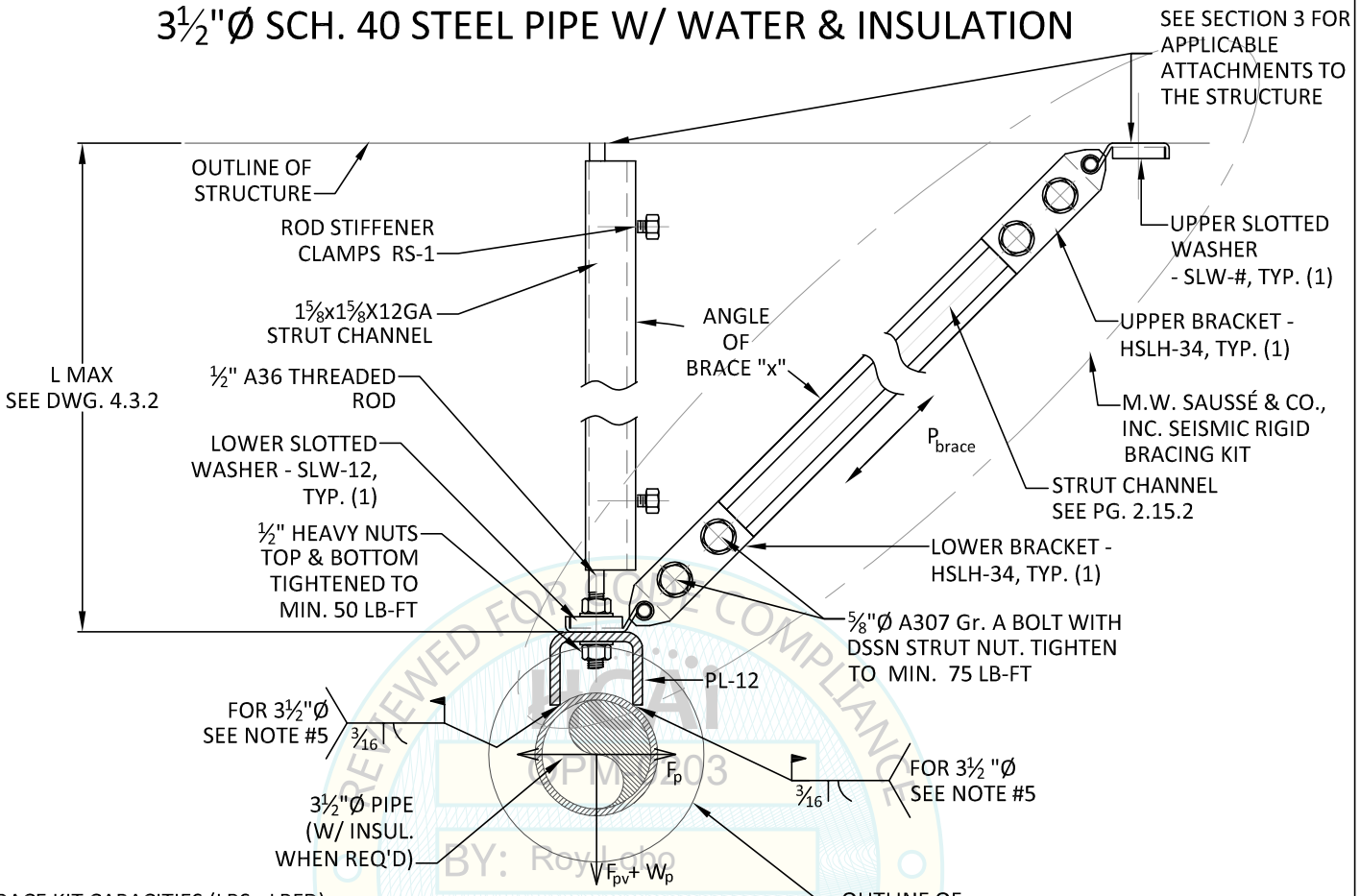
Page No.: 2.2.10
Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
## 3½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

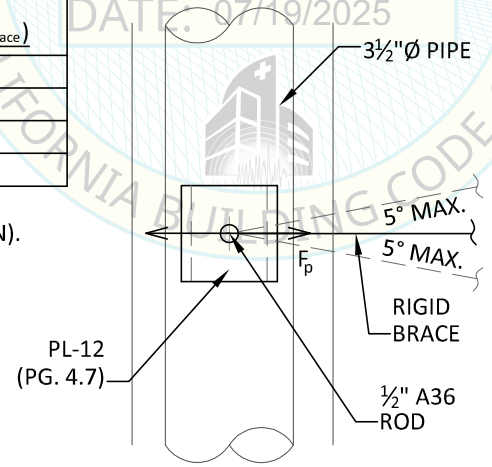



TYPICAL ELEVATION VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 448 | 2213 |
| [a]45°≤ x <60° | 662 | 3320 |
| 60°= x | 501 | 3130 |
| [c]60°< x ≤70° | 170 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

PIPE BRACING KIT 1-PR-12R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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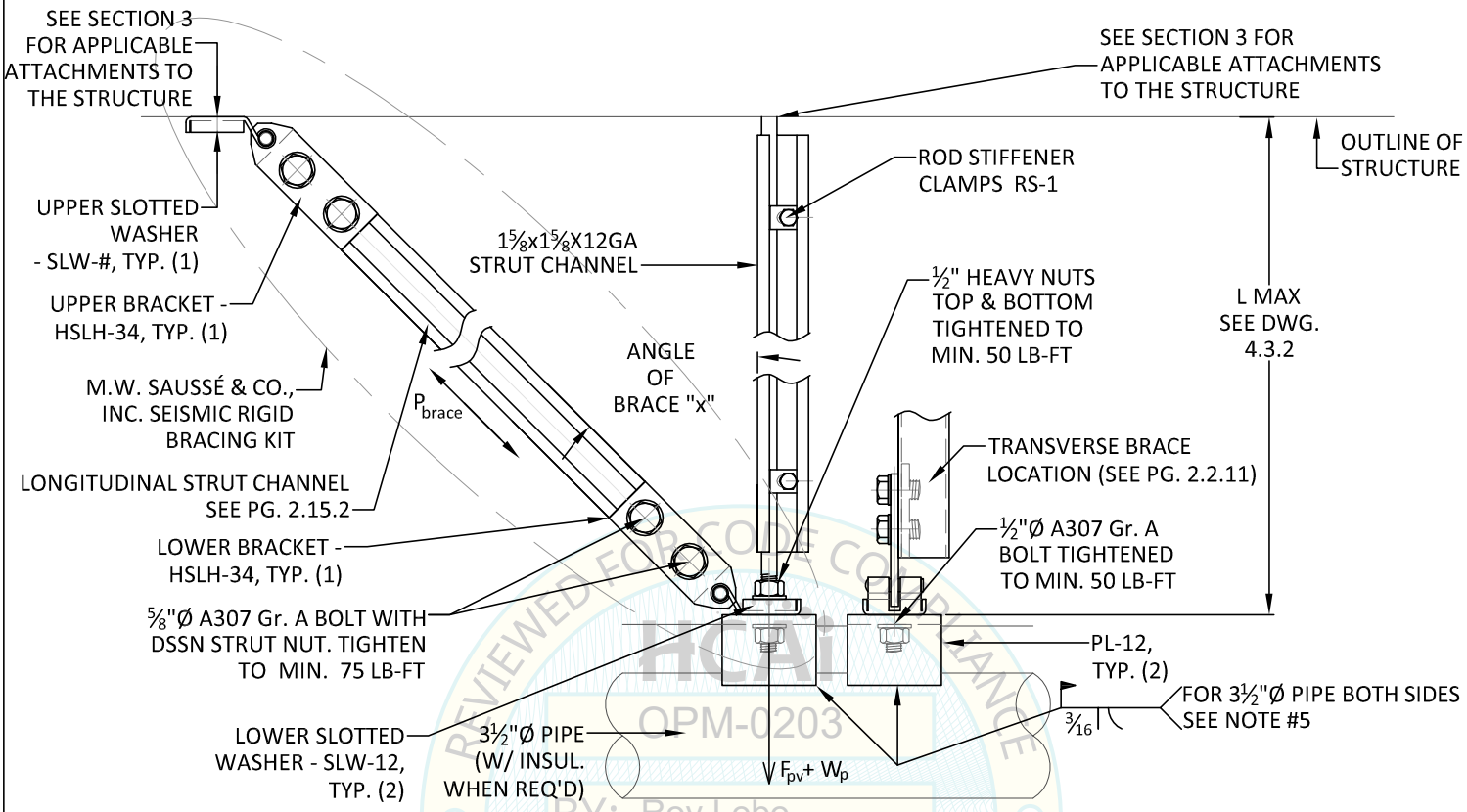
Page No.: **2.2.11**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 3½"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

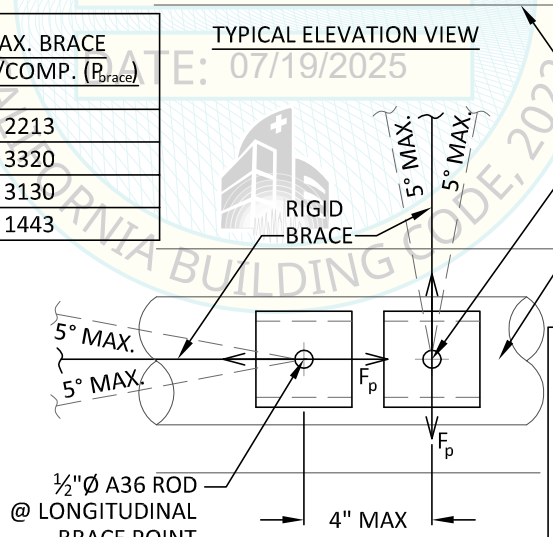



RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 448 | 1107 | 2213 |
| [a]45°≤ x <60° | 662 | 2348 | 3320 |
| 60°= x | 501 | 2711 | 3130 |
| [c]60°< x ≤70° | 170 | 1356 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

TYPICAL ELEVATION VIEW




TYPICAL PLAN VIEW

PIPE BRACING KIT 2-PR-12R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#d
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(#e) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(02) PIPE LUG - PL-12

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
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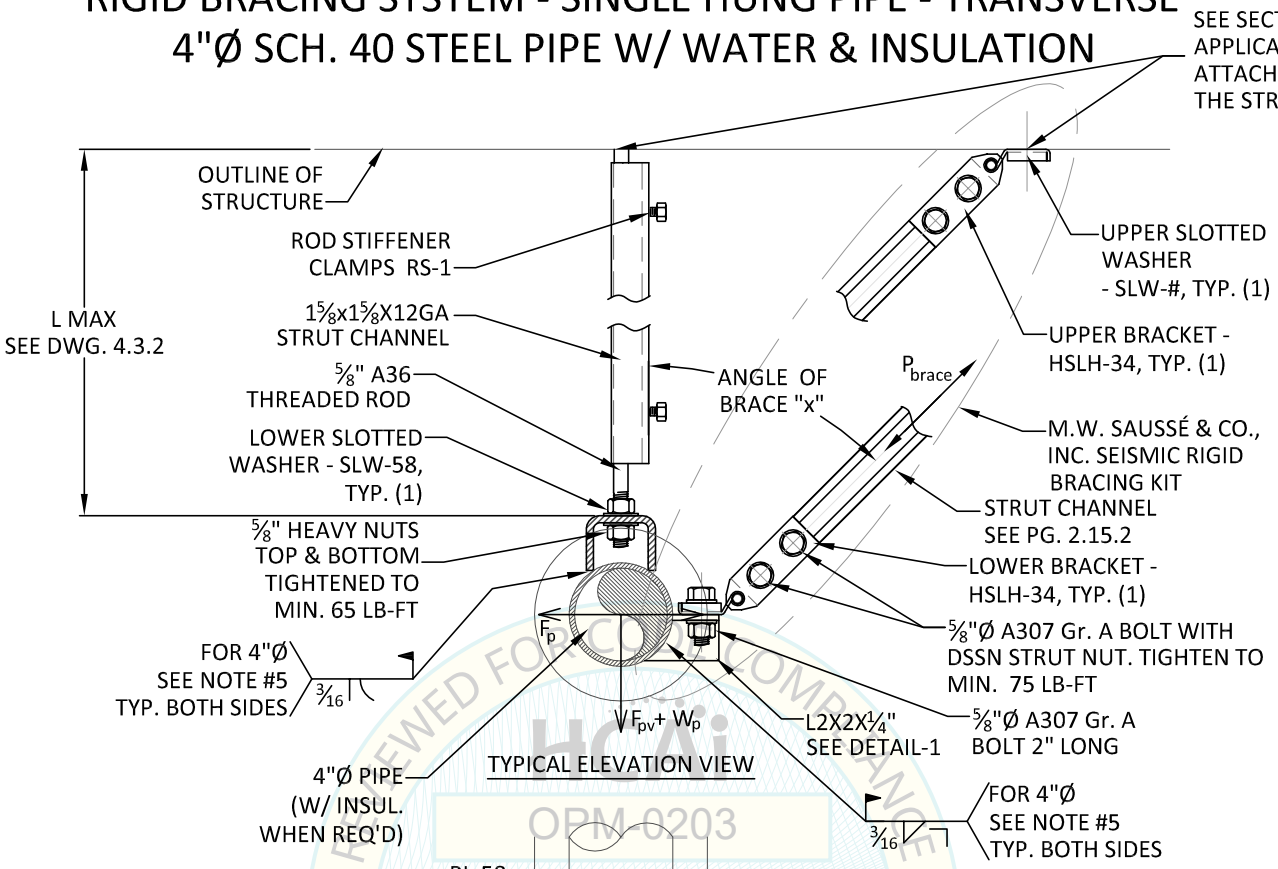
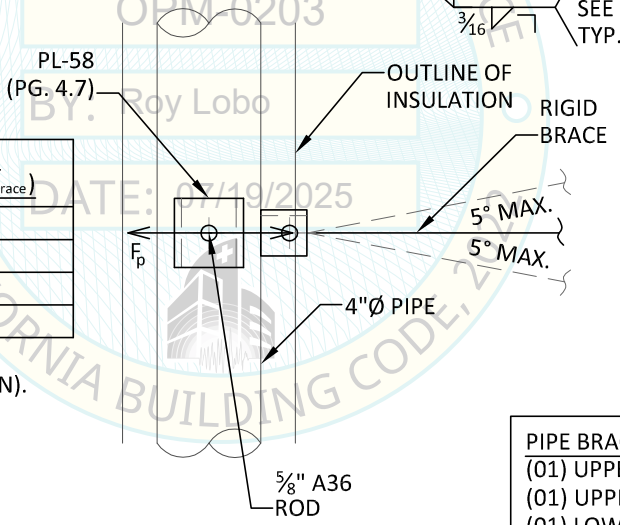
California PE No. S6481

Page No.: 2.2.12
Date: February 5, 2025

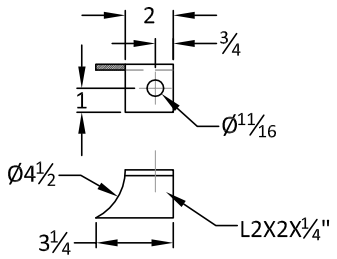
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 4"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




TYPICAL ELEVATION VIEW




TYPICAL PLAN VIEW




DETAIL-1

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| [c]60°< x ≤90° | 2691 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-PR-58R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-58

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.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DATE: 07/19/2025
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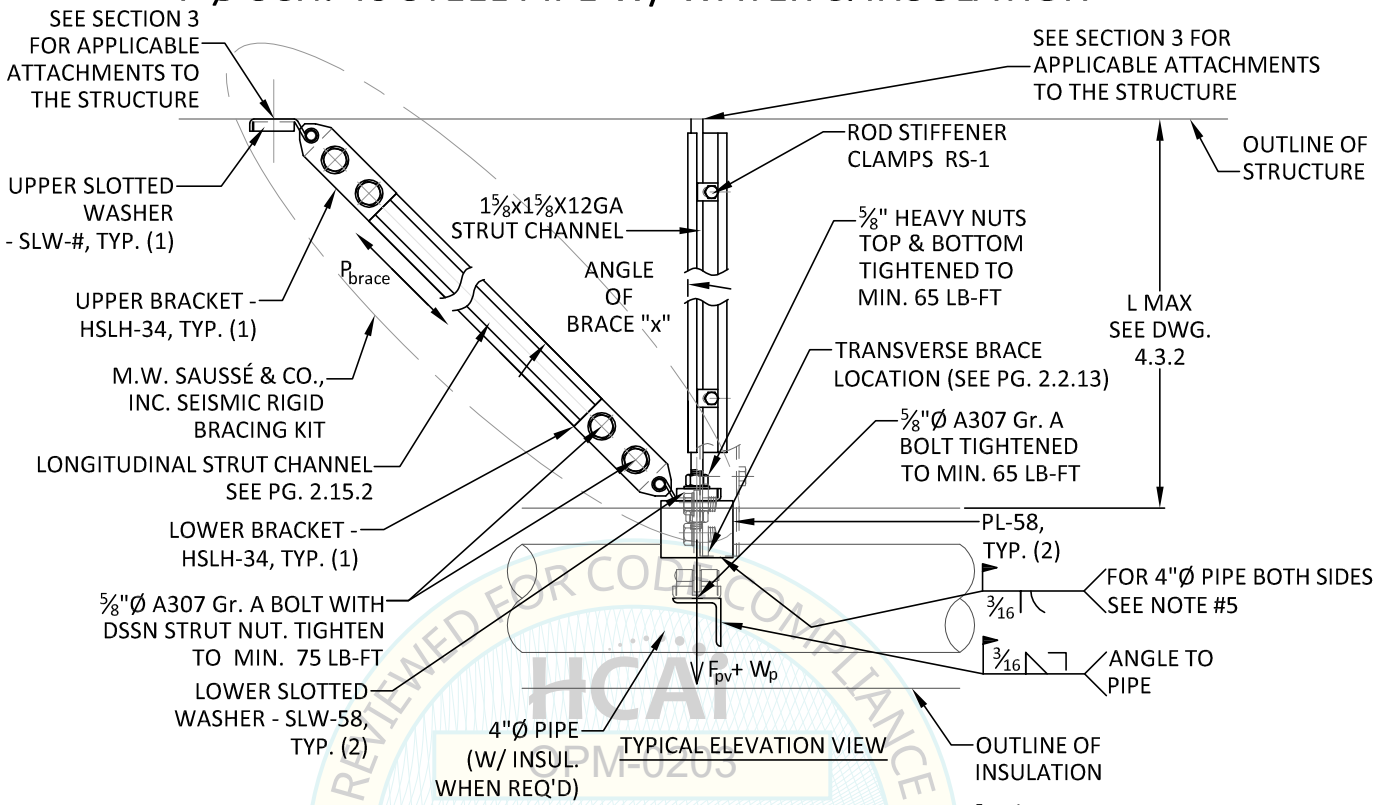
Page No.: **2.2.13**
Date: February 5, 2025

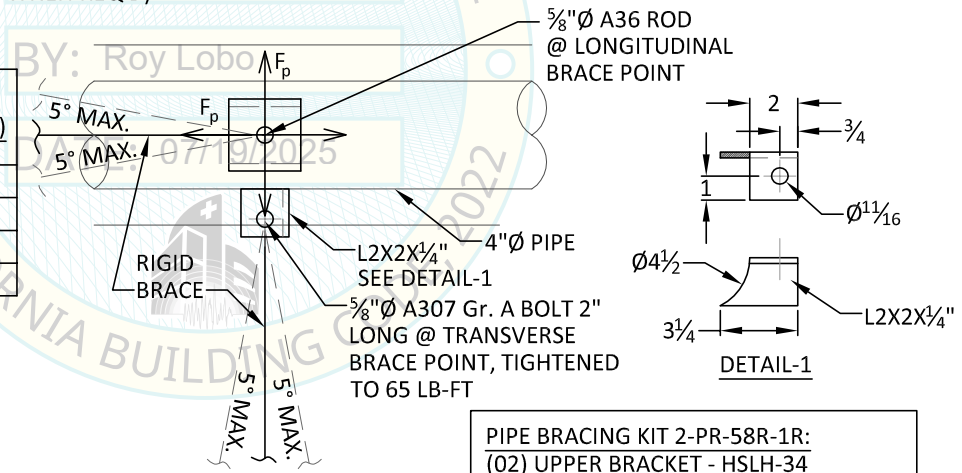
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 4"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1256 | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 2385 | 3373 |
| 60°= x | 2883 | 2354 | 3329 |
| [c]60°< x ≤90° | 2691 | 2480 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




PIPE BRACING KIT 2-PR-58R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(01) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
HCAI
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

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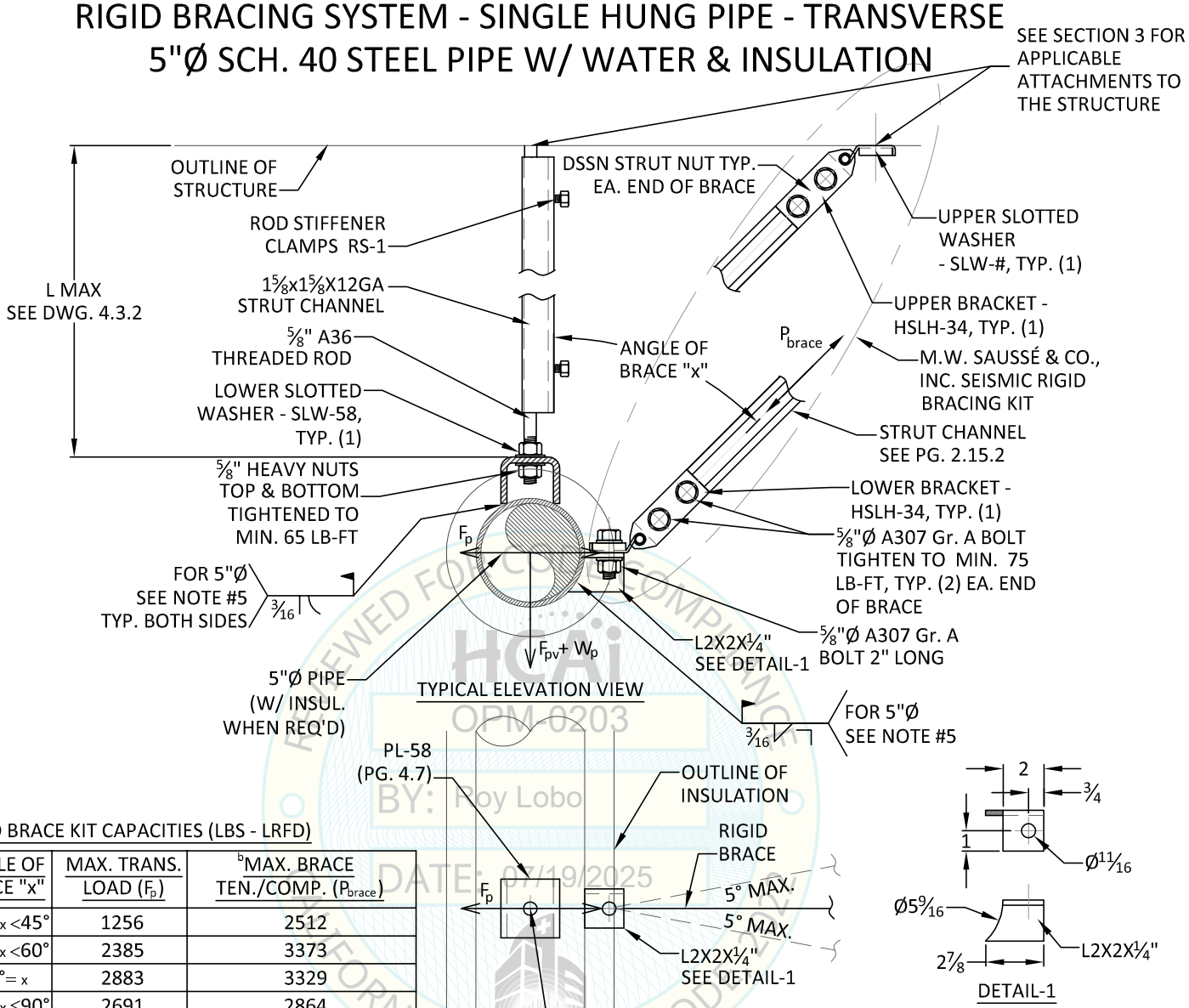
Page No.: **2.2.14**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 5"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| [c]60°< x ≤90° | 2691 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-PR-58R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-58

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE

Vibrex® vibration & seismic control systems
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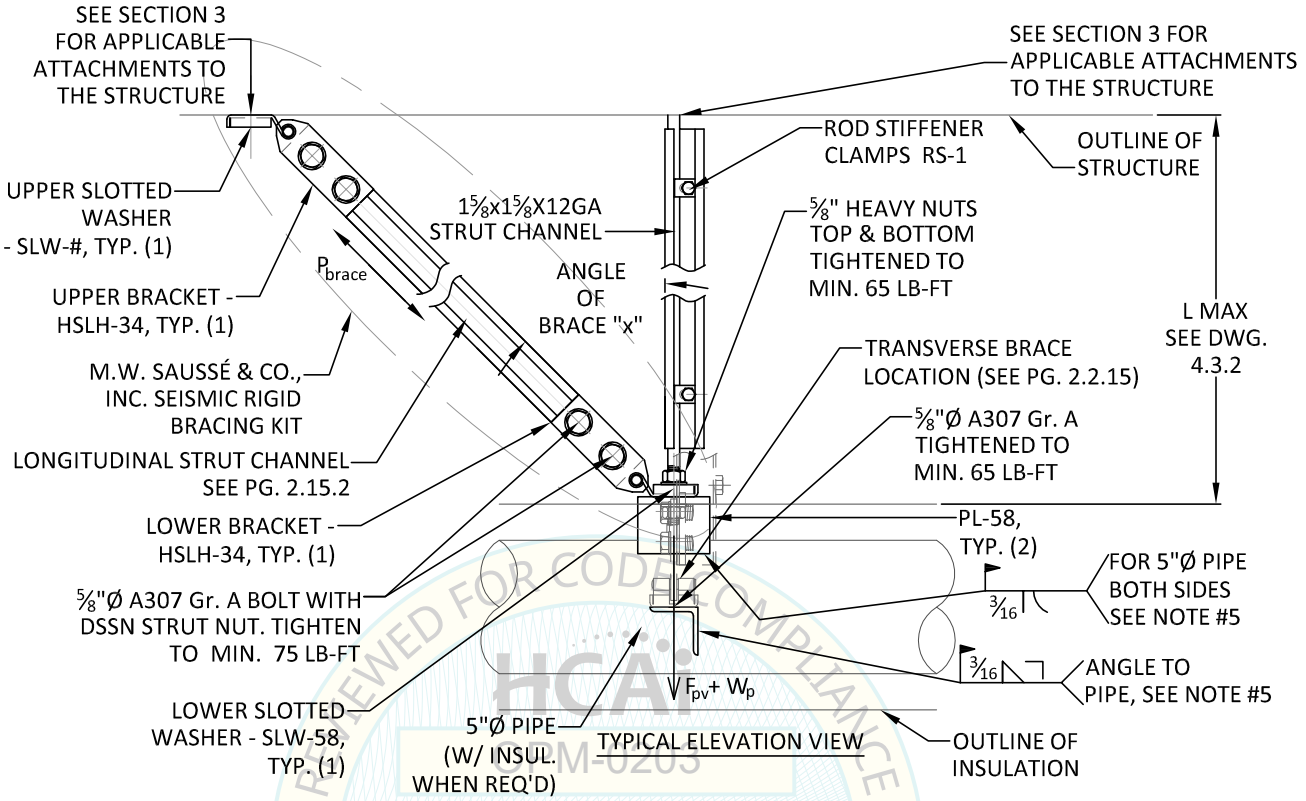
Page No.: **2.2.15**
Date: February 5, 2025

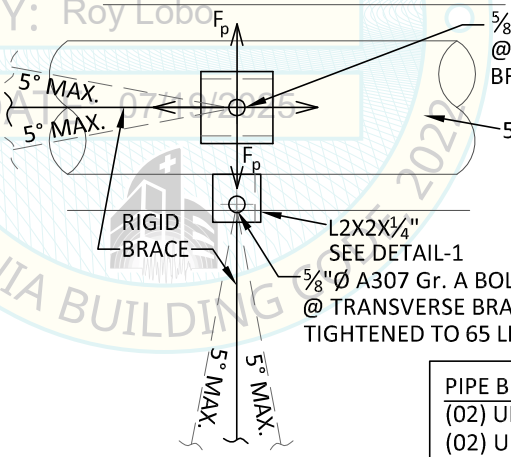
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 5"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION



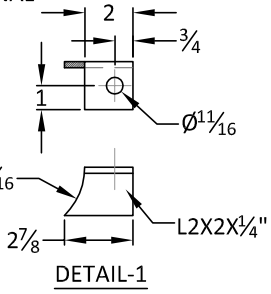

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1256 | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 2385 | 3373 |
| 60°= x | 2883 | 2354 | 3329 |
| [c]60°< x ≤90° | 2691 | 2480 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW




DETAIL-1

PIPE BRACING KIT 2-PR-58R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(01) PIPE LUG - PL-58

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

REVIEWED FOR CODE COMPLIANCE
HCAI
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
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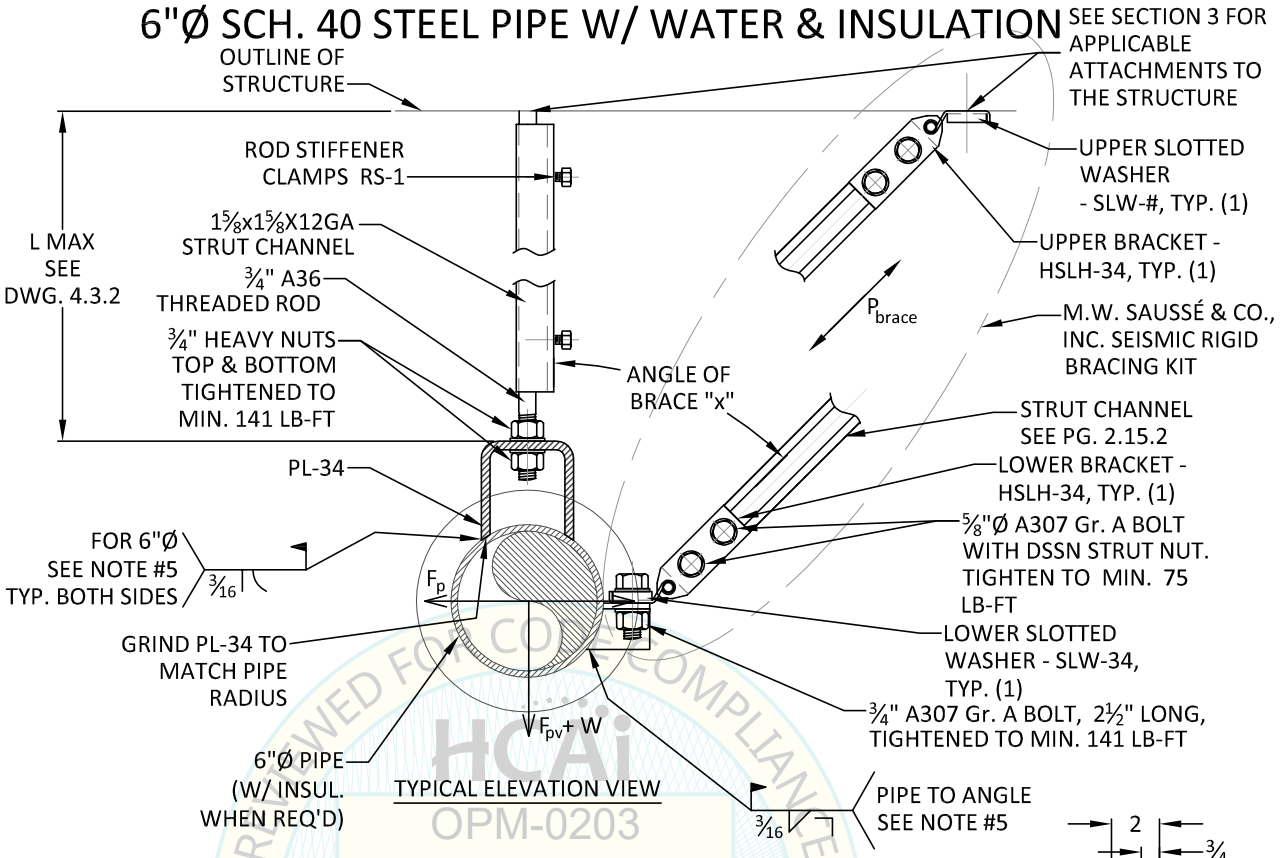
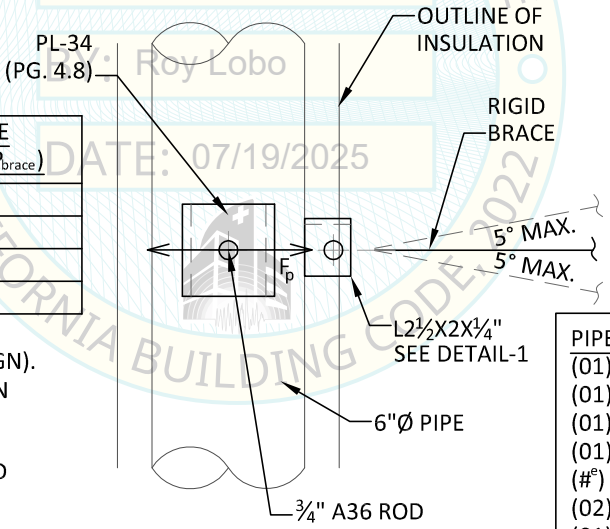
Page No.: 2.2.16

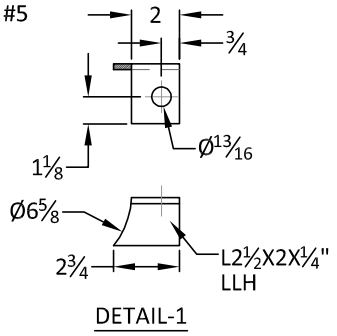
Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 6"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




TYPICAL PLAN VIEW




DETAIL-1

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1445 | 2890 |
| [a]45°≤ x <60° | 2384 | 3371 |
| 60°= x | 2886 | 3332 |
| [c]60°< x ≤90° | 2934 | 3122 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

PIPE BRACING KIT 1-PR-34R-1R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-34
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

HCAi OPM-0203 REVIEWED FOR CODE COMPLIANCE BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

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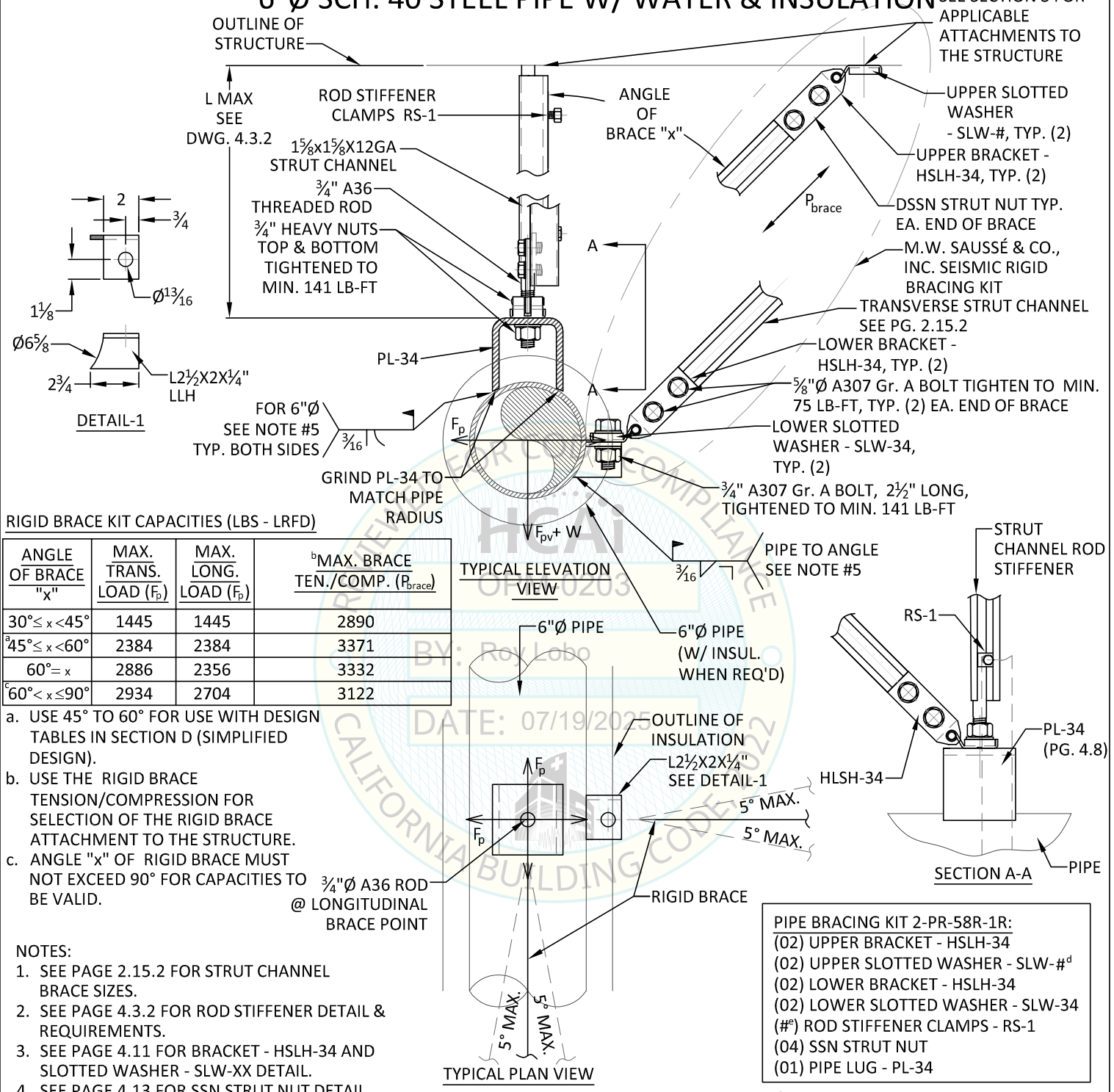
California PE No. S6481

Page No.: **2.2.17**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 6"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1445 | 1445 | 2890 |
| [a]45°≤ x <60° | 2384 | 2384 | 3371 |
| 60°= x | 2886 | 2356 | 3332 |
| [c]60°< x ≤90° | 2934 | 2704 | 3122 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. HOWEVER THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-PR-58R-1R:
(02) UPPER BRACKET - HSLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-34
(02) LOWER SLOTTED WASHER - SLW-34
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(01) PIPE LUG - PL-34

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

HCAI PREAPPROVAL FOR CODE COMPLIANCE OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

Vibrex vibration & seismic control systems
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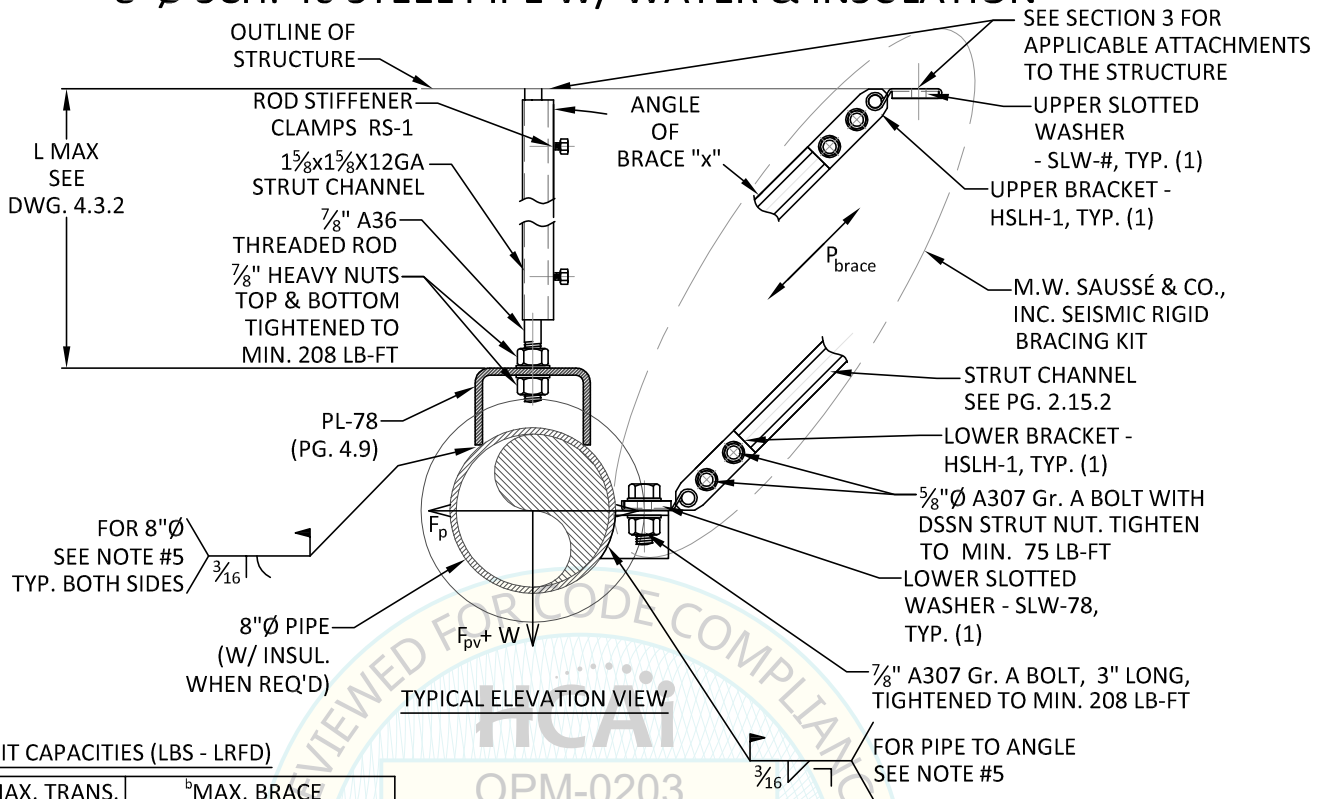
Page No.: **2.2.18**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 8"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

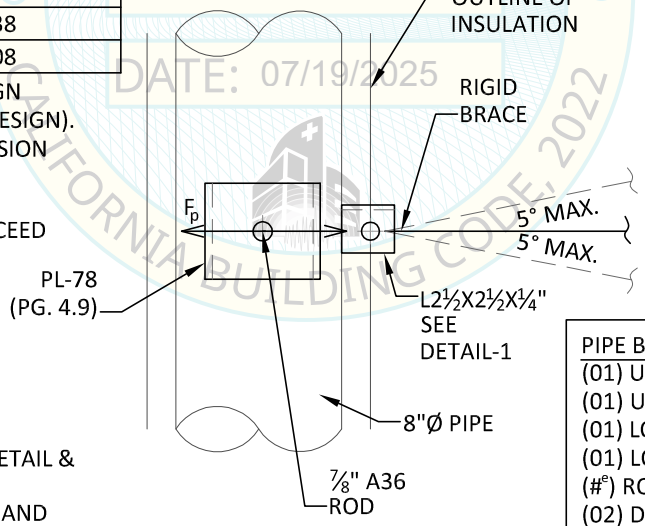



TYPICAL ELEVATION VIEW

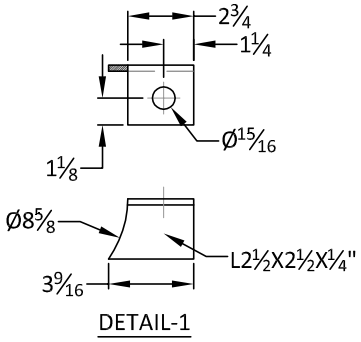
RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1060 | 2120 |
| [a]45°≤ x <60° | 2206 | 3120 |
| 60°= x | 2977 | 3438 |
| [c]60°< x ≤70° | 3015 | 3208 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW




DETAIL-1

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-PR-78R-1R:
(01) UPPER BRACKET - HSLH-1
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-1
(01) LOWER SLOTTED WASHER - SLW-78
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-78

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

REVIEWED FOR CODE COMPLIANCE
ICC-ES
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

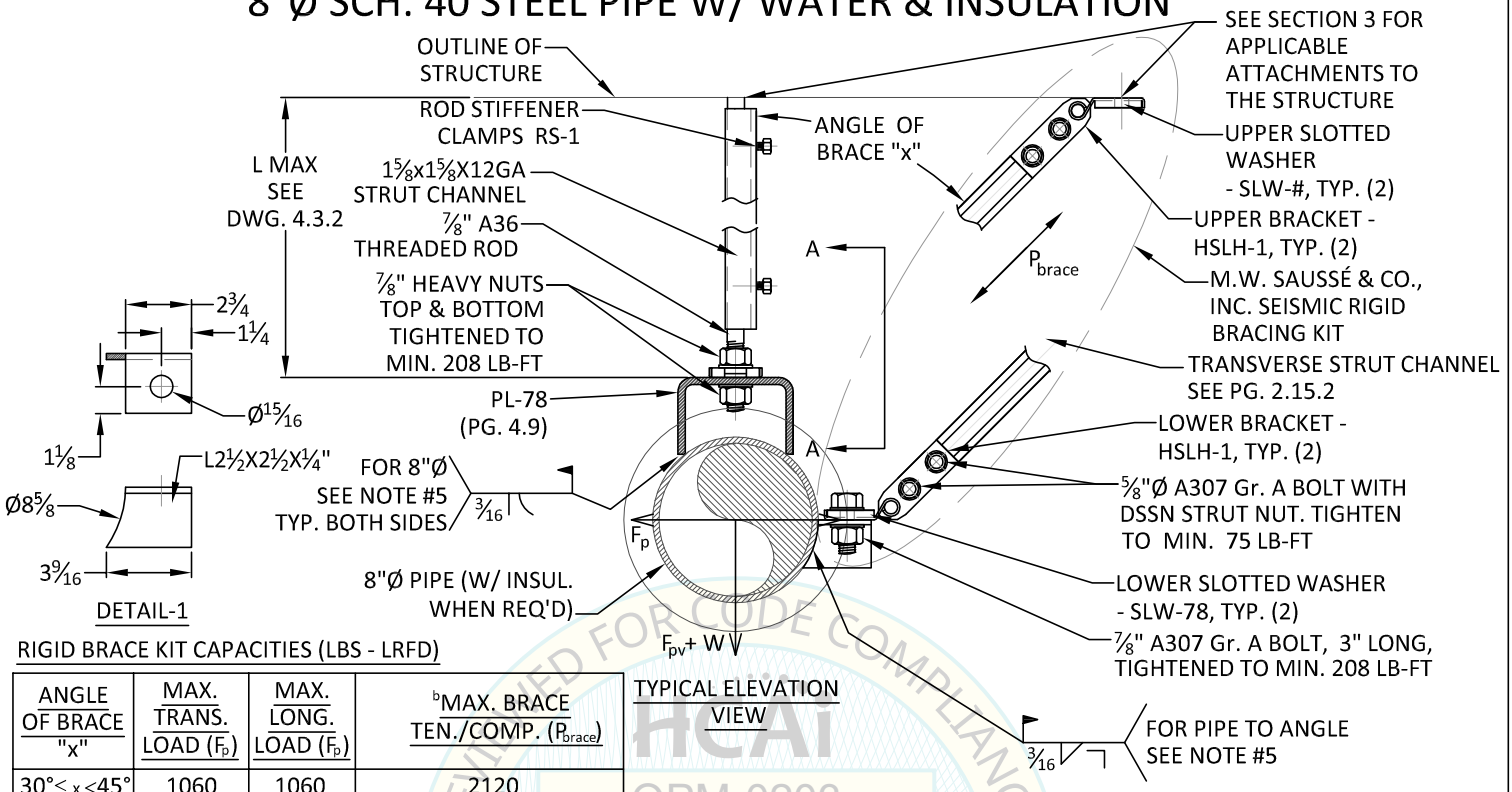
Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050

Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: 2.2.19

Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 8"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION

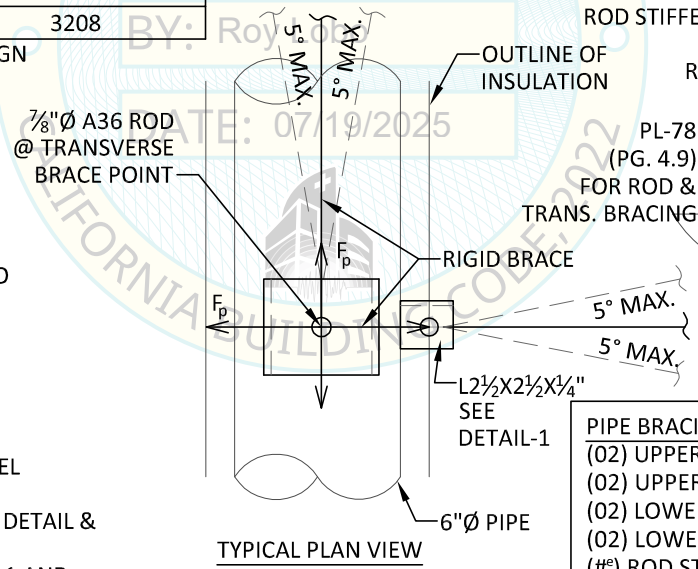



TYPICAL ELEVATION VIEW

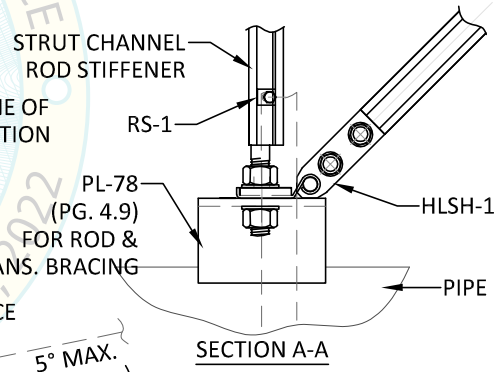
RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1060 | 1060 | 2120 |
| [a]45°≤ x <60° | 2206 | 2206 | 3120 |
| 60°= x | 2977 | 2977 | 3438 |
| [c]60°< x ≤90° | 3015 | 3015 | 3208 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW




SECTION A-A

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-PR-78R-1R:
(02) UPPER BRACKET - HSLH-1
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-1
(02) LOWER SLOTTED WASHER - SLW-78
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(01) PIPE LUG - PL-78

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.


REVIEWED FOR CODE COMPLIANCE WITH HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022



Vibrex® vibration & seismic control systems
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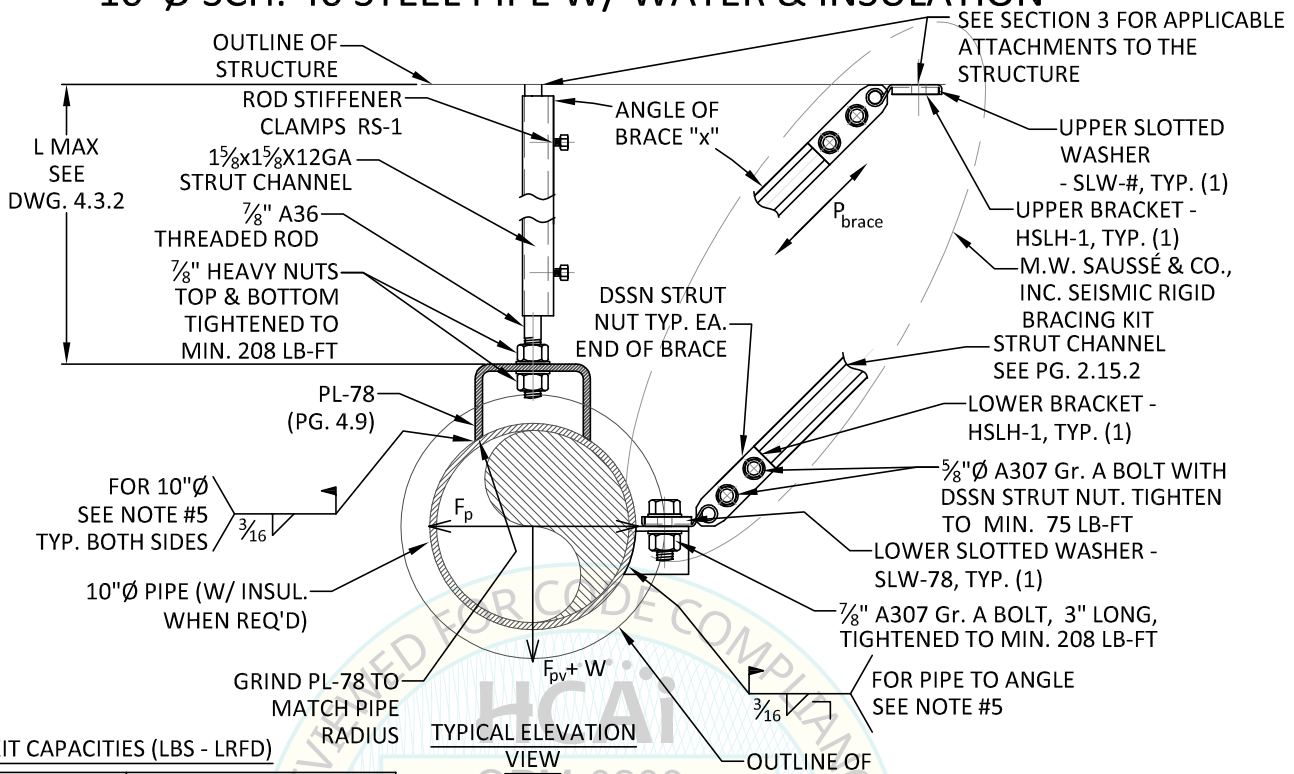
California PE No. S6481


Page No.: 2.2.20
Date: February 5, 2025

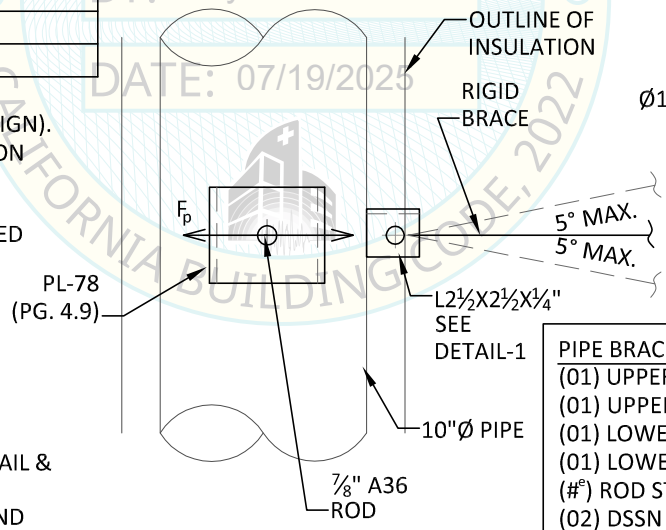
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 10"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION



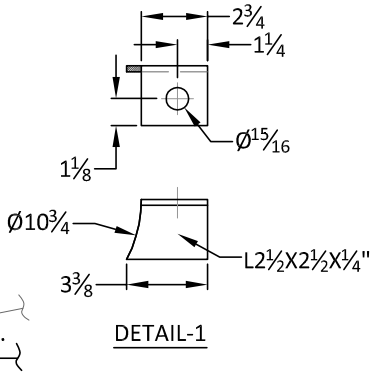

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1060 | 2120 |
| [a]45°≤ x <60° | 2206 | 3120 |
| 60°= x | 2977 | 3438 |
| [c]60°< x ≤90° | 3015 | 3208 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW




DETAIL-1

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-PR-78R-1R:
(01) UPPER BRACKET - HSLH-1
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-1
(01) LOWER SLOTTED WASHER - SLW-78
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-78

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.


APPROVED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022



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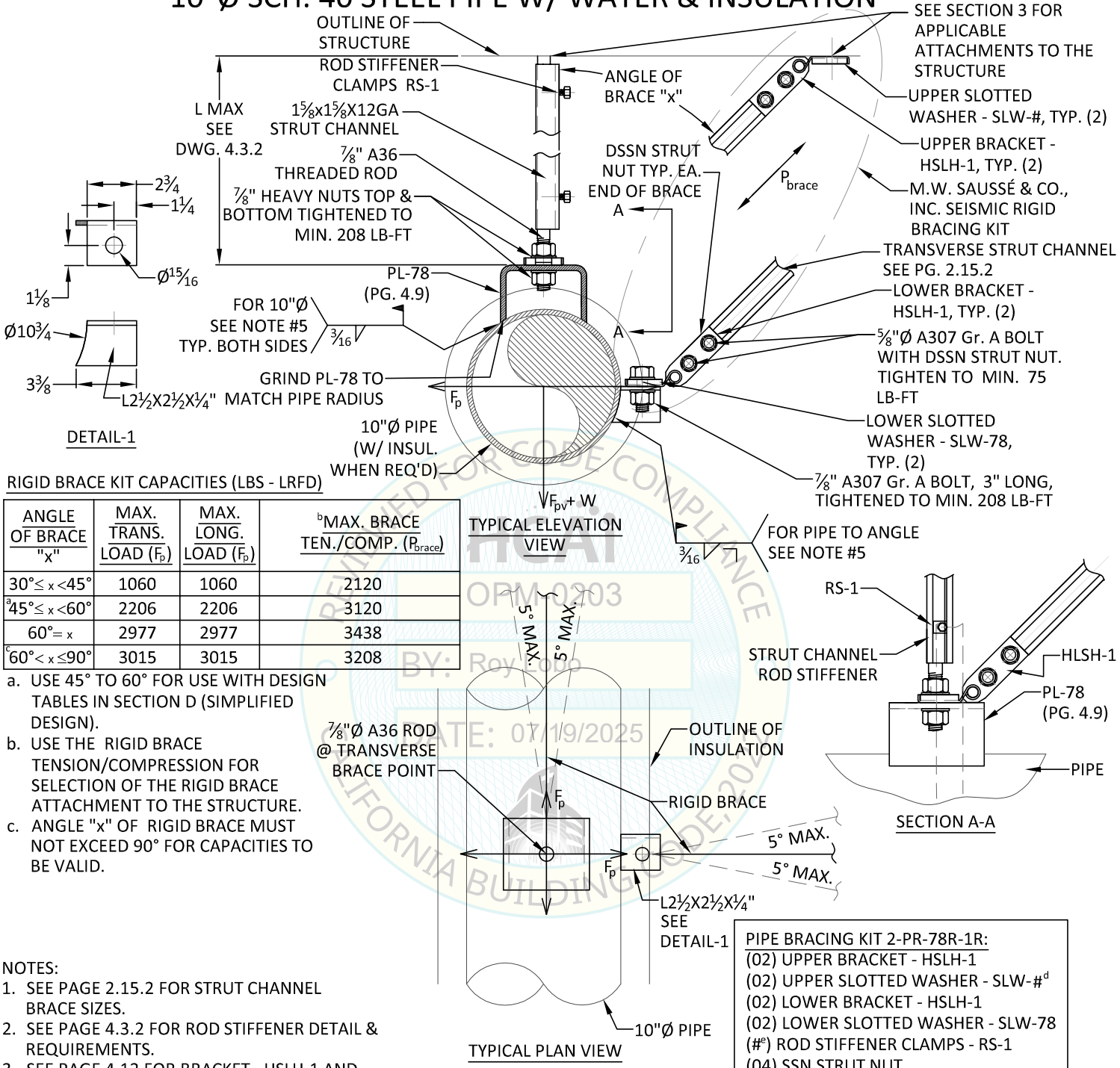
Structural Engineer: M. Tremblay
California PE No. S6481


Page No.: **2.2.21**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
# 10"Ø SCH. 40 STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1060 | 1060 | 2120 |
| [a]45°≤ x <60° | 2206 | 2206 | 3120 |
| 60°= x | 2977 | 2977 | 3438 |
| [c]60°< x ≤90° | 3015 | 3015 | 3208 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-PR-78R-1R:
(02) UPPER BRACKET - HSLH-1
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-1
(02) LOWER SLOTTED WASHER - SLW-78
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(01) PIPE LUG - PL-78

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.


ICC-ES REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE



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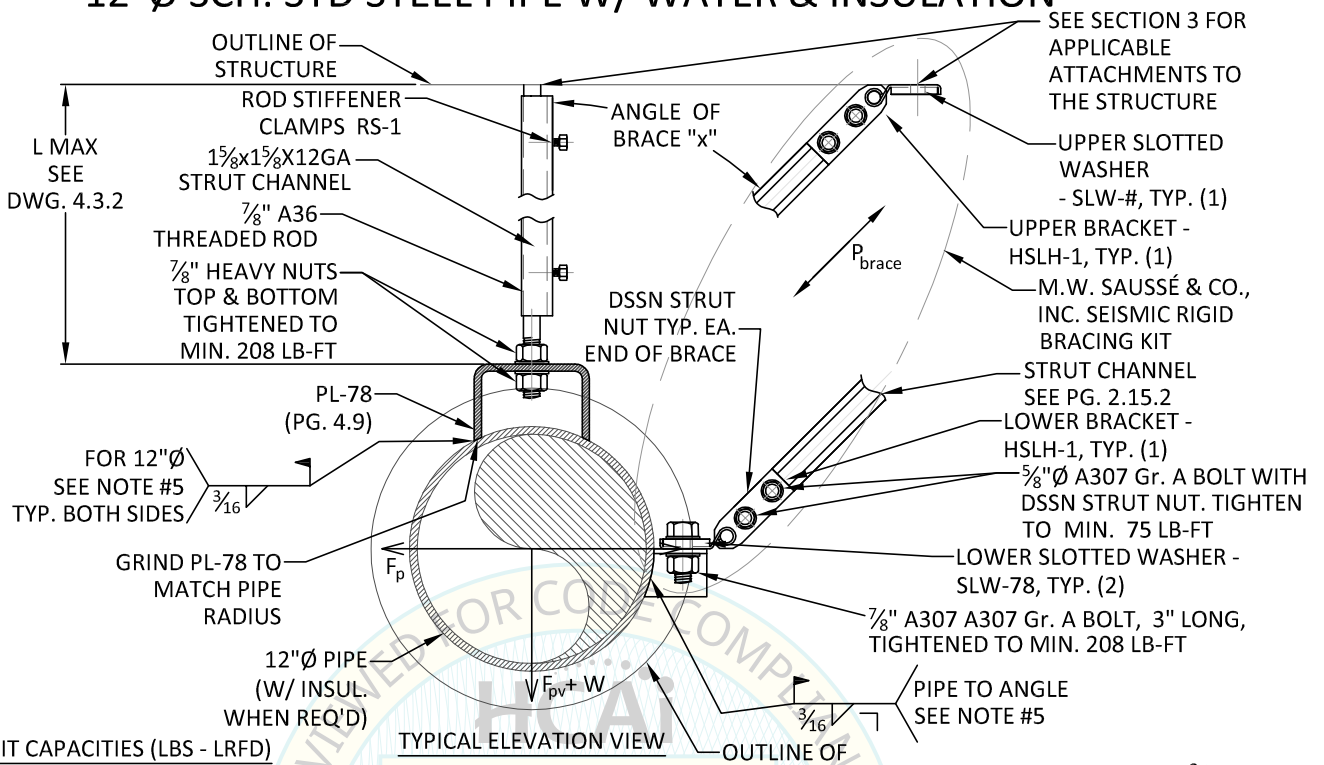
Page No.: **2.2.22**
Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 12"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION

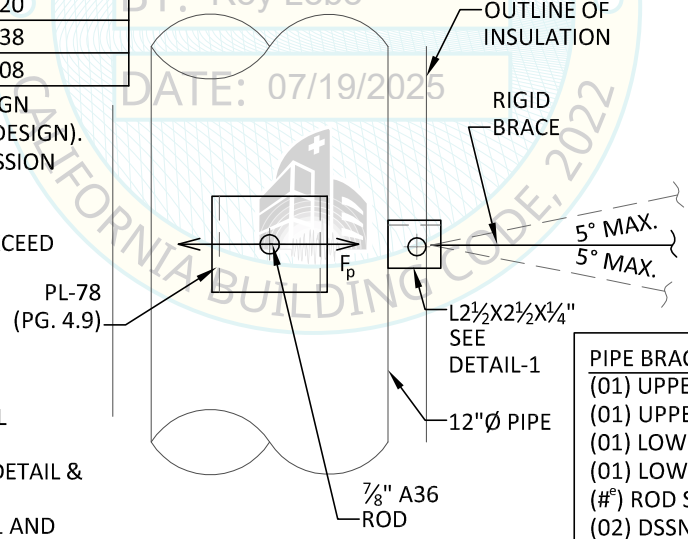



TYPICAL ELEVATION VIEW

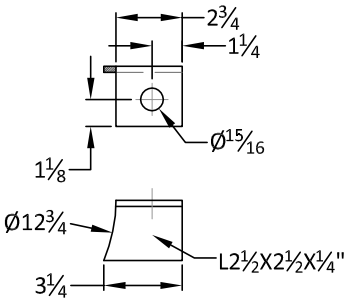
RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1060 | 2120 |
| [a]45°≤ x <60° | 2206 | 3120 |
| 60°= x | 2977 | 3438 |
| [c]60°< x ≤70° | 3015 | 3208 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW




DETAIL-1

PIPE BRACING KIT 1-PR-78R-1R:
(01) UPPER BRACKET - HSLH-1
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-1
(01) LOWER SLOTTED WASHER - SLW-78
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-78

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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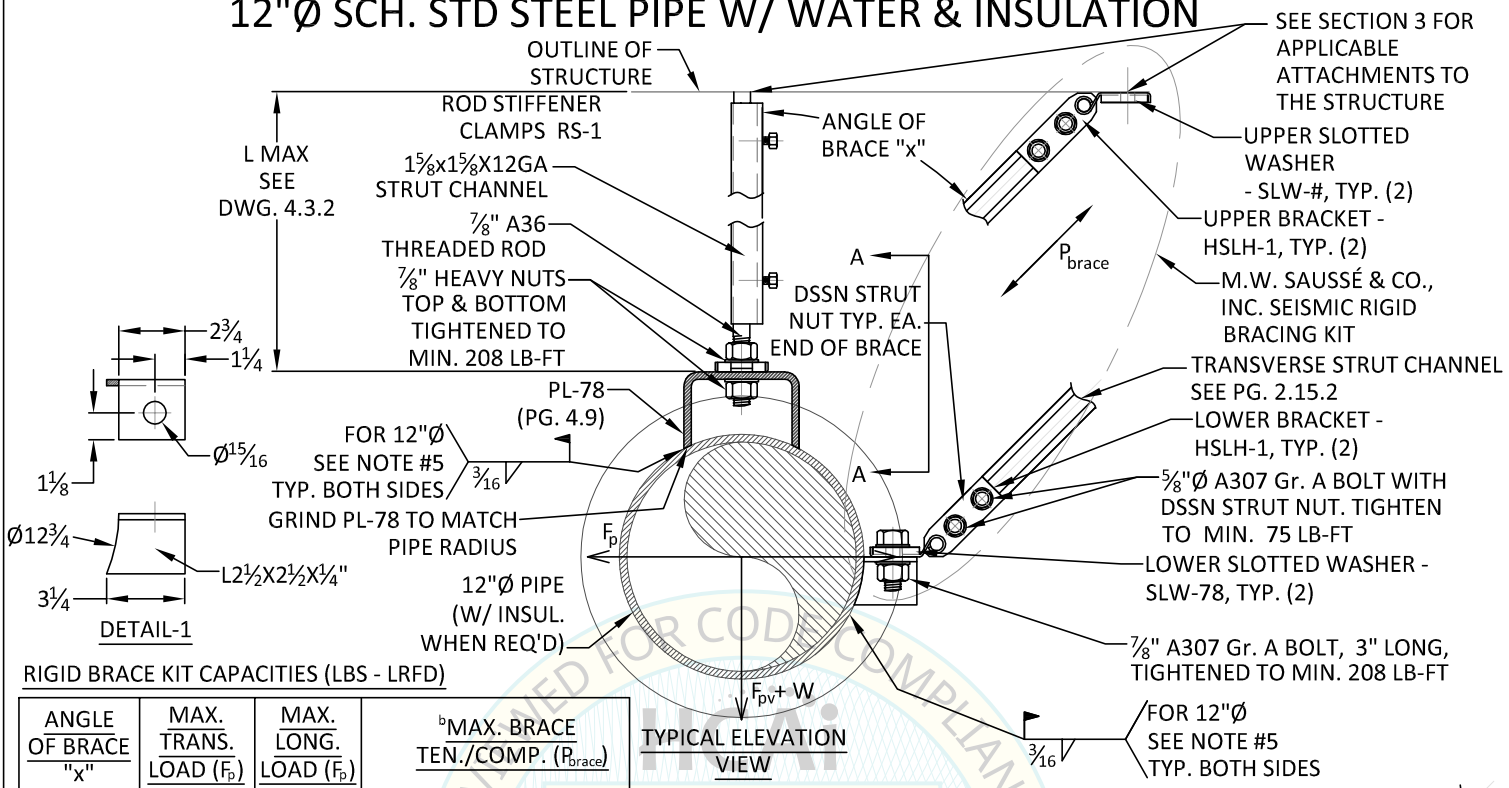
Page No.: **2.2.23**
Date: **February 5, 2025**

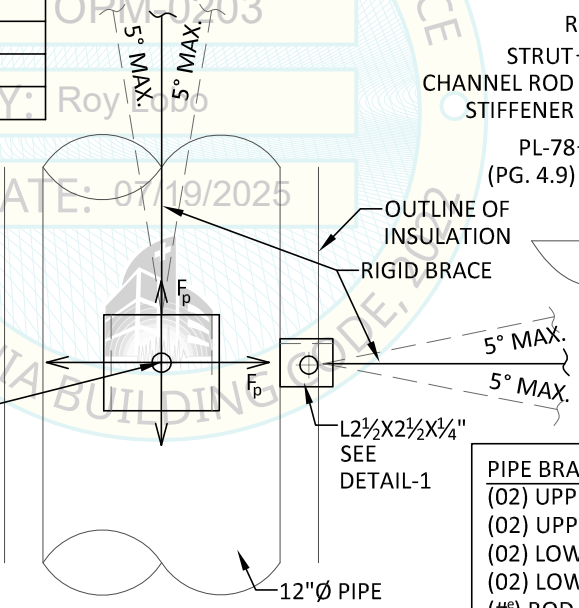
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 12"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION



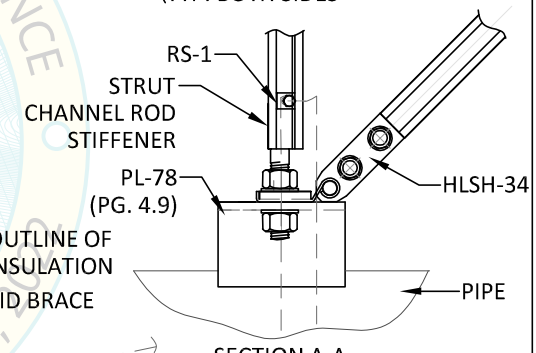

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1060 | 1060 | 2120 |
| [a]45°≤ x <60° | 2206 | 2206 | 3120 |
| 60°= x | 2977 | 2977 | 3438 |
| [c]60°< x ≤70° | 3015 | 3015 | 3208 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW




SECTION A-A

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-PR-78R-1R:
(02) UPPER BRACKET - HSLH-1
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-1
(02) LOWER SLOTTED WASHER - SLW-78
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(02) PIPE LUG - PL-78

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE

Vibrex® vibration & seismic control systems
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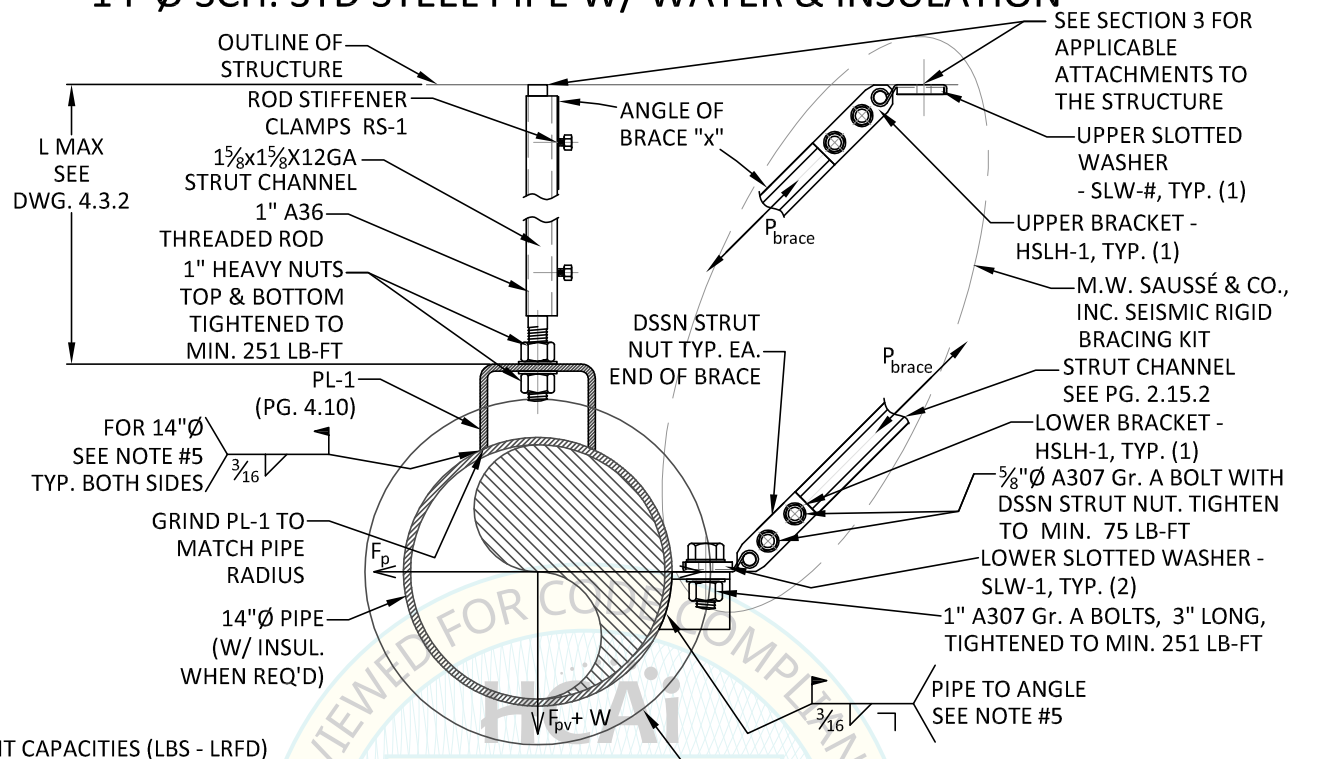
Page No.: **2.2.24**
Date: **February 5, 2025**

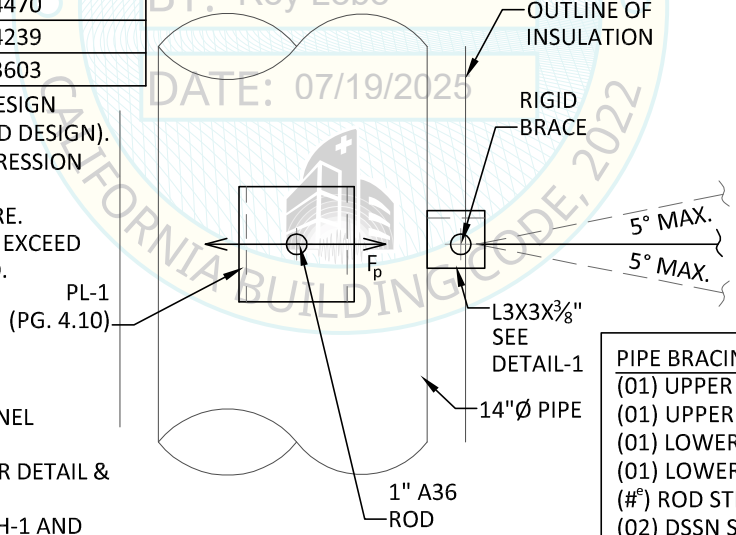
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 14"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION

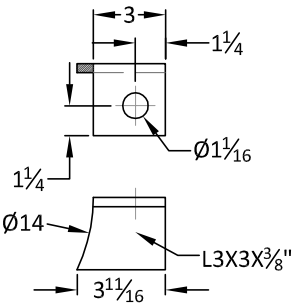



RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1217 | 2434 |
| [a]45°≤ x <60° | 3161 | 4470 |
| 60°= x | 3671 | 4239 |
| [c]60°< x ≤70° | 3386 | 3603 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




DETAIL-1

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-PR-1R-1R:
(01) UPPER BRACKET - HSLH-1
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-1
(01) LOWER SLOTTED WASHER - SLW-1
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-1

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

OPM-0203 REVIEWED FOR CODE COMPLIANCE BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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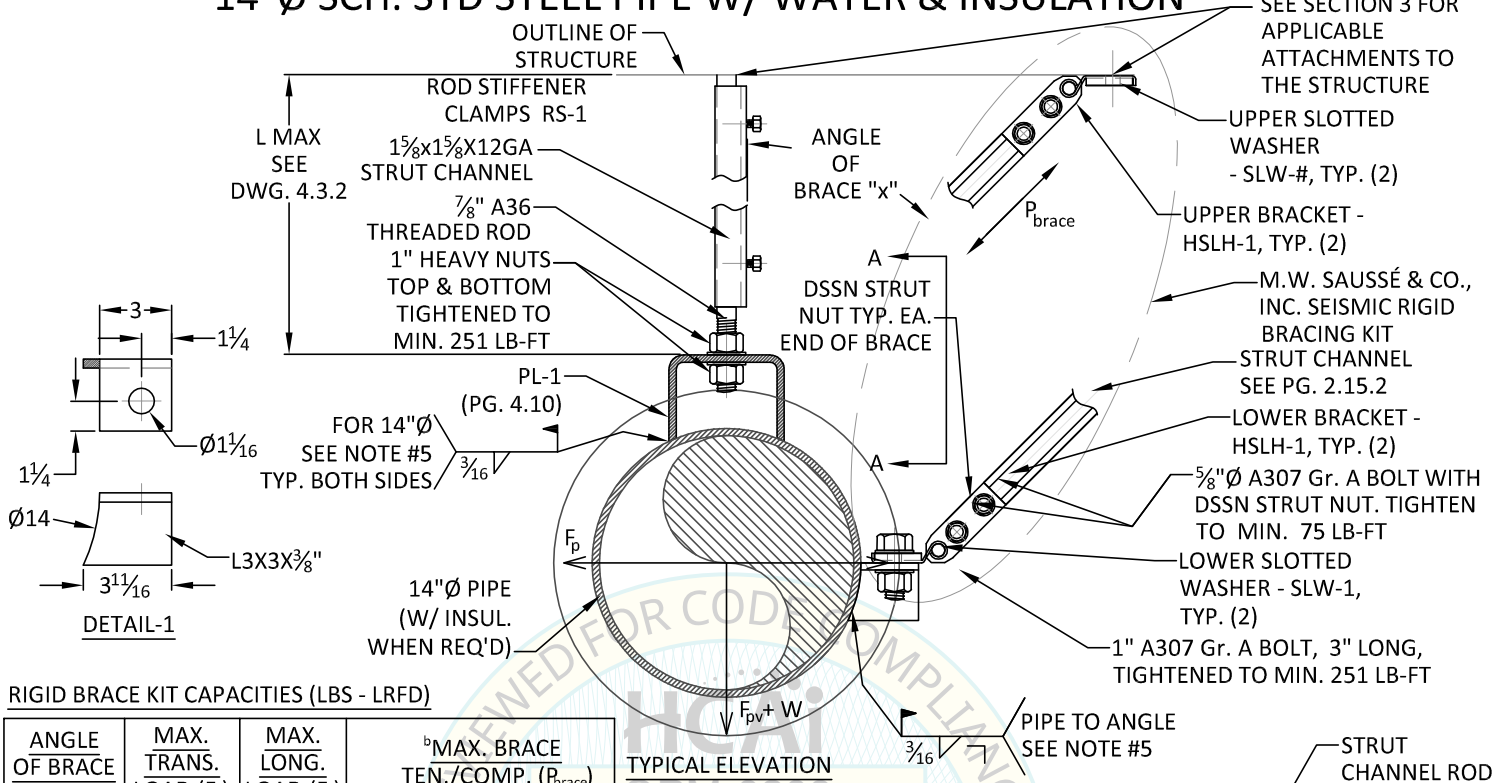
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: **2.2.25**

Date: February 5, 2025

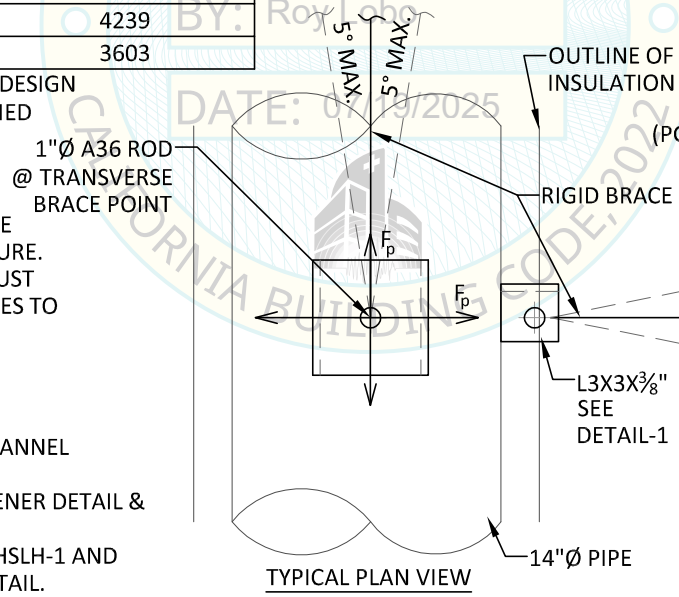
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 14"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION

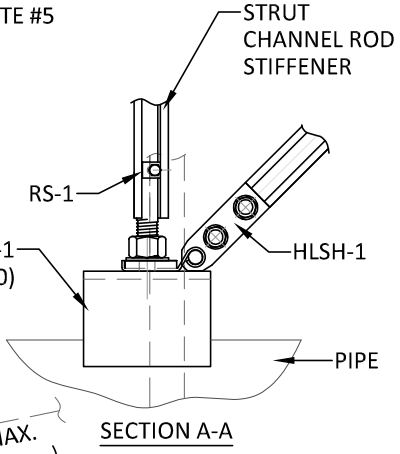



RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1217 | 1217 | 2434 |
| [a]45°≤ x <60° | 3161 | 3161 | 4470 |
| 60°= x | 3671 | 3671 | 4239 |
| [c]60°< x ≤70° | 3386 | 3386 | 3603 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-PR-1R-1R:
(02) UPPER BRACKET - HSLH-1
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-1
(02) LOWER SLOTTED WASHER - SLW-1
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(01) PIPE LUG - PL-1

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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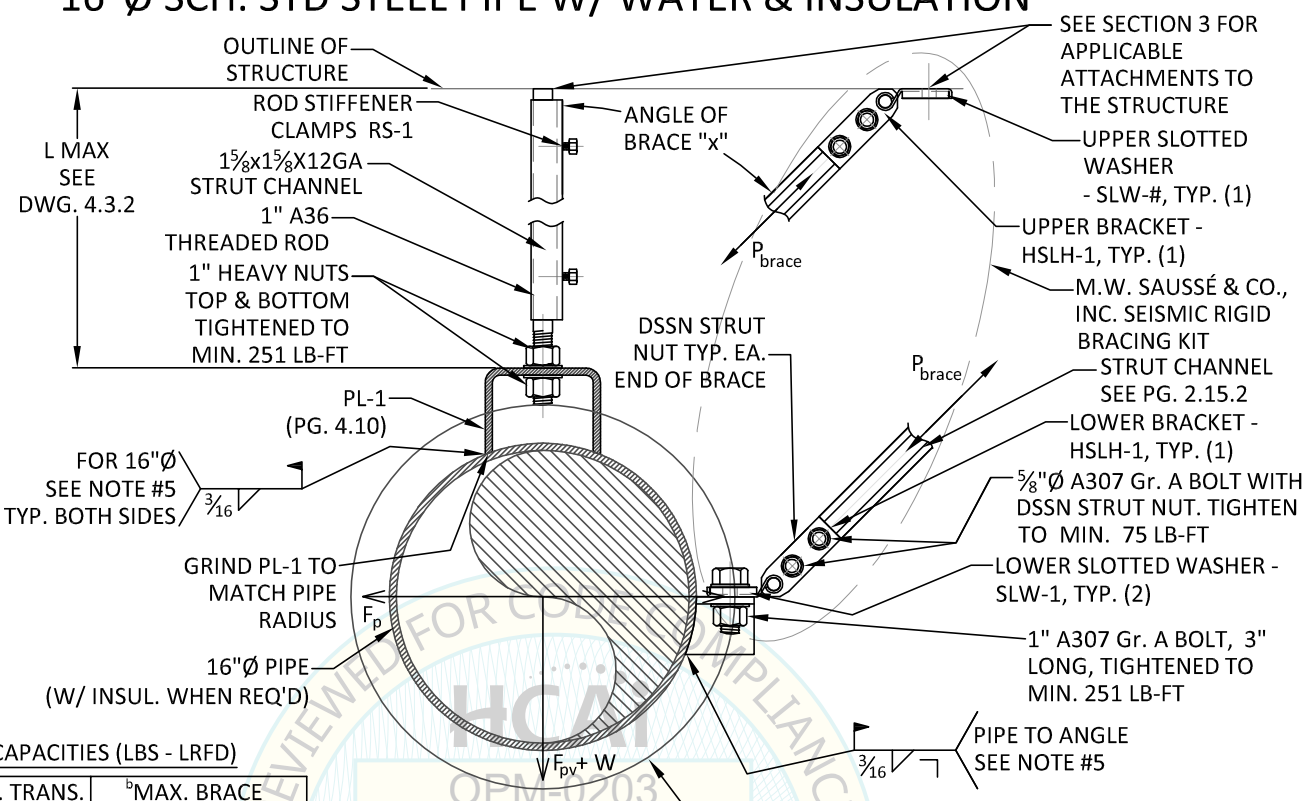
Page No.: **2.2.26**
Date: **February 5, 2025**

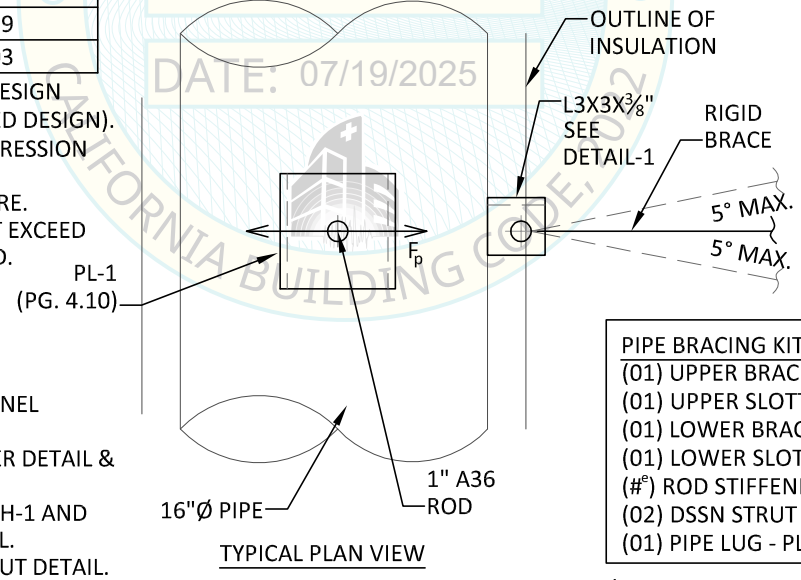
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 16"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION

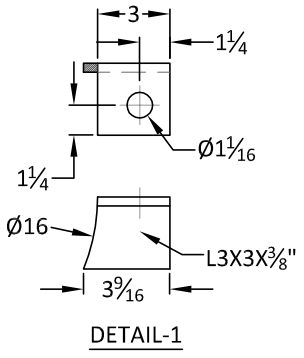



RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1217 | 2434 |
| [a]45°≤ x <60° | 3161 | 4470 |
| 60°= x | 3671 | 4239 |
| [c]60°< x ≤90° | 3120 | 3603 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-PR-1R-1R:
(01) UPPER BRACKET - HSLH-1
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-1
(01) LOWER SLOTTED WASHER - SLW-1
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-1

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

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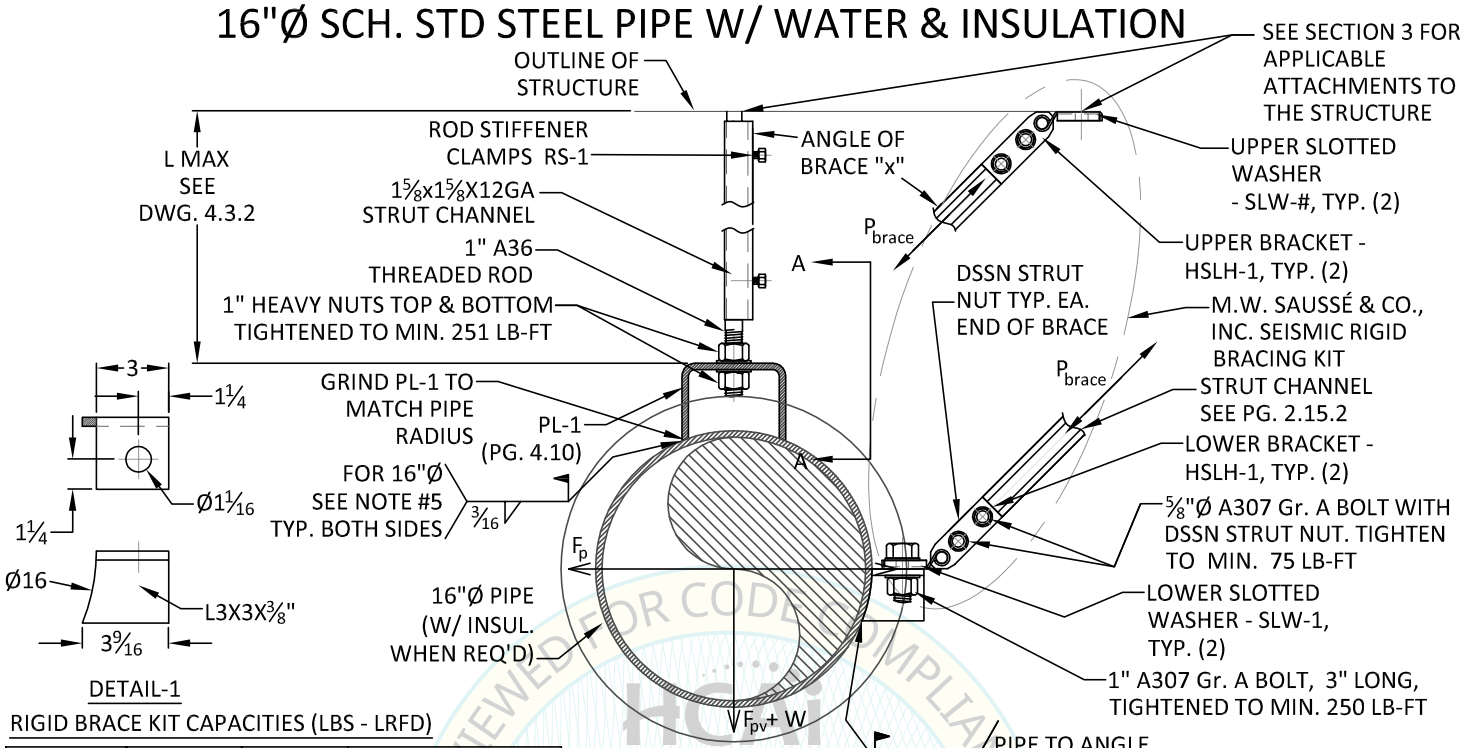
Page No.: **2.2.27**

Date: **February 5, 2025**

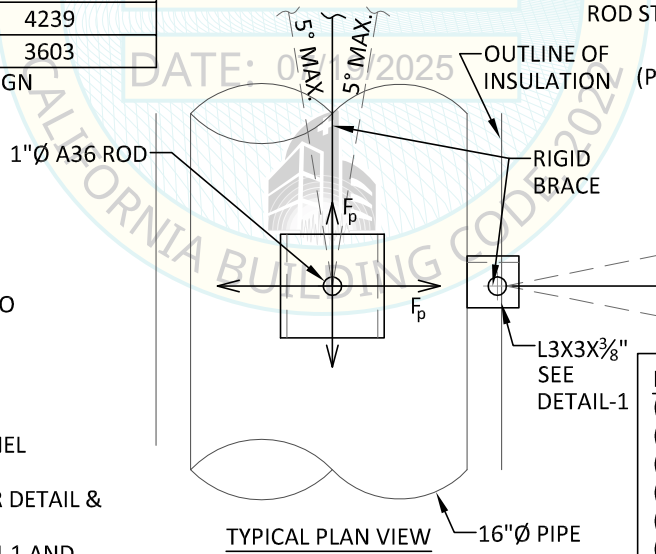
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 16"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION

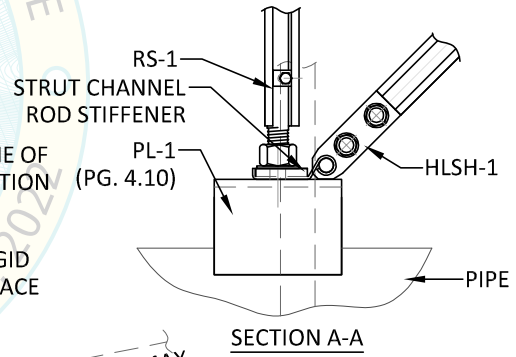



RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1217 | 1217 | 2434 |
| [a]45°≤ x <60° | 3161 | 3161 | 4470 |
| 60°= x | 3671 | 3671 | 4239 |
| [c]60°< x ≤90° | 3120 | 3120 | 3603 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-PR-1R-1R:
(02) UPPER BRACKET - HSLH-1
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-1
(02) LOWER SLOTTED WASHER - SLW-1
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(01) PIPE LUG - PL-1

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

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OPM-0203
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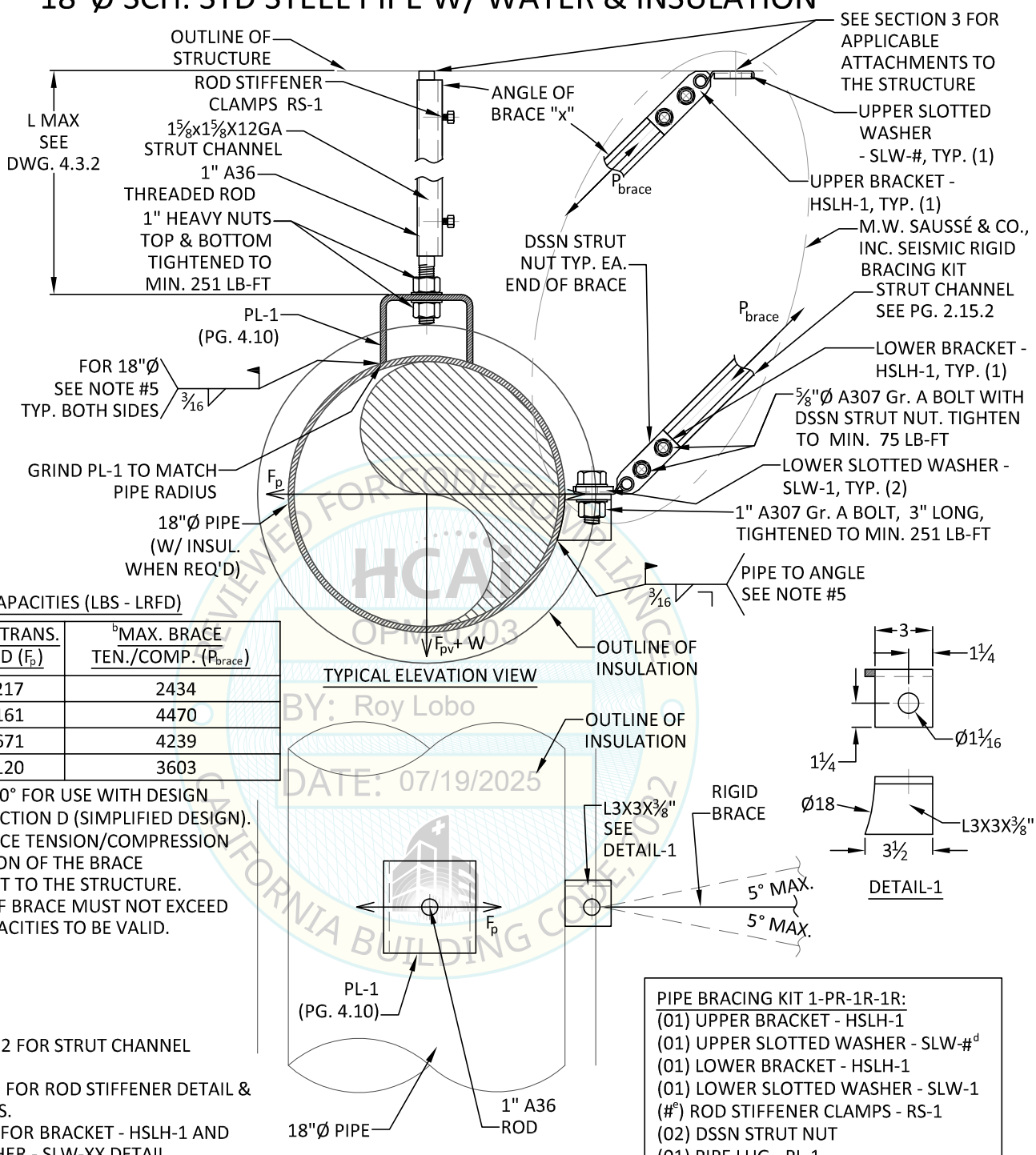
# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - TRANSVERSE
# 18"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1217 | 2434 |
| [a]45°≤ x <60° | 3161 | 4470 |
| 60°= x | 3671 | 4239 |
| [c]60°< x ≤90° | 3120 | 3603 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION/COMPRESSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-1 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR DSSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 1-PR-1R-1R:
(01) UPPER BRACKET - HSLH-1
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-1
(01) LOWER SLOTTED WASHER - SLW-1
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT
(01) PIPE LUG - PL-1

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.

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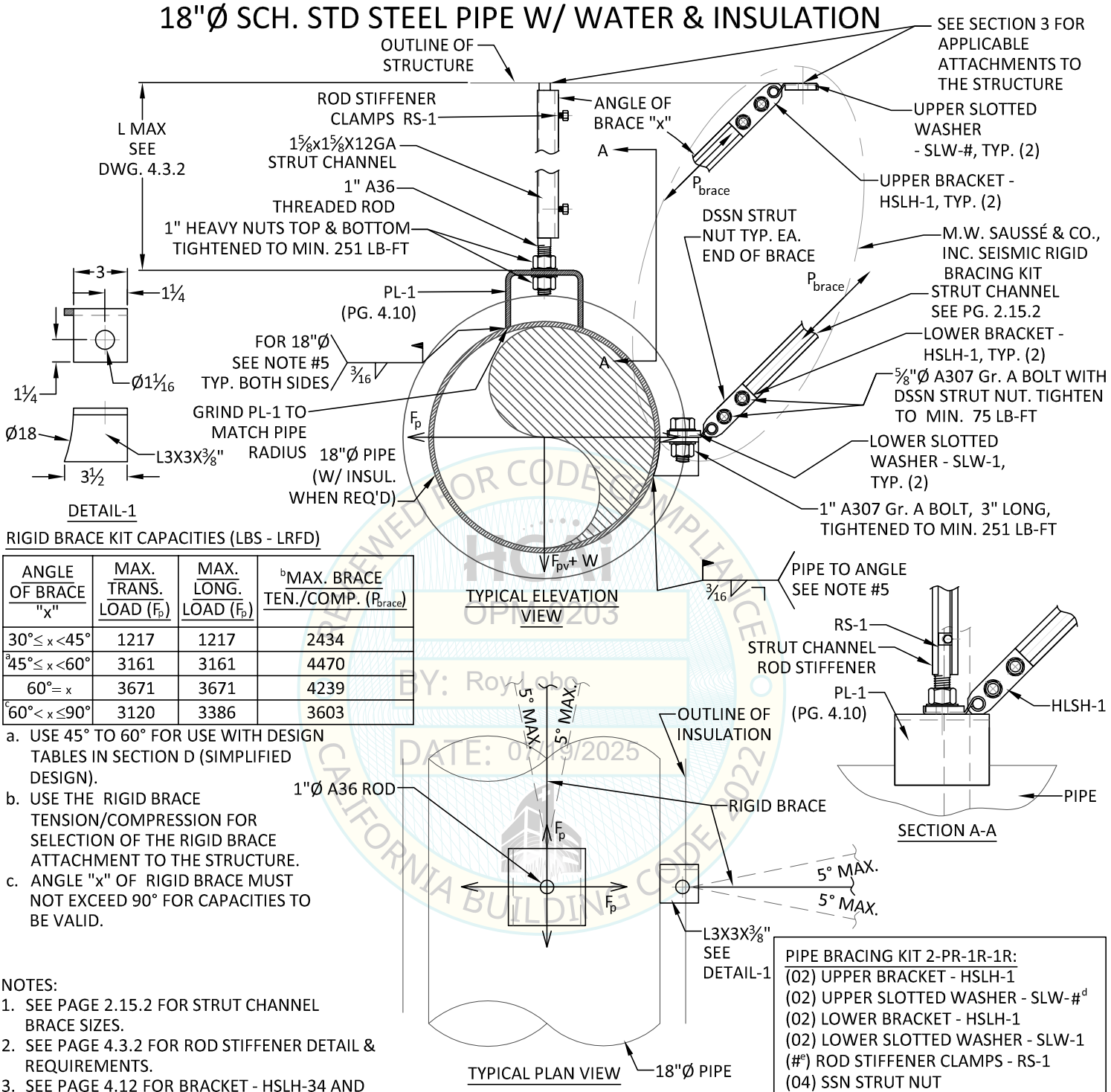
Page No.: 2.2.29
Date: February 5, 2025

# RIGID BRACING SYSTEM - SINGLE HUNG PIPE - LONGITUDINAL & TRANSVERSE
## 18"Ø SCH. STD STEEL PIPE W/ WATER & INSULATION




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | MAX. LONG. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|---|
| 30°≤ x <45° | 1217 | 1217 | 2434 |
| [a]45°≤ x <60° | 3161 | 3161 | 4470 |
| 60°= x | 3671 | 3671 | 4239 |
| [c]60°< x ≤90° | 3120 | 3386 | 3603 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE RIGID BRACE TENSION/COMPRESSION FOR SELECTION OF THE RIGID BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF RIGID BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

NOTES:
1. SEE PAGE 2.15.2 FOR STRUT CHANNEL BRACE SIZES.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.12 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. WELDING OF PIPE LUG & ANGLE MAY BE PERFORMED IN A SHOP. THE SPACING OF THE LUGS ALONG THE PIPE SECTIONS MUST BE COORDINATED WITH THE FINAL DESIGN SPACING.

PIPE BRACING KIT 2-PR-1R-1R:
(02) UPPER BRACKET - HSLH-1
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - HSLH-1
(02) LOWER SLOTTED WASHER - SLW-1
(#[e]) ROD STIFFENER CLAMPS - RS-1
(04) SSN STRUT NUT
(01) PIPE LUG - PL-1

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED ON L MAX.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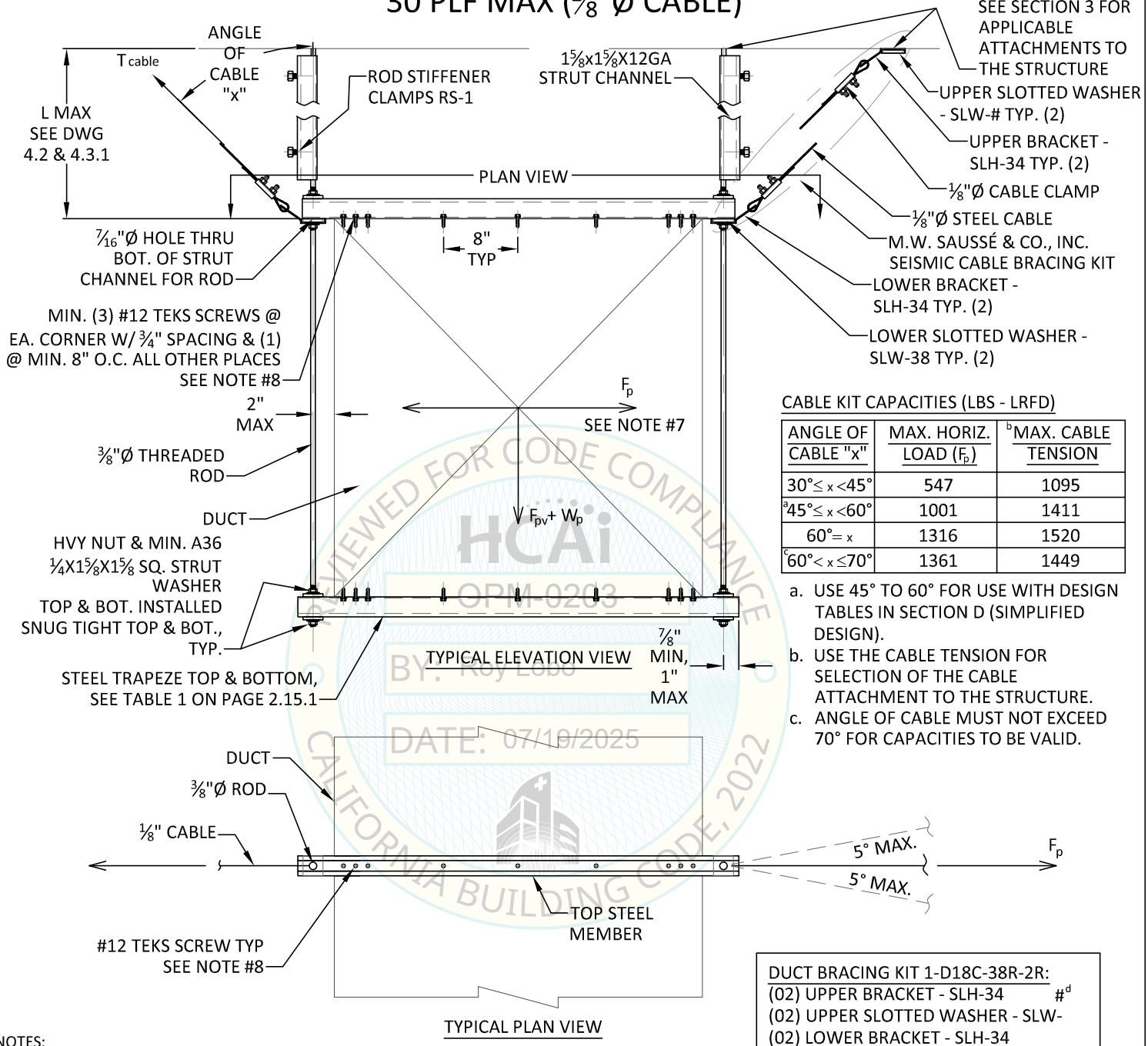
Page No.: **2.2.30**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE
# 30 PLF MAX (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-D18C-38R-2R:
(02) UPPER BRACKET - SLH-34 #[d]
(02) UPPER SLOTTED WASHER - SLW-
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_P$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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BY: Roy Lobo
DATE: 07/19/2025
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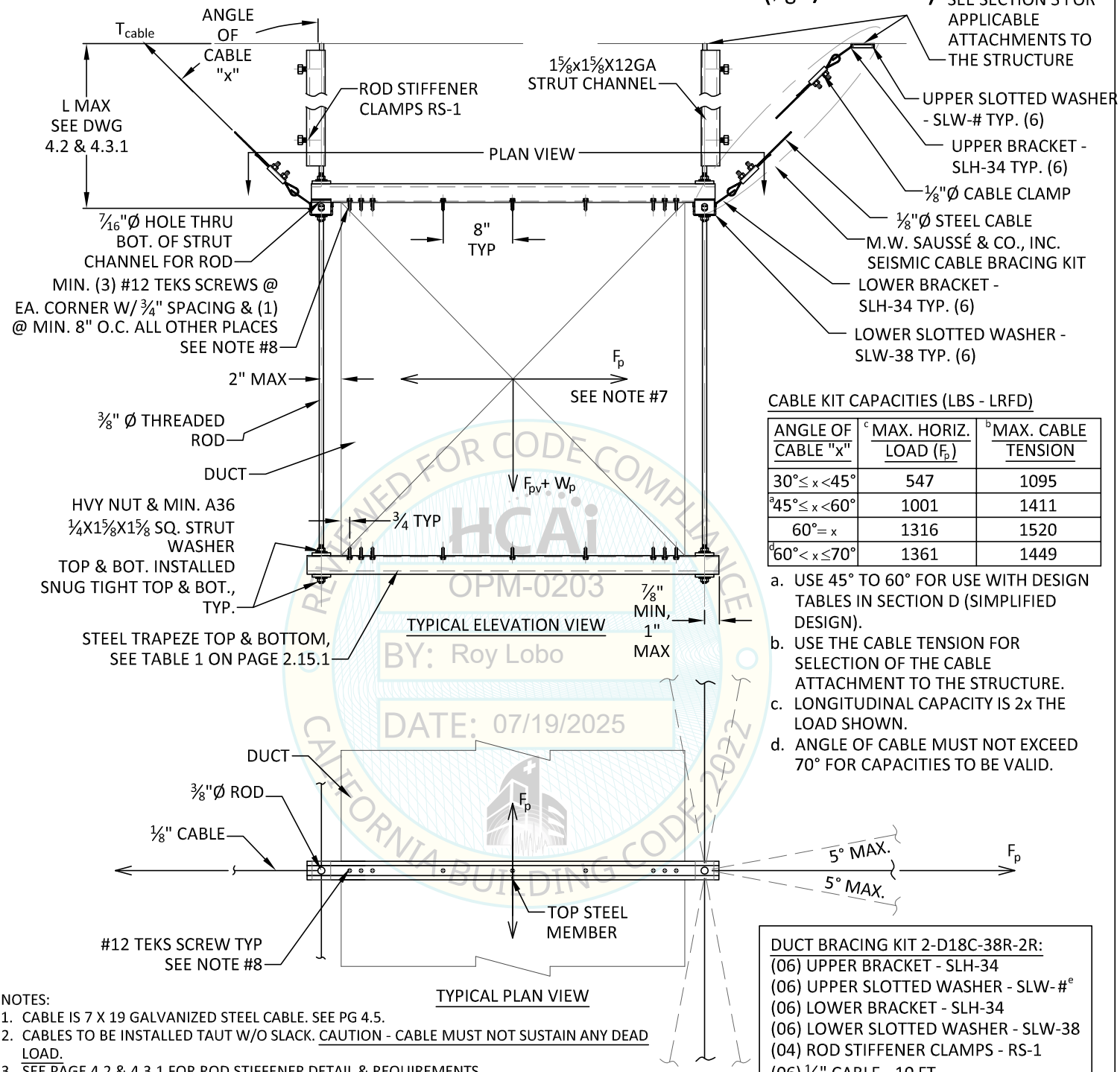
Page No.: **2.7.1**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT
# TRANSVERSE & LONGITUDINAL - 30 PLF MAX (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c] MAX. HORIZ. LOAD ($F_p$) | [b] MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a] 45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [d] 60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 2-D18C-38R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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DATE: 07/19/2025
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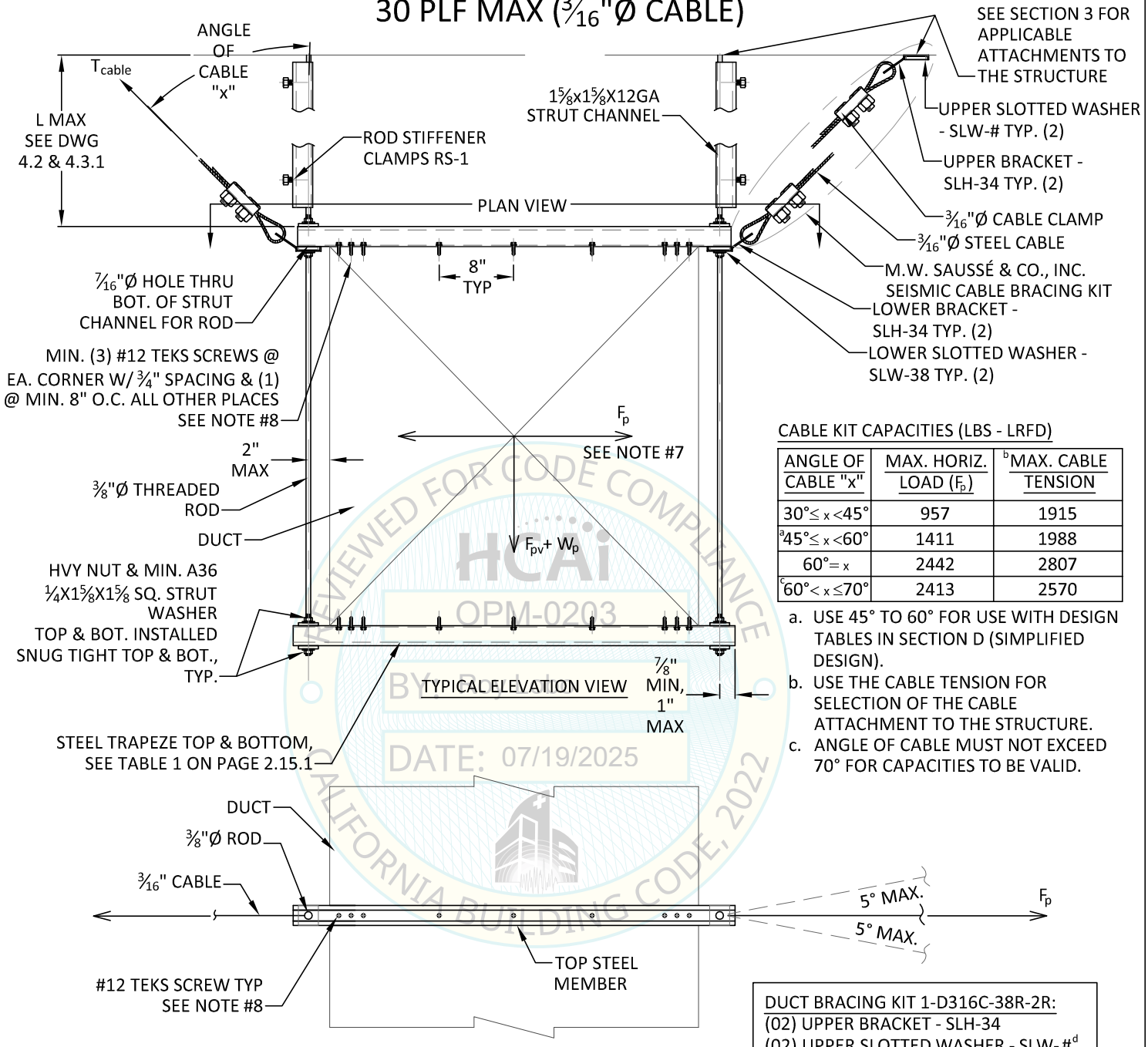
Page No.: **2.7.2**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE
## 30 PLF MAX (3/16"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| $30° \leq x < 45°$ | 957 | 1915 |
| [a]$45° \leq x < 60°$ | 1411 | 1988 |
| $60° = x$ | 2442 | 2807 |
| [c]$60° < x \leq 70°$ | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-D316C-38R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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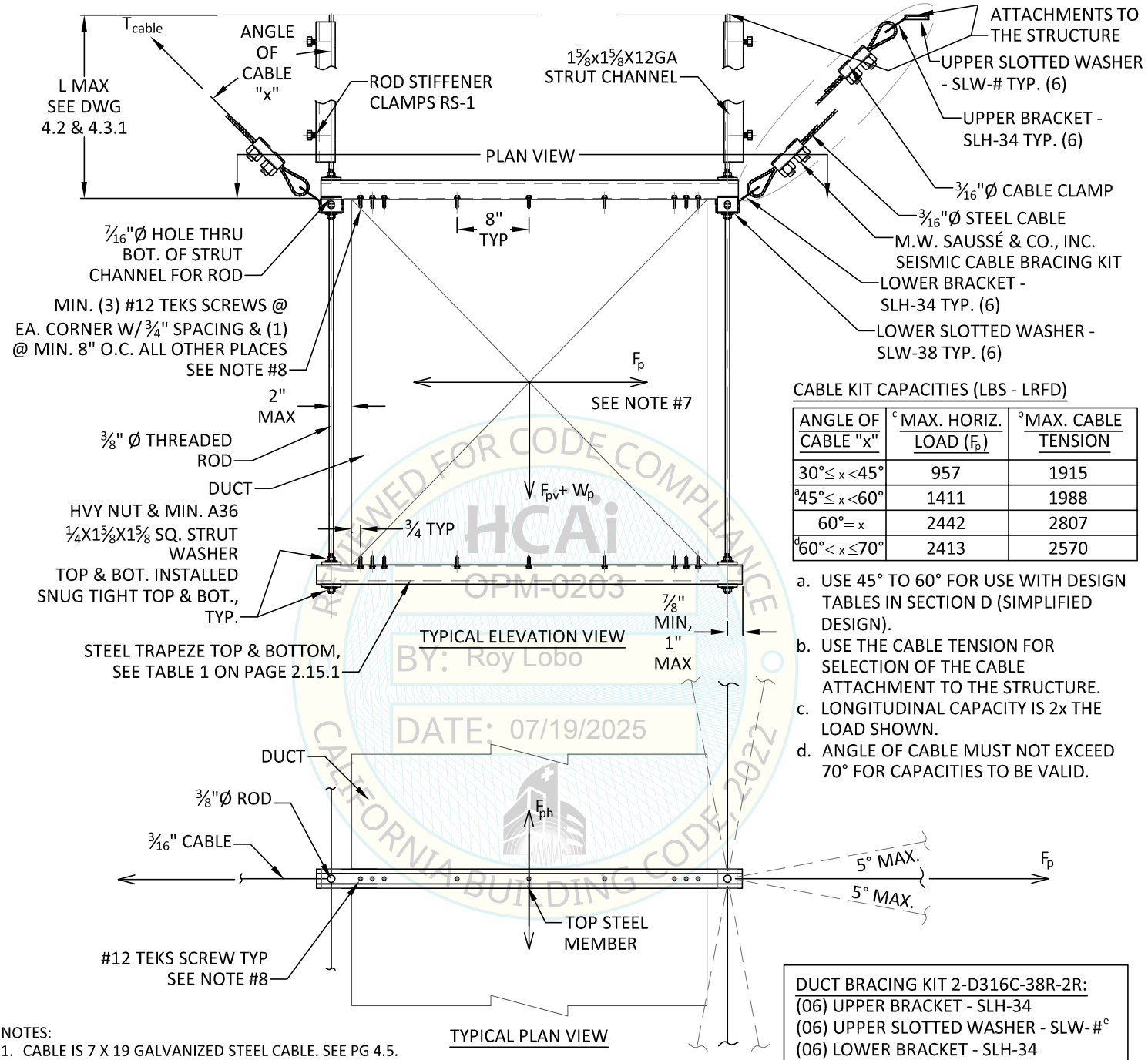
Page No.: **2.7.3**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT
# TRANSVERSE & LONGITUDINAL - 30 PLF MAX (3/16"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c] MAX. HORIZ. LOAD ($F_p$) | [b] MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a] 45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [d] 60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

DUCT BRACING KIT 2-D316C-38R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT.
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
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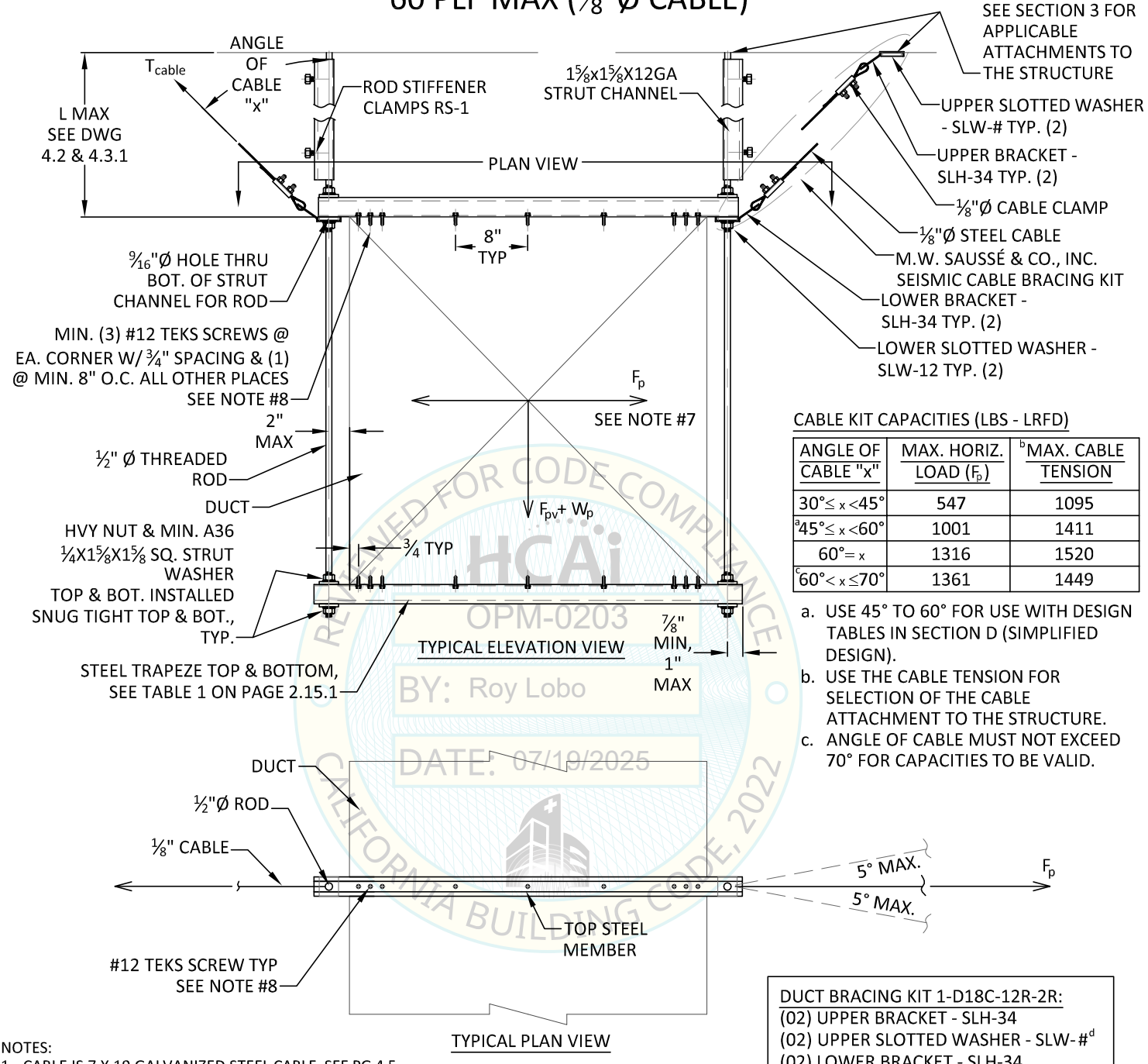
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.7.4**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE
# 60 PLF MAX (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-D18C-12R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE, 2022

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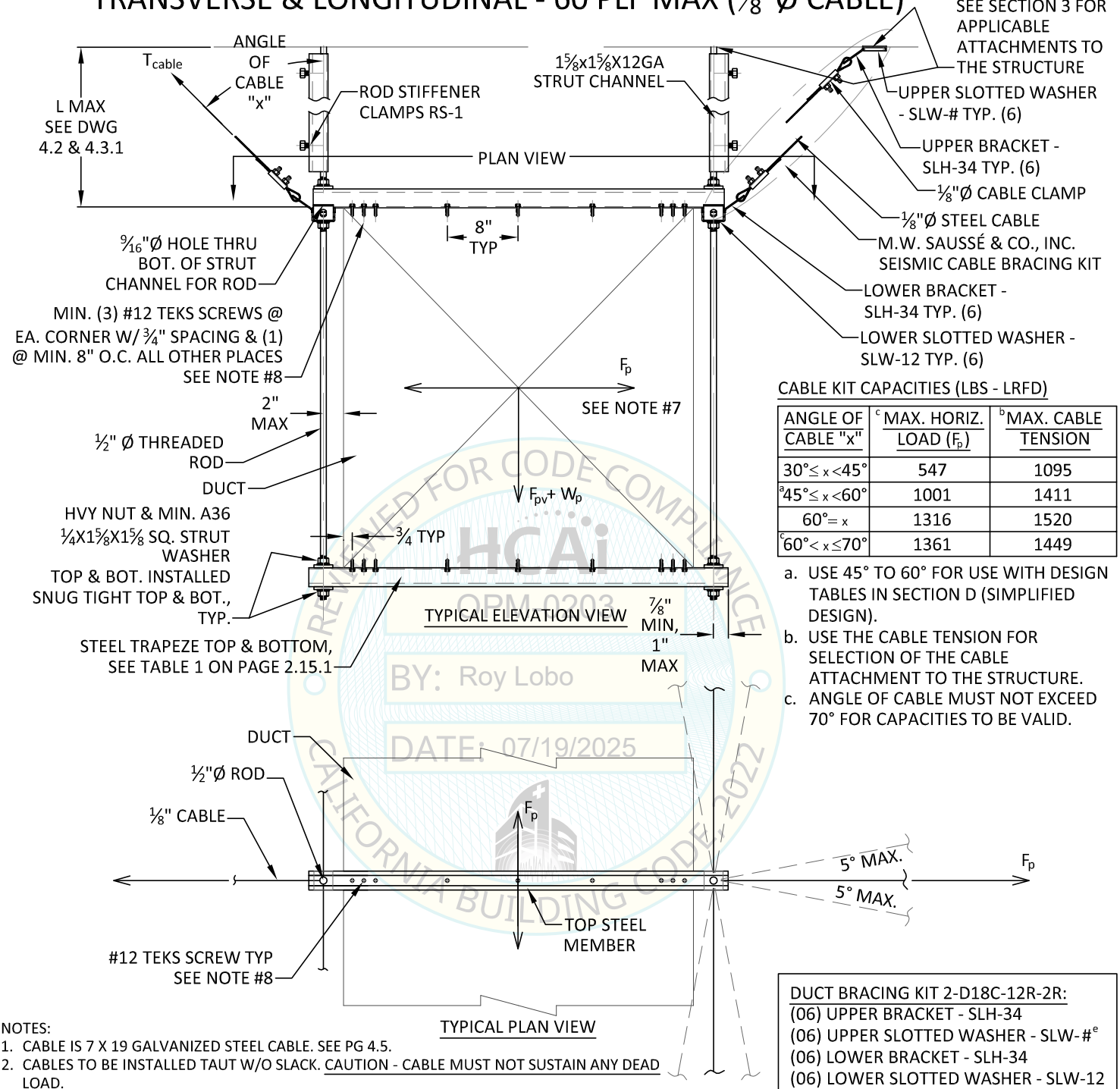
California PE No. S6481

Page No.: **2.7.5**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT
# TRANSVERSE & LONGITUDINAL - 60 PLF MAX (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c] MAX. HORIZ. LOAD ($F_p$) | [b] MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 2-D18C-12R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_P$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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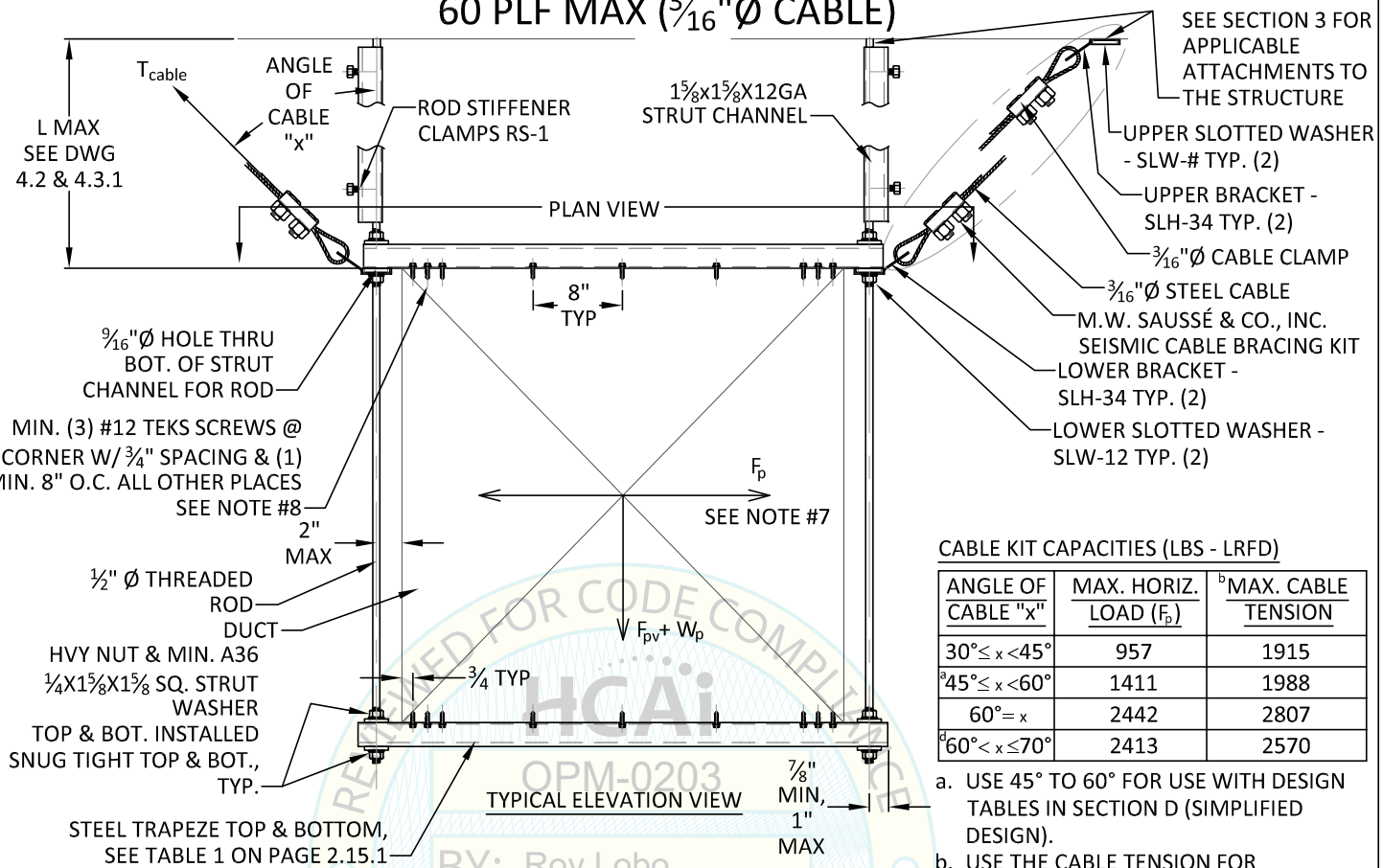
Page No.: **2.7.6**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE
## 60 PLF MAX (3/16"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [d]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-D316C-12R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_P$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).


REVIEWED FOR CODE COMPLIANCE
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OPM-0203
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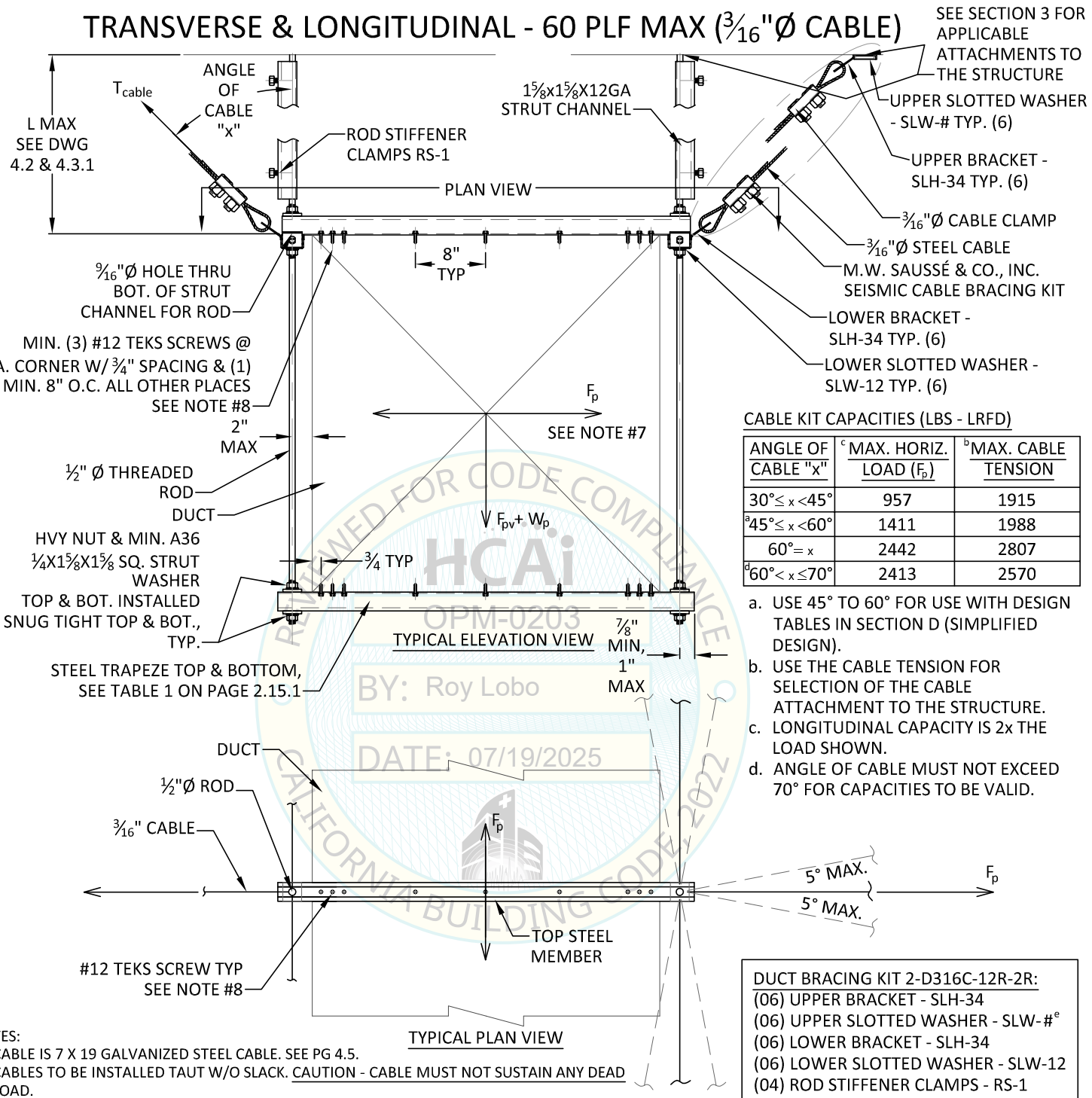
Page No.: **2.7.7**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT
# TRANSVERSE & LONGITUDINAL - 60 PLF MAX (3/16"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c] MAX. HORIZ. LOAD ($F_p$) | [b] MAX. CABLE TENSION |
|---|---|---|
| $30° \le x < 45°$ | 957 | 1915 |
| [a] $45° \le x < 60°$ | 1411 | 1988 |
| $60° = x$ | 2442 | 2807 |
| [d] $60° < x \le 70°$ | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 2-D316C-12R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

REVIEWED FOR CODE COMPLIANCE
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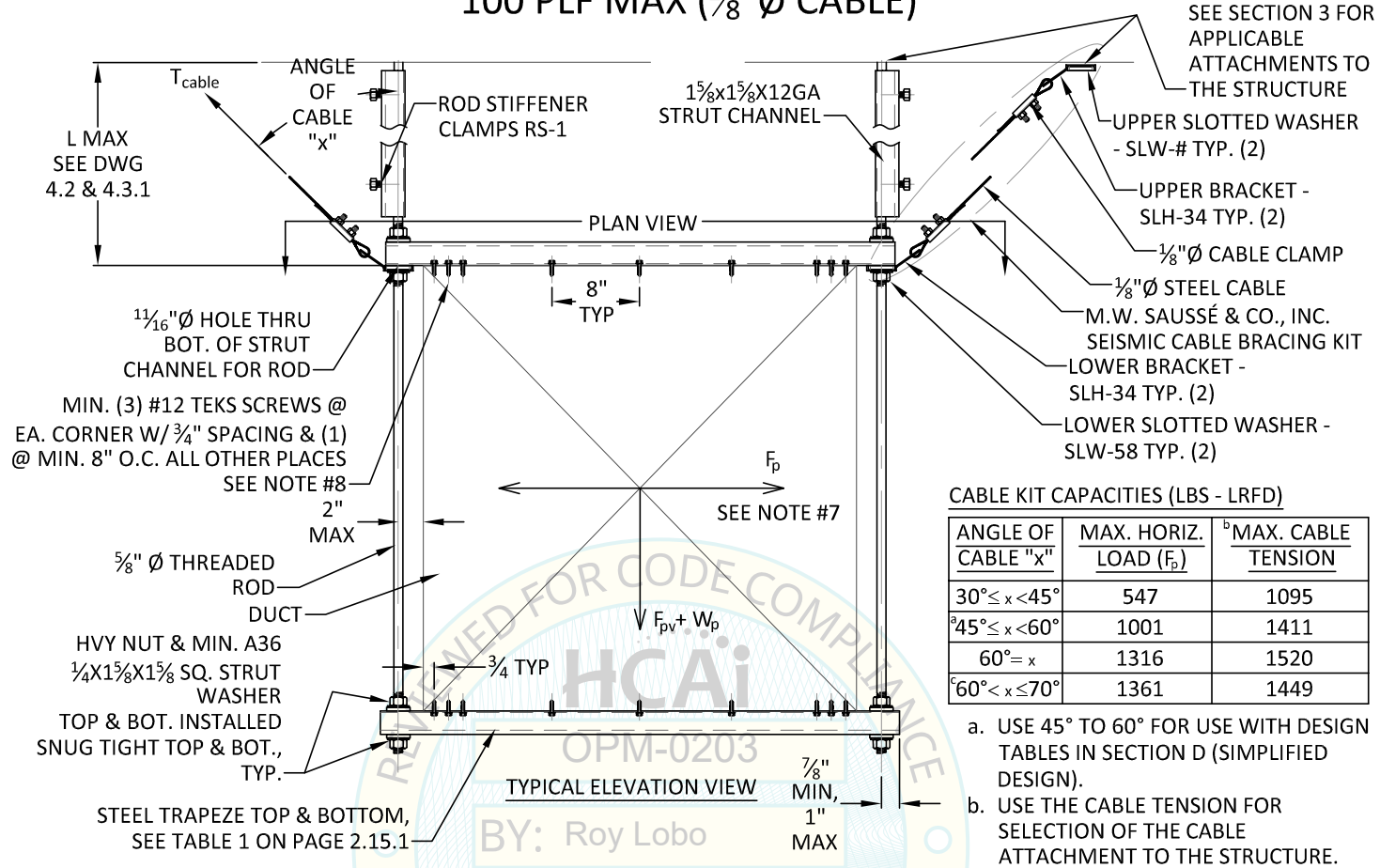
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.7.8**
Date: **February 5, 2025**

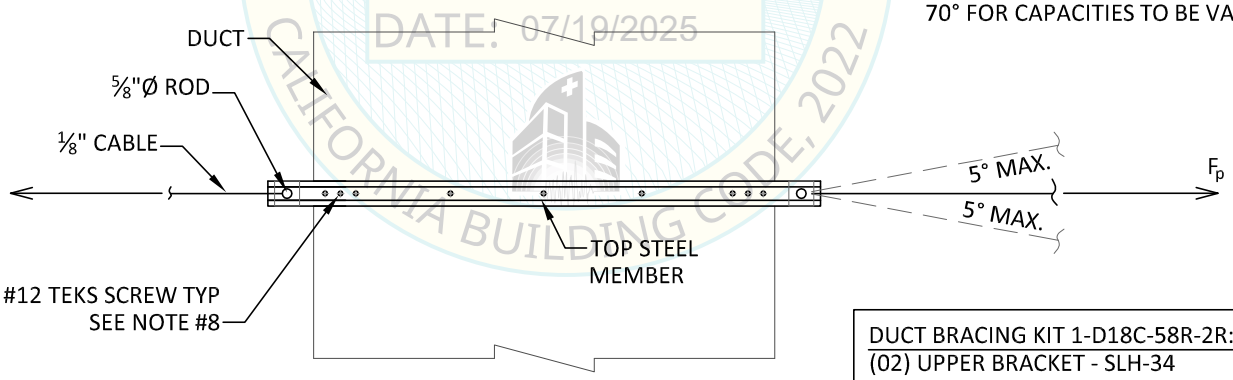
# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE
# 100 PLF MAX (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

DUCT BRACING KIT 1-D18C-58R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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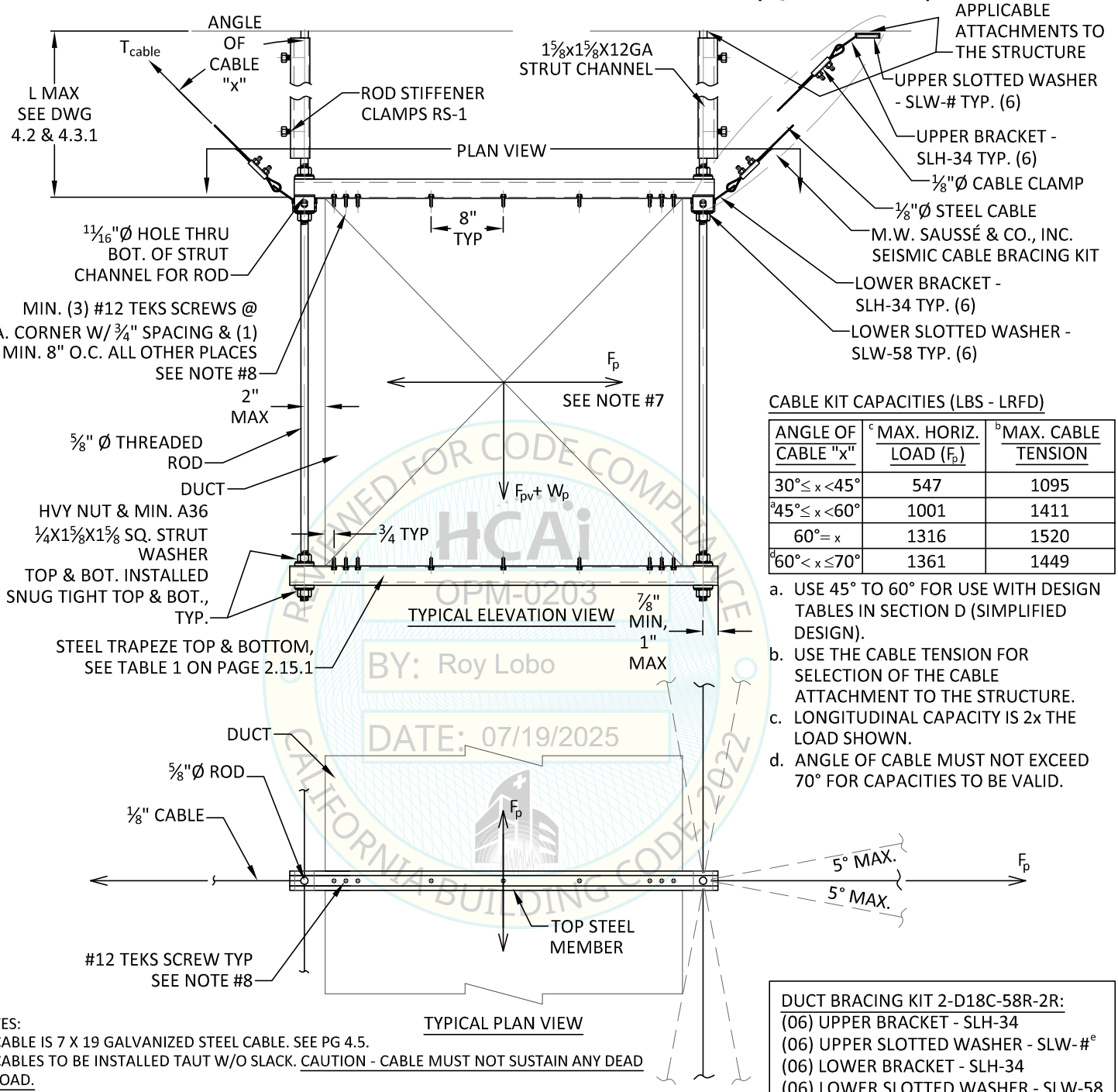
Page No.: **2.7.9**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT
# TRANSVERSE & LONGITUDINAL - 100 PLF MAX (⅛"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c] MAX. HORIZ. LOAD ($F_p$) | [b] MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a] 45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [d] 60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 2-D18C-58R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

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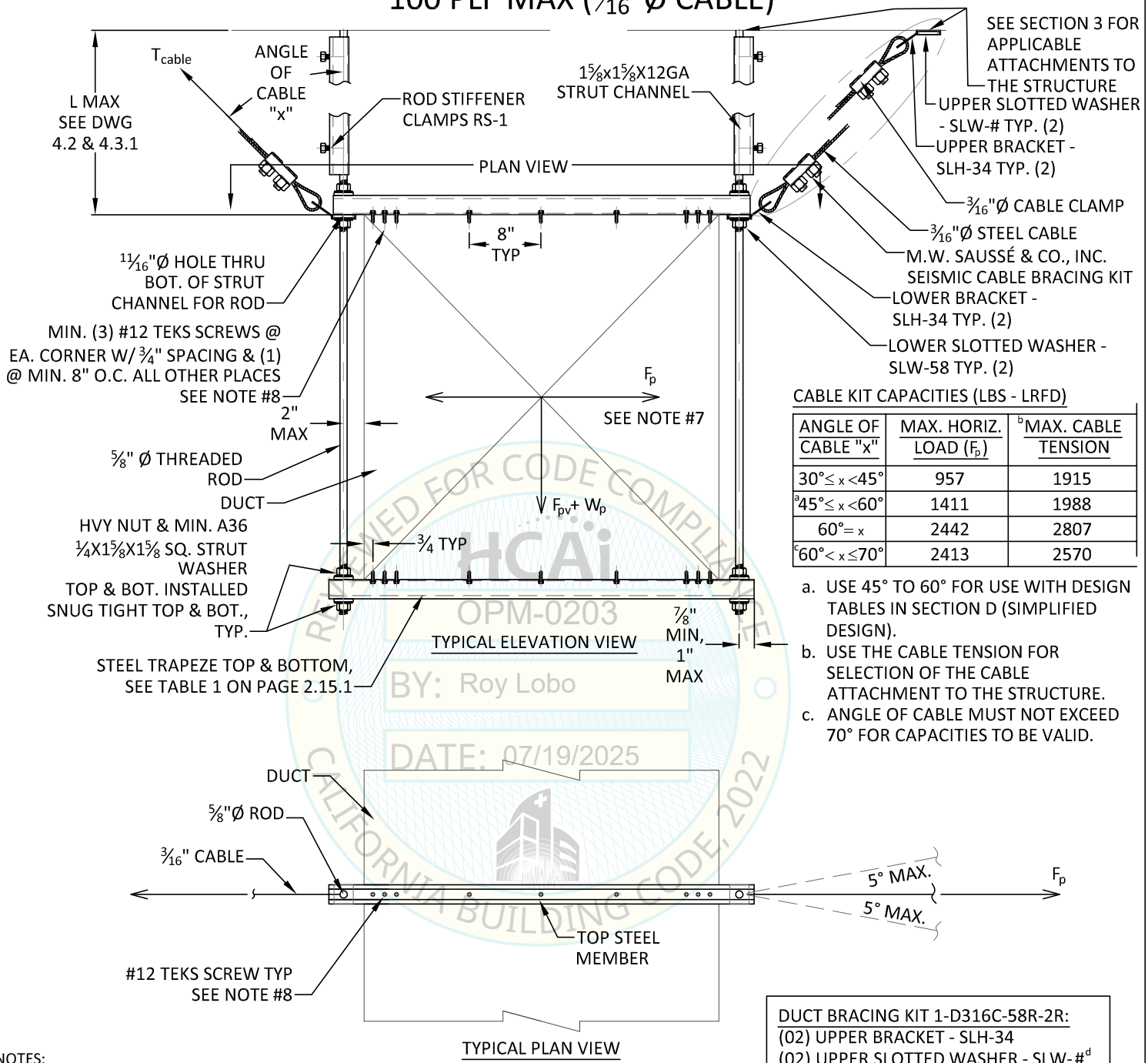
Page No.: **2.7.10**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE
# 100 PLF MAX (3/16"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [c]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

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NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

DUCT BRACING KIT 1-D316C-58R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

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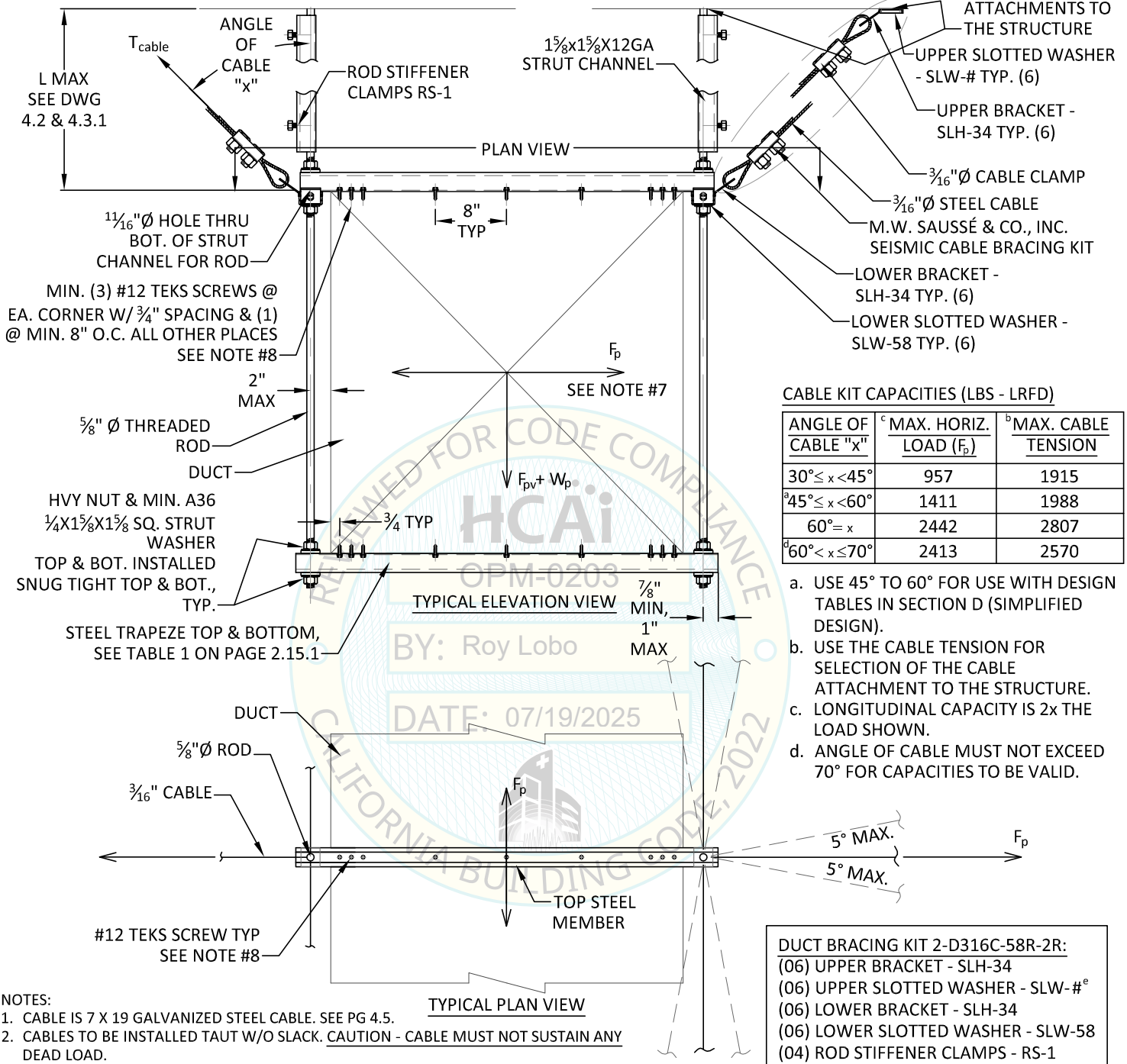
Page No.: **2.7.11**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG DUCT
# TRANSVERSE & LONGITUDINAL 100 PLF MAX (3/16"Ø CABLE)

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CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c] MAX. HORIZ. LOAD ($F_p$) | [b] MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [d]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 2-D316C-58R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
8. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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California PE No. S6481

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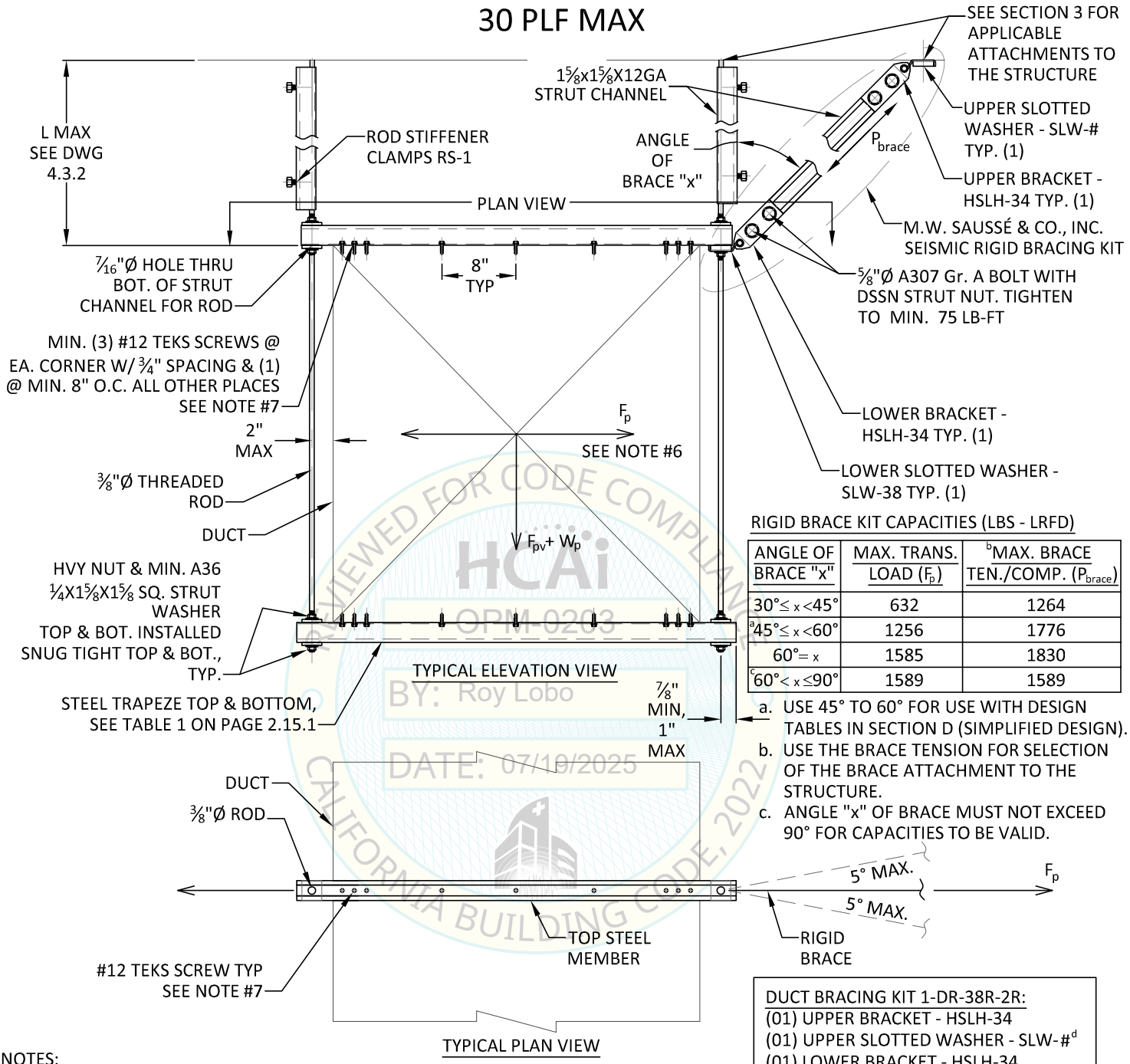
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE
## 30 PLF MAX




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 632 | 1264 |
| [a]45°≤ x <60° | 1256 | 1776 |
| 60°= x | 1585 | 1830 |
| [c]60°< x ≤90° | 1589 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-DR-38R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1 5/8"X1 5/8"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_P$ VALUE USED IN THE DESIGN
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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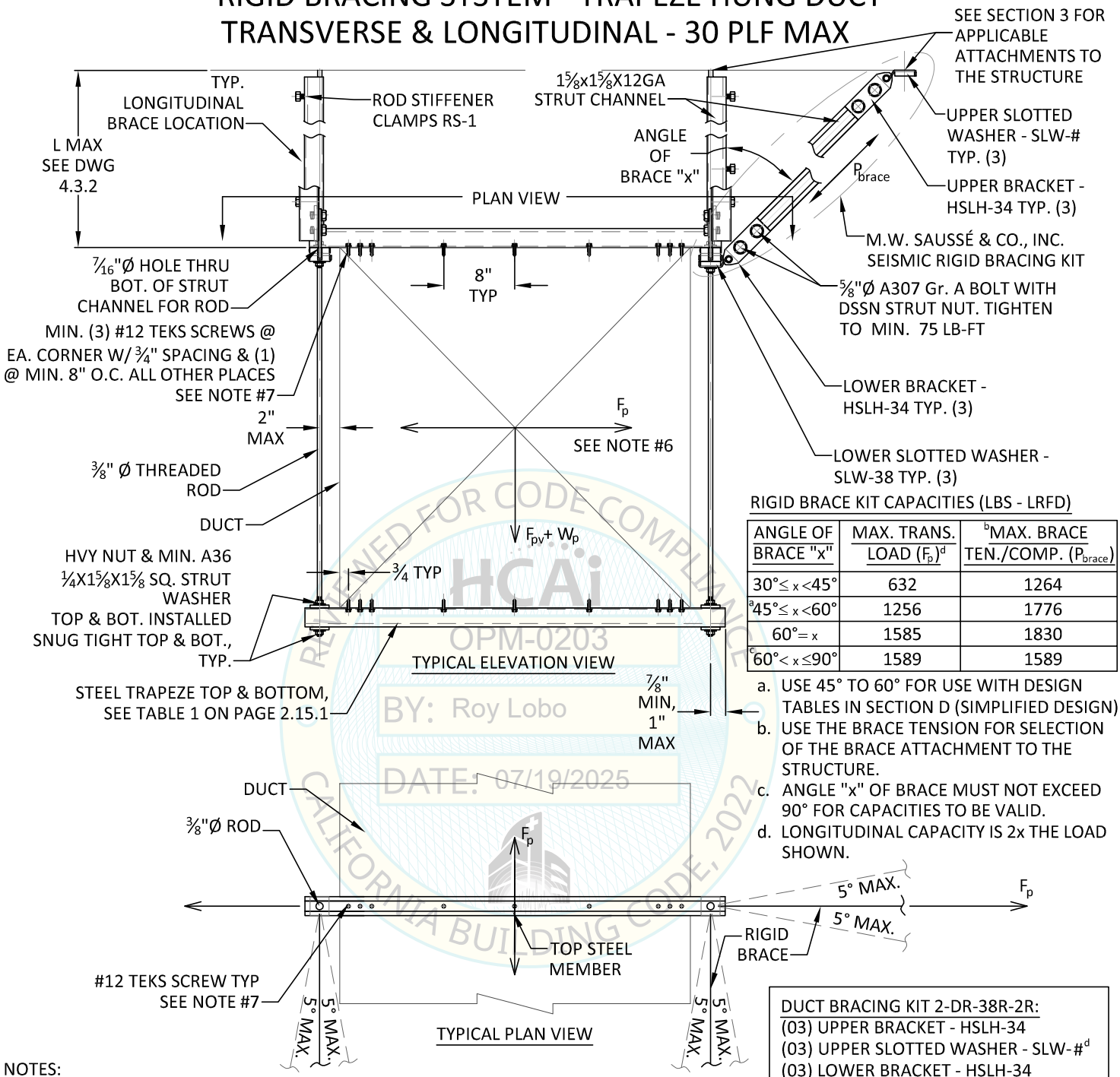
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.8.1**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG DUCT
# TRANSVERSE & LONGITUDINAL - 30 PLF MAX




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 632 | 1264 |
| [a]45°≤ x <60° | 1256 | 1776 |
| 60°= x | 1585 | 1830 |
| [c]60°< x ≤90° | 1589 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.

DUCT BRACING KIT 2-DR-38R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_P$ VALUE USED IN THE DESIGN
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

REVIEWED FOR CODE COMPLIANCE
HCAi
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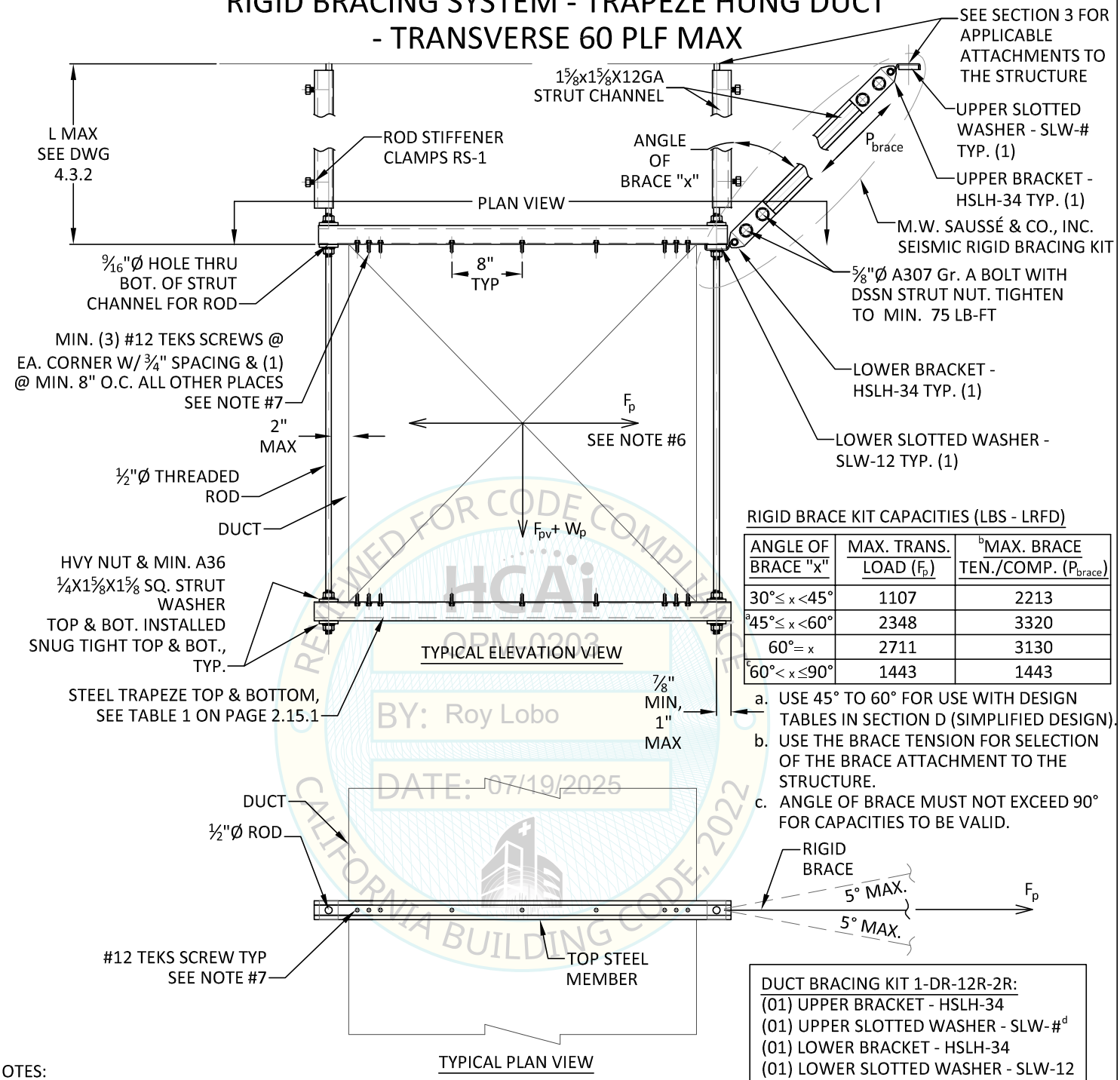
Page No.: **2.8.2**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE 60 PLF MAX




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1107 | 2213 |
| [a]45°≤ x <60° | 2348 | 3320 |
| 60°= x | 2711 | 3130 |
| [c]60°< x ≤90° | 1443 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-DR-12R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_p$ VALUE USED IN THE DESIGN
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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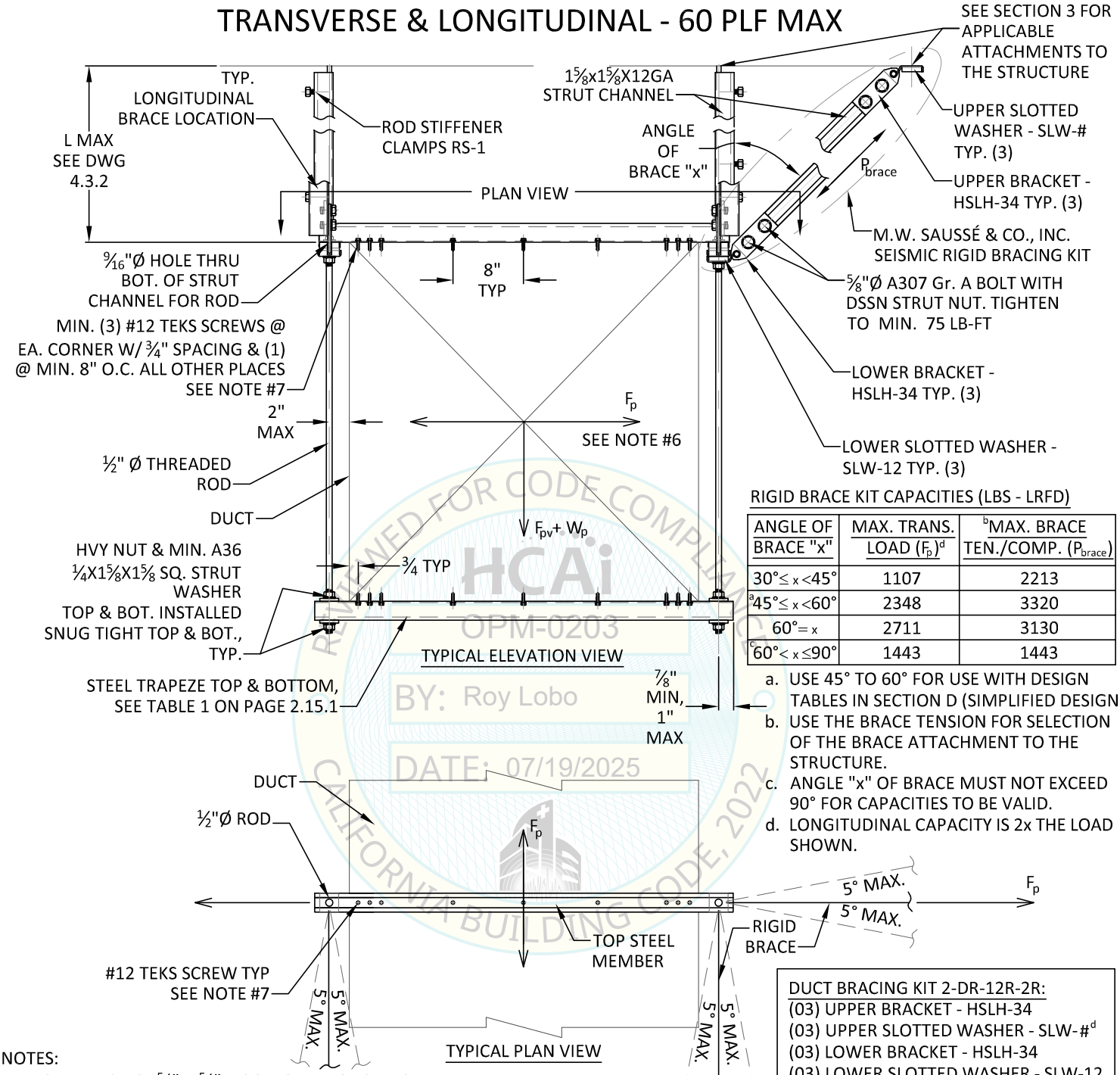
Page No.: **2.8.3**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG DUCT
# TRANSVERSE & LONGITUDINAL - 60 PLF MAX




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1107 | 2213 |
| [a]45°≤ x <60° | 2348 | 3320 |
| 60°= x | 2711 | 3130 |
| [c]60°< x ≤90° | 1443 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.

DUCT BRACING KIT 2-DR-12R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1 5/8"X1 5/8"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_P$ VALUE USED IN THE DESIGN
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

REVIEWED FOR CODE COMPLIANCE
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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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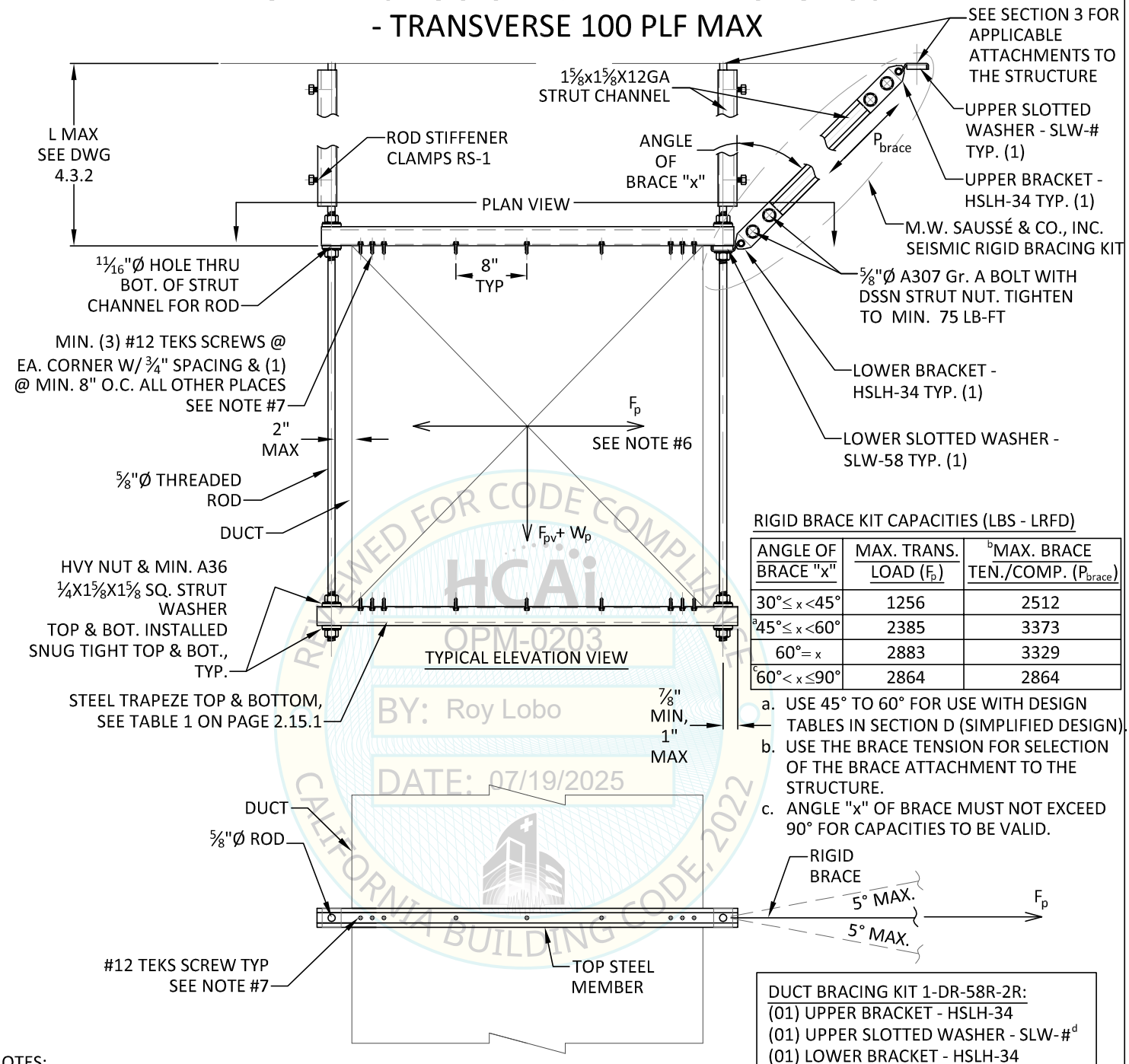
Page No.: **2.8.4**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG DUCT - TRANSVERSE 100 PLF MAX




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| [c]60°< x ≤90° | 2864 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-DR-58R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_P$ VALUE USED IN THE DESIGN
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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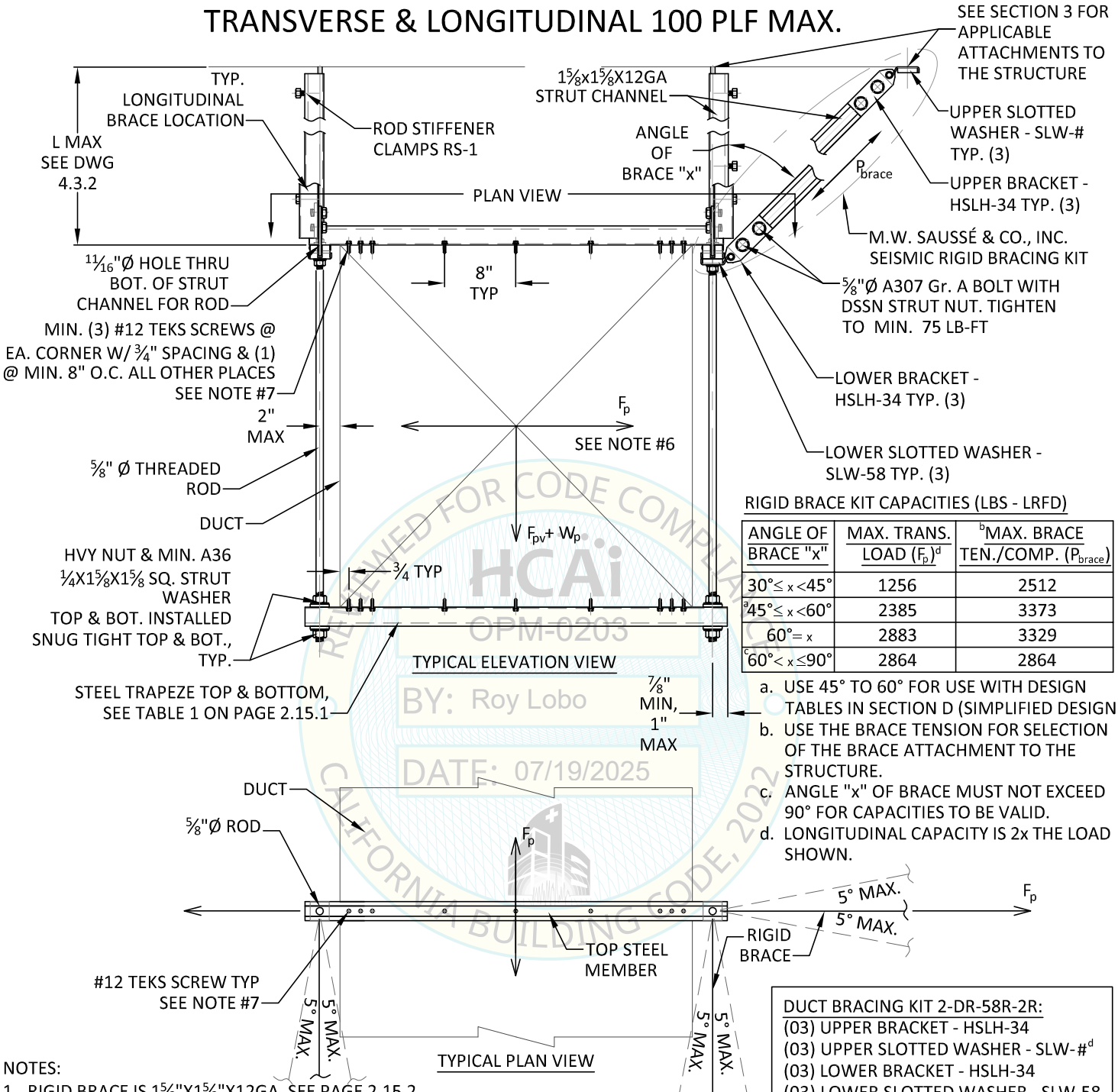
Page No.: **2.8.5**

Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG DUCT TRANSVERSE & LONGITUDINAL 100 PLF MAX.




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| [c]60°< x ≤90° | 2864 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.

DUCT BRACING KIT 2-DR-58R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. RDP SHALL CONSIDER THE ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING THE $F_P$ VALUE USED IN THE DESIGN
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE, 2022

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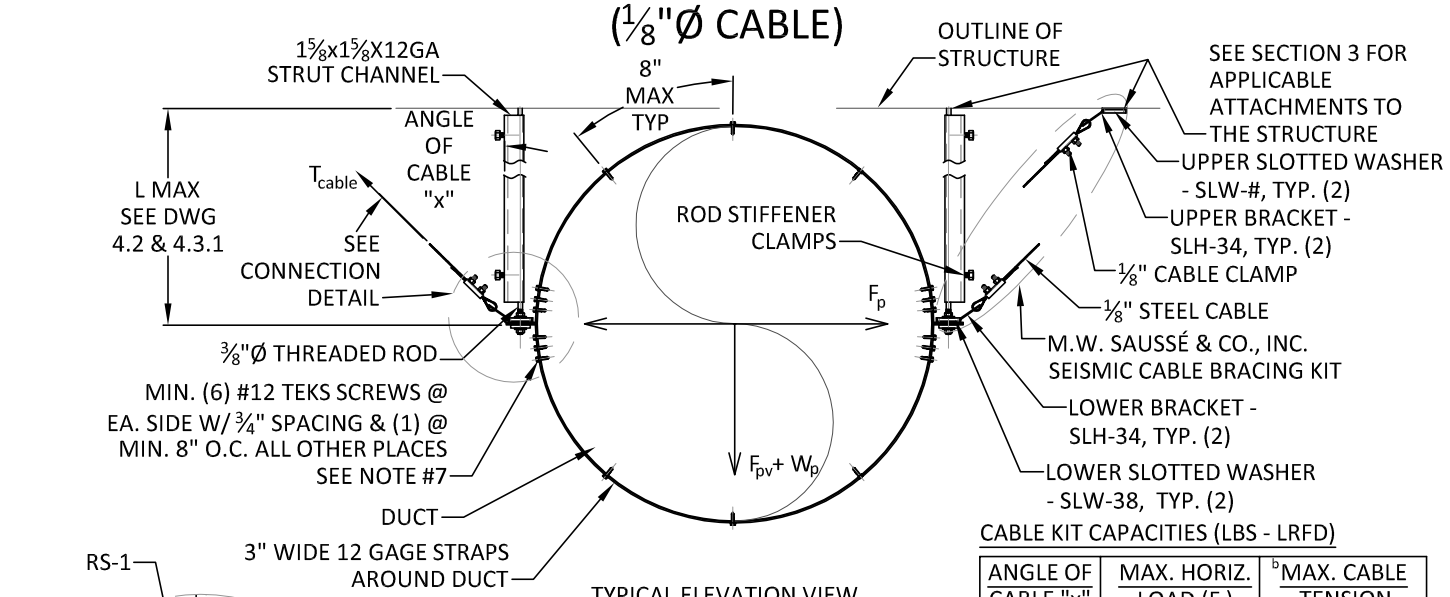
Page No.: 2.8.6
Date: February 5, 2025

# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 30 PLF MAX (⅛"Ø CABLE)

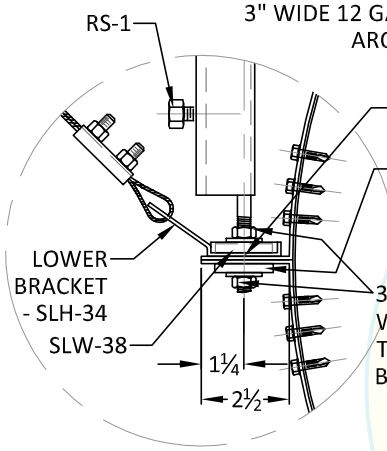



TYPICAL ELEVATION VIEW

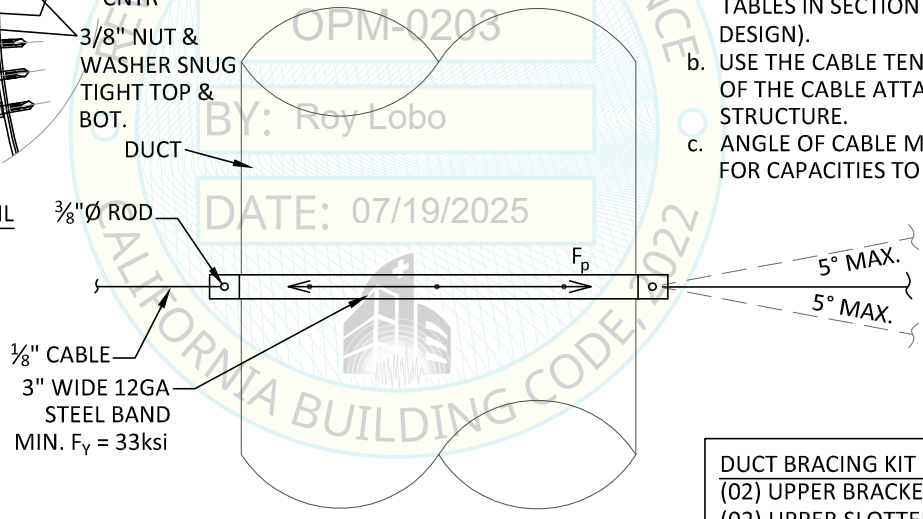
CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 1-D18C-38R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).


HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
ACCEPTED FOR CODE COMPLIANCE
CALIFORNIA BUILDING CODE 2022



Vibrex® vibration & seismic control systems
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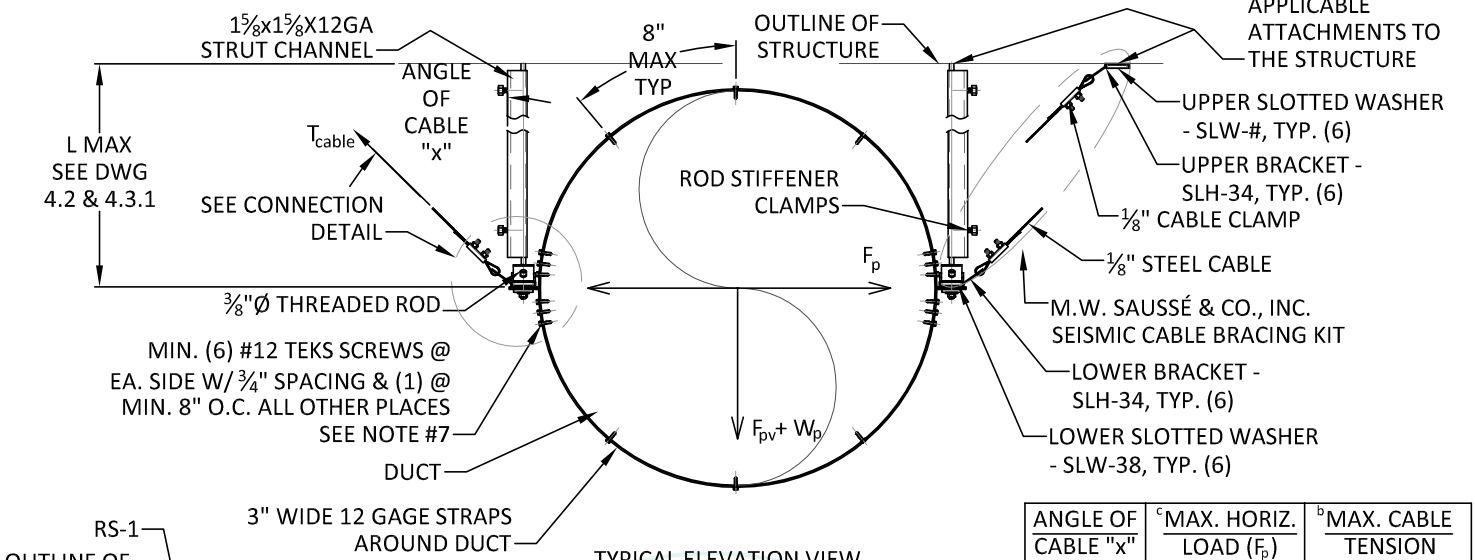
Page No.: **2.9.1**
Date: **February 5, 2025**

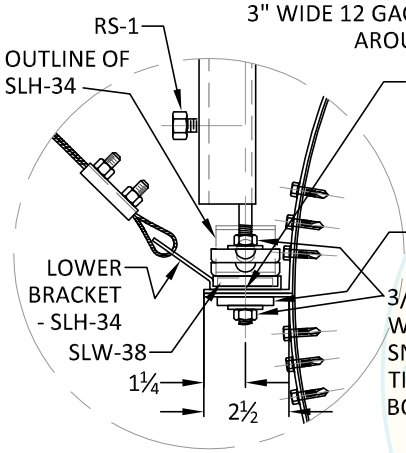
# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 30 PLF MAX (⅛"Ø CABLE)



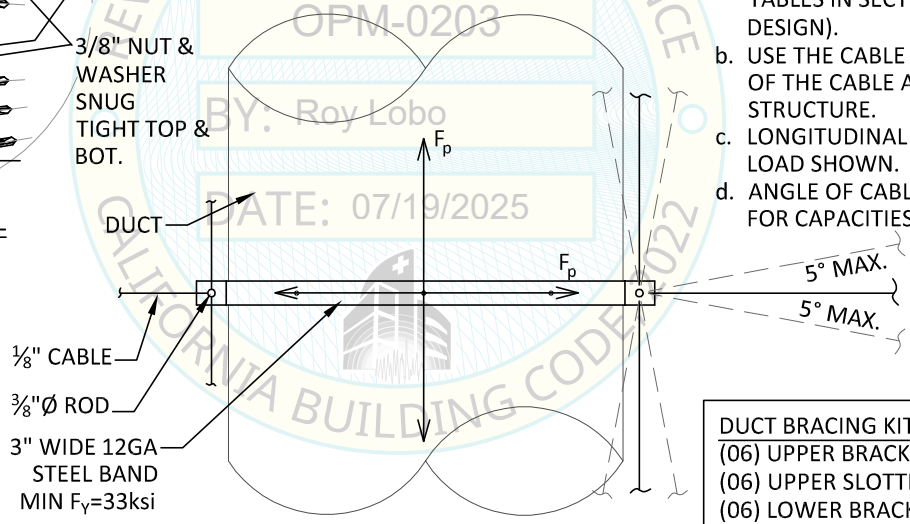

TYPICAL ELEVATION VIEW

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [d]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 2-D18C-38R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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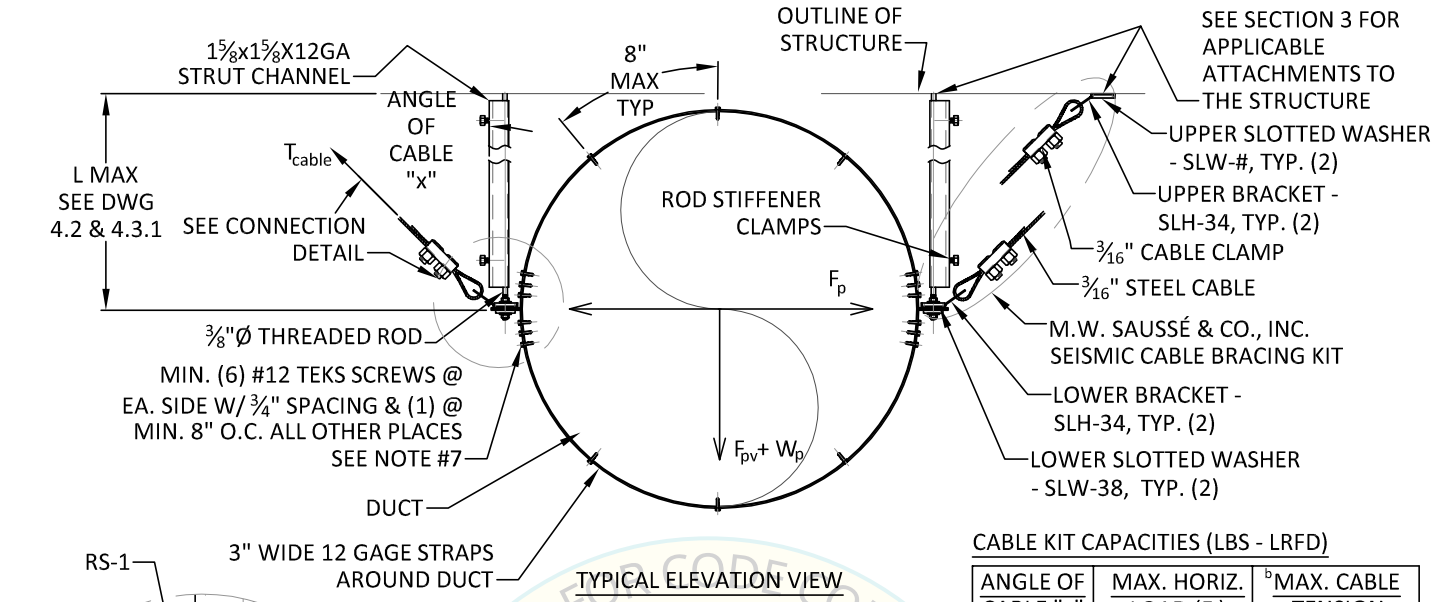
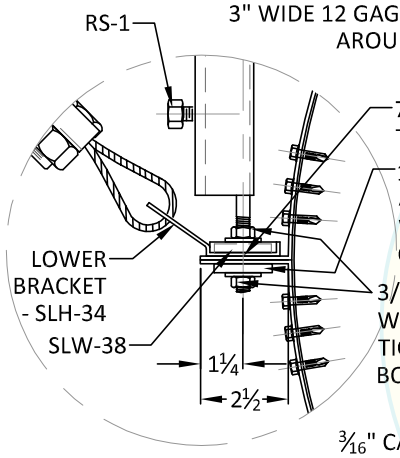
Page No.: **2.9.2**
Date: **February 5, 2025**

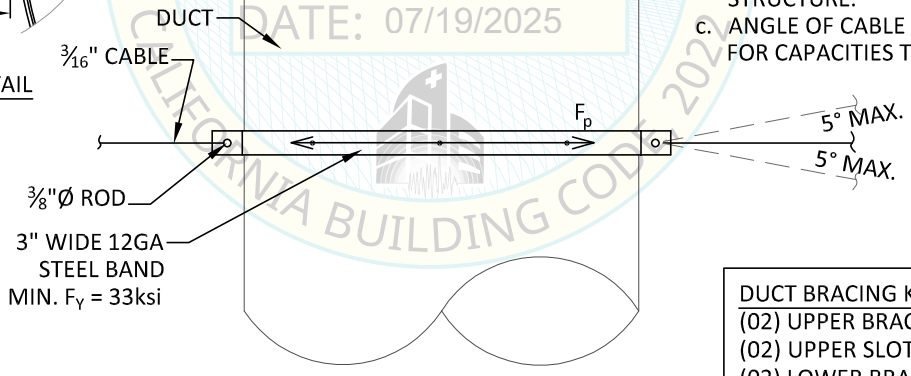
# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 30 PLF MAX
# (3/16"Ø CABLE)




TYPICAL ELEVATION VIEW




CONNECTION DETAIL




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [c]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-D316C-38R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

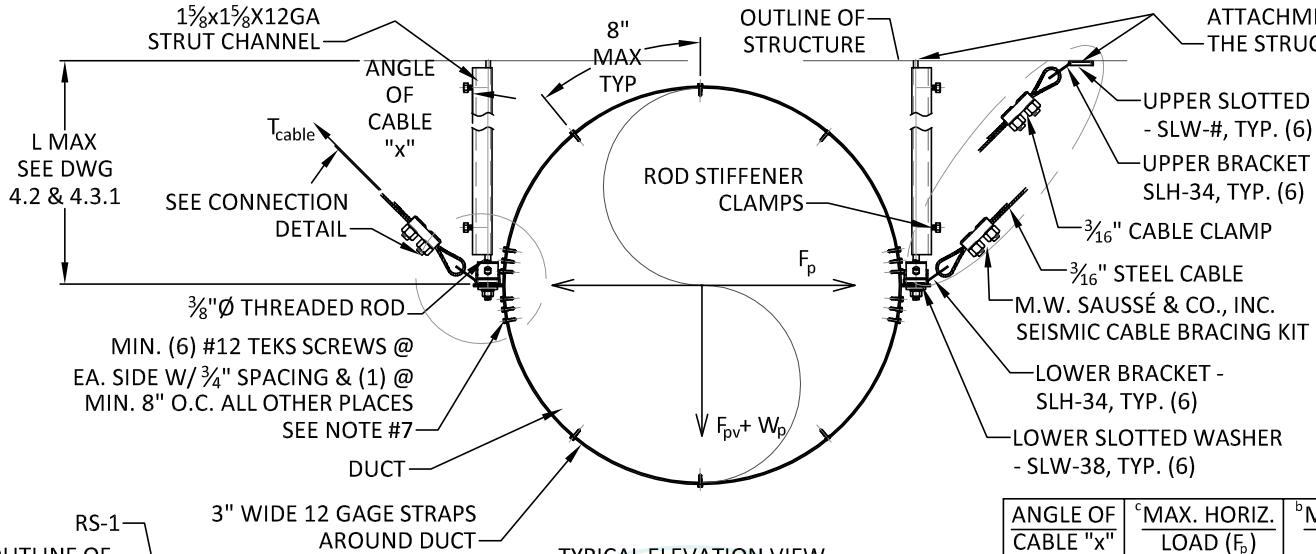
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CERTIFIED FOR CODE COMPLIANCE
CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.9.3**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 30 PLF MAX ($\frac{3}{16}$"Ø CABLE)

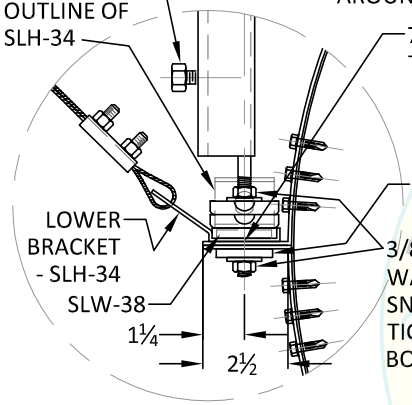
SEE SECTION 3 FOR APPLICABLE ATTACHMENTS TO THE STRUCTURE



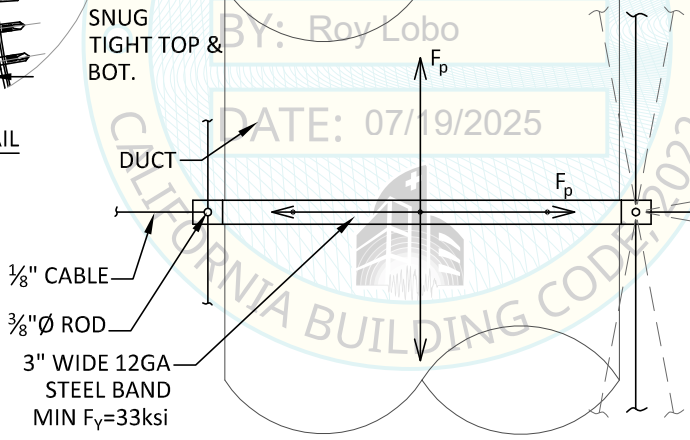

TYPICAL ELEVATION VIEW

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [d]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 2-D316C-38R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT.
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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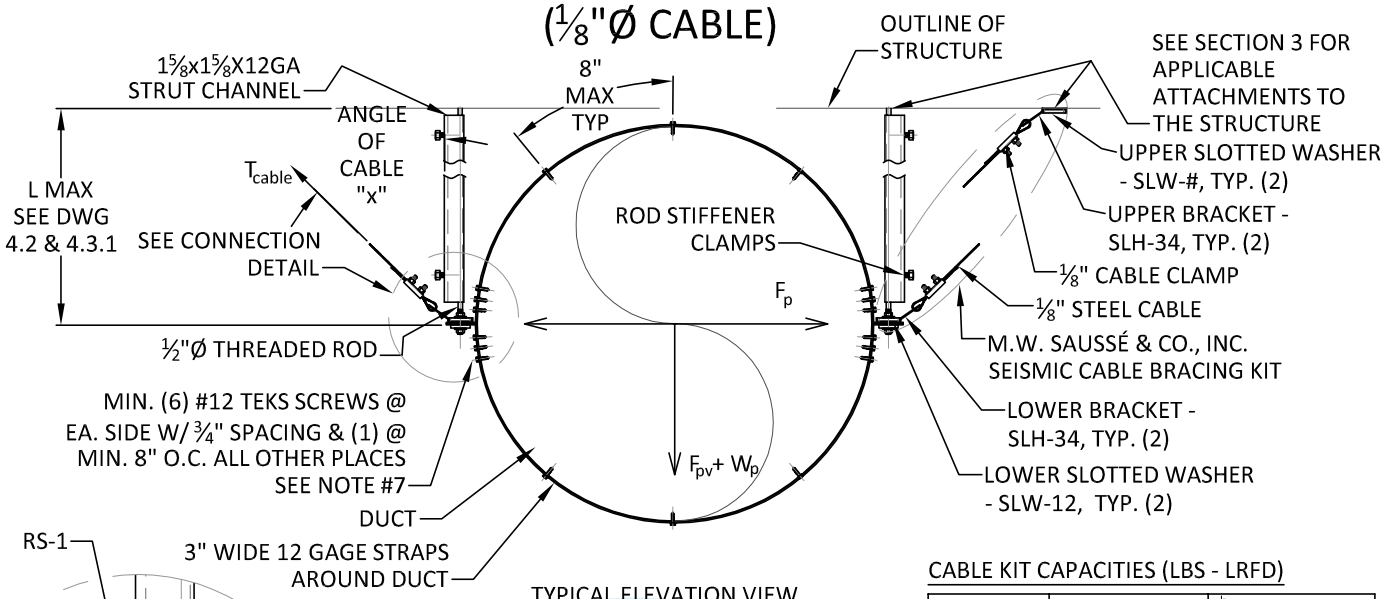
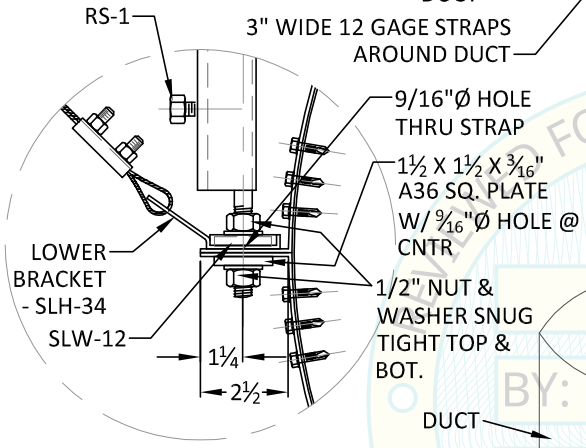
Page No.: **2.9.4**

Date: **February 5, 2025**

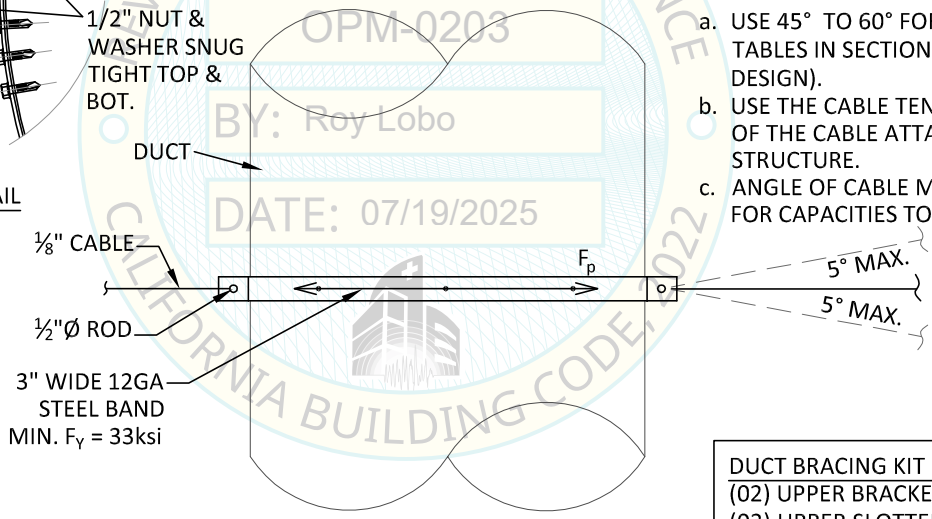
# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 60 PLF MAX (⅛"Ø CABLE)




TYPICAL ELEVATION VIEW




CONNECTION DETAIL




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-D18C-12R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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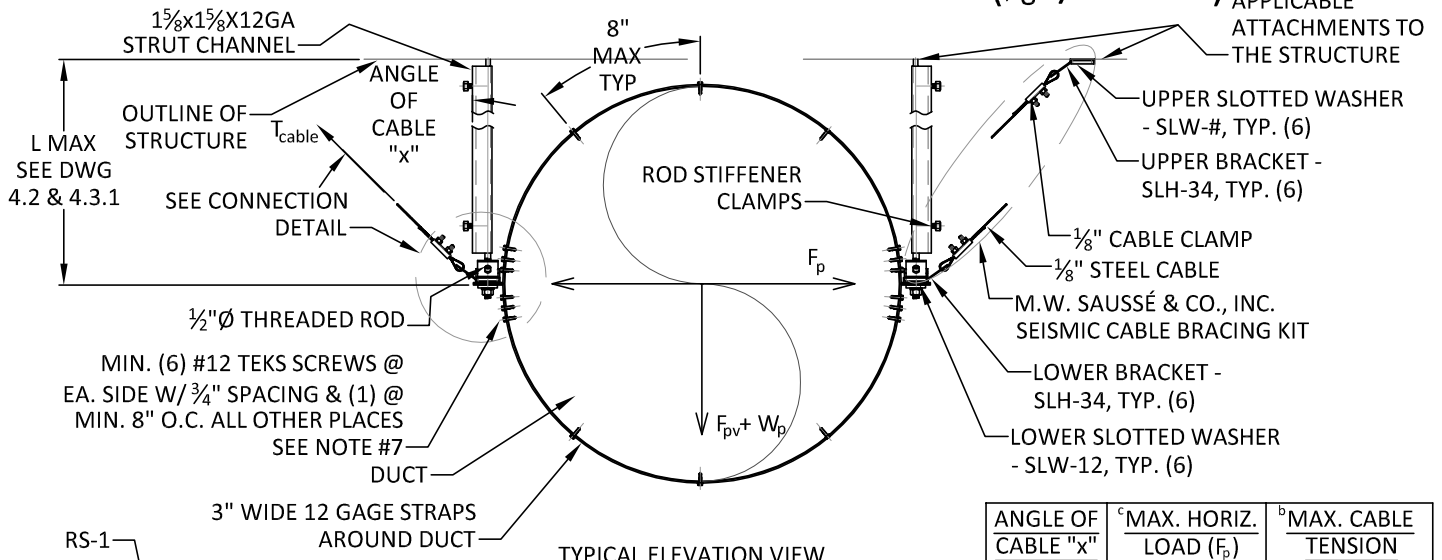
Page No.: **2.9.5**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 60 PLF MAX (⅛"Ø CABLE)

SEE SECTION 3 FOR APPLICABLE ATTACHMENTS TO THE STRUCTURE




TYPICAL ELEVATION VIEW

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [d]60°< x ≤70° | 1361 | 1449 |

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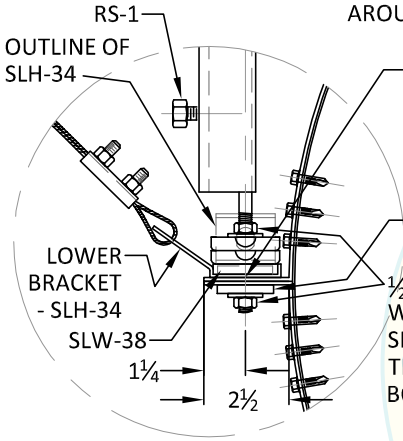
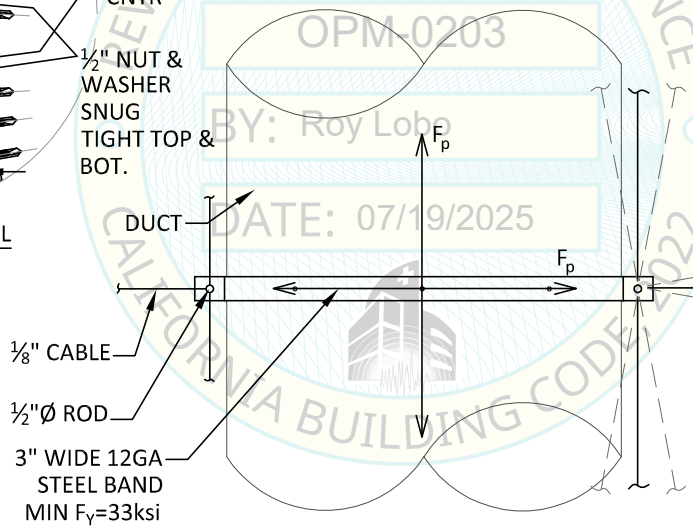
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 2-D18C-12R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
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5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).


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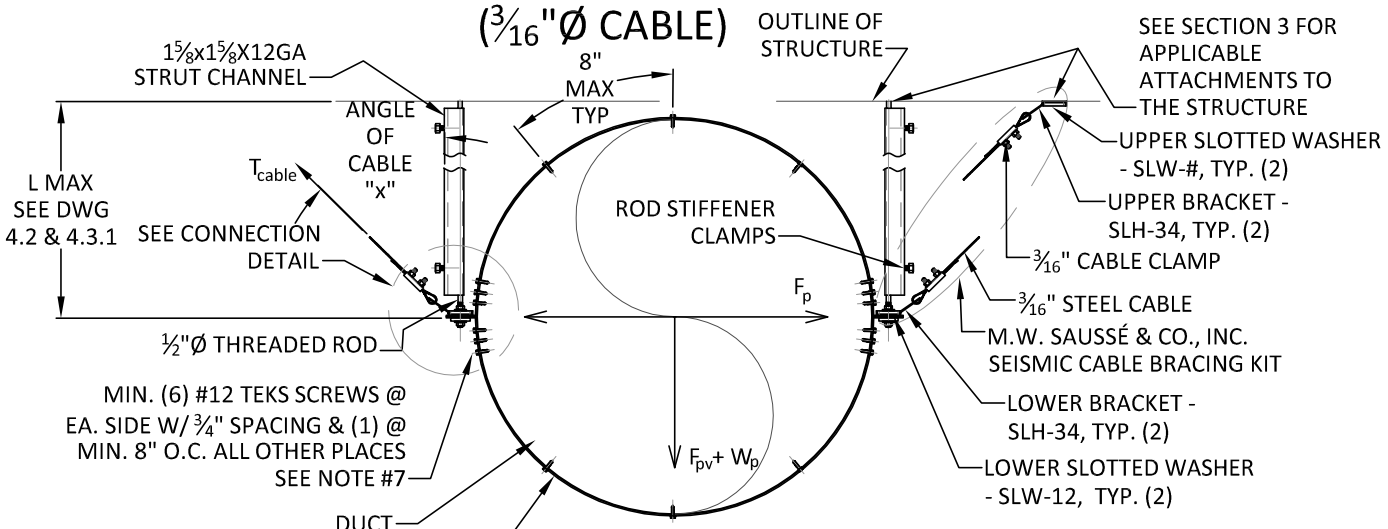
Page No.: **2.9.6**

Date: **February 5, 2025**

# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 60 PLF MAX ($\frac{3}{16}$"Ø CABLE)




TYPICAL ELEVATION VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [c]60°< x ≤70° | 2413 | 2570 |

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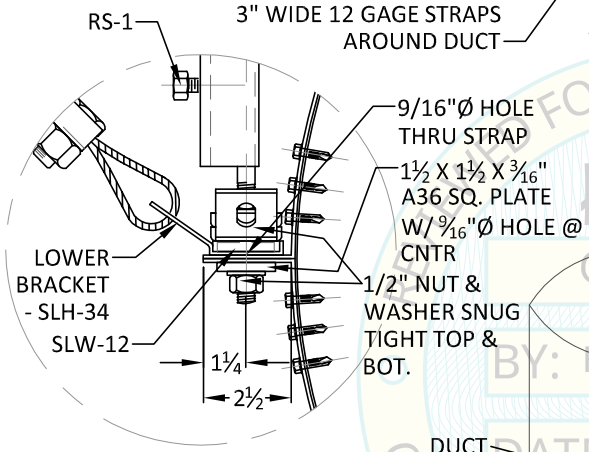
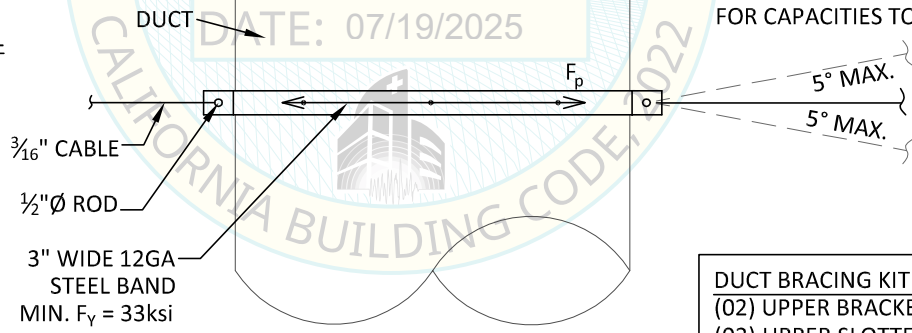



CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 1-D316C-12R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(02) $\frac{3}{16}$" CABLE - 10 FT.
(04) $\frac{3}{16}$" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
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6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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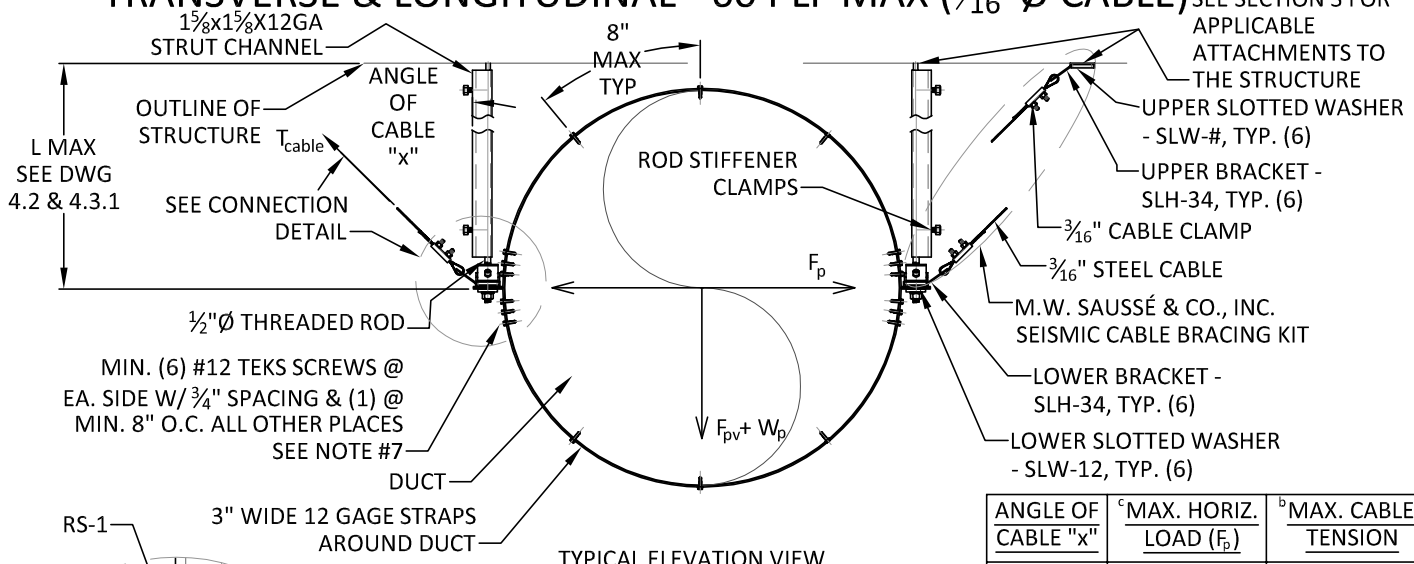
Page No.: **2.9.7**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 60 PLF MAX (3/16"Ø CABLE)




TYPICAL ELEVATION VIEW

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
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c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
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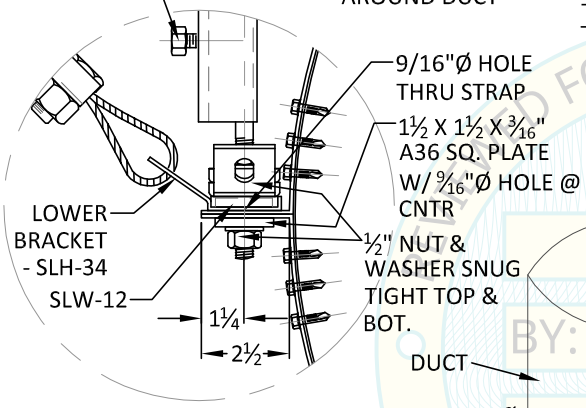
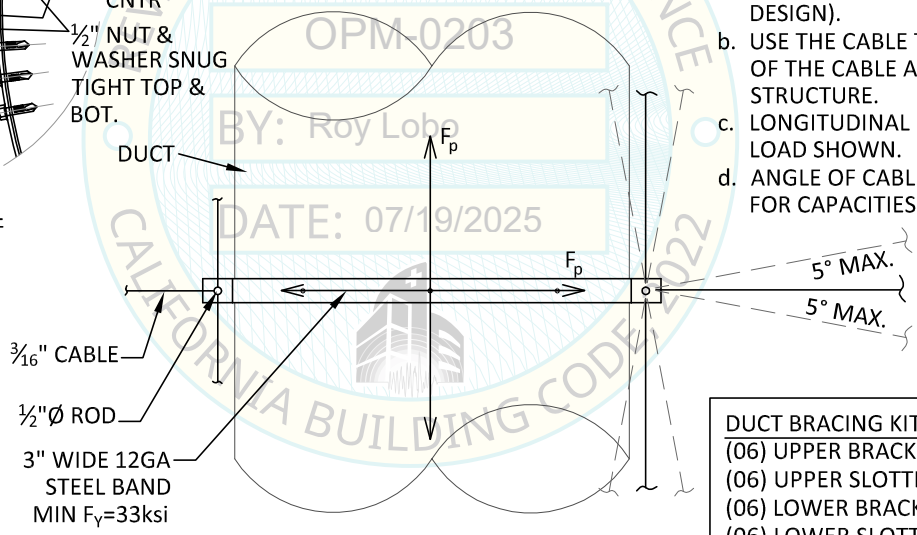



CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 2-D316C-12R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT.
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
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6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

HCAi
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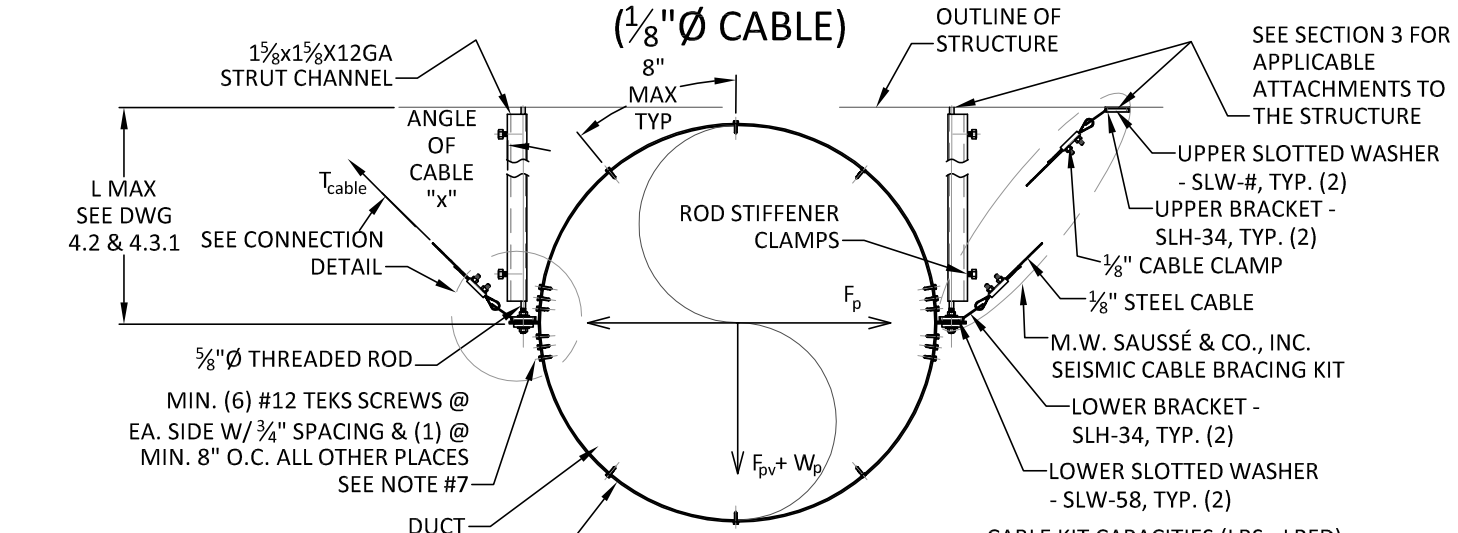
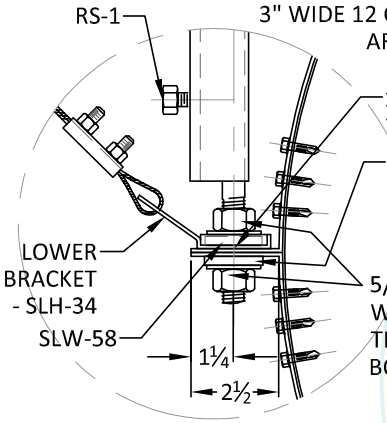
Page No.: **2.9.8**
Date: **February 5, 2025**

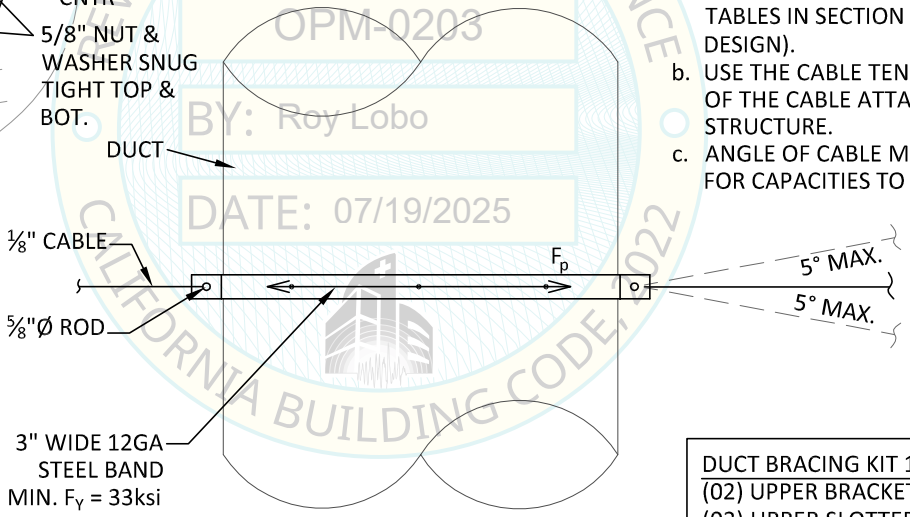
# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 100 PLF MAX
## (⅛"Ø CABLE)




TYPICAL ELEVATION VIEW




CONNECTION DETAIL




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-D18C-58R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

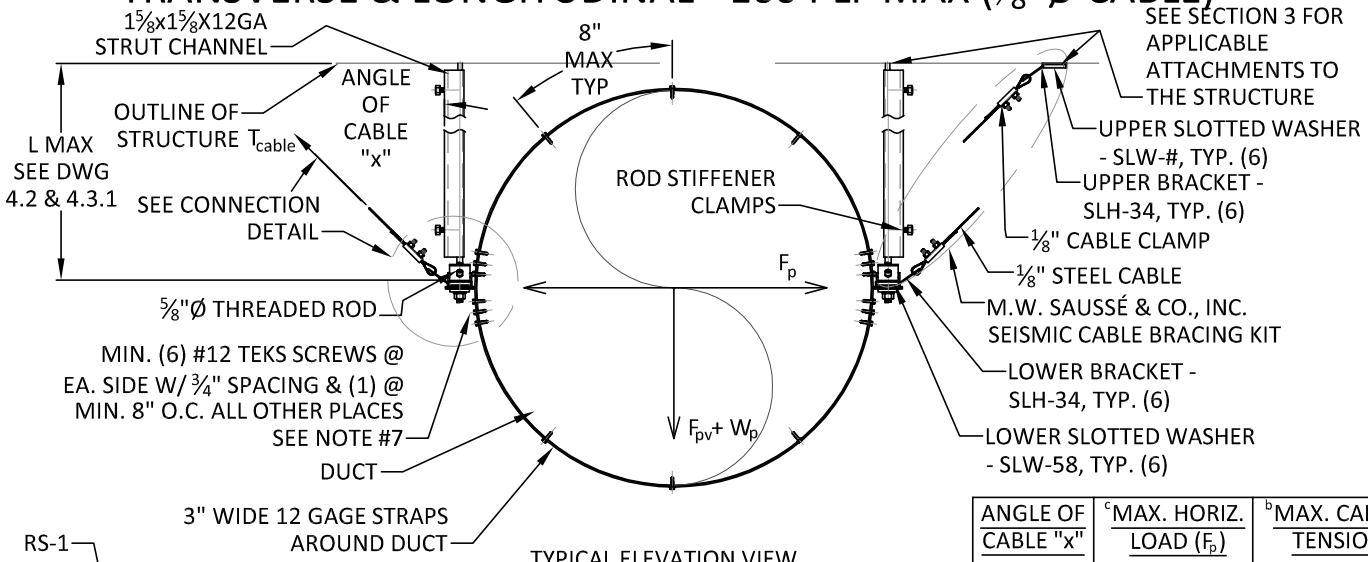
NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).


HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
REVIEWED FOR CODE COMPLIANCE
CALIFORNIA BUILDING CODE 2022



Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050
Structural Engineer: N. Tremblay
California PE No. S6481

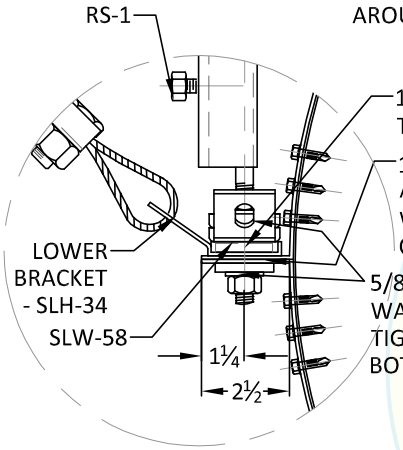
# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 100 PLF MAX (⅛"Ø CABLE)



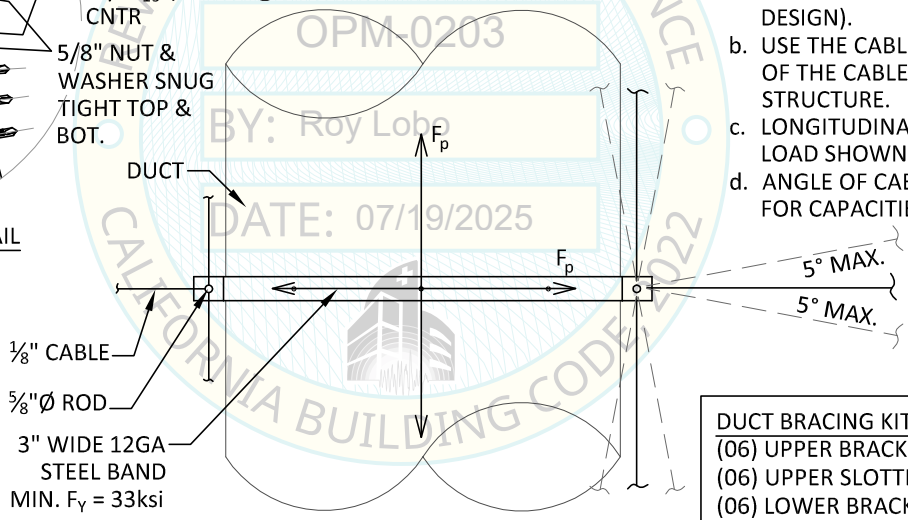

TYPICAL ELEVATION VIEW

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 2-D18C-58R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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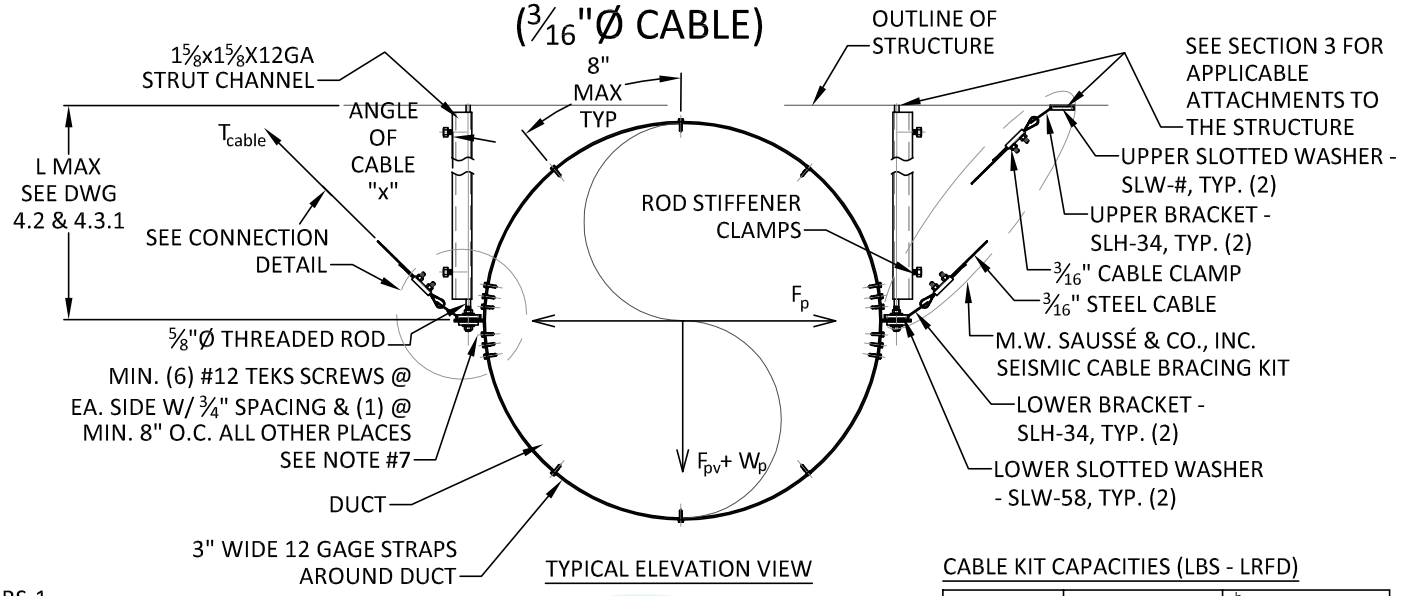
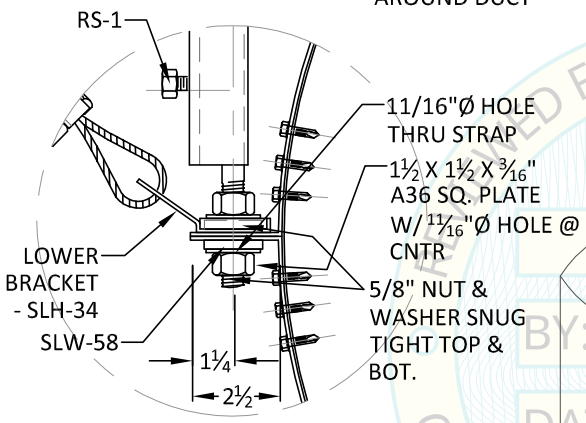
Page No.: **2.9.10**
Date: **February 5, 2025**

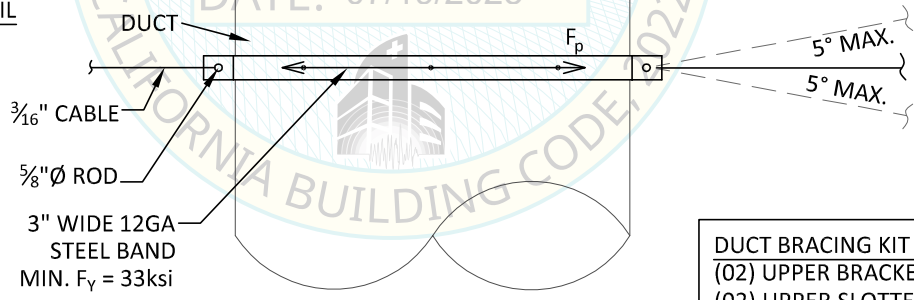
# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 100 PLF MAX ($\frac{3}{16}$"Ø CABLE)




TYPICAL ELEVATION VIEW




CONNECTION DETAIL




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [c]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 1-D316C-58R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(02) $\frac{3}{16}$" CABLE - 10 FT.
(04) $\frac{3}{16}$" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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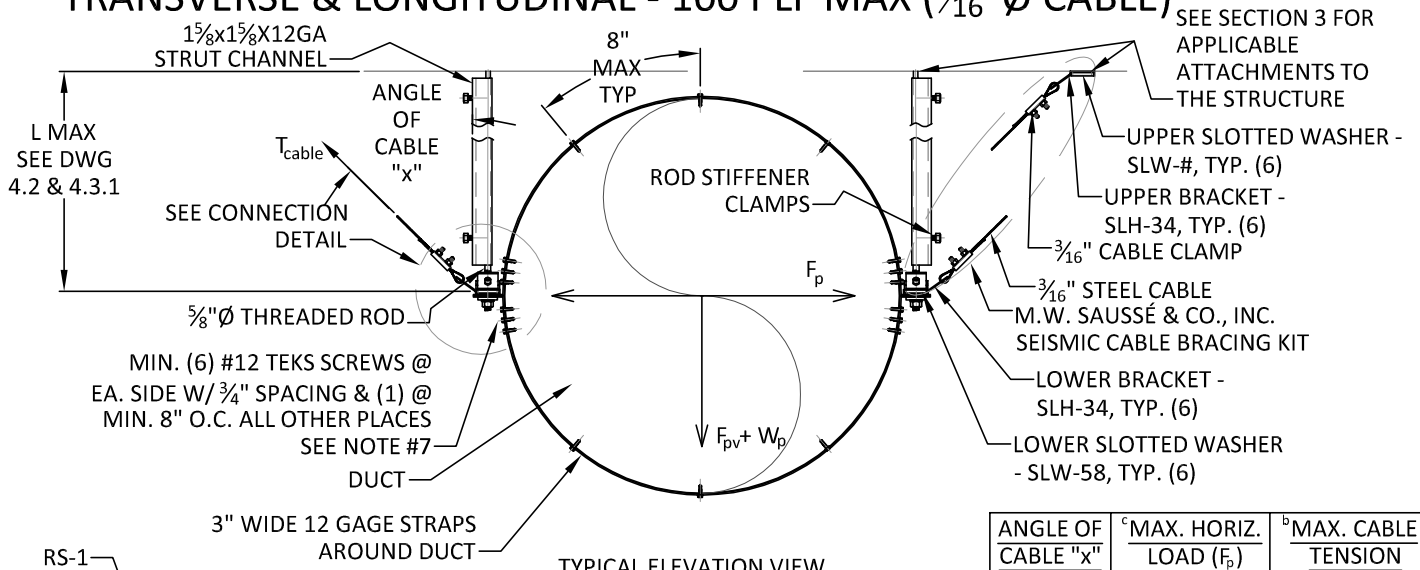
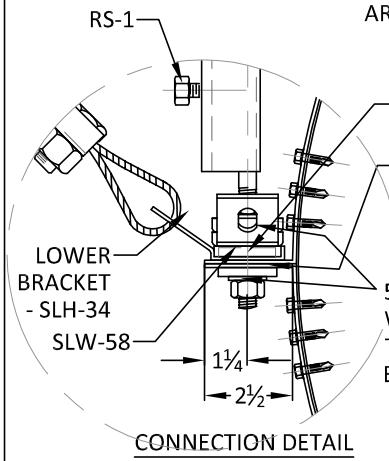
Page No.: **2.9.11**
Date: **February 5, 2025**

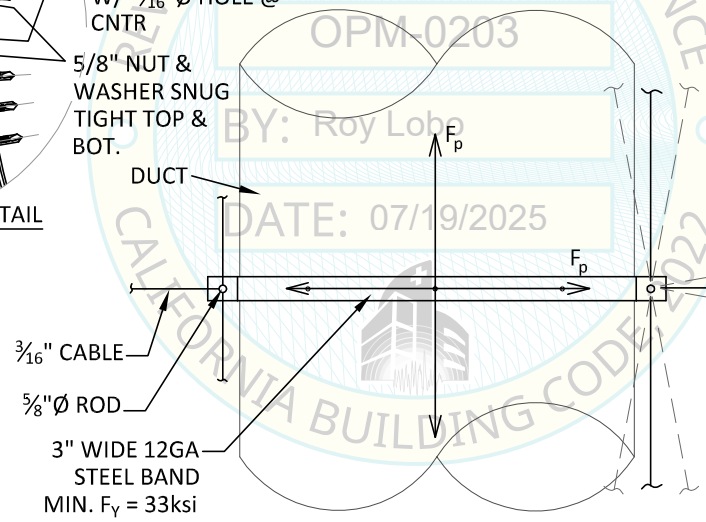
# CABLE BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 100 PLF MAX (3/16"Ø CABLE)




TYPICAL ELEVATION VIEW




CONNECTION DETAIL




TYPICAL PLAN VIEW

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [d]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT 2-D316C-58R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT.
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PAGE 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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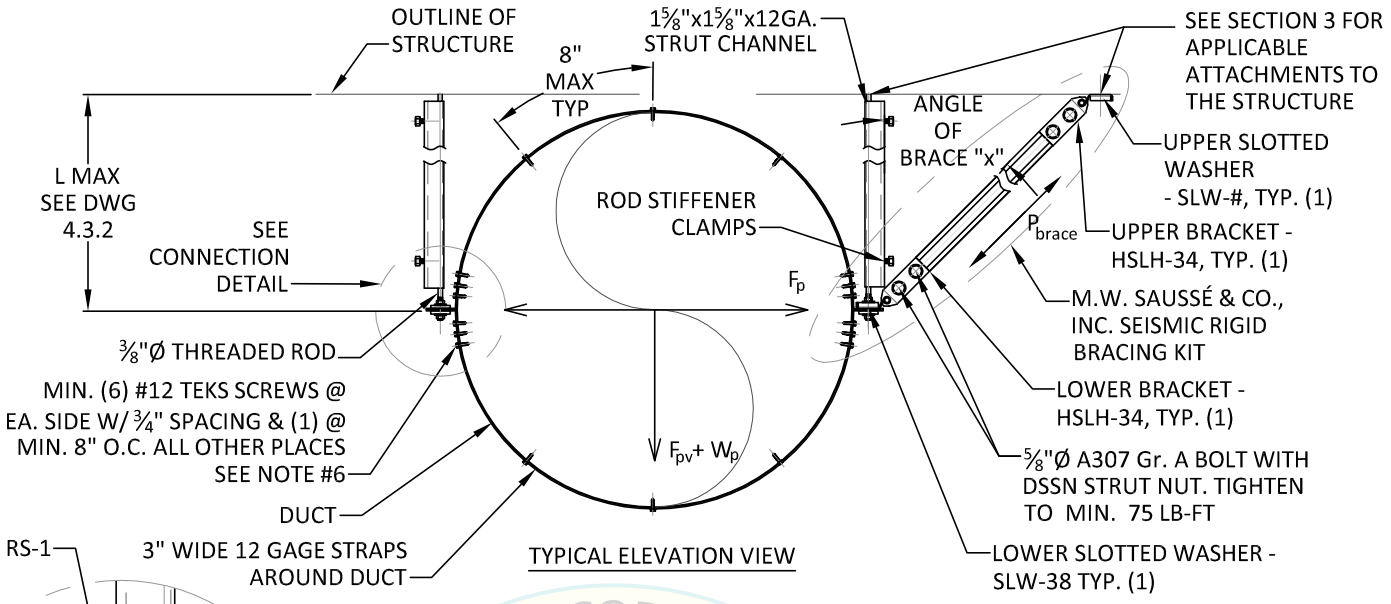
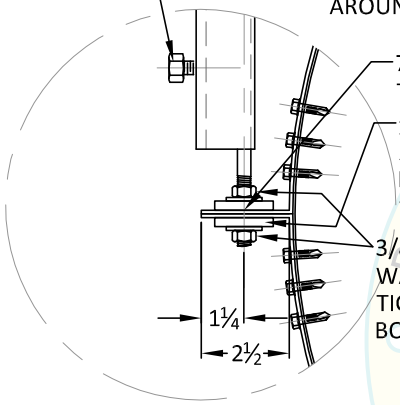
Page No.: **2.9.12**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 30 PLF MAX




TYPICAL ELEVATION VIEW

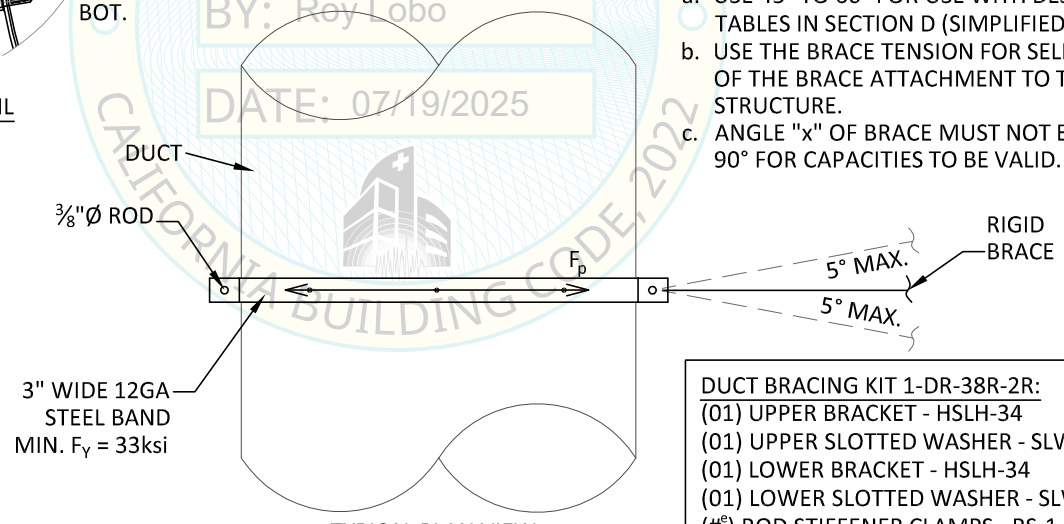



CONNECTION DETAIL

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 632 | 1264 |
| [a]45°≤ x <60° | 1776 | 1776 |
| 60°= x | 1830 | 1830 |
| [c]60°< x ≤90° | 1589 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

DUCT BRACING KIT 1-DR-38R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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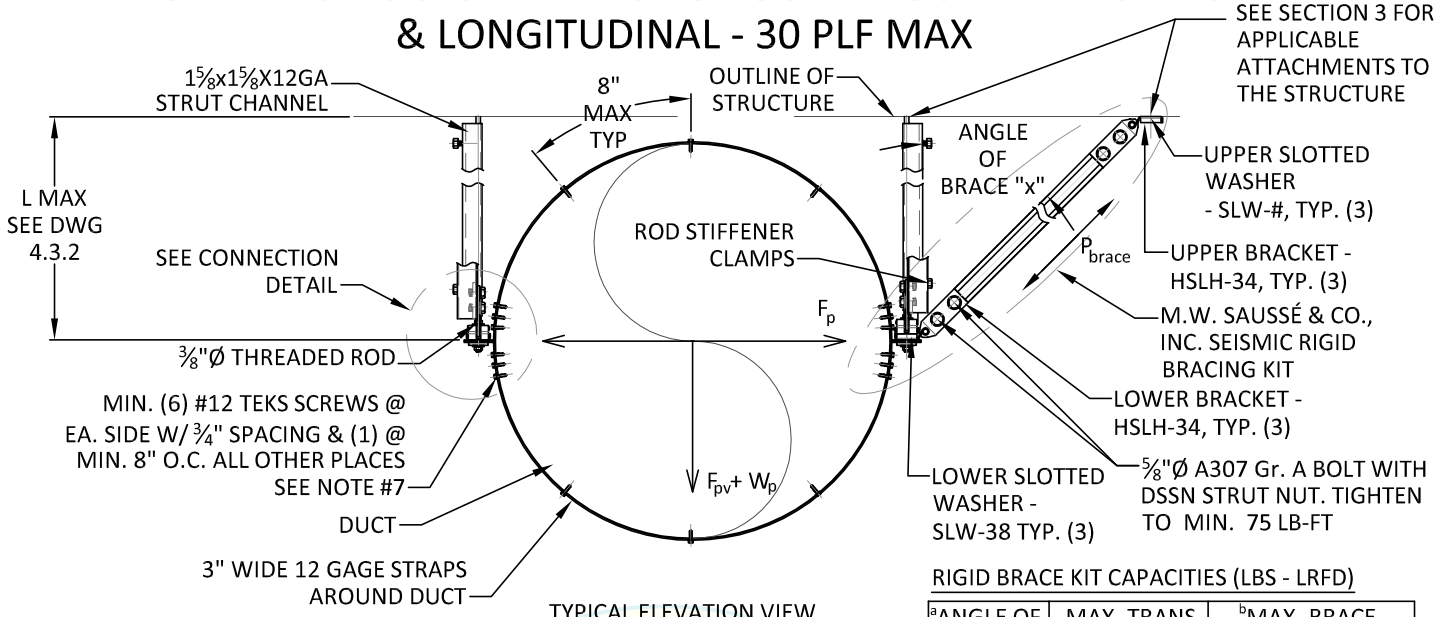
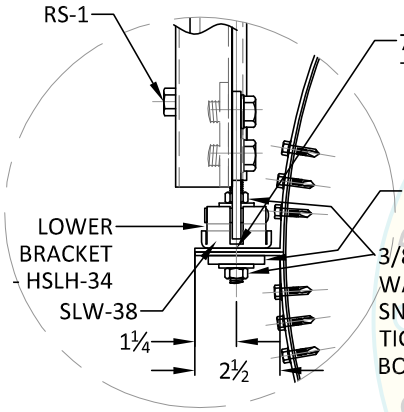
Page No.: **2.10.1**
Date: **February 5, 2025**

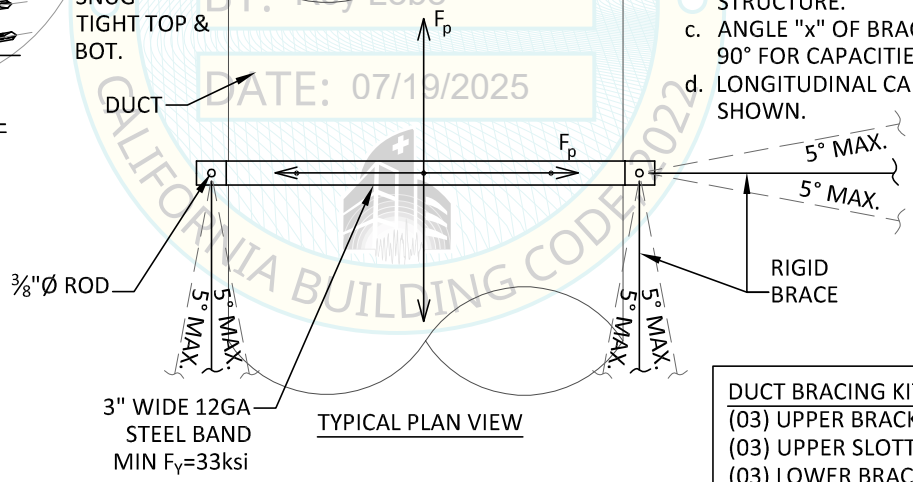
# RIGID BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 30 PLF MAX




TYPICAL ELEVATION VIEW




CONNECTION DETAIL




TYPICAL PLAN VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| [a]ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 632 | 1264 |
| [c]45°≤ x <60° | 1776 | 1776 |
| 60°= x | 1830 | 1830 |
| 60°< x ≤90° | 1589 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.

DUCT BRACING KIT 2-DR-38R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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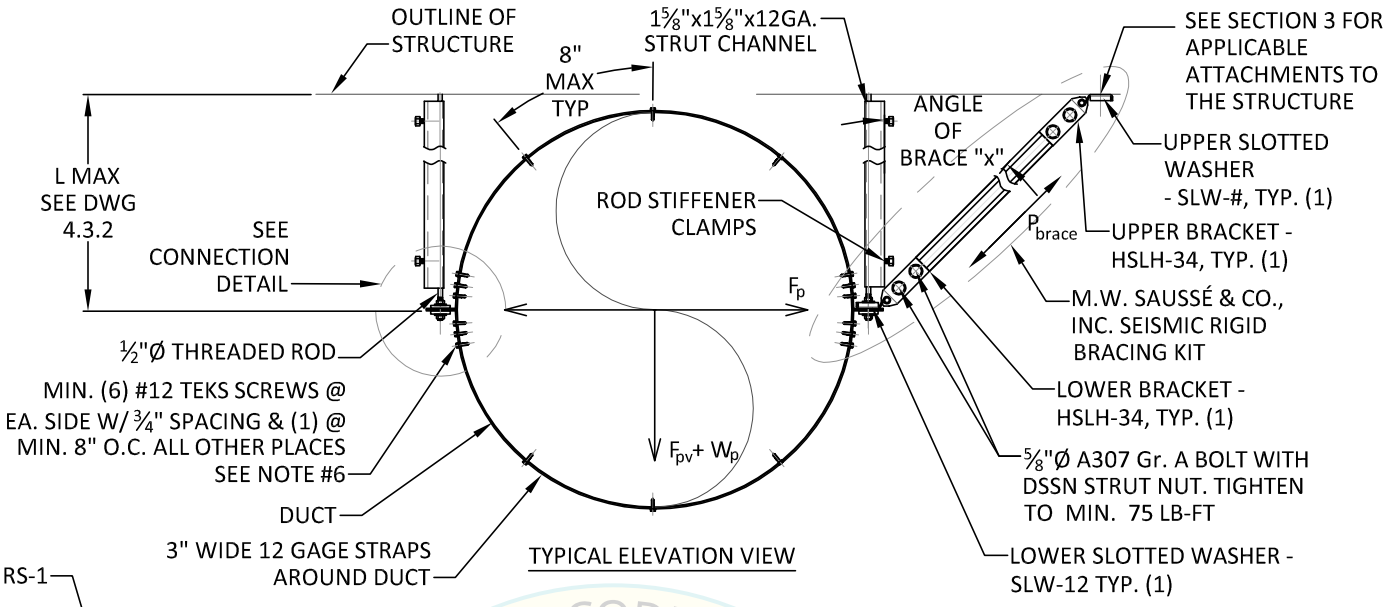
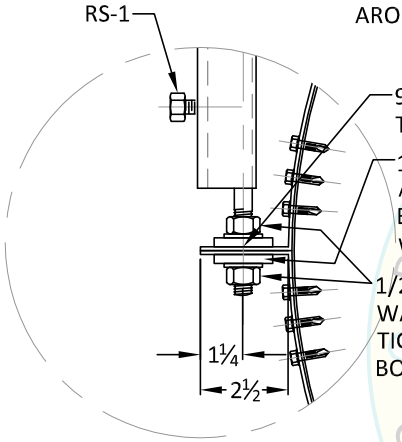
Page No.: **2.10.2**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 60 PLF MAX




TYPICAL ELEVATION VIEW

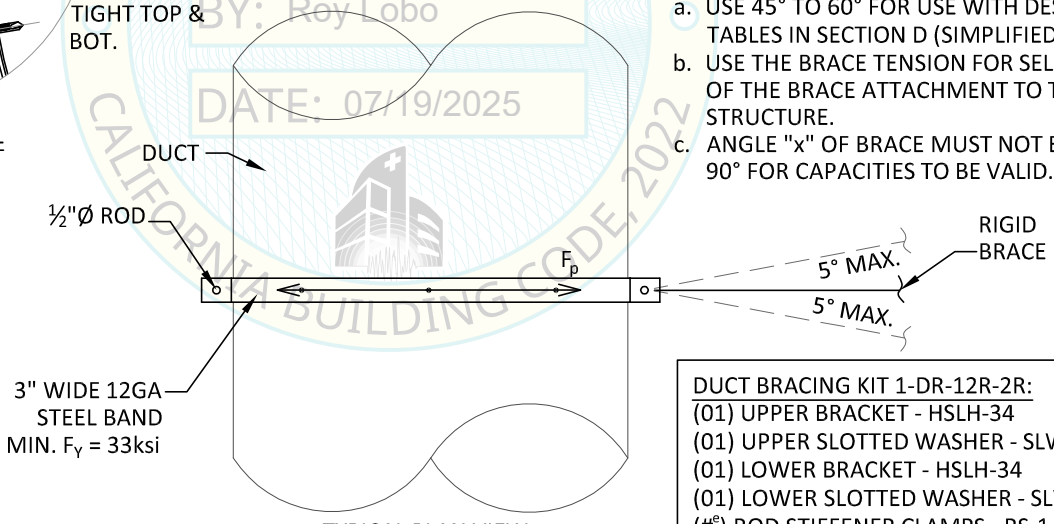



CONNECTION DETAIL

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1107 | 2213 |
| [a]45°≤ x <60° | 2348 | 3320 |
| 60°= x | 2711 | 3130 |
| [c]60°< x ≤90° | 1443 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

DUCT BRACING KIT 1-DR-12R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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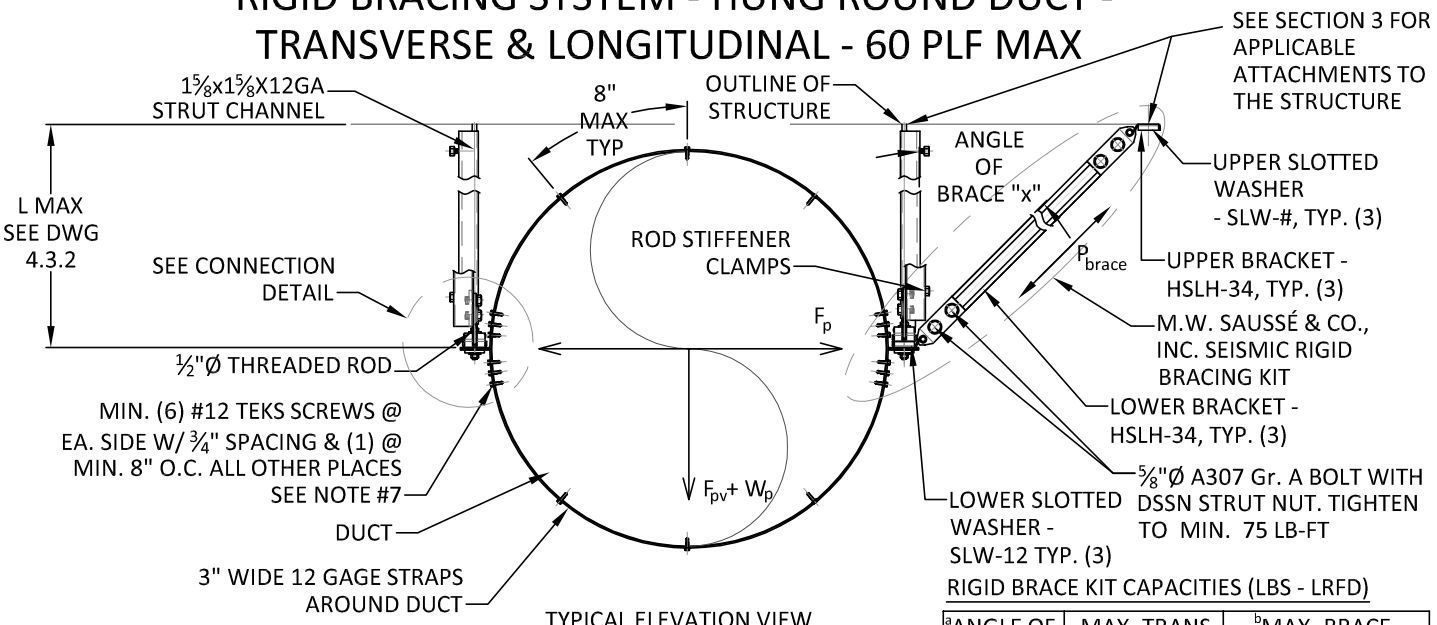
Page No.: **2.10.3**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 60 PLF MAX

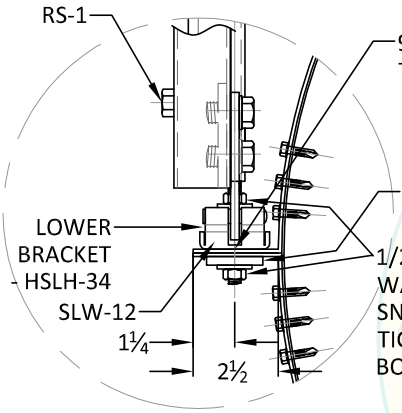



TYPICAL ELEVATION VIEW

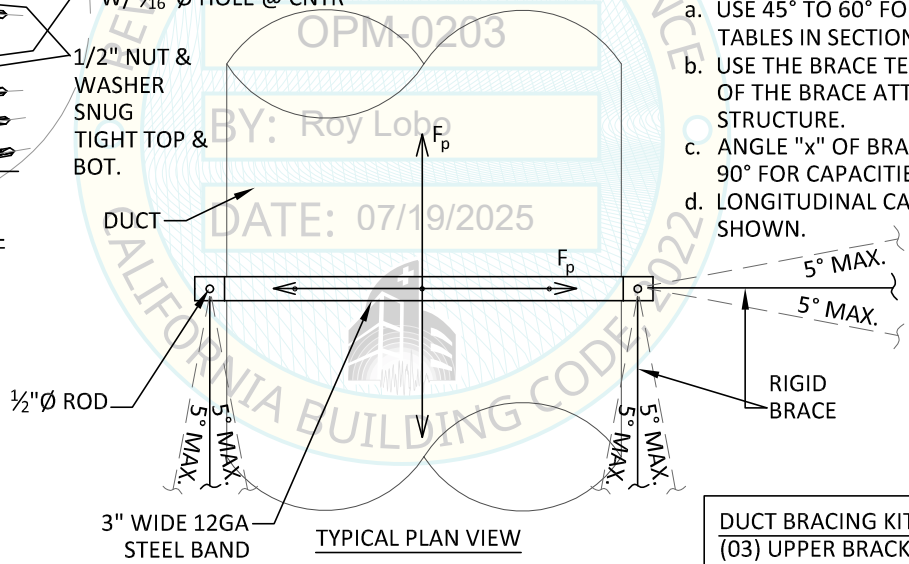
RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| [a]ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1107 | 2213 |
| [c]45°≤ x <60° | 2348 | 3320 |
| 60°= x | 2711 | 3130 |
| 60°< x ≤90° | 1443 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.




CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 2-DR-12R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).


HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
REVIEWED FOR CODE COMPLIANCE
CALIFORNIA BUILDING CODE 2022



Vibrex® vibration & seismic control systems
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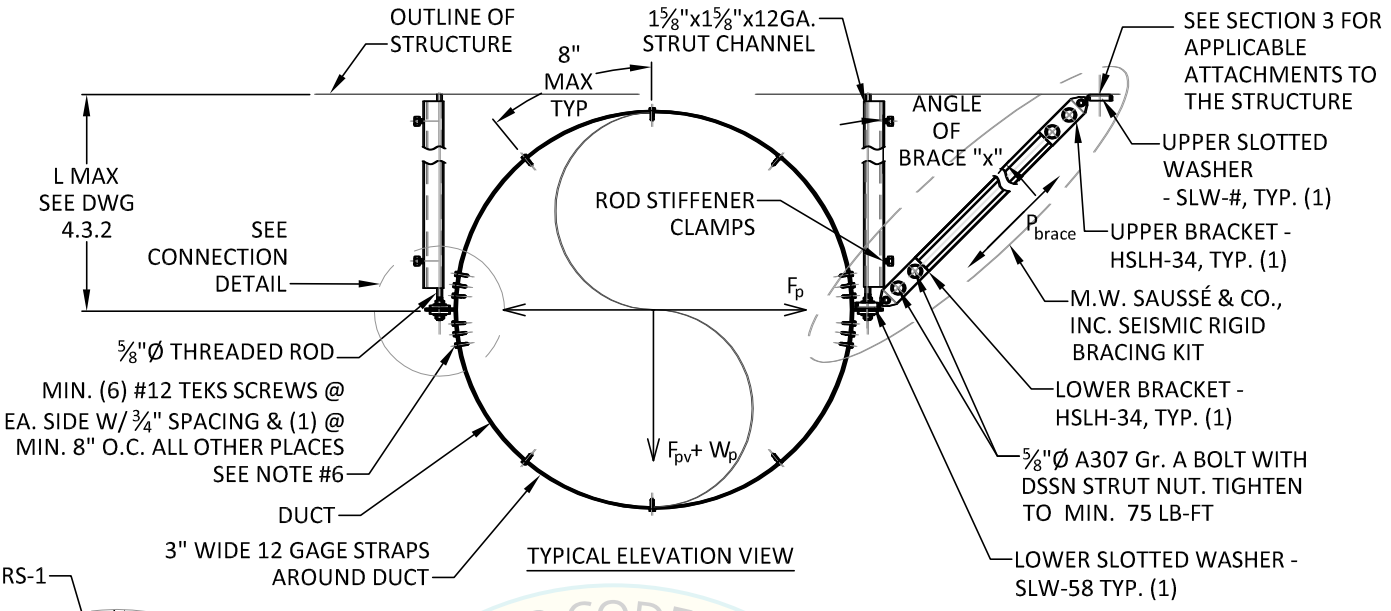
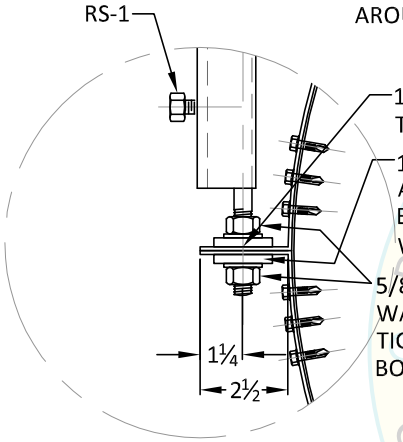
California PE No. S6481


Page No.: **2.10.4**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE - 100 PLF MAX




TYPICAL ELEVATION VIEW

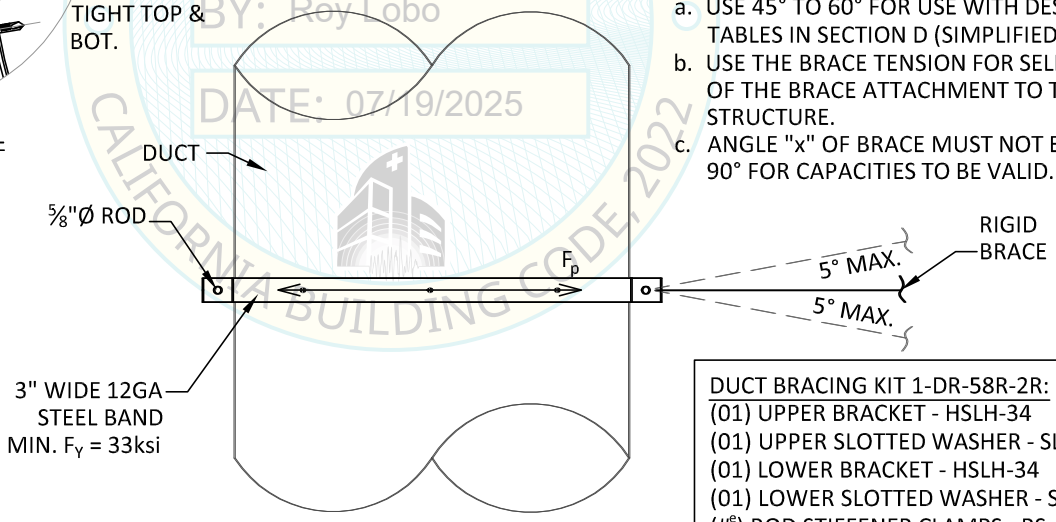



CONNECTION DETAIL

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| [c]60°< x ≤90° | 2864 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

DUCT BRACING KIT 1-DR-58R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).

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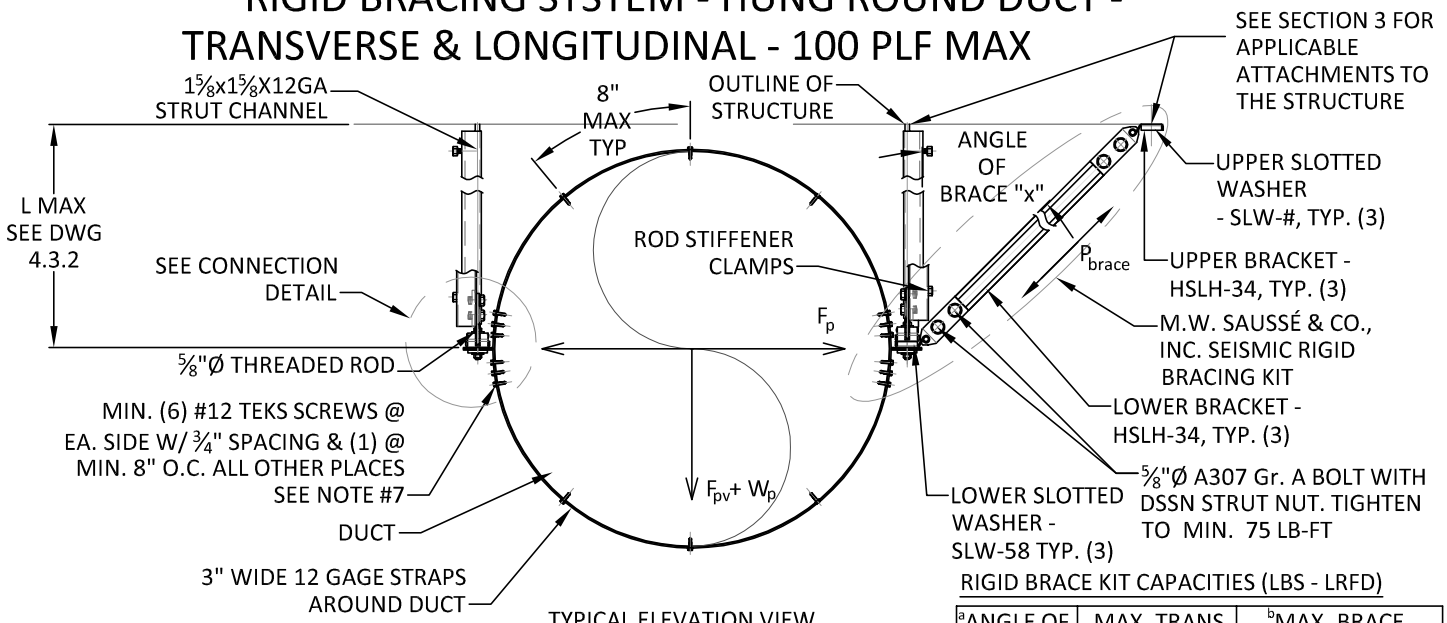
Page No.: **2.10.5**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - HUNG ROUND DUCT - TRANSVERSE & LONGITUDINAL - 100 PLF MAX

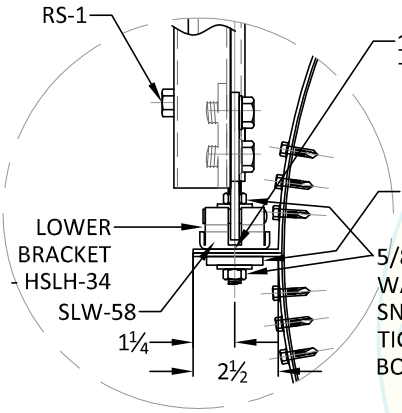



TYPICAL ELEVATION VIEW

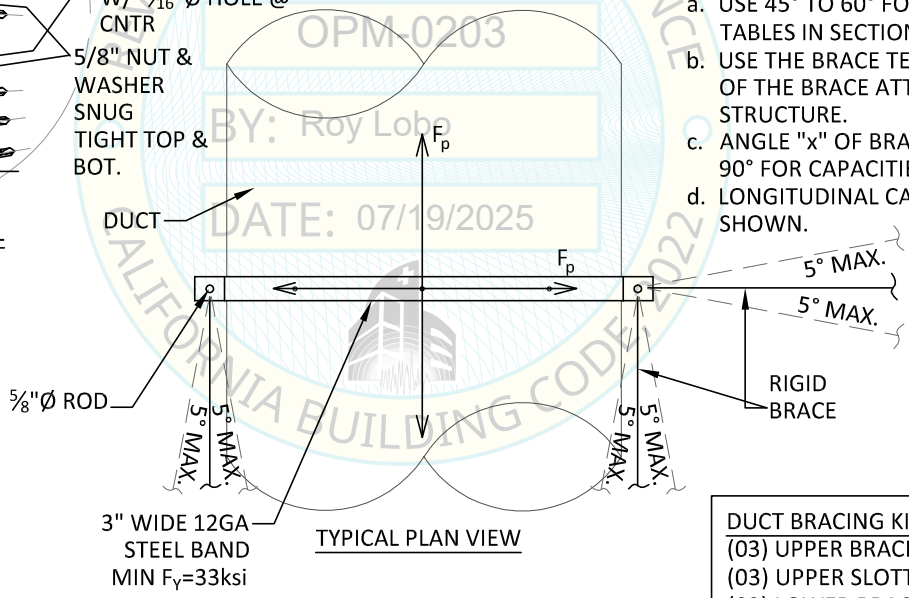
RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| [a]ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| [c]45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| 60°< x ≤90° | 2864 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.




CONNECTION DETAIL




TYPICAL PLAN VIEW

DUCT BRACING KIT 2-DR-58R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. USE SHORTEST SMS POSSIBLE WHEN PENETRATING DUCTWORK TO MINIMIZE AIRFLOW NOISE INSIDE THE DUCT (FEMA 414).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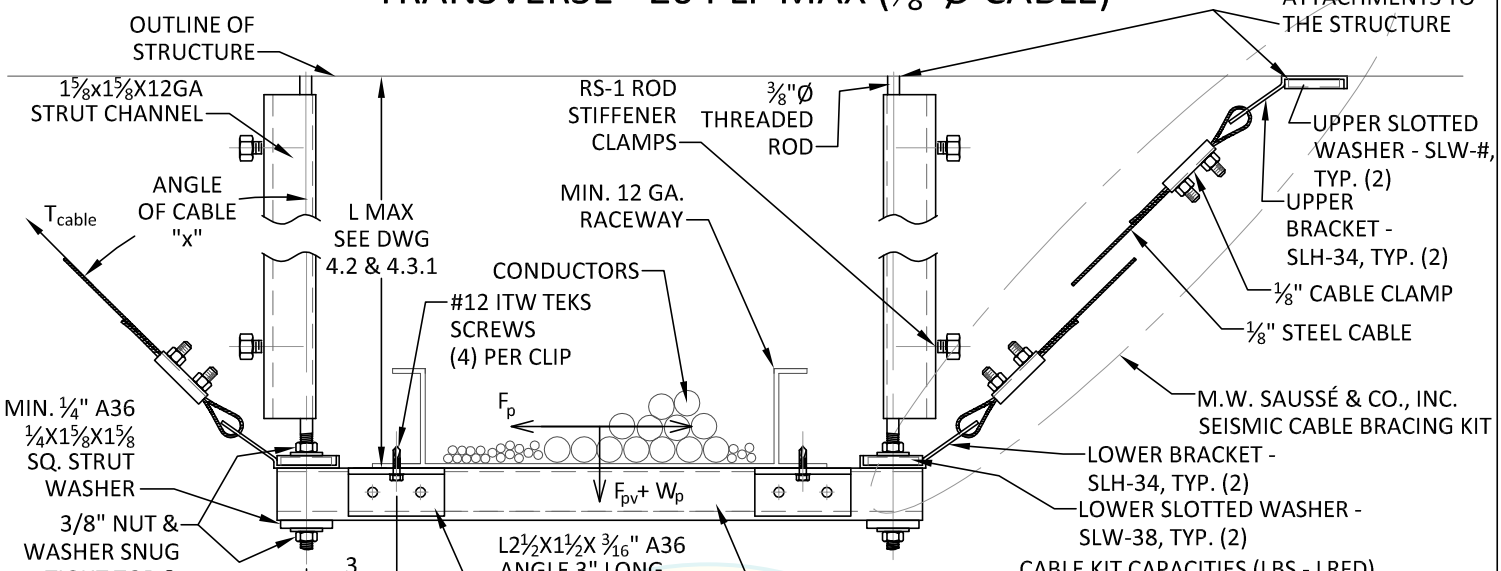
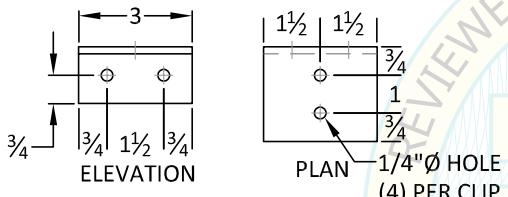
Page No.: **2.10.6**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE - 20 PLF MAX (⅛"Ø CABLE)




TYPICAL ELEVATION VIEW

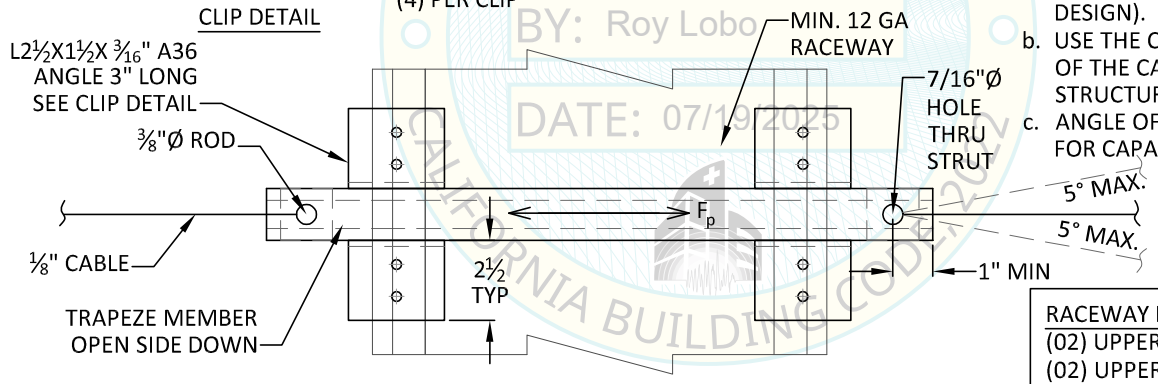



CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

CLIP DETAIL




TYPICAL PLAN VIEW

RACEWAY BRACING KIT 1-R18C-38R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$VALUE USED IN DESIGN.

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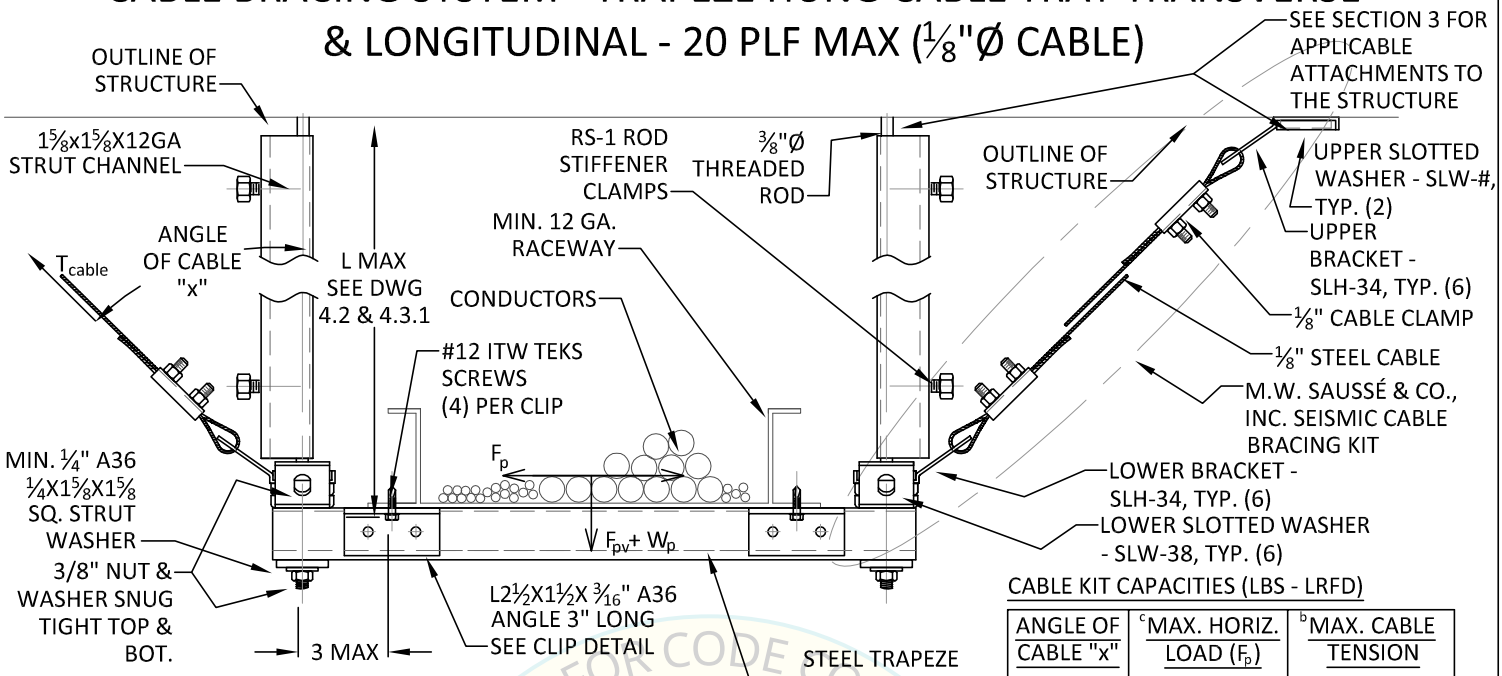
Page No.: **2.11.1**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE & LONGITUDINAL - 20 PLF MAX (⅛"Ø CABLE)

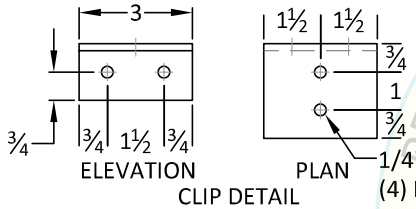



TYPICAL ELEVATION VIEW

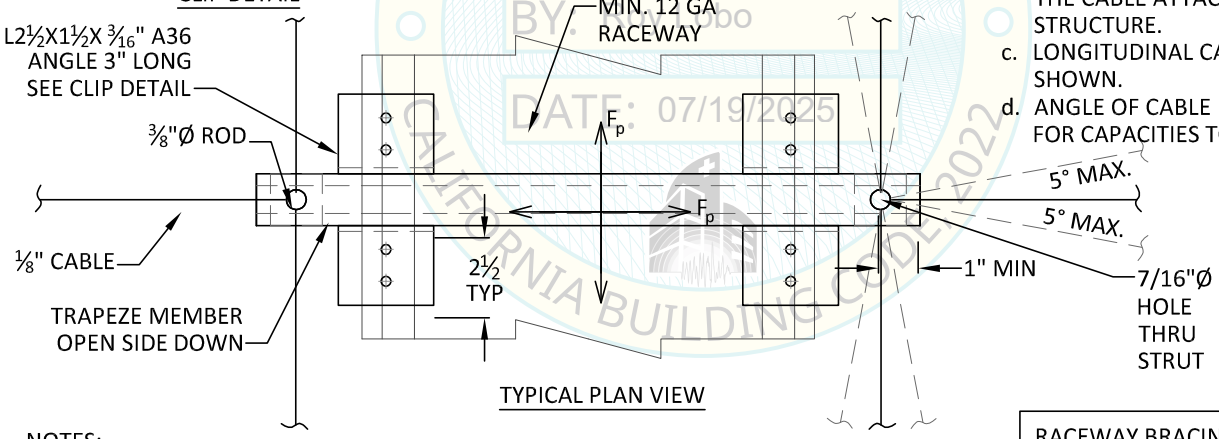
CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CLIP DETAIL




TYPICAL PLAN VIEW

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

RACEWAY BRACING KIT 1-R18C-38R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
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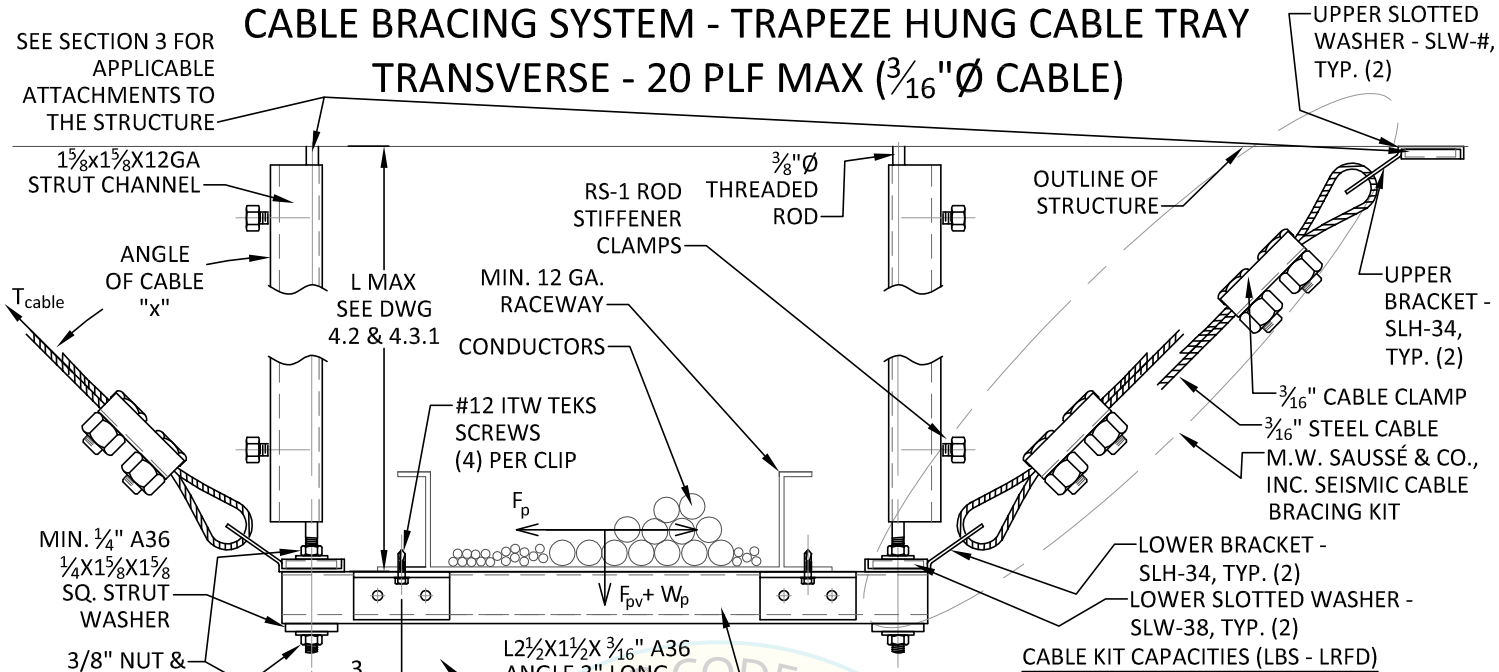
Page No.: **2.11.2**
Date: **February 5, 2025**

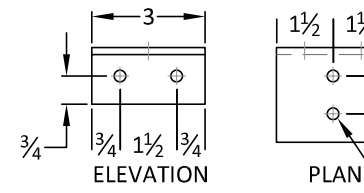
# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE - 20 PLF MAX (3/16"Ø CABLE)



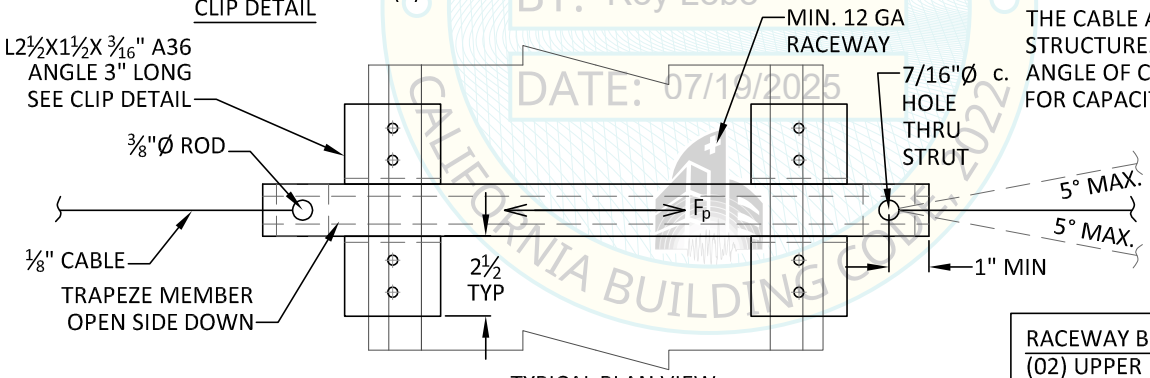

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [c]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CLIP DETAIL




TYPICAL PLAN VIEW

RACEWAY BRACING KIT 1-R316C-38R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

HCAI OPM-0203 REVIEWED BY: Roy Lobo DATE: 07/19/2025 CODE COMPLIANCE CALIFORNIA BUILDING CODE 2022

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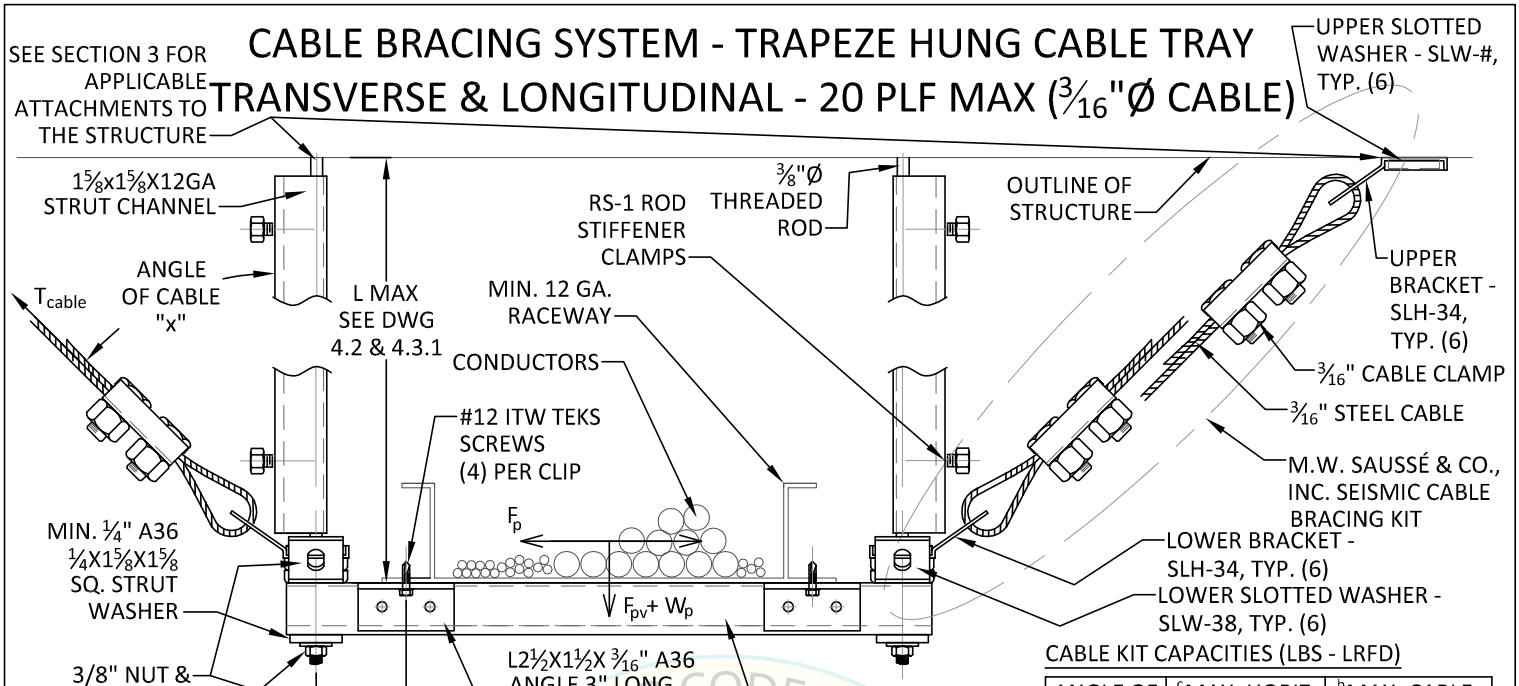
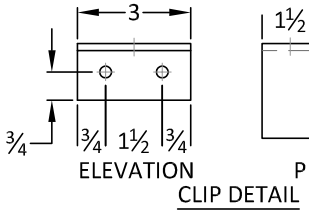
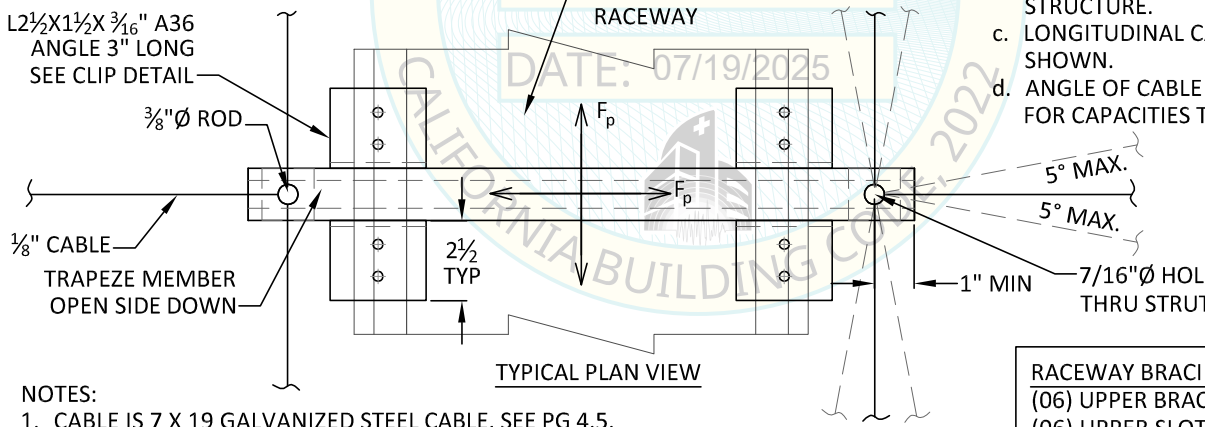
Page No.: **2.11.3**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE & LONGITUDINAL - 20 PLF MAX (3/16"Ø CABLE)




CLIP DETAIL




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [d]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

RACEWAY BRACING KIT 1-R316C-38R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-38
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT.
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
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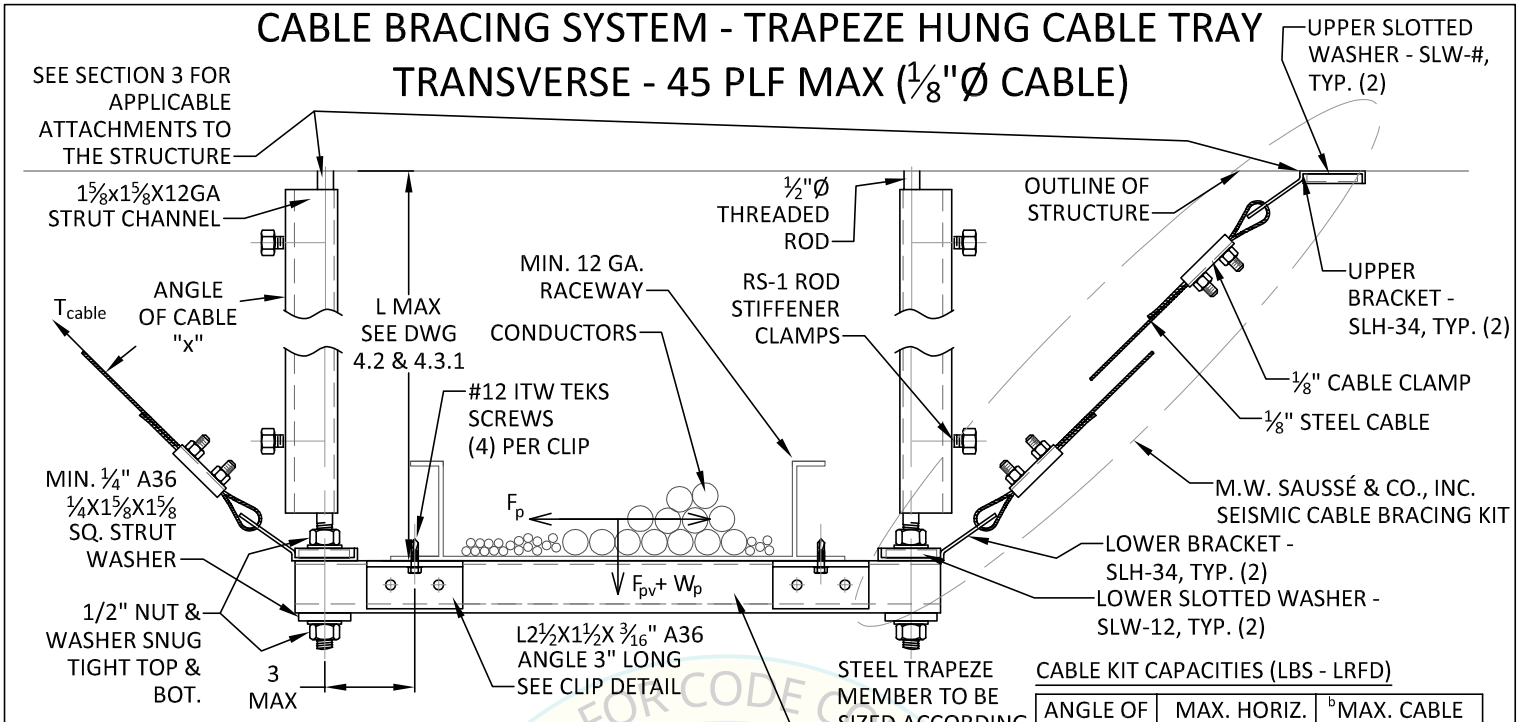
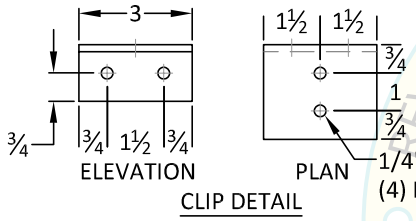
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 2.11.4
Date: February 5, 2025

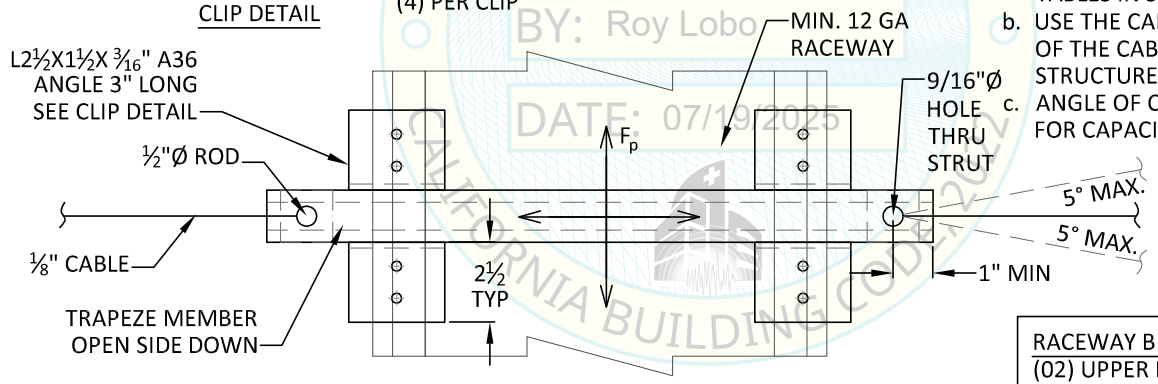
# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE - 45 PLF MAX (⅛"Ø CABLE)




TYPICAL ELEVATION VIEW




CLIP DETAIL




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

RACEWAY BRACING KIT 1-R18C-12R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

REVIEWED FOR CODE COMPLIANCE
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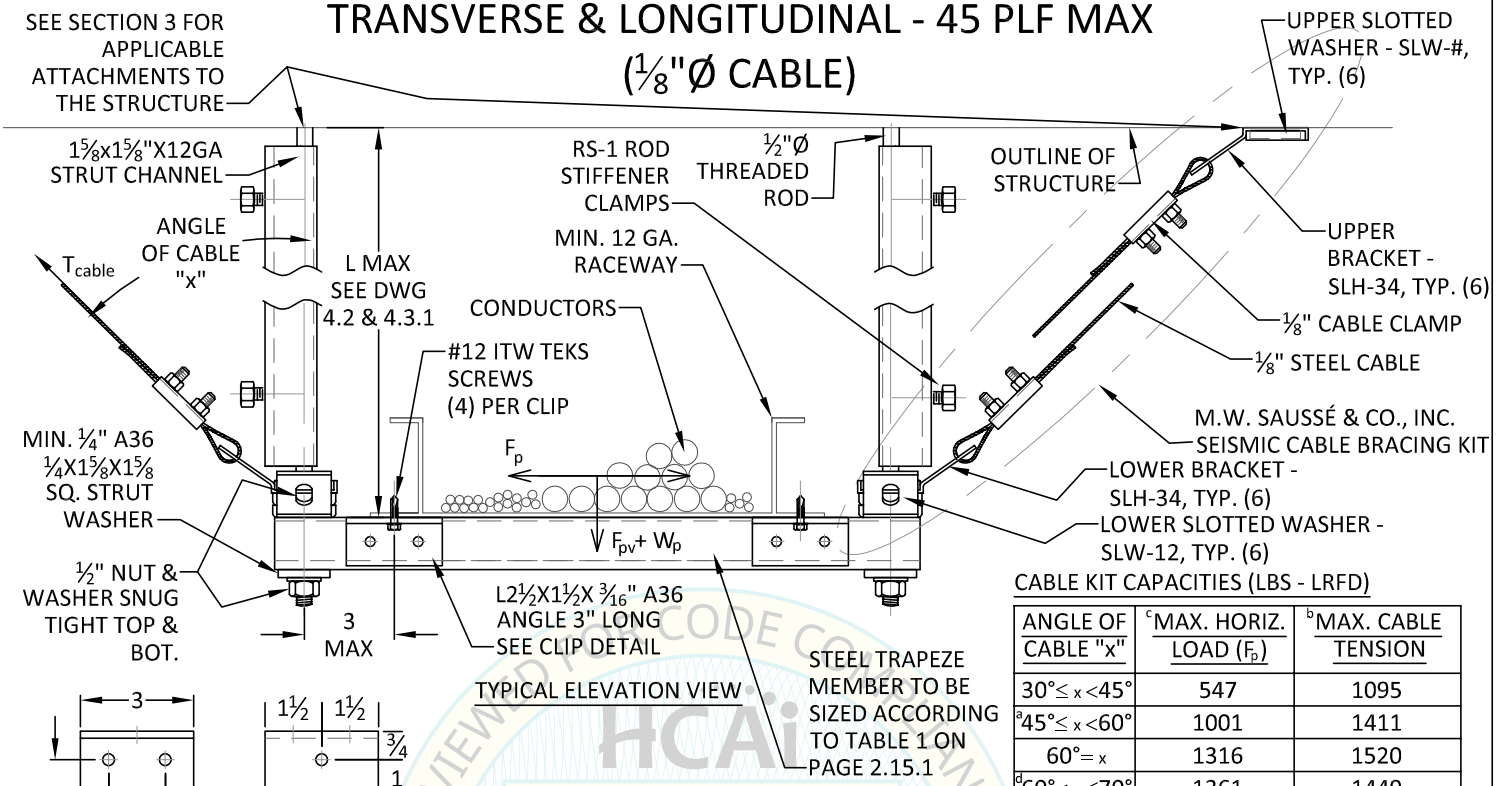
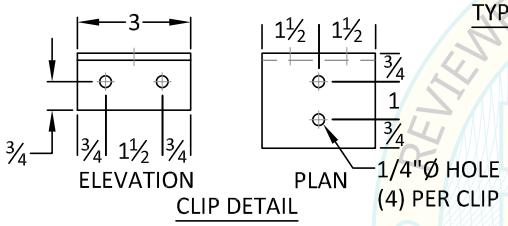
Page No.: **2.11.5**
Date: **February 5, 2025**

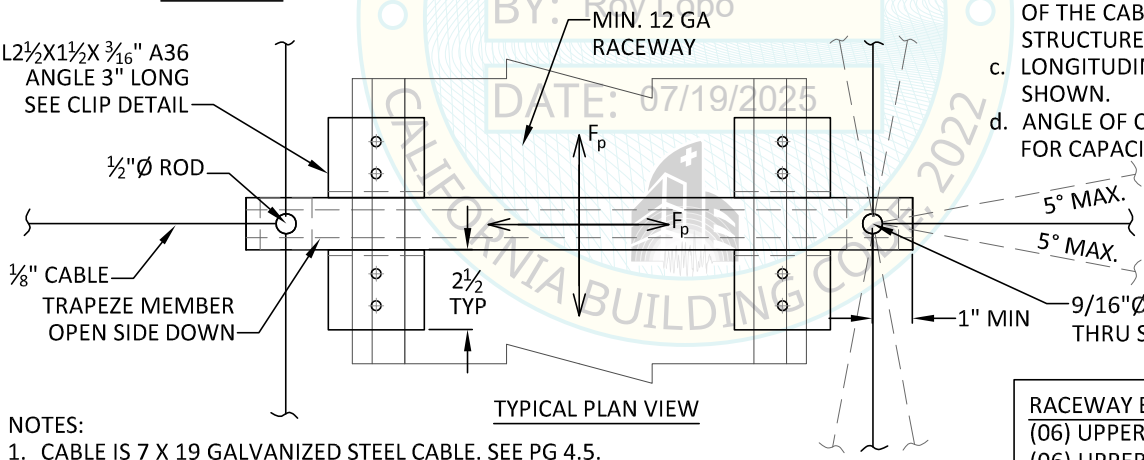
# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY
# TRANSVERSE & LONGITUDINAL - 45 PLF MAX
# (⅛"Ø CABLE)




TYPICAL ELEVATION VIEW




CLIP DETAIL




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [d]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

RACEWAY BRACING KIT 1-R18C-12R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

REVIEWED BY CODE COMPLIANCE
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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

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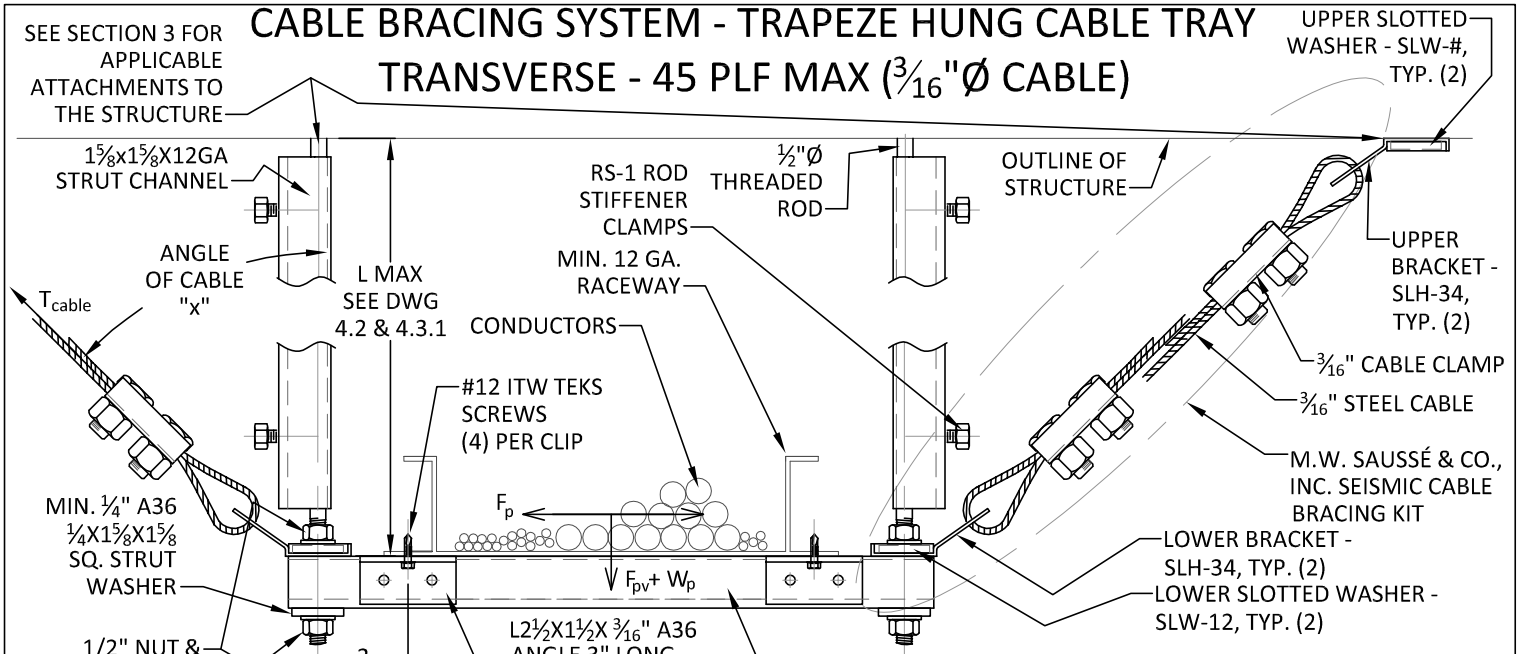
California PE No. S6481

Page No.: **2.11.6**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE - 45 PLF MAX (3/16"Ø CABLE)

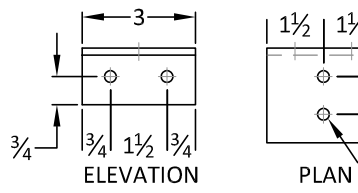



TYPICAL ELEVATION VIEW

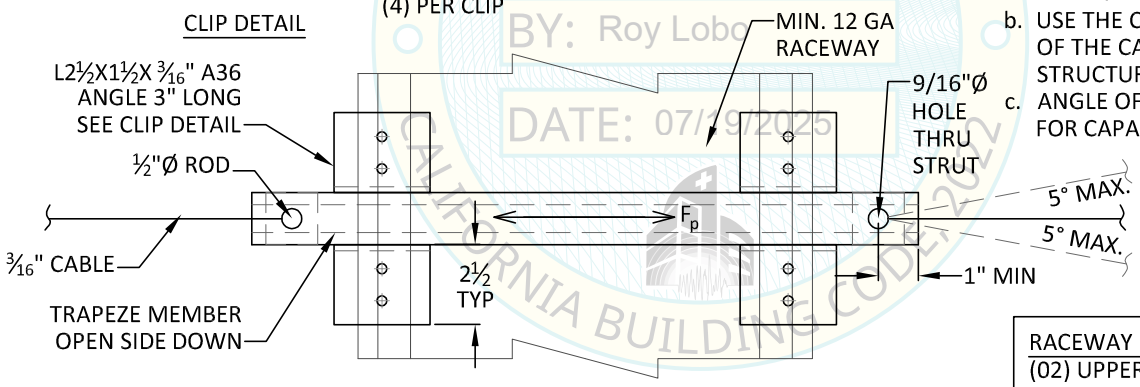
CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [c]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CLIP DETAIL




TYPICAL PLAN VIEW

RACEWAY BRACING KIT 1-R316C-12R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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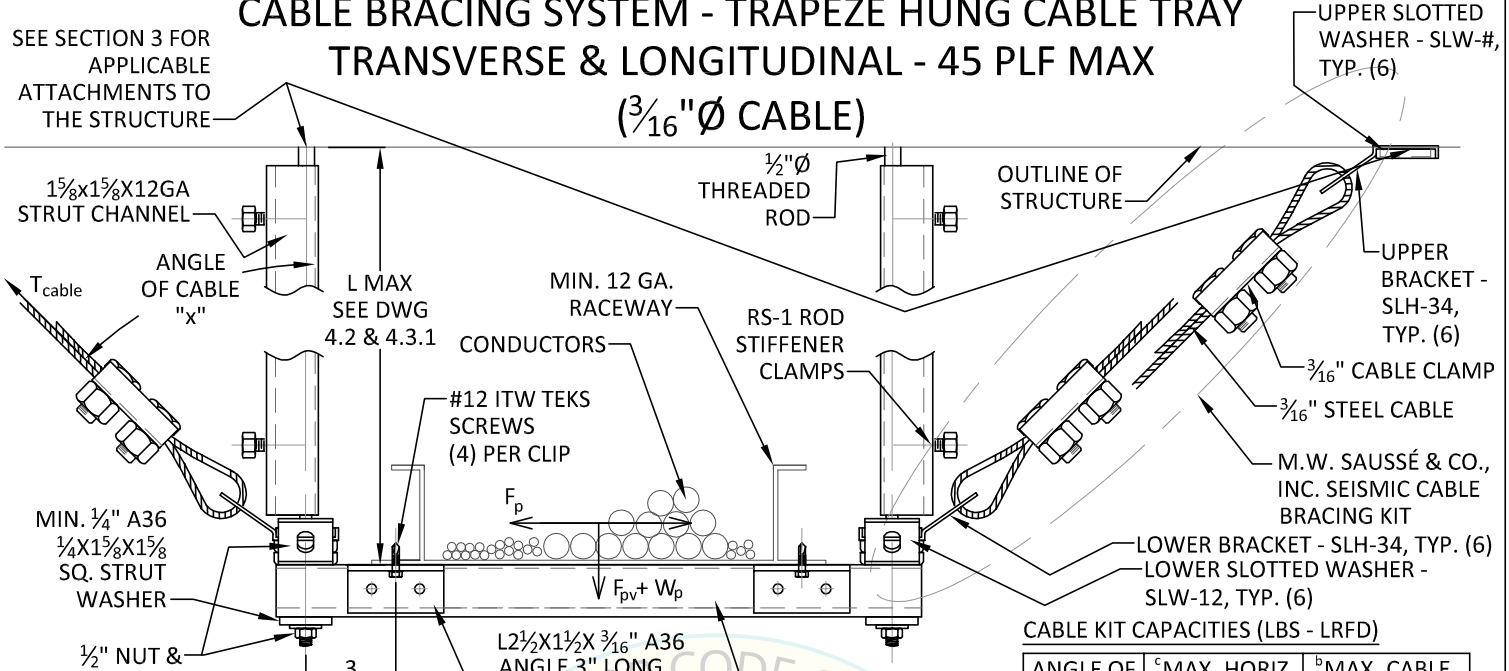
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 2.11.7
Date: February 5, 2025

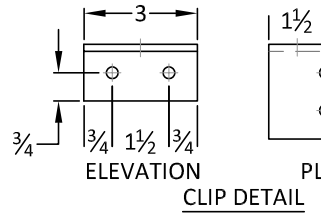
# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE & LONGITUDINAL - 45 PLF MAX ($\frac{3}{16}$"Ø CABLE)



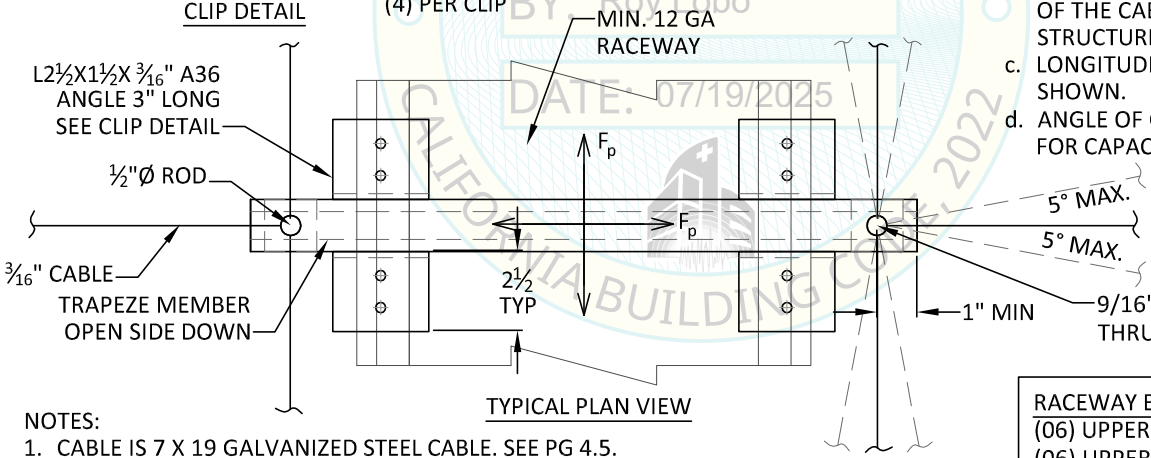

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [d]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




CLIP DETAIL




TYPICAL PLAN VIEW

RACEWAY BRACING KIT 2-R316C-12R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-12
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT.
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

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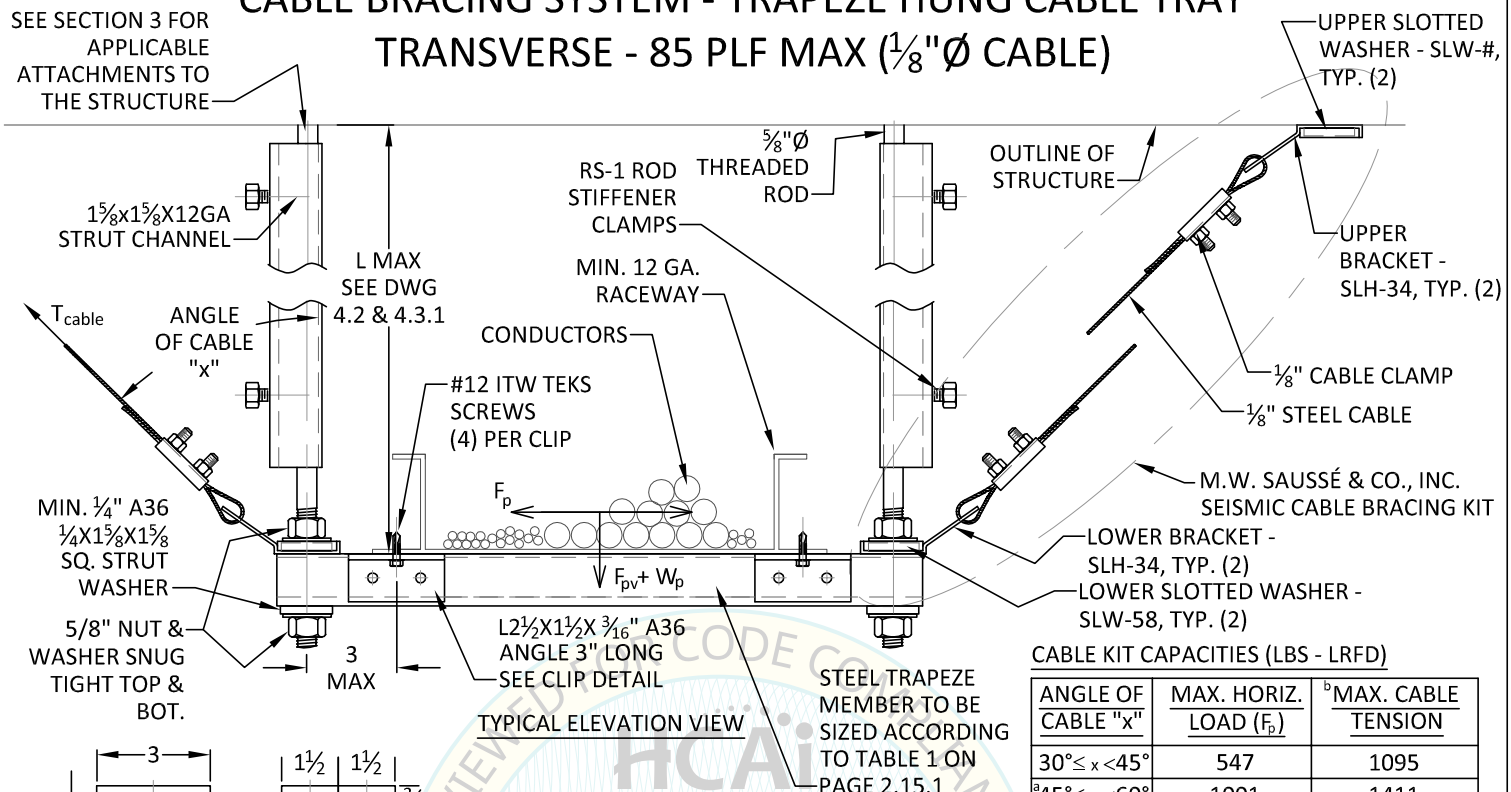
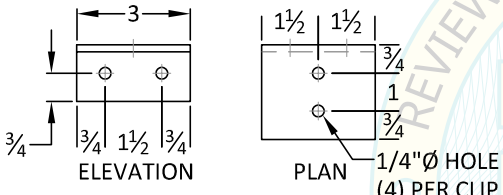
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: **2.11.8**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY
# TRANSVERSE - 85 PLF MAX (⅛"Ø CABLE)




TYPICAL ELEVATION VIEW

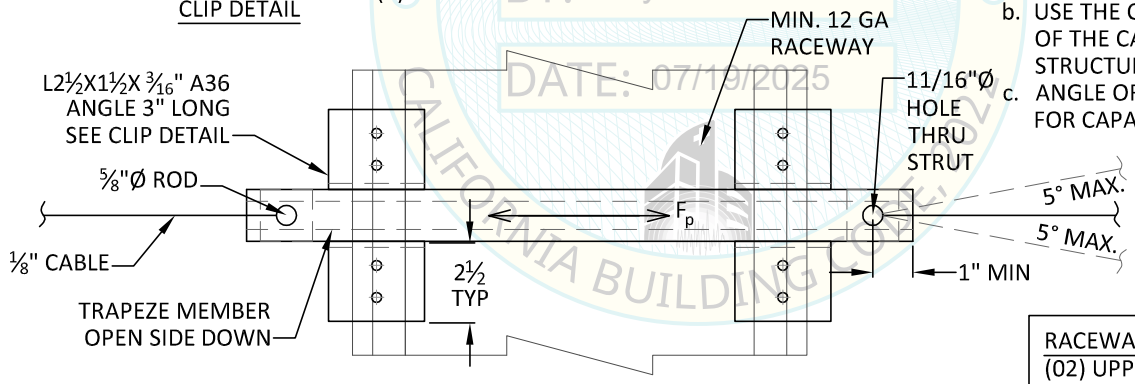



CLIP DETAIL

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [c]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




TYPICAL PLAN VIEW

RACEWAY BRACING KIT 1-R18C-58R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(02) ⅛" CABLE - 10 FT.
(04) ⅛" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
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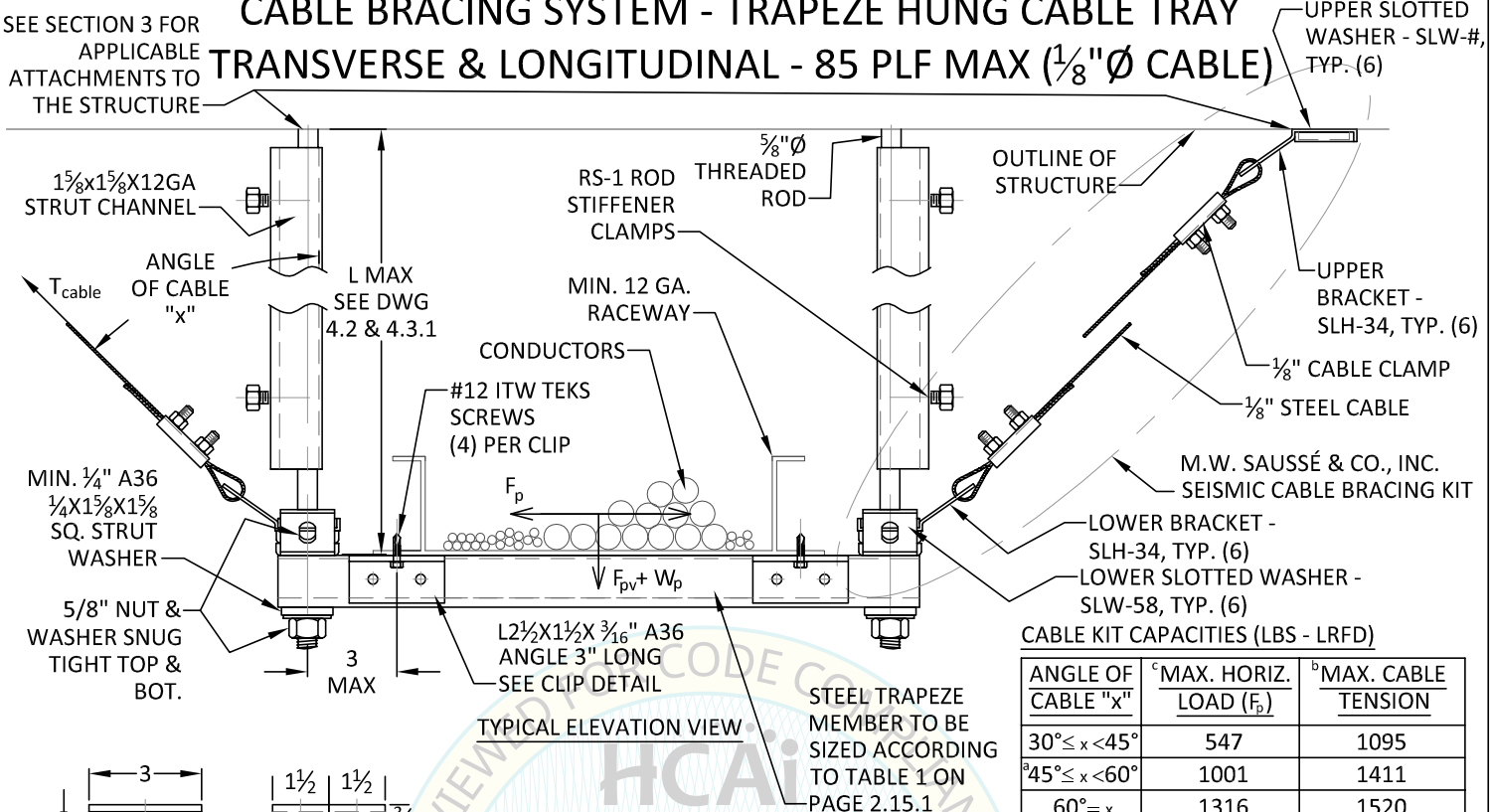
Page No.: **2.11.9**
Date: **February 5, 2025**

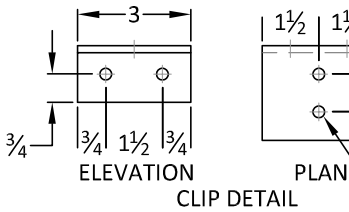
# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY
# TRANSVERSE & LONGITUDINAL - 85 PLF MAX (⅛"Ø CABLE)

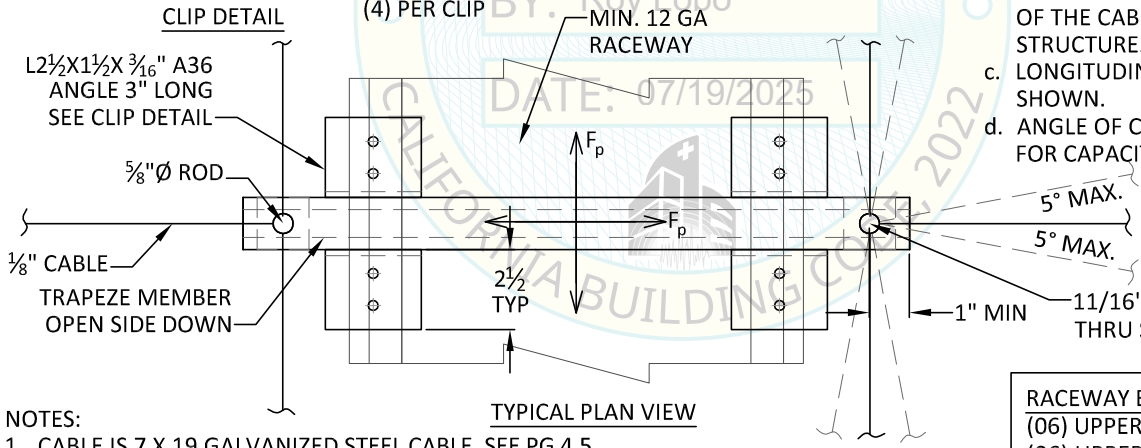



CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| [a]45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [d]60°< x ≤70° | 1361 | 1449 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.




NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

RACEWAY BRACING KIT 1-R18C-58R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(06) ⅛" CABLE - 10 FT.
(12) ⅛" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
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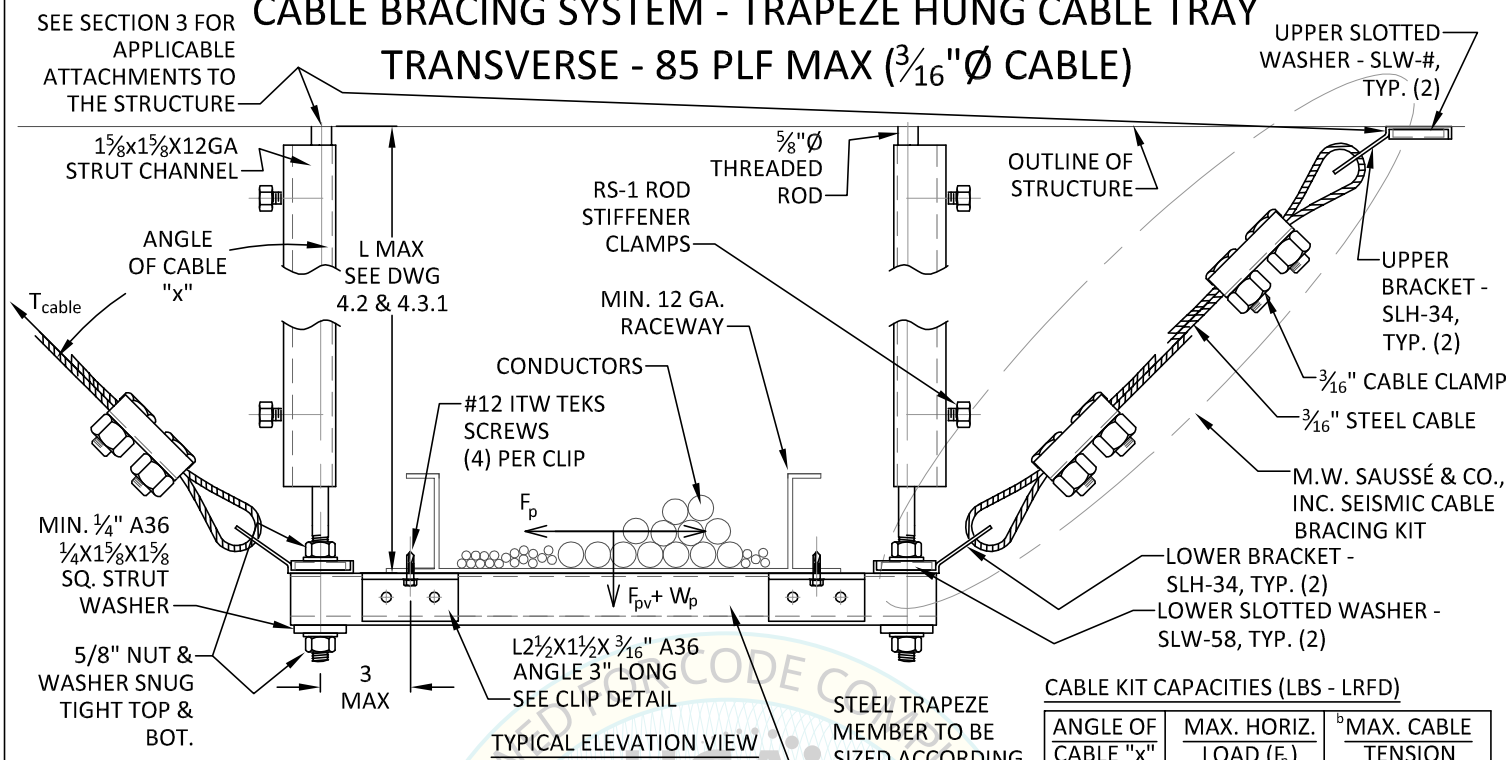
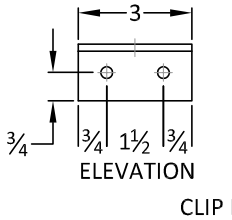
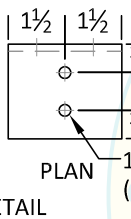
Page No.: **2.11.10**
Date: **February 5, 2025**

# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE - 85 PLF MAX (3/16"Ø CABLE)

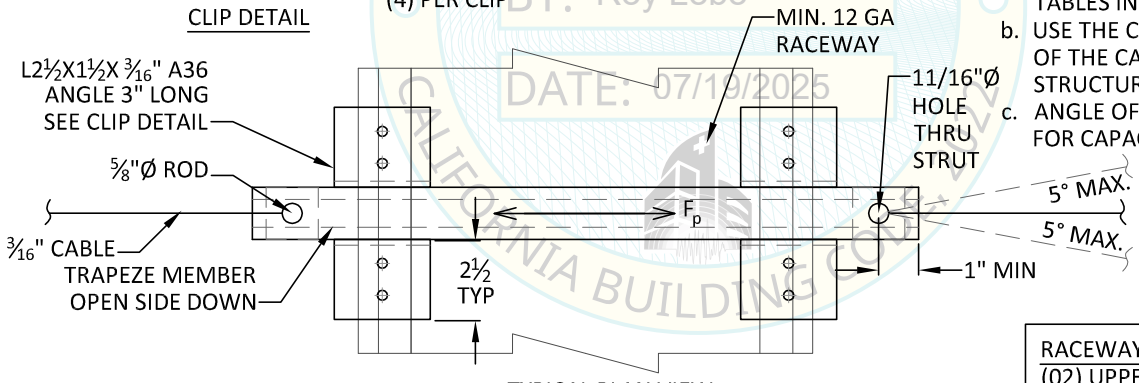



TYPICAL ELEVATION VIEW




CLIP DETAIL




TYPICAL PLAN VIEW

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [c]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

RACEWAY BRACING KIT 1-R316C-58R-2R:
(02) UPPER BRACKET - SLH-34
(02) UPPER SLOTTED WASHER - SLW-#[d]
(02) LOWER BRACKET - SLH-34
(02) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(02) 3/16" CABLE - 10 FT.
(04) 3/16" CABLE CLAMPS

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE

Vibrex® vibration & seismic control systems
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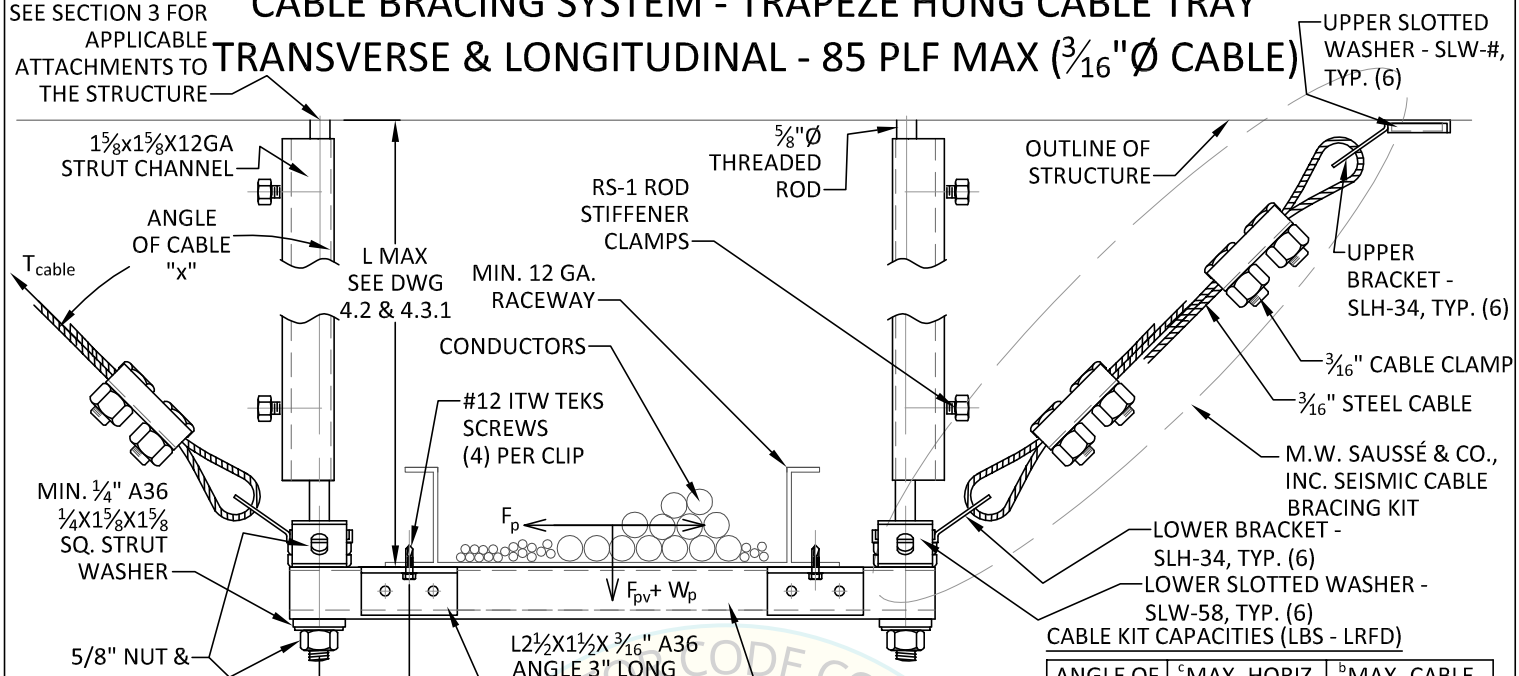
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: 2.11.11
Date: February 5, 2025

# CABLE BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY
# TRANSVERSE & LONGITUDINAL - 85 PLF MAX (3/16"Ø CABLE)




CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | [c]MAX. HORIZ. LOAD ($F_p$) | [b]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| [a]45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [d]60°< x ≤70° | 2413 | 2570 |

a. USE 45° TO 60°FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
c. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.
d. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG 4.5.
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. TEKS SCREWS MUST BE PER ICC ESR-1976.
7. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.1 GOVERNS.
8. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

RACEWAY BRACING KIT 2-R316C-58R-2R:
(06) UPPER BRACKET - SLH-34
(06) UPPER SLOTTED WASHER - SLW-#[e]
(06) LOWER BRACKET - SLH-34
(06) LOWER SLOTTED WASHER - SLW-58
(04) ROD STIFFENER CLAMPS - RS-1
(06) 3/16" CABLE - 10 FT.
(12) 3/16" CABLE CLAMPS

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
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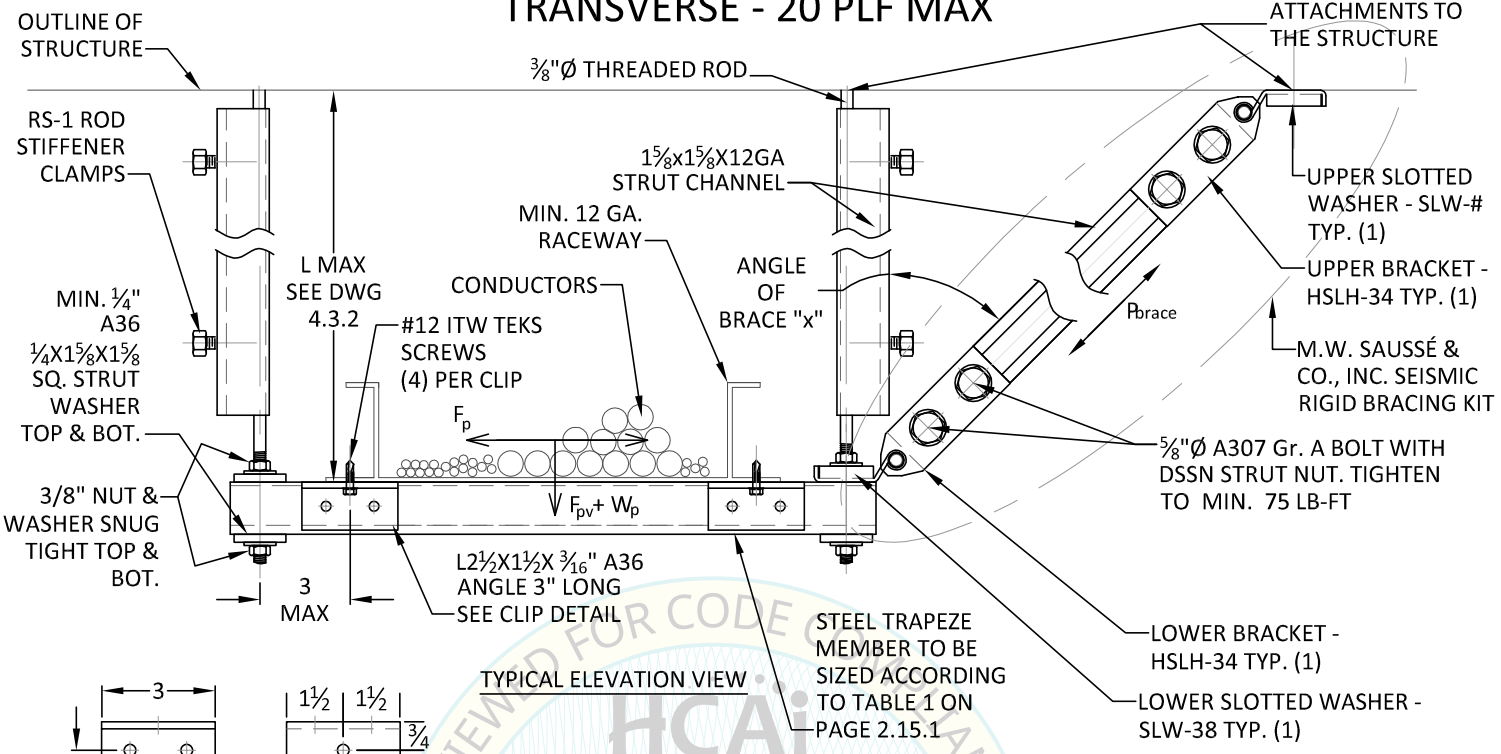
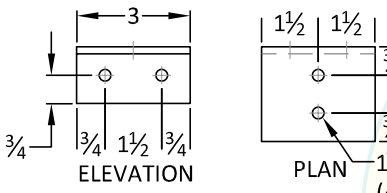
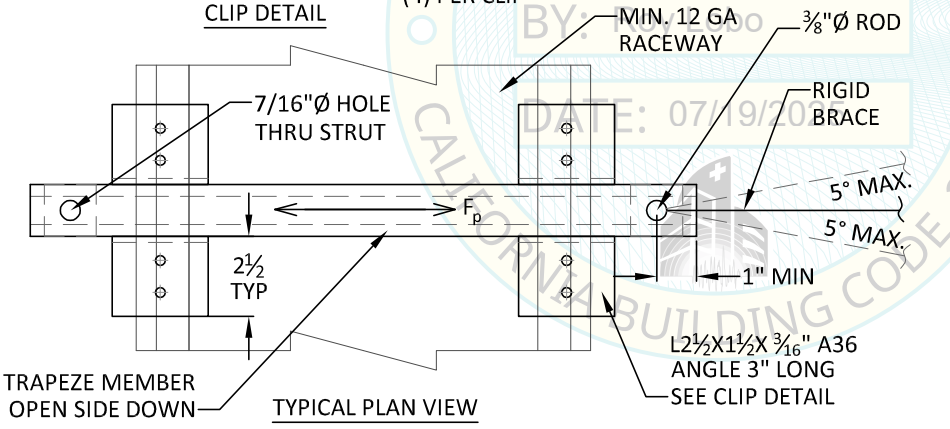
Page No.: **2.11.12**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE - 20 PLF MAX




CLIP DETAIL




TYPICAL PLAN VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 632 | 1264 |
| [a]45°≤ x <60° | 1256 | 1776 |
| 60°= x | 1585 | 1830 |
| [c]60°< x ≤90° | 1589 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

RACEWAY BRACING KIT 1-RR-38R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.2 GOVERNS.
7. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

REVIEWED FOR CODE COMPLIANCE
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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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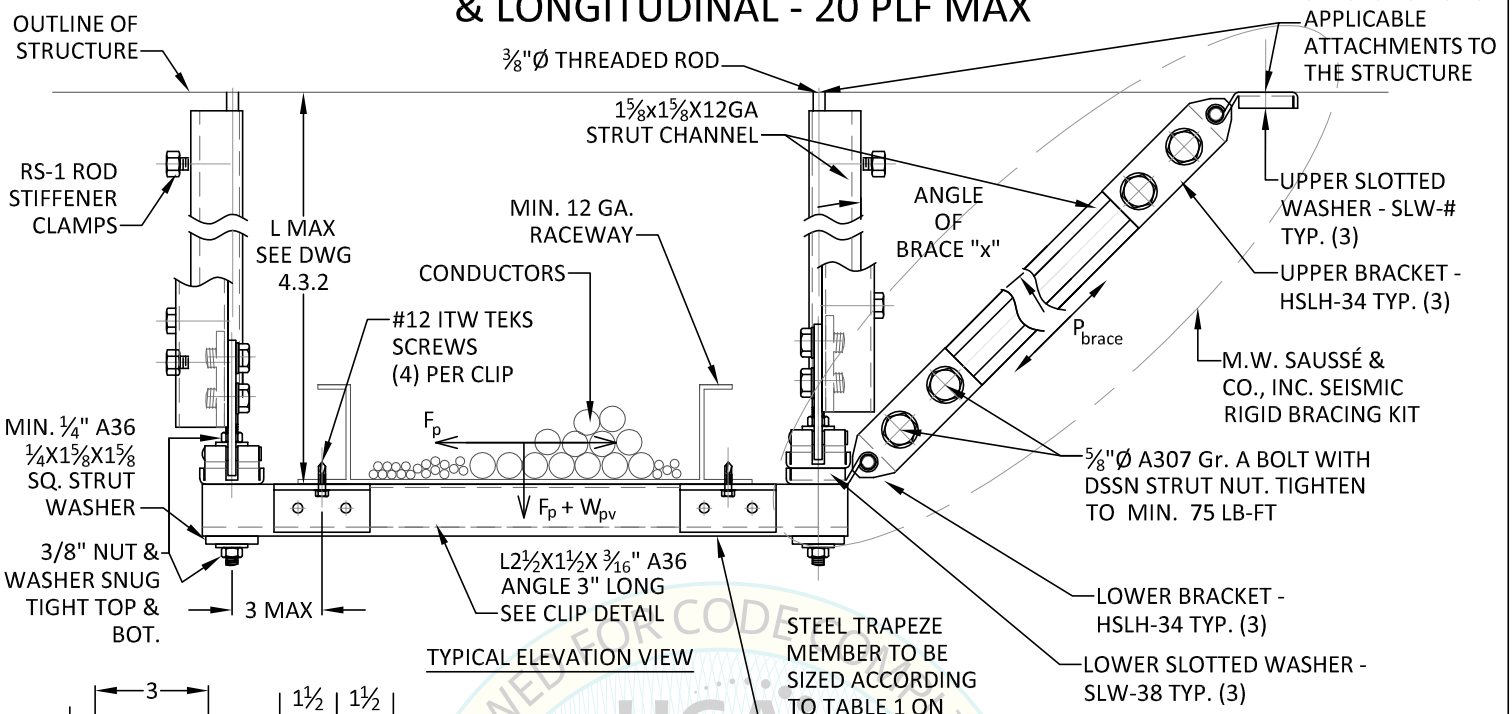
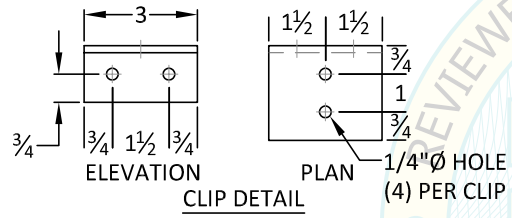
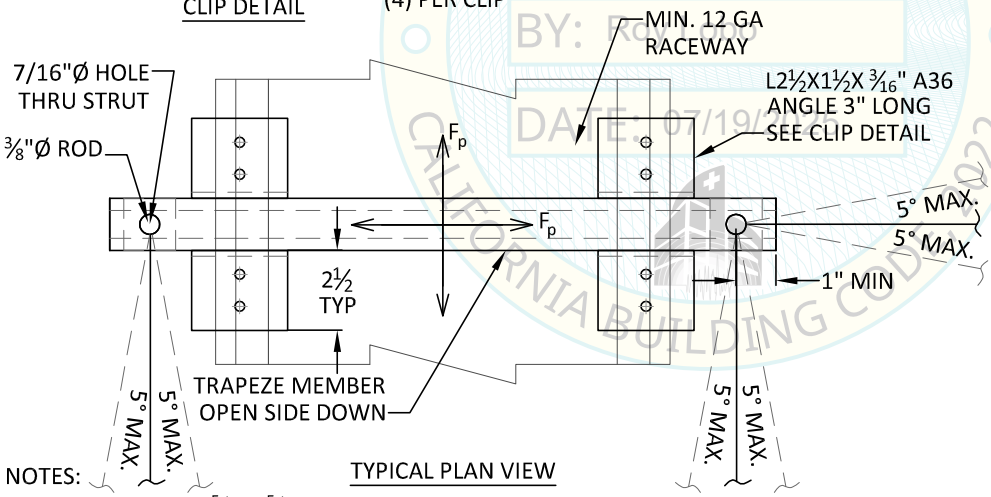
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.12.1**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY TRANSVERSE & LONGITUDINAL - 20 PLF MAX




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 632 | 1264 |
| [a]45°≤ x <60° | 1256 | 1776 |
| 60°= x | 1585 | 1830 |
| [c]60°< x ≤90° | 1589 | 1589 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.

RACEWAY BRACING KIT 2-RR-38R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-38
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

f. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.2 GOVERNS.
7. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

REVIEWED FOR CODE COMPLIANCE
HCAI
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
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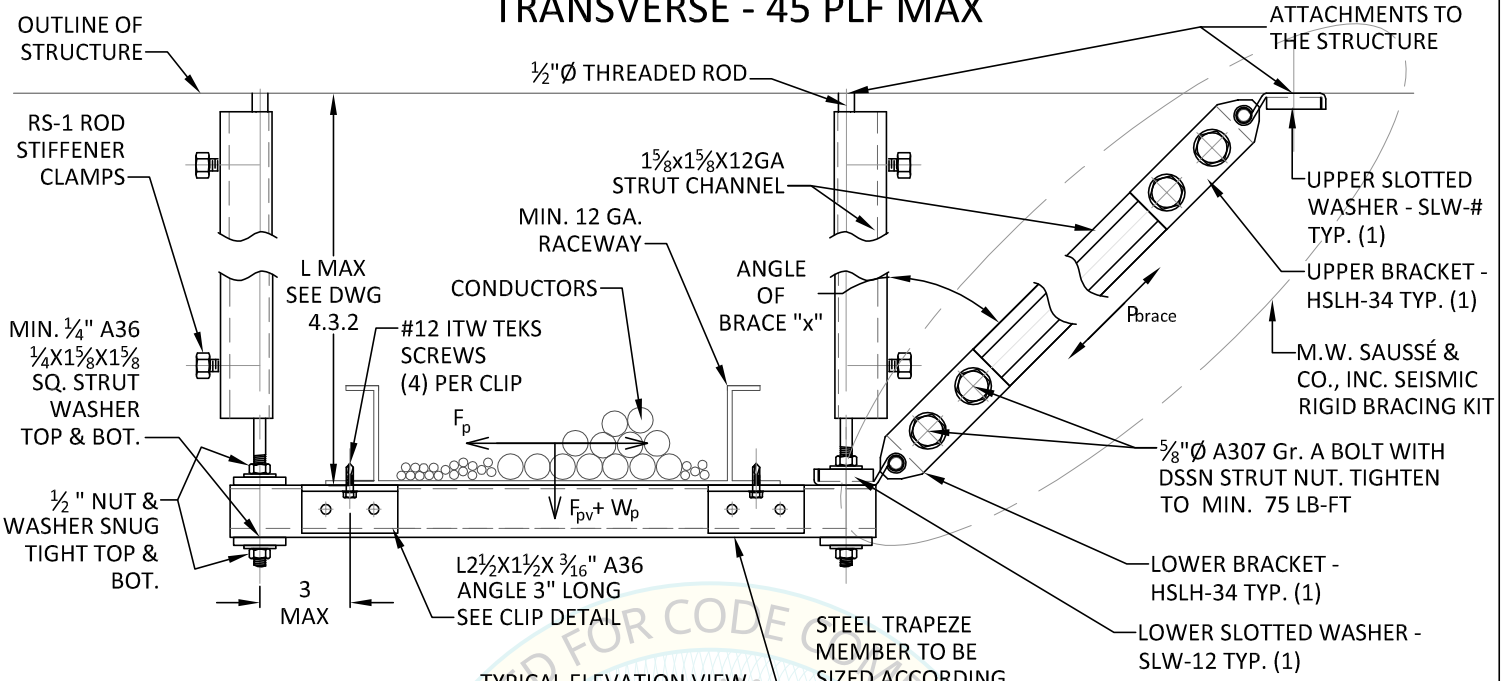
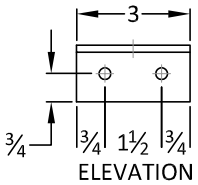
California PE No. S6481

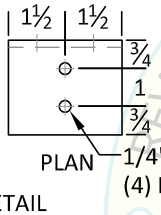
Page No.: **2.12.2**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY
# TRANSVERSE - 45 PLF MAX




TYPICAL ELEVATION VIEW

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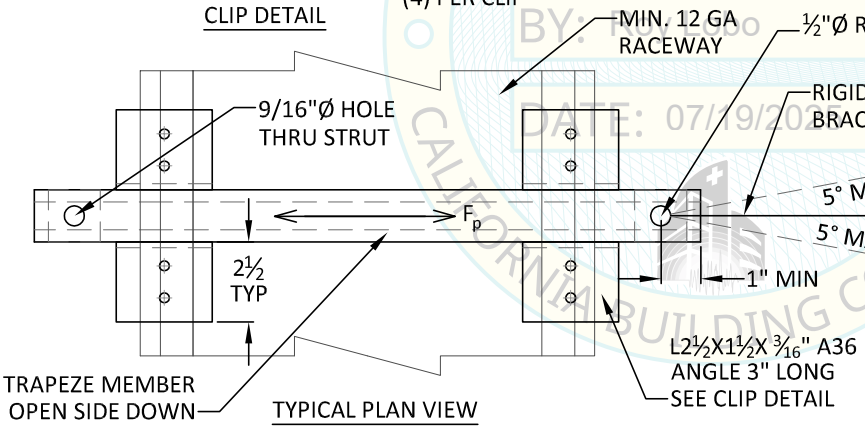


TYPICAL PLAN VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1107 | 2213 |
| [a]45°≤ x <60° | 2348 | 3320 |
| 60°= x | 2711 | 3130 |
| [c]60°< x ≤90° | 1443 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

RACEWAY BRACING KIT 1-RR-12R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.2 GOVERNS.
7. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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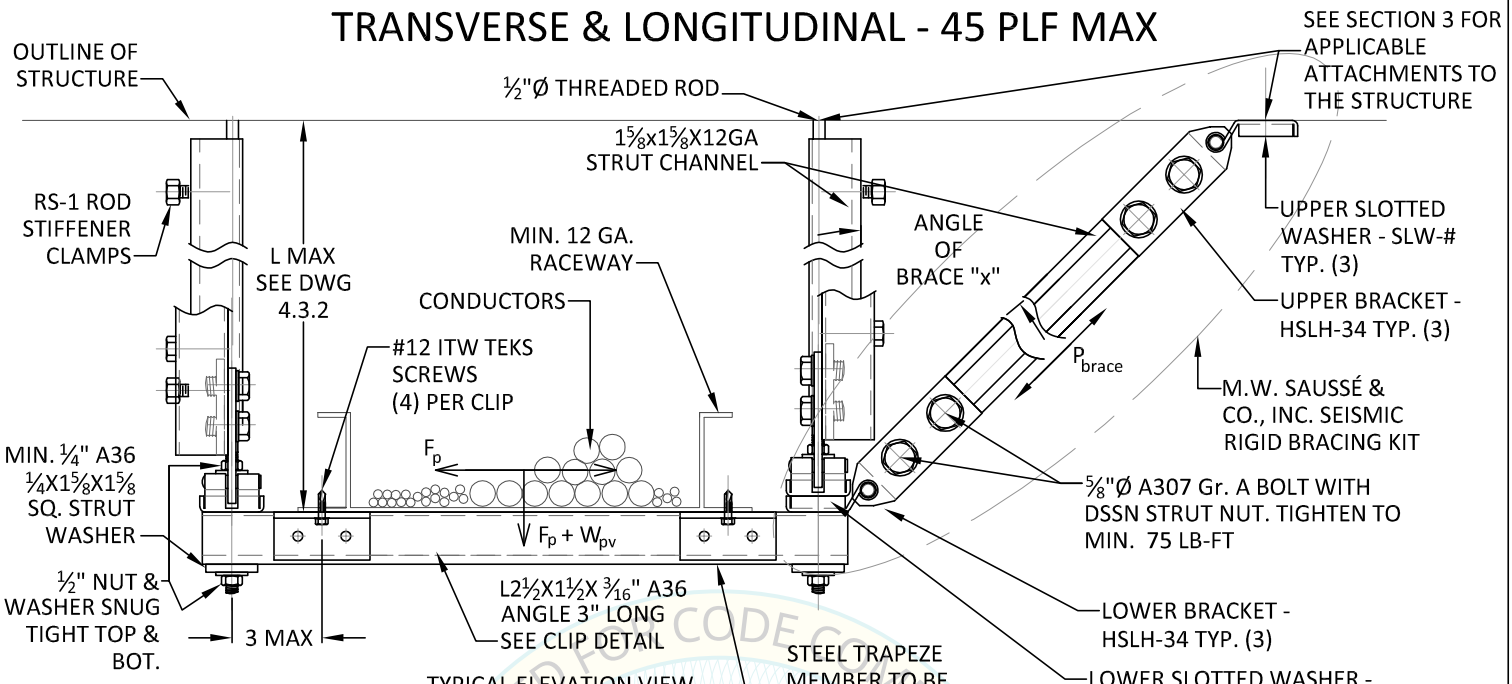
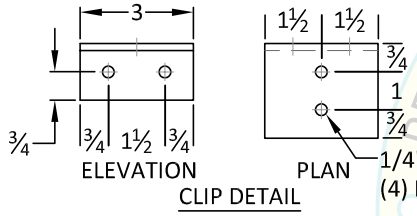
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.12.3**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY
# TRANSVERSE & LONGITUDINAL - 45 PLF MAX




TYPICAL ELEVATION VIEW

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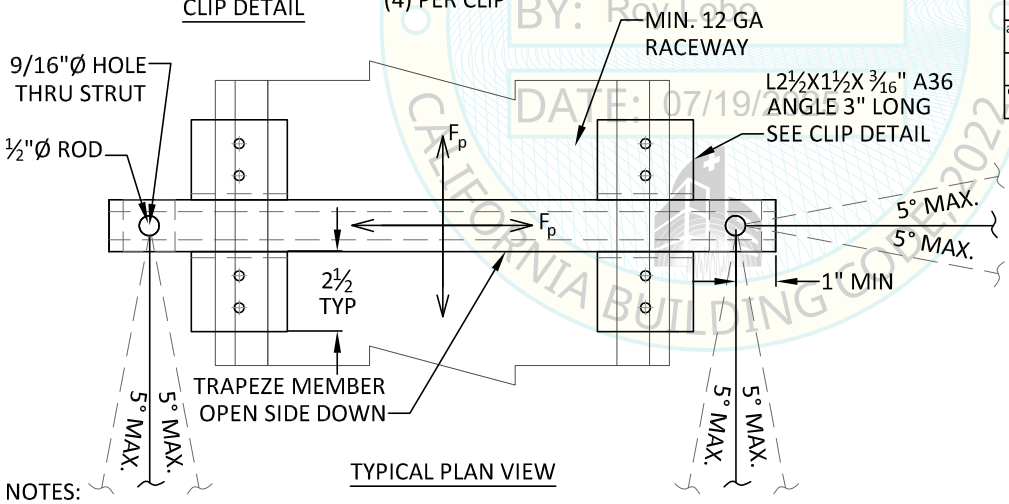


TYPICAL PLAN VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1107 | 2213 |
| [a]45°≤ x <60° | 2348 | 3320 |
| 60°= x | 2711 | 3130 |
| [c]60°< x ≤90° | 1443 | 1443 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.

RACEWAY BRACING KIT 2-RR-12R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-12
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
f. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.2 GOVERNS.
7. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

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HCAI
OPM-0203
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DATE: 07/19/2025
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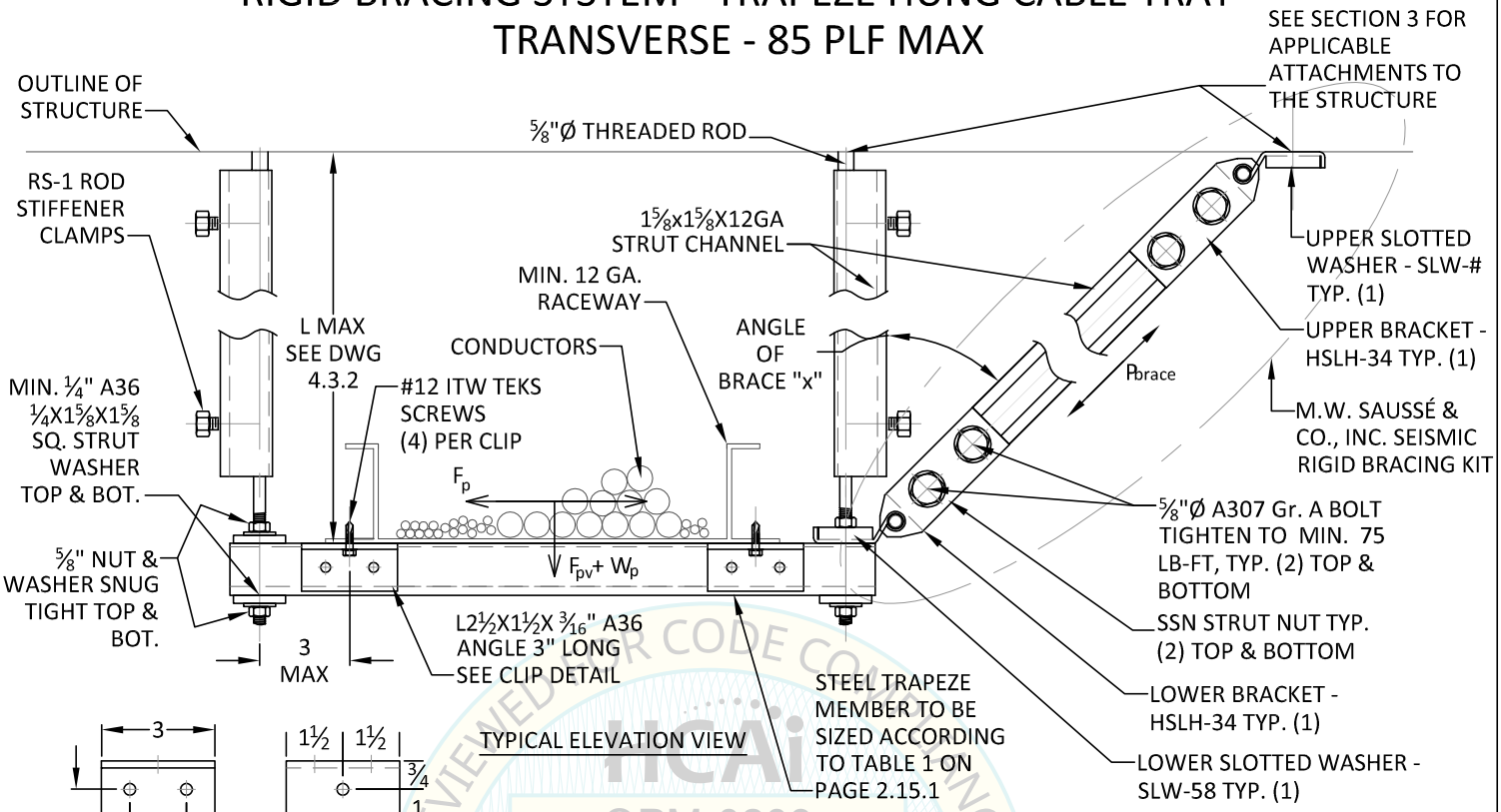
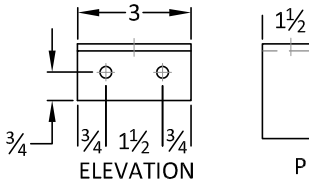
Structural Engineer: M. Tremblay
California PE No. S6481

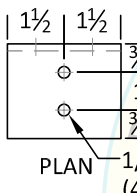
Page No.: **2.12.4**

Date: **February 5, 2025**

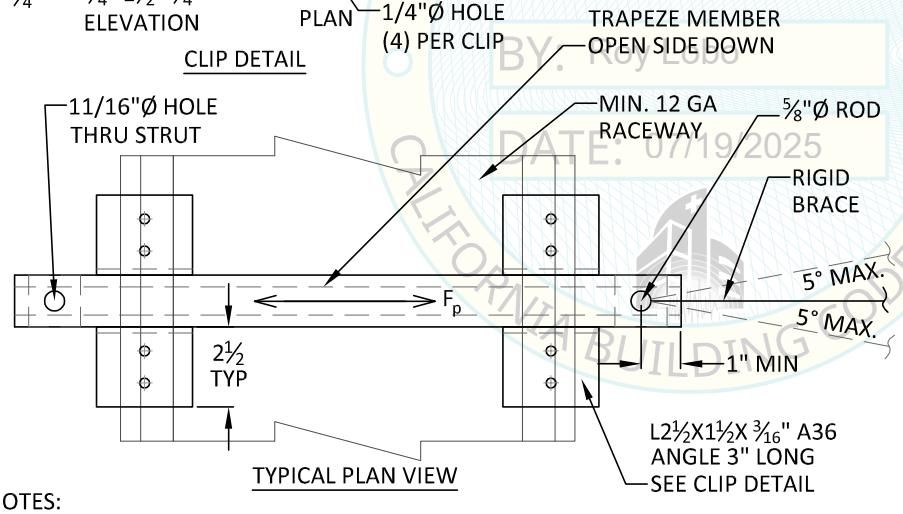
# RIGID BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY
# TRANSVERSE - 85 PLF MAX




CLIP DETAIL




TYPICAL PLAN VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| [c]60°< x ≤90° | 2864 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.

RACEWAY BRACING KIT 1-RR-58R-2R:
(01) UPPER BRACKET - HSLH-34
(01) UPPER SLOTTED WASHER - SLW-#[d]
(01) LOWER BRACKET - HSLH-34
(01) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(02) DSSN STRUT NUT

d. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
e. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.2 GOVERNS.
7. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.


REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022



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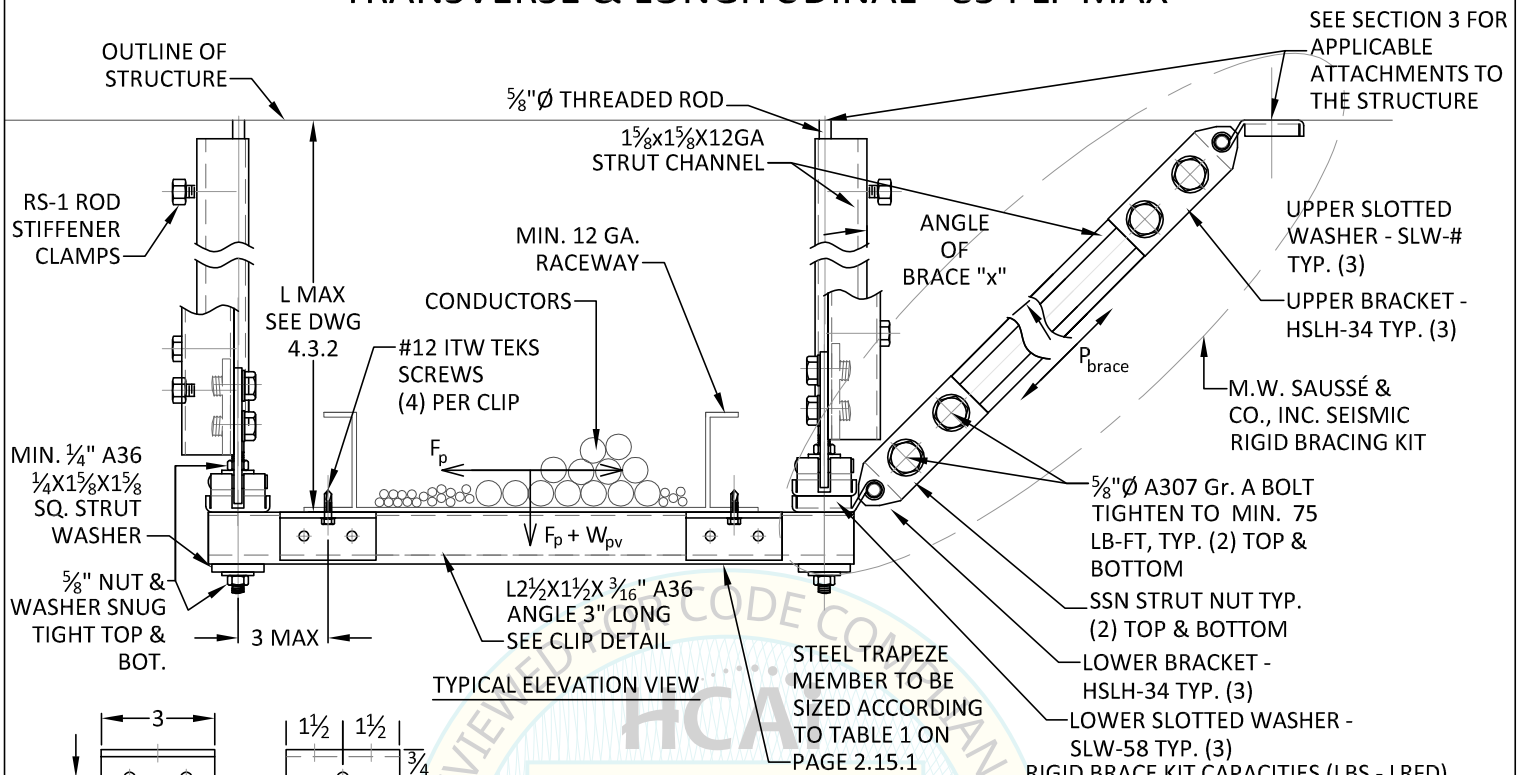
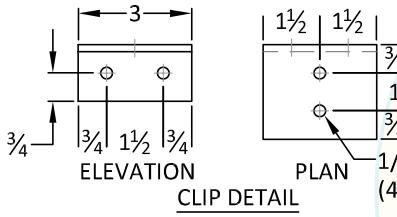
California PE No. S6481

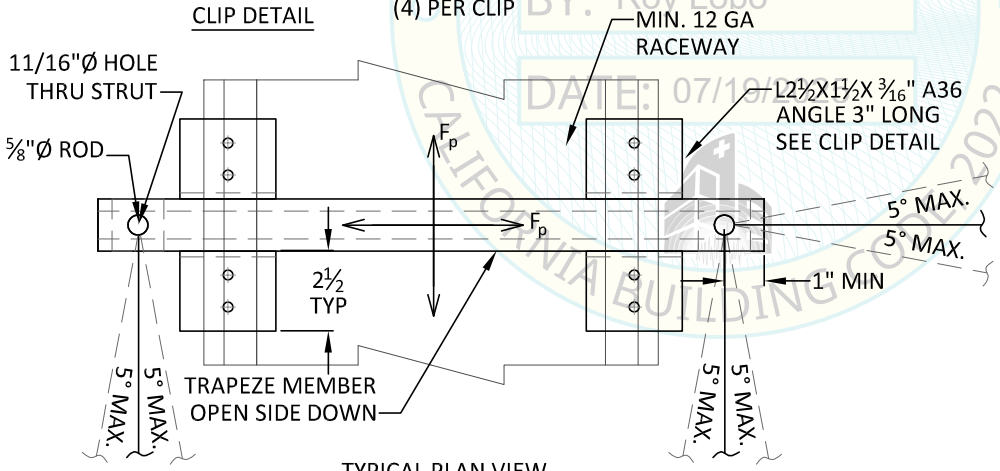

Page No.: **2.12.5**
Date: **February 5, 2025**

# RIGID BRACING SYSTEM - TRAPEZE HUNG CABLE TRAY
# TRANSVERSE & LONGITUDINAL - 85 PLF MAX




CLIP DETAIL




TYPICAL PLAN VIEW

RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$)[d] | [b]MAX. BRACE TEN./COMP. ($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| [a]45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| [c]60°< x ≤90° | 2864 | 2864 |

a. USE 45° TO 60° FOR USE WITH DESIGN TABLES IN SECTION D (SIMPLIFIED DESIGN).
b. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
c. ANGLE "x" OF BRACE MUST NOT EXCEED 90° FOR CAPACITIES TO BE VALID.
d. LONGITUDINAL CAPACITY IS 2x THE LOAD SHOWN.

RACEWAY BRACING KIT 2-RR-58R-2R:
(03) UPPER BRACKET - HSLH-34
(03) UPPER SLOTTED WASHER - SLW-#[d]
(03) LOWER BRACKET - HSLH-34
(03) LOWER SLOTTED WASHER - SLW-58
(#[e]) ROD STIFFENER CLAMPS - RS-1
(06) DSSN STRUT NUT

e. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
f. COORDINATE WITH THE ENGINEER OF RECORD FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.12.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. CABLE TRAY BRACING SPACING MUST BE APPROVED OR PRE-APPROVED BY OSHPD. LESSER SPACING VALUE OF CABLE TRAY BRACE SPACING OR KIT SPACING ON PAGE D.8.2 GOVERNS.
7. RDP MUST CONSIDER ECCENTRIC LOAD DISTRIBUTION WHEN DETERMINING $F_p$ VALUE USED IN DESIGN.

HCAI REVIEWED FOR CODE COMPLIANCE OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

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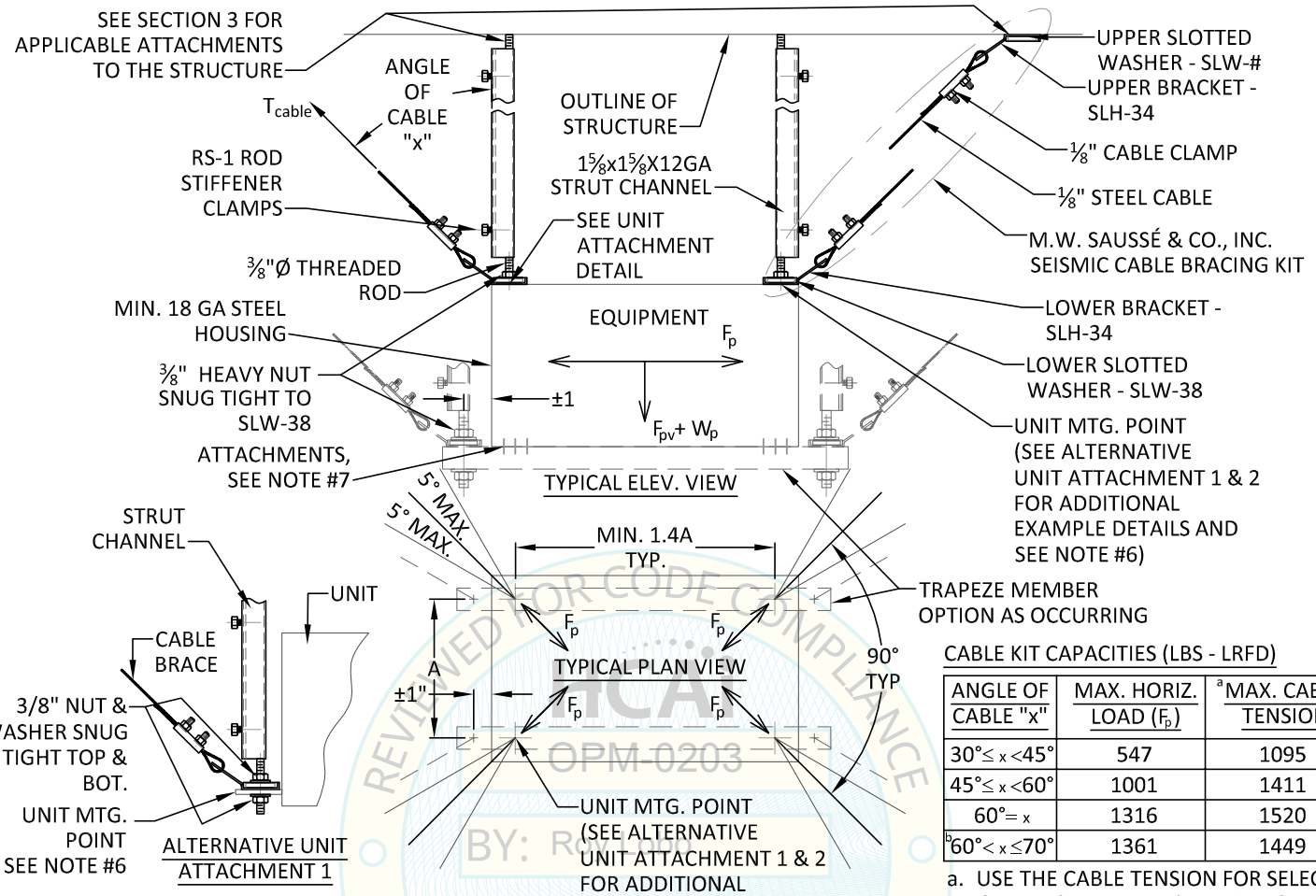
Page No.: **2.12.6**

Date: **February 5, 2025**

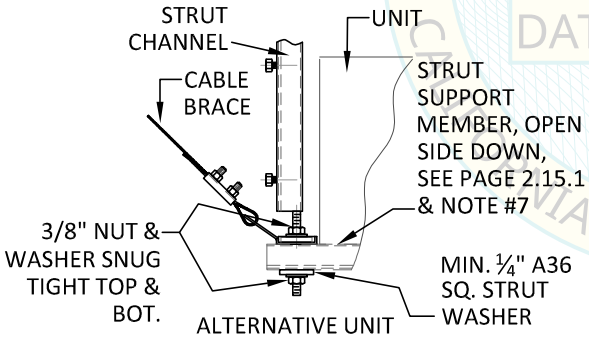
# TYPICAL EQUIPMENT CABLE BRACING SYSTEM - ⅜"Ø ROD, ⅛"Ø CABLE



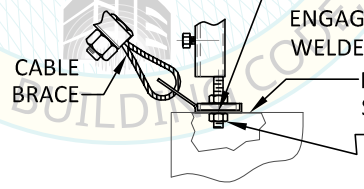




ALTERNATIVE UNIT ATTACHMENT 1




ALTERNATIVE UNIT ATTACHMENT 2




UNIT ATTACHMENT DETAIL

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [a]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| 45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [b]60°< x ≤70° | 1361 | 1449 |

a. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT U18C-38R-4R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[c]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-38
(08) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG. 4.5
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CA OSHPD PREAPPROVAL 2022

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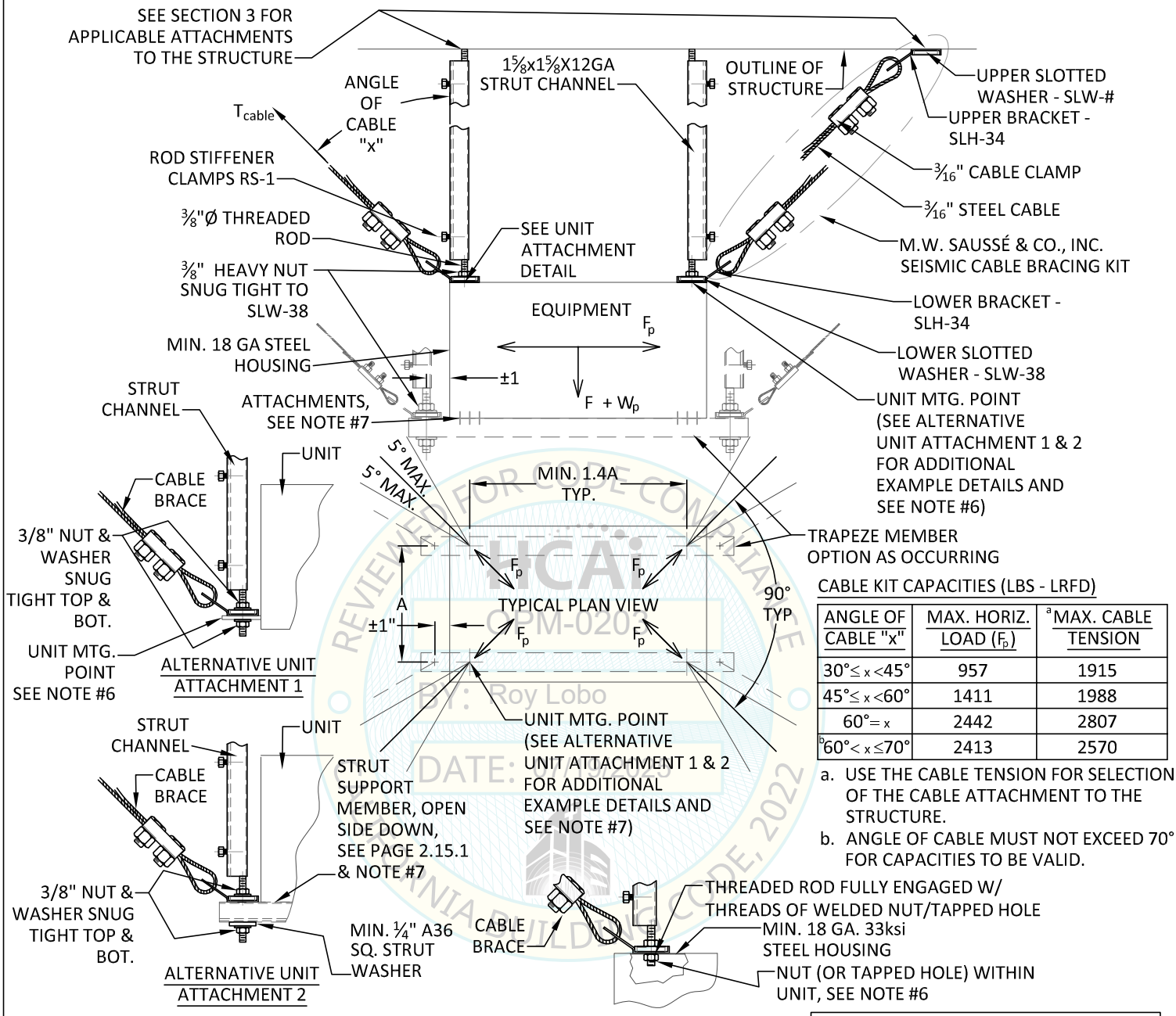
Page No.: **2.13.1**
Date: **February 5, 2025**

# TYPICAL EQUIPMENT CABLE BRACING SYSTEM - ⅜"Ø ROD, ³⁄₁₆"Ø CABLE




UNIT ATTACHMENT DETAIL

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [a]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| 45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [b]60°< x ≤70° | 2413 | 2570 |

a. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG. 4.5
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

DUCT BRACING KIT U316C-38R-4R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[c]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-38
(08) ROD STIFFENER CLAMPS - RS-1
(04) ³⁄₁₆" CABLE - 10 FT.
(08) ³⁄₁₆" CABLE CLAMPS

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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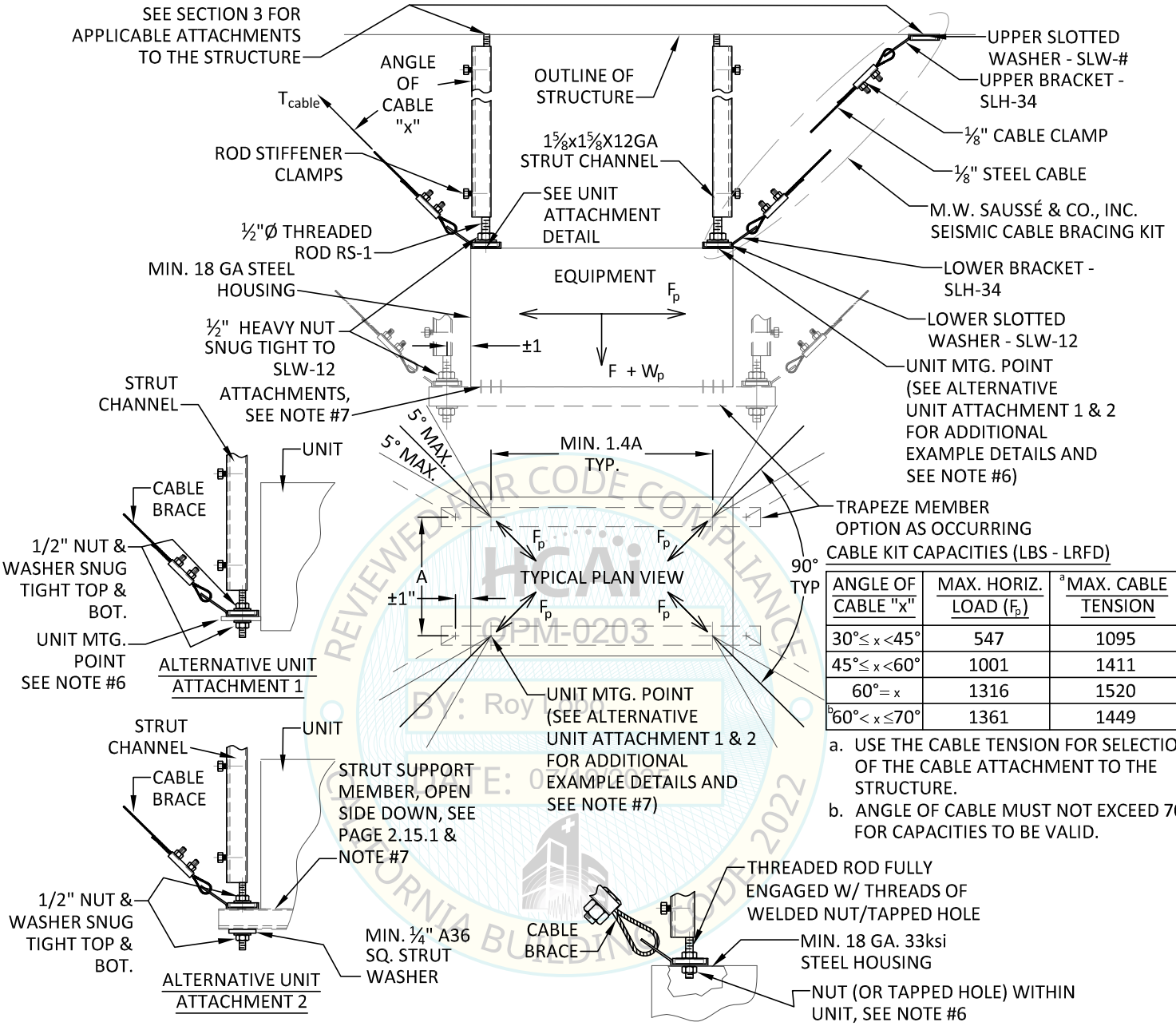
Page No.: **2.13.2**
Date: **February 5, 2025**

# TYPICAL EQUIPMENT CABLE BRACING SYSTEM - ½"Ø ROD, ⅛"Ø CABLE




UNIT ATTACHMENT DETAIL

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [a] MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| 45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [b] 60°< x ≤70° | 1361 | 1449 |

a. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT U18C-12R-4R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[c]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-12
(08) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG. 4.5
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

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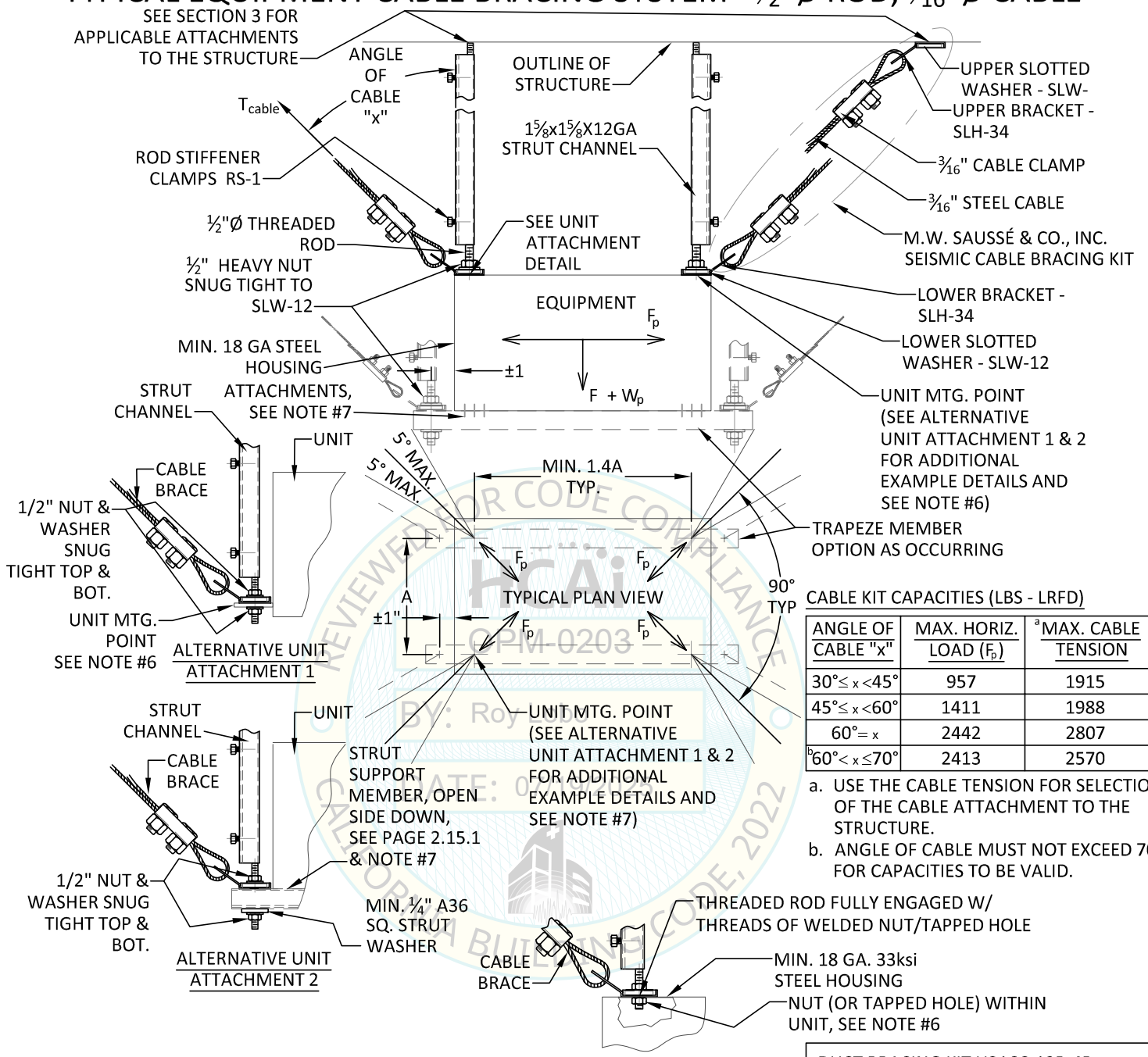
California PE No. S6481

Page No.: 2.13.3

Date: February 5, 2025

# TYPICAL EQUIPMENT CABLE BRACING SYSTEM - ½"Ø ROD, 3/16"Ø CABLE




HCAi OPM-0203 REVIEWED FOR CODE COMPLIANCE BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE, 2022

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [a] MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| 45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [b] 60°< x ≤70° | 2413 | 2570 |

a. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG. 4.5
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

DUCT BRACING KIT U316C-12R-4R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[c]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-12
(08) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

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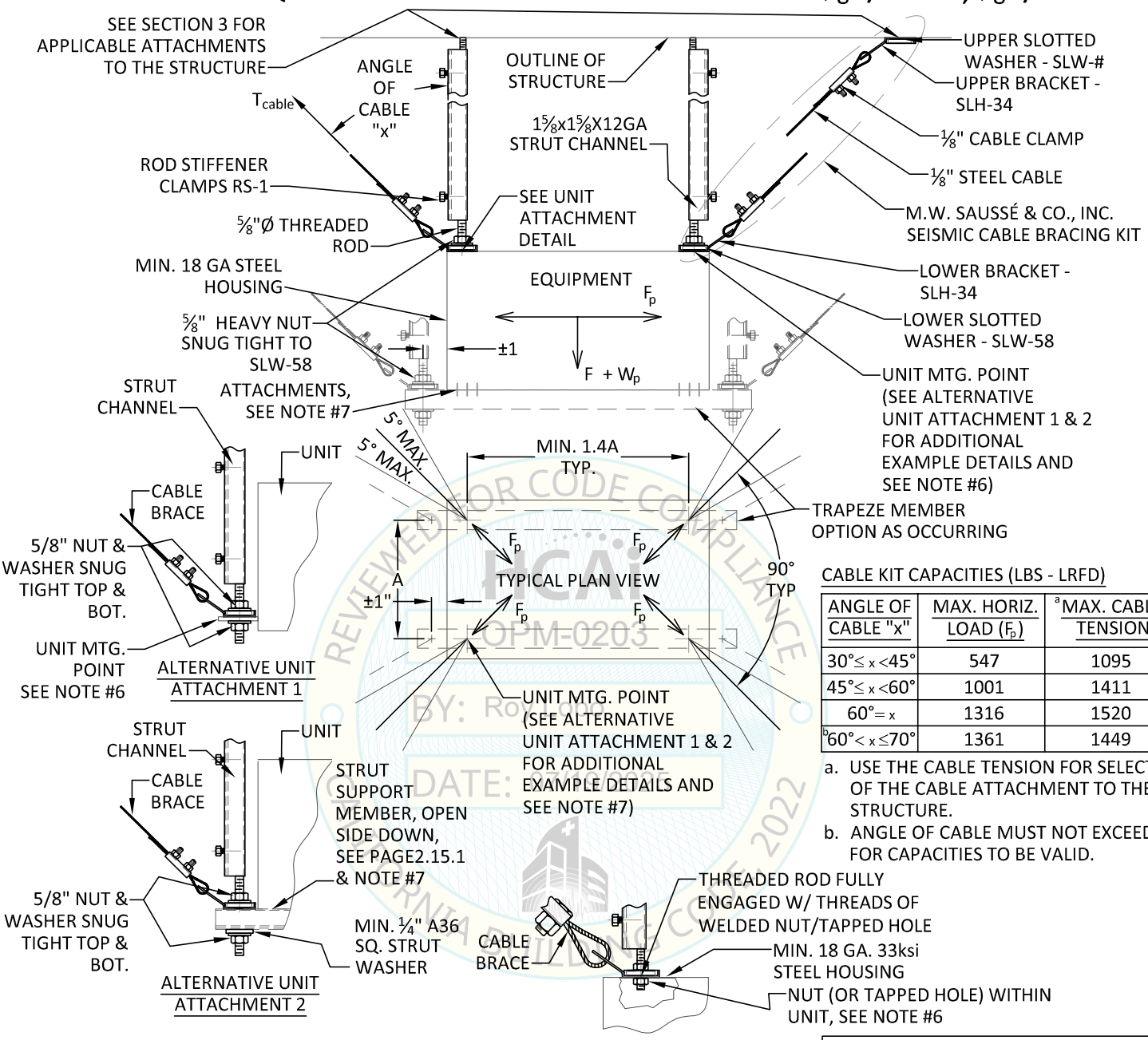
Page No.: **2.13.4**
Date: **February 5, 2025**

# TYPICAL EQUIPMENT CABLE BRACING SYSTEM - ⅝"Ø ROD, ⅛"Ø CABLE




UNIT ATTACHMENT DETAIL

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [a]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 547 | 1095 |
| 45°≤ x <60° | 1001 | 1411 |
| 60°= x | 1316 | 1520 |
| [b]60°< x ≤70° | 1361 | 1449 |

a. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT U18C-58R-4R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[c]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-58
(08) ROD STIFFENER CLAMPS - RS-1
(04) ⅛" CABLE - 10 FT.
(08) ⅛" CABLE CLAMPS

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG. 4.5
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2022

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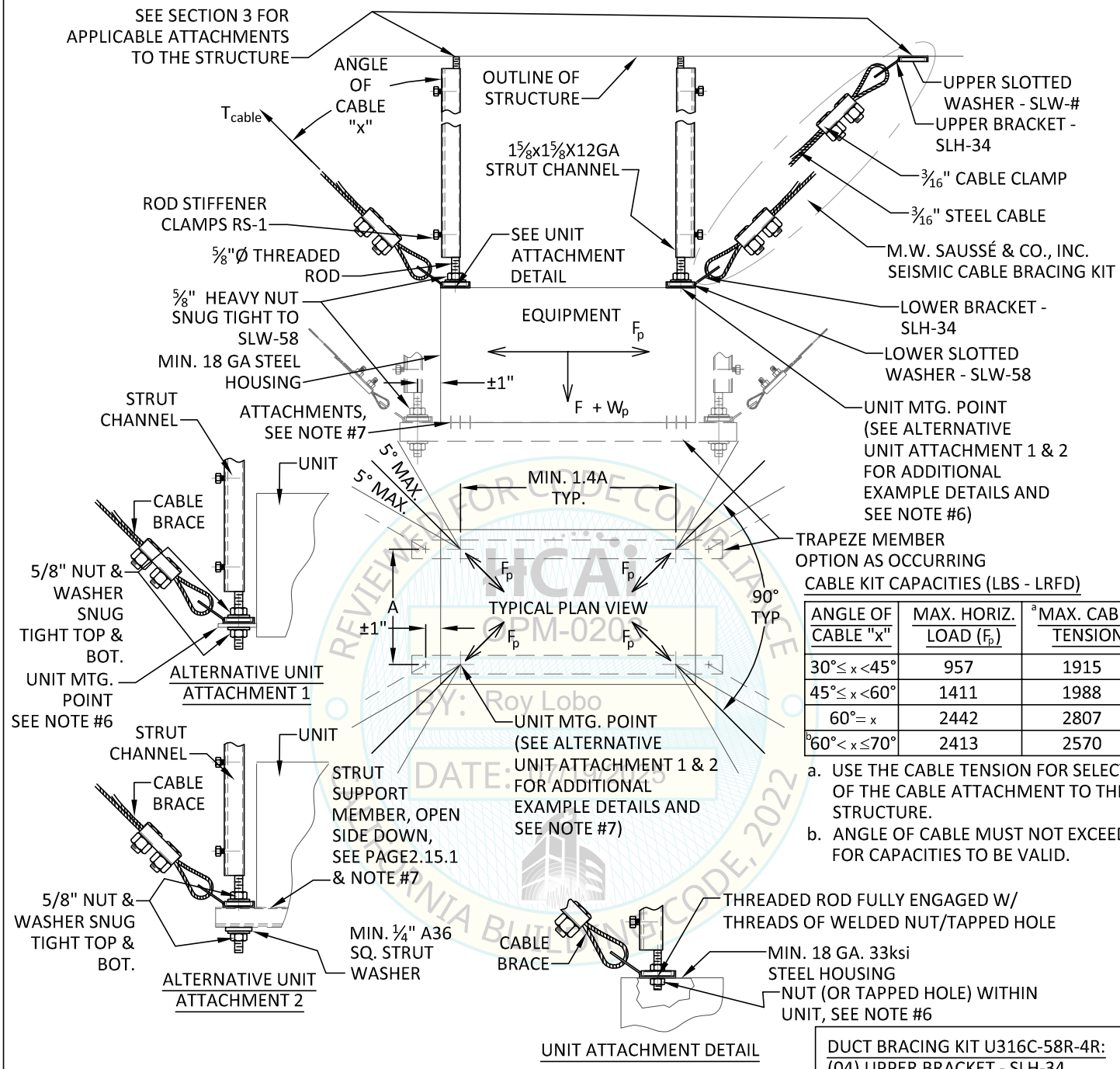
Page No.: **2.13.5**
Date: **February 5, 2025**

# TYPICAL EQUIPMENT CABLE BRACING SYSTEM - 5/8"Ø ROD, 3/16"Ø CABLE




UNIT ATTACHMENT DETAIL

CABLE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF CABLE "x" | MAX. HORIZ. LOAD ($F_p$) | [a]MAX. CABLE TENSION |
|---|---|---|
| 30°≤ x <45° | 957 | 1915 |
| 45°≤ x <60° | 1411 | 1988 |
| 60°= x | 2442 | 2807 |
| [b]60°< x ≤70° | 2413 | 2570 |

a. USE THE CABLE TENSION FOR SELECTION OF THE CABLE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF CABLE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT U316C-58R-4R:
(04) UPPER BRACKET - SLH-34
(04) UPPER SLOTTED WASHER - SLW-#[c]
(04) LOWER BRACKET - SLH-34
(04) LOWER SLOTTED WASHER - SLW-58
(08) ROD STIFFENER CLAMPS - RS-1
(04) 3/16" CABLE - 10 FT.
(08) 3/16" CABLE CLAMPS

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.

NOTES:
1. CABLE IS 7 X 19 GALVANIZED STEEL CABLE. SEE PG. 4.5
2. CABLES TO BE INSTALLED TAUT W/O SLACK. CAUTION - CABLE MUST NOT SUSTAIN ANY DEAD LOAD.
3. SEE PAGE 4.2 & 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
4. SEE PAGE 4.4 FOR BRACKET - SLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
5. SEE PAGE 4.5 FOR CABLE CLAMP DETAIL.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

HCAi REVIEWED FOR CODE COMPLIANCE OPM-0203 BY: Roy Lobo DATE: 07/19/25 CALIFORNIA BUILDING CODE, 2022

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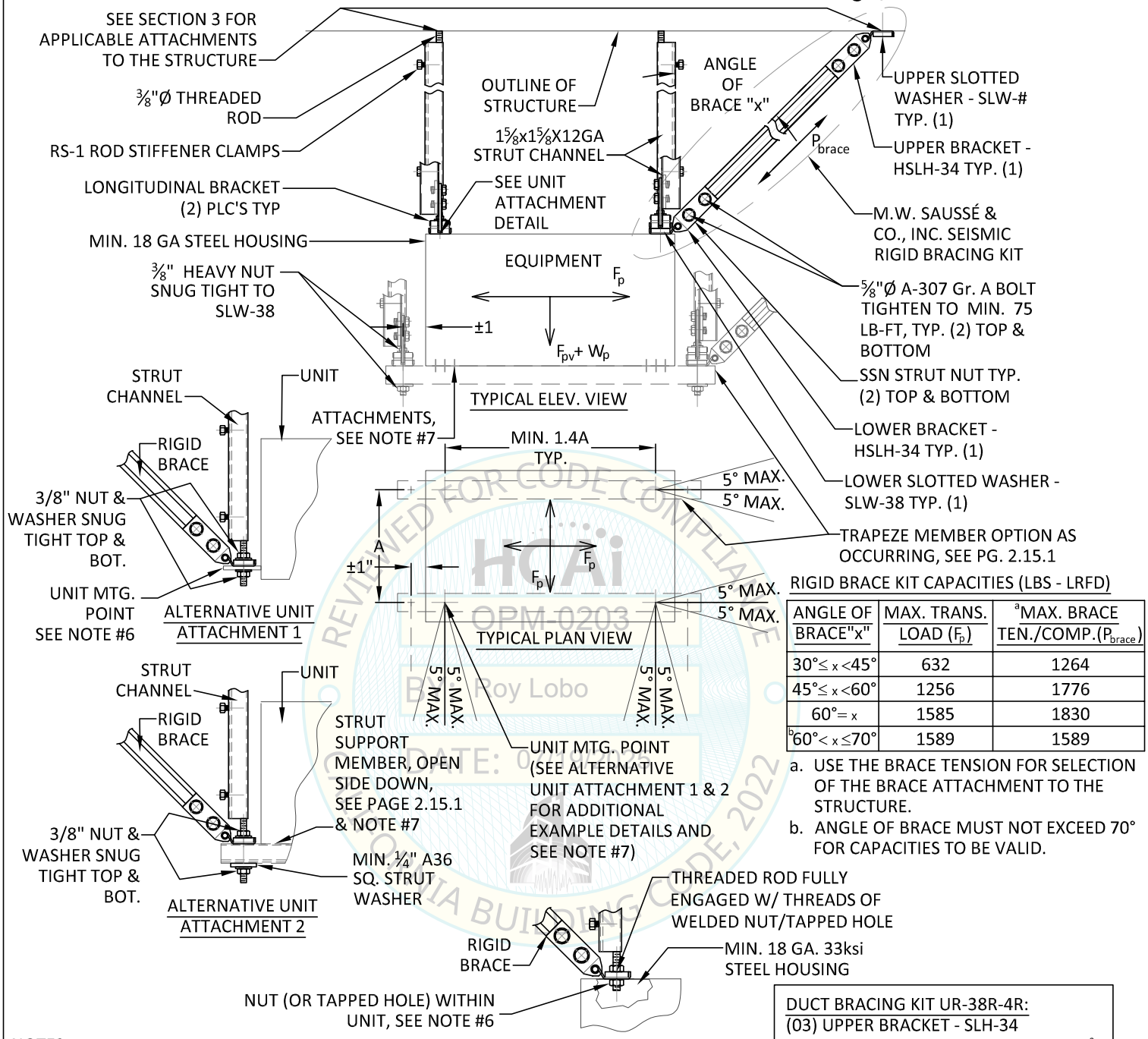
California PE No. S6481

Page No.: **2.13.6**
Date: **February 5, 2025**

# TYPICAL EQUIPMENT RIGID BRACING SYSTEM - ⅜"Ø ROD




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE"x" | MAX. TRANS. LOAD ($F_p$) | [a]MAX. BRACE TEN./COMP.($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 632 | 1264 |
| 45°≤ x <60° | 1256 | 1776 |
| 60°= x | 1585 | 1830 |
| [b]60°< x ≤70° | 1589 | 1589 |

a. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT UR-38R-4R:
(03) UPPER BRACKET - SLH-34
(03) UPPER SLOTTED WASHER - SLW-#[c]
(03) LOWER BRACKET - SLH-34
(03) LOWER SLOTTED WASHER - SLW-38
(#[d]) ROD STIFFENER CLAMPS - RS-1
(03) SSN STRUT NUT

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
d. COORDINATE WITH DESIGN ENGINEER FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
By: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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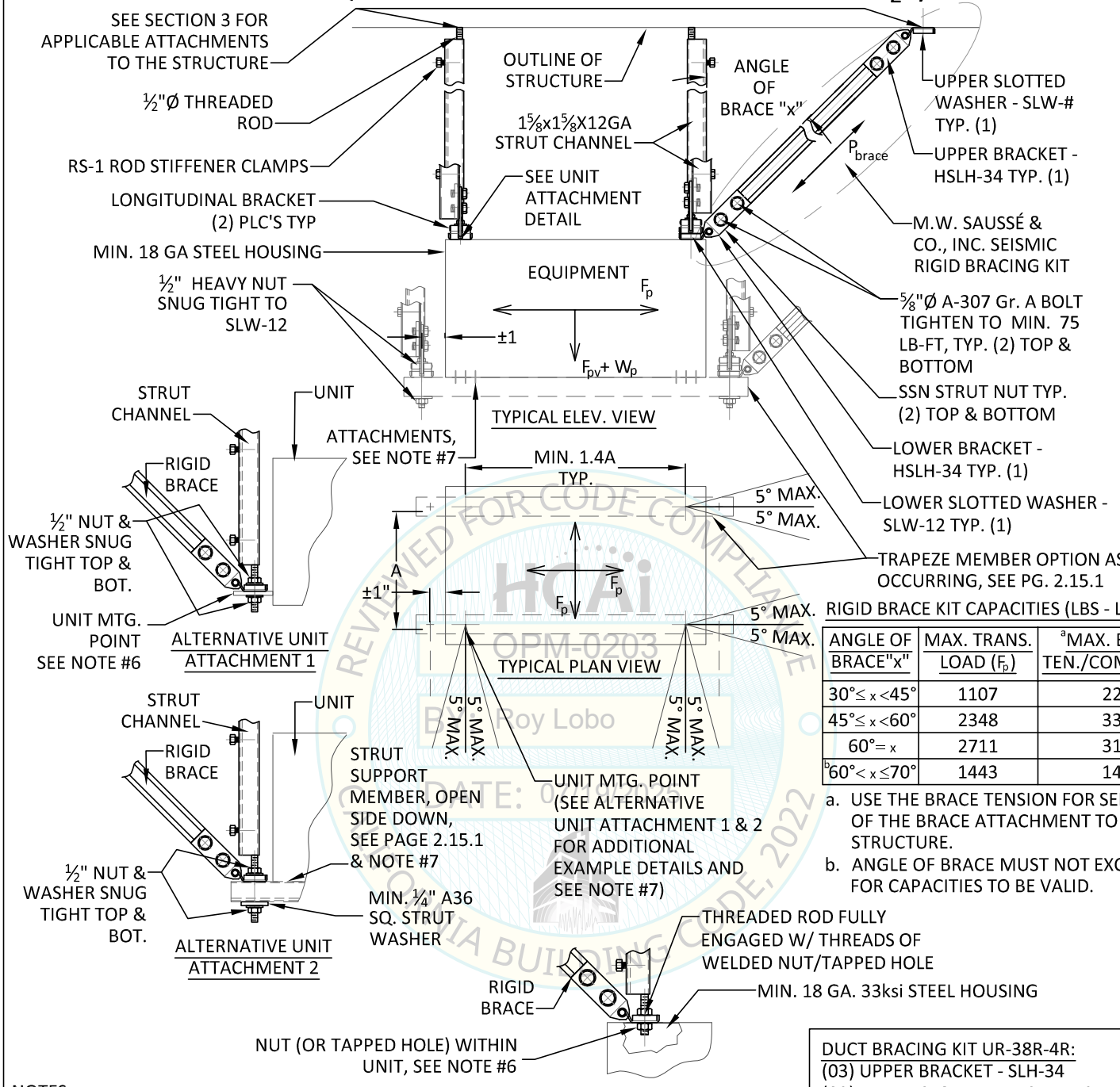
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **2.14.1**

Date: February 5, 2025

# TYPICAL EQUIPMENT RIGID BRACING SYSTEM - ½"Ø ROD




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE"x" | MAX. TRANS. LOAD ($F_p$) | [a]MAX. BRACE TEN./COMP.($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1107 | 2213 |
| 45°≤ x <60° | 2348 | 3320 |
| 60°= x | 2711 | 3130 |
| [b]60°< x ≤70° | 1443 | 1443 |

a. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

DUCT BRACING KIT UR-38R-4R:
(03) UPPER BRACKET - SLH-34
(03) UPPER SLOTTED WASHER - SLW-#[c]
(03) LOWER BRACKET - SLH-34
(03) LOWER SLOTTED WASHER - SLW-12
(#[d]) ROD STIFFENER CLAMPS - RS-1
(03) SSN STRUT NUT

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
d. COORDINATE WITH DESIGN ENGINEER FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.1 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

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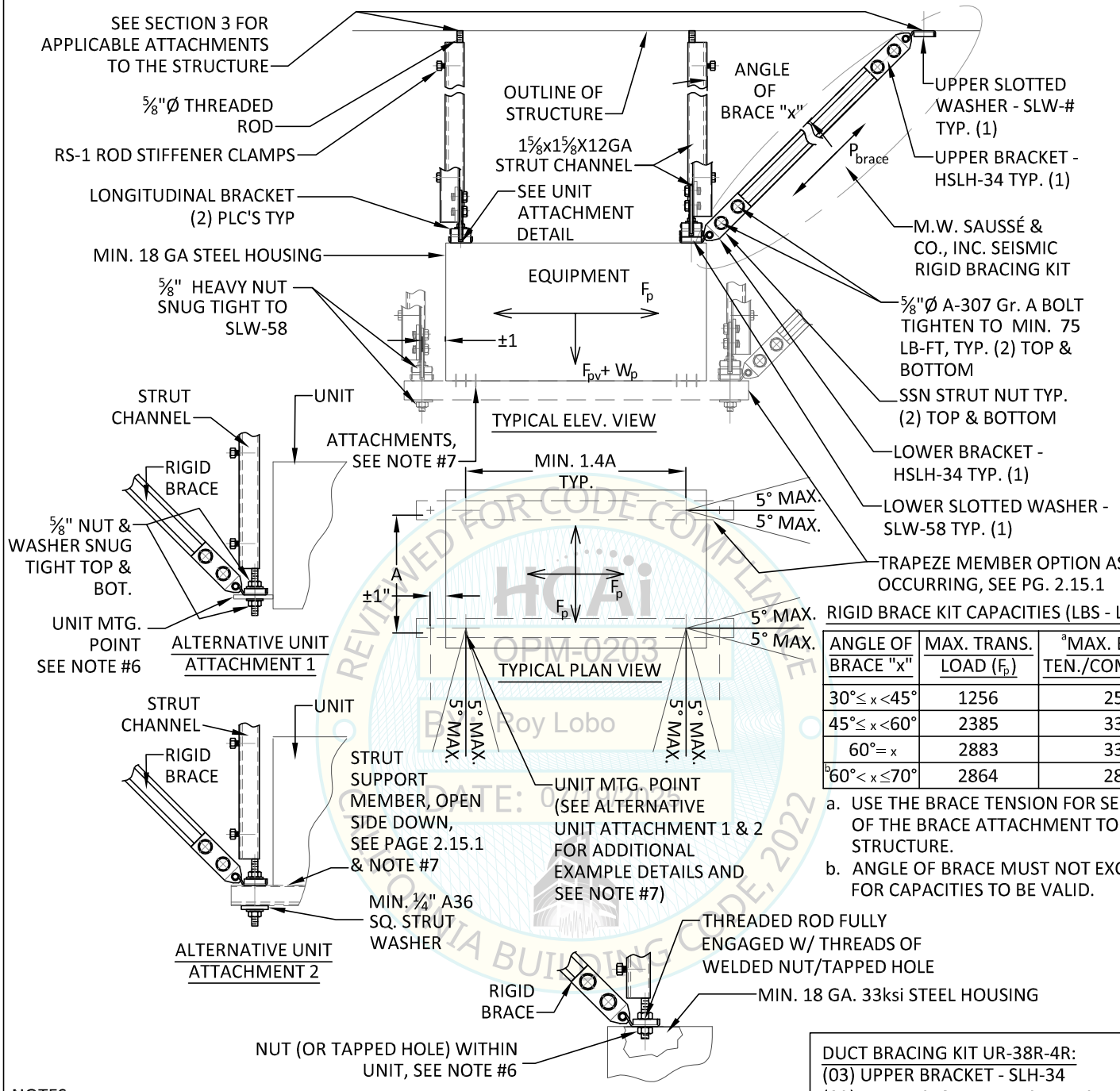
Page No.: **2.14.2**
Date: **February 5, 2025**

# TYPICAL EQUIPMENT RIGID BRACING SYSTEM - ⅝"Ø ROD




RIGID BRACE KIT CAPACITIES (LBS - LRFD)

| ANGLE OF BRACE "x" | MAX. TRANS. LOAD ($F_p$) | [a]MAX. BRACE TEN./COMP.($P_{brace}$) |
|---|---|---|
| 30°≤ x <45° | 1256 | 2512 |
| 45°≤ x <60° | 2385 | 3373 |
| 60°= x | 2883 | 3329 |
| [b]60°< x ≤70° | 2864 | 2864 |

a. USE THE BRACE TENSION FOR SELECTION OF THE BRACE ATTACHMENT TO THE STRUCTURE.
b. ANGLE OF BRACE MUST NOT EXCEED 70° FOR CAPACITIES TO BE VALID.

NOTES:
1. RIGID BRACE IS 1⅝"X1⅝"X12GA. SEE PAGE 2.15.2.
2. SEE PAGE 4.3.2 FOR ROD STIFFENER DETAIL & REQUIREMENTS.
3. SEE PAGE 4.11 FOR BRACKET - HSLH-34 AND SLOTTED WASHER - SLW-XX DETAIL.
4. SEE PAGE 4.13 FOR SSN STRUT NUT DETAIL.
5. TEKS SCREWS MUST BE PER ICC ESR-1976.
6. UNIT MTG. TAB TO BE MIN. 18 GAGE.
7. SUPPORT MEMBERS UNDERNEATH AND THE CONNECTION TO THE EQUIPMENT MUST BE DESIGNED AND SUBMITTED TO OSHPD FOR APPROVAL. MINIMUM THICKNESS SHALL BE 12 GAGE WITH A MINIMUM YIELD STRENGTH OF 33ksi.

DUCT BRACING KIT UR-38R-4R:
(03) UPPER BRACKET - SLH-34
(03) UPPER SLOTTED WASHER - SLW-#[c]
(03) LOWER BRACKET - SLH-34
(03) LOWER SLOTTED WASHER - SLW-58
(#[d]) ROD STIFFENER CLAMPS - RS-1
(03) SSN STRUT NUT

c. UPPER SLOTTED WASHER TO MATCH SELECTED ATTACHMENT.
d. COORDINATE WITH DESIGN ENGINEER FOR NO. OF RS-1 NEEDED BASED OFF ROD DROP.

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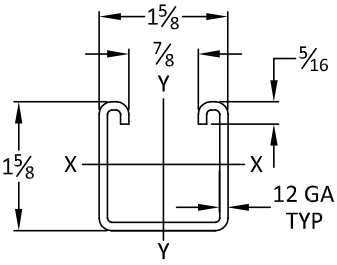
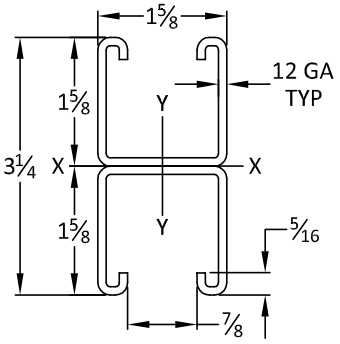
Date: February 5, 2025

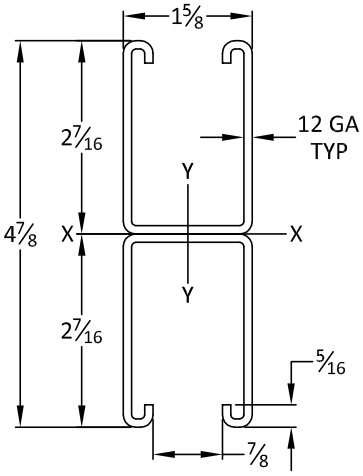
# TRAPEZE MEMBER FOR ALL SYSTEMS



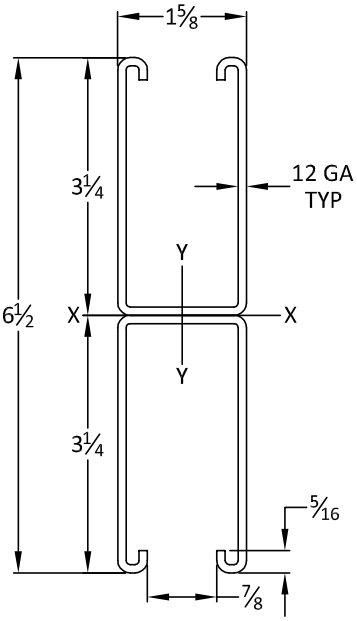

1-5/8 X 1-5/8 X 12GA STRUT



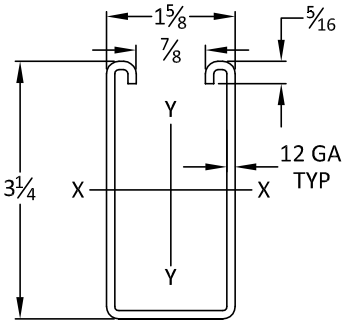

1-5/8 X 1-5/8 X 12GA DBL STRUT



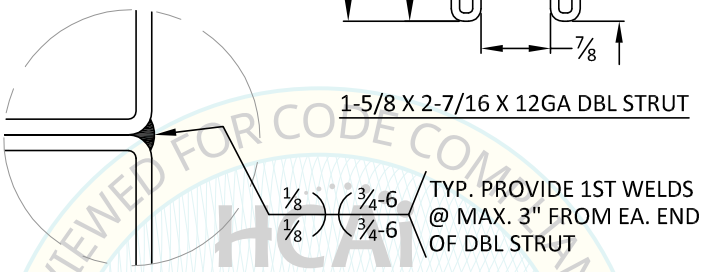

1-5/8 X 2-7/16 X 12GA DBL STRUT




1-5/8 X 6-1/2 X 12GA DBL STRUT




1-5/8 X 3-1/4 X 12GA DBL STRUT




TYP. DBL. STRUT WELD
REQUIREMENT DETAIL

TABLE 1 - DESIGN LOAD CAPACITY OF TRAPEZE SUPPORT MEMBERS

| MAX. SPAN | 1⅝ X 1⅝ X 12GA STRUT | | 1⅝ X 3¼ X 12GA STRUT | | 1⅝ X 1⅝ X 12GA DBL STRUT | | 1⅝ X 4⅞ X 12GA DBL STRUT | | 1⅝ X 6½ X 12GA DBL STRUT | |
|---|---|---|---|---|---|---|---|---|---|---|
| | [3]DIST. LOAD | [4]POINT LOAD | [3]DIST. LOAD | [4]POINT LOAD | [3]DIST. LOAD | [4]POINT LOAD | [3]DIST. LOAD | [4]POINT LOAD | [3]DIST. LOAD | [4]POINT LOAD |
| 18" | 548 | 274 | 1178 | 589 | 1224 | 612 | 1893 | 946 | 2574 | 1287 |
| 24" | 410 | 205 | 881 | 440 | 914 | 457 | 1415 | 707 | 1925 | 962 |
| 30" | 326 | 163 | 702 | 351 | 728 | 364 | 1128 | 564 | 1535 | 767 |
| 36" | 270 | 135 | 582 | 291 | 603 | 301 | 935 | 467 | 1273 | 636 |
| 48" | 199 | 99 | 431 | 215 | 446 | 223 | 693 | 346 | 944 | 472 |
| 60" | 156 | 78 | 339 | 169 | 350 | 175 | 545 | 272 | 745 | 372 |

TABLE 2 - MINIMUM GEOMETRIC PROPERTIES OF SECTIONS

| 1⅝ X 1⅝ X 12GA STRUT | | | | 1⅝ X 3¼ X 12GA STRUT | | | | 1⅝X3¼X12GA DBL STRUT | | | | 1⅝X4⅞X12GA DBL STRUT | | | | 1⅝X6½X12GA DBL STRUT | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $I_x$ $in^4$ | $I_y$ $in^4$ | $S_x$ $in^3$ | $S_y$ $in^3$ | $I_x$ $in^4$ | $I_y$ $in^4$ | $S_x$ $in^3$ | $S_y$ $in^3$ | $I_x$ $in^4$ | $I_y$ $in^4$ | $S_x$ $in^3$ | $S_y$ $in^3$ | $I_x$ $in^4$ | $I_y$ $in^4$ | $S_x$ $in^3$ | $S_y$ $in^3$ | $I_x$ $in^4$ | $I_y$ $in^4$ | $S_x$ $in^3$ | $S_y$ $in^3$ |
| 0.185 | 0.236 | 0.202 | 0.290 | 1.098 | 0.433 | 0.627 | 0.533 | 0.928 | 0.471 | 0.571 | 0.580 | 2.805 | 0.669 | 1.151 | 0.823 | 6.227 | 0.866 | 1.916 | 1.066 |

NOTES:
1. ALL STRUT MEMBERS MUST BE MADE OF MIN. A1011 SS Gr. 33 STEEL.
2. ALL SUPPORTING STRUT MUST BE SOLID. SLOTTED OR HOLED STRUT NOT PERMITTED.
3. TO MEET THE DIST. LOADING REQUIREMENT THE LOAD MUST BE SPREAD EVENLY OVER 90% OF THE SPAN OF THE MEMBER.
4. TO MEET THE POINT LOAD REQUIREMENT THE LOAD MUST BE WITHIN THE MIDDLE THIRD OF THE SPAN OF THE MEMBER.

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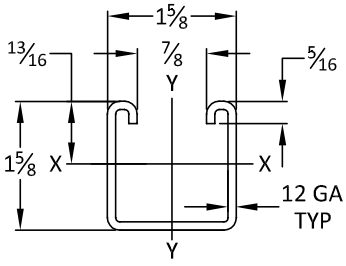
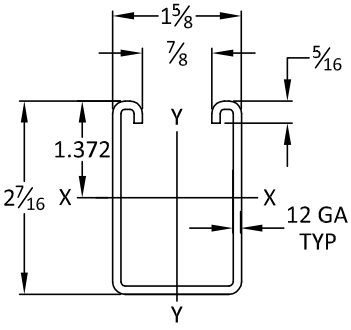
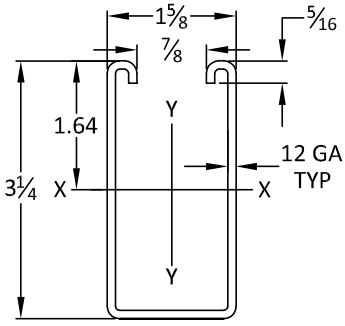
# STRUT CHANNEL BRACE MEMBER SIZES FOR USE WITH HSLH-34 OR HSLH-1



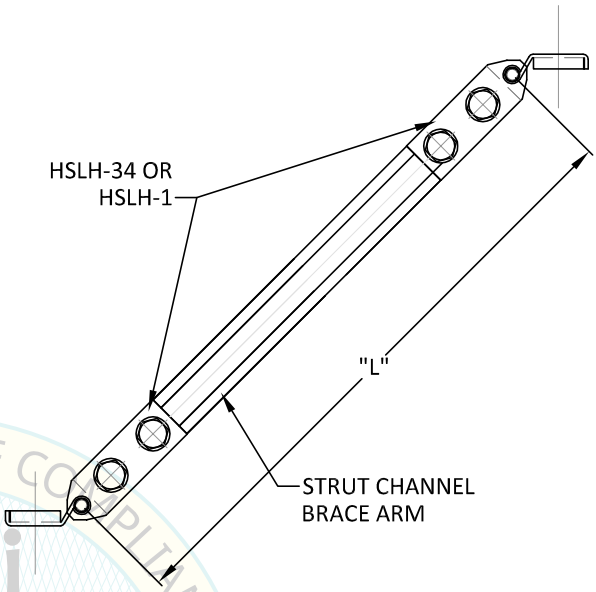

1-5/8 X 1-5/8 X 12GA STRUT




1-5/8 X 2-7/16 X 12GA STRUT




1-5/8 X 3-1/4 X 12GA STRUT




[2] TABLE 1 - DESIGN LOAD CAPACITY OF STRUT CHANNEL BRACE ARM

| TOTAL BRACE LENGTH "L" (in) | 1⅝ X 1⅝ X 12GA STRUT MAXIMUM $P_{brace}$ (lbs) | 1⅝ X 2 7/16 X 12GA STRUT MAXIMUM $P_{brace}$ (lbs) | 1⅝ X 3¼ X 12GA STRUT MAXIMUM $P_{brace}$ (lbs) |
|---|---|---|---|
| 12 | 4,493 | 5,947 | 7,415 |
| 24 | 4,394 | 5,888 | 7,372 |
| 36 | 4,224 | 5,788 | 7,301 |
| 48 | 3,978 | 5,645 | 7,199 |
| 60 | 3,652 | 5,457 | 7,066 |
| 72 | 3,245 | 4,221 | 6,900 |
| 84 | 2,772 | 4,936 | 6,701 |
| 96 | 2,350 | 4,602 | 6,466 |
| 108 | 2,004 | 4,219 | 6,196 |
| 120 | 1,721 | 3,791 | 5,888 |

[2] TABLE 2 - MINIMUM GEOMETRIC PROPERTIES OF SECTIONS

| 1⅝ X 1⅝ X 12GA STRUT | | | |
|---|---|---|---|
| $I_x$ $in^4$ | $S_x$ $in^3$ | $A_g$ $in^2$ | $r_x$ in |
| 0.156 | 0.188 | 0.496 | 0.561 |
| **1⅝ X 2 7/16 X 12GA STRUT** | | | |
| $I_x$ $in^4$ | $S_x$ $in^3$ | $A_g$ $in^2$ | $r_x$ in |
| 0.451 | 0.365 | 0.667 | 0.822 |
| **1⅝ X 3¼ X 12GA STRUT** | | | |
| $I_x$ $in^4$ | $S_x$ $in^3$ | $A_g$ $in^2$ | $r_x$ in |
| 0.966 | 0.601 | 0.837 | 1.074 |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DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022


NOTES:
1. ALL STRUT MEMBERS MUST BE MADE OF MIN. A1011 SS Gr. 33 STEEL.
2. STRUT CHANNEL BRACE ARMS VALUES ABOVE ARE FOR SLOTTED STYLE CHANNEL (SLOTS ARE 1-1/8"x9/16"). SOLID STRUT CHANNEL OR STRUT CHANNEL WITH 9/16"Ø HOLES ARE ALSO PERMITTED.


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Structural Engineer: N. Tremblay
California PE No. S6481


Page No.: **2.15.2**

Date: February 5, 2025

# TESTING REQUIREMENTS OF POST-INSTALLED ANCHOR BOLTS

TESTING REQUIREMENTS FOR POST-INSTALLED ANCHOR BOLTS

1. EXPANSION ANCHORS IN THIS SECTION SHALL BE TORQUE TESTED USING THE VALUES LISTED BELOW IN THE EXPANSION ANCHOR TORQUE TEST VALUES TABLE.
2. SCREW-TYPE ANCHORS IN THIS SECTION SHALL BE TENSION TESTED USING THE VALUES LISTED BELOW IN THE SCREW ANCHOR TENSION TEST VALUES TABLE.
3. TESTING OF THE ANCHORS IS NOT PERMITTED WITHIN THE FIRST 24 HOURS AFTER THE ANCHOR BOLTS ARE INSTALLED.
4. TESTING FREQUENCY IS AS FOLLOWS:
   - 4.1. A MINIMUM OF 50% OR ALTERNATE BOLTS IN A GROUP, INCLUDING AT LEAST ½ OF THE ANCHORS IN EACH GROUP.
   - 4.2. IF AN ANCHOR SHOULD FAIL THE TEST, CONTINUOUS TESTING IS REQUIRED UNTIL (20) CONSECUTIVE ANCHORS PASS, THEN THE TESTING FREQUENCY PER 4.1 ABOVE SHALL RESUME.
5. TESTING & SPECIAL INSPECTION OF ANCHORS SHALL BE PERFORMED BY AN APPROVED INDEPENDENT AGENCY EMPLOYED BY THE FACILITY OWNER PER CBC 1704A & 1910A.5 AND CAC 7-149. ALL REPORTS SHALL BE SENT TO THE INSPECTOR OF RECORD, OWNER AND THE ARCHITECT OR ENGINEER IN RESPONSIBLE CHARGE.

ACCEPTANCE CRITERIA FOR POST-INSTALLED ANCHOR BOLTS

1. FOR DIRECTION TENSION TESTS—► THE ANCHOR SHOULD HAVE NO OBSERVABLE MOVEMENT AT THE TEST LOAD (WASHER SHOULD NOT BECOME LOOSE).
   TORQUE TEST —► THE SPECIFIED TORQUE MUST BE ACHIEVED WITHIN THE FOLLOWING LIMIT: ½ TURN OF THE NUT

GENERAL NOTE

1. ALL TENSION TEST AND TORQUE TEST VALUES LISTED ARE SPECIFIC ONLY TO THE ANCHOR DESIGNS SHOWN IN SECTION 3. APPLICATION OF THESE VALUES TO ANY OTHER CASE IS OUTSIDE THE SCOPE OF THIS OPM AND WILL REQUIRE REVIEW AND APPROVAL BY OSHPD.
2. MIN. CONCRETE COMPRESSIVE STRENGTH FOR ALL VALUES SHOWN IS 3000psi.

## EXPANSION ANCHOR TORQUE TEST VALUES

| MAKE & MODEL | ANCHOR DIAMETER (in) | REQUIRED TORQUE (lb-ft) |
|---|---|---|
| CARBON[1] STEEL HILTI KB-TZ2 PER PGS. 3.1.1-3.2.4, 3.11.1-3.12.2 | 3/8 | 30 |
| | 1/2 | 50 |
| | 5/8 | 40 |
| | 3/4 | 110 |
| DEWALT SD2[2] PER PAGES 3.4, 3.5, 3.15 & 3.16 | 3/8 | 20 |
| | 1/2 | 40 |
| | 5/8 | 60 |
| | 3/4 | 110 |
| DEWALT SD1[3] | 7/8 | 175 |
| | --- | --- |
| SIMPSON[4] SB2 (STRONG BOLT 2) | 3/8 | 30 |
| | 1/2 | 60 |
| | 5/8 | 80 |
| | 3/4 | 150 |
| | 1 | 230 |

NOTES:

1. SEE PAGES 3.1.1, 3.2.1, 3.11.1, 3.12.1, 3.28, 3.29, 3.31, 3.33, 3.34, & 3.35 FOR DETAILS USING THE HILTI KB-TZ2 EXPANSION ANCHOR.
2. SEE PAGES 3.4, 3.4.1, 3.5, 3.5.1, 3.15, 3.16, 3.28, 3.29, 3.31, 3.33, 3.34, & 3.35 FOR DETAILS USING THE DEWALT SD2 EXPANSION ANCHOR.
3. SEE PAGE 3.35 FOR DETAIL USING THE DEWALT SD1 EXPANSION ANCHOR.
4. SEE PAGES 3.7, 3.8, 3.8.1, 3.19, 3.20, 3.28, 3.31, 3.33, & 3.35 FOR DETAILS USING THE SIMPSON STRONG-BOLT 2 (SB2) EXPANSION ANCHORS.
5. SEE PAGES 3.3.2, 3.3.4, 3.13.1, 3.13.2, 3.14.1, 3.14.2, & 3.30 FOR DETAILS USING THE HILTI KH-EZ SCREW ANCHOR.
6. SEE PAGES 3.6.1, 3.6.8, 3.17.1 - 3.18.2, & 3.30 FOR DETAILS USING THE DEWALT SCREW BOLT ANCHOR.
7. SEE PAGES 3.9.1 - 3.10.4, 3.21.1 - 3.22.2, & 3.30 FOR DETAILS USING THE SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR.
8. TENSION TESTS SHOWN ARE 125% OF THE MAXIMUM DESIGN CAPACITIES OF EACH ANCHOR. INSTALLATION OF THE ANCHORS IS INTO THE LOWER FLUTE OF THE DECK (OR SLAB) AS SHOWN IN ALL REFERENCED DETAILS (SEE NOTES 5 THRU 7 ABOVE), WITH THE EXCEPTION OF THE ANCHOR BOLTS ADDRESSED IN NOTE 9 BELOW.
9. FOR THE 3/8" AND 1/2" SIMPSON TITEN HD ANCHORS INSTALLED IN THE UPPER FLUTE THE TEST CAPACITIES ARE AS FOLLOWS:
   - 9.1. FOR THE 3/8" ANCHOR: 305 lbs
   - 9.2. FOR THE 1/2" ANCHOR: 1036 lbs
10. FOR SCREW-TYPE ROD HANGER ANCHORS, SEE PAGE 3.37.

## SCREW ANCHOR TENSION TEST VALUES

| MAKE & MODEL | ANCHOR DIAMETER (in) | NOMINAL EMBED. "$h_{nom}$" (in) | | EFFECTIVE EMBED. "$h_{ef}$" (in) | | TENSION TEST VALUES (lbs)[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | SLAB | DECK | SLAB | DECK | TO DECK | SINGLE TO SLAB | DOUBLE TO SLAB |
| HILTI[5] KH-EZ | 3/8 | 1 5/8 | 1 5/8 | 1 1/8 | 1 1/8 | 494 | 484 | 484 |
| | 3/8 | 2 1/2 | 2 1/2 | 1 7/8 | 1 7/8 | 969 | 1439 | 1439 |
| | 3/8 | 3 1/4 | 3 1/4 | 2 1/2 | 2 1/2 | 1694 | 2243 | 2243 |
| | 1/2 | 2 1/4 | 2 1/4 | 1 9/16 | 1 9/16 | 500 | 1064 | 1064 |
| | 1/2 | 3 | 3 | 2 3/16 | 2 3/16 | 1176 | 1801 | 1801 |
| | 1/2 | 4 1/4 | 4 1/4 | 3 1/4 | 3 1/4 | 2057 | 3279 | 2996 |
| | 5/8 | 3 1/4 | 3 1/4 | 2 3/8 | 2 3/8 | 1602 | 2094 | 2094 |
| | 5/8 | 5 | 5 | 3 7/8 | 3 7/8 | 3644 | 4329 | 3654 |
| | 3/4 | 4 | 4 | 2 15/16 | 2 15/16 | 1603 | 2831 | 2709 |
| | 3/4 | 6 1/4 | 6 1/4 | 4 7/8 | 4 7/8 | n/a | 6041 | 4685 |
| DEWALT SCREW-BOLT+[6] | 3/8 | 2 | 2 | 1 5/16 | 1 5/16 | 542 | 601 | 601 |
| | 3/8 | 2 1/2 | 2 1/2 | 1 3/4 | 1 3/4 | 957 | 1098 | 1098 |
| | 3/8 | 3 1/4 | 3 1/4 | 2 3/8 | 2 3/8 | 1228 | 1846 | 1846 |
| | 1/2 | 2 1/2 | 2 1/2 | 1 3/4 | 1 3/4 | 750 | 1098 | 1098 |
| | 1/2 | 3 | 3 | 2 3/16 | 2 3/16 | 1420 | 1679 | 1679 |
| | 1/2 | 4 1/4 | 4 1/4 | 3 1/4 | 3 1/4 | 2456 | 3138 | 2970 |
| | 5/8 | 3 1/4 | 3 1/4 | 2 1/4 | 2 1/4 | 603 | 1275 | 1275 |
| | 5/8 | 4 | 4 | 2 7/8 | 2 7/8 | 1054 | 1633 | 1633 |
| | 5/8 | 5 | 5 | 3 3/4 | 3 3/4 | 1472 | 2250 | 2250 |
| | 3/4 | 4 1/4 | 4 1/4 | 3 1/16 | 3 1/16 | 2078 | 2728 | 2728 |
| SIMPSON TITEN HD[7] | 3/8 | 1 1/8 | 1 1/8 | 1 1/4 | 1 1/4 | 229 | 1336 | 1336 |
| | 3/8 | 2 1/2 | 2 1/2 | 1 3/4 | 1 3/4 | 530[9] | 1803 | 1803 |
| | 1/2 | 3 1/4 | 2 | 2 3/8 | 1 3/4 | 552[9] | 2044 | 2044 |
| | 1/2 | 4 | 3 1/2 | 3 | 2 9/16 | 1243 | 2934 | 2775 |
| | 5/8 | 4 | n/a | 3 | n/a | n/a | 2029 | 2029 |
| | 5/8 | 5 1/2 | n/a | 4 1/4 | n/a | n/a | 3719 | 3719 |
| | 3/4 | 5 1/2 | n/a | 4 1/4 | n/a | n/a | 4053 | 4014 |
| | 3/4 | 6 1/4 | n/a | 4 7/8 | n/a | n/a | 4803 | 4708 |

| MAKE & MODEL | ANCHOR DIA. (in) | NOM. EMBED.(in) | EFF. EMBED.(in) | TO DECK UPPER FLUTE | TO DECK LOWER FLUTE | SOLID SLAB | TYPE "B" DECK |
|---|---|---|---|---|---|---|---|
| HILTI KH-EZ I ROD HANGER[10] | 1/4 | 2-1/2 | 1-15/16 | 566 | 593 | 750 | n/a |
| DEWALT HANGERMATE+[10] | 3/8 | 2-1/2 | 1-15/16 | 646 | 646 | 723 | 646 |
| SIMPSON TITEN HD HANGER[10] | 3/8 | 2-1/2 | 1-3/4 | n/a | 530 | 753 | n/a |

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Vibrex® vibration & seismic control systems
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Structural Engineer: M. Tremblay
California PE No. S6481

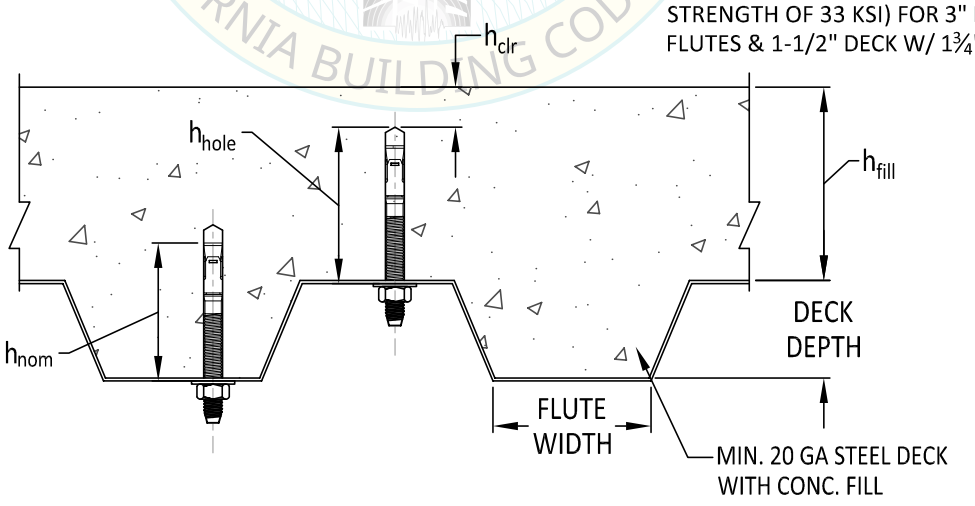
Page No.: **3.0.1**

Date: February 5, 2025

# MINIMUM COMPOSITE DECK DIMENSIONS FOR POST-INSTALLED EXPANSION ANCHORS

| MAKE & MODEL | ANCHOR DIAMETER (in) | NOMINAL EMBED. "$h_{nom}$" (in) | EFFECTIVE EMBED. "$h_{ef}$" (in) | HOLE DEPTH "$h_o$" (in) | 3" DECK W/ 4½" WIDE FLUTES | | | 3" DECK W/ 3⅞" WIDE FLUTES | | | 1-1/2" DECK W/ 1¾" WIDE FLUTES | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | CLEARANCE ABOVE HOLE "$h_{clr}$" (in) | MIN. FILL THICKNESS "$h_{fill}$" (in) | | CLEARANCE ABOVE HOLE "$h_{clr}$" (in) | MIN. FILL THICKNESS "$h_{fill}$" (in) | | CLEARANCE ABOVE HOLE "$h_{clr}$" (in) | MIN. FILL THICKNESS "$h_{fill}$" (in) | |
| | | | | | | ANCHOR TO LOWER FLUTE | ANCHOR TO UPPER FLUTE | | ANCHOR TO LOWER FLUTE | ANCHOR TO UPPER FLUTE | | ANCHOR TO LOWER FLUTE | ANCHOR TO UPPER FLUTE |
| HILTI KB-TZ2 | 3/8 | 1-7/8 | 1-1/2 | 2 | 5/8 | 2-1/2 | 2-3/4 | 5/8 | 2-1/2 | 2-5/8 | 5/8 | 2-1/4 | 2-5/8 |
| | 3/8 | 2-1/2 | 2 | 2-3/4 | 5/8 | 2-1/2 | 3-1/2 | 5/8 | 2-1/2 | 3-3/8 | 5/8 | 2-1/4 | 3-3/8 |
| | 3/8 | 3 | 2-1/2 | 3-1/4 | 5/8 | 2-1/2 | 4 | 5/8 | 2-1/2 | 3-7/8 | 5/8 | | |
| | 1/2 | 2-1/2 | 2 | 2-3/4 | 5/8 | 2-1/2 | 3-1/2 | 5/8 | 2-1/2 | 3-3/8 | 5/8 | 2-1/4 | 3-3/8 |
| | 1/2 | 3-3/4 | 3-1/4 | 4-1/4 | 5/8 | 2-1/2 | 5 | 5/8 | 2-1/2 | 4-7/8 | 5/8 | 3-3/8 | 4-7/8 |
| | 5/8 | 3-1/4 | 2-3/4 | 3-3/4 | 5/8 | 2-1/2 | 4-1/2 | 5/8 | 2-1/2 | 4-3/8 | 5/8 | 2-7/8 | 4-3/8 |
| | 5/8 | 4-1/2 | 4 | 4-3/4 | 5/8 | 2-1/2 | 5-1/2 | 5/8 | 3-1/4 | 5-3/8 | 5/8 | | |
| | 3/4 | 4-1/2 | 3-3/4 | 4-3/4 | 5/8 | 3-1/4 | 5-1/2 | 5/8 | 3-1/4 | 5-3/8 | 5/8 | | |
| DEWALT SD2 | 3/8 | 2-3/8 | 2 | 2-5/8 | 3/4 | 3-1/4 | 3-1/2 | 1 | 2-1/2 | 3-5/8 | 1 | 2-1/4 | 3-5/8 |
| | 1/2 | 2-1/2 | 2 | 2-3/4 | 3/4 | 3-1/4 | 3-1/2 | 1 | 2-1/2 | 3-3/4 | 1 | 2-1/4 | 3-3/4 |
| | 1/2 | 3-3/4 | 3-1/4 | 4 | 3/4 | 3-1/4 | 4-3/4 | 1 | 2-1/2 | 5 | | | |
| | 5/8 | 3-7/8 | 3-1/4 | 4-1/4 | 3/4 | 3-1/4 | 5 | | | | | | |
| | 5/8 | 4-7/8 | 4-1/4 | 4-3/4 | 3/4 | 3-1/4 | 5-1/2 | | | | | | |
| | 3/4 | 4-1/2 | 3-3/4 | 5 | 3/4 | 3-1/4 | 5-3/4 | | | | | | |
| SIMPSON STRONG-BOLT 2 | 3/8 | 2 | 1-5/8 | 2-1/8 | 1/2 | 1-1/2 | 2-3/4 | | | | | | |
| | 3/8 | 3-3/8 | 3 | 3-1/2 | 1/2 | 1-1/2 | | | | | | | |
| | 1/2 | 2-3/4 | 2-1/4 | 3 | 1/2 | 1-1/2 | 3-1/2 | | | | | | |
| | 1/2 | 4-1/2 | 4 | 4-3/4 | 1/2 | 2-1/4 | | | | | | | |
| | 5/8 | 3-3/8 | 2-3/4 | 3-5/8 | 1/2 | 1-1/2 | | | | | | | |
| | 5/8 | 5-5/8 | 5 | 5-7/8 | 1/2 | 3-3/8 | | | | | | | |
| | 3/4 | 4-1/8 | 3-3/8 | 4-3/8 | 1/2 | 1-7/8 | | | | | | | |

NOTES:
1. FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 IN THE APPENDIX.
2. ANCHOR CENTERLINE OFFSETS FROM THE FLUTE CENTERLINE ARE SHOWN IN THE SPECIFIC DETAILS WITHIN SECTION 3.
3. ANCHOR BOLTS SHOWN REQUIRE MIN. ASTM A653/A653M SS GRADE 50 (MIN. YIELD STRENGTH OF 50 KSI) DECKING.
   3.1. EXCEPTION: POWERS SD2 & SIMPSON STRONG-BOLT 2 ANCHOR BOLTS REQUIRE MIN. ASTM A653/A653M SS GRADE 33 (MIN. YIELD STRENGTH OF 33 KSI) FOR 3" DECK W/ 3⅞" WIDE FLUTES & 1-1/2" DECK W/ 1¾" WIDE FLUTES ONLY.

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California PE No. S6481

Page No.: **3.0.2**

Date: **February 5, 2025**

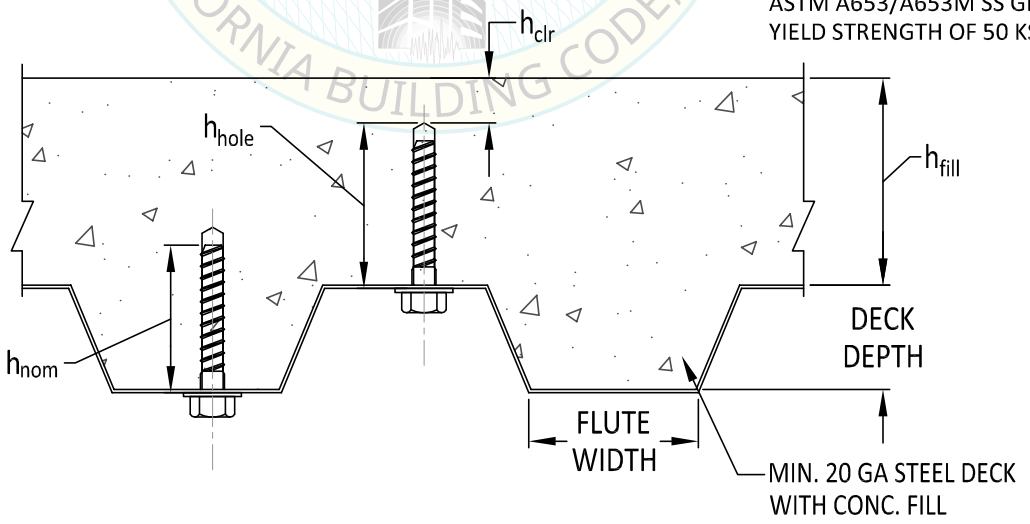
# MINIMUM COMPOSITE DECK DIMENSIONS FOR POST-INSTALLED SCREW ANCHORS

| MAKE & MODEL | ANCHOR DIAMETER (in) | NOMINAL EMBED. "$h_{nom}$" (in) | EFFECTIVE EMBED. "$h_{ef}$" (in) | HOLE DEPTH "$h_o$" (in) | 3" DECK W/ 4½" WIDE FLUTES: CLEARANCE ABOVE HOLE "$h_{clr}$" (in) | MIN. FILL THICKNESS "$h_{fill}$" (in): ANCHOR TO LOWER FLUTE | MIN. FILL THICKNESS "$h_{fill}$" (in): ANCHOR TO UPPER FLUTE |
|---|---|---|---|---|---|---|---|
| HILTI KH-EZ | 3/8 | 1-5/8 | 1-1/8 | 1-7/8 | 1-1/4 | 3-1/4 | 3-1/4 |
| | 3/8 | 2-1/2 | 1-7/8 | 2-3/4 | 1-1/4 | 3-1/4 | 4 |
| | 3/8 | 3-1/4 | 2-1/2 | 3-1/2 | 1-1/4 | 3-1/4 | 4-3/4 |
| | 1/2 | 2-1/4 | 1-1/2 | 2-5/8 | 1-1/4 | 3-1/4 | 3-7/8 |
| | 1/2 | 3 | 2-3/16 | 3-3/8 | 1-1/4 | 3-1/4 | 4-5/8 |
| | 1/2 | 4-1/4 | 3-1/4 | 4-5/8 | 1-1/4 | 3-1/4 | 5-7/8 |
| | 5/8 | 3-1/4 | 2-3/8 | 3-5/8 | 1-1/4 | 3-1/4 | 4-7/8 |
| | 5/8 | 5 | 3-7/8 | 5-3/8 | 1-1/4 | 3-5/8 | 3-5/8 |
| | 3/4 | 4 | 2-15/16 | 4-3/8 | 1-1/4 | 3-1/4 | 5-5/8 |
| HILTI KH-EZ I (ROD HANGER) | 1/4 | 2-1/2 | 1-15/16 | 2-7/8 | 1-1/4 | 2-1/2 | 4-1/8 |
| DEWALT SCREW-BOLT+ | 3/8 | 2-1/8 | 1-7/16 | 2-1/4 | 3/4 | 3-1/4 | 3-1/4 |
| | 1/2 | 2-1/2 | 1-11/16 | 2-3/4 | 3/4 | 3-1/4 | 3-1/2 |
| | 1/2 | 3-1/2 | 2-1/2 | 4 | 3/4 | 3-1/4 | 4-3/4 |
| | 5/8 | 3-1/4 | 2-3/16 | 4 | 3/4 | 3-1/4 | 4-3/4 |
| | 5/8 | 4-3/8 | 3-1/8 | 5 | 3/4 | 3-1/4 | 5-3/4 |
| POWERS VERTIGO+ (ROD HANGER) | 3/8 | 2-1/8 | 1-7/16 | 2-1/2 | 3/4 | 3-1/4 | 3-1/4 |
| SIMPSON TITEN HD | 3/8 | 1-7/8 | 1-1/4 | 2-1/8 | 3/4 | 1-1/2 | 3-1/4 |
| | 3/8 | 2-1/2 | 1-3/4 | 2-3/4 | 3/4 | 1-1/2 | |
| | 1/2 | 2 | 1-5/16 | 2-1/2 | 3/4 | 1-1/2 | 3-1/4 |
| | 1/2 | 3-1/2 | 2-9/16 | 4 | 3/4 | 1-3/4 | |
| SIMPSON TITEN HD (ROD HANGER) | 3/8 | 2-1/2 | 1-3/4 | 3 | 3/4 | 1-1/2 | |

| 3" DECK W/ 3⅞" WIDE FLUTES | | |
|---|---|---|
| CLEARANCE ABOVE HOLE "$h_{clr}$" (in) | MIN. FILL THICKNESS "$h_{fill}$" (in): ANCHOR TO LOWER FLUTE | MIN. FILL THICKNESS "$h_{fill}$" (in): ANCHOR TO UPPER FLUTE |
| 1-1/4 | 2-1/2 | 4-1/8 |

| 1-1/2" DECK W/ 1¾" WIDE FLUTES | | |
|---|---|---|
| CLEARANCE ABOVE HOLE "$h_{clr}$" (in) | MIN. FILL THICKNESS "$h_{fill}$" (in): ANCHOR TO LOWER FLUTE | MIN. FILL THICKNESS "$h_{fill}$" (in): ANCHOR TO UPPER FLUTE |
| 3/4 | 2-1/4 | |

NOTES:
1. FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 IN THE APPENDIX.
2. ANCHOR CENTERLINE OFFSETS FROM THE FLUTE CENTERLINE ARE SHOWN IN THE SPECIFIC DETAILS WITHIN SECTION 3.
3. ANCHOR BOLTS SHOWN REQUIRE MIN. ASTM A653/A653M SS GRADE 50 (MIN. YIELD STRENGTH OF 50 KSI) DECKING.

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DATE: 07/19/2025
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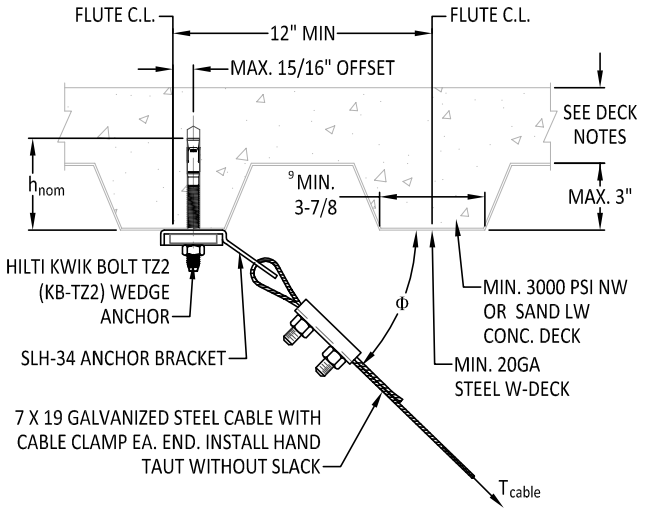
Structural Engineer: N. Tremblay
California PE No. S6481

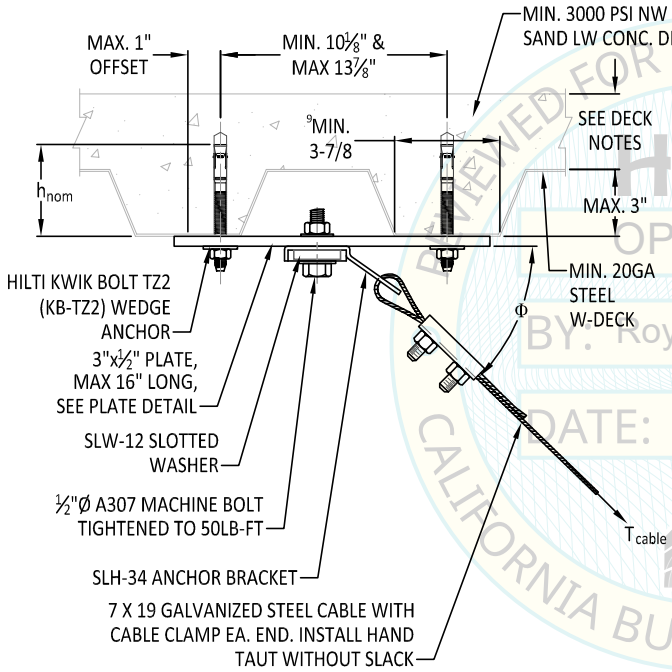
# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) ANCHOR

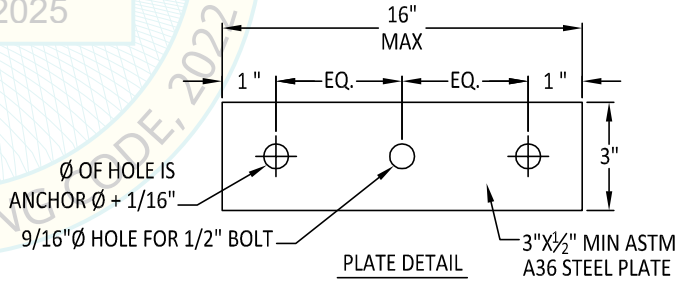
| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| TZ2D31 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 6-3/4" | 336 | 232 | 187 |
| TZ2D32 | 3/8" | SLW-38 | 2-1/2" | 2" | 6-3/4" | 502 | 338 | 268 |
| TZ2D33 | 3/8" | SLW-38 | 3" | 2-1/2" | 7-1/2" | 513 | 349 | 279 |
| TZ2D34 | 1/2" | SLW-12 | 2-1/2" | 2" | 6-3/4" | 501 | 326 | 255 |
| TZ2D35 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 9-3/4" | 862 | 536 | 409 |
| TZ2D36 | 5/8" | SLW-58 | 3-1/4" | 2-3/4" | 8-1/4 | 882 | 586 | 463 |
| TZ2D37 | 5/8" | SLW-58 | 4-1/2" | 4" | 12" | 1171 | 717 | 543 |
| TZ2D38 | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 11-1/4" | 1158 | 655 | 479 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2TZ2D31 | 3/8" | 1-7/8" | 1-1/2" | 6-3/4" | 780 | 672 | 629 |
| 2TZ2D32 | 3/8" | 2-1/2" | 2" | 6-3/4" | 1174 | 993 | 914 |
| 2TZ2D33 | 3/8" | 3" | 2-1/2" | 7-1/2" | 1195 | 1020 | 946 |
| 2TZ2D34 | 1/2" | 2-1/2" | 2" | 6-3/4" | 1185 | 977 | 882 |
| 2TZ2D35 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 2080 | 1648 | 1447 |
| 2TZ2D36 | 5/8" | 3-1/4" | 2-3/4" | 8-1/4" | 2073 | 1736 | 1587 |
| 2TZ2D37 | 5/8" | 4-1/2" | 4" | 12" | 2843 | 2223 | 1933 |
| 2TZ2D38 | 3/4" | 4-1/2" | 3-3/4" | 11-1/4" | 2916 | 2120 | 1759 |

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DATE: 07/19/2025
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NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR THE ⅝" ANCHOR WITH 4-1/2" NOMINAL EMBEDMENT AND THE ¾" ANCHOR, THE MIN. FLUTE WIDTH IS 4-1/2". SEE PAGE 3.0.2 FOR ALL MINIMUM REQUIRED DIMENSIONS OF THE DECK.

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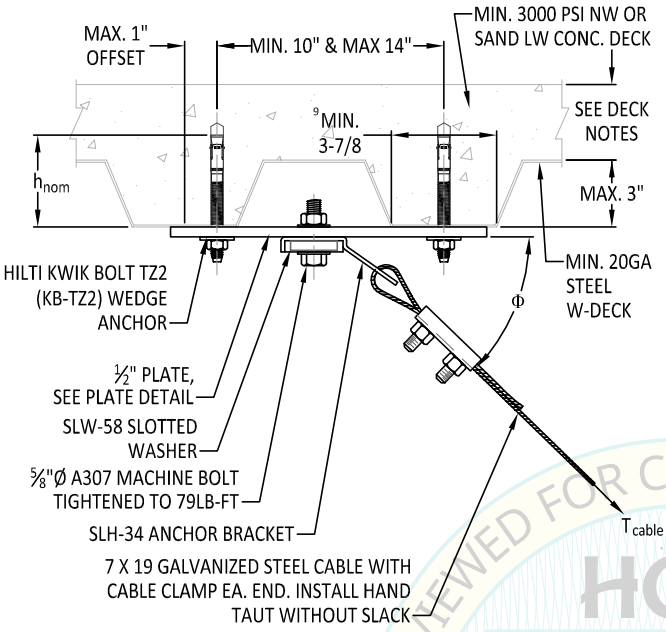
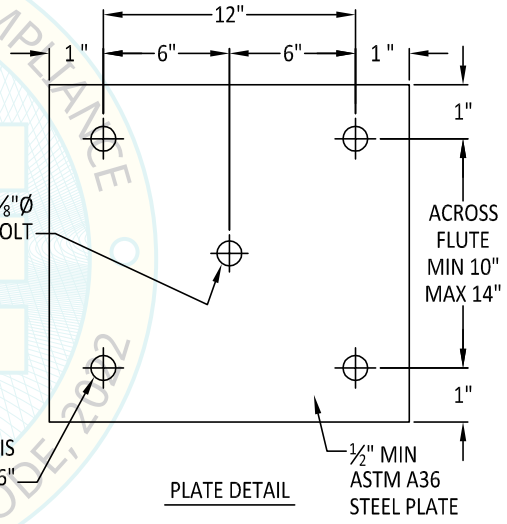
# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE (lbs), "$T_{cable}$", @ ANGLE "Φ"[18] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4TZ2D31 | 3/8" | 1-7/8" | 1-1/2" | 6-3/4" | 1560 | 1345 | 1257 |
| 4TZ2D32 | 3/8" | 2-1/2" | 2" | 6-3/4" | 2349 | 1986 | 1829 |
| 4TZ2D33 | 3/8" | 3" | 2-1/2" | 7-1/2" | 2391 | 2040 | 1891 |
| 4TZ2D34 | 1/2" | 2-1/2" | 2" | 6-3/4" | 2370 | 1953 | 1763 |
| 4TZ2D35 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 4160 | 3296 | 2893 |
| 4TZ2D36 | 5/8" | 3-1/4" | 2-3/4" | 8-1/4" | 4145 | 3473 | 3174 |
| 4TZ2D37 | 5/8" | 4-1/2" | 4" | 12" | 5686 | 4445 | 3865 |
| 4TZ2D38 | 3/4" | 4-1/2" | 3-3/4" | 11-1/4" | 5833 | 4240 | 3519 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_o$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR THE ⅝" ANCHOR WITH 4-1/2" NOMINAL EMBEDMENT AND THE ¾" ANCHOR, THE MIN. FLUTE WIDTH IS 4-1/2". SEE PAGE 3.0.2 FOR ALL MINIMUM REQUIRED DIMENSIONS OF THE DECK.

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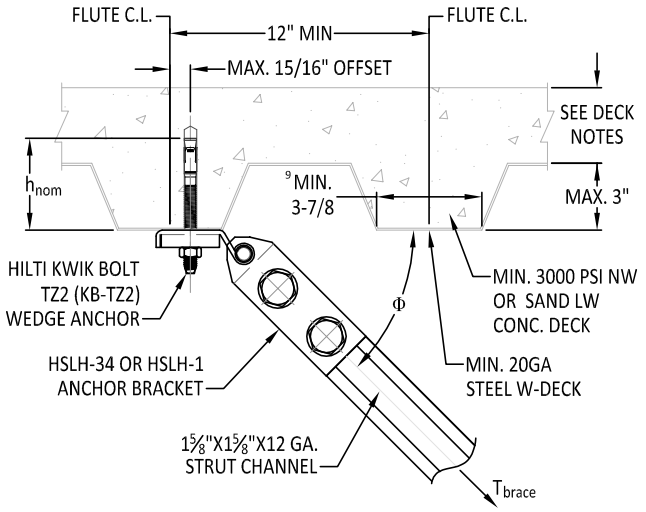
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.1.2**

Date: **February 5, 2025**

# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK

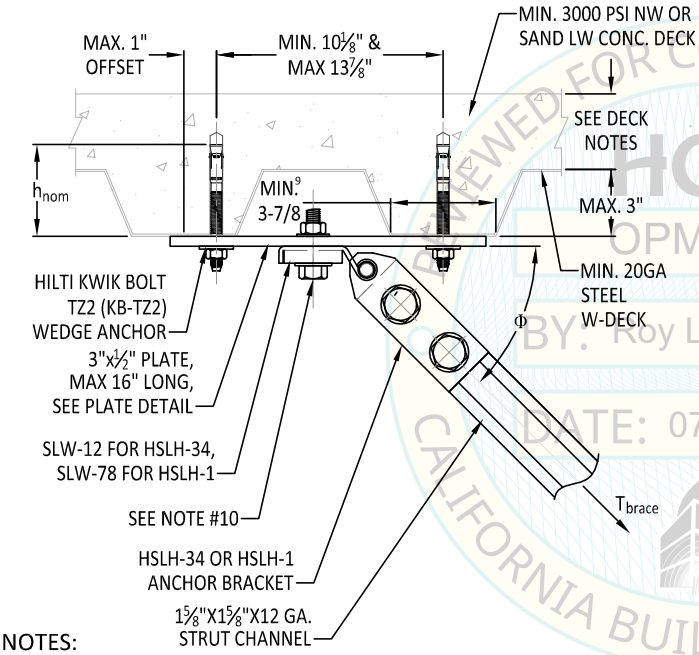



## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| TZ2DR31 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 6-3/4" | 324 | 242 | 188 |
| TZ2DR32 | 3/8" | SLW-38 | 2-1/2" | 2" | 6-3/4" | 483 | 353 | 268 |
| TZ2DR33 | 3/8" | SLW-38 | 3" | 2-1/2" | 7-1/2" | 494 | 365 | 279 |
| TZ2DR34 | 1/2" | SLW-12 | 2-1/2" | 2" | 6-3/4" | 481 | 342 | 252 |
| TZ2DR35 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 9-3/4" | 824 | 564 | 399 |
| TZ2DR36 | 5/8" | SLW-58 | 3-1/4" | 2-3/4" | 8-1/4 | 848 | 614 | 460 |
| TZ2DR37 | 5/8" | SLW-58 | 4-1/2" | 4" | 12" | 1118 | 754 | 528 |
| TZ2DR38 | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 11-1/4" | 1098 | 692 | 457 |

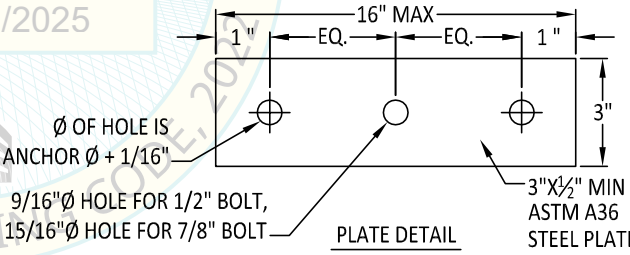
DECK NOTES:

- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2TZ2DR31 | 3/8" | 1-7/8" | 1-1/2" | 6-3/4" | 732 | 637 | 605 |
| 2TZ2DR32 | 3/8" | 2-1/2" | 2" | 6-3/4" | 1098 | 938 | 867 |
| 2TZ2DR33 | 3/8" | 3" | 2-1/2" | 7-1/2" | 1120 | 964 | 902 |
| 2TZ2DR34 | 1/2" | 2-1/2" | 2" | 6-3/4" | 1102 | 919 | 820 |
| 2TZ2DR35 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 1918 | 1545 | 1313 |
| 2TZ2DR36 | 5/8" | 3-1/4" | 2-3/4" | 8-1/4" | 1935 | 1638 | 1494 |
| 2TZ2DR37 | 5/8" | 4-1/2" | 4" | 12" | 2614 | 2080 | 1740 |
| 2TZ2DR38 | 3/4" | 4-1/2" | 3-3/4" | 11-1/4" | 2637 | 1968 | 1525 |




NOTES:

1. THE OVER STRENGTH FACTOR $\Omega_o$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR THE ⅝" ANCHOR WITH 4-7/16" NOMINAL EMBEDMENT AND THE ¾" ANCHOR, THE MIN. FLUTE WIDTH IS 4-1/2". SEE PAGE 3.0.2 FOR ALL MINIMUM REQUIRED DIMENSIONS OF THE DECK.
10. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 BRACKET & SLW-78 ON PAGE 4.12, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 100 LB-FT.

REVIEWED FOR CODE COMPLIANCE HCAI OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE, 2022

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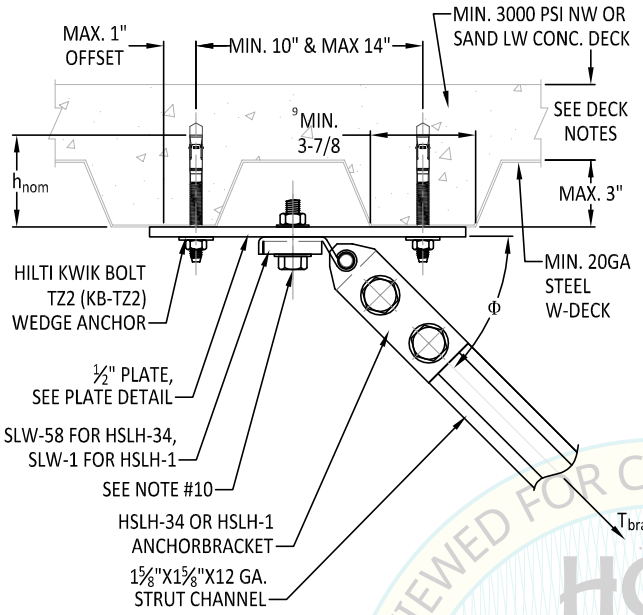
Page No.: **3.1.3**

Date: February 5, 2025

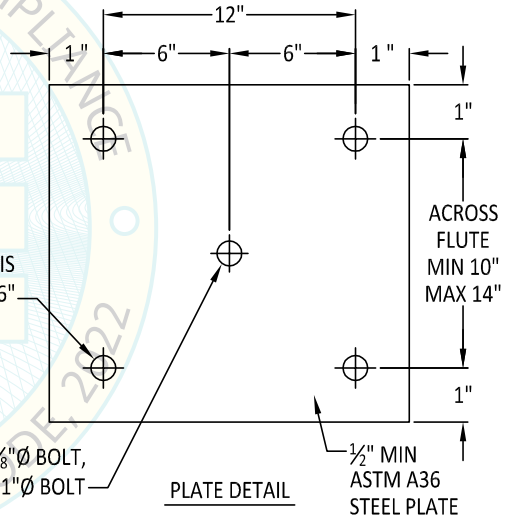
# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4TZDR31 | 3/8" | 1-7/8" | 1-1/2" | 6-3/4" | 1464 | 1273 | 1210 |
| 4TZDR32 | 3/8" | 2-1/2" | 2" | 6-3/4" | 2197 | 1876 | 1733 |
| 4TZDR33 | 3/8" | 3" | 2-1/2" | 7-1/2" | 2240 | 1929 | 1805 |
| 4TZDR34 | 1/2" | 2-1/2" | 2" | 6-3/4" | 2205 | 1839 | 1641 |
| 4TZDR35 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 3836 | 3089 | 2626 |
| 4TZDR36 | 5/8" | 3-1/4" | 2-3/4" | 8-1/4" | 3869 | 3276 | 2988 |
| 4TZDR37 | 5/8" | 4-1/2" | 4" | 12" | 5228 | 4159 | 3479 |
| 4TZDR38 | 3/4" | 4-1/2" | 3-3/4" | 11-1/4" | 5275 | 3936 | 3049 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR THE ⅝" ANCHOR WITH 4-7/16" NOMINAL EMBEDMENT AND THE ¾" ANCHOR, THE MIN. FLUTE WIDTH IS 4-1/2". SEE PAGE 3.0.2 FOR ALL MINIMUM REQUIRED DIMENSIONS OF THE DECK.
10. FOR HSLH-34 BRACKET & SLW-58 ON PAGE 4.11, USE ⅝" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 65 LB-FT. FOR HSLH-1 BRACKET & SLW-1 ON PAGE 4.12, USE 1" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 100 LB-FT.

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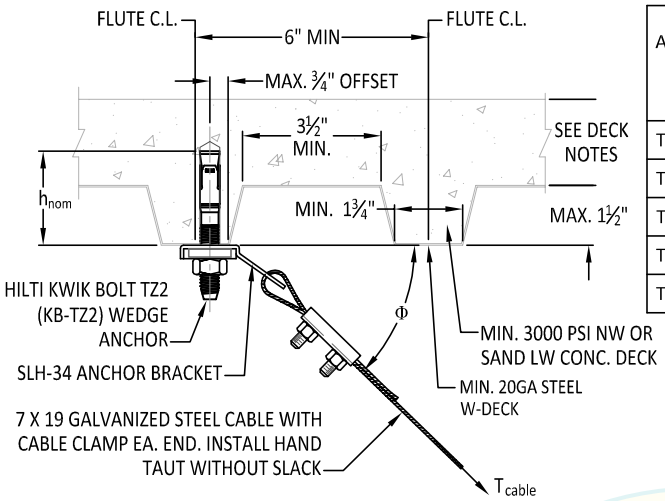
California PE No. C59644

Page No.: **3.1.4**

Date: **February 5, 2025**

# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK

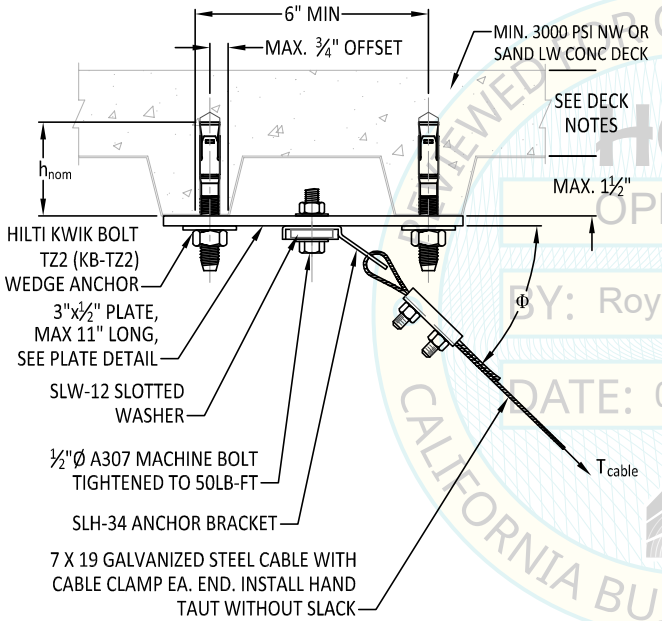



## ATTACHMENT WITH (1) ANCHOR

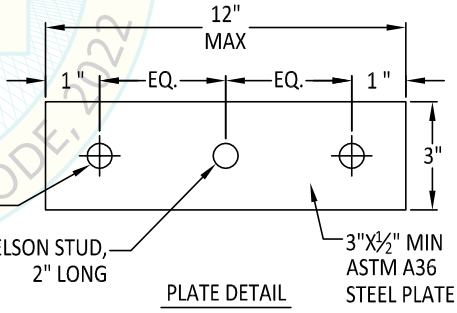
| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| TZ2D1.51 | 3/8" | SLW-38 | 1-1/2" | 1-1/2" | 6-3/4" | 292 | 158 | 114 |
| TZ2D1.52 | 3/8" | SLW-38 | 2-1/2" | 2" | 6-3/4" | 525 | 334 | 258 |
| TZ2D1.53 | 1/2" | SLW-12 | 2-1/2" | 2" | 6-3/4" | 462 | 261 | 190 |
| TZ2D1.54 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 9-3/4" | 559 | 325 | 240 |
| TZ2D1.55 | 5/8" | SLW-58 | 3-1/4" | 2-3/4" | 8-1/4" | 732 | 439 | 329 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

## ATTACHMENT WITH (2) ANCHORS




| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2TZ2D1.51 | 3/8" | 1-1/2" | 1-1/2" | 6-3/4" | 750 | 523 | 424 |
| 2TZ2D1.52 | 3/8" | 2-1/2" | 2" | 6-3/4" | 1255 | 1014 | 902 |
| 2TZ2D1.53 | 1/2" | 2-1/2" | 2" | 6-3/4" | 1165 | 845 | 700 |
| 2TZ2D1.54 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 1392 | 1036 | 873 |
| 2TZ2D1.55 | 5/8" | 3-1/4" | 2-3/4" | 8-1/4" | 1794 | 1376 | 1182 |

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
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4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
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6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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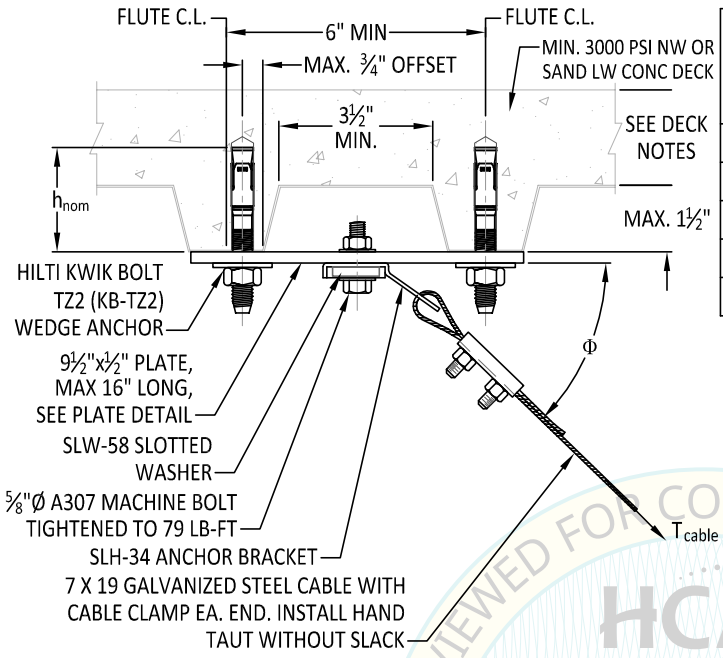
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.2.1**

Date: February 5, 2025

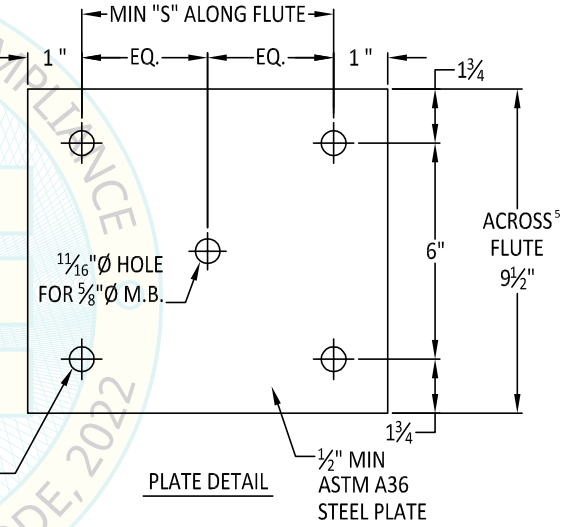
# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4TZD21.51 | 3/8" | 1-1/2" | 1-1/2" | 6-3/4" | 1500 | 1047 | 848 |
| 4TZ2D1.52 | 3/8" | 2-1/2" | 2" | 6-3/4" | 2511 | 2028 | 1804 |
| 4TZ2D1.53 | 1/2" | 2-1/2" | 2" | 6-3/4" | 2331 | 1689 | 1400 |
| 4TZ2D1.54 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 2783 | 2072 | 1745 |
| 4TZ2D1.55 | 5/8" | 3-1/4" | 2-3/4" | 8-1/4" | 3588 | 2753 | 2364 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
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4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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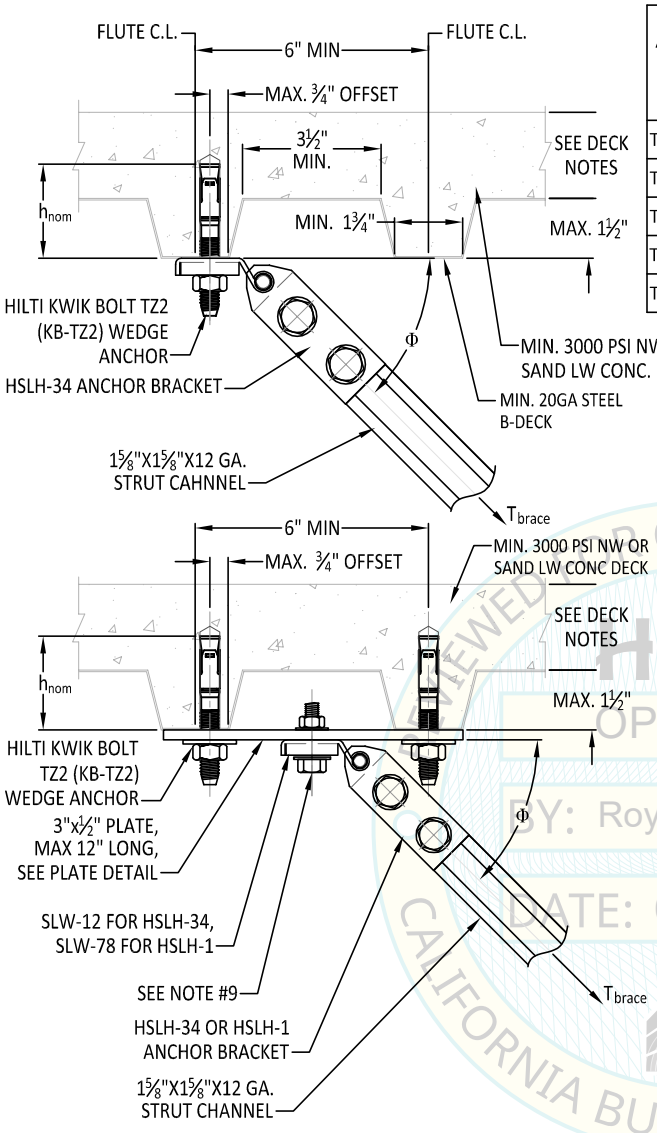
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.2.2**

Date: **February 5, 2025**

# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) ANCHOR

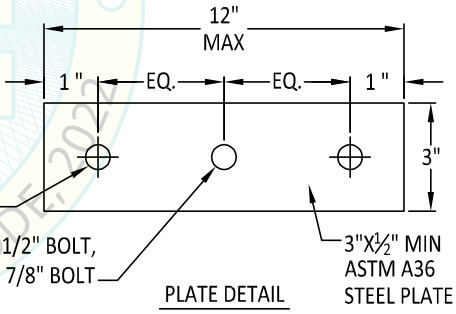
| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| TZD2R1.51 | 3/8" | SLW-38 | 1-1/2" | 1-1/2" | 6-3/4" | 275 | 167 | 107 |
| TZ2DR1.52 | 3/8" | SLW-38 | 2-1/2" | 2" | 6-3/4" | 503 | 351 | 253 |
| TZ2DR1.53 | 1/2" | SLW-12 | 2-1/2" | 2" | 6-3/4" | 438 | 275 | 181 |
| TZ2DR1.54 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 9-3/4" | 531 | 342 | 230 |
| TZ2DR1.55 | 5/8" | SLW-58 | 3-1/4" | 2-3/4" | 8-1/4" | 698 | 462 | 318 |

DECK NOTES:

- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2TZ2DR1.51 | 3/8" | 1-13/16" | 1-1/2" | 6-3/4" | 672 | 484 | 361 |
| 2TZ2DR1.52 | 3/8" | 2-5/16" | 2" | 6-3/4" | 1163 | 952 | 828 |
| 2TZ2DR1.53 | 1/2" | 2-3/8" | 2" | 6-3/4" | 1053 | 784 | 606 |
| 2TZ2DR1.54 | 1/2" | 3-5/8" | 3-1/4" | 9-3/4" | 1266 | 964 | 765 |
| 2TZ2DR1.55 | 5/8" | 3-1/4" | 2-3/4" | 9-3/8" | 1643 | 1285 | 1053 |




NOTES:

1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR HSLH-34 DETAILS.
8. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 BRACKET & SLW-78 ON PAGE 4.12, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 100 LB-FT.

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DATE: 07/19/2025
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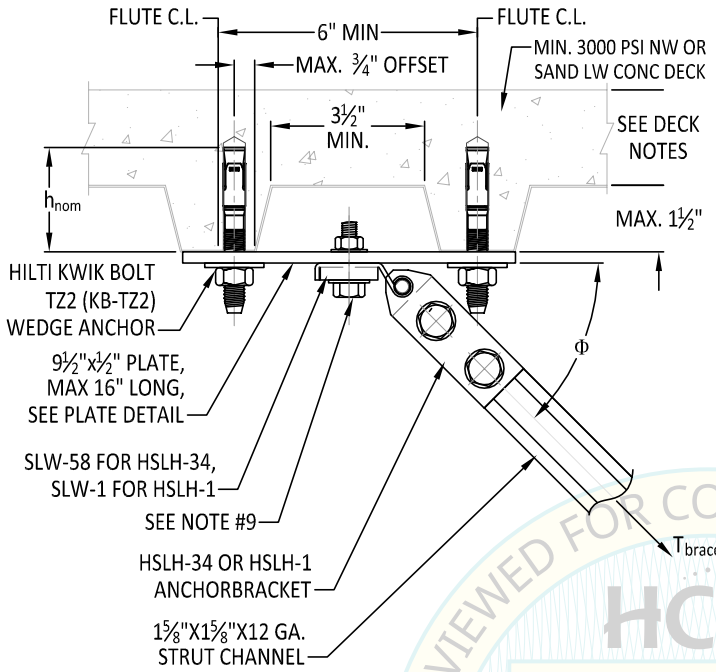
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.2.3**

Date: **February 5, 2025**

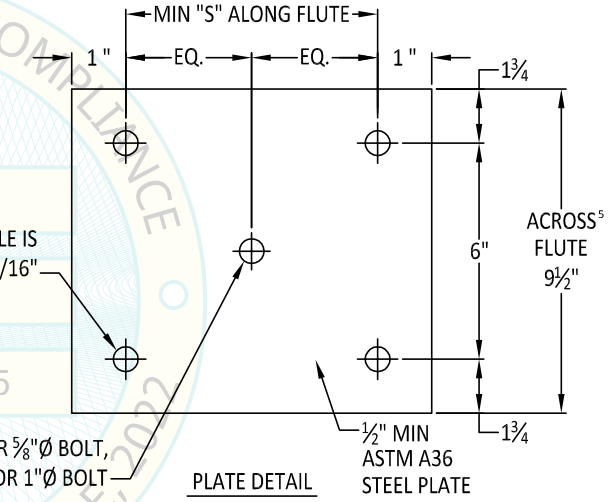
# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4TZ2DR1.51 | 3/8" | 1-1/2" | 1-1/2" | 6-3/4" | 1343 | 968 | 722 |
| 4TZ2DR1.52 | 3/8" | 2-1/2" | 2" | 6-3/4" | 2326 | 1905 | 1657 |
| 4TZ2DR1.53 | 1/2" | 2-1/2" | 2" | 6-3/4" | 2106 | 1568 | 1211 |
| 4TZ2DR1.54 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 2531 | 1929 | 1530 |
| 4TZ2DR1.55 | 5/8" | 3-1/4" | 2-3/4" | 8-1/4" | 3286 | 2570 | 2105 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-58 ON PAGE 4.11, USE ⅝" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 65 LB-FT. FOR HSLH-1 BRACKET & SLW-1 ON PAGE 4.12, USE 1" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 100 LB-FT.

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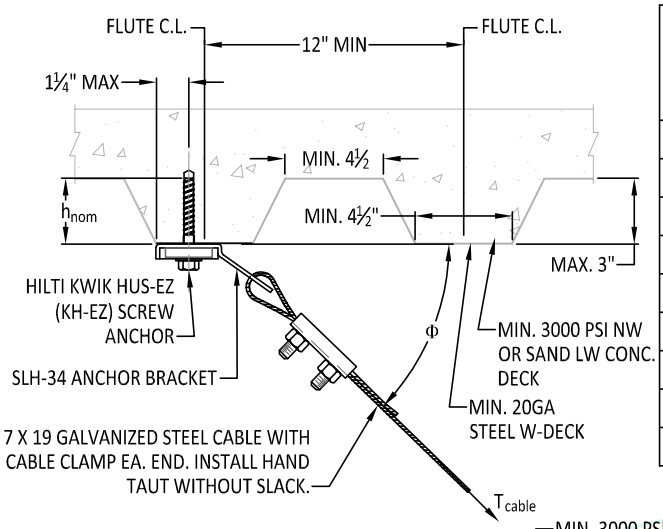
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.2.4**

Date: February 5, 2025

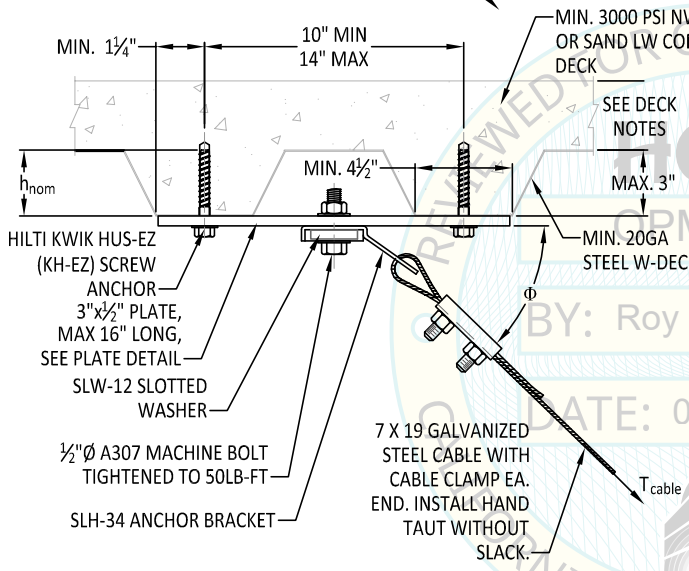
# HILTI KWIK HUS-EZ (KH-EZ) SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK

## ATTACHMENT WITH (1) SCREW ANCHOR




| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| KHD31 | 3/8" | SLW-38 | 1-5/8" | 1-1/8" | 6-3/4" | 187 | 123 | 96 |
| KHD32 | 3/8" | SLW-38 | 2-1/2" | 1-7/8" | 6-3/4" | 249 | 192 | 165 |
| KHD33 | 3/8" | SLW-38 | 3-1/4" | 2-1/2" | 7-1/2" | 529 | 378 | 310 |
| KHD34 | 1/2" | SLW-12 | 2-1/4" | 1-1/2" | 6-3/4" | 195 | 126 | 98 |
| KHD35 | 1/2" | SLW-12 | 3" | 2-3/16" | 6-3/4" | 400 | 276 | 222 |
| KHD36 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 9-3/4" | 569 | 427 | 361 |
| KHD37 | 5/8" | SLW-58 | 3-1/4" | 2-3/8" | 7-3/16" | 505 | 359 | 295 |
| KHD38 | 5/8" | SLW-58 | 5" | 3-7/8" | 11-11/16" | 758 | 629 | 571 |
| KHD39 | 3/4" | SLW-34 | 4" | 2-15/16" | 8-13/16" | 573 | 386 | 307 |

## ATTACHMENT WITH (2) SCREW ANCHOR




| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2KHD31 | 3/8" | 1-5/8" | 1-1/8" | 6-3/4" | 443 | 367 | 332 |
| 2KHD32 | 3/8" | 2-1/2" | 1-7/8" | 6-3/4" | 555 | 520 | 524 |
| 2KHD33 | 3/8" | 3-1/4" | 2-1/2" | 7-1/2" | 1210 | 1073 | 1027 |
| 2KHD34 | 1/2" | 2-1/4" | 1-1/2" | 6-3/4" | 462 | 379 | 341 |
| 2KHD35 | 1/2" | 3" | 2-3/16" | 6-3/4" | 928 | 800 | 747 |
| 2KHD36 | 1/2" | 4-1/4" | 3-1/4" | 9-3/4" | 1280 | 1177 | 1162 |
| 2KHD37 | 5/8" | 3-1/4" | 2-3/8" | 7-3/16" | 1157 | 1023 | 976 |
| 2KHD38 | 5/8" | 5" | 3-7/8" | 11-11/16" | 1655 | 1632 | 1725 |
| 2KHD39 | 3/4" | 4" | 2-15/16" | 8-13/16" | 1339 | 1134 | 1045 |

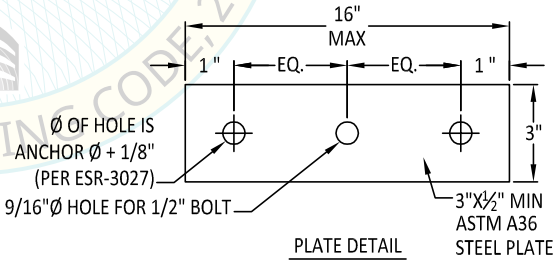



PLATE DETAIL

DECK NOTES:

- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

NOTES:

1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

ICC-ES REVIEWED FOR CODE COMPLIANCE
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DATE: 07/19/2025
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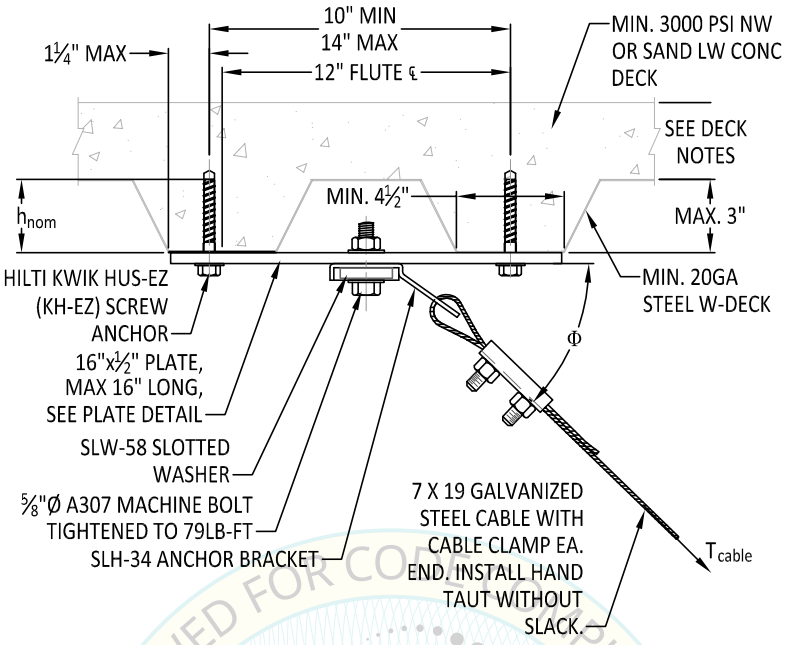
Structural Engineer: N. Tremblay
California PE No. S6481

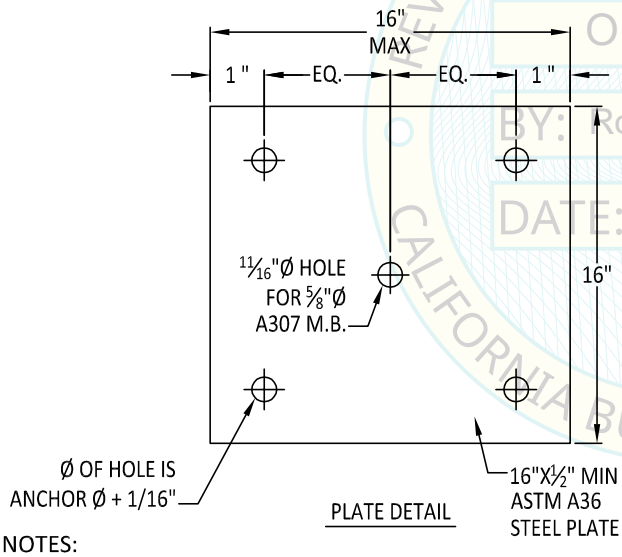
Page No.: **3.3.1**

Date: **February 5, 2025**

# HILTI KWIK HUS-EZ (KH-EZ) SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) SCREW ANCHORS




| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4KHD31 | 3/8" | 1-5/8" | 1-1/8" | 6-3/4" | 886 | 733 | 665 |
| 4KHD32 | 3/8" | 2-1/2" | 1-7/8" | 6-3/4" | 1110 | 1041 | 1047 |
| 4KHD33 | 3/8" | 3-1/4" | 2-1/2" | 7-1/2" | 2421 | 2146 | 2053 |
| 4KHD34 | 1/2" | 2-1/4" | 1-1/2" | 6-3/4" | 924 | 758 | 682 |
| 4KHD35 | 1/2" | 3" | 2-3/16" | 6-3/4" | 1857 | 1600 | 1495 |
| 4KHD36 | 1/2" | 4-1/4" | 3-1/4" | 9-3/4" | 2560 | 2354 | 2325 |
| 4KHD37 | 5/8" | 3-1/4" | 2-3/8" | 7-3/16" | 2314 | 2046 | 1952 |
| 4KHD38 | 5/8" | 5" | 3-7/8" | 11-11/16" | 3311 | 3264 | 3449 |
| 4KHD39 | 3/4" | 4" | 2-15/16" | 8-13/16" | 2678 | 2268 | 2091 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
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4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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DATE: 07/19/2025
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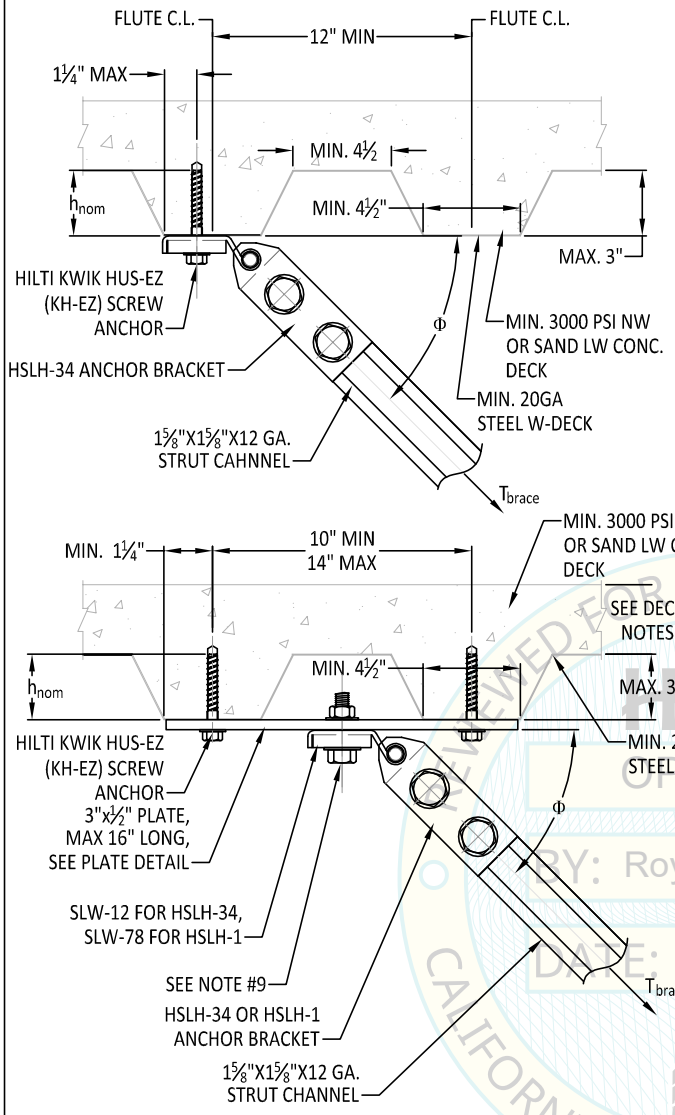
California PE No. S6481

Page No.: **3.3.2**

Date: **February 5, 2025**

# HILTI KWIK HUS-EZ (KH-EZ) SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK





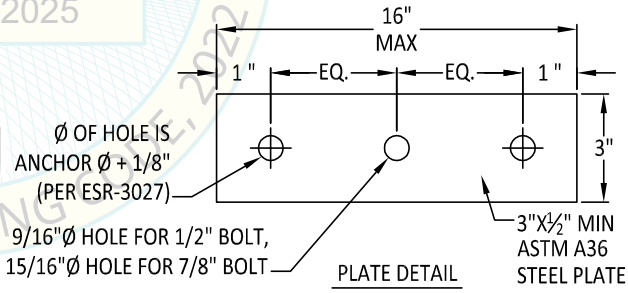


## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| KHDR31 | 3/8" | SLW-38 | 1-5/8" | 1-1/8" | 6-3/4" | 180 | 129 | 106 |
| KHDR32 | 3/8" | SLW-38 | 2-1/2" | 1-7/8" | 6-3/4" | 242 | 199 | 180 |
| KHDR33 | 3/8" | SLW-38 | 3-1/4" | 2-1/2" | 7-1/2" | 512 | 394 | 339 |
| KHDR34 | 1/2" | SLW-12 | 2-1/4" | 1-1/2" | 6-3/4" | 187 | 132 | 108 |
| KHDR35 | 1/2" | SLW-12 | 3" | 2-3/16" | 6-3/4" | 386 | 288 | 243 |
| KHDR36 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 9-3/4" | 552 | 444 | 393 |
| KHDR37 | 5/8" | SLW-58 | 3-1/4" | 2-3/8" | 7-3/16" | 488 | 375 | 322 |
| KHDR38 | 5/8" | SLW-58 | 5" | 3-7/8" | 11-11/16" | 741 | 650 | 616 |
| KHDR39 | 3/4" | SLW-34 | 4" | 2-15/16" | 8-13/16" | 551 | 404 | 337 |

## ATTACHMENT WITH (2) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2KHDR31 | 3/8" | 1-5/8" | 1-1/8" | 6-3/4" | 412 | 345 | 316 |
| 2KHDR32 | 3/8" | 2-1/2" | 1-7/8" | 6-3/4" | 530 | 498 | 503 |
| 2KHDR33 | 3/8" | 3-1/4" | 2-1/2" | 7-1/2" | 1143 | 1020 | 981 |
| 2KHDR34 | 1/2" | 2-1/4" | 1-1/2" | 6-3/4" | 429 | 357 | 324 |
| 2KHDR35 | 1/2" | 3" | 2-3/16" | 6-3/4" | 872 | 757 | 712 |
| 2KHDR36 | 1/2" | 4-1/4" | 3-1/4" | 9-3/4" | 1218 | 1124 | 1113 |
| 2KHDR37 | 5/8" | 3-1/4" | 2-3/8" | 7-3/16" | 1092 | 971 | 932 |
| 2KHDR38 | 5/8" | 5" | 3-7/8" | 11-11/16" | 1596 | 1573 | 1664 |
| 2KHDR39 | 3/4" | 4" | 2-15/16" | 8-13/16" | 1253 | 1071 | 995 |




DECK NOTES:

- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

NOTES:

1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 BRACKET & SLW-78 ON PAGE 4.12, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 100 LB-FT.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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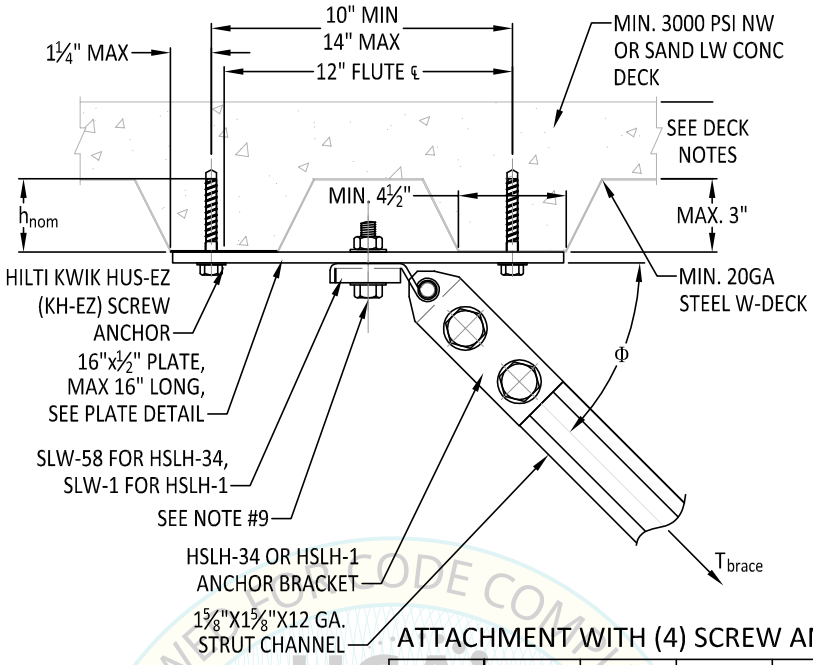
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050

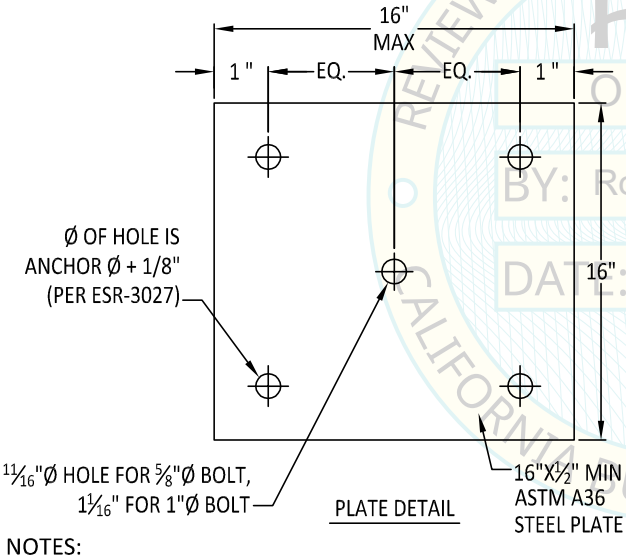
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.3.3**

Date: February 5, 2025

# HILTI KWIK HUS-EZ (KH-EZ) SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE, "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4KHDR31 | 3/8" | 1-5/8" | 1-1/8" | 6-3/4" | 825 | 691 | 632 |
| 4KHDR32 | 3/8" | 2-1/2" | 1-7/8" | 6-3/4" | 1060 | 997 | 1005 |
| 4KHDR33 | 3/8" | 3-1/4" | 2-1/2" | 7-1/2" | 2286 | 2039 | 1961 |
| 4KHDR34 | 1/2" | 2-1/4" | 1-1/2" | 6-3/4" | 859 | 713 | 647 |
| 4KHDR35 | 1/2" | 3" | 2-3/16" | 6-3/4" | 1743 | 1515 | 1425 |
| 4KHDR36 | 1/2" | 4-1/4" | 3-1/4" | 9-11/16" | 2436 | 2247 | 2227 |
| 4KHDR37 | 5/8" | 3-1/4" | 2-3/8" | 7-3/16" | 2184 | 1943 | 1864 |
| 4KHDR38 | 5/8" | 5" | 3-7/8" | 11-11/16" | 3191 | 3147 | 3327 |
| 4KHDR39 | 3/4" | 4" | 2-15/16" | 8-13/16" | 2505 | 2142 | 1990 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

HCAI REVIEWED FOR CODE COMPLIANCE OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE"x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-58 ON PAGE 4.11, USE 5/8" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 65 LB-FT. FOR HSLH-1 & SLW-1 ON PAGE. 4.12, USE 1" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 100 LB-FT.

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Structural Engineer: N. Tremblay
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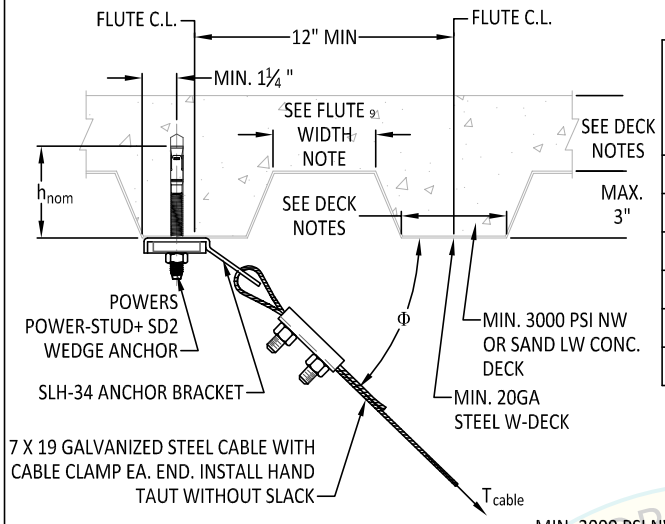
Page No.: **3.3.4**

Date: **February 5, 2025**

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" [8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SD2D31 | 3/8" | SLW-38 | 2-3/8" | 2" | 6-3/4" | 358 | 227 | 175 |
| SD2D32 | 1/2" | SLW-12 | 2-1/2" | 2" | 6-3/4" | 433 | 251 | 186 |
| SD2D33 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 9-3/4" | 779 | 449 | 331 |
| SD2D34 | 5/8" | SLW-58 | 3-7/8" | 3-1/4" | 9-3/4" | 661 | 454 | 365 |
| SD2D35 | 5/8" | SLW-58 | 4-7/8" | 4-1/4" | 12-3/4" | 1031 | 720 | 584 |
| SD2D36[10] | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 11-1/4" | 708 | 491 | 397 |

DECK NOTES:

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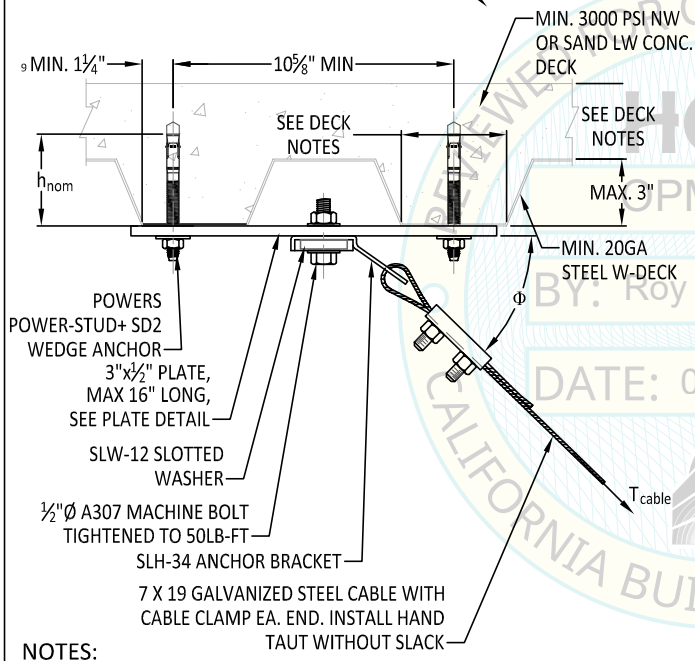
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" [8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SD2D31 | 3/8" | 2-3/8" | 2" | 6-3/4" | 856 | 690 | 613 |
| 2SD2D32 | 1/2" | 2-1/2" | 2" | 6-3/4" | 1077 | 802 | 676 |
| 2SD2D33 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 1943 | 1438 | 1207 |
| 2SD2D34 | 5/8" | 3-7/8" | 3-1/4" | 9-3/4" | 1534 | 1320 | 1232 |
| 2SD2D35 | 5/8" | 4-7/8" | 4-1/4" | 12-3/4" | 2377 | 2072 | 1955 |
| 2SD2D36[10] | 3/4" | 4-1/2" | 3-3/4" | 11-1/4" | 1638 | 1419 | 1332 |

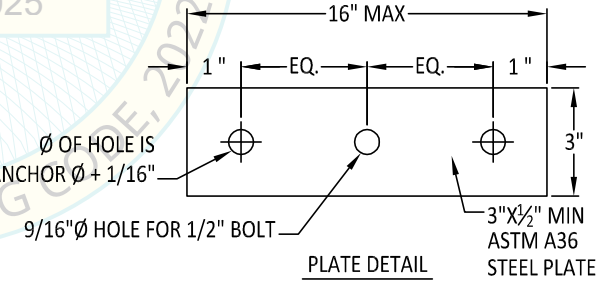



PLATE DETAIL

REVIEWED FOR CODE COMPLIANCE BY HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE, 2022

NOTES:

1. THE OVER STRENGTH FACTOR $\Omega_o$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2502 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. EDGE OF FLUTE DISTANCE FOR 3-7/8" WIDE FLUTES IS 1" AND IS APPLICABLE TO THE ⅜" AND ½" DIA. ANCHORS ONLY.
10. MINIMUM DECK FLUTE WIDTH FOR ¾"Ø ANCHORS IS 4½".

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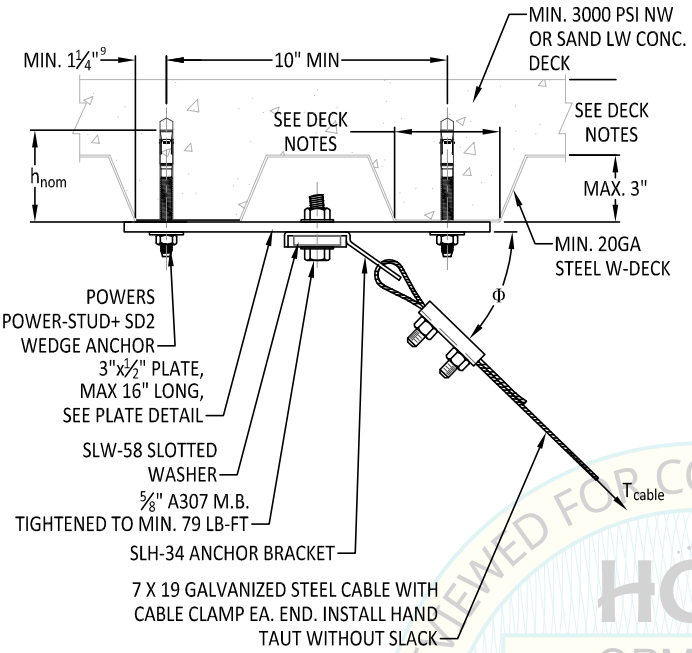
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.4.1**

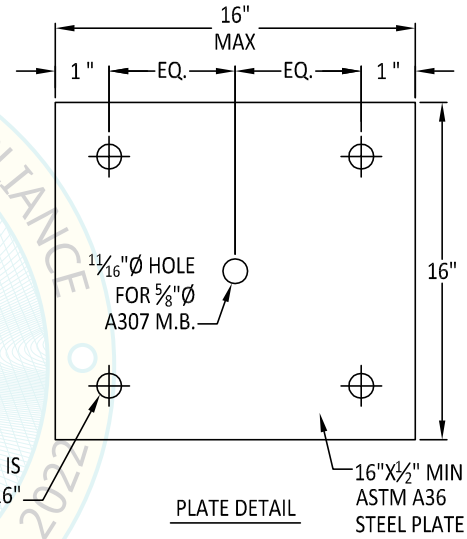
Date: February 5, 2025

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[9] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SD231 | 3/8" | 2-3/8" | 2" | 6-3/4" | 1712 | 1381 | 1227 |
| 4SD232 | 1/2" | 2-1/2" | 2" | 6-3/4" | 2154 | 1605 | 1352 |
| 4SD233 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 3886 | 2877 | 2414 |
| 4SD234 | 5/8" | 3-7/8" | 3-1/4" | 9-3/4" | 3067 | 2640 | 2464 |
| 4SD235 | 5/8" | 4-7/8" | 4-1/4" | 12-3/4" | 4754 | 4145 | 3910 |
| 4SD236[10] | 3/4" | 4-1/2" | 3-3/4" | 11-1/4" | 3276 | 2838 | 2664 |




DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

REVIEWED FOR CODE COMPLIANCE
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OPM-0203
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DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
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6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. EDGE OF FLUTE DISTANCE FOR 3-7/8" WIDE FLUTES IS 1" AND IS APPLICABLE TO THE ⅜" AND ½" DIA. ANCHORS ONLY.
10. MINIMUM DECK FLUTE WIDTH FOR ¾"Ø ANCHORS IS 4½".

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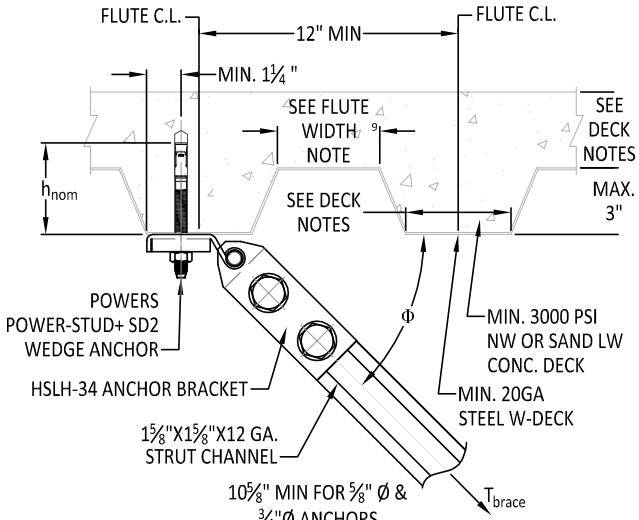
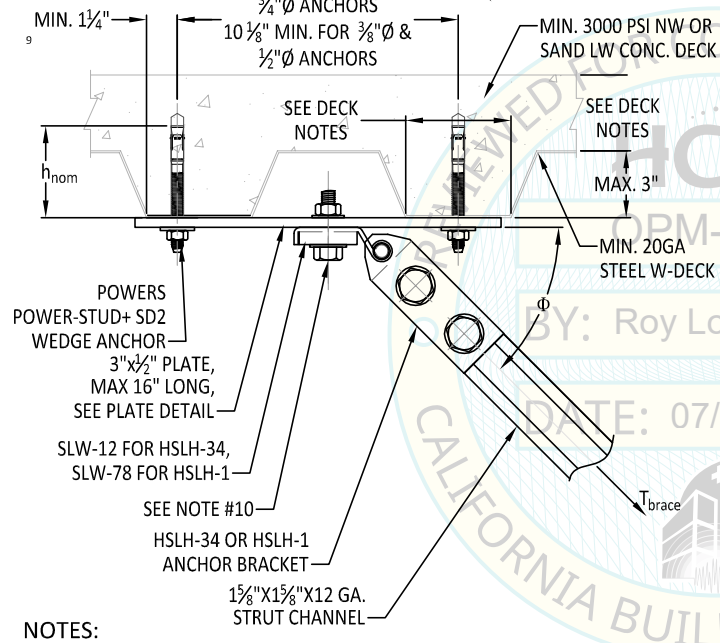
Page No.: **3.4.2**

Date: **February 5, 2025**

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SD2DR31 | 3/8" | SLW-38 | 2-3/8" | 2" | 6-3/4" | 343 | 238 | 193 |
| SD2DR32 | 1/2" | SLW-12 | 2-1/2" | 2" | 6-3/4" | 411 | 265 | 206 |
| SD2DR33 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 9-3/4" | 739 | 474 | 367 |
| SD2DR34 | 5/8" | SLW-58 | 3-7/8" | 3-1/4" | 9-3/4" | 637 | 475 | 400 |
| SD2DR35 | 5/8" | SLW-58 | 4-7/8" | 4-1/4" | 12-3/4" | 995 | 752 | 640 |
| SD2DR36[11] | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 11-1/4" | 683 | 513 | 434 |

DECK NOTES:

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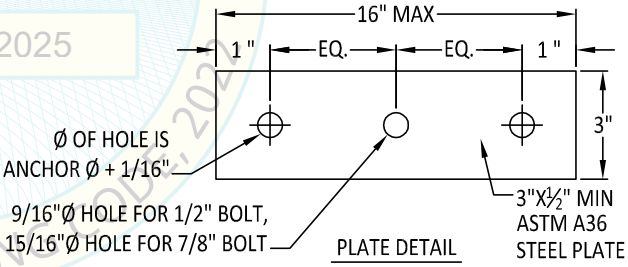
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SD2DR31 | 3/8" | 2-3/8" | 2" | 6-3/4" | 793 | 648 | 582 |
| 2SD2DR32 | 1/2" | 2-1/2" | 2" | 6-3/4" | 979 | 747 | 638 |
| 2SD2DR33 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 1765 | 1338 | 1140 |
| 2SD2DR34 | 5/8" | 3-7/8" | 3-1/4" | 9-3/4" | 1440 | 1249 | 1174 |
| 2SD2DR35 | 5/8" | 4-7/8" | 4-1/4" | 12-3/4" | 2237 | 1965 | 1865 |
| 2SD2DR36[11] | 3/4" | 4-1/2" | 3-3/4" | 11-1/4" | 1540 | 1344 | 1270 |

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2023

NOTES:

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5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
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8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. EDGE OF FLUTE DISTANCE FOR 3-7/8" WIDE FLUTES IS 1" AND IS APPLICABLE TO THE ⅜" AND ½" DIA. ANCHORS ONLY.
10. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 & SLW-78 ON PAGE 4.12, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 208 LB-FT.
11. MINIMUM DECK FLUTE WIDTH FOR ¾"Ø ANCHORS IS 4½".

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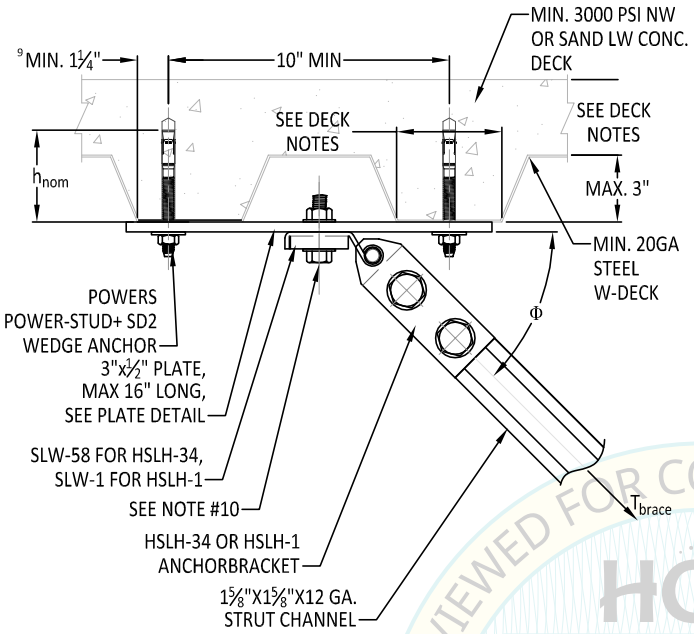
Page No.: **3.4.3**

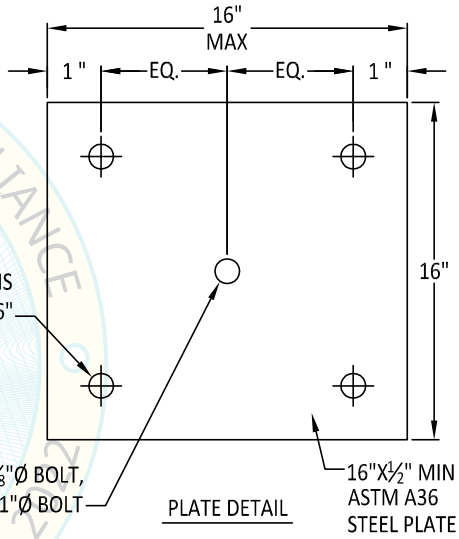
Date: **February 5, 2025**

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[9] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SD2DR31 | 3/8" | 2-3/8" | 2" | 6-3/4" | 1585 | 1296 | 1164 |
| 4SD2DR32 | 1/2" | 2-1/2" | 2" | 6-3/4" | 1959 | 1493 | 1277 |
| 4SD2DR33 | 1/2" | 3-3/4" | 3-1/4" | 9-3/4" | 3530 | 2675 | 2279 |
| 4SD2DR34 | 5/8" | 3-7/8" | 3-1/4" | 9-3/4" | 2879 | 2498 | 2348 |
| 4SD2DR35 | 5/8" | 4-7/8" | 4-1/4" | 12-3/4" | 4474 | 3929 | 3730 |
| 4SD2DR36[11] | 3/4" | 4-1/2" | 3-3/4" | 11-1/4" | 3079 | 2689 | 2540 |




DECK NOTES:
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- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

REVIEWED FOR CODE COMPLIANCE
HCAi
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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2502 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. EDGE OF FLUTE DISTANCE FOR 3-7/8" WIDE FLUTES IS 1" AND IS APPLICABLE TO THE ⅜" AND ½" DIA. ANCHORS ONLY.
10. FOR HSLH-34 BRACKET & SLW-58 ON PAGE 4.11, USE ⅝" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 65 LB-FT. FOR HSLH-1 & SLW-1 ON PAGE 4.12, USE 1" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 251 LB-FT.
11. MINIMUM DECK FLUTE WIDTH FOR ¾"Ø ANCHORS IS 4½".

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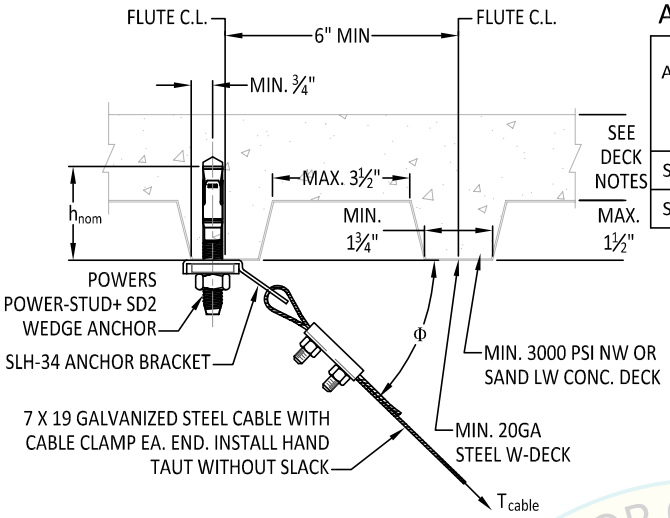
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.4.4**

Date: **February 5, 2025**

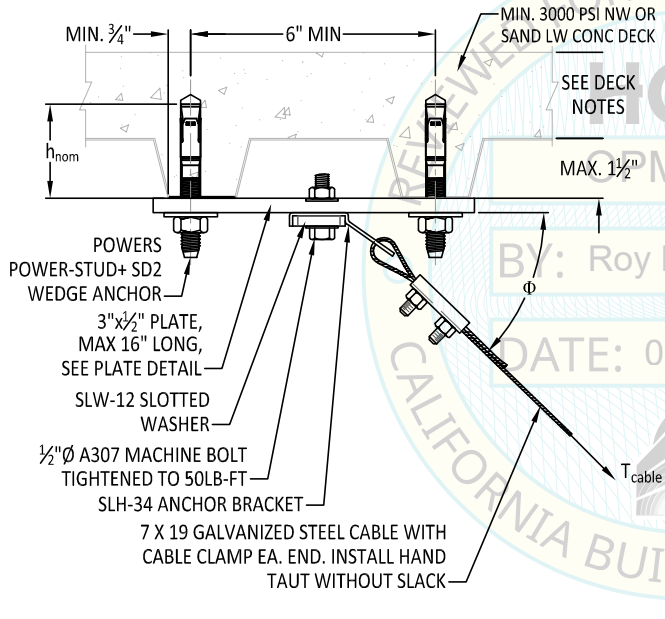
# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) ANCHOR

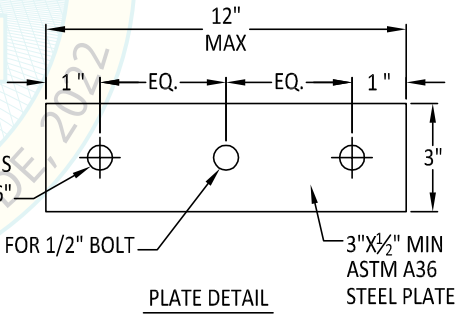
| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" [8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SD2D1.51 | 3/8" | SLW-38 | 2-5/16" | 2" | 6-3/4" | 347 | 208 | 156 |
| SD2D1.52 | 1/2" | SLW-12 | 2-3/8" | 2" | 6-3/4" | 438 | 250 | 184 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SD2D1.51 | 3/8" | 2-5/16" | 2" | 6-3/4" | 852 | 653 | 561 |
| 2SD2D1.52 | 1/2" | 2-3/8" | 2" | 6-3/4" | 1099 | 806 | 672 |

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2502 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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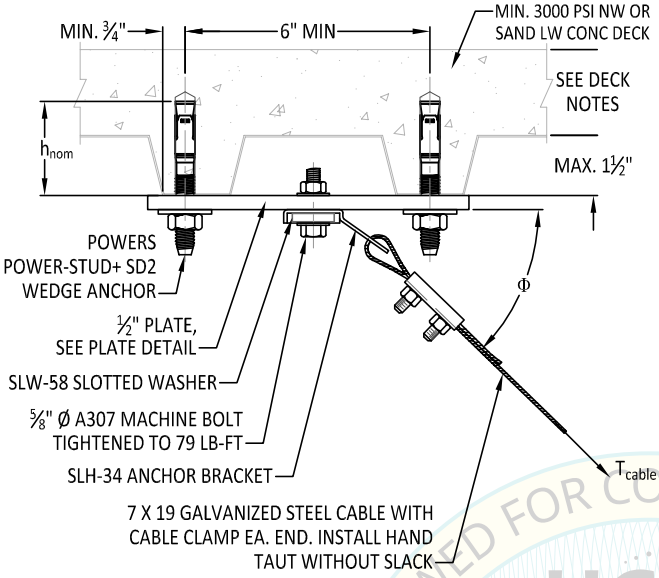
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.5.1**

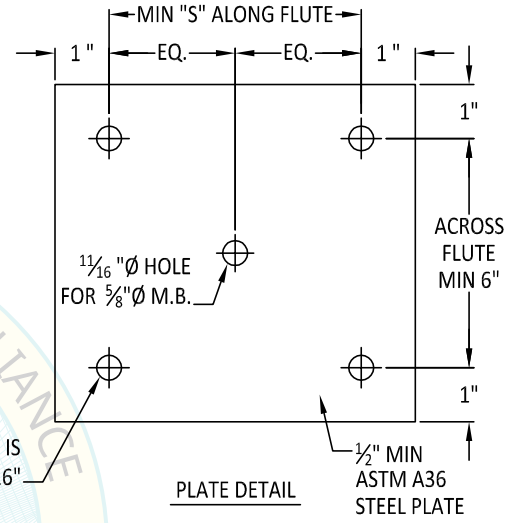
Date: February 5, 2025

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SD2D1.51 | 3/8" | 2-5/16" | 2" | 6-3/4" | 1703 | 1306 | 1121 |
| 4SD2D1.52 | 1/2" | 2-3/8" | 2" | 6-3/4" | 2198 | 1611 | 1344 |




DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
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CALIFORNIA BUILDING CODE, 2022

NOTES:
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2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2502 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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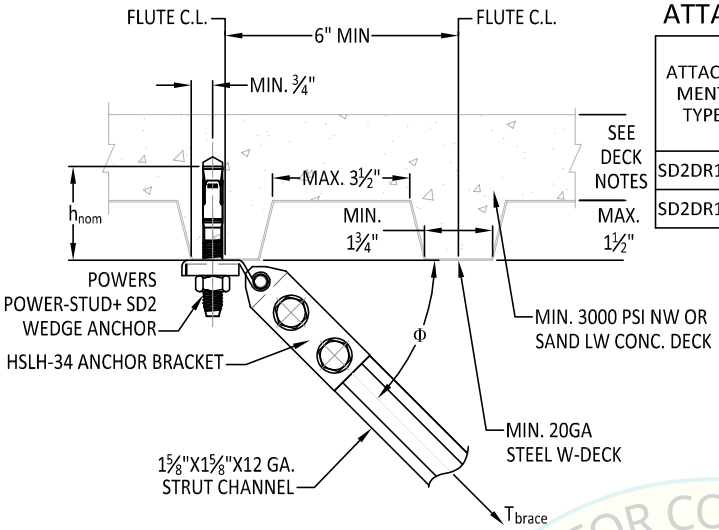
Page No.: **3.5.2**

Date: February 5, 2025

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SD2DR1.51 | 3/8" | SLW-38 | 2-5/16" | 2" | 6-3/4" | 315 | 213 | 154 |
| SD2DR1.52 | 1/2" | SLW-12 | 2-3/8" | 2" | 6-3/4" | 416 | 264 | 184 |

DECK NOTES:
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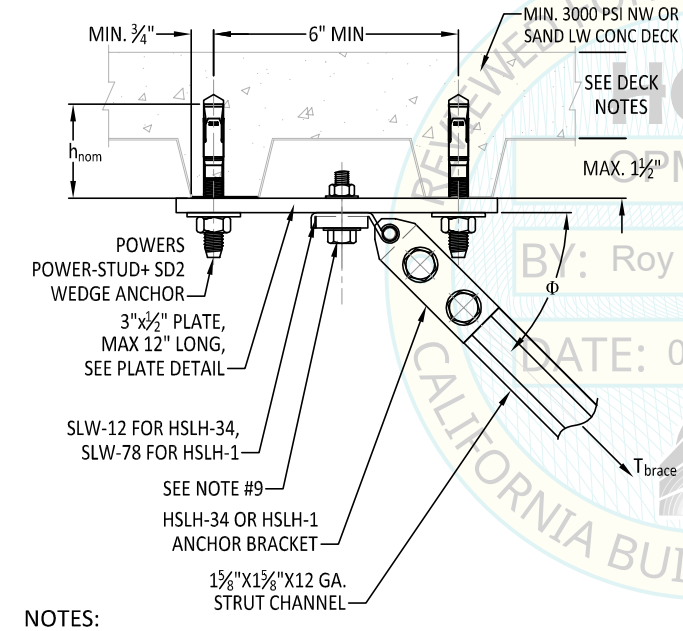
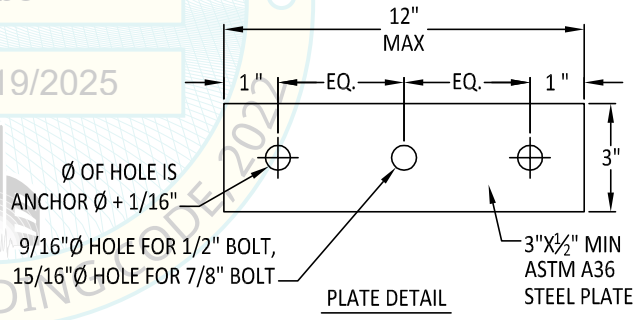
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SD2DR1.51 | 3/8" | 2-5/16" | 2" | 6-3/4" | 736 | 588 | 518 |
| 2SD2DR1.52 | 1/2" | 2-3/8" | 2" | 6-3/4" | 996 | 748 | 634 |

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ICC-ES
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

NOTES:
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6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 & SLW-78 ON PAGE 4.12, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 208 LB-FT.

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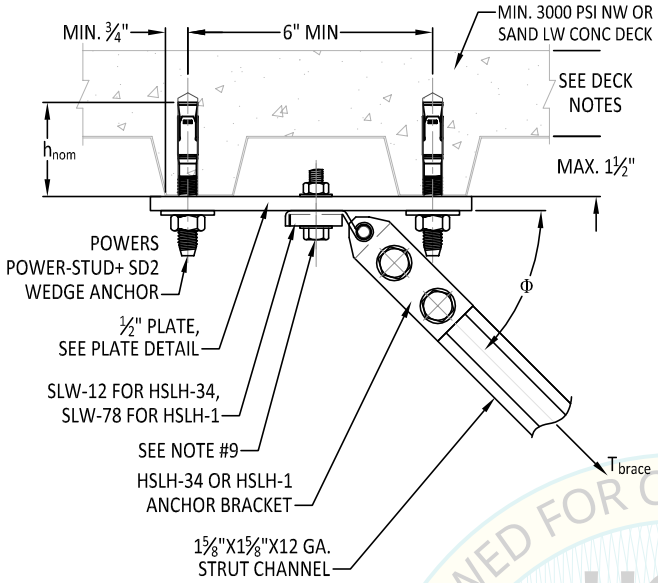
Page No.: **3.5.3**

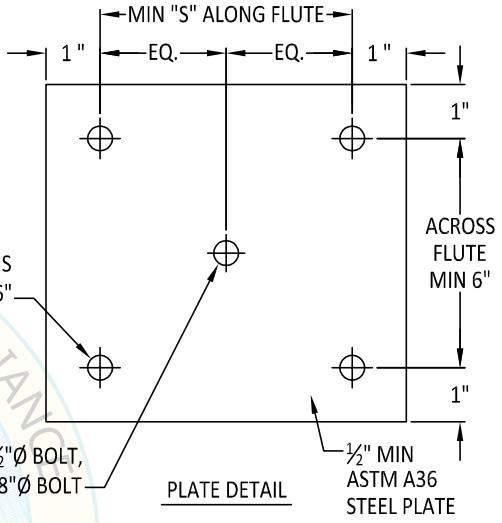
Date: **February 5, 2025**

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SD2DR1.51 | 3/8" | 2-5/16" | 2" | 6-3/4" | 1473 | 1175 | 1037 |
| 4SD2DR1.52 | 1/2" | 2-3/8" | 2" | 6-3/4" | 1992 | 1497 | 1268 |




DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
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4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-58 ON PAGE 4.11, USE ⅝" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 65 LB-FT. FOR HSLH-1 & SLW-1 ON PAGE 4.12, USE 1" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 251 LB-FT.

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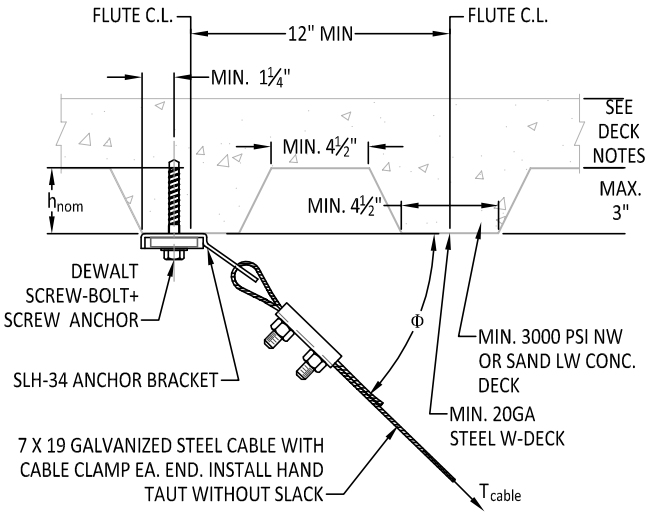
Page No.: **3.5.4**

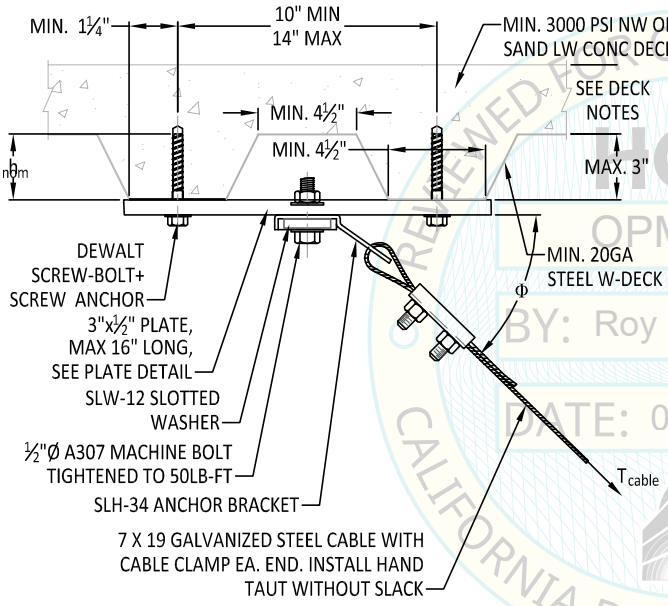
Date: **February 5, 2025**

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SCD31 | 3/8" | SLW-38 | 2" | 1-5/16" | 6-3/4" | 264 | 153 | 113 |
| SCD32 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 6-3/4" | 383 | 245 | 189 |
| SCD33 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 6-3/4" | 466 | 306 | 239 |
| SCD34 | 1/2" | SLW-12 | 2-1/2" | 1-3/4" | 6-3/4" | 334 | 203 | 153 |
| SCD35 | 1/2" | SLW-12 | 3" | 2-3/16" | 6-3/4" | 481 | 332 | 267 |
| SCD36 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 9-3/4" | 950 | 617 | 481 |
| SCD37 | 5/8" | SLW-58 | 3-1/4" | 2-1/4" | 6-3/4" | 301 | 172 | 127 |
| SCD38 | 5/8" | SLW-58 | 4" | 2-7/8" | 8-5/8" | 437 | 275 | 211 |
| SCD39 | 5/8" | SLW-58 | 5" | 3-3/4" | 11-1/4" | 728 | 418 | 308 |
| SCD310 | 3/4" | SLW-34 | 4-1/4" | 3-1/16" | 9-3/16" | 822 | 528 | 410 |




## ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SCD31 | 3/8" | 2" | 1-5/16" | 6-3/4" | 657 | 488 | 411 |
| 2SCD32 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 912 | 740 | 661 |
| 2SCD33 | 3/8" | 3-1/4" | 2-3/8" | 6-3/4" | 1101 | 912 | 826 |
| 2SCD34 | 1/2" | 2-1/2" | 1-3/4" | 6-3/4" | 814 | 631 | 546 |
| 2SCD35 | 1/2" | 3" | 2-3/16" | 6-3/4" | 1115 | 962 | 900 |
| 2SCD36 | 1/2" | 4-1/4" | 3-1/4" | 9-3/4" | 2252 | 1852 | 1669 |
| 2SCD37 | 5/8" | 3-1/4" | 2-1/4" | 6-3/4" | 753 | 554 | 463 |
| 2SCD38 | 5/8" | 4" | 2-7/8" | 8-5/8" | 1050 | 840 | 742 |
| 2SCD39 | 5/8" | 5" | 3-3/4" | 11-1/4" | 1821 | 1343 | 1125 |
| 2SCD310 | 3/4" | 4-1/4" | 3-1/16" | 9-3/16" | 1956 | 1595 | 1428 |

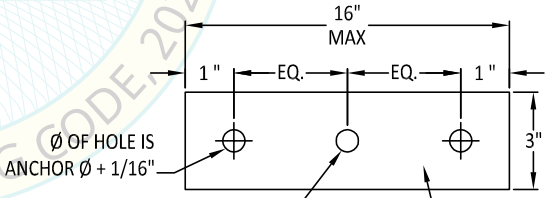



PLATE DETAIL

DECK NOTES:

- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

NOTES:

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2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3889 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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BY: Roy Lobo
DATE: 07/19/2025
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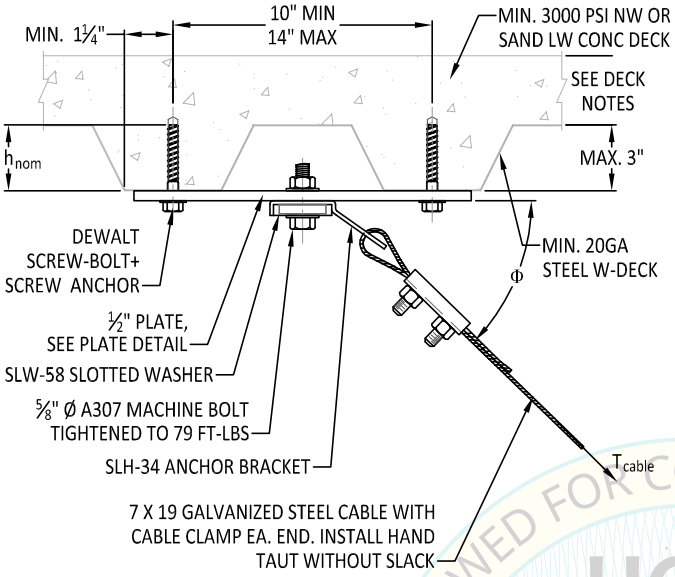
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.6.1**

Date: February 5, 2025

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SCD31 | 3/8" | 2" | 1-5/16" | 6-3/4" | 1313 | 977 | 822 |
| 4SCD32 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 1825 | 1481 | 1322 |
| 4SCD33 | 3/8" | 3-1/4" | 2-3/8" | 6-3/4" | 2203 | 1824 | 1653 |
| 4SCD34 | 1/2" | 2-1/2" | 1-3/4" | 6-3/4" | 1628 | 1262 | 1091 |
| 4SCD35 | 1/2" | 3" | 2-3/16" | 6-3/4" | 2229 | 1924 | 1800 |
| 4SCD36 | 1/2" | 4-1/4" | 3-1/4" | 9-3/4" | 4504 | 3704 | 3338 |
| 4SCD37 | 5/8" | 3-1/4" | 2-1/4" | 6-3/4" | 1507 | 1107 | 925 |
| 4SCD38 | 5/8" | 4" | 2-7/8" | 8-5/8" | 2100 | 1679 | 1483 |
| 4SCD39 | 5/8" | 5" | 3-3/4" | 11-1/4" | 3641 | 2686 | 2249 |
| 4SCD310 | 3/4" | 4-1/4" | 3-1/16" | 9-3/16" | 3912 | 3189 | 2856 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

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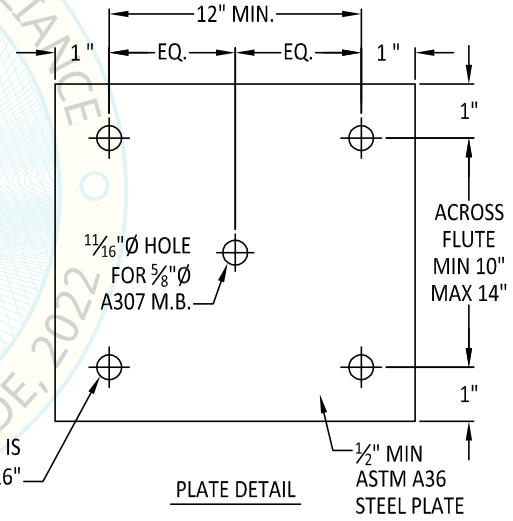
CALIFORNIA BUILDING CODE, 2022




NOTES:
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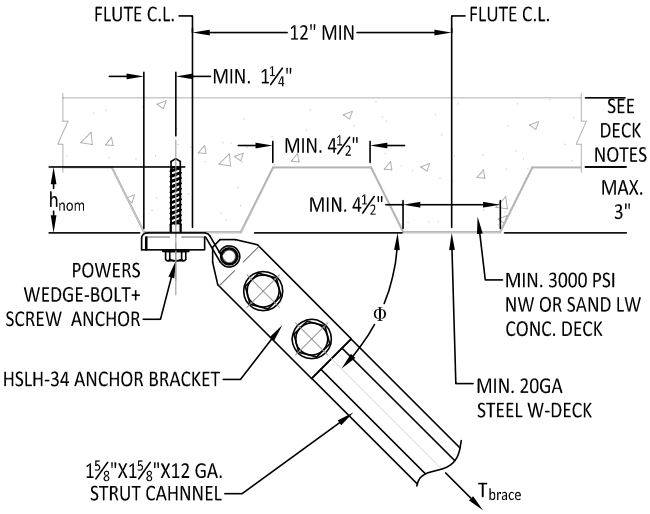
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.6.2**

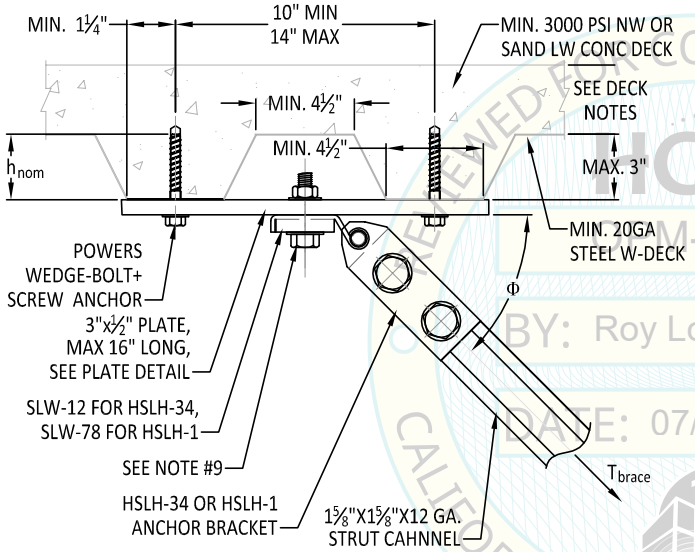
Date: **February 5, 2025**

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK



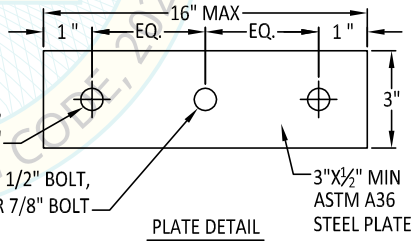

## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SCDR31 | 3/8" | SLW-38 | 2" | 1-5/16" | 6-3/4" | 251 | 161 | 125 |
| SCDR32 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 6-3/4" | 367 | 257 | 208 |
| SCDR33 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 6-3/4" | 448 | 320 | 263 |
| SCDR34 | 1/2" | SLW-12 | 2-1/2" | 1-3/4" | 6-3/4" | 318 | 213 | 169 |
| SCDR35 | 1/2" | SLW-12 | 3" | 2-3/16" | 6-3/4" | 464 | 347 | 293 |
| SCDR36 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 9-3/4" | 912 | 647 | 293 |
| SCDR37 | 5/8" | SLW-58 | 3-1/4" | 2-1/4" | 6-3/4" | 285 | 182 | 140 |
| SCDR38 | 5/8" | SLW-58 | 4" | 2-7/8" | 8-5/8" | 418 | 289 | 232 |
| SCDR39 | 5/8" | SLW-58 | 5" | 3-3/4" | 11-1/4" | 691 | 441 | 341 |
| SCDR310 | 3/4" | SLW-34 | 4-1/4" | 3-1/16" | 9-3/16" | 788 | 554 | 451 |




## ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SCDR31 | 3/8" | 2" | 1-5/16" | 6-3/4" | 597 | 455 | 388 |
| 2SCDR32 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 846 | 696 | 627 |
| 2SCDR33 | 3/8" | 3-1/4" | 2-3/8" | 6-3/4" | 1025 | 859 | 785 |
| 2SCDR34 | 1/2" | 2-1/2" | 1-3/4" | 6-3/4" | 747 | 590 | 516 |
| 2SCDR35 | 1/2" | 3" | 2-3/16" | 6-3/4" | 1047 | 911 | 858 |
| 2SCDR36 | 1/2" | 4-1/4" | 3-1/4" | 9-3/4" | 2094 | 1743 | 1585 |
| 2SCDR37 | 5/8" | 3-1/4" | 2-1/4" | 6-3/4" | 683 | 514 | 437 |
| 2SCDR38 | 5/8" | 4" | 2-7/8" | 8-5/8" | 970 | 788 | 703 |
| 2SCDR39 | 5/8" | 5" | 3-3/4" | 11-1/4" | 1652 | 1249 | 1062 |
| 2SCDR310 | 3/4" | 4-1/4" | 3-1/16" | 9-3/16" | 1815 | 1499 | 1356 |




DECK NOTES:

- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

NOTES:

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8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 & SLW-78 ON PAGE 4.12, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 208 LB-FT.

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Structural Engineer: N. Tremblay
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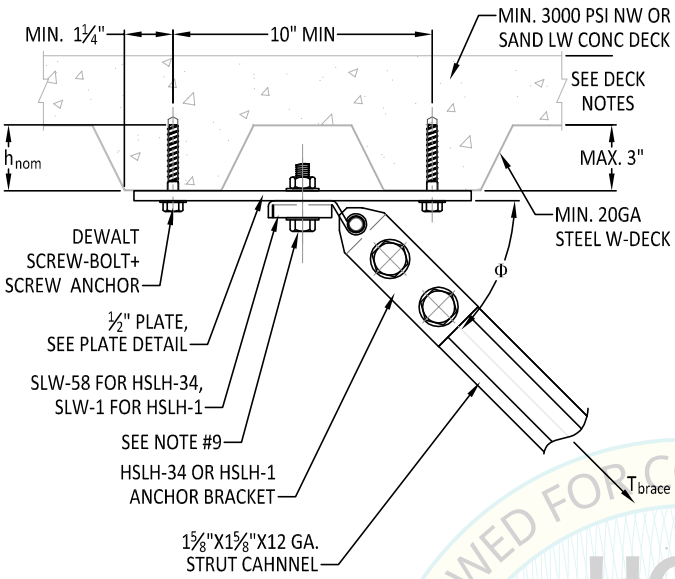
Page No.: **3.6.3**

Date: February 5, 2025

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SCDR31 | 3/8" | 2" | 1-5/16" | 6-3/4" | 1194 | 909 | 777 |
| 4SCDR32 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 1692 | 1392 | 1255 |
| 4SCDR33 | 3/8" | 3-1/4" | 2-3/8" | 6-3/4" | 2051 | 1718 | 1571 |
| 4SCDR34 | 1/2" | 2-1/2" | 1-3/4" | 6-3/4" | 1494 | 1180 | 1033 |
| 4SCDR35 | 1/2" | 3" | 2-3/16" | 6-3/4" | 2094 | 1822 | 1716 |
| 4SCDR36 | 1/2" | 4-1/4" | 3-1/4" | 9-3/4" | 4188 | 3486 | 3170 |
| 4SCDR37 | 5/8" | 3-1/4" | 2-1/4" | 6-3/4" | 1366 | 1029 | 873 |
| 4SCDR38 | 5/8" | 4" | 2-7/8" | 8-5/8" | 1941 | 1575 | 1406 |
| 4SCDR39 | 5/8" | 5" | 3-3/4" | 11-1/4" | 3304 | 2497 | 2123 |
| 4SCDR310 | 3/4" | 4-1/4" | 3-1/16" | 9-3/16" | 3631 | 2998 | 2711 |

DECK NOTES:
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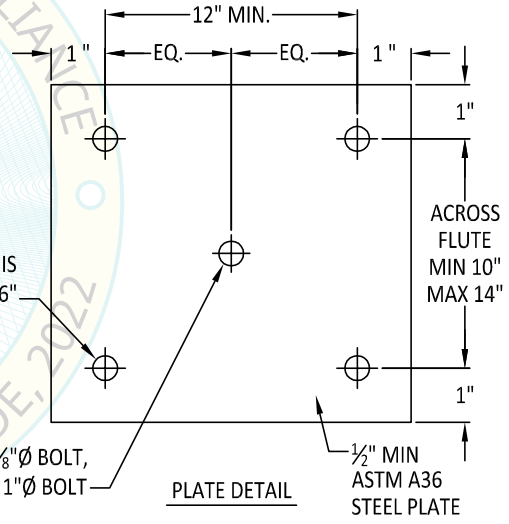


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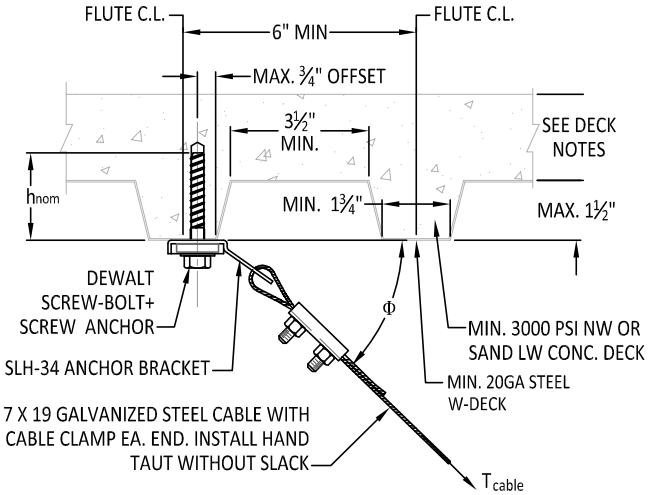
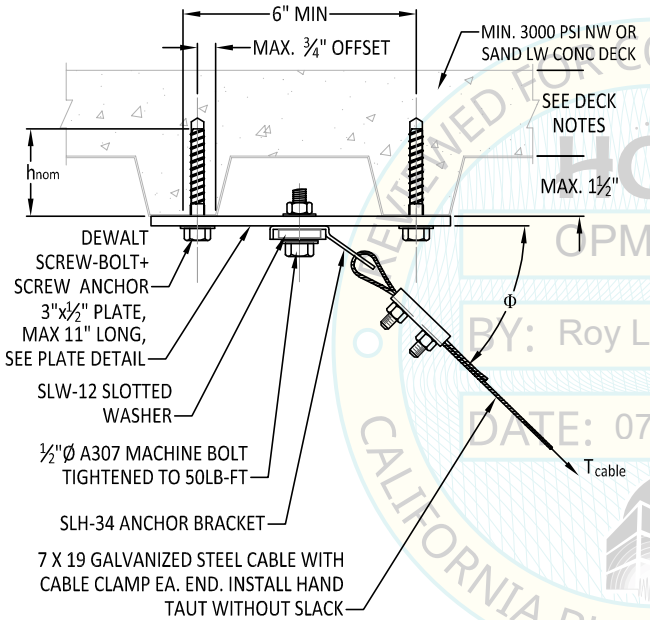
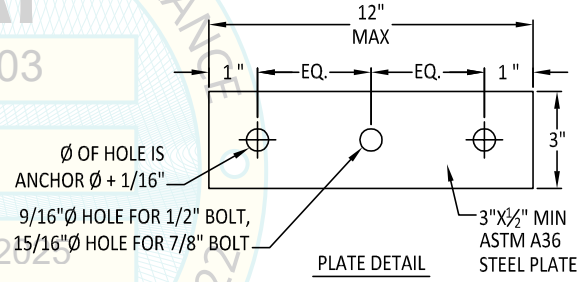
# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK

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ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SCD1.51 | 3/8" | SLW-38 | 2" | 1-5/16" | 3-15/16" | 183 | 101 | 73 |
| SCD1.52 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 5-1/4" | 312 | 198 | 153 |
| SCD1.53 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 7-1/8" | 432 | 291 | 231 |
| SCD1.54 | 1/2" | SLW-12 | 2-1/2" | 1-3/4" | 5-1/4" | 320 | 202 | 155 |

ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SCD1.51 | 3/8" | 2" | 1-5/16" | 3-15/16" | 466 | 331 | 271 |
| 2SCD1.52 | 3/8" | 2-1/2" | 1-3/4" | 5-1/4" | 746 | 602 | 535 |
| 2SCD1.53 | 3/8" | 3-1/4" | 2-3/8" | 7-1/8" | 1009 | 855 | 788 |
| 2SCD1.54 | 1/2" | 2-1/2" | 1-3/4" | 5-1/4" | 766 | 615 | 545 |

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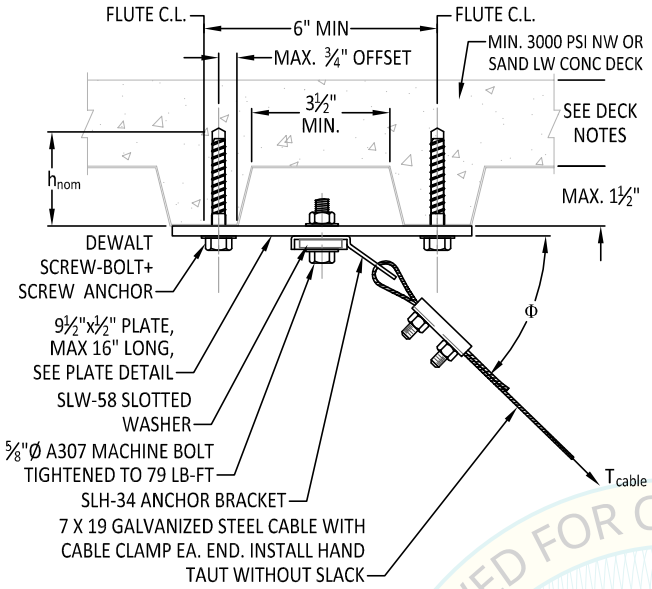
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 3.6.5

Date: February 5, 2025

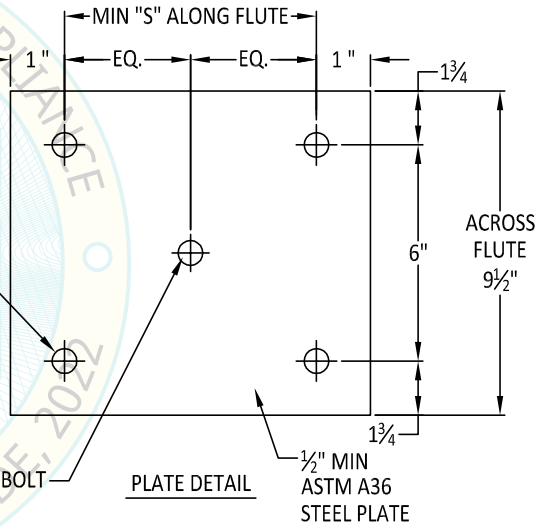
# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SCD151 | 3/8" | 2" | 1-5/16" | 3-15/16" | 931 | 662 | 543 |
| 4SCD152 | 3/8" | 2-1/2" | 1-3/4" | 5-1/4" | 1493 | 1204 | 1069 |
| 4SCD153 | 3/8" | 3-1/4" | 2-3/8" | 7-1/8" | 2018 | 1710 | 1577 |
| 4SCD154 | 1/2" | 2-1/2" | 1-3/4" | 5-1/4" | 1531 | 1231 | 1091 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3889 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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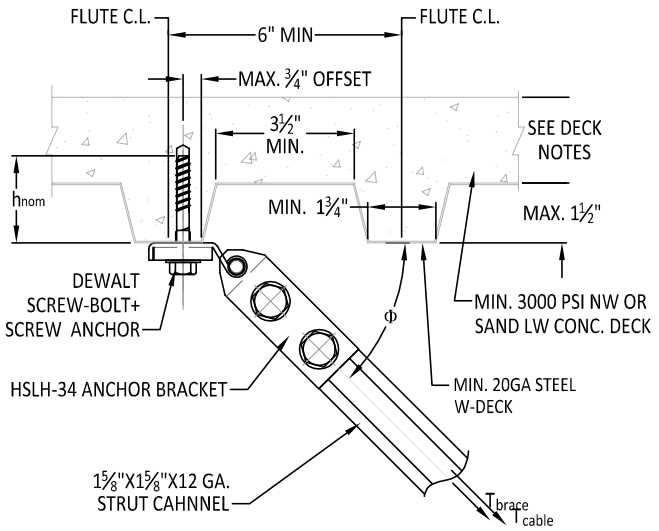
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.6.6**

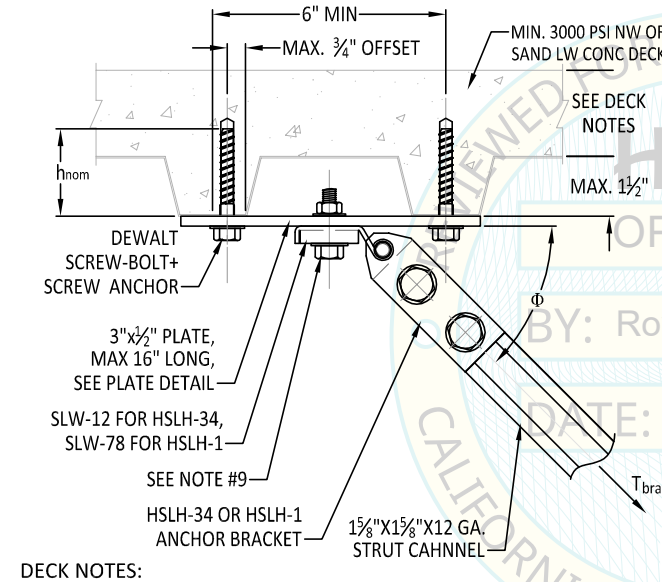
Date: **February 5, 2025**

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK



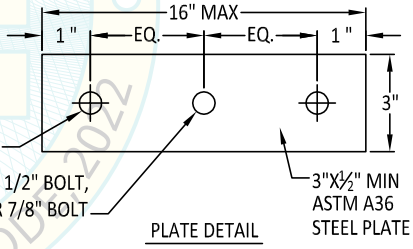

## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SCDR1.51 | 3/8" | SLW-38 | 2" | 1-5/16" | 3-15/16" | 173 | 107 | 81 |
| SCDR1.52 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 5-1/4" | 299 | 208 | 168 |
| SCDR1.53 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 7-1/8" | 416 | 305 | 254 |
| SCDR1.54 | 1/2" | SLW-12 | 2-1/2" | 1-3/4" | 5-1/4" | 306 | 212 | 171 |




## ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SCDR1.51 | 3/8" | 2" | 1-5/16" | 3-15/16" | 419 | 307 | 256 |
| 2SCDR1.52 | 3/8" | 2-1/2" | 1-3/4" | 5-1/4" | 691 | 565 | 507 |
| 2SCDR1.53 | 3/8" | 3-1/4" | 2-3/8" | 7-1/8" | 944 | 808 | 750 |
| 2SCDR1.54 | 1/2" | 2-1/2" | 1-3/4" | 5-1/4" | 708 | 578 | 517 |




DECK NOTES:

- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

NOTES:

1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3889 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 & SLW-58 ON PAGE 4.12, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 208 LB-FT.

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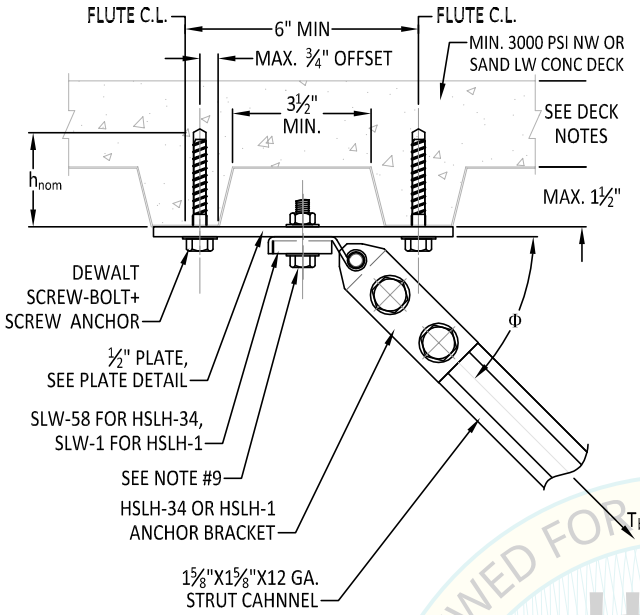
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.6.7**

Date: **February 5, 2025**

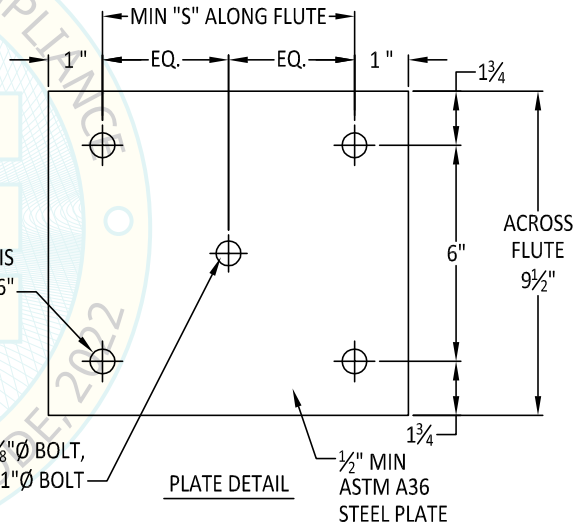
# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 1½" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SCDR1.51 | 3/8" | 2" | 1-5/16" | 6-3/4" | 838 | 614 | 511 |
| 4SCDR1.52 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 1382 | 1130 | 1015 |
| 4SCDR1.53 | 3/8" | 3-1/4" | 2-3/8" | 6-3/4" | 1888 | 1615 | 1501 |
| 4SCDR1.54 | 1/2" | 2-1/2" | 1-3/4" | 6-3/4" | 1417 | 1155 | 1035 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN RIGID BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3889 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
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4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-58 ON PAGE 4.11, USE ⅝" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 65 LB-FT. FOR HSLH-1 & SLW-1 ON PAGE 4.12, USE 1" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 251 LB-FT.

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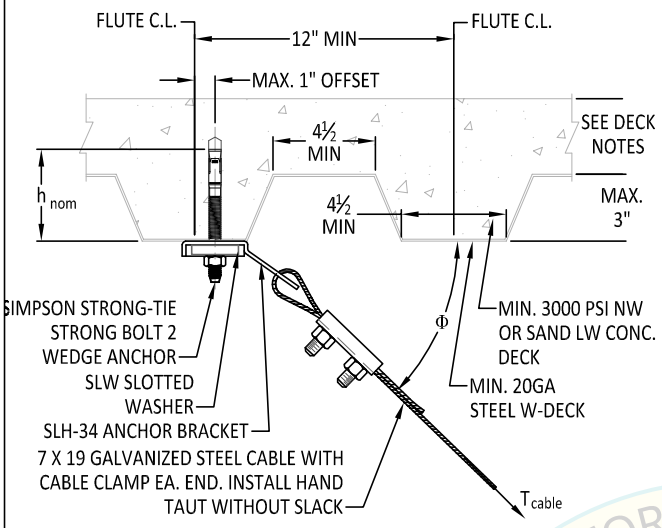
Structural Engineer: N. Tremblay
California PE No. S6481

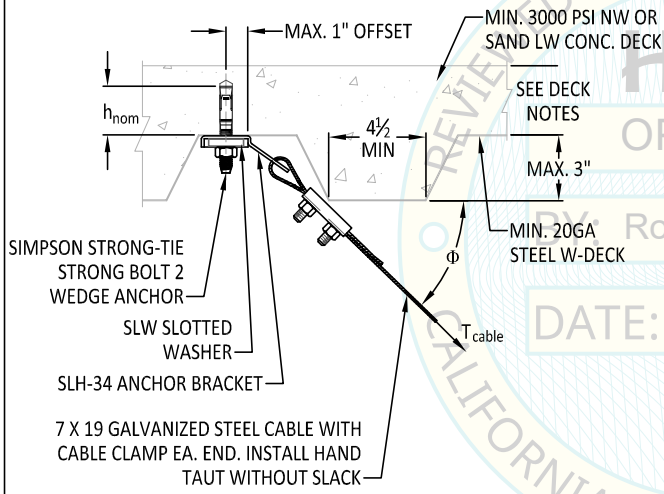
# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" [8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SB2D31 | 3/8" | SLW-38 | 2" | 1-5/8" | 6-3/4" | 288 | 173 | 130 |
| SB2D32 | 3/8" | SLW-38 | 3-3/8" | 3" | 9" | 683 | 422 | 322 |
| SB2D33 | 1/2" | SLW-12 | 2-3/4" | 2-1/4" | 6-3/4" | 451 | 302 | 239 |
| SB2D34 | 1/2" | SLW-12 | 4-1/2" | 4" | 12" | 750 | 452 | 340 |
| SB2D35 | 5/8" | SLW-58 | 3-3/8" | 2-3/4" | 8-1/4" | 567 | 383 | 305 |
| SB2D36 | 5/8" | SLW-58 | 5-5/8" | 5" | 15" | 1271 | 796 | 609 |
| SB2D37 | 3/4" | SLW-34 | 4-1/8" | 3-3/8" | 10-1/8" | 729 | 453 | 345 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" [8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SB2D38 | 3/8" | SLW-38 | 2" | 1⅝" | 6-3/4" | 446 | 243 | 175 |
| SB2D39 | 1/2" | SLW-12 | 2-3/4" | 2¼" | 6-3/4" | 1011 | 618 | 468 |

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NOTES:
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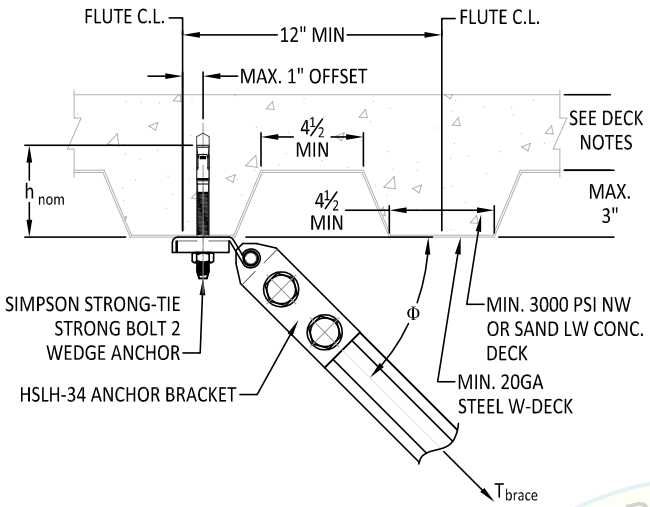
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3037 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" [8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| SB2DR31 | 3/8" | SLW-38 | 2" | 1-5/8" | 6-3/4" | 274 | 182 | 143 |
| SB2DR32 | 3/8" | SLW-38 | 3-3/8" | 3" | 9" | 652 | 444 | 355 |
| SB2DR33 | 1/2" | SLW-12 | 2-3/4" | 2-1/4" | 6-3/4" | 434 | 316 | 262 |
| SB2DR34 | 1/2" | SLW-12 | 4-1/2" | 4" | 12" | 846 | 594 | 483 |
| SB2DR35 | 5/8" | SLW-58 | 3-3/8" | 2-3/4" | 8-1/4" | 546 | 401 | 334 |
| SB2DR36 | 5/8" | SLW-58 | 5-5/8" | 5" | 15" | 1216 | 836 | 672 |
| SB2DR37 | 3/4" | SLW-34 | 4-1/8" | 3-3/8" | 10-1/8" | 697 | 476 | 381 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

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NOTES:
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2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3037 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
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6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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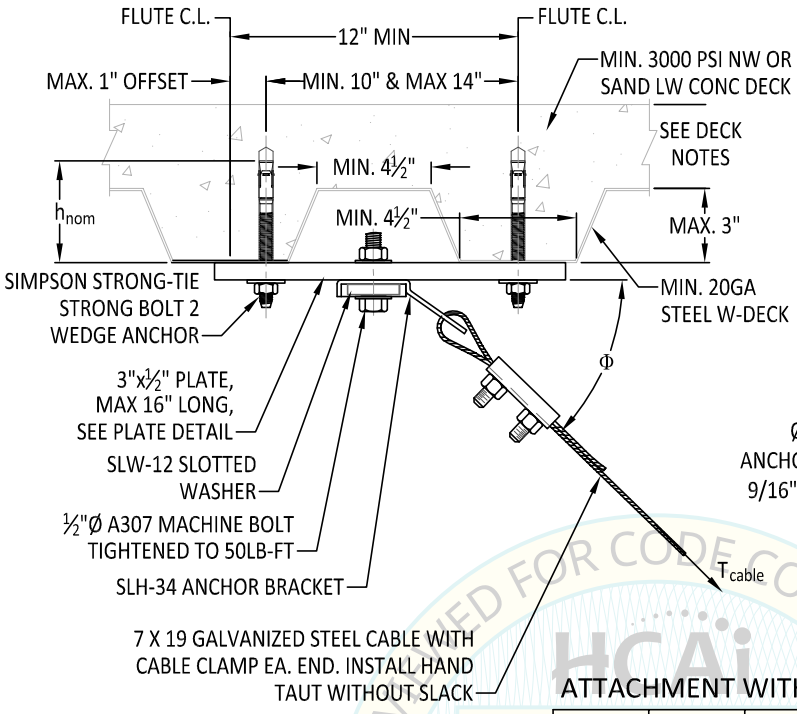
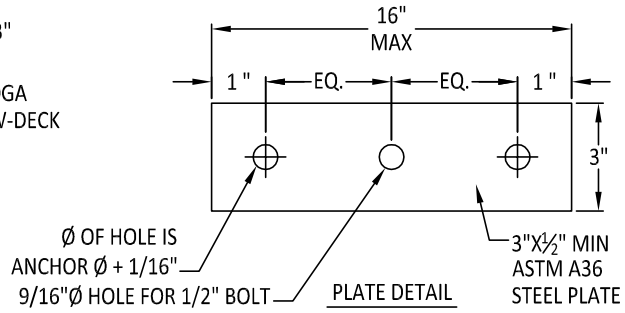
Page No.: **3.7.2**

Date: **February 5, 2025**

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SB2D31 | 3/8" | 2" | 1-5/8" | 6-3/4" | 587 | 481 | 432 |
| 2SB2D32 | 3/8" | 3-3/8" | 3" | 9" | 1391 | 1162 | 1060 |
| 2SB2D33 | 1/2" | 2-3/4" | 2-1/4" | 6-3/4" | 916 | 805 | 765 |
| 2SB2D34 | 1/2" | 4-1/2" | 4" | 12" | 1530 | 1257 | 1132 |
| 2SB2D35 | 5/8" | 3-3/8" | 2-3/4" | 8-1/4" | 1151 | 1018 | 971 |
| 2SB2D36 | 5/8" | 5-5/8" | 5" | 15" | 2588 | 2180 | 2000 |
| 2SB2D37 | 3/4" | 4-1/8" | 3-3/8" | 10-1/8" | 1485 | 1244 | 1137 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3037 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR SLH-34 BRACKET & SLW-12 ON PAGE 4.4, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT.


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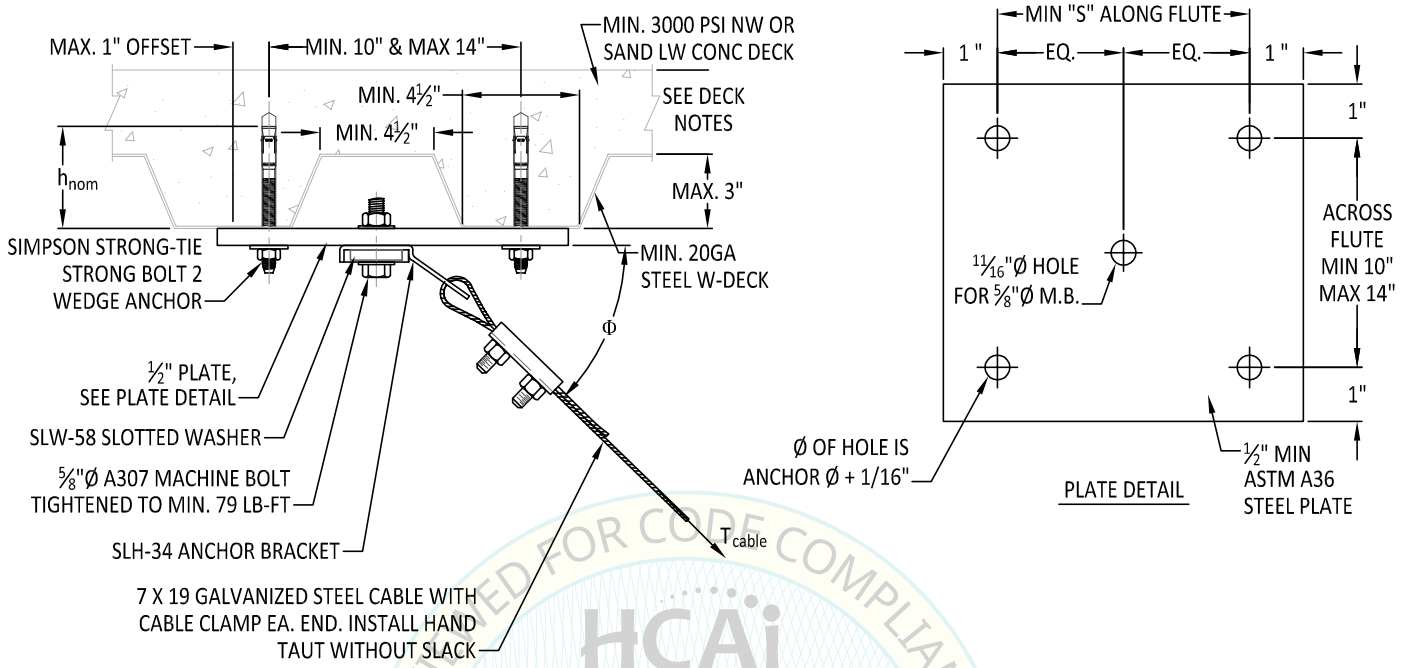
**Structural Engineer: N. Tremblay**
**California PE No. S6481**


**Page No.: 3.8.1**

**Date: February 5, 2025**

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SB2D31 | 3/8" | 2" | 1-5/8" | 6-3/4" | 1409 | 1083 | 931 |
| 4SB2D32 | 3/8" | 3-3/8" | 3" | 9" | 3301 | 2603 | 2277 |
| 4SB2D33 | 1/2" | 2-3/4" | 2-1/4" | 6-3/4" | 2112 | 1779 | 1634 |
| 4SB2D34 | 1/2" | 4-1/2" | 4" | 12" | 3669 | 2829 | 2437 |
| 4SB2D35 | 5/8" | 3-3/8" | 2-3/4" | 8-1/4" | 2648 | 2247 | 2074 |
| 4SB2D36 | 5/8" | 5-5/8" | 5" | 15" | 6116 | 4874 | 4295 |
| 4SB2D37 | 3/4" | 4-1/8" | 3-3/8" | 10-1/8" | 3520 | 2785 | 2442 |

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
FLORIDA BUILDING CODE

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3037 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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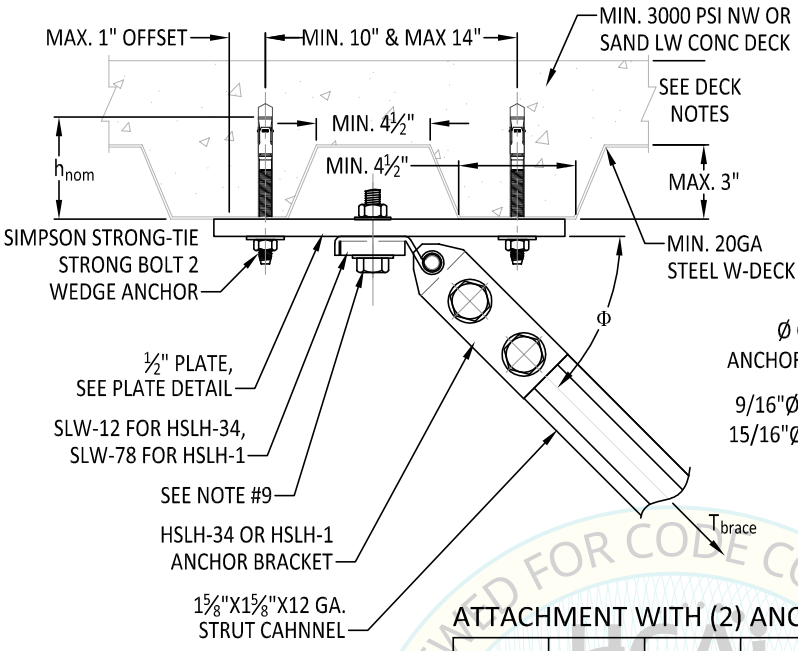
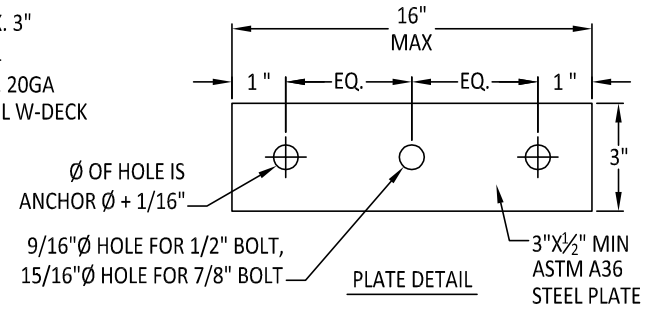
California PE No. S6481

Page No.: **3.8.2**

Date: **February 5, 2025**

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2SB2DR31 | 3/8" | 2" | 1-5/8" | 6-3/4" | 645 | 506 | 440 |
| 2SB2DR32 | 3/8" | 3-3/8" | 3" | 9" | 1521 | 1219 | 1079 |
| 2SB2DR33 | 1/2" | 2-3/4" | 2-1/4" | 6-3/4" | 987 | 840 | 777 |
| 2SB2DR34 | 1/2" | 4-1/2" | 4" | 12" | 1949 | 1607 | 1452 |
| 2SB2DR35 | 5/8" | 3-3/8" | 2-3/4" | 8-1/4" | 1239 | 1061 | 987 |
| 2SB2DR36 | 5/8" | 5-5/8" | 5" | 15" | 2824 | 2285 | 2036 |
| 2SB2DR37 | 3/4" | 4-1/8" | 3-3/8" | 10-1/8" | 1623 | 1305 | 1157 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

REVIEWED FOR CODE COMPLIANCE BY ICC-ES OPM-0203 BY Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE

NOTES:
1. THE OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN THE DESIGN LOAD ON THE ANCHORS MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3037 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 & SLW-78 ON PAGE 4.12, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 208 LB-FT.

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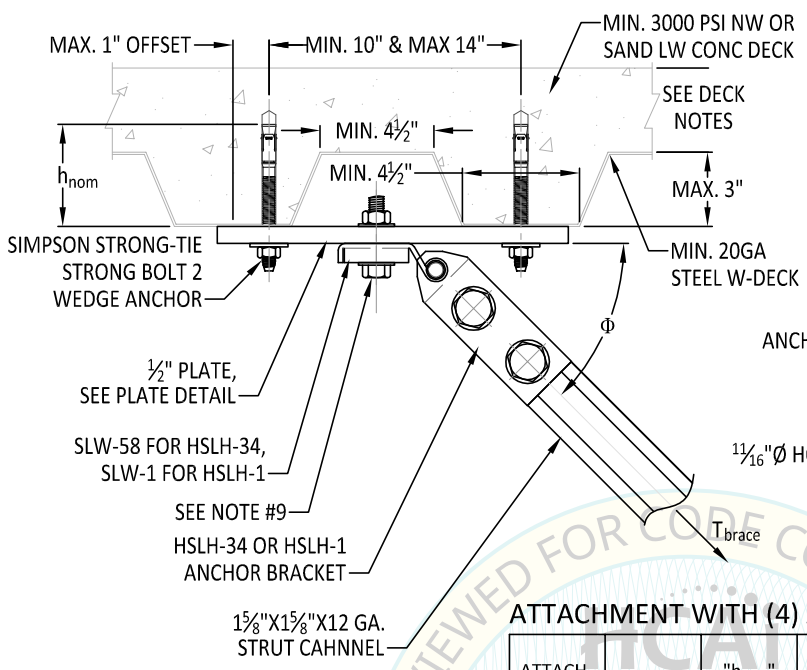
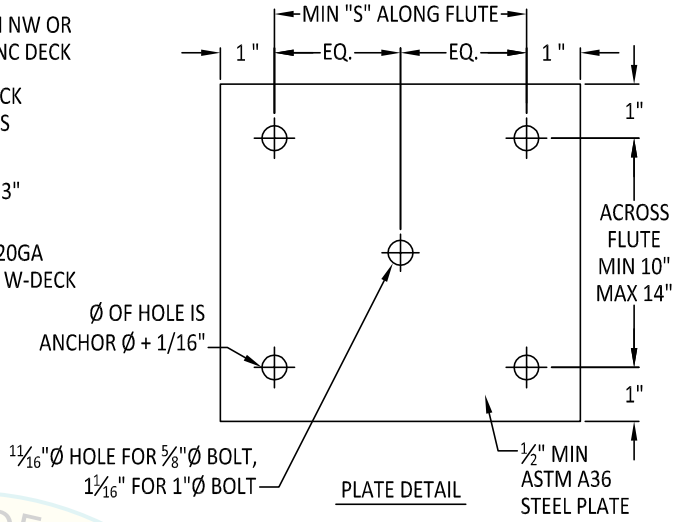
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.8.3**

Date: **February 5, 2025**

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (4) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4SB2DR31 | 3/8" | 2" | 1-5/8" | 6-3/4" | 1291 | 1011 | 881 |
| 4SB2DR32 | 3/8" | 3-3/8" | 3" | 9" | 3041 | 2438 | 2158 |
| 4SB2DR33 | 1/2" | 2-3/4" | 2-1/4" | 6-3/4" | 1973 | 1680 | 1554 |
| 4SB2DR34 | 1/2" | 4-1/2" | 4" | 12" | 3898 | 3215 | 2904 |
| 4SB2DR35 | 5/8" | 3-3/8" | 2-3/4" | 8-1/4" | 2478 | 2123 | 1974 |
| 4SB2DR36 | 5/8" | 5-5/8" | 5" | 15" | 5648 | 4570 | 4071 |
| 4SB2DR37 | 3/4" | 4-1/8" | 3-3/8" | 10-1/8" | 3245 | 2610 | 2314 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

REVIEWED FOR CODE COMPLIANCE BY: Roy Lobo DATE: 07/19/2025 OPM-0203 CALIFORNIA BUILDING CODE 2022

NOTES:
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8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-58 ON PAGE 4.11, USE ⅝" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 65 LB-FT. FOR HSLH-1 & SLW-1 ON PAGE 4.12, USE 1" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 251 LB-FT.

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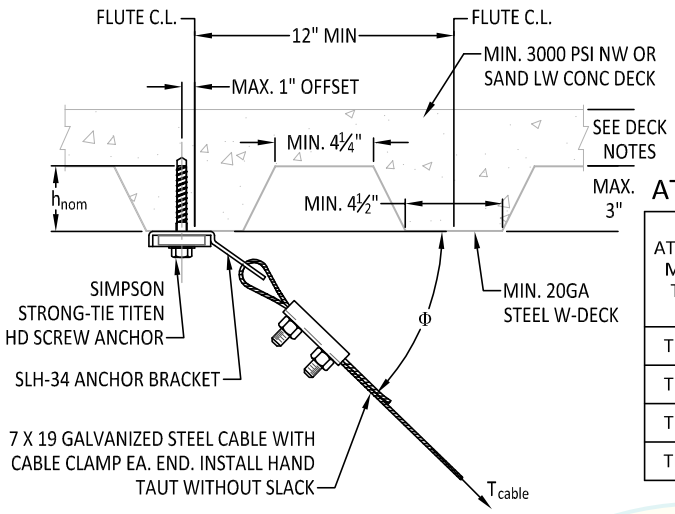
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.8.4**

Date: **February 5, 2025**

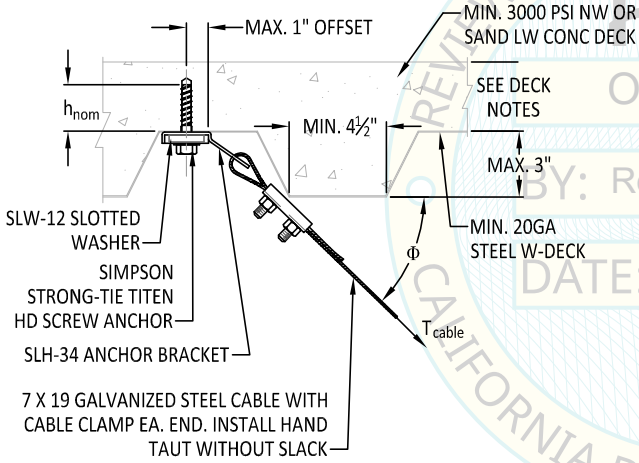
# SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE (lbs), "$T_{cable}$", @ ANGLE "Φ" [8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| THD31 | 3/8" | SLW-38 | 1-7/8" | 1-1/4" | 6-3/4" | 134 | 70 | 50 |
| THD32 | 3/8" | SLW-12 | 2-1/2" | 1-3/4" | 6-3/4" | 246 | 146 | 109 |
| THD33 | 1/2" | SLW-12 | 2" | 1-5/16" | 6-3/4" | 254 | 152 | 113 |
| THD34 | 1/2" | SLW-58 | 3-1/2" | 2-9/16" | 7 11/16" | 524 | 327 | 250 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.




## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" [8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| THD35 | 3/8" | SLW-38 | 1-7/8" | 1-1/4" | 6-3/4" | 191 | 96 | 67 |
| THD36 | 1/2" | SLW-12 | 2" | 1-5/16" | 6-3/4" | 556 | 306 | 221 |

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2713 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
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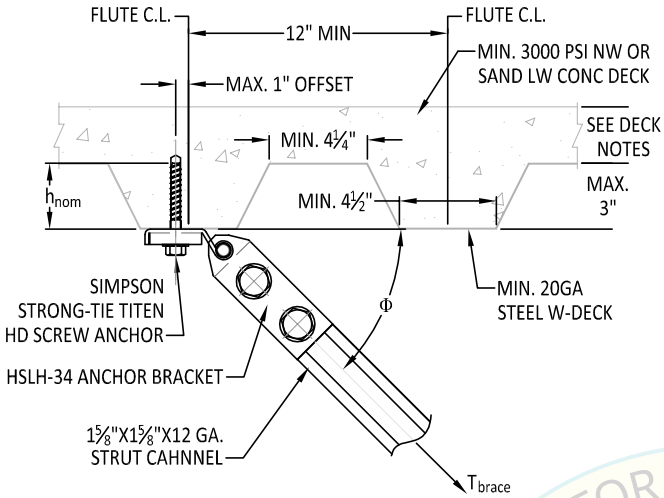
California PE No. S6481

# SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN. 20GA METAL DECK




## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| THDR31 | 3/8" | SLW-38 | 1-7/8" | 1-1/4" | 6-3/4" | 126 | 74 | 55 |
| THDR32 | 3/8" | SLW-12 | 2-1/2" | 1-3/4" | 6-3/4" | 234 | 154 | 121 |
| THDR33 | 1/2" | SLW-12 | 2" | 1-5/16" | 6-3/4" | 242 | 160 | 125 |
| THDR34 | 1/2" | SLW-58 | 3-1/2" | 2-9/16" | 7-11/16" | 501 | 343 | 275 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
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8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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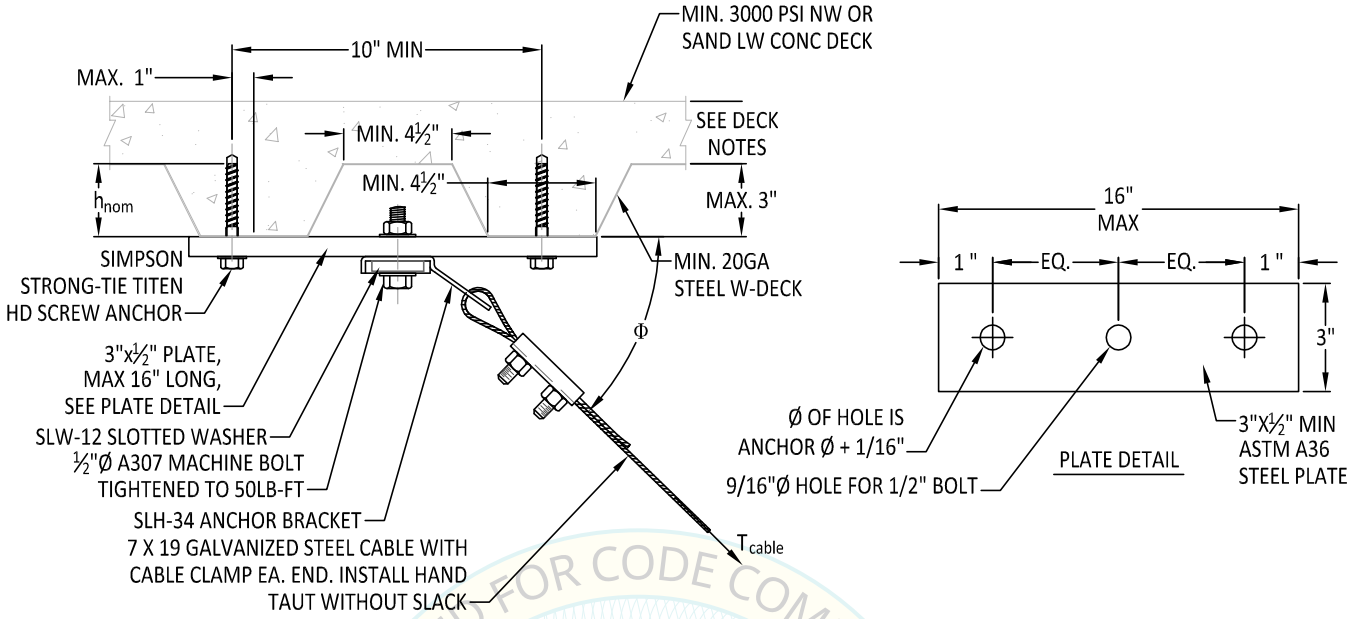
Page No.: **3.9.2**

Date: **February 5, 2025**

# SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN 20GA METAL DECK




## ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE (lbs), "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2THD31 | 3/8" | 1-7/8" | 1-1/4" | 6-3/4" | 351 | 236 | 188 |
| 2THD32 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 606 | 461 | 394 |
| 2THD33 | 1/2" | 2" | 1-5/16" | 6-3/4" | 625 | 477 | 408 |
| 2THD34 | 1/2" | 3-1/2" | 2-9/16" | 7-11/16" | 1263 | 1003 | 882 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

REVIEWED FOR CODE COMPLIANCE HCAi OPM 0203 BY: Roy Lobo DATE: 07/19/2025 FLORIDA BUILDING CODE 2023

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2713 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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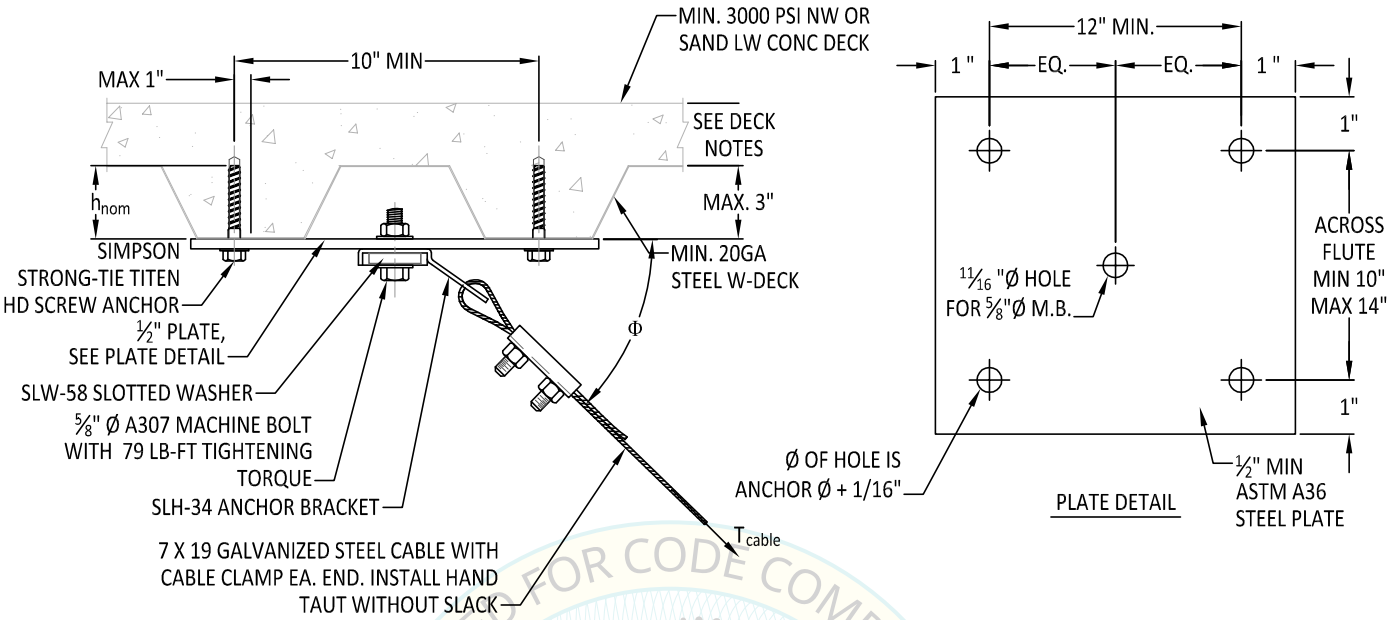
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.10.1**

Date: **February 5, 2025**

# SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN 20GA METAL DECK




## ATTACHMENT WITH (4) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4THD31 | 3/8" | 1-7/8" | 1-1/4" | 6-3/4" | 703 | 473 | 375 |
| 4THD32 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 1212 | 922 | 787 |
| 4THD33 | 1/2" | 2" | 1-5/16" | 6-3/4" | 1250 | 954 | 816 |
| 4THD34 | 1/2" | 3-1/2" | 2-9/16" | 7-11/16" | 2527 | 2006 | 1763 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2025

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2713 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.4 FOR SLH-34 DETAILS.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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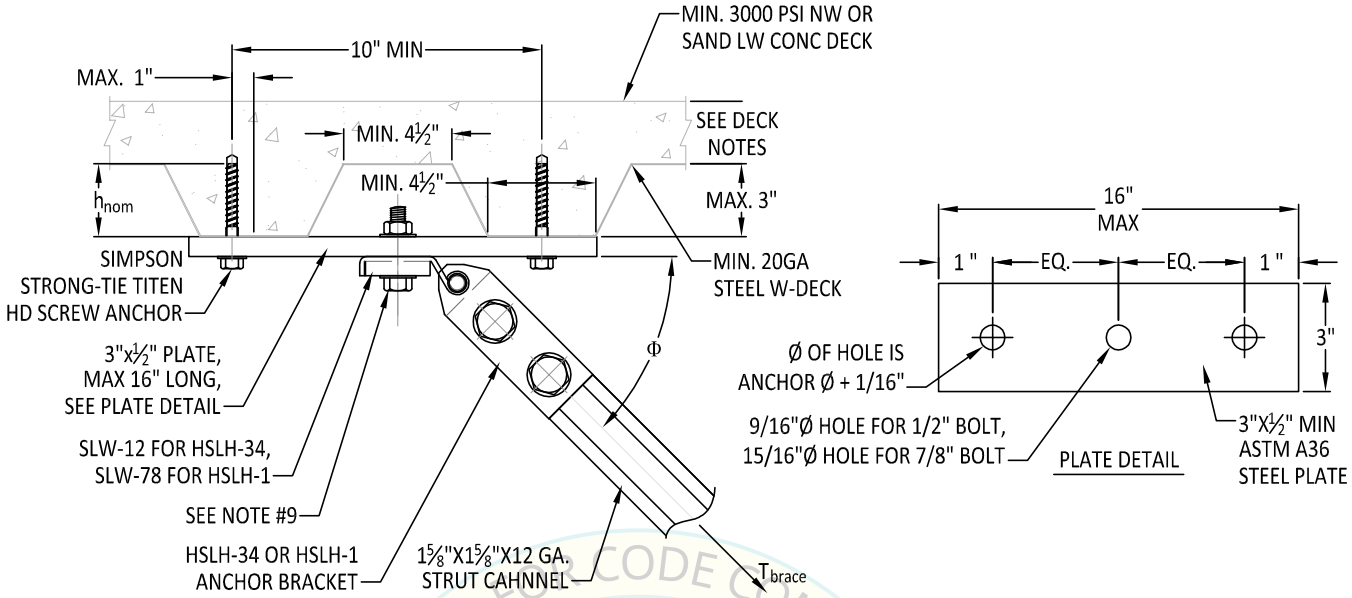
Page No.: **3.10.2**

Date: **February 5, 2025**

# SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN 20GA METAL DECK




## ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 2THDR31 | 3/8" | 1-7/8" | 1-1/4" | 6-3/4" | 312 | 218 | 176 |
| 2THDR32 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 554 | 430 | 372 |
| 2THDR33 | 1/2" | 2" | 1-5/16" | 6-3/4" | 572 | 445 | 386 |
| 2THDR34 | 1/2" | 3-1/2" | 2-9/16" | 7-11/16" | 1166 | 940 | 836 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

REVIEWED FOR CODE COMPLIANCE HCAi OPM 0203 BY: Roy Lobo DATE: 07/19/2025 FLORIDA BUILDING CODE 2023

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2713 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS TABULATED ABOVE ARE ALONG THE FLUTE LENGTH.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
8. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-12 ON PAGE 4.11, USE ½" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 50 LB-FT. FOR HSLH-1 & SLW-78 ON PAGE 4.11, USE ⅞" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 208 LB-FT.

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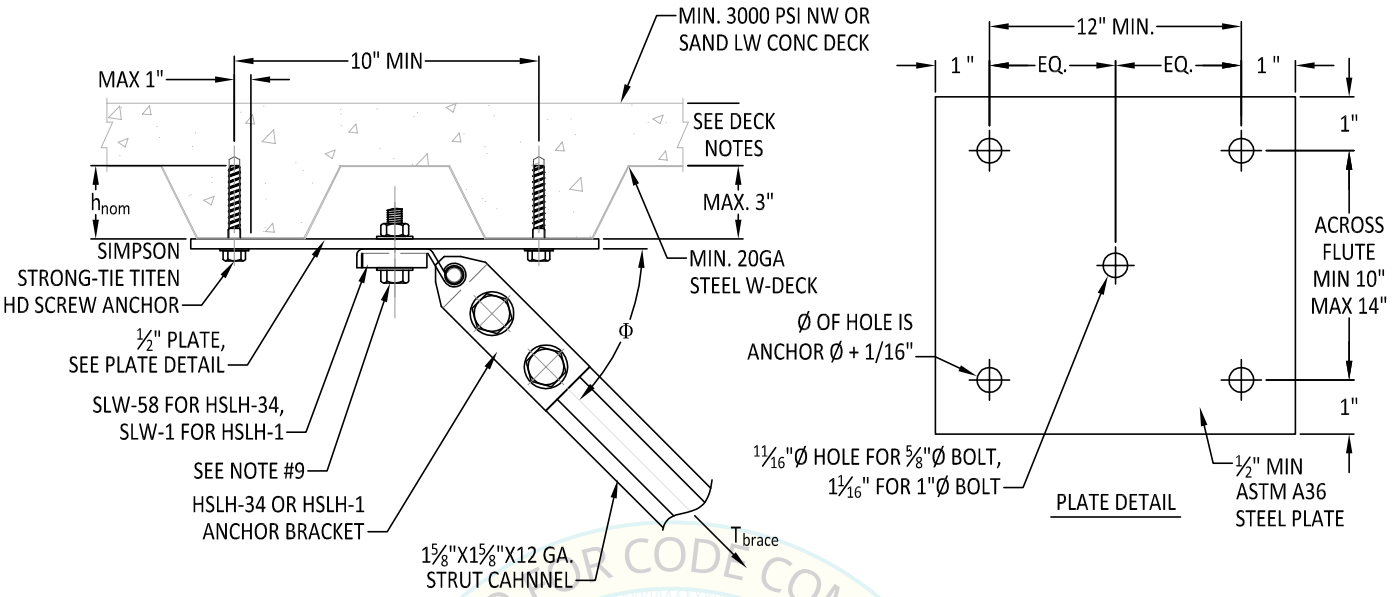
Page No.: **3.10.3**

Date: February 5, 2025

# SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR IN 3000 PSI NORMAL OR SAND LIGHT WEIGHT CONCRETE OVER MAX. 3" DEEP MIN 20GA METAL DECK




## ATTACHMENT WITH (4) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "S" MIN. SPACING BETWEEN ANCHORS[5] | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ"[8] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| 4THDR31 | 3/8" | 1-7/8" | 1-1/4" | 6-3/4" | 624 | 435 | 353 |
| 4THDR32 | 3/8" | 2-1/2" | 1-3/4" | 6-3/4" | 1108 | 860 | 744 |
| 4THDR33 | 1/2" | 2" | 1-5/16" | 6-3/4" | 1143 | 830 | 772 |
| 4THDR34 | 1/2" | 3-1/2" | 2-9/16" | 7-11/16" | 2332 | 1881 | 1671 |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH SCREW ANCHOR SIZE SEE PAGE 3.0.3.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0
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6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
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8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-34 BRACKET & SLW-58 ON PAGE 4.11, USE ⅝" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 65 LB-FT. FOR HSLH-1 & SLW-1 ON PAGE 4.12, USE 1" A307 Gr. A HEX BOLT TIGHTENED TO MIN. 100 LB-FT.

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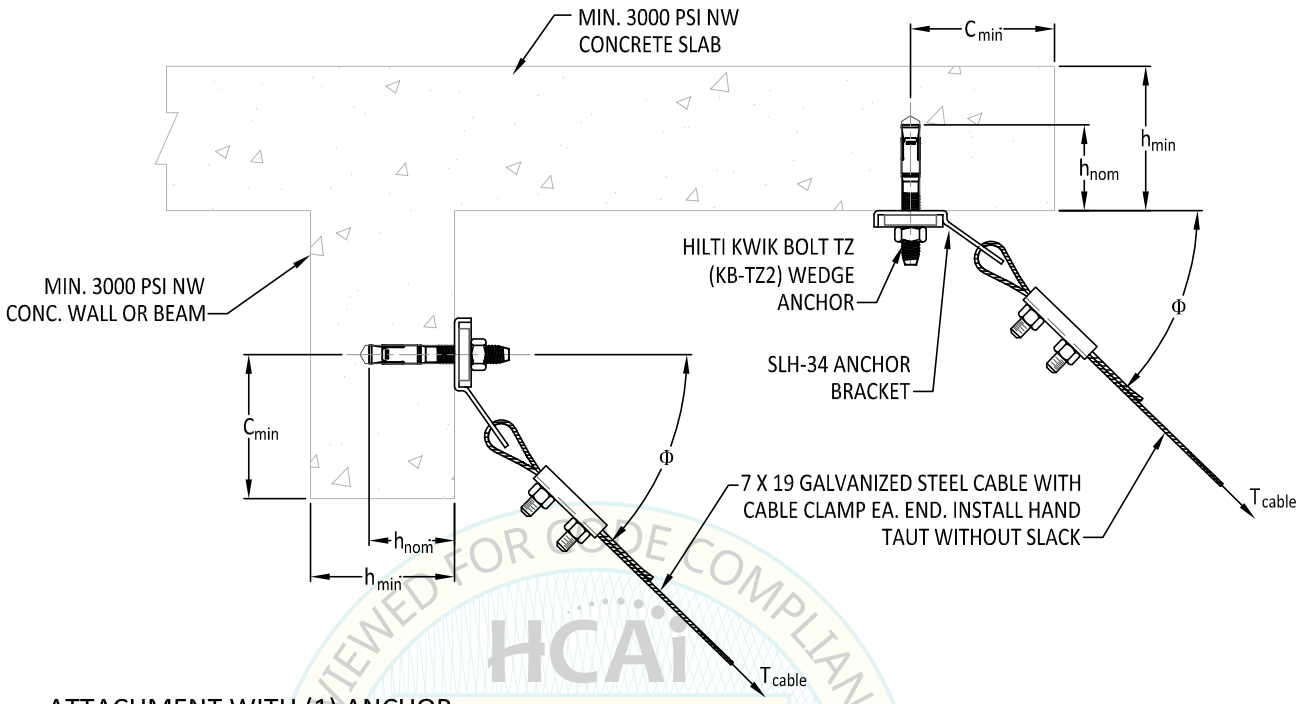
Page No.: **3.10.4**

Date: **February 5, 2025**

# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE(lbs), "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE(lbs), "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| TZ2RC1 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 5" | 3-1/4" | 482 | 318 | 250 | 250 | 318 | 482 |
| TZ2RC2 | 3/8" | SLW-38 | 2-1/2" | 2" | 4-3/8" | 4" | 608 | 438 | 361 | 361 | 438 | 608 |
| TZ2RC3 | 3/8" | SLW-38 | 3" | 2-1/2" | 5-1/2" | 5" | 798 | 539 | 429 | 429 | 539 | 798 |
| TZ2RC4 | 1/2" | SLW-12 | 2-1/2" | 2" | 5-1/2" | 4" | 725 | 483 | 382 | 382 | 483 | 725 |
| TZ2RC5 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 10" | 5-1/2" | 1388 | 870 | 666 | 666 | 870 | 1388 |
| TZ2RC6 | 5/8" | SLW-58 | 3-3/4" | 3-1/4" | 11-1/2" | 5-1/2" | 1759 | 1088 | 829 | 829 | 1088 | 1759 |
| TZ2RC7 | 5/8" | SLW-58 | 4-1/2" | 4" | 9-1/2" | 6" | 1791 | 1153 | 895 | 895 | 1153 | 1791 |
| TZ2RC8 | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 10" | 6" | 1963 | 1277 | 997 | 997 | 1277 | 1963 |
| TZ2RC9 | 3/4" | SLW-34 | 5-1/2" | 4-3/4" | 9" | 8" | 2147 | 1400 | 1094 | 1094 | 1400 | 2147 |

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
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5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE

Vibrex® vibration & seismic control systems
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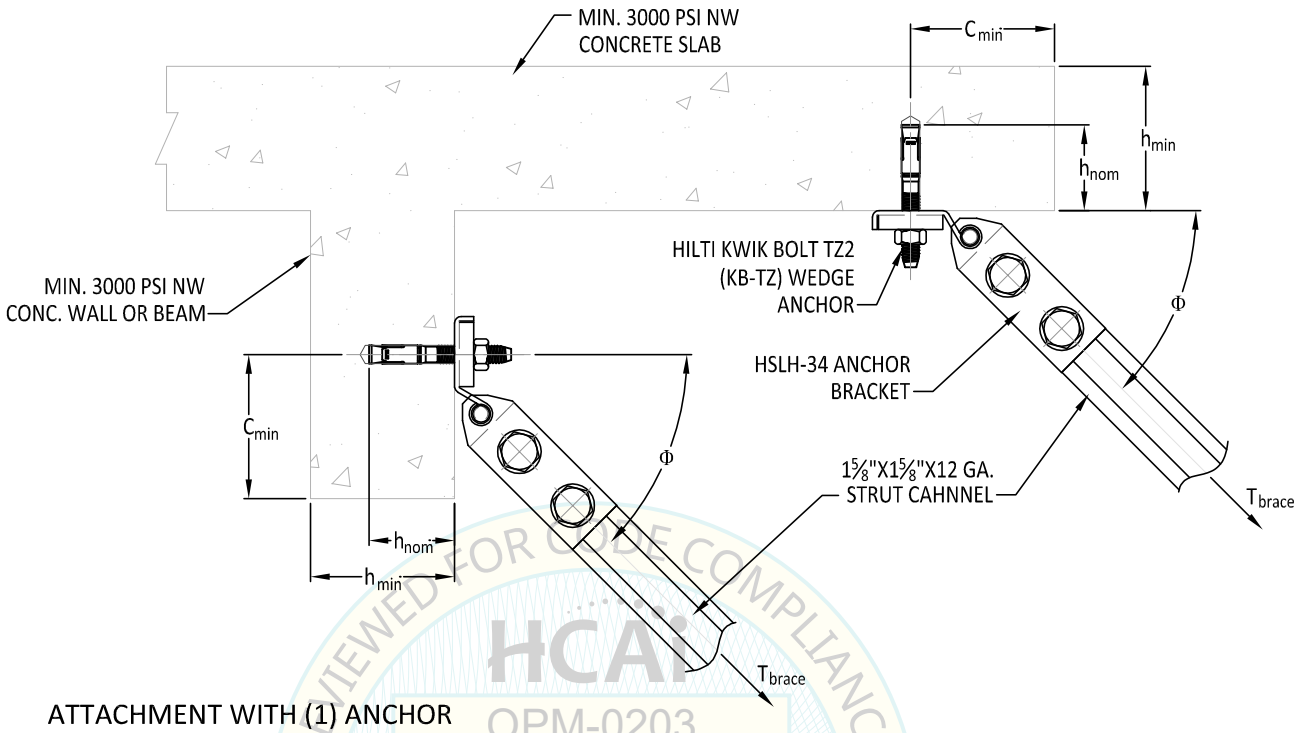
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.11.1**

Date: January 19, 2024

# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| TZ2RCR1 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 5" | 3-1/4" | 463 | 333 | 275 | 275 | 333 | 463 |
| TZ2RCR2 | 3/8" | SLW-38 | 2-1/2" | 2" | 4-3/8" | 4" | 589 | 456 | 394 | 394 | 456 | 589 |
| TZ2RCR3 | 3/8" | SLW-38 | 3" | 2-1/2" | 5-1/2" | 5" | 768 | 564 | 470 | 470 | 564 | 768 |
| TZ2RCR4 | 1/2" | SLW-12 | 2-1/2" | 2" | 5-1/2" | 4" | 697 | 506 | 420 | 420 | 506 | 697 |
| TZ2RCR5 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 10" | 5-1/2" | 1329 | 914 | 734 | 734 | 914 | 1329 |
| TZ2RCR6 | 5/8" | SLW-58 | 3-3/4" | 3-1/4" | 11-1/2" | 5-1/2" | 1681 | 1144 | 914 | 914 | 1144 | 1681 |
| TZ2RCR7 | 5/8" | SLW-58 | 4-1/2" | 4" | 9-1/2" | 6" | 1718 | 1209 | 985 | 985 | 1209 | 1718 |
| TZ2RCR8 | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 10" | 6" | 1884 | 1339 | 1097 | 1097 | 1339 | 1884 |
| TZ2RCR9 | 3/4" | SLW-34 | 5-1/2" | 4-3/4" | 9" | 8" | 2061 | 1467 | 1203 | 1203 | 1467 | 2061 |

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
7. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
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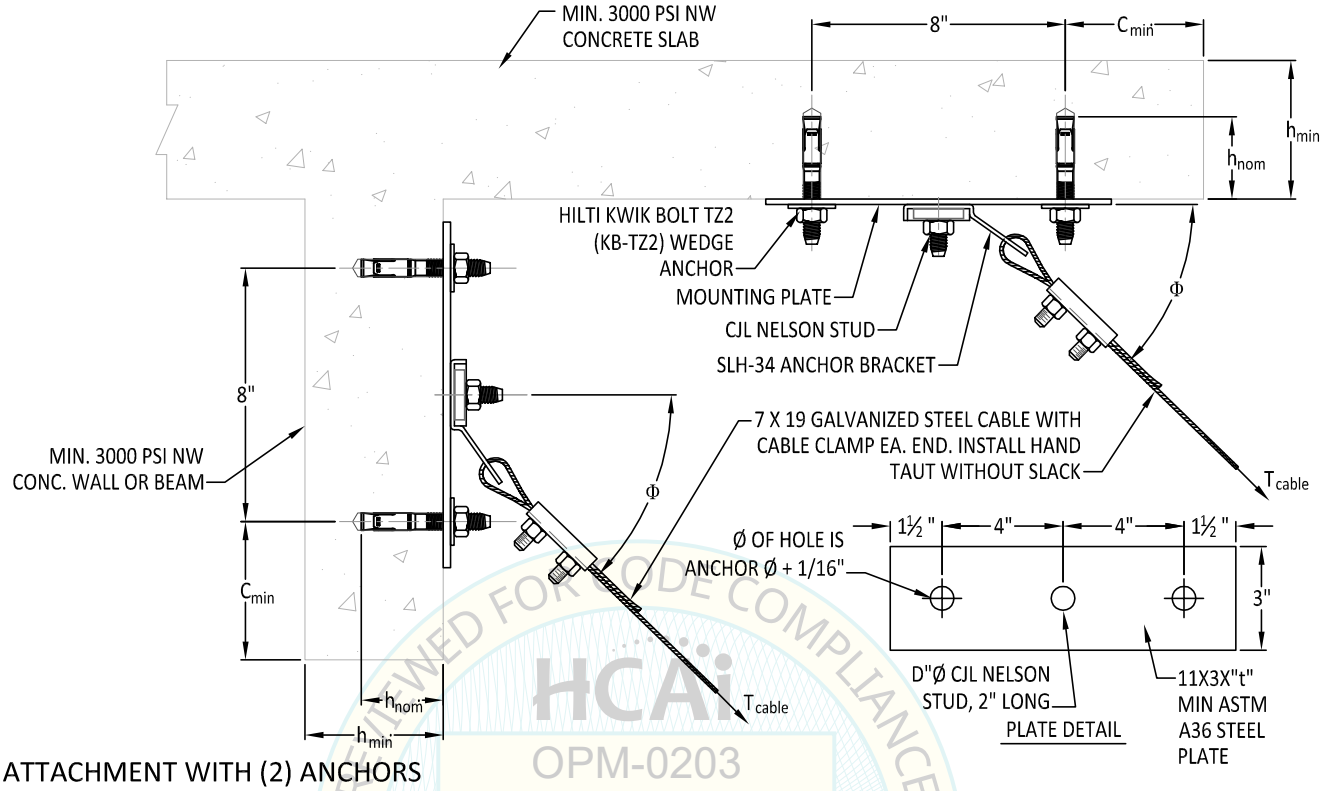
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.11.2**

Date: February 5, 2025

# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | |
| 2TZ2RC1 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 5" | 3-1/4" | 1550 | 1301 | 1191 | 1191 | 1301 | 1550 | 3/8" | 1/2" |
| 2TZ2RC2 | 3/8" | SLW-38 | 2-1/2" | 2" | 4-3/8" | 4" | 1765 | 1614 | 1586 | 1586 | 1614 | 1765 | 3/8" | 1/2" |
| 2TZ2RC3 | 3/8" | SLW-38 | 3" | 2-1/2" | 5-1/2" | 5" | 2492 | 2144 | 2001 | 2001 | 2144 | 2492 | 3/8" | 1/2" |
| 2TZ2RC4 | 1/2" | SLW-12 | 2-1/2" | 2" | 5-1/2" | 4" | 2302 | 1954 | 1804 | 1804 | 1954 | 2302 | 3/8" | 1/2" |
| 2TZ2RC5 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 10" | 5-1/2" | 4706 | 3618 | 3111 | 3111 | 3618 | 4706 | 1/2" | 1/2" |
| 2TZ2RC6 | 5/8" | SLW-58 | 3-3/4" | 3-1/4" | 11-1/2" | 5-1/2" | 6071 | 4592 | 3906 | 3906 | 4592 | 6071 | 1/2" | 1/2" |
| 2TZ2RC7 | 5/8" | SLW-58 | 4-1/2" | 4" | 9-3/4" | 6" | 5731 | 4449 | 3850 | 3850 | 4449 | 5731 | 1/2" | 3/4" |
| 2TZ2RC8 | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 10" | 6" | 6232 | 4938 | 4334 | 4334 | 4938 | 6232 | 5/8" | 3/4" |
| 2TZ2RC9 | 3/4" | SLW-34 | 5-1/2" | 4-3/4" | 9" | 8" | 7024 | 5816 | 5269 | 5269 | 5816 | 7024 | 5/8" | 3/4" |

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 DATE: 07/19/2025 CALIFORNIA BUILDING CODE

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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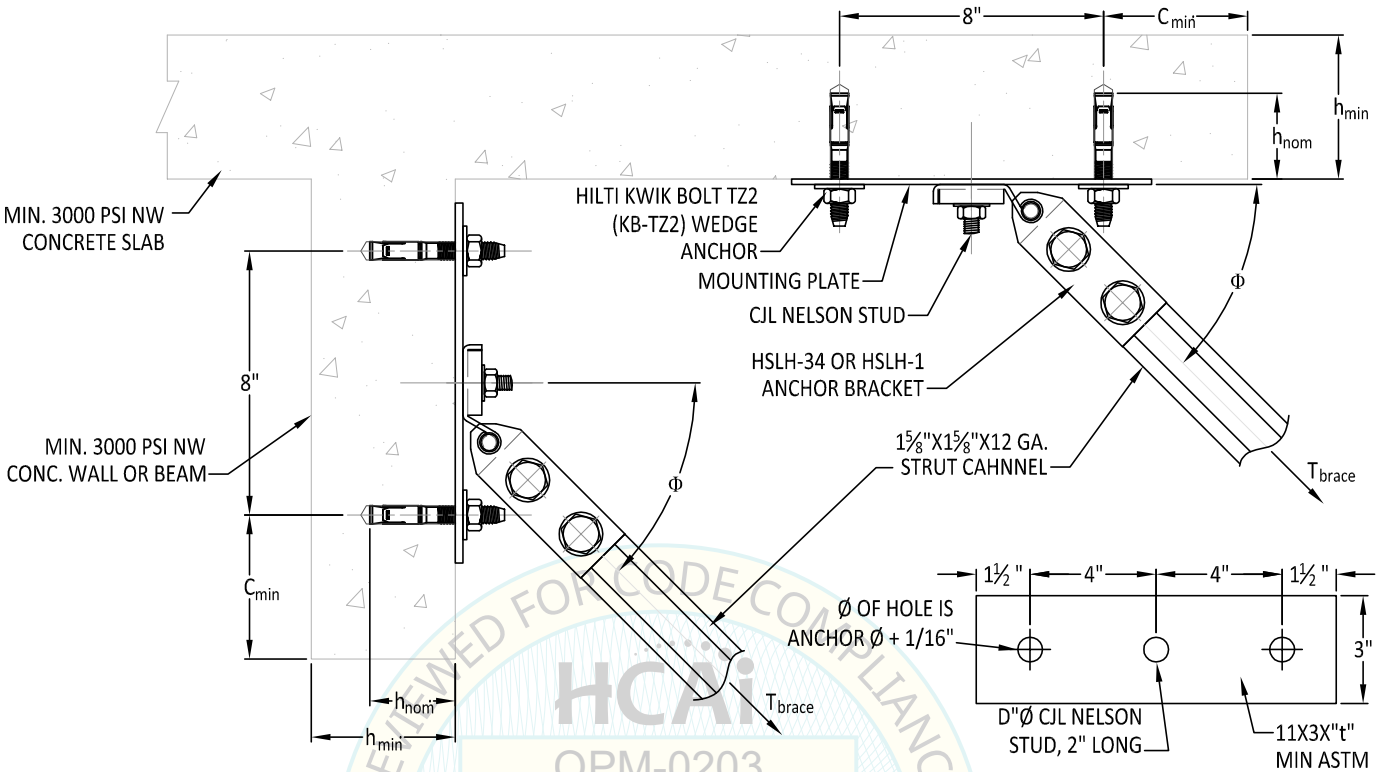
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 3.12.1

Date: February 5, 2025

# HILTI KWIK BOLT TZ2 (KB-TZ2) WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" FOR HSLH-34 | STUD DIA-METER "D" FOR HSLH-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°≤Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | | |
| 2TZ2RCR1 | 3/8" | SLW-38 | 1-13/16" | 1-1/2" | 5" | 3-1/4" | 1053 | 867 | 783 | 783 | 867 | 1053 | 3/8" | 1/2" | --- |
| 2TZ2RCR2 | 3/8" | SLW-38 | 2-5/16" | 2" | 4-3/8" | 4" | 1309 | 1151 | 1093 | 1093 | 1151 | 1309 | 3/8" | 1/2" | --- |
| 2TZ2RCR3 | 3/8" | SLW-38 | 3-1/16" | 2-1/2" | 5-1/2" | 5" | 1736 | 1455 | 1331 | 1331 | 1455 | 1736 | 3/8" | 1/2" | --- |
| 2TZ2RCR4 | 1/2" | SLW-12 | 2-3/8" | 2" | 5-1/2" | 4" | 1582 | 1313 | 1192 | 1192 | 1313 | 1582 | 3/8" | 1/2" | --- |
| 2TZ2RCR5 | 1/2" | SLW-12 | 3-5/8" | 3-1/4" | 10" | 5-1/2" | 2925 | 2273 | 1969 | 1969 | 2273 | 2925 | 1/2" | 1/2" | --- |
| 2TZ2RCR6 | 5/8" | SLW-58[9] | 3-9/16" | 3-1/4" | 11-1/2" | 5-1/2" | 3711 | 2856 | 2457 | 2457 | 2856 | 3711 | 1/2" | 1/2" | 7/8" |
| 2TZ2RCR7 | 5/8" | SLW-58[9] | 4-7/16" | 4" | 9-3/4" | 6" | 3597 | 2812 | 2445 | 2445 | 2812 | 3597 | 1/2" | 3/4" | 7/8" |
| 2TZ2RCR8 | 3/4" | SLW-34[9] | 4-5/16" | 3-3/4" | 10" | 6" | 3994 | 3163 | 2775 | 2775 | 3163 | 3994 | 5/8" | 3/4" | 7/8" |
| 2TZ2RCR9 | 3/4" | SLW-34[9] | 5-9/16" | 4-3/4" | 9" | 8" | 4708 | 3839 | 3439 | 3439 | 3839 | 4708 | 5/8" | 3/4" | 7/8" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
7. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-1 ON PAGE 4.12, USE SLW-78 FROM PAGE 4.12.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: ROY LOBO
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

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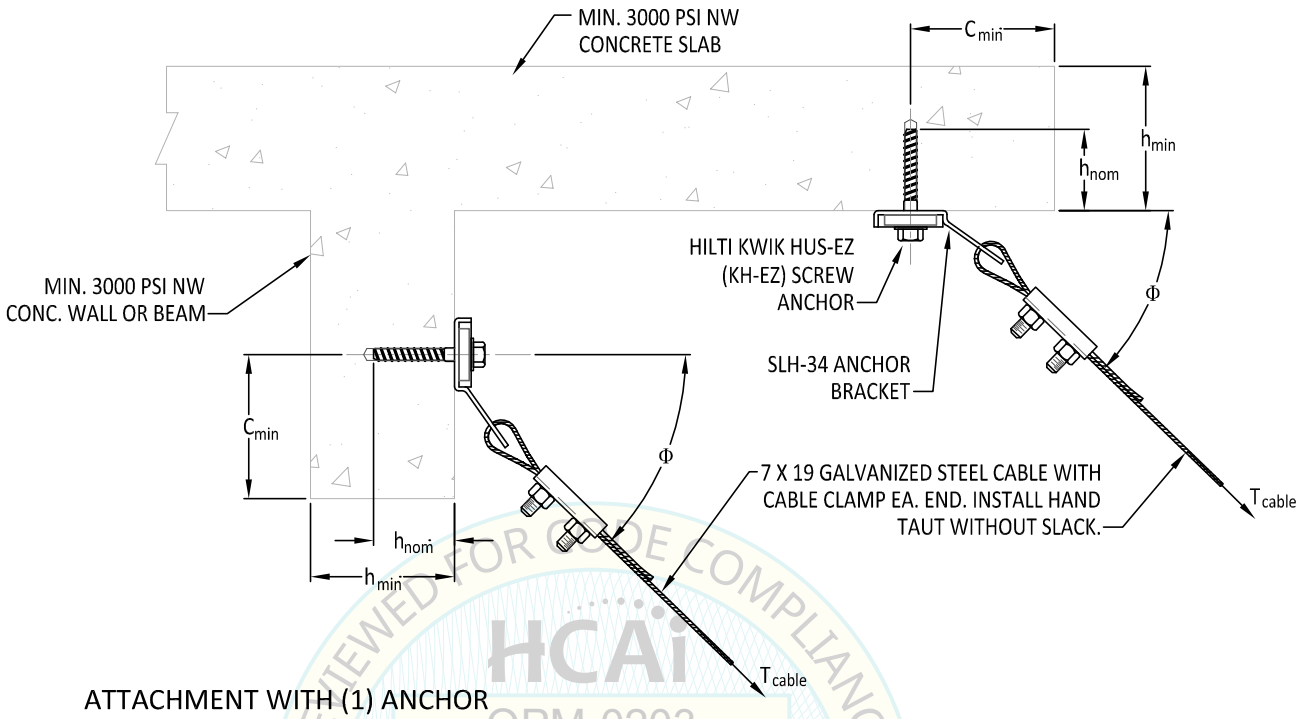
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.12.2**

Date: **February 5, 2025**

# HILTI KWIK HUS-EZ (KH-EZ) SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE(lbs), "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE(lbs), "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| KHRC1 | 3/8" | SLW-38 | 1-5/8" | 1-1/8" | 2-1/8" | 3-1/4" | 190 | 123 | 95 | 95 | 123 | 190 |
| KHRC2 | 3/8" | SLW-38 | 2-1/2" | 1-7/8" | 3" | 4" | 423 | 310 | 258 | 258 | 310 | 423 |
| KHRC3 | 3/8" | SLW-38 | 3-1/4" | 2-1/2" | 3-3/4" | 4-3/4" | 629 | 469 | 396 | 396 | 469 | 629 |
| KHRC4 | 1/2" | SLW-12 | 2-1/4" | 1-1/2" | 2-3/4" | 4-1/2" | 367 | 251 | 201 | 201 | 251 | 367 |
| KHRC5 | 1/2" | SLW-12 | 3" | 2-3/16" | 3-11/16" | 5-1/2" | 620 | 425 | 341 | 341 | 425 | 620 |
| KHRC6 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 5-1/4" | 6-3/4" | 1080 | 754 | 612 | 612 | 754 | 1080 |
| KHRC7 | 5/8" | SLW-58 | 3-1/4" | 2-3/8" | 3-5/8" | 5" | 665 | 472 | 386 | 386 | 472 | 665 |
| KHRC8 | 5/8" | SLW-58 | 5" | 3-7/8" | 5-13/16" | 7" | 1383 | 979 | 799 | 799 | 979 | 1383 |
| KHRC9 | 3/4" | SLW-34 | 4" | 2-15/16" | 4-7/16" | 6" | 944 | 656 | 530 | 530 | 656 | 944 |
| KHRC10 | 3/4" | SLW-34 | 6-1/4" | 4-7/8" | 7-5/16" | 8" | 2009 | 1397 | 1130 | 1130 | 1397 | 2009 |

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BY: Roy Lobo
DATE: 07/19/2025
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FOR CALIFORNIA BUILDING CODE 2022

NOTES:

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2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
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4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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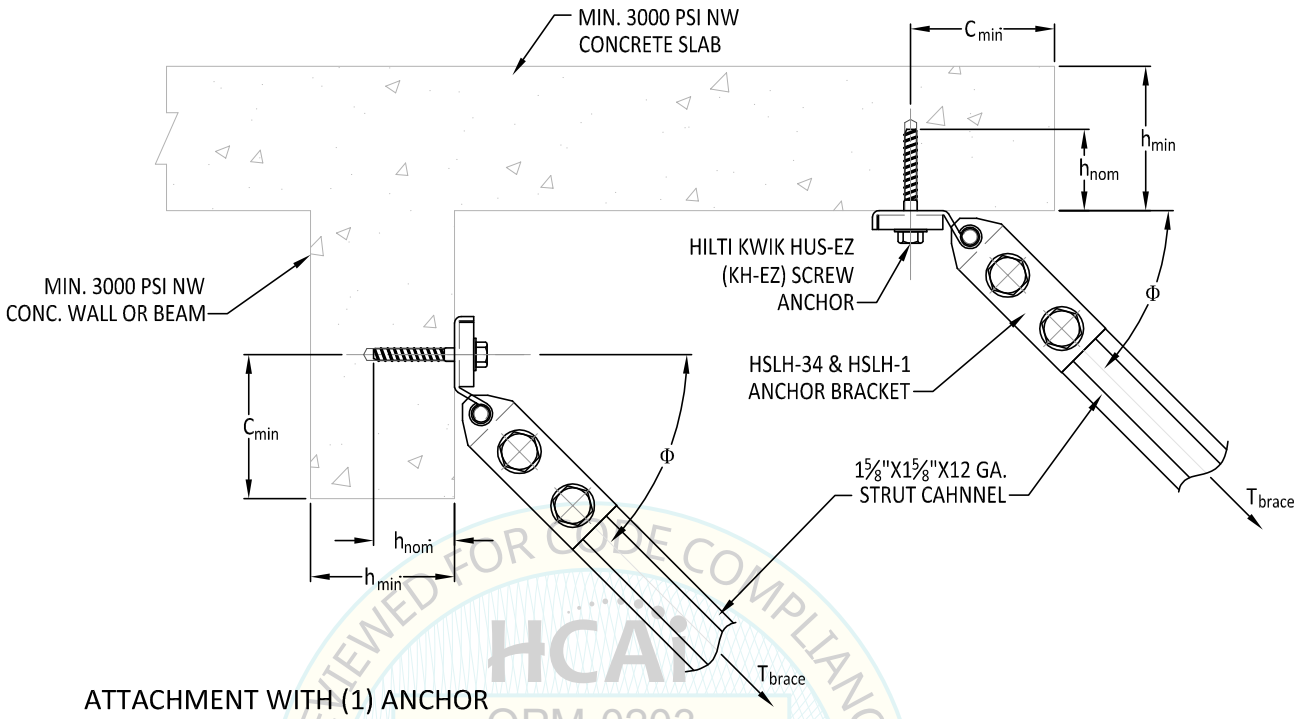
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 3.13.1

Date: February 5, 2025

# HILTI KWIK HUS-EZ (KH-EZ) SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| KHRCR1 | 3/8" | SLW-38 | 1-5/8" | 1-1/8" | 2-1/8" | 3-1/4" | 182 | 129 | 105 | 105 | 129 | 182 |
| KHRCR2 | 3/8" | SLW-38 | 2-1/2" | 1-7/8" | 3" | 4" | 410 | 323 | 282 | 282 | 323 | 410 |
| KHRCR3 | 3/8" | SLW-38 | 3-1/4" | 2-1/2" | 3-3/4" | 4-3/4" | 611 | 488 | 431 | 431 | 488 | 611 |
| KHRCR4 | 1/2" | SLW-12 | 2-1/4" | 1-1/2" | 2-3/4" | 4-1/2" | 354 | 263 | 221 | 221 | 263 | 354 |
| KHRCR5 | 1/2" | SLW-12 | 3" | 2-3/16" | 3-11/16" | 5-1/2" | 593 | 444 | 374 | 374 | 444 | 593 |
| KHRCR6 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 5-1/4" | 6-3/4" | 1043 | 788 | 670 | 670 | 788 | 1043 |
| KHRCR7 | 5/8" | SLW-58 | 3-1/4" | 2-3/8" | 3-5/8" | 5" | 643 | 492 | 422 | 422 | 492 | 643 |
| KHRCR8 | 5/8" | SLW-58 | 5" | 3-7/8" | 5-13/16" | 7" | 1337 | 1021 | 874 | 874 | 1021 | 1337 |
| KHRCR9 | 3/4" | SLW-34 | 4" | 2-15/16" | 4-7/16" | 6" | 911 | 685 | 581 | 581 | 685 | 911 |
| KHRCR10 | 3/4" | SLW-34 | 6-1/4" | 4-7/8" | 7-5/16" | 8" | 1939 | 1459 | 1238 | 1238 | 1459 | 1939 |

HCAi REVIEWED FOR CODE COMPLIANCE OPM-0203 BY: Roy Lobo DATE: 07/19/2025 ICC-ES COMPLIANT BUILDING CODE 2022

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
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6. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
7. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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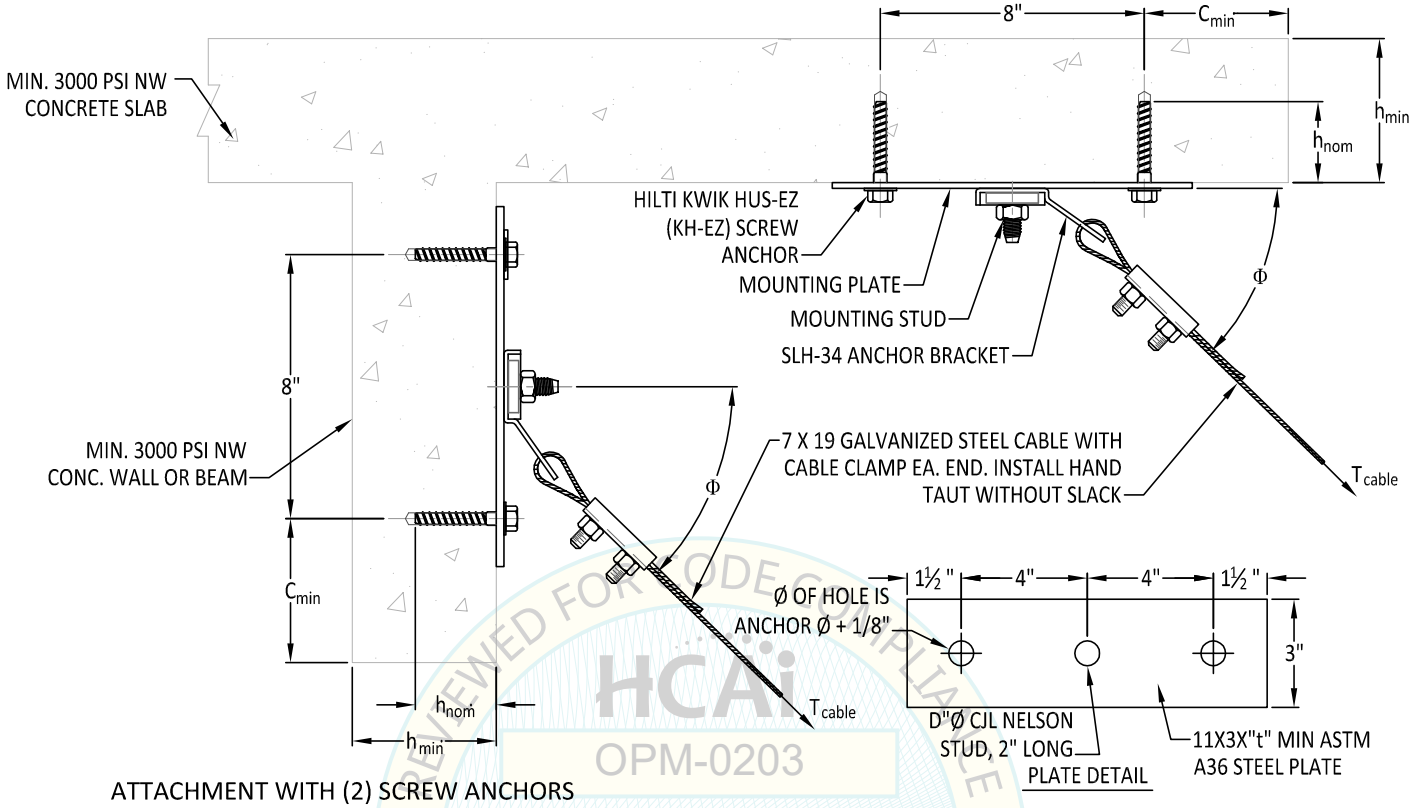
California PE No. S6481

Page No.: **3.13.2**

Date: February 5, 2025

# HILTI KWIK HUS-EZ (KH-EZ) SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | |
| 2KHRC1 | 3/8" | SLW-38 | 1-5/8" | 1-1/8" | 2-1/8" | 4" | 484 | 377 | 328 | 328 | 377 | 484 | 3/8" | 1/2" |
| 2KHRC2 | 3/8" | SLW-38 | 2-1/2" | 1-7/8" | 3" | 4" | 1008 | 882 | 834 | 834 | 882 | 1008 | 3/8" | 1/2" |
| 2KHRC3 | 3/8" | SLW-38 | 3-1/4" | 2-1/2" | 3-3/4" | 4-3/4" | 1487 | 1320 | 1265 | 1265 | 1320 | 1487 | 3/8" | 1/2" |
| 2KHRC4 | 1/2" | SLW-12 | 2-1/4" | 1-1/2" | 2-3/4" | 4-1/2" | 905 | 746 | 673 | 673 | 746 | 905 | 3/8" | 1/2" |
| 2KHRC5 | 1/2" | SLW-12 | 3" | 2-3/16" | 3-11/16" | 5-1/2" | 1529 | 1261 | 1139 | 1139 | 1261 | 1529 | 3/8" | 1/2" |
| 2KHRC6 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 5-1/4" | 6-3/4" | 2561 | 2107 | 1899 | 1899 | 2107 | 2561 | 1/2" | 1/2" |
| 2KHRC7 | 5/8" | SLW-58 | 3-1/4" | 2-3/8" | 3-5/8" | 5" | 1610 | 1369 | 1267 | 1267 | 1369 | 1610 | 1/2" | 1/2" |
| 2KHRC8 | 5/8" | SLW-58 | 5" | 3-7/8" | 5-13/16" | 7" | 3178 | 2599 | 2333 | 2333 | 2599 | 3178 | 1/2" | 1/2" |
| 2KHRC9 | 3/4" | SLW-34 | 4" | 2-15/16" | 4-7/16" | 6" | 2278 | 1884 | 1705 | 1705 | 1884 | 2278 | 1/2" | 1/2" |
| 2KHRC10 | 3/4" | SLW-34 | 6-1/4" | 4-7/8" | 7-5/16" | 8" | 4502 | 3558 | 3117 | 3117 | 3558 | 4502 | 5/8" | 3/4" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
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7. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
PER Roy Lobo
UPDATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

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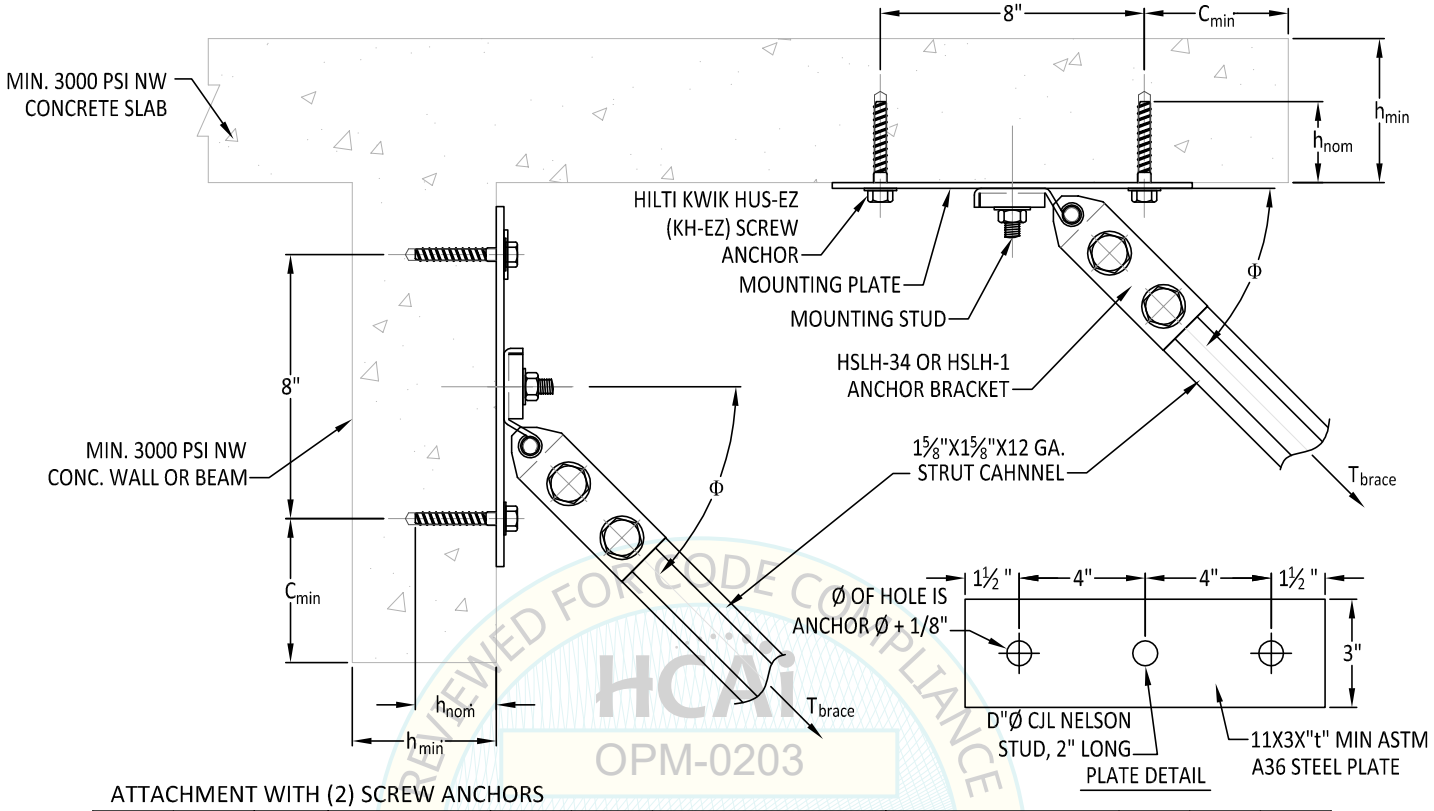
California PE No. S6481

Page No.: **3.14.1**

Date: **February 5, 2025**

# HILTI KWIK HUS-EZ (KH-EZ) SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" FOR HSLH-34 | STUD DIA-METER "D" FOR HSLH-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | | |
| 2KHRCR1 | 3/8" | SLW-38 | 1-5/8" | 1-1/8" | 2-1/8" | 4" | 417 | 338 | 301 | 301 | 338 | 417 | 3/8" | 1/2" | --- |
| 2KHRCR2 | 3/8" | SLW-38 | 2-1/2" | 1-7/8" | 3" | 4" | 907 | 808 | 775 | 775 | 808 | 907 | 3/8" | 1/2" | --- |
| 2KHRCR3 | 3/8" | SLW-38 | 3-1/4" | 2-1/2" | 3-3/4" | 4-3/4" | 1345 | 1214 | 1179 | 1179 | 1214 | 1345 | 3/8" | 1/2" | --- |
| 2KHRCR4 | 1/2" | SLW-12 | 2-1/4" | 1-1/2" | 2-3/4" | 4-1/2" | 797 | 675 | 622 | 622 | 675 | 797 | 3/8" | 1/2" | --- |
| 2KHRCR5 | 1/2" | SLW-12 | 3" | 2-3/16" | 3-11/16" | 5-1/2" | 1347 | 1141 | 1052 | 1052 | 1141 | 1347 | 3/8" | 1/2" | --- |
| 2KHRCR6 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 5-1/4" | 6-3/4" | 2254 | 1906 | 1755 | 1755 | 1906 | 2254 | 1/2" | 1/2" | --- |
| 2KHRCR7 | 5/8" | SLW-58[9] | 3-1/4" | 2-3/8" | 3-5/8" | 5" | 1434 | 1247 | 1174 | 1174 | 1247 | 1434 | 1/2" | 1/2" | 7/8" |
| 2KHRCR8 | 5/8" | SLW-58[9] | 5" | 3-7/8" | 5-13/16" | 7" | 2791 | 2349 | 2155 | 2155 | 2349 | 2791 | 1/2" | 1/2" | 7/8" |
| 2KHRCR9 | 3/4" | SLW-34[9] | 4" | 2-15/16" | 4-7/16" | 6" | 2009 | 1706 | 1576 | 1576 | 1706 | 2009 | 1/2" | 1/2" | 7/8" |
| 2KHRCR10 | 3/4" | SLW-34[9] | 6-1/4" | 4-7/8" | 7-5/16" | 8" | 3904 | 3195 | 2870 | 2870 | 3195 | 3904 | 5/8" | 3/4" | 7/8" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
7. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-1 ON PAGE 4.12, USE SLW-78 ON PAGE 4.12.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
DATE: 07/19/2025
by Roy Lobo
CITY OF LOS ANGELES
REGISTRATION NO. 25965
CALIFORNIA BUILDING CODE

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
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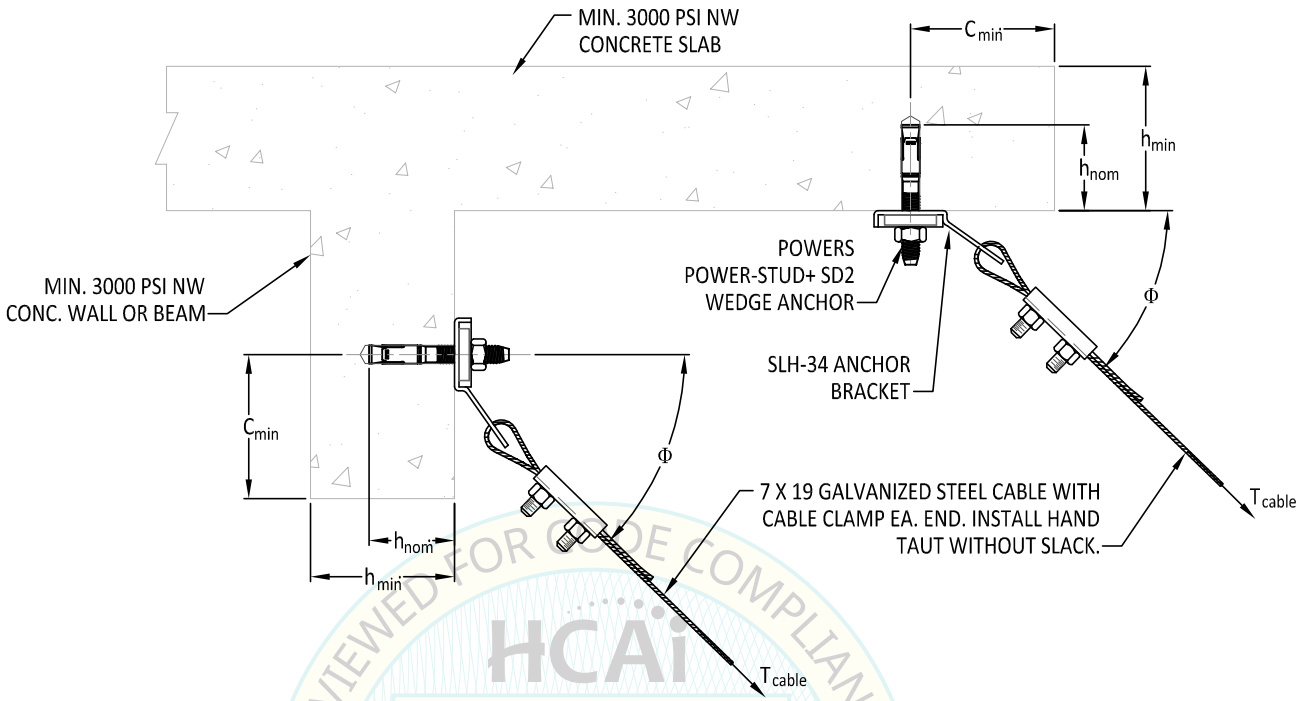
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.14.2**

Date: February 5, 2025

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM

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HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
FLORIDA BUILDING CODE

## ATTACHMENT WITH (1) ANCHOR BOLT

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| SD2RC1 | 3/8" | SLW-38 | 2-3/8" | 2" | 6-1/2" | 4" | 521 | 345 | 272 | 272 | 345 | 521 |
| SD2RC2 | 1/2" | SLW-12 | 2-1/2" | 2" | 8" | 4-1/2" | 623 | 404 | 315 | 315 | 404 | 623 |
| SD2RC3 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 10" | 5-3/4" | 1083 | 717 | 565 | 565 | 717 | 1083 |
| SD2RC4 | 5/8" | SLW-58 | 3-7/8 | 3-1/4" | 8" | 5-3/4" | 1290 | 837 | 652 | 652 | 837 | 1290 |
| SD2RC5 | 5/8" | SLW-58 | 4-7/8" | 4-1/4" | 15-3/4" | 6-1/2" | 1684 | 1162 | 936 | 936 | 1162 | 1684 |
| SD2RC6 | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 12" | 7" | 1678 | 1064 | 820 | 820 | 1064 | 1678 |
| SD2RC7 | 3/4" | SLW-34 | 5-3/4" | 5" | 12" | 10" | 1889 | 1264 | 1001 | 1001 | 1264 | 1889 |

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2502 (2022). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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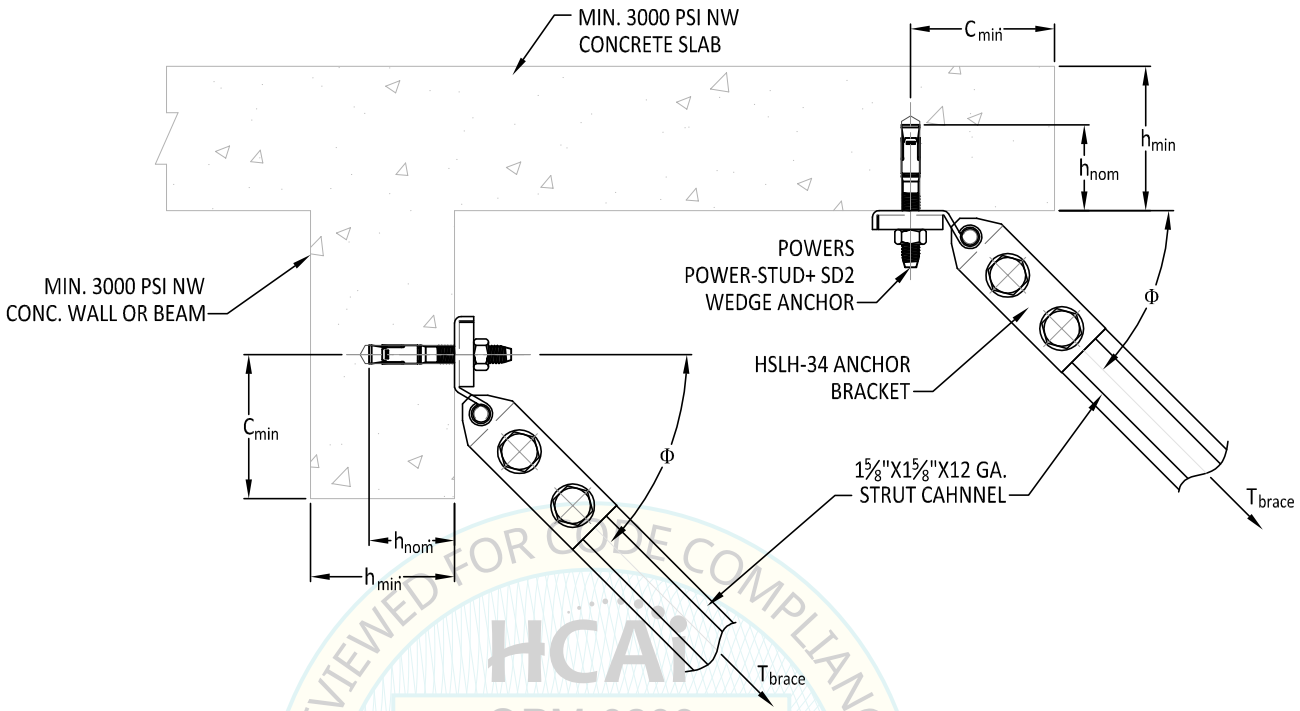
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 3.15.1

Date: February 5, 2025

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




HCAi
OPM-0203
REVIEWED FOR CODE COMPLIANCE
BY: Roy Lobo
DATE: 07/19/2025
FLORIDA BUILDING CODE

## ATTACHMENT WITH (1) ANCHOR BOLT

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| SD2RCR1 | 3/8" | SLW-38 | 2-3/8" | 2" | 6-1/2" | 4" | 501 | 361 | 298 | 298 | 361 | 501 |
| SD2RCR2 | 1/2" | SLW-12 | 2-1/2" | 2" | 8" | 4-1/2" | 598 | 424 | 346 | 346 | 424 | 598 |
| SD2RCR3 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 10" | 5-3/4" | 1052 | 756 | 623 | 623 | 756 | 1052 |
| SD2RCR4 | 5/8" | SLW-58 | 3-7/8 | 3-1/4" | 8" | 5-3/4" | 1287 | 898 | 727 | 727 | 898 | 1287 |
| SD2RCR5 | 5/8" | SLW-58 | 4-7/8" | 4-1/4" | 15-3/4" | 6-1/2" | 1625 | 1214 | 1025 | 1025 | 1214 | 1625 |
| SD2RCR6 | 3/4" | SLW-34 | 4-1/2" | 3-3/4" | 12" | 7" | 1607 | 1117 | 903 | 903 | 1117 | 1607 |
| SD2RCR7 | 3/4" | SLW-34 | 5-3/4" | 5" | 12" | 10" | 1818 | 1323 | 1099 | 1099 | 1323 | 1818 |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2502 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
7. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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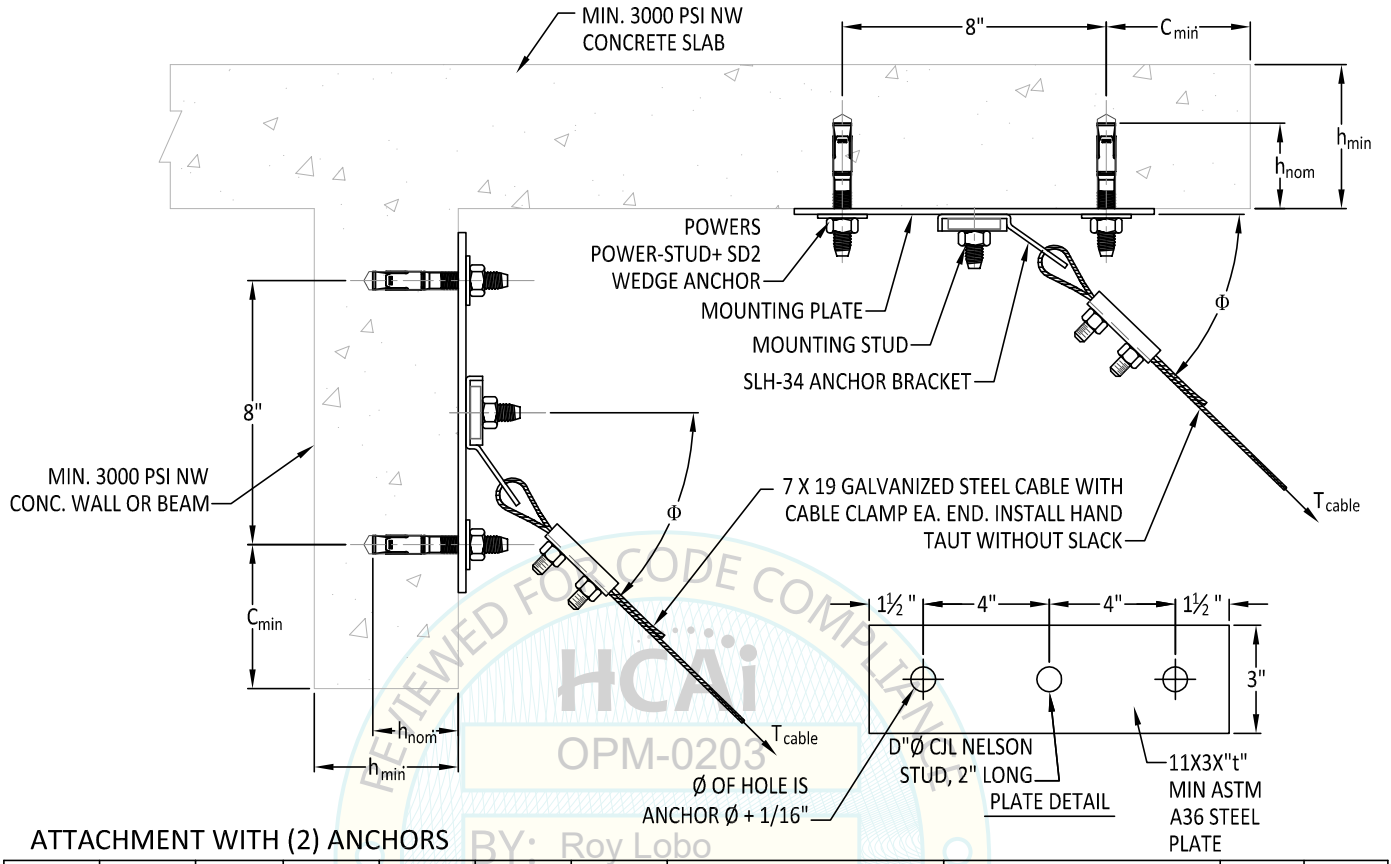
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 3.15.2

Date: February 5, 2025

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | |
| 2SD2RC1 | 3/8" | SLW-38 | 2-3/8" | 2" | 6-1/2" | 4" | 1308 | 1045 | 922 | 922 | 1045 | 1308 | 3/8" | 1/2" |
| 2SD2RC2 | 1/2" | SLW-12 | 2-1/2" | 2" | 8" | 4-1/2" | 1582 | 1239 | 1079 | 1079 | 1239 | 1582 | 3/8" | 1/2" |
| 2SD2RC3 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 10" | 5-3/4" | 2755 | 2192 | 1929 | 1929 | 2192 | 2755 | 1/2" | 1/2" |
| 2SD2RC4 | 5/8" | SLW-58 | 3-7/8 | 3-1/4" | 8" | 5-3/4" | 3428 | 2548 | 2144 | 2144 | 2548 | 3428 | 1/2" | 1/2" |
| 2SD2RC5 | 5/8" | SLW-58 | 4-7/8" | 4-1/4" | 15-3/4" | 6-1/2" | 3853 | 3055 | 2682 | 2682 | 3055 | 3853 | 1/2" | 1/2" |
| 2SD2RC6 | 3/4" | SLW-34 | 3-7/8 | 3-1/4" | 12" | 7" | 4042 | 2990 | 2508 | 2508 | 2990 | 4042 | 5/8" | 3/4" |
| 2SD2RC7 | 3/4" | SLW-34 | 4-7/8" | 4-1/4" | 15-3/4" | 6-1/2" | 4603 | 3658 | 3217 | 3217 | 3658 | 4603 | 5/8" | 3/4" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2502 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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BY: Roy Lobo
DATE: 7/19/2025
CALIFORNIA BUILDING CODE 2022

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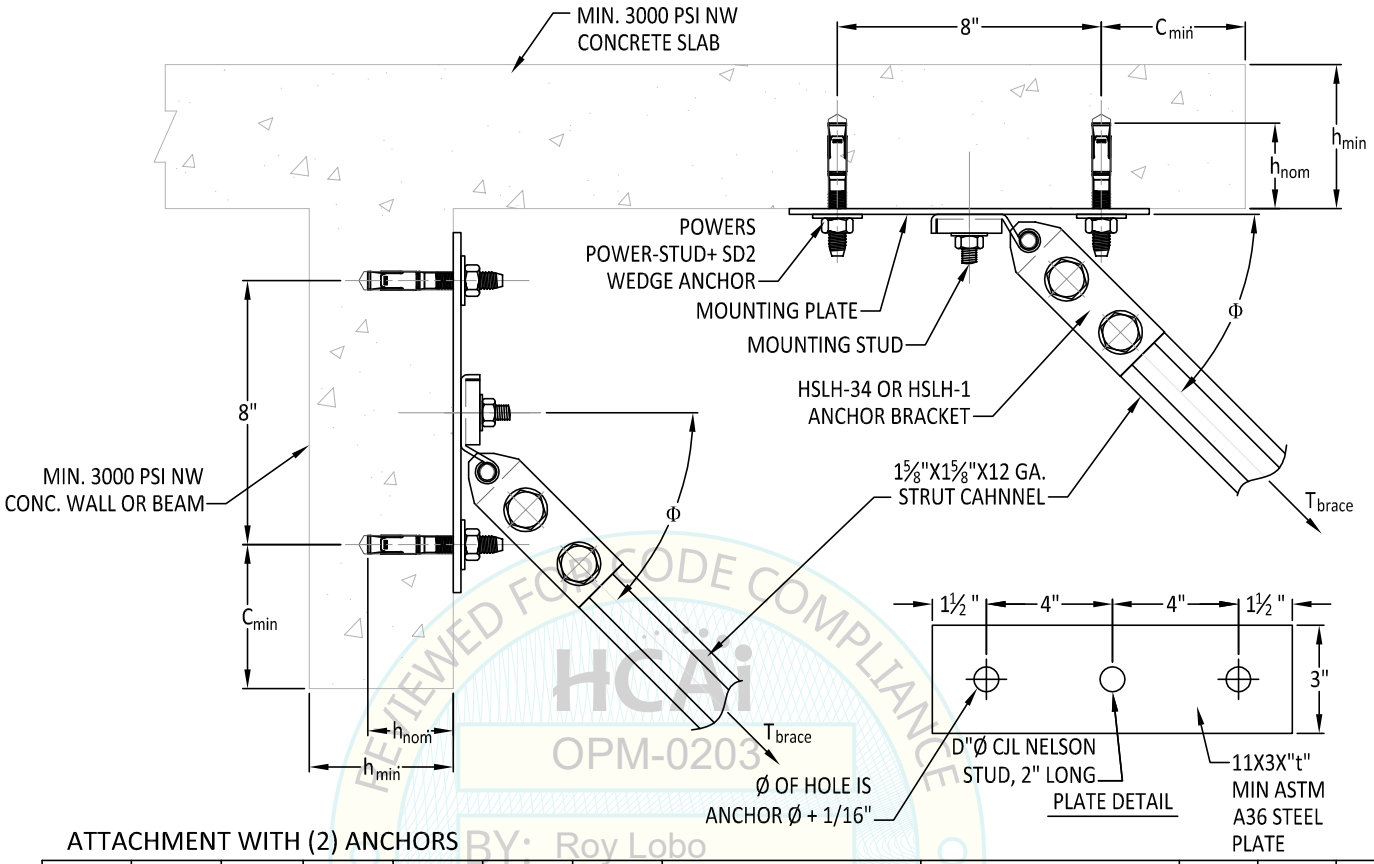
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.16.1**

Date: February 5, 2025

# DEWALT POWER-STUD+ SD2 WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" FOR HSLH-34 | STUD DIA-METER "D" FOR HSLH-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | | |
| 2SD2RCR1 | 3/8" | SLW-38 | 2-3/8" | 2" | 6-1/2" | 4" | 1139 | 940 | 850 | 850 | 940 | 1139 | 3/8" | 1/2" | --- |
| 2SD2RCR2 | 1/2" | SLW-12 | 2-1/2" | 2" | 8" | 4-1/2" | 1367 | 1111 | 992 | 992 | 1111 | 1367 | 3/8" | 1/2" | --- |
| 2SD2RCR3 | 1/2" | SLW-12 | 3-3/4" | 3-1/4" | 10" | 5-3/4" | 2395 | 1970 | 1777 | 1777 | 1970 | 2395 | 1/2" | 1/2" | --- |
| 2SD2RCR4 | 5/8" | SLW-58[9] | 3-7/8 | 3-1/4" | 8" | 5-3/4" | 3047 | 2414 | 2118 | 2118 | 2414 | 3047 | 1/2" | 1/2" | 7/8" |
| 2SD2RCR5 | 5/8" | SLW-58[9] | 4-7/8" | 4-1/4" | 15-3/4" | 6-1/2" | 3652 | 3111 | 2881 | 2881 | 3111 | 3652 | 1/2" | 1/2" | 7/8" |
| 2SD2RCR6 | 3/4" | SLW-34[9] | 3-7/8 | 3-1/4" | 12" | 7" | 3700 | 2952 | 2603 | 2603 | 2952 | 3700 | 5/8" | 3/4" | 7/8" |
| 2SD2RCR7 | 3/4" | SLW-34[9] | 4-7/8" | 4-1/4" | 15-3/4" | 6-1/2" | 4121 | 3429 | 3118 | 3118 | 3429 | 4121 | 5/8" | 3/4" | 7/8" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2502 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
7. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-1 ON PAGE 4.12, USE SLW-78 ON PAGE 4.12.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 7/19/2025 CALIFORNIA BUILDING CODE

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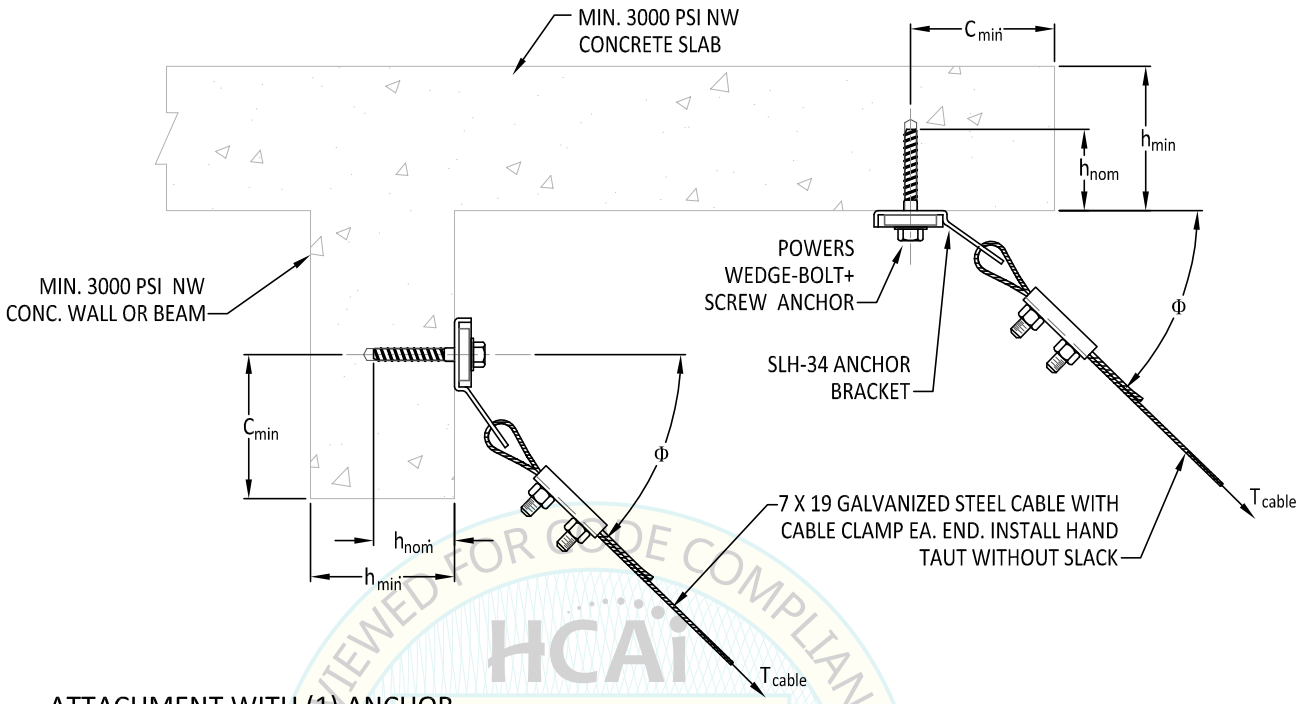
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.16.2**

Date: February 5, 2025

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| SCRC1 | 3/8" | SLW-38 | 2" | 1-5/16" | 5" | 3-1/2" | 275 | 165 | 123 | 123 | 165 | 275 |
| SCRC2 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 6-1/4" | 4" | 455 | 286 | 219 | 219 | 286 | 455 |
| SCRC3 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 7-3/4" | 5" | 663 | 446 | 354 | 354 | 446 | 663 |
| SCRC4 | 1/2" | SLW-12 | 2-1/2" | 1-3/4" | 3-3/8" | 4-1/2" | 429 | 278 | 216 | 216 | 278 | 429 |
| SCRC5 | 1/2" | SLW-12 | 3" | 2-3/16" | 6" | 5-1/4" | 676 | 431 | 333 | 333 | 431 | 676 |
| SCRC6 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 8" | 6-3/4" | 1309 | 820 | 628 | 628 | 820 | 1309 |
| SCRC7 | 5/8" | SLW-58 | 3-1/4" | 2-1/4" | 6-1/4" | 5" | 588 | 820 | 628 | 628 | 820 | 588 |
| SCRC8 | 5/8" | SLW-58 | 4" | 2-7/8" | 8" | 6" | 864 | 479 | 347 | 347 | 479 | 864 |
| SCRC9 | 5/8" | SLW-58 | 5" | 3-3/4" | 10" | 7" | 1202 | 663 | 480 | 480 | 663 | 1202 |
| SCRC10 | 3/4" | SLW-34 | 4-1/4" | 3-1/16" | 11" | 6" | 1388 | 785 | 575 | 575 | 785 | 1388 |

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BY: Roy Lobo
DATE: 07/19/2025
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NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3889 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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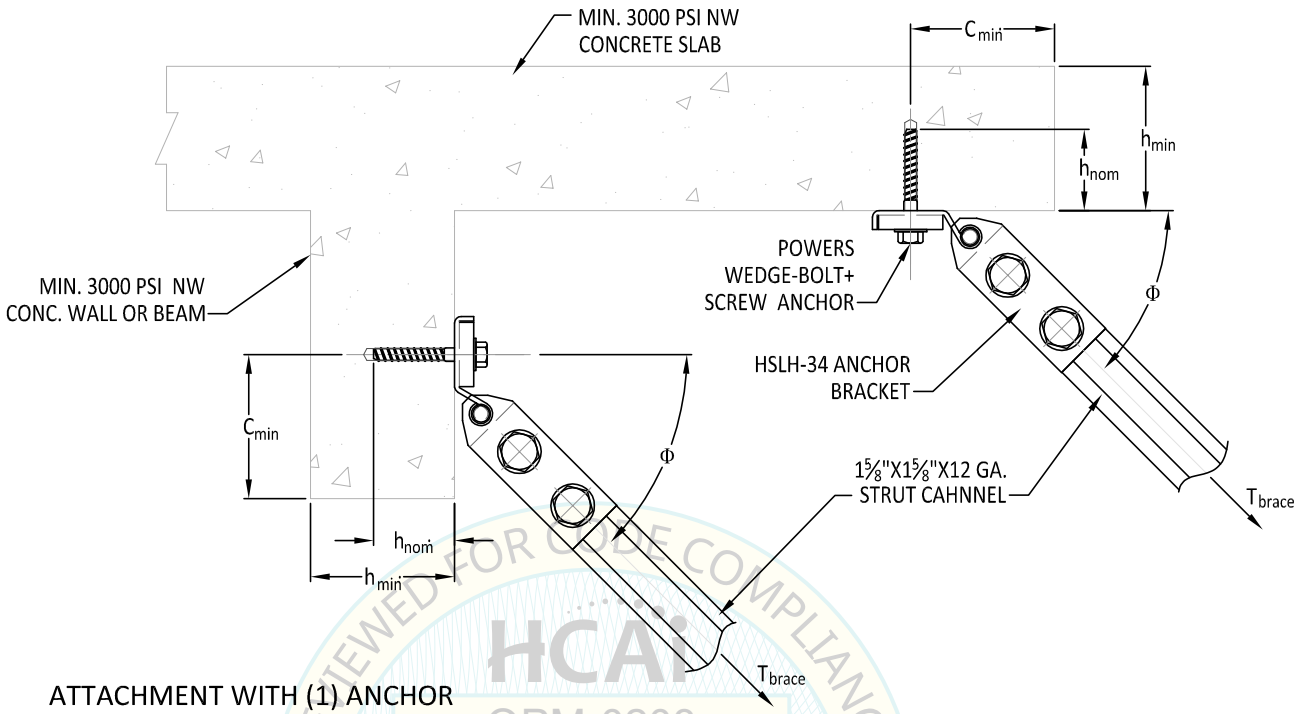
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: **3.17.1**

Date: February 5, 2025

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| SCRCR1 | 3/8" | SLW-38 | 2" | 1-5/16" | 5" | 3-1/2" | 262 | 173 | 136 | 136 | 173 | 262 |
| SCRCR2 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 6-1/4" | 4" | 435 | 300 | 388 | 388 | 300 | 435 |
| SCRCR3 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 7-3/4" | 5" | 638 | 466 | 388 | 388 | 466 | 638 |
| SCRCR4 | 1/2" | SLW-12 | 2-1/2" | 1-3/4" | 3-3/8" | 4-1/2" | 412 | 291 | 238 | 238 | 291 | 412 |
| SCRCR5 | 1/2" | SLW-12 | 3" | 2-3/16" | 6" | 5-1/4" | 648 | 452 | 367 | 367 | 452 | 648 |
| SCRCR6 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 8" | 6-3/4" | 1253 | 862 | 693 | 693 | 862 | 1253 |
| SCRCR7 | 5/8" | SLW-58 | 3-1/4" | 2-1/4" | 6-1/4" | 5" | 560 | 369 | 290 | 290 | 369 | 560 |
| SCRCR8 | 5/8" | SLW-58 | 4" | 2-7/8" | 8" | 6" | 817 | 506 | 385 | 385 | 506 | 817 |
| SCRCR9 | 5/8" | SLW-58 | 5" | 3-3/4" | 10" | 7" | 1137 | 701 | 533 | 533 | 701 | 1137 |
| SCRCR10 | 3/4" | SLW-34 | 4-1/4" | 3-1/16" | 11" | 6" | 1315 | 829 | 637 | 637 | 829 | 1315 |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3889 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
7. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
PER 2022 CBC & CRC
HCAi

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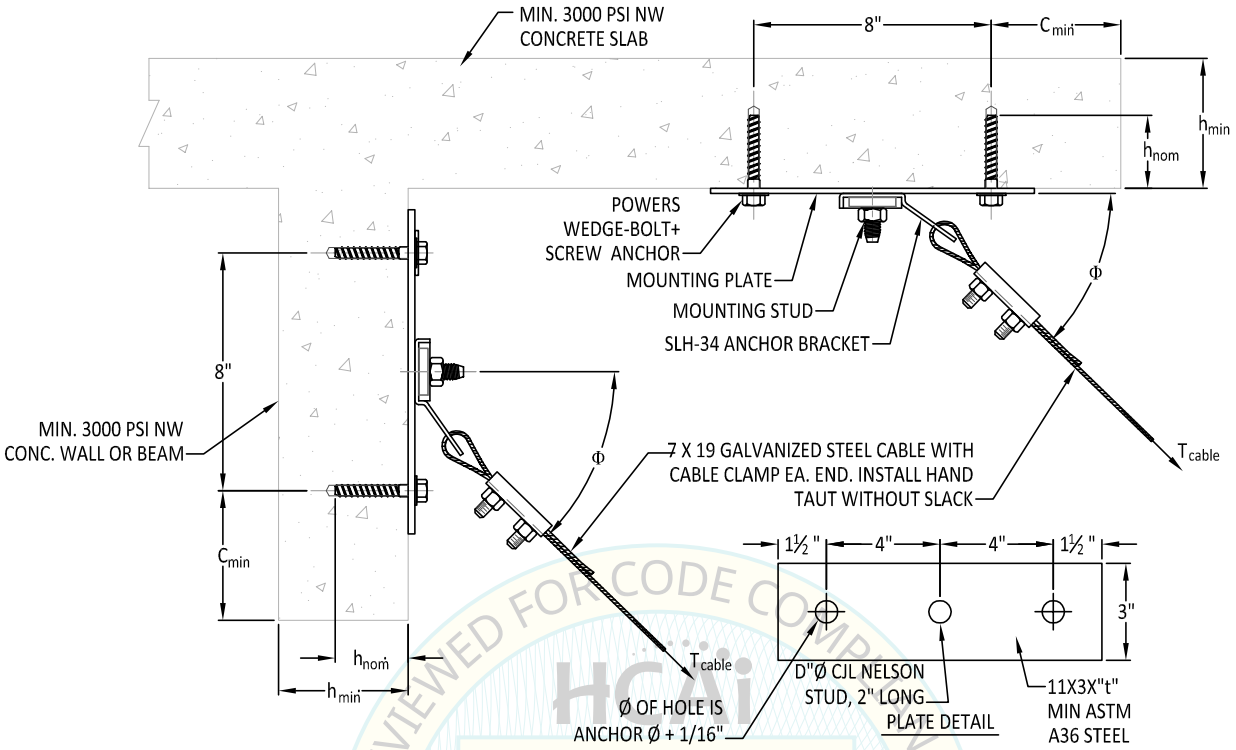
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: **3.17.2**

Date: February 5, 2025

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | |
| 2SCRC1 | 3/8" | SLW-38 | 2" | 1-5/16" | 5" | 3-1/2" | 686 | 508 | 427 | 427 | 508 | 686 | 1/4" | 3/8" |
| 2SCRC2 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 6-1/4" | 4" | 1109 | 861 | 745 | 745 | 861 | 1109 | 1/4" | 3/8" |
| 2SCRC3 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 7-3/4" | 5" | 1570 | 1294 | 1168 | 1168 | 1294 | 1570 | 3/8" | 3/8" |
| 2SCRC4 | 1/2" | SLW-12 | 2-1/2" | 1-3/4" | 3-3/8" | 4-1/2" | 1035 | 824 | 725 | 725 | 824 | 1035 | 3/8" | 1/2" |
| SCRC5 | 1/2" | SLW-12 | 3" | 2-3/16" | 6" | 5-1/4" | 1639 | 1288 | 1124 | 1124 | 1288 | 1639 | 3/8" | 1/2" |
| SCRC6 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 8" | 6-3/4" | 3119 | 2387 | 2046 | 2046 | 2387 | 3119 | 1/2" | 1/2" |
| SCRC7 | 5/8" | SLW-58 | 3-1/4" | 2-1/4" | 6-1/4" | 5" | 1470 | 1085 | 909 | 909 | 1085 | 1470 | 3/8" | 5/8" |
| SCRC8 | 5/8" | SLW-58 | 4" | 2-7/8" | 8" | 6" | 2245 | 1539 | 1235 | 1235 | 1539 | 2245 | 3/8" | 5/8" |
| SCRC9 | 5/8" | SLW-58 | 5" | 3-3/4" | 10" | 7" | 3132 | 2136 | 1709 | 1709 | 2136 | 3132 | 1/2" | 5/8" |
| SCRC10 | 3/4" | SLW-34 | 4-1/4" | 3-1/16" | 11" | 6" | 3564 | 2498 | 2029 | 2029 | 2498 | 3564 | 1/2" | 3/4" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3889 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
FLORIDA BUILDING CODE 2023

Vibrex® vibration & seismic control systems
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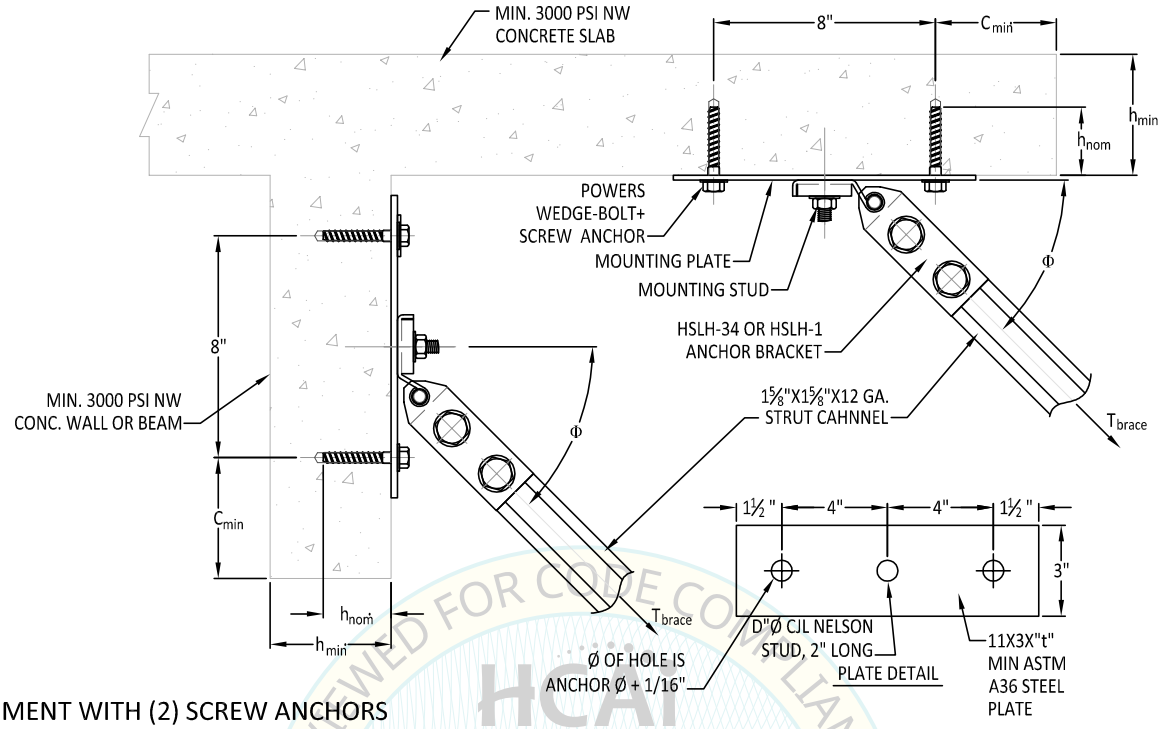
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: **3.18.1**

Date: **February 5, 2025**

# DEWALT SCREW-BOLT+ SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" | STUD DIA-METER "D" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | | |
| 2SCRC1 | 3/8" | SLW-38 | 2" | 1-5/16" | 5" | 3-1/2" | 614 | 467 | 399 | 399 | 467 | 614 | 1/4" | 3/8" | --- |
| 2SCRC2 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 6-1/4" | 4" | 1004 | 796 | 699 | 699 | 796 | 1004 | 1/4" | 3/8" | --- |
| 2SCRC3 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 7-3/4" | 5" | 1444 | 1206 | 1100 | 1100 | 1206 | 1444 | 3/8" | 3/8" | --- |
| 2SCRC4 | 1/2" | SLW-12 | 2-1/2" | 1-3/4" | 3-3/8" | 4-1/2" | 943 | 764 | 681 | 681 | 764 | 943 | 3/8" | 1/2" | --- |
| SCRC5 | 1/2" | SLW-12 | 3" | 2-3/16" | 6" | 5-1/4" | 1489 | 1193 | 1055 | 1055 | 1193 | 1489 | 3/8" | 1/2" | --- |
| SCRC6 | 1/2" | SLW-12 | 4-1/4" | 3-1/4" | 8" | 6-3/4" | 2815 | 2203 | 1917 | 1917 | 2203 | 2815 | 1/2" | 1/2" | --- |
| SCRC7 | 5/8" | SLW-58[9] | 3-1/4" | 2-1/4" | 6-1/4" | 5" | 1314 | 997 | 850 | 850 | 997 | 1314 | 3/8" | 5/8" | 7/8" |
| SCRC8 | 5/8" | SLW-58[9] | 4" | 2-7/8" | 8" | 6" | 1967 | 1402 | 1150 | 1150 | 1402 | 1967 | 3/8" | 5/8" | 7/8" |
| SCRC9 | 5/8" | SLW-58[9] | 5" | 3-3/4" | 10" | 7" | 2739 | 1945 | 1591 | 1591 | 1945 | 2739 | 1/2" | 5/8" | 7/8" |
| SCRC10 | 3/4" | SLW-34[9] | 4-1/4" | 3-1/16" | 11" | 6" | 3141 | 2282 | 1893 | 1893 | 2282 | 3141 | 1/2" | 3/4" | 7/8" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3889 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR SHLH-34 DETAILS.
7. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-1 ON PAGE 4.12, USE SLW-78 ON PAGE 4.12.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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CALIFORNIA BUILDING CODE 2025

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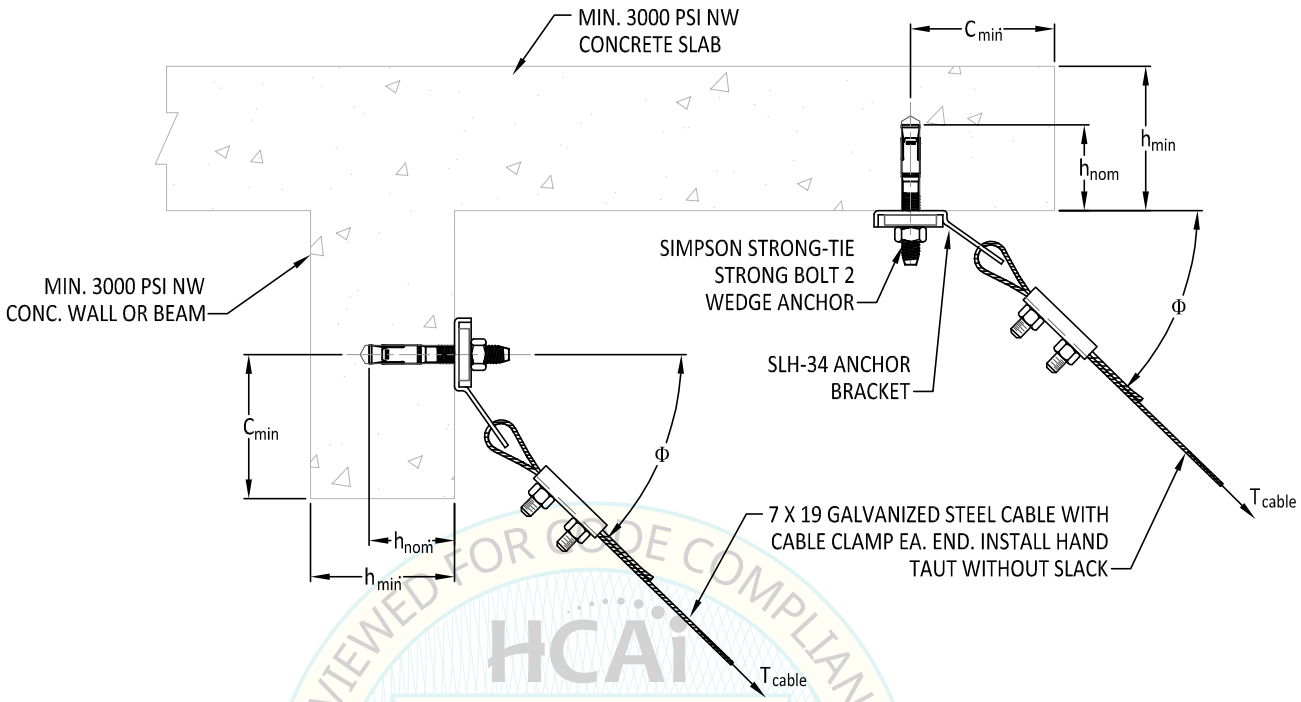
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: **3.18.2**

Date: February 5, 2025

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

## ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONCRETE THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| SB2RC1 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 6-1/2" | 3-1/4" | 355 | 224 | 173 | 173 | 224 | 355 |
| SB2RC2 | 3/8" | SLW-38 | 2-7/8" | 2-1/2" | 6" | 4-1/2" | 514 | 385 | 326 | 326 | 385 | 514 |
| SB2RC3 | 1/2" | SLW-12 | 2-3/4" | 2-1/4" | 7" | 4-1/2" | 716 | 473 | 372 | 372 | 473 | 716 |
| SB2RC4 | 1/2" | SLW-12 | 3-7/8" | 3-3/8" | 7-1/2" | 6" | 1094 | 669 | 506 | 506 | 669 | 1094 |
| SB2RC5 | 5/8" | SLW-58 | 3-3/8" | 2-3/4" | 7-1/2" | 5-1/2" | 1109 | 686 | 522 | 522 | 686 | 1109 |
| SB2RC6 | 5/8" | SLW-58 | 5-1/8" | 4-1/2" | 9" | 7-7/8" | 1783 | 1188 | 916 | 916 | 1188 | 1783 |
| SB2RC7 | 3/4" | SLW-34 | 4-1/8" | 3-3/8" | 9" | 6-3/4" | 1605 | 962 | 722 | 722 | 962 | 1605 |
| SB2RC8 | 3/4" | SLW-34 | 5-3/4" | 5" | 8" | 8-3/4" | 2096 | 1391 | 1097 | 1097 | 1391 | 2096 |

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3037 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. $\Phi = 90°$ – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90°$ – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

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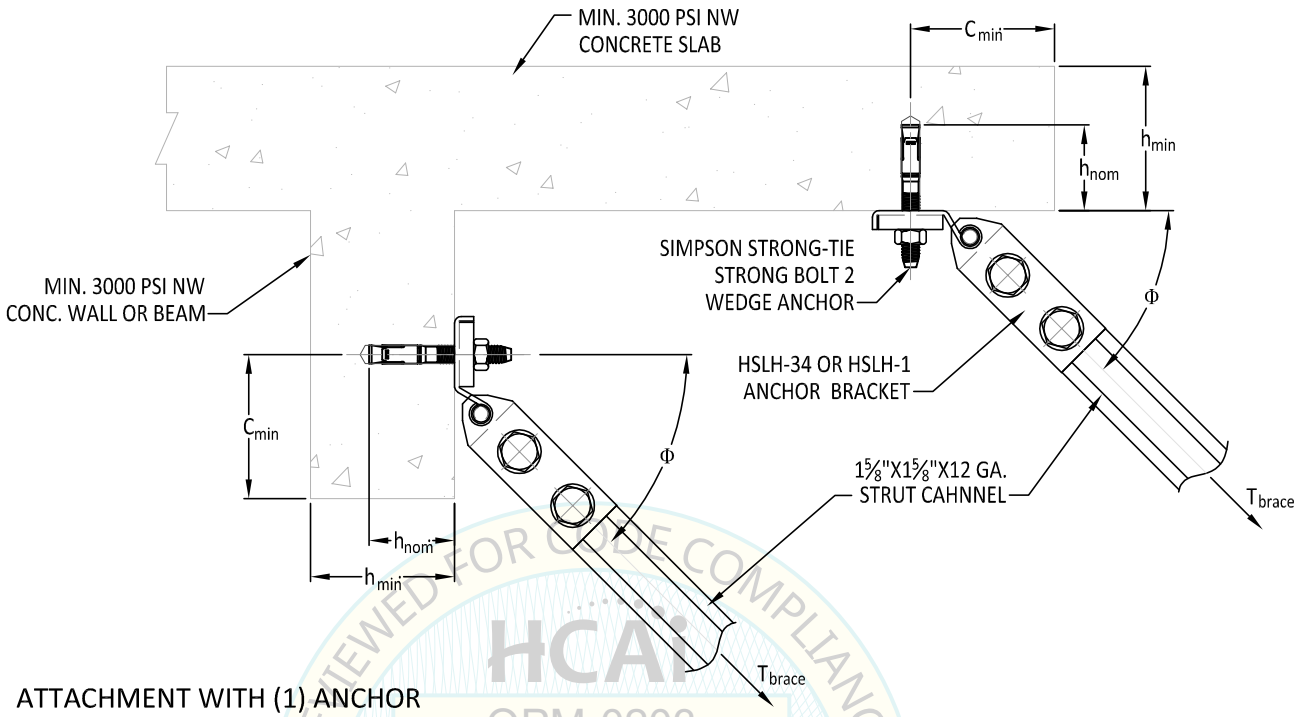
California PE No. S6481

Page No.: 3.19.1

Date: February 5, 2025

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (1) ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONCRETE THICKNESS | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| SB2RCR1 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 6-1/2" | 3-1/4" | 340 | 236 | 190 | 190 | 236 | 340 |
| SB2RCR2 | 3/8" | SLW-38 | 2-7/8" | 2-1/2" | 6" | 4-1/2" | 499 | 400 | 354 | 354 | 400 | 499 |
| SB2RCR3 | 1/2" | SLW-12 | 2-3/4" | 2-1/4" | 7" | 4-1/2" | 688 | 495 | 408 | 408 | 495 | 688 |
| SB2RCR4 | 1/2" | SLW-12 | 3-7/8" | 3-3/8" | 7-1/2" | 6" | 1044 | 703 | 559 | 559 | 703 | 1044 |
| SB2RCR5 | 5/8" | SLW-58 | 3-3/8" | 2-3/4" | 7-1/2" | 5-1/2" | 1060 | 721 | 576 | 576 | 721 | 1060 |
| SB2RCR6 | 5/8" | SLW-58 | 5-1/8" | 4-1/2" | 9" | 7-7/8" | 1794 | 1247 | 1009 | 1009 | 1247 | 1794 |
| SB2RCR7 | 3/4" | SLW-34 | 4-1/8" | 3-3/8" | 9" | 6-3/4" | 1529 | 1013 | 798 | 798 | 1013 | 1529 |
| SB2RCR8 | 3/4" | SLW-34 | 5-3/4" | 5" | 8" | 8-3/4" | 2015 | 1457 | 1205 | 1205 | 1457 | 2015 |
| SB2RCR9 | 1" | SLW-1 | 5-1/4" | 4-1/2" | 18" | 9" | 1598 | 1072 | 850 | 850 | 1072 | 1598 |
| SB2RCR10 | 1" | SLW-1 | 9-3/4" | 9" | 13-1/2" | 13-1/2" | 2080 | 1464 | 1192 | 1192 | 1464 | 2080 |

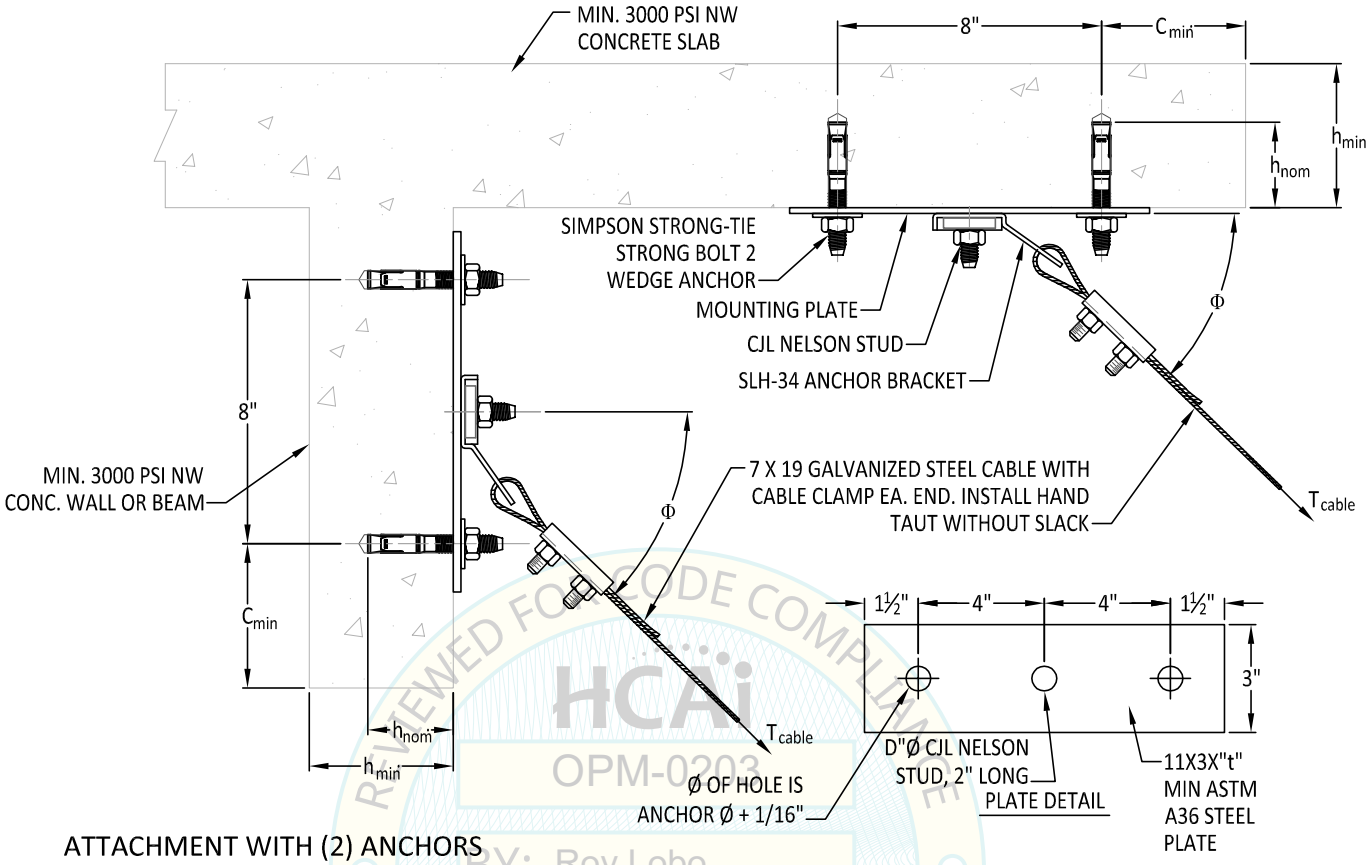
NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3037 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS. SEE PAGE 4.12 FOR HSLH-1 DETAILS.
7. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050
Structural Engineer: M. Tremblay
California PE No. S6481

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | |
| 2SB2RC1 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 6-1/2" | 914 | 698 | 598 | 598 | 698 | 914 | 3/8" | 1/2" |
| 2SB2RC2 | 3/8" | SLW-12 | 2-7/8" | 2-1/2" | 6" | 1211 | 1080 | 1038 | 1038 | 1080 | 1211 | 3/8" | 1/2" |
| 2SB2RC3 | 1/2" | SLW-12 | 2-3/4" | 2-1/4" | 7" | 1801 | 1435 | 1263 | 1263 | 1435 | 1801 | 3/8" | 1/2" |
| 2SB2RC4 | 1/2" | SLW-58 | 3-7/8" | 3-3/8" | 7-1/2" | 2879 | 2124 | 1779 | 1779 | 2124 | 2879 | 1/2" | 1/2" |
| 2SB2RC5 | 5/8" | SLW-58 | 3-3/8" | 2-3/4" | 7-1/2" | 2879 | 2142 | 1803 | 1803 | 2142 | 2879 | 1/2" | 1/2" |
| 2SB2RC6 | 5/8" | SLW-34 | 5-1/8" | 4-1/2" | 9" | 4692 | 3542 | 3010 | 3010 | 3542 | 4692 | 5/8" | 3/4" |
| 2SB2RC7 | 3/4" | SLW-34 | 4-1/8" | 3-3/8" | 9" | 3898 | 2795 | 2301 | 2301 | 2795 | 3898 | 5/8" | 3/4" |
| 2SB2RC8 | 3/4" | SLW-34 | 5-3/4" | 5" | 8" | 4959 | 3836 | 3312 | 3312 | 3836 | 4959 | 5/8" | 3/4" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3037 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. $\Phi = 90°$ – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
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REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CBC 2022 CALIFORNIA BUILDING CODE

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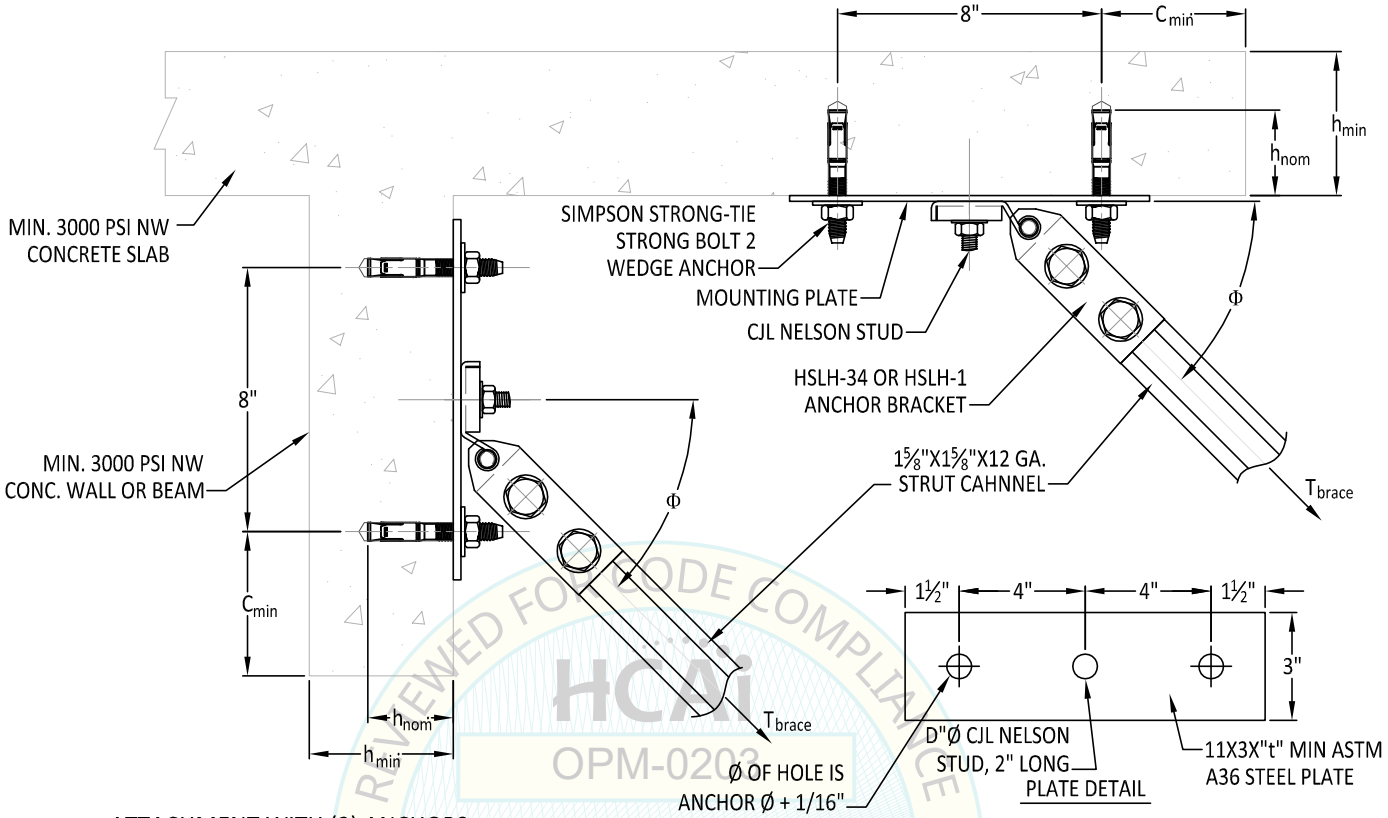
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.20.1**

Date: February 5, 2025

# SIMPSON STRONG-TIE STRONG-BOLT 2 WEDGE ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (2) ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONCRETE THICKNESS | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN BRACE (lbs), "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" FOR HSLH-34 | STUD DIA-METER "D" FOR HSLH-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | | |
| 2SB2RCR1 | 3/8" | SLW-38 | 1-7/8" | 1-1/2" | 6-1/2" | 3-1/4" | 782 | 623 | 549 | 549 | 623 | 782 | 3/8" | 1/2" | --- |
| 2SB2RCR2 | 3/8" | SLW-12 | 2-7/8" | 2-1/2" | 6" | 4-1/2" | 1097 | 993 | 968 | 968 | 993 | 1097 | 3/8" | 1/2" | --- |
| 2SB2RCR3 | 1/2" | SLW-12 | 2-3/4" | 2-1/4" | 7" | 4-1/2" | 1567 | 1290 | 1164 | 1164 | 1290 | 1567 | 3/8" | 1/2" | --- |
| 2SB2RCR4 | 1/2" | SLW-58 | 3-7/8" | 3-3/8" | 7-1/2" | 6" | 2432 | 1884 | 1628 | 1628 | 1884 | 2432 | 1/2" | 1/2" | --- |
| 2SB2RCR5 | 5/8" | SLW-58[9] | 3-3/8" | 2-3/4" | 7-1/2" | 5-1/2" | 2440 | 1903 | 1652 | 1652 | 1903 | 2440 | 1/2" | 1/2" | 7/8" |
| 2SB2RCR6 | 5/8" | SLW-34[9] | 5-1/8" | 4-1/2" | 9" | 7-7/8" | 3998 | 3155 | 2760 | 2760 | 3155 | 3998 | 5/8" | 3/4" | 7/8" |
| 2SB2RCR7 | 3/4" | SLW-34[9] | 4-1/8" | 3-3/8" | 9" | 6-3/4" | 3256 | 2467 | 2102 | 2102 | 2467 | 3256 | 5/8" | 3/4" | 7/8" |
| 2SB2RCR8 | 3/4" | SLW-34[9] | 5-3/4" | 5" | 8" | 8-3/4" | 4266 | 3431 | 3044 | 3044 | 3431 | 4266 | 5/8" | 3/4" | 7/8" |
| 2SB2RCR9 | 1" | SLW-1 | 5-1/4" | 4-1/2" | 18" | 9" | 4128 | 3020 | 2517 | 2517 | 3020 | 4128 | 5/8" | 3/4" | 1" |
| 2SB2RCR10 | 1" | SLW-1 | 9-3/4" | 9" | 13-1/2" | 13-1/2" | 6006 | 4696 | 4084 | 4084 | 4696 | 6006 | 5/8" | 3/4" | 1" |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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022


NOTES:

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7. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-1 ON PAGE 4.12, USE SLW-78 ON PAGE 4.12.


Vibrex® vibration & seismic control systems

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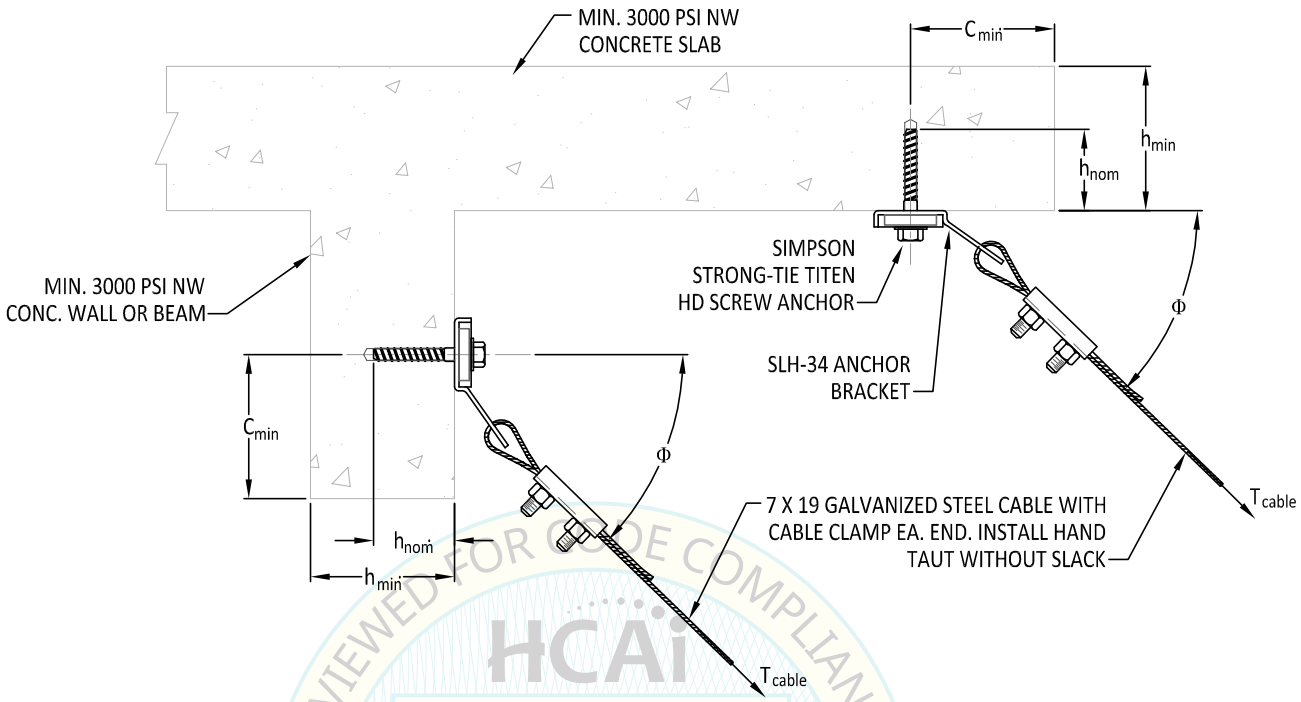
**Structural Engineer: N. Tremblay**
**California PE No. S6481**


**Page No.: 3.20.2**

**Date: February 5, 2025**

# SIMPSON STRONG-TIE TITEN HD SCREW IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| THRC1 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 2-11/16" | 4" | 365 | 275 | 234 | 234 | 275 | 365 |
| THRC2 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 3-5/8" | 5" | 571 | 406 | 332 | 332 | 406 | 571 |
| THRC3 | 1/2" | SLW-12 | 3-1/4" | 2-3/8" | 3-9/16" | 5" | 625 | 450 | 372 | 372 | 450 | 625 |
| THRC4 | 1/2" | SLW-12 | 4" | 3" | 4-1/2" | 6-1/4" | 915 | 654 | 537 | 537 | 654 | 915 |
| THRC5 | 5/8" | SLW-58 | 4" | 2-15/16" | 4-1/2" | 6" | 798 | 514 | 400 | 400 | 514 | 798 |
| THRC6 | 5/8" | SLW-58 | 5-1/2" | 4-1/4" | 6-3/8" | 8-1/2" | 1439 | 935 | 729 | 729 | 935 | 1439 |
| THRC7 | 3/4" | SLW-34 | 5-1/2" | 4-1/4" | 6-3/8" | 8-3/4" | 1555 | 1014 | 793 | 793 | 1014 | 1555 |
| THRC8 | 3/4" | SLW-34 | 6-1/4" | 4-7/8" | 7-5/16" | 10" | 1879 | 1214 | 945 | 945 | 1214 | 1879 |

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OPM-0203
DATE: 07/19/2025
APPROVED
CALIFORNIA BUILDING CODE

NOTES:
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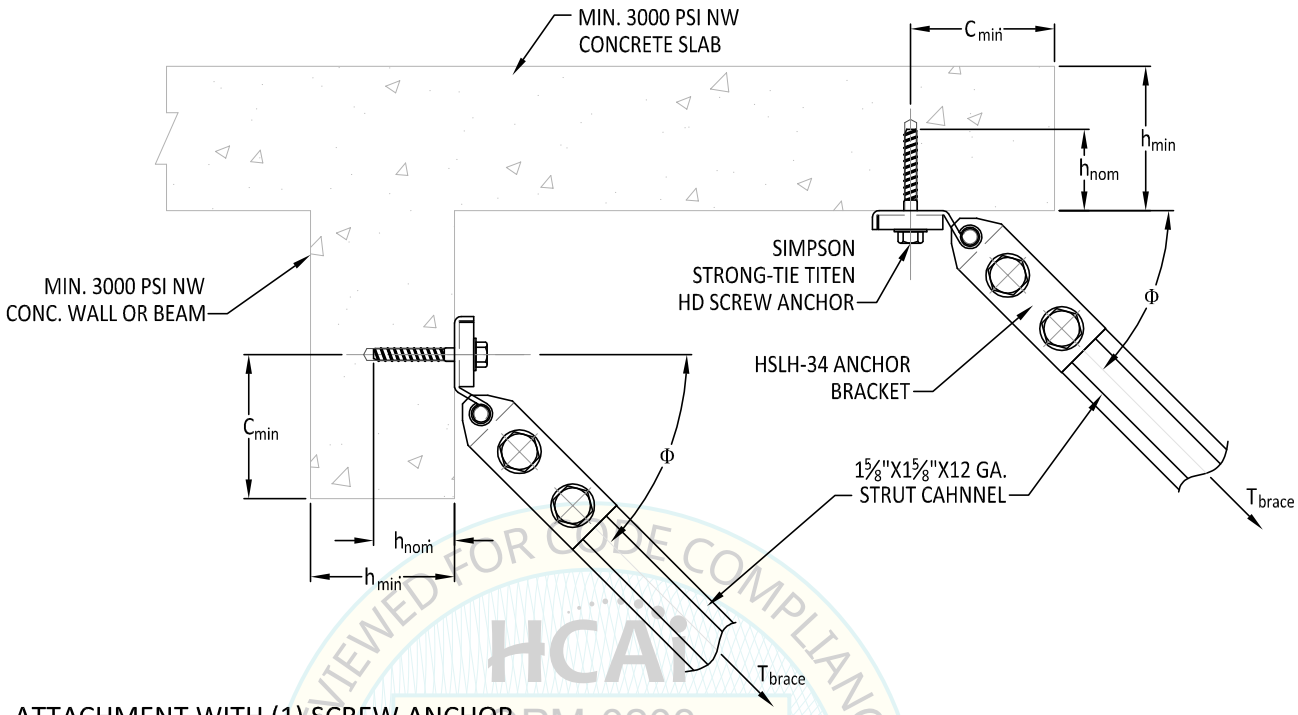
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.21.1**

Date: February 5, 2025

# SIMPSON STRONG-TIE TITEN HD SCREW IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (1) SCREW ANCHOR

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| THRCR1 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 2-11/16" | 4" | 417 | 317 | 271 | 271 | 317 | 417 |
| THRCR2 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 3-5/8" | 5" | 668 | 474 | 388 | 388 | 474 | 668 |
| THRCR3 | 1/2" | SLW-12 | 3-1/4" | 2-3/8" | 3-9/16" | 5" | 726 | 525 | 434 | 434 | 525 | 726 |
| THRCR4 | 1/2" | SLW-12 | 4" | 3" | 4-1/2" | 6-1/4" | 1066 | 763 | 628 | 628 | 763 | 1066 |
| THRCR5 | 5/8" | SLW-58 | 4" | 2-15/16" | 4-1/2" | 6" | 972 | 615 | 473 | 473 | 615 | 972 |
| THRCR6 | 5/8" | SLW-58 | 5-1/2" | 4-1/4" | 6-3/8" | 8-1/2" | 1748 | 1116 | 863 | 863 | 1116 | 1748 |
| THRCR7 | 3/4" | SLW-34 | 5-1/2" | 4-1/4" | 6-3/8" | 8-3/4" | 1884 | 1209 | 937 | 937 | 1209 | 1884 |
| THRCR8 | 3/4" | SLW-34 | 6-1/4" | 4-7/8" | 7-5/16" | 10" | 2286 | 1451 | 1118 | 1118 | 1451 | 2286 |

REVIEWED FOR CODE COMPLIANCE
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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
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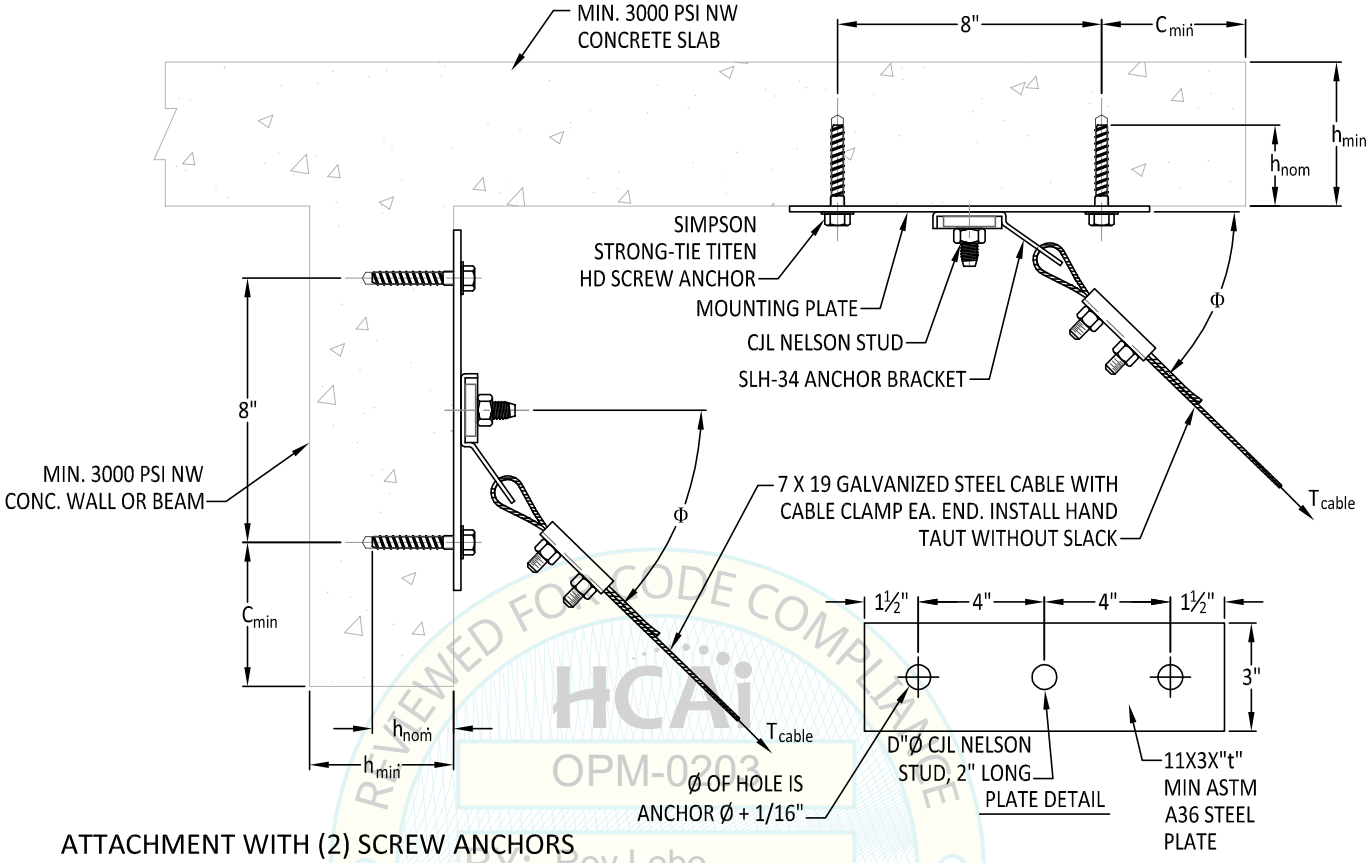
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.21.2**

Date: February 5, 2025

# SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




## ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | MIN. PLATE THICK-NESS "t" | STUD DIA-METER "D" |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | |
| 2THRC1 | 3/8" | SLW-12 | 2-1/2" | 1-3/4" | 2-3/4" | 4" | 889 | 805 | 784 | 784 | 805 | 889 | 3/8" | 1/2" |
| 2THRC2 | 3/8" | SLW-12 | 3-1/4" | 2-3/8" | 3-5/8" | 5" | 1446 | 1243 | 1158 | 1158 | 1243 | 1446 | 3/8" | 1/2" |
| 2THRC3 | 1/2" | SLW-12 | 3-1/4" | 2-3/8" | 3-11/16" | 5" | 1568 | 1365 | 1286 | 1286 | 1365 | 1568 | 3/8" | 1/2" |
| 2THRC4 | 1/2" | SLW-12 | 4" | 3" | 5-1/4" | 6-1/4" | 2271 | 1940 | 1800 | 1800 | 1940 | 2271 | 1/2" | 1/2" |
| 2THRC5 | 5/8" | SLW-58 | 4" | 2-15/16" | 4-1/2" | 6-1/4" | 2157 | 1689 | 1471 | 1471 | 1689 | 2157 | 1/2" | 5/8" |
| 2THRC6 | 5/8" | SLW-58 | 5-1/2" | 4-1/4" | 6-3/8" | 8-1/2" | 3869 | 3054 | 2673 | 2673 | 3054 | 3869 | 5/8" | 5/8" |
| 2THRC7 | 3/4" | SLW-34 | 5-1/2" | 4-1/4" | 6-3/8" | 8-3/4" | 4154 | 3285 | 2879 | 2879 | 3285 | 4154 | 5/8" | 3/4" |
| 2THRC8 | 3/4" | SLW-34 | 6-1/4" | 4-7/8" | 7-5/16" | 10" | 5034 | 3934 | 3420 | 3420 | 3934 | 5034 | 5/8" | 3/4" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2713 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 RETURN WITH BUILDING CODE SUBMITTAL

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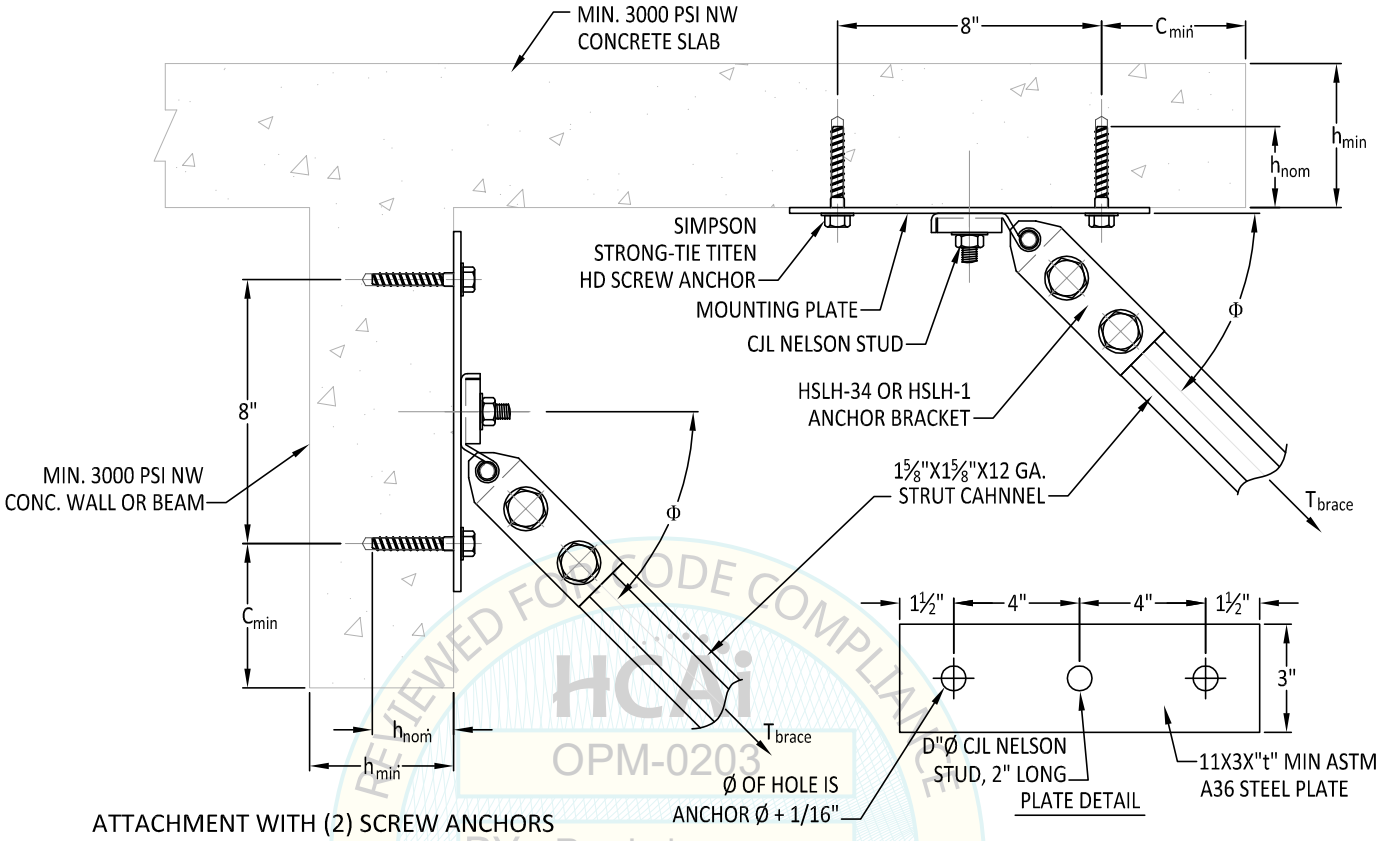
Structural Engineer: M. Tremblay
California PE No. S6481

# SIMPSON STRONG-TIE TITEN HD SCREW ANCHOR IN 3000 PSI NORMAL WEIGHT CONCRETE SLAB/WALL/BEAM




ATTACHMENT WITH (2) SCREW ANCHORS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | MAX TENSION IN CABLE, "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO SLAB[7] | | | MAX TENSION IN CABLE, "$T_{brace}$", @ ANGLE "Φ" ANCHORING TO WALL/BEAM[8] | | | STUD DIA-METER "D" FOR HSLH-34 | STUD DIA-METER "D" FOR HSLH-1 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° | | |
| 2THRCR1 | 3/8" | SLW-38 | 2-1/2" | 1-3/4" | 2-3/4" | 4" | 777 | 707 | 692 | 692 | 707 | 777 | 1/2" | --- |
| 2THRCR2 | 3/8" | SLW-38 | 3-1/4" | 2-3/8" | 3-5/8" | 5" | 1232 | 1072 | 1010 | 1010 | 1072 | 1232 | 1/2" | --- |
| 2THRCR3 | 1/2" | SLW-12 | 3-1/4" | 2-3/8" | 3-11/16" | 5" | 1344 | 1183 | 1125 | 1125 | 1183 | 1344 | 1/2" | --- |
| 2THRCR4 | 1/2" | SLW-12 | 4" | 3" | 5-1/4" | 6-1/4" | 1929 | 1671 | 1568 | 1568 | 1671 | 1929 | 1/2" | --- |
| 2THRCR5 | 5/8" | SLW-58[9] | 4" | 2-15/16" | 4-1/2" | 6-1/4" | 1753 | 1418 | 1262 | 1262 | 1418 | 1753 | 3/4" | 7/8" |
| 2THRCR6 | 5/8" | SLW-58[9] | 5-1/2" | 4-1/4" | 6-3/8" | 8-1/2" | 3158 | 2569 | 2296 | 2296 | 2569 | 3158 | 3/4" | 7/8" |
| 2THRCR7 | 3/4" | SLW-34[9] | 5-1/2" | 4-1/4" | 6-3/8" | 8-3/4" | 3394 | 2764 | 2474 | 2474 | 2764 | 3394 | 3/4" | 7/8" |
| 2THRCR8 | 3/4" | SLW-34[9] | 6-1/4" | 4-7/8" | 7-5/16" | 10" | 4088 | 3300 | 2934 | 2934 | 3300 | 4088 | 3/4" | 7/8" |

NOTES:

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-2713 (2023). SEE NOTE #5 ON PAGE 3.0.1 UNDER "TESTING REQUIREMENTS FOR POST-INSTALLED ANCHORS BOLTS" FOR TESTING, SPECIAL INSPECTION & REPORTING REQUIREMENTS.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
7. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
8. $\Phi = 90°$ – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.
9. FOR HSLH-1 ON PAGE 4.12, USE SLW-78 ON PAGE 4.12.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
ICC-ES REPORT ESR-2713 CODE COMPLIANT

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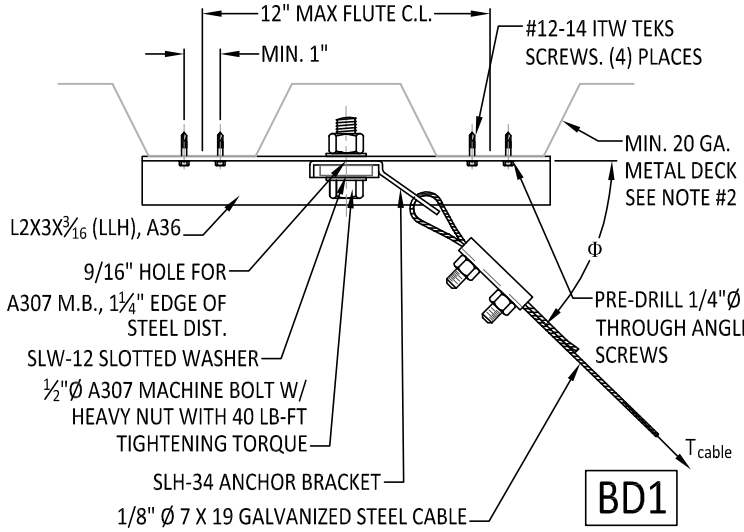
Structural Engineer: M. Tremblay
California PE No. S6481

Page No.: **3.22.2**

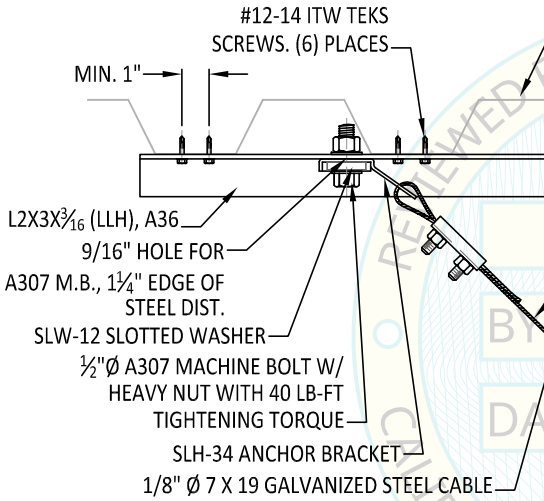
Date: February 5, 2025

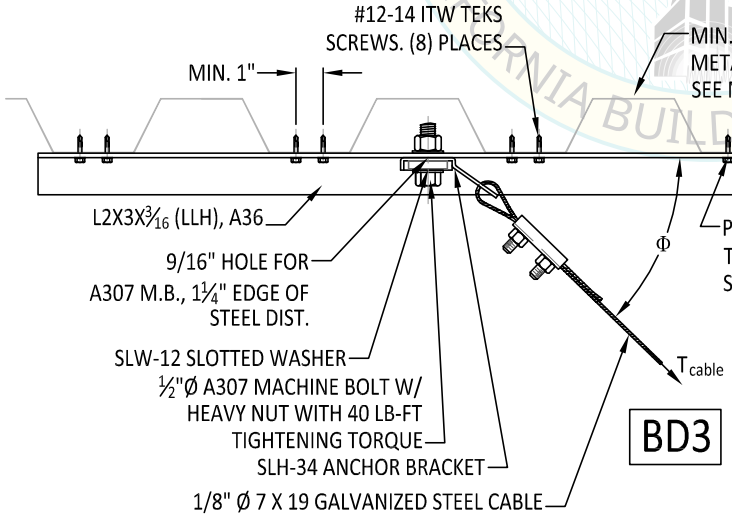
# TEKS SCREWS TO METAL DECK




| ATTACH-MENT TYPE | NUMBER OF SCREW (TOTAL)* | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[4] | | |
|---|---|---|---|---|
| | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| BD1 | 4 | 617 | 547 | 523 |
| BD2 | 6 | 910 | 810 | 778 |
| BD3 | 8 | 1193 | 1068 | 1029 |

*(2) SCREWS TYP. & EA. DECK CONTACT




NOTES:
1. LOADS FOR ITW TEKS SCREW ATTACHMENT BASED ON THE ICC ESR-1976 (2023).
2. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
3. SEE PAGE 4.4 FOR SLH-34 DETAILS.
4. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
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CALIFORNIA BUILDING CODE, 2022

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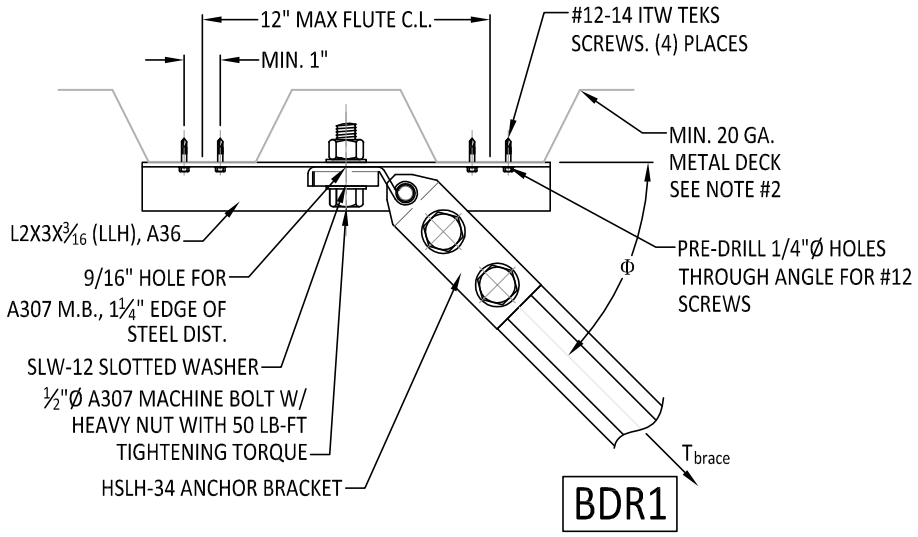
California PE No. S6481

Page No.: 3.23.1

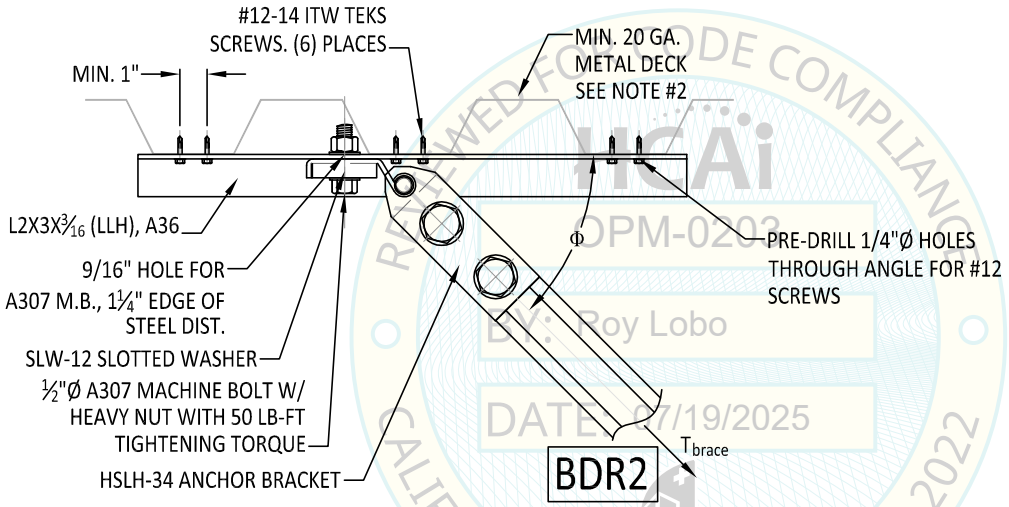
Date: February 5, 2025

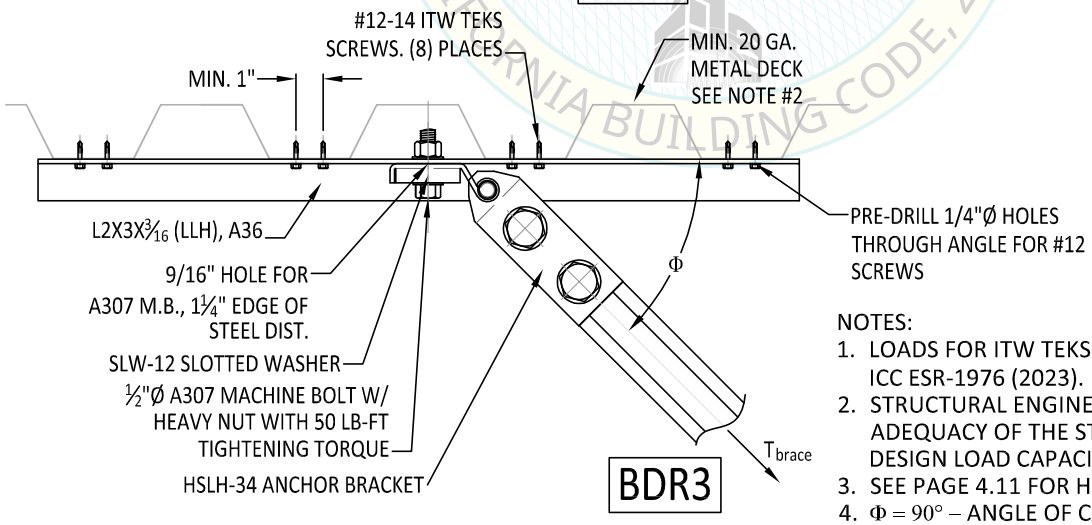
# TEKS SCREWS TO METAL DECK




| ATTACH-MENT TYPE | NUMBER OF SCREW (TOTAL)* | MAX TENSION IN BRACE, "$T_{cable}$", @ ANGLE "Φ"[4] | | |
|---|---|---|---|---|
| | | 30°≤Φ≤45° | 45°<Φ≤60° | 60°<Φ≤90° |
| BDR1 | 4 | 617 | 547 | 523 |
| BDR2 | 6 | 910 | 810 | 778 |
| BDR3 | 8 | 1193 | 1068 | 1029 |

*(2) SCREWS TYP. & EA. DECK CONTACT

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. LOADS FOR ITW TEKS SCREW ATTACHMENT BASED ON THE ICC ESR-1976 (2023).
2. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
3. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
4. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 30° FOR CAPACITIES TO BE VALID.

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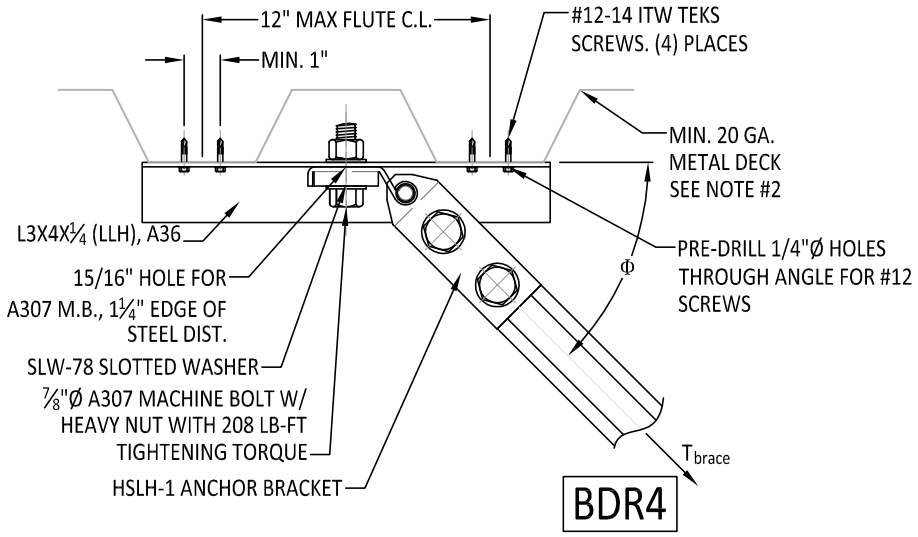
California PE No. S6481

Page No.: 3.23.2

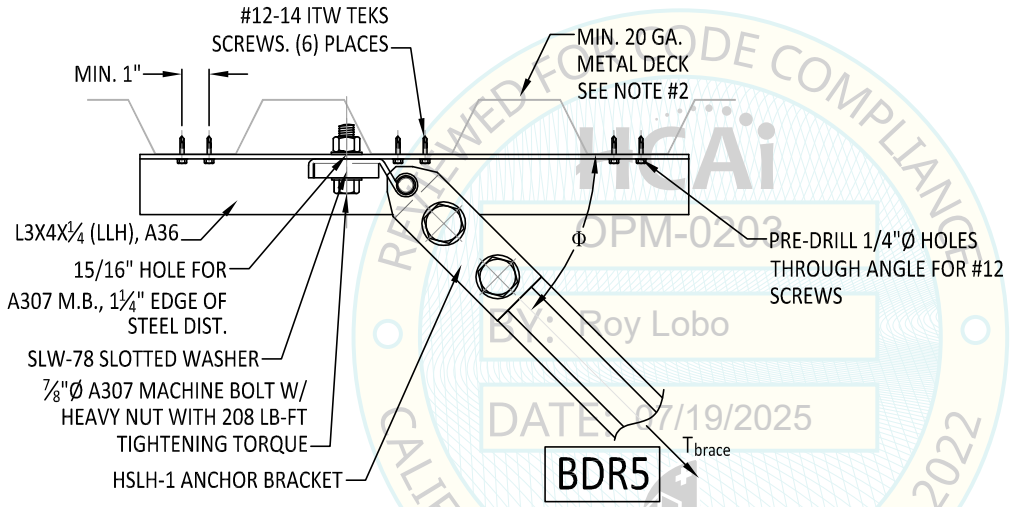
Date: February 5, 2025

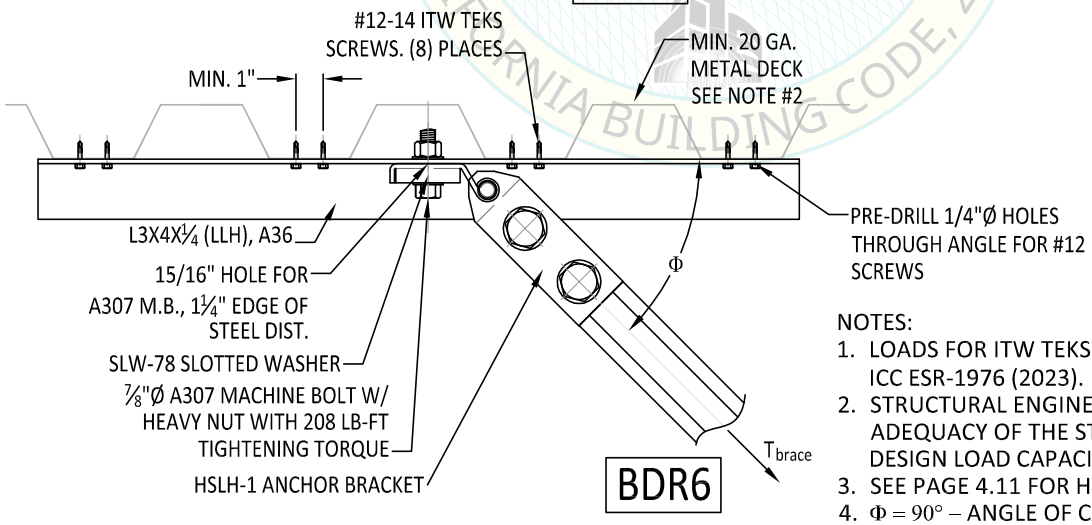
# TEKS SCREWS TO METAL DECK




| ATTACH-MENT TYPE | NUMBER OF SCREW (TOTAL)* | MAX TENSION IN BRACE, "T cable", @ ANGLE "Φ"[4] | | |
|---|---|---|---|---|
| | | 30°≤Φ≤45° | 45°<Φ≤60° | 60°<Φ≤90° |
| BDR4 | 4 | 617 | 547 | 523 |
| BDR5 | 6 | 910 | 810 | 778 |
| BDR6 | 8 | 1193 | 1068 | 1029 |

*(2) SCREWS TYP. & EA. DECK CONTACT

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HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
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2. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
3. SEE PAGE 4.11 FOR HSLH-34 DETAILS.
4. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. $\Phi$ MUST NOT BE LESS THAN 30° FOR CAPACITIES TO BE VALID.

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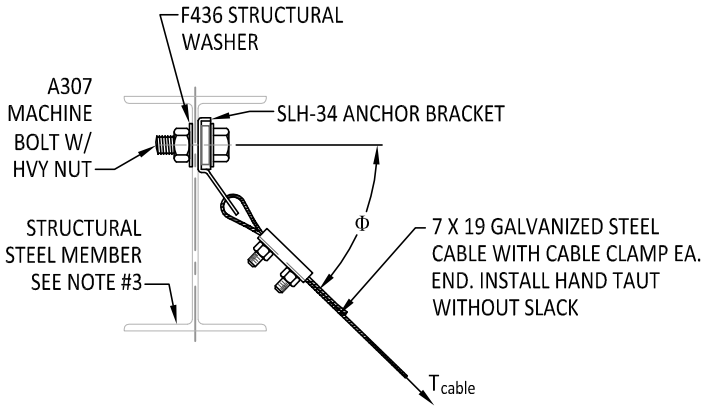
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 3.23.3

Date: February 5, 2025

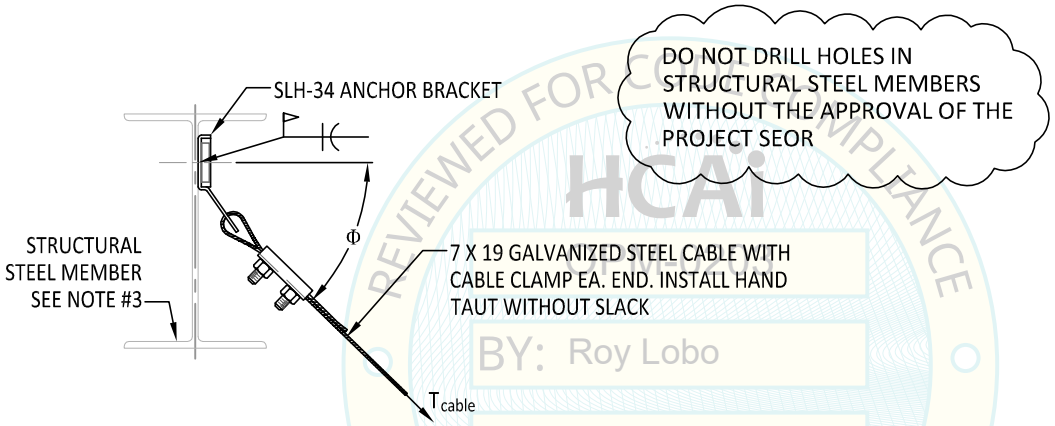
# BOLT OR WELD TO STEEL




| ATTACH-MENT TYPE | A307 BOLT DIAMETER | MIN. INSTALL TORQUE | SLW SIZE | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[11] | | |
|---|---|---|---|---|---|---|
| | | | | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| SS1 | 3/8" | 16 | SLW-38 | 1563 | 1715 | 2055 |
| SS2 | 1/2" | 40 | SLW-12 | 2785 | 3056 | 3663 |
| SS3 | 5/8" | 79 | SLW-58 | 4362 | 4787 | 5737 |
| SS4 | 3/4" | 141 | SLW-34 | 6281 | 6892 | 8259 |

NOTE: MAXIMUM LOADS SHOWN DEVELOPED USING A307 MATERIAL STRENGTHS PER THE AISC STEEL CONSTRUCTION MANUAL, 15th EDITION

*CAPACITIES ARE LRFD




REVIEWED FOR CODE COMPLIANCE
HCAI
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. ALL STRUCTURAL STEEL SHALL BE MINIMUM A36.
2. INSTALL SLH-34 BRACKET WITHIN TOP 1/3 OF BEAM HEIGHT
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WELDING SHALL BE DONE BY ELECTRIC SHIELDED ARC PROCESS USING E-70XX ELECTRODES.
5. ALL WELDING SHALL BE PERFORMED BY A CERTIFIED WELDER.
6. ALL WELDING SHALL BE PERFORMED WITH SPECIAL INSPECTION.
7. ALL WELDING SHALL BE IN COMPLIANCE WITH 2019 CALIFORNIA BUILDING CODE.
8. WELDED ATTACHMENT TO STEEL BEAM SHALL NOT BE PLACED WITHIN PROTECTED ZONE AS DEFINED IN AISC 341.
9. SEE PAGE 4.3 FOR SLH-34 DETAILS
10. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE GREATER THAN 70° FOR CAPACITIES TO BE VALID.
11. MAX TENSION IN BRACE ELEMENT MAY BE LIMITED BY THE CAPACITIES OF THE BRACE ATTACHMENTS, BRACE (CABLE), OR ATTACHMENTS.

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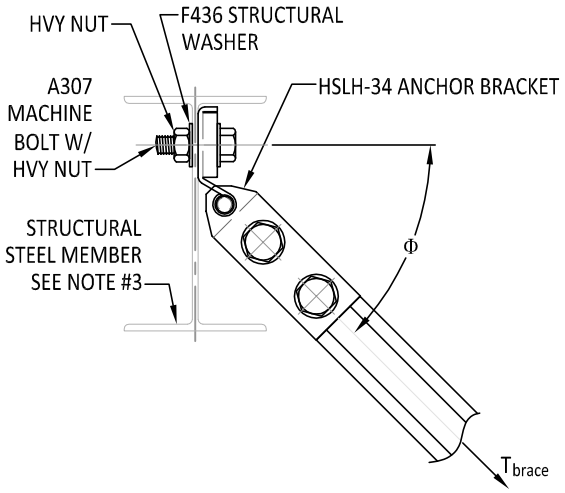
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.24.1**

Date: February 5, 2025

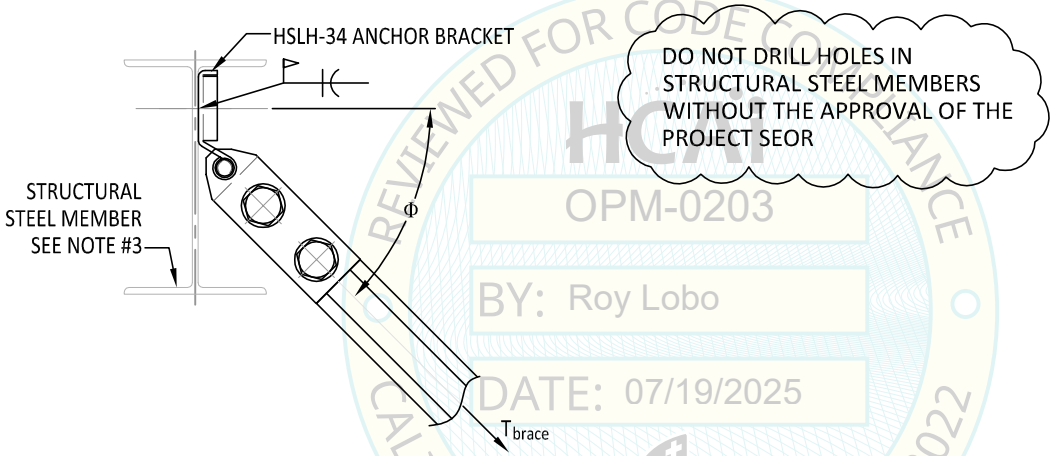
# BOLT OR WELD TO STEEL




| ATTACH-MENT TYPE | A307 BOLT DIAMETER | MIN. INSTALL TORQUE | SLW SIZE | MAX TENSION IN BRACE, "$T_{brace}$", @ ANGLE "Φ"[11] | | |
|---|---|---|---|---|---|---|
| | | | | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤90° |
| SSR1 | 3/8" | 25 | SLW-38 | 1789 | 1935 | 2275 |
| SSR2 | 1/2" | 50 | SLW-12 | 3180 | 3440 | 4045 |
| SSR3 | 5/8" | 65 | SLW-58 | 4969 | 5375 | 6322 |
| SSR4 | 3/4" | 141 | SLW-34 | 7156 | 7740 | 9103 |

NOTE: MAXIMUM LOADS SHOWN DEVELOPED USING A307 MATERIAL STRENGTHS PER THE AISC STEEL CONSTRUCTION MANUAL, 15th EDITION

*CAPACITIES ARE LRFD




REVIEWED FOR CODE COMPLIANCE
HCAI
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. ALL STRUCTURAL STEEL SHALL BE MINIMUM A36.
2. INSTALL HSLH-34 BRACKET WITHIN TOP 1/3 OF BEAM HEIGHT
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WELDING SHALL BE DONE BY ELECTRIC SHIELDED ARC PROCESS USING E-70XX ELECTRODES.
5. ALL WELDING SHALL BE PERFORMED BY A CERTIFIED WELDER.
6. ALL WELDING SHALL BE PERFORMED WITH SPECIAL INSPECTION.
7. ALL WELDING SHALL BE IN COMPLIANCE WITH 2019 CALIFORNIA BUILDING CODE.
8. WELDED ATTACHMENT TO STEEL BEAM SHALL NOT BE PLACED WITHIN PROTECTED ZONE AS DEFINED IN AISC 341.
9. SEE PAGE 2.15.2 FOR STRUT DETAILS.
10. SEE PAGE 4.10 FOR HSLH-34 DETAILS
11. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 30° FOR CAPACITIES TO BE VALID.
12. MAX TENSION IN BRACE MAY BE LIMITED BY THE CAPACITIES OF THE BRACE ATTACHMENTS, BRACE, CHANNEL NUT, OR ATTACHMENTS.

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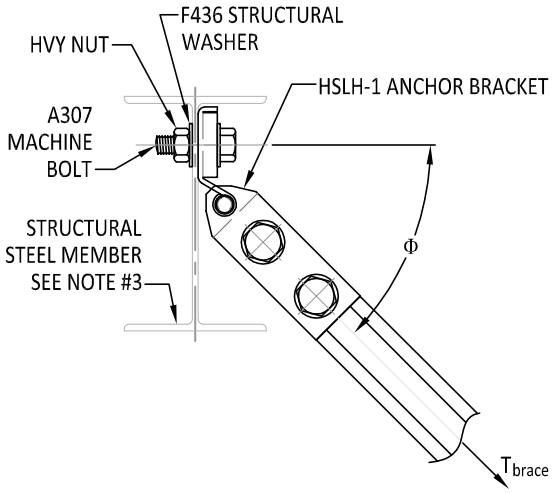
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.24.2**

Date: February 5, 2025

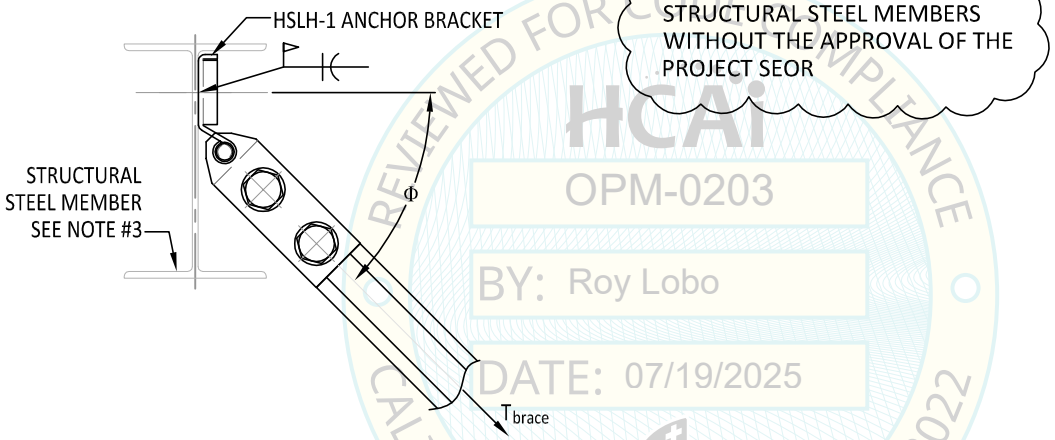
# BOLT OR WELD TO STEEL




| ATTACH-MENT TYPE | A307 BOLT DIAMETER | MIN. INSTALL TORQUE | SLW SIZE | MAX TENSION IN BRACE, "$T_{cable}$", @ ANGLE "Φ"[11] | | |
|---|---|---|---|---|---|---|
| | | | | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| SSR5 | 7/8" | 100 | SLW-78 | 8521 | 9247 | 10922 |
| SSR6 | 1" | 100 | SLW-1 | 11129 | 12077 | 14265 |

NOTE: MAXIMUM LOADS SHOWN DEVELOPED USING A307 MATERIAL STRENGTHS PER THE AISC STEEL CONSTRUCTION MANUAL, 15th EDITION

*CAPACITIES ARE LRFD




REVIEWED FOR CODE COMPLIANCE
HCAI
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. ALL STRUCTURAL STEEL SHALL BE MINIMUM A36.
2. INSTALL HSLH-34 BRACKET WITHIN TOP 1/3 OF BEAM HEIGHT
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. WELDING SHALL BE DONE BY ELECTRIC SHIELDED ARC PROCESS USING E-70XX ELECTRODES.
5. ALL WELDING SHALL BE PERFORMED BY A CERTIFIED WELDER.
6. ALL WELDING SHALL BE PERFORMED WITH SPECIAL INSPECTION.
7. ALL WELDING SHALL BE IN COMPLIANCE WITH 2019 CALIFORNIA BUILDING CODE.
8. WELDED ATTACHMENT TO STEEL BEAM SHALL NOT BE PLACED WITHIN PROTECTED ZONE AS DEFINED IN AISC 341.
9. SEE PAGE 2.15.1 FOR STRUT DETAILS.
10. SEE PAGE 4.12 FOR HSLH-1 DETAILS
11. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 30° FOR CAPACITIES TO BE VALID.
12. MAX TENSION IN RBACE MAY BE LIMITED BY THE CAPACITIES OF THE BRACE ATTACHMENTS, BRACE, CHANNEL NUT, OR ATTACHMENTS.

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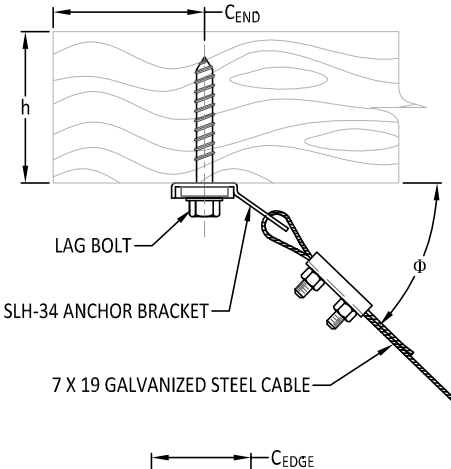
Structural Engineer: N. Tremblay
California PE No. S6481

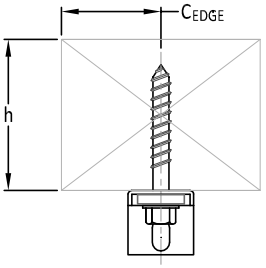
# LAG BOLT TO WOOD MEMBER




## ATTACHMENT WITH (1) LAG BOLT

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$C_{EDGE}$" MIN EDGE. DISTANCE | "$C_{END}$" MIN. END DISTANCE | MIN. LAG BOLT LENGTH | "h" MIN. WOOD THREADS | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[6] | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ<30° | 30°≤Φ≤45° | 45°<Φ≤60° |
| LBW1 | 3/8" | SLW-38 | 1-1/2" | 2-5/8" | 3" | 3-1/2" | 332 | 390 | 473 |
| LBW2 | 1/2" | SLW-12 | 2" | 3-1/2" | 4" | 4-1/2" | 609 | 698 | 743 |
| LBW3 | 5/8" | SLW-58 | 2-1/2" | 4-3/8" | 5" | 5-1/2" | 854 | 979 | 1041 |
| LBW4 | 3/4" | SLW-34 | 3" | 5-1/4" | 6" | 7-1/2" | 1179 | 1343 | 1390 |

NOTE: LOADS ARE DETERMINED USING LRFD DESIGN METHOD AS PRESCRIBED PER THE 2018 NDS.

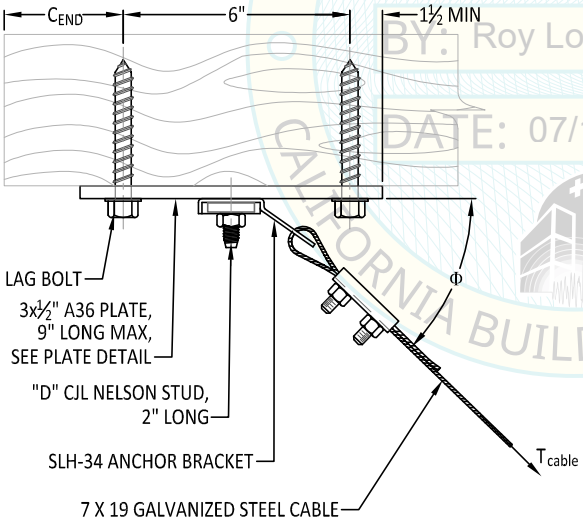



EDGE DISTANCE DETAIL

## ATTACHMENT WITH (2) LAG BOLTS

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$C_{MIN}$" MIN EDGE. DISTANCE | "$C_{END}$" MIN. END DISTANCE | MIN. SPACING BETWEEN BOLTS | MIN. LAG BOLT LENGTH | "h" MIN. WOOD THREADS | "D" SIZE STUD | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[6] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 20°≤Φ<30° | 30°≤Φ≤45° | 45°<Φ≤60° |
| 2LBW1 | 3/8" | SLW-12 | 1-1/2" | 2-5/8" | 1-1/2" | 3" | 3-1/2" | ½" | 593 | 655 | 1296 |
| 2LBW2 | 1/2" | SLW-12 | 2" | 3-1/2" | 2" | 4" | 4-1/2" | ½" | 1125 | 1237 | 2219 |
| 2LBW3 | 5/8" | SLW-12 | 2-1/2" | 4-3/8" | 2-1/2" | 5" | 5-1/2" | ½" | 1604 | 1763 | 3138 |
| 2LBW4 | 3/4" | SLW-58 | 3" | 5-1/4" | 3" | 6" | 7-1/2" | ⅝" | 2238 | 2459 | 4270 |

NOTE: LOADS ARE DETERMINED USING LRFD DESIGN METHOD AS PRESCRIBED PER THE 2018 NDS.



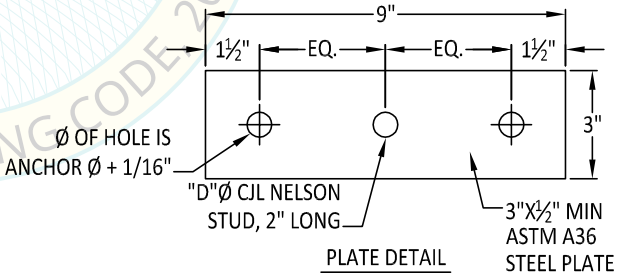




PLATE DETAIL

NOTES:
1. LOADS FOR LAG BOLT ATTACHMENTS ARE DERIVED FROM 2019 CBC AND 2018 NDS FOR WOOD WITH A MINIMUM SPECIFIC GRAVITY = 0.50 (I.E. DOUGLAS FIR-LARCH OR EQUAL), MIN. CONSTRUCTION GRADE. WOOD MEMBER LOADED PERPENDICULAR TO GRAIN.
2. MINIMUM WOOD MEMBER SIZE TO MEET THE EDGE, END, AND DEPTH REQUIREMENTS AS SPECIFIED IN THE TABLES ABOVE.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. FASTENERS SHALL BE A307 BOLTS OR BETTER.
5. SEE PAGE 4.4 FOR SLH-34 DETAILS.
6. $\Phi = 90° -$ ANGLE "x" OF CABLE FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.
7. MAX TENSION IN BRACE ELEMENT MAY BE LIMITED BY THE CAPACITIES OF THE BRACE ATTACHMENTS, BRACE (CABLE), OR ATTACHMENTS.)


REVIEWED FOR CODE COMPLIANCE
ICC-ES
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022



Vibrex® vibration & seismic control systems
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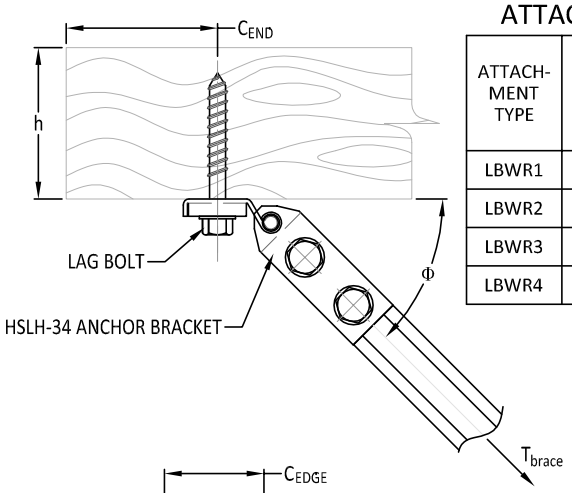
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.25.1**

Date: February 5, 2025

# LAG BOLT TO WOOD MEMBER

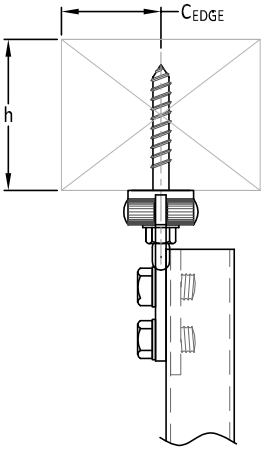
## ATTACHMENT WITH (1) LAG BOLT




| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$C_{EDGE}$" MIN EDGE. DISTANCE | "$C_{END}$" MIN. END DISTANCE | MIN. LAG BOLT LENGTH | "h" MIN. WOOD THREADS | MAX TENSION IN BRACE, "$T_{brace}$", @ ANGLE "Φ"[6] | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 30°≤Φ<45° | 45°≤Φ≤60° | 60°<Φ≤90° |
| LBWR1 | 3/8" | SLW-38 | 1-1/2" | 2-5/8" | 3" | 3-1/2" | 336 | 393 | 510 |
| LBWR2 | 1/2" | SLW-12 | 2" | 3-1/2" | 4" | 4-1/2" | 615 | 701 | 806 |
| LBWR3 | 5/8" | SLW-58 | 2-1/2" | 4-3/8" | 5" | 5-1/2" | 861 | 983 | 1130 |
| LBWR4 | 3/4" | SLW-34 | 3" | 5-1/4" | 6" | 7-1/2" | 1188 | 1348 | 1510 |

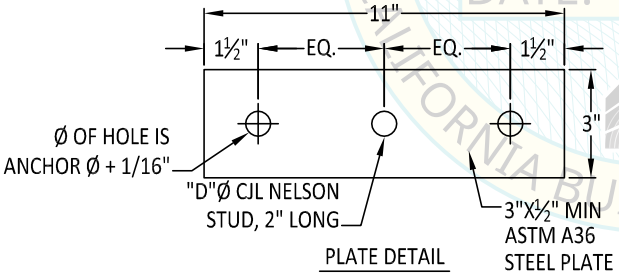
NOTE: LOADS ARE DETERMINED USING LRFD DESIGN METHOD AS PRESCRIBED PER THE 2018 NDS.

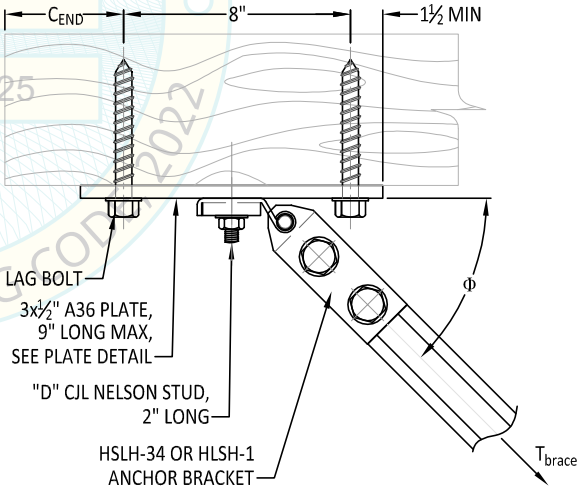
## ATTACHMENT WITH (2) LAG BOLTS




| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE[7] | "$C_{MIN}$" MIN EDGE. DISTANCE | "$C_{END}$" MIN. END DISTANCE | MIN. SPACING BETWEEN BOLTS | MIN. LAG BOLT LENGTH | "h" MIN. WOOD THREADS | "D" SIZE STUD[7] | MAX TENSION IN BRACE, "$T_{brace}$", @ ANGLE "Φ"[6] | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | 30°≤Φ<45° | 45°≤Φ≤60° | 60°<Φ≤90° |
| 2LBWR1 | 3/8" | SLW-12 | 1-1/2" | 2-5/8" | 1-1/2" | 3" | 3-1/2" | ½" | 573 | 693 | 1222 |
| 2LBWR2 | 1/2" | SLW-12 | 2" | 3-1/2" | 2" | 4" | 4-1/2" | ½" | 1086 | 1288 | 2028 |
| 2LBWR3 | 5/8" | SLW-12 | 2-1/2" | 4-3/8" | 2-1/2" | 5" | 5-1/2" | ½" | 1548 | 1831 | 2861 |
| 2LBWR4 | 3/4" | SLW-58 | 3" | 5-1/4" | 3" | 6" | 7-1/2" | ⅝" | 2160 | 2544 | 3867 |

NOTE: LOADS ARE DETERMINED USING LRFD DESIGN METHOD AS PRESCRIBED PER THE 2018 NDS.




NOTES:
1. LOADS FOR LAG BOLT ATTACHMENTS ARE DERIVED FROM 2019 CBC AND 2018 NDS FOR WOOD WITH A MINIMUM SPECIFIC GRAVITY = 0.50 (I.E. DOUGLAS FIR-LARCH OR EQUAL), MIN. CONSTRUCTION GRADE. WOOD MEMBER LOADED PERPENDICULAR TO GRAIN.
2. MINIMUM WOOD MEMBER SIZE TO MEET THE EDGE, END, AND DEPTH REQUIREMENTS AS SPECIFIED IN THE TABLES ABOVE.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. FASTENERS SHALL BE A307 BOLTS OR BETTER.
5. SEE PAGE 4.11 FOR HSLH-34 DETAILS & 4.12 FOR HSLH-1 DETAILS.
6. $\Phi = 90° -$ ANGLE "x" OF BRACE FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 30° FOR CAPACITIES TO BE VALID.
7. FOR HSLH-1 BRACKETS USE SLW-78 AND ⅞" CJL NELSON STUDS FOR THE ANCHOR PLATE.
8. MAX TENSION IN BRACE ELEMENT MAY BE LIMITED BY THE CAPACITIES OF THE BRACE ATTACHMENTS, BRACE, OR ATTACHMENTS.

REVIEWED FOR CODE COMPLIANCE
ICC-ES
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
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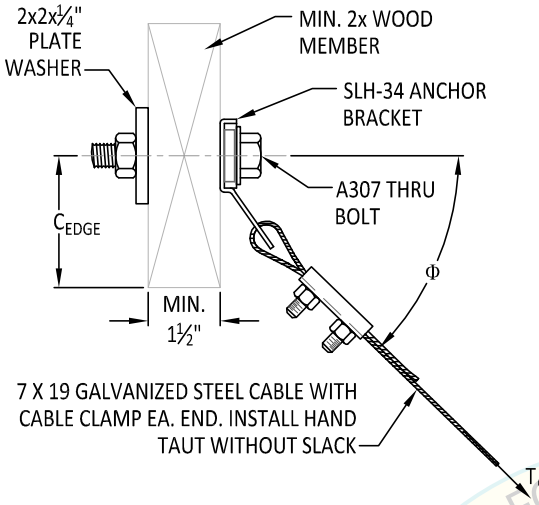
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.25.2**

Date: February 5, 2025

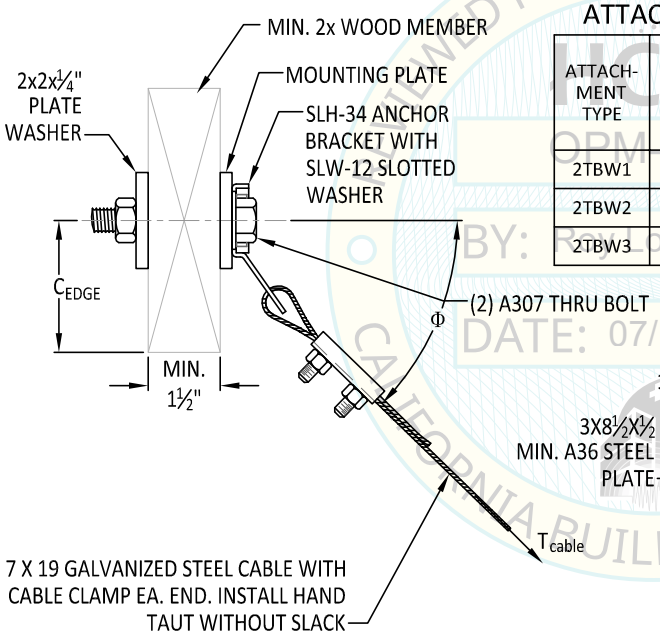
# THRU-BOLT PERPENDICULAR TO WOOD MEMBER




## ATTACHMENT WITH (1) THRU BOLT

| ATTACH-MENT TYPE | ANCHOR DIA. | "$C_{EDGE}$" MIN. EDGE DISTANCE | "$C_{END}$" MIN. END DISTANCE | TIGHTENING TORQUE (ft-lbs) | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[7] | | |
|---|---|---|---|---|---|---|---|
| | | | | | 20°≤Φ<30° | 30°≤Φ≤45° | 45°<Φ≤60° |
| TBW1 | 1/2" | 2" | 3-1/2" | 50 | 756 | 618 | 569 |
| TBW2 | 5/8" | 2-1/2" | 4-3/8" | 65 | 879 | 717 | 661 |
| TBW3 | 3/4" | 3" | 5-1/4" | 65 | 1025 | 837 | 771 |

NOTE: LOADS ARE DETERMINED USING LRFD DESIGN METHOD AS PRESCRIBED PER THE 2018 NDS.




## ATTACHMENT WITH (2) THRU BOLTS

| ATTACH-MENT TYPE | ANCHOR DIA. | "$C_{EDGE}$" MIN. EDGE DISTANCE | "$C_{END}$" MIN. END DISTANCE | MIN. SPACING BETWEEN BOLTS | TIGHTENING TORQUE (ft-lbs) | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[7] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 30°≤Φ<45° | 45°≤Φ<60° | 60°≤Φ≤70° |
| 2TBW1 | 1/2" | 2" | 3-1/2" | 2" | 50 | 1513 | 1236 | 1139 |
| 2TBW2 | 5/8" | 2-1/2" | 4-3/8" | 2-1/2" | 65 | 1757 | 1435 | 1322 |
| 2TBW3 | 3/4" | 3" | 5-1/4" | 3" | 65 | 2050 | 1674 | 1543 |

NOTE: LOADS ARE DETERMINED USING LRFD DESIGN METHOD AS PRESCRIBED PER THE 2018 NDS.

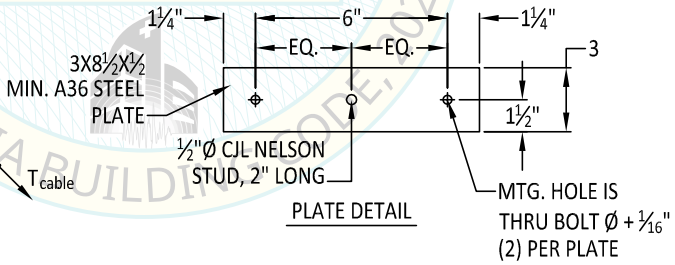



PLATE DETAIL

REVIEWED FOR CODE COMPLIANCE
HCAI
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:
1. BOLT HOLES SHALL BE BORED 1/16" LARGER THAN THE NOMINAL BOLT DIAMETER.
2. LOADS FOR THRU-BOLT ATTACHMENTS ARE DERIVED FROM 2019 CBC AND 2018 NDS FOR WOOD WITH A MINIMUM SPECIFIC GRAVITY = 0.50 (I.E. DOUGLAS FIR-LARCH) AND GRADE NO.2. WOOD MEMBER LOADED PERPENDICULAR TO GRAIN.
3. MINIMUM BEAM SIZE TO MEET THE DIMENSIONAL REQUIREMENTS SHOWN IN THE FIGURES AND TABLES ABOVE.
4. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
5. FASTENERS SHALL BE A307 BOLTS OR BETTER.
6. SEE PAGE 4.4 FOR SLH-34 DETAILS.
7. $\Phi = 90° -$ ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE EXCEED 70° FOR CAPACITIES TO BE VALID.

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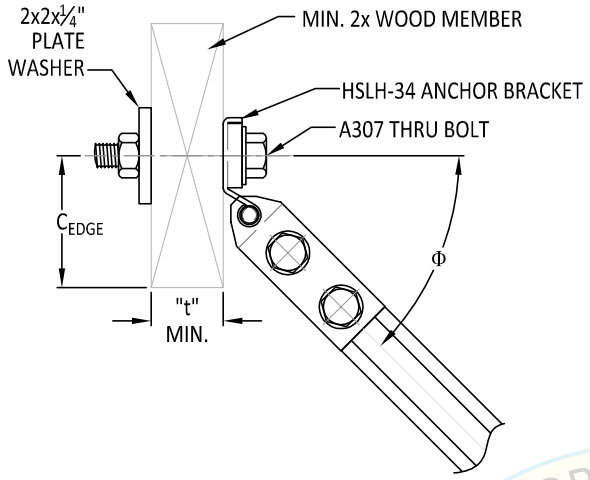
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 3.26.1
Date: February 5, 2025

07/19/2025 OPM-0203: Reviewed for Code Compliance by Roy Lobo 268 of 337

# THRU-BOLT PERPENDICULAR TO WOOD MEMBER

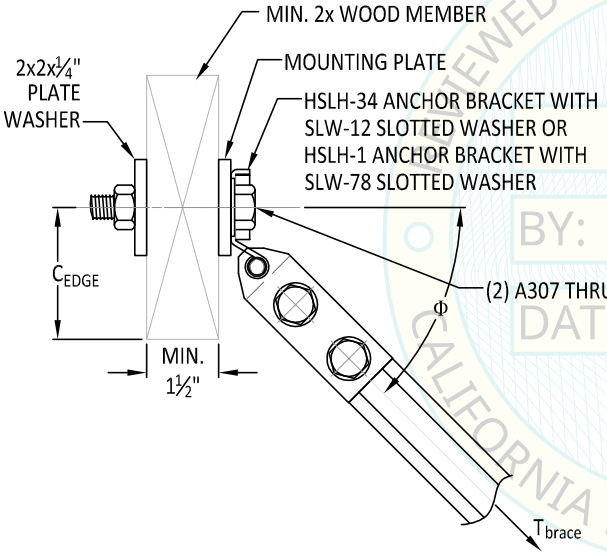
## ATTACHMENT WITH (1) THRU BOLT




| ATTACH-MENT TYPE | ANCHOR DIA. | "$C_{EDGE}$" MIN EDGE. DISTANCE | "$C_{END}$" MIN. END DISTANCE | "t" MIN THICK-NESS | TIGHTENING TORQUE (ft-lbs) | MAX TENSION IN BRACE, "$T_{brace}$", @ ANGLE "Φ"[7] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 30°≤Φ<45° | 45°≤Φ≤60° | 60°<Φ≤70° |
| TBWR1 | 1/2" | 2" | 3-1/2" | 1-1/2" | 50 | 946 | 772 | 712 |
| TBWR2 | 5/8" | 2-1/2" | 4-3/8" | 1-1/2" | 65 | 1099 | 897 | 827 |
| TBWR3 | 3/4" | 3" | 5-1/4" | 1-1/2" | 65 | 1282 | 1047 | 965 |
| TBWR2 | 7/8" | 3-1/2" | 6-1/8" | 2-1/2" | 100 | 1322 | 1080 | 995 |
| TBWR3 | 1" | 4" | 7" | 3-1/2" | 100 | 1373 | 1121 | 1033 |

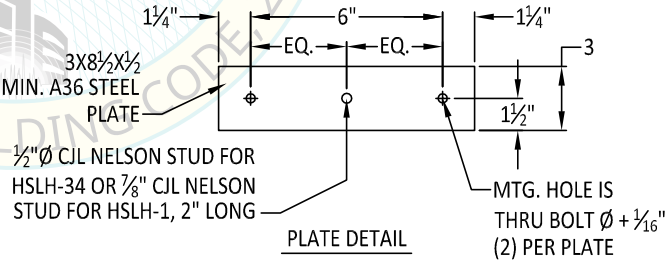
NOTE: LOADS ARE DETERMINED USING LRFD DESIGN METHOD AS PRESCRIBED PER THE 2018 NDS.

## ATTACHMENT WITH (2) THRU BOLTS




| ATTACH-MENT TYPE | ANCHOR DIA. | "$C_{EDGE}$" MIN EDGE. DISTANCE | "$C_{END}$" MIN. END DISTANCE | MIN. SPACING BETWEEN BOLTS | TIGHTENING TORQUE (ft-lbs) | MAX TENSION IN BRACE, "$T_{brace}$", @ ANGLE "Φ"[7] | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 30°≤Φ<45° | 45°≤Φ≤60° | 60°≤Φ≤70° |
| 2TBWR1 | 1/2" | 2" | 3-1/2" | 2" | 50 | 1892 | 1545 | 1424 |
| 2TBWR2 | 5/8" | 2-1/2" | 4-3/8" | 2-1/2" | 65 | 2197 | 1794 | 1653 |
| 2TBWR3 | 3/4" | 3" | 5-1/4" | 3" | 65 | 2564 | 2093 | 1929 |

NOTE: LOADS ARE DETERMINED USING LRFD DESIGN METHOD AS PRESCRIBED PER THE 2018 NDS.




REVIEWED FOR CODE COMPLIANCE
ICAI
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

NOTES:
1. BOLT HOLES SHALL BE BORED 1/16" LARGER THAN THE NOMINAL BOLT DIAMETER.
2. LOADS FOR THRU-BOLT ATTACHMENTS ARE DERIVED FROM 2019 CBC AND 2018 NDS FOR WOOD WITH A MINIMUM SPECIFIC GRAVITY = 0.50 (I.E. DOUGLAS FIR-LARCH) AND GRADE NO.2.
3. MINIMUM BEAM SIZE TO MEET THE DIMENSIONAL REQUIREMENTS SHOWN IN THE FIGURES AND TABLES ABOVE.
4. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
5. FASTENERS SHALL BE A307 BOLTS OR BETTER.
6. SEE PAGE 4.11 FOR HSLH-34 DETAILS & PAGE 4.12 FOR HSLH-1 DETAILS.
7. $\Phi = 90° -$ ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT LESS THAN 30° FOR CAPACITIES TO BE VALID.

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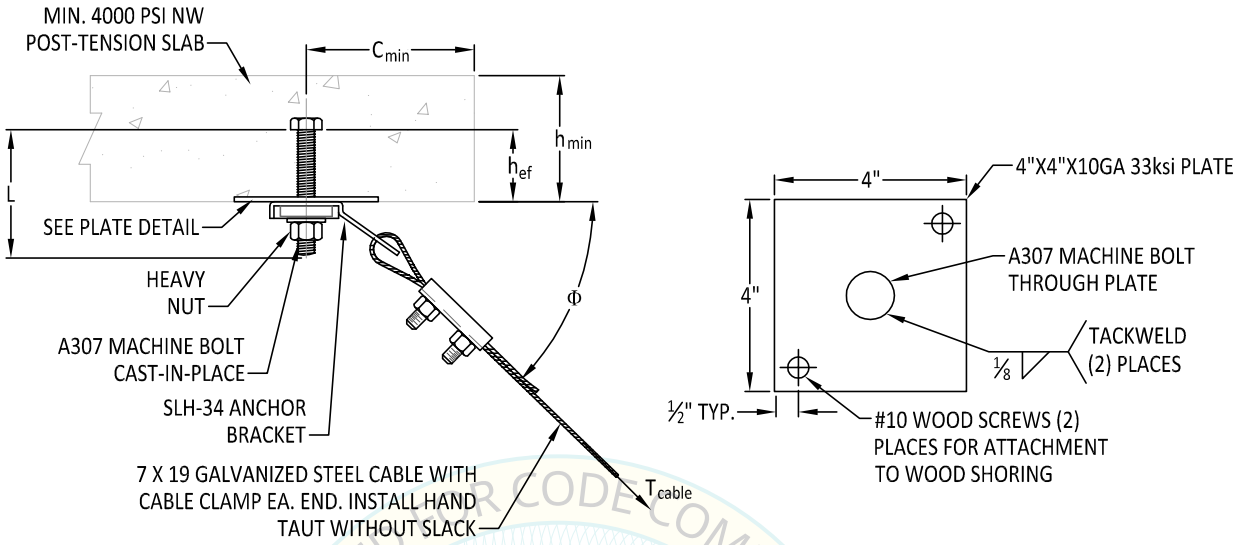
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.26.2**

Date: February 5, 2025

# CAST-IN-PLACE BOLT IN MIN. 4000 PSI POST-TENSION CONCRETE SLAB




| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | "L" LENGTH OF BOLT FOR ASSEMBLY | MAX TENSION IN CABLE, "$T_{cable}$", @ ANGLE "Φ"[4] | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20°≤Φ≤30° | 30°<Φ≤45° | 45°<Φ≤60° |
| CIP1 | 3/8" | SLW-38 | 2-1/2" | 4" | 4" | 4" | 714 | 576 | 513 |
| CIP2 | 1/2" | SLW-12 | 3" | 5" | 5" | 5" | 1139 | 928 | 831 |
| CIP3 | 5/8" | SLW-58 | 4" | 7" | 6" | 6" | 1908 | 1510 | 1324 |
| CIP4 | 3/4" | SLW-34 | 5" | 8" | 7-1/2" | 7" | 2684 | 2119 | 1855 |
| CIP5 | 3/4" | SLW-34 | 6-5/8" | 10" | 10" | 10" | 3477 | 2690 | 2323 |

REVIEWED FOR CODE COMPLIANCE BY HCAi OPM-0203 UPDATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN CABLE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
3. SEE PAGE 4.4 FOR SLH-34 DETAILS.
4. Φ = 90° – ANGLE OF CABLE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 20° FOR CAPACITIES TO BE VALID.

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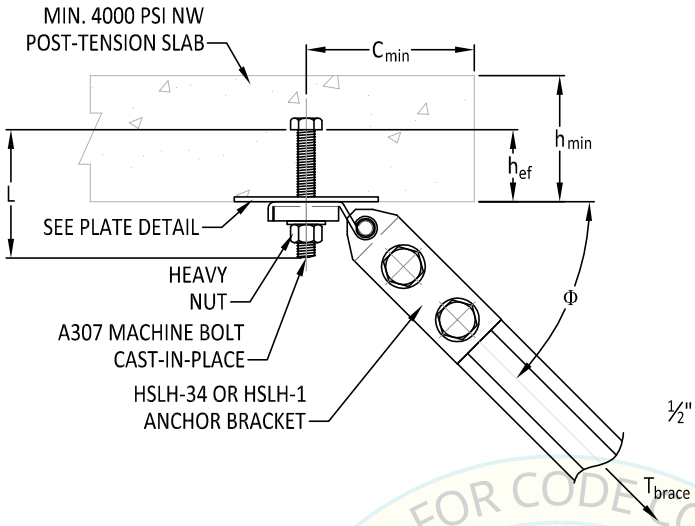
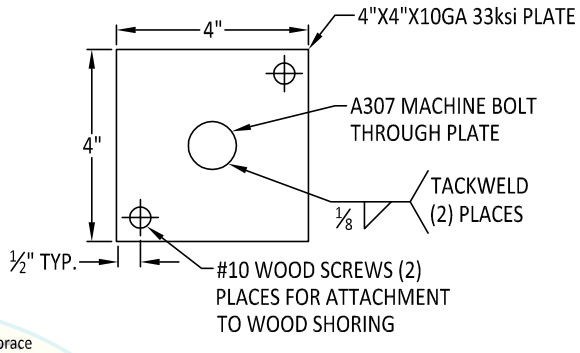
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 3.27.1

Date: February 5, 2025

# CAST-IN-PLACE BOLT IN MIN. 4000 PSI POST-TENSION CONCRETE SLAB




REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY ROY LOBO
UPDATE: 07/19/2025
CITY OF LA BUILDING CODE

| ATTACH-MENT TYPE | ANCHOR DIA. | SLW SIZE | "$h_{ef}$" EFFECTIVE EMBED. | "$C_{a1}$ & $C_{a2}$" MIN. EDGE DISTANCE | "$h_{min}$" MIN. CONC. THICKNESS | "L" LENGTH OF BOLT FOR ASSEMBLY | MAX TENSION IN BRACE, "$T_{cable}$", @ ANGLE "Φ"[4] | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 30°≤Φ<45° | 45°≤Φ≤60° | 60°<Φ≤90° |
| CIPR1 | 3/8" | SLW-38 | 2-1/2" | 4" | 4" | 4" | 795 | 653 | 588 |
| CIPR2 | 1/2" | SLW-12 | 3" | 5" | 5" | 5" | 1266 | 1049 | 951 |
| CIPR3 | 5/8" | SLW-58 | 4" | 7" | 6" | 6" | 2142 | 1720 | 1524 |
| CIPR4 | 3/4" | SLW-34 | 5" | 8" | 7-1/2" | 7" | 3015 | 2415 | 2136 |
| CIPR5 | 3/4" | SLW-34 | 6-5/8" | 10" | 10" | 10" | 3934 | 3082 | 2683 |
| CIPR6 | 7/8" | SLW-78 | 7" | 10" | 10" | 10" | 3873 | 3211 | 2912 |
| CIPR7 | 1" | SLW-1 | 8" | 12" | 10" | 11" | 4769 | 4023 | 3697 |

NOTES:
1. OVER STRENGTH FACTOR $\Omega_0$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS USED IN DETERMINING THE MAXIMUM DESIGN BRACE TENSION VALUES SHOWN. TO OBTAIN LOAD ON THE ANCHORAGE MULTIPLY THE TABULATED VALUES BY 2.0.
2. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
3. SEE PAGE 4.11 FOR HSLH-34 DETAILS & PAGE 4.12 FOR HSLH-1.
4. Φ = 90° – ANGLE OF BRACE "x" FROM SECTION 2 DETAILS. Φ MUST NOT BE LESS THAN 30° FOR CAPACITIES TO BE VALID.

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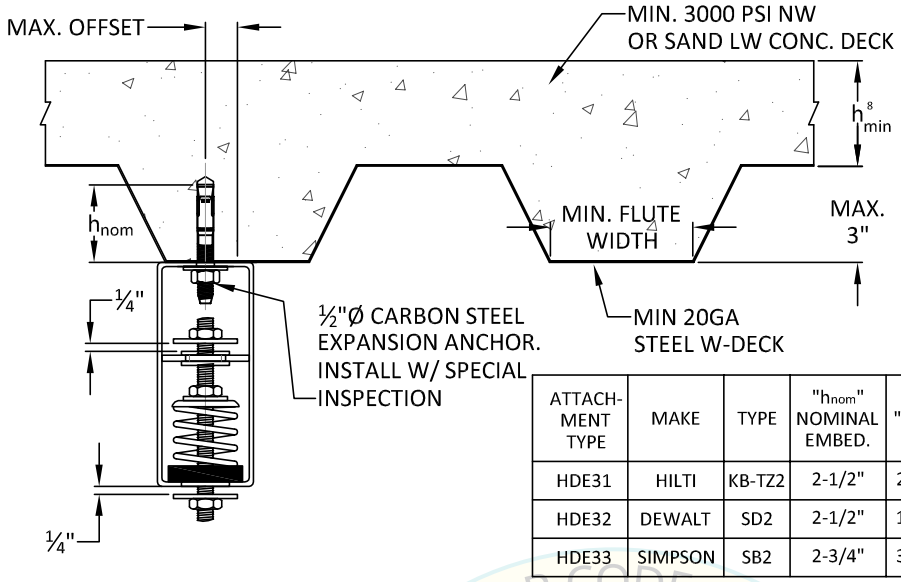
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.27.2**

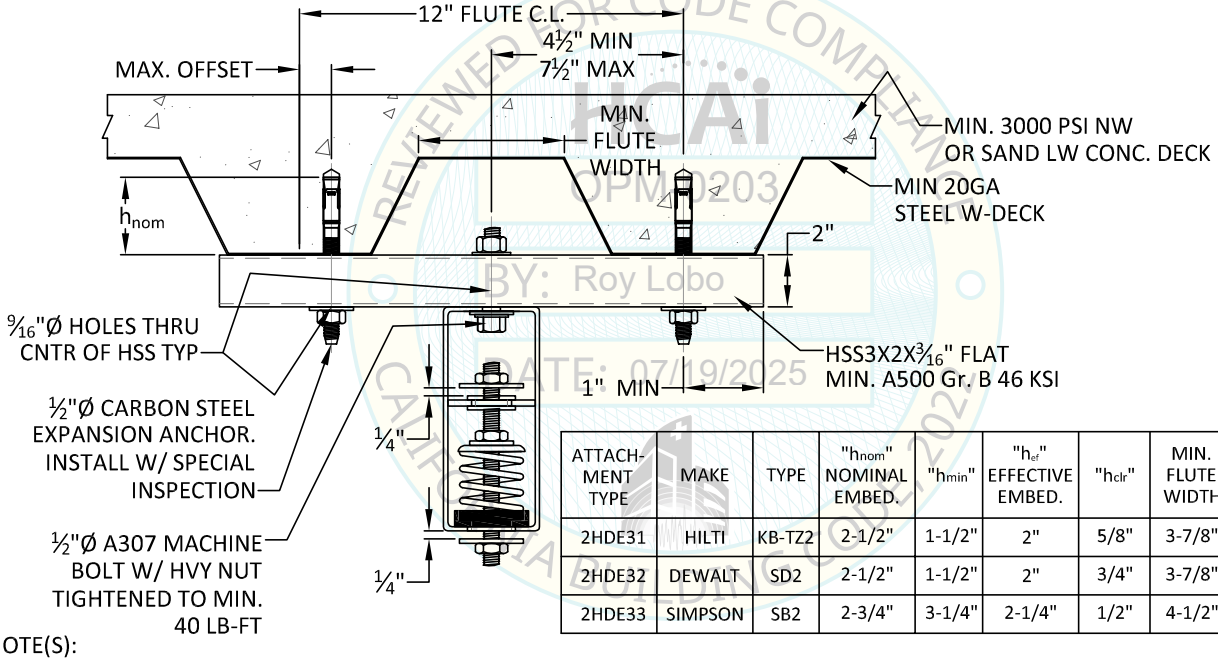
Date: February 5, 2025

# HANGER BOX ATTACHMENT OPTIONS - LOWER FLUTE ONLY




DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

| ATTACH-MENT TYPE | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{min}$"[8] | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{clr}$" | MIN. FLUTE WIDTH | MAX OFFSET | MAX BOLT TENSION[3] 1 BOLT |
|---|---|---|---|---|---|---|---|---|---|
| HDE31 | HILTI | KB-TZ2 | 2-1/2" | 2-1/2" | 2" | 5/8" | 3-7/8" | 15/16" | 1041 lbs |
| HDE32 | DEWALT | SD2 | 2-1/2" | 1-1/2" | 2" | 3/4" | 3-7/8" | 15/16" | 714 lbs |
| HDE33 | SIMPSON | SB2 | 2-3/4" | 3-1/4" | 2-1/4" | 1/2" | 4-1/2" | 1" | 995 lbs |




| ATTACH-MENT TYPE | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{min}$" | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{clr}$" | MIN. FLUTE WIDTH | MAX OFFSET | MAX BOLT TENSION[3] 2 BOLT |
|---|---|---|---|---|---|---|---|---|---|
| 2HDE31 | HILTI | KB-TZ2 | 2-1/2" | 1-1/2" | 2" | 5/8" | 3-7/8" | 15/16" | 1666 lbs |
| 2HDE32 | DEWALT | SD2 | 2-1/2" | 1-1/2" | 2" | 3/4" | 3-7/8" | 15/16" | 1142 lbs |
| 2HDE33 | SIMPSON | SB2 | 2-3/4" | 3-1/4" | 2-1/4" | 1/2" | 4-1/2" | 1" | 1592 lbs |

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NOTE(S):
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS INCLUDED FOR ANCHORAGE TO CONCRETE. WHEN DESIGNING ANCHORAGE AS SHOWN $\Omega_0$ MUST BE TAKEN INTO ACCOUNT IN DETERMINING THE FINAL DESIGN SPRING HANGER AND/OR ROD TENSION (TYPICALLY FOR OVERTURNING ACTION OF SUSPENDED EQUIPMENT OR DUCT.)
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023), ESR-2502 (2023), OR ESR-3037 (2023).
3. MAX. DESIGN RATING IS THE LESSER OF THE LOAD CAPACITY SHOWN OR THE SEISMIC LOAD RATING OF HANGER BOX (1,200 LBS).
4. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
5. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.1 FOR HANGER BOX DETAILS.
8. FILL THICKNESS MUST NOT BE LESS THAN THE VALUE OF $h_{min}$ LISTED AND MUST BE THICK ENOUGH TO ACCOMMODATE THE ANCHOR EMBEDMENT PLUS THE VALUE OF $h_{clr}$.
9. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.

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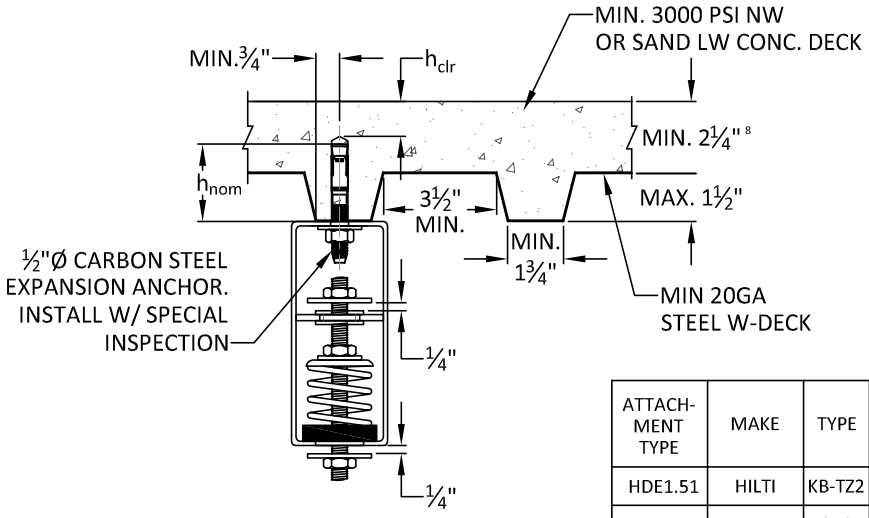
California PE No. S6481

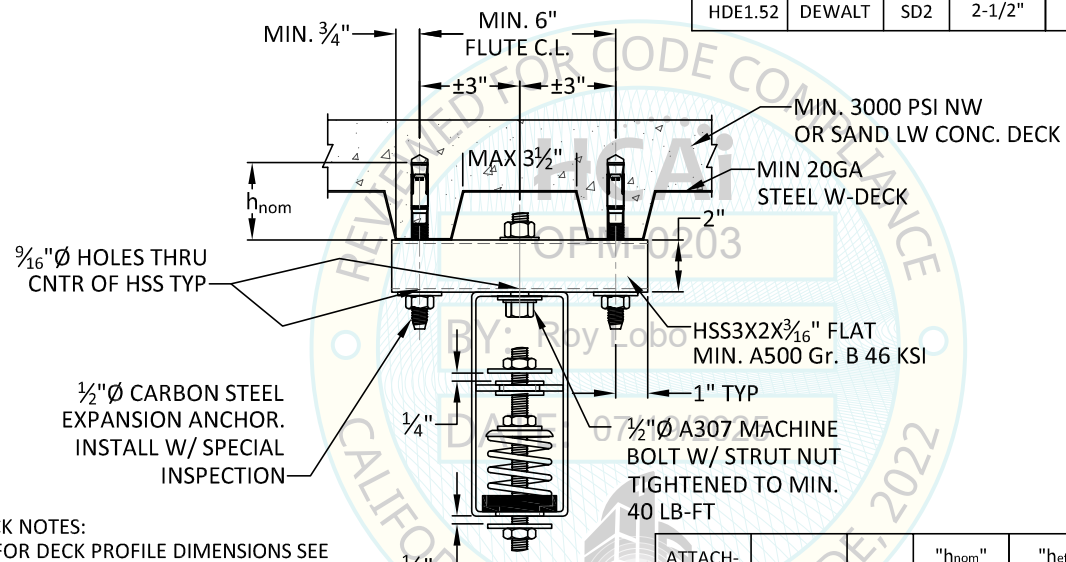
Page No.: **3.28**

Date: February 5, 2025

# HANGER BOX ATTACHMENT OPTIONS - LOWER FLUTE ONLY




| ATTACH-MENT TYPE | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{clr}$" | MAX BOLT TENSION [3] |
|---|---|---|---|---|---|---|
| | | | | | | 1 BOLT |
| HDE1.51 | HILTI | KB-TZ2 | 2-1/2" | 2" | 5/8" | 722 lbs |
| HDE1.52 | DEWALT | SD2 | 2-1/2" | 2" | 1" | 700 lbs |




DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.

| ATTACH-MENT TYPE | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{clr}$" | MAX BOLT TENSION [3] |
|---|---|---|---|---|---|---|
| | | | | | | 2 BOLT |
| 2HDE1.51 | HILTI | KB-TZ2 | 2-1/2" | 2" | 5/8" | 1400 lbs |
| 2HDE1.52 | DEWALT | SD2 | 2-1/2" | 2" | 1" | 1400 lbs |

NOTE(S):
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS INCLUDED FOR ANCHORAGE TO CONCRETE. WHEN DESIGNING ANCHORAGE AS SHOWN $\Omega_0$ MUST BE TAKEN INTO ACCOUNT IN DETERMINING THE FINAL DESIGN SPRING HANGER AND/OR ROD TENSION (TYPICALLY FOR OVERTURNING ACTION OF SUSPENDED EQUIPMENT OR DUCT.)
2. INSTALL WEDGE ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023), OR ESR-2502 (2023).
3. MAX. DESIGN RATING IS THE LESSER OF THE LOAD CAPACITY SHOWN OR THE SEISMIC LOAD RATING OF HANGER BOX (1,200 LBS).
4. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
5. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
6. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
7. SEE PAGE 4.1 FOR HANGER BOX DETAILS.
8. FILL THICKNESS MUST NOT BE LESS THAN THE VALUE LISTED AND MUST BE THICK ENOUGH TO ACCOMMODATE THE ANCHOR EMBEDMENT PLUS THE VALUE OF $h_{clr}$.
9. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.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DATE: 07/19/2025
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California PE No. S6481


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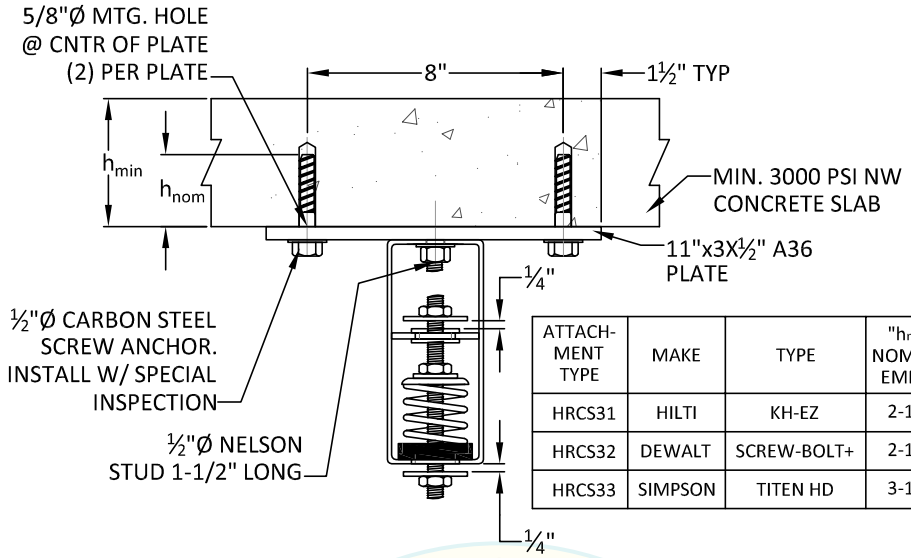
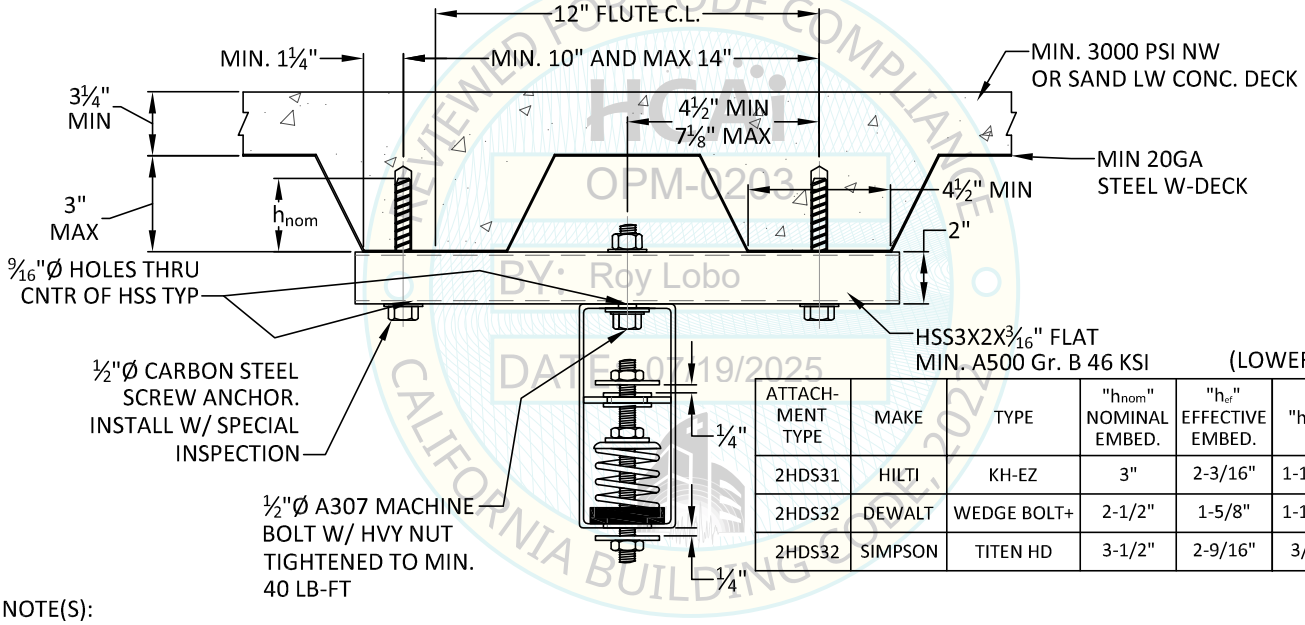
Date: **February 5, 2025**

# HANGER BOX ATTACHMENT OPTIONS




| ATTACH-MENT TYPE | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" MIN. CONC. THICKNESS | MAX BOLT TENSION FOR 2 BOLTS[3] |
|---|---|---|---|---|---|---|
| HRCS31 | HILTI | KH-EZ | 2-1/4" | 1-1/2" | 4-1/2" | 1702 lbs |
| HRCS32 | DEWALT | SCREW-BOLT+ | 2-1/2" | 1-3/4" | 4-1/2" | 1452 lbs |
| HRCS33 | SIMPSON | TITEN HD | 3-1/4" | 2-3/8" | 5" | 3270 lbs |




| ATTACH-MENT TYPE | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{clr}$" | MAX BOLT[3] TENSION FOR 2 BOLTS |
|---|---|---|---|---|---|---|
| 2HDS31 | HILTI | KH-EZ | 3" | 2-3/16" | 1-1/4" | 1505 lbs |
| 2HDS32 | DEWALT | WEDGE BOLT+ | 2-1/2" | 1-5/8" | 1-1/4" | 1022 lbs |
| 2HDS32 | SIMPSON | TITEN HD | 3-1/2" | 2-9/16" | 3/4" | 1592 lbs |

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DATE: 07/19/2025
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NOTE(S):

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS INCLUDED FOR ANCHORAGE TO CONCRETE. WHEN DESIGNING ANCHORAGE AS SHOWN $\Omega_0$ MUST BE TAKEN INTO ACCOUNT IN DETERMINING THE FINAL DESIGN SPRING HANGER AND/OR ROD TENSION (TYPICALLY FOR OVERTURNING ACTION OF SUSPENDED EQUIPMENT OR DUCT.)
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023), ESR-2526 (2023), OR ESR-2713 (2023).
3. MAX. DESIGN RATING IS THE LESSER OF THE LOAD CAPACITY SHOWN OR THE SEISMIC LOAD RATING OF HANGER BOX (1,200 LBS.)
4. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
5. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
6. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
7. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS ARE ALONG THE FLUTE LENGTH.
8. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT 1/8" PER ICC-ESR.
9. SEE PAGE 4.1 FOR HANGER BOX DETAILS.
10. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.

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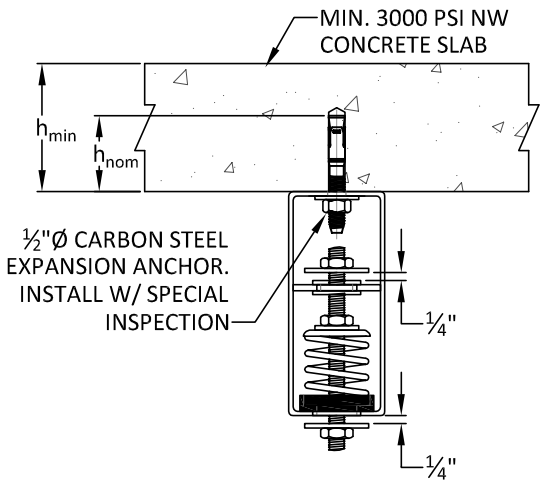
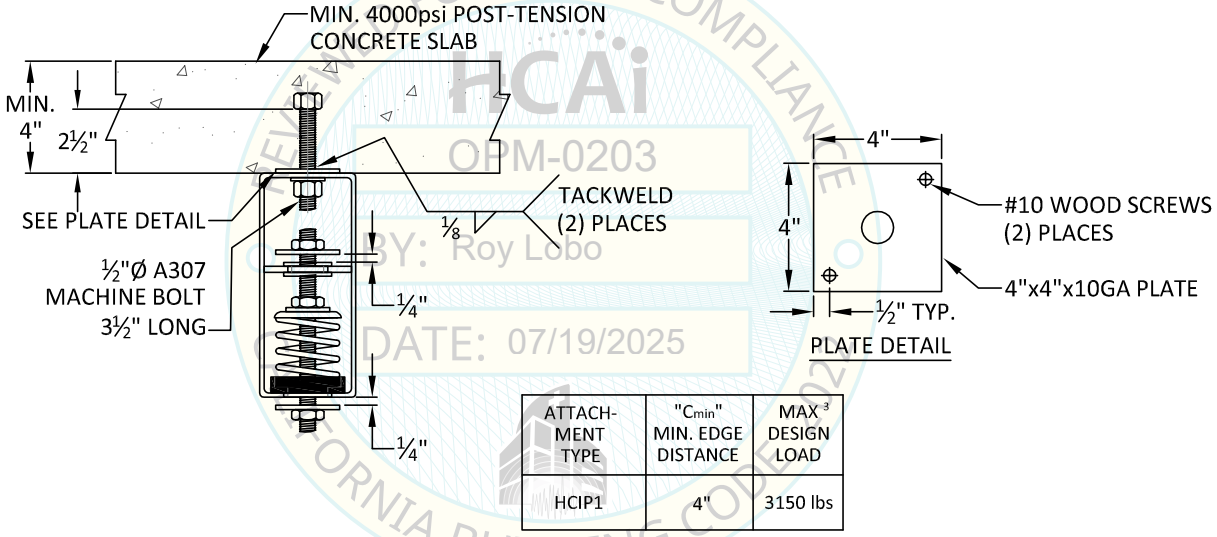
Date: **February 5, 2025**

# HANGER BOX ATTACHMENT OPTIONS




| ATTACH-MENT TYPE | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" MIN. CONC. THICKNESS | "$C_{min}$" MIN. EDGE DISTANCE | MAX [3] DESIGN LOAD |
|---|---|---|---|---|---|---|---|
| HRCE31 | HILTI | KB-TZ2 | 2-1/2" | 2" | 4" | 5-1/2" | 1586 lbs |
| HRCE32 | DEWALT | SD2 | 2-1/2" | 2" | 4-1/2" | 8" | 1284 lbs |
| HRCE32 | SIMPSON | SB2 | 2-3/4" | 2-1/4" | 4-1/2" | 7" | 1532 lbs |




| ATTACH-MENT TYPE | "$C_{min}$" MIN. EDGE DISTANCE | MAX [3] DESIGN LOAD |
|---|---|---|
| HCIP1 | 4" | 3150 lbs |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DATE: 07/19/2025


NOTE(S):

1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS INCLUDED FOR ANCHORAGE TO CONCRETE. WHEN DESIGNING ANCHORAGE AS SHOWN $\Omega_0$ MUST BE TAKEN INTO ACCOUNT IN DETERMINING THE FINAL DESIGN SPRING HANGER AND/OR ROD TENSION (TYPICALLY FOR OVERTURNING ACTION OF SUSPENDED EQUIPMENT OR DUCT.)
2. INSTALL ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-4266 (2023), ESR-2502 (2023), OR ESR-3037 (2023)
3. MAX. DESIGN RATING IS THE LESSER OF THE LOAD CAPACITY SHOWN OR THE SEISMIC LOAD RATING OF HANGER BOX (1,200 LBS).
4. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
5. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
6. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
7. SEE PAGE 4.1 FOR HANGER BOX DETAILS.
8. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.


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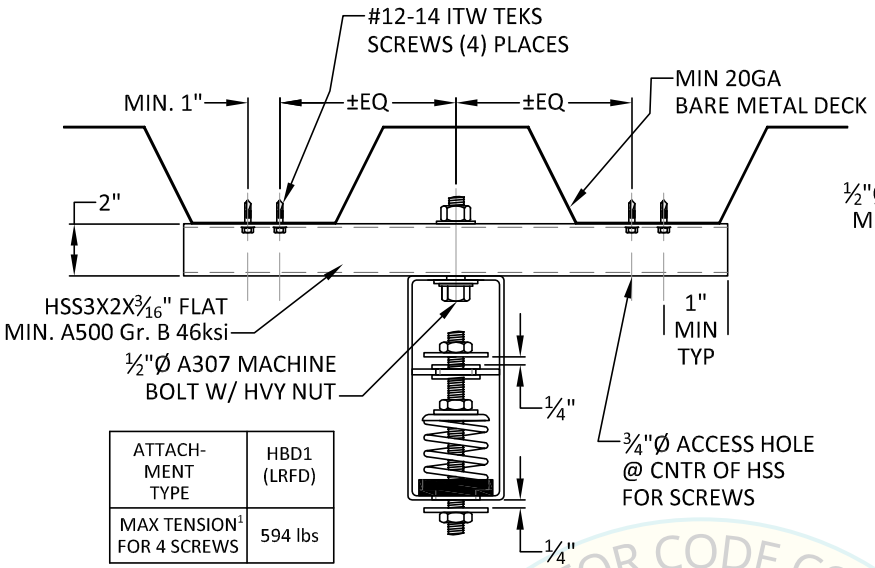
**Structural Engineer: N. Tremblay**
**California PE No. S6481**

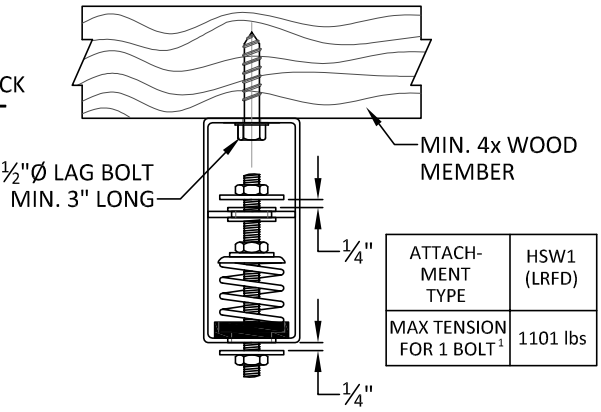
**Page No.:** **3.31**

**Date:** **February 5, 2025**

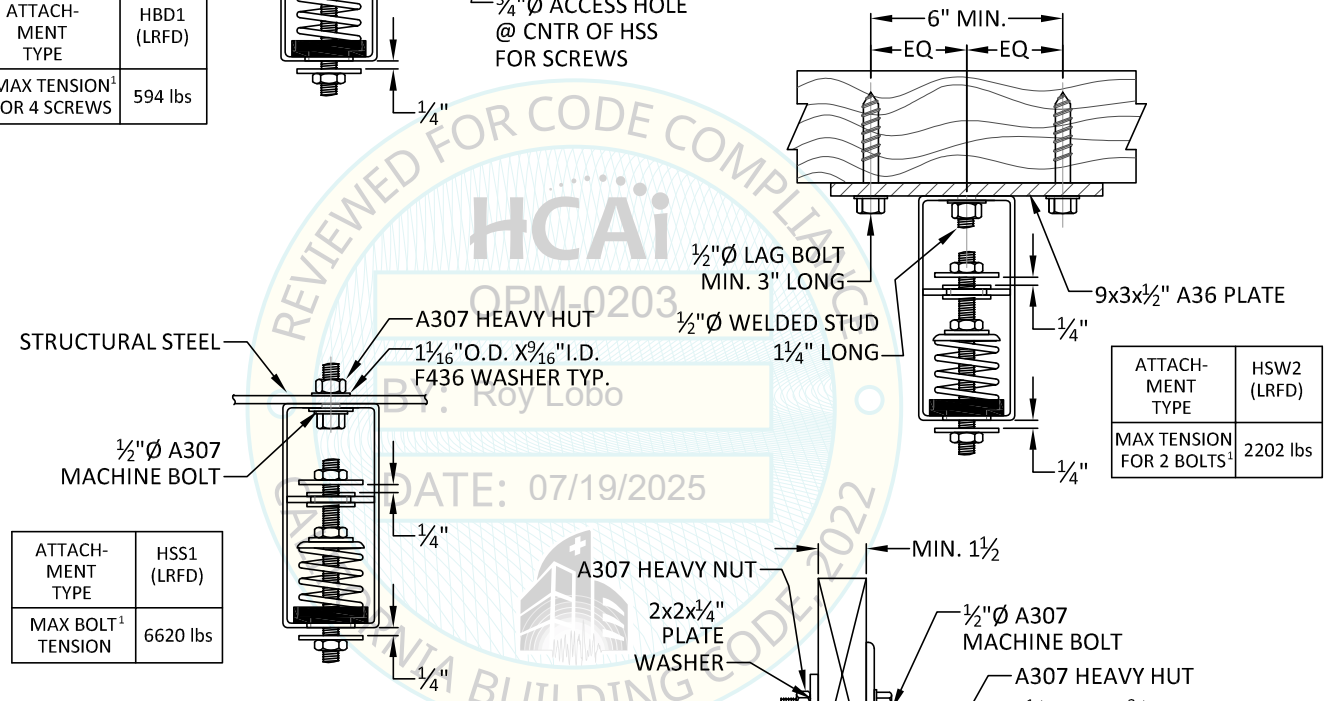
# HANGER BOX ATTACHMENT OPTIONS




| ATTACH-MENT TYPE | HBD1 (LRFD) |
|---|---|
| MAX TENSION[1] FOR 4 SCREWS | 594 lbs |

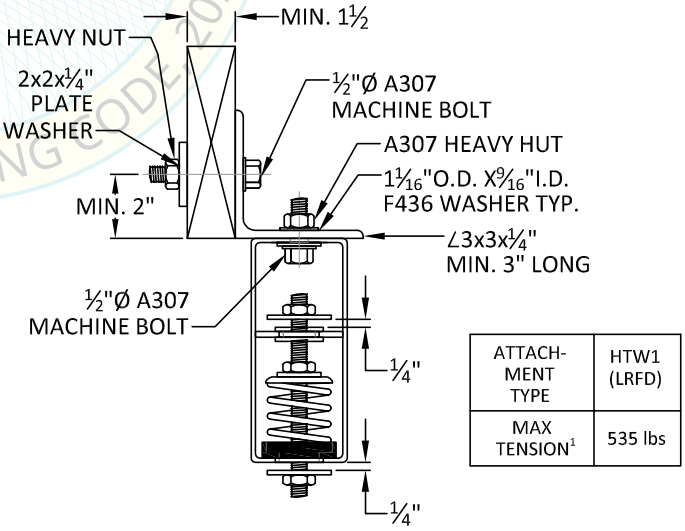



| ATTACH-MENT TYPE | HSW1 (LRFD) |
|---|---|
| MAX TENSION FOR 1 BOLT[1] | 1101 lbs |




| ATTACH-MENT TYPE | HSW2 (LRFD) |
|---|---|
| MAX TENSION FOR 2 BOLTS[1] | 2202 lbs |

| ATTACH-MENT TYPE | HSS1 (LRFD) |
|---|---|
| MAX BOLT[1] TENSION | 6620 lbs |




| ATTACH-MENT TYPE | HTW1 (LRFD) |
|---|---|
| MAX TENSION[1] | 535 lbs |

NOTE(S):

1. MAX. DESIGN RATING IS THE LESSER OF THE LOAD CAPACITY SHOWN OR THE SEISMIC LOAD RATING OF HANGER BOX (1,200 LBS). SEE PG. 4.1.
2. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
3. BOLT HOLES FOR THRU BOLT SHALL BE BORED 1/16" LARGER THAN THE NOMINAL BOLT DIAMETER.
4. LOADS FOR LAG BOLT ATTACHMENTS AND THRU-BOLT ATTACHMENTS ARE DERIVED FROM CBC 2019 AND NDS 2018 FOR WOOD WITH A MINIMUM SPECIFIC GRAVITY = 0.50 (I.E. DOUGLAS FIR-LARCH OR EQUAL), MIN. CONSTRUCTION GRADE.
5. SEE PAGE 4.1 FOR HANGER BOX DETAILS.
6. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.

REVIEWED FOR CODE COMPLIANCE
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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
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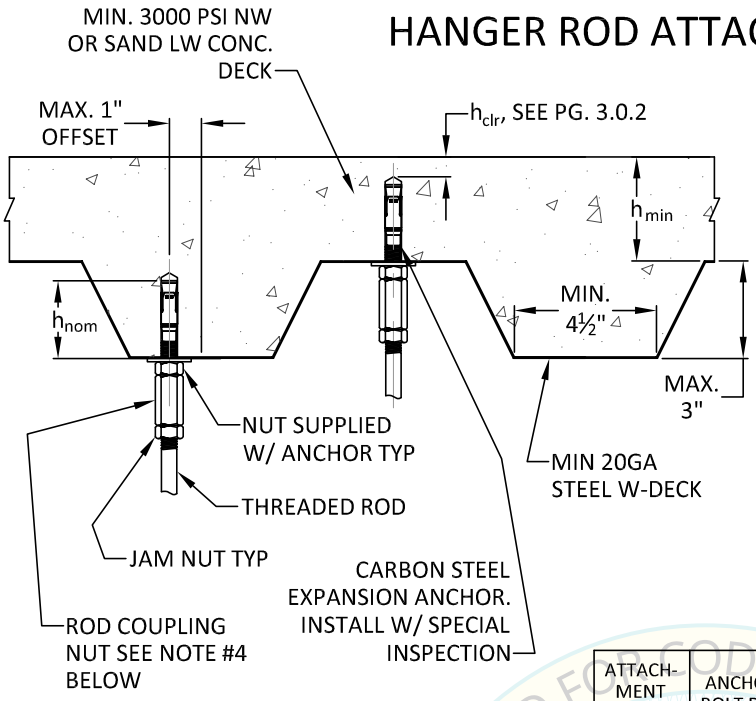
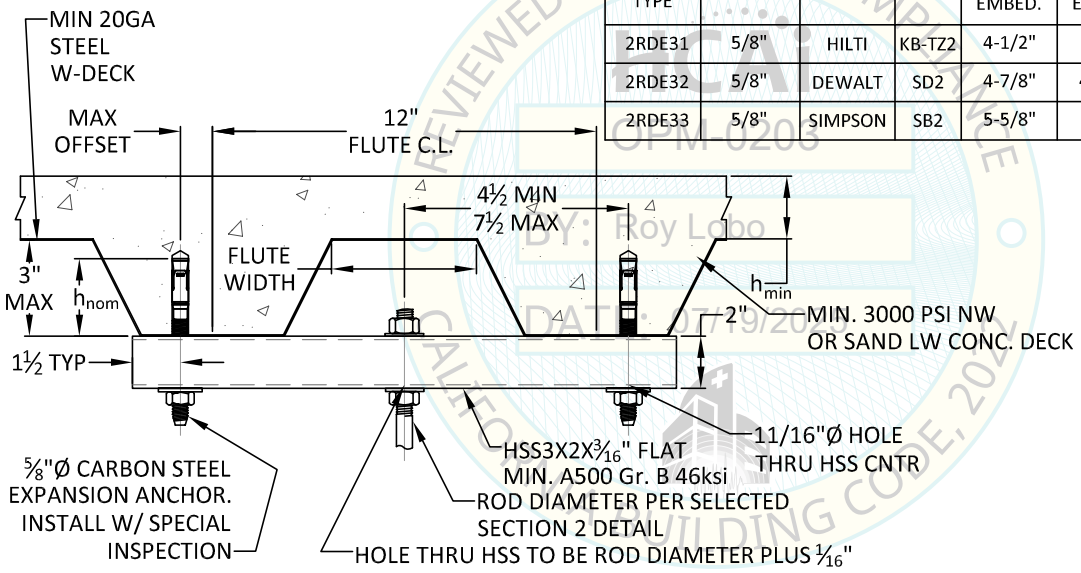
# HANGER ROD ATTACHMENT OPTIONS




| ATTACH-MENT TYPE | ROD & ANCHOR BOLT DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" | MAX BOLT TENSION |
|---|---|---|---|---|---|---|---|
| RDE31 | 3/8" | HILTI | KB-TZ2 | 2-1/2" | 2" | 2-1/2" | 1038 lbs |
| RDE32 | 1/2" | HILTI | KB-TZ2 | 2-1/2" | 2" | 2-1/2" | 722 lbs |
| RDE33 | 5/8" | HILTI | KB-TZ2 | 3-1/4" | 2-3/4" | 3-1/4" | 921 lbs |
| RDE34 | 3/8" | POWERS | SD2 | 2-3/8" | 2" | 3-1/4" | 704 lbs |
| RDE35 | 1/2" | POWERS | SD2 | 2-1/2" | 2" | 3-1/4" | 714 lbs |
| RDE36 | 5/8" | POWERS | SD2 | 3-7/8" | 3-1/4" | 3-1/4" | 1611 lbs |
| RDE37 | 3/8" | SIMPSON | SB2 | 2" | 1-5/8" | 3-1/4" | 507 lbs |
| RDE38 | 1/2" | SIMPSON | SB2 | 2-3/4" | 2-1/4" | 3-1/4" | 995 lbs |
| RDE39 | 5/8" | SIMPSON | SB2 | 3-3/8" | 2-3/4" | 3-1/4" | 1275 lbs |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




| ATTACH-MENT TYPE | ANCHOR BOLT DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" | MIN. FLUTE WIDTH | MAX OFFSET | MAX COMBINED BOLT TENSION |
|---|---|---|---|---|---|---|---|---|---|
| 2RDE31 | 5/8" | HILTI | KB-TZ2 | 4-1/2" | 4" | 2-1/2" | 3-7/8" | 15/16" | 3428 lbs |
| 2RDE32 | 5/8" | DEWALT | SD2 | 4-7/8" | 4-1/4" | 3-1/4" | 3-7/8" | 15/16" | 4013 lbs |
| 2RDE33 | 5/8" | SIMPSON | SB2 | 5-5/8" | 5" | 3-3/8" | 4-1/2" | 1" | 3892 lbs |

REVIEWED FOR CODE COMPLIANCE OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE, 2022

NOTE(S):
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS INCLUDED FOR ANCHORAGE TO CONCRETE. WHEN DESIGNING ANCHORAGE AS SHOWN $\Omega_0$ MUST BE TAKEN INTO ACCOUNT IN DETERMINING THE FINAL DESIGN SPRING HANGER AND/OR ROD TENSION (TYPICALLY FOR OVERTURNING ACTION OF SUSPENDED EQUIPMENT OR DUCT.)
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3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOAD CAPACITIES.
4. ROD COUPLING NUT MUST BE MIN. ASTM A194-2H HEAVY HEX OR A563-DH HEAVY HEX NUTS. ROD AND ANCHOR MUST HAVE A MIN. THREAD ENGAGEMENT INTO THE COUPLING NUT EQUAL TO THE DIAMETER OF THE ROD/ANCHOR. ROD AND ANCHOR MUST BE IN CONTACT W/ EACH OTHER WITHIN THE COUPLING NUT AND TIGHTENED ACCORDINGLY.
5. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
6. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS ARE ALONG THE FLUTE LENGTH.
7. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT ⅛" PER ICC-ESR.
8. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.

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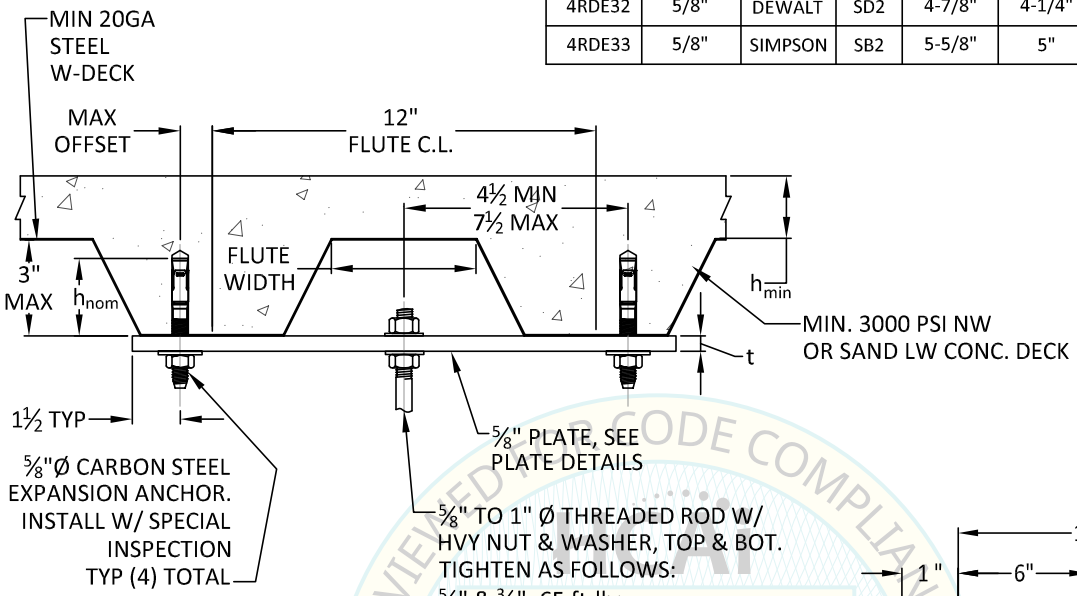
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.33**

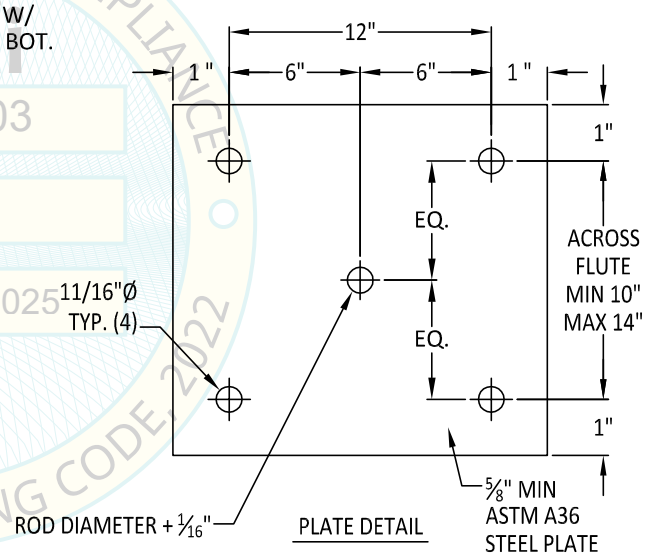
Date: **February 5, 2025**

# HANGER ROD ATTACHMENT OPTIONS

| ATTACH-MENT TYPE | ANCHOR BOLT DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" | MIN. FLUTE WIDTH | MAX OFFSET | MAX COMBINED BOLT TENSION |
|---|---|---|---|---|---|---|---|---|---|
| 4RDE31 | 5/8" | HILTI | KB-TZ2 | 4-1/2" | 4" | 2-1/2" | 3-7/8" | 15/16" | 6856 lbs |
| 4RDE32 | 5/8" | DEWALT | SD2 | 4-7/8" | 4-1/4" | 3-1/4" | 3-7/8" | 15/16" | 8026 lbs |
| 4RDE33 | 5/8" | SIMPSON | SB2 | 5-5/8" | 5" | 3-3/8" | 4-1/2" | 1" | 7784 lbs |




FINAL PLATE DIMENSIONS MUST BE DETERMINED PRIOR TO SHOP FABRICATION AND MUST BE WITHIN THE DIMENSIONAL LIMITS SHOWN

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CALIFORNIA BUILDING CODE 2022
OPM-0203
BY: Roy Lobo
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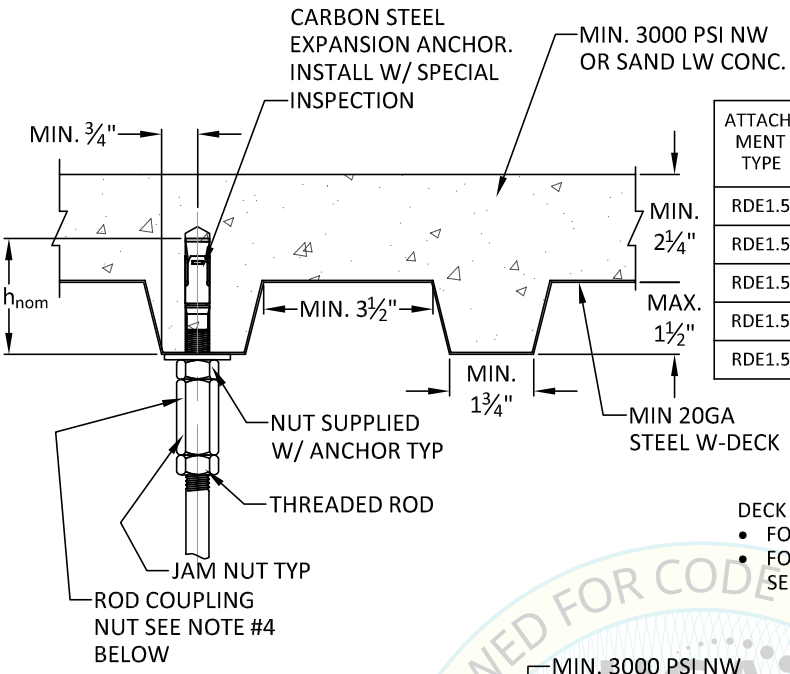
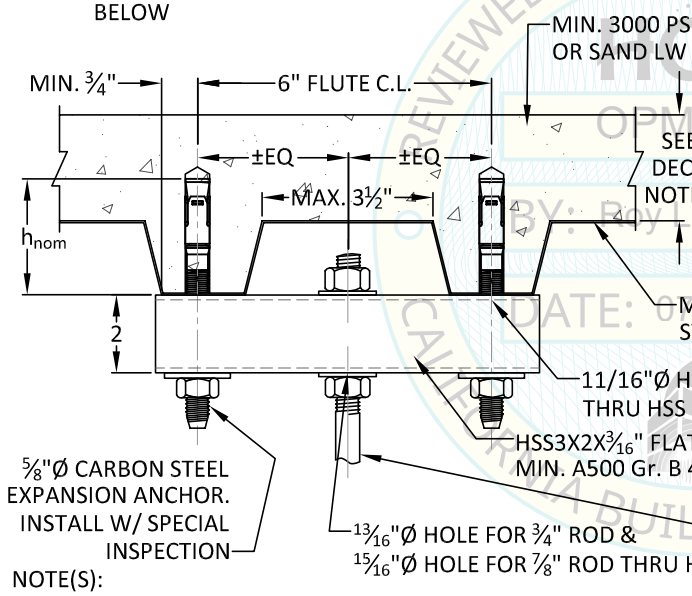
# HANGER ROD ATTACHMENT OPTIONS




| ATTACH-MENT TYPE | ROD & ANCHOR BOLT DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{clr}$" | MAX BOLT TENSION |
|---|---|---|---|---|---|---|---|
| RDE1.51 | 3/8" | HILTI | KB-TZ2 | 2-1/2" | 2" | 5/8" | 1038 lbs |
| RDE1.52 | 1/2" | HILTI | KB-TZ2 | 2-1/2" | 2" | 5/8" | 722 lbs |
| RDE1.53 | 5/8" | HILTI | KB-TZ2 | 3-1/4 | 2-3/4" | 5/8" | 1285 lbs |
| RDE1.54 | 3/8" | DEWALT | SD2 | 2-3/8" | 2" | 3/4" | 609 lbs |
| RDE1.55 | 1/2" | DEWALT | SD2 | 2-1/2" | 2" | 3/4" | 700 lbs |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.2.




| ATTACH-MENT TYPE | ROD & ANCHOR BOLT DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{clr}$" | MAX BOLT TENSION |
|---|---|---|---|---|---|---|---|
| 2RDE1.51 | 5/8" | HILTI | KB-TZ2 | 3-1/4" | 2-3/4" | 5/8" | 2570 lbs |

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Page No.: **3.34**

Date: **February 5, 2025**

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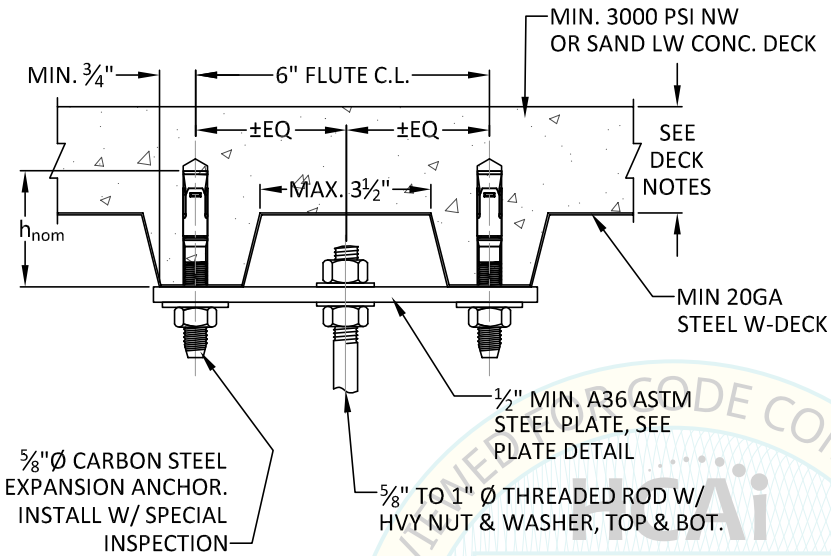
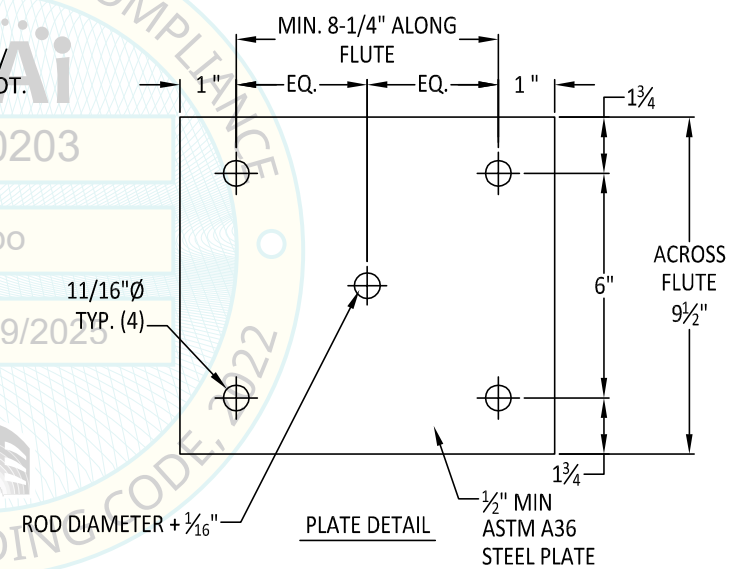
|---|---|---|---|---|---|---|---|
| 4RDE1.51 | 5/8" | HILTI | KB-TZ2 | 3-1/4" | 2-3/4" | 5/8" | 5140 lbs |
| 4RDE1.52 | 1/2" | DEWALT | SD2 | 2-1/2" | 2" | 3/4" | 2800 lbs |

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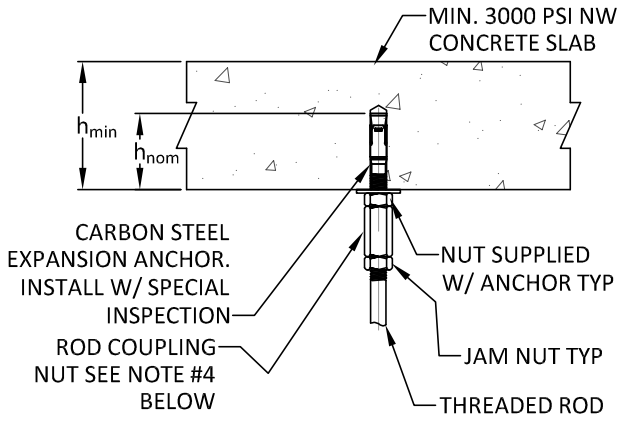
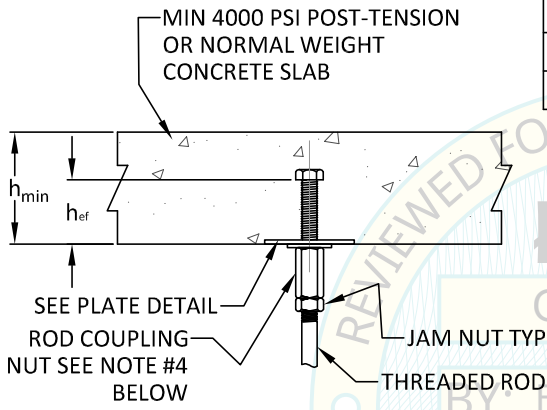
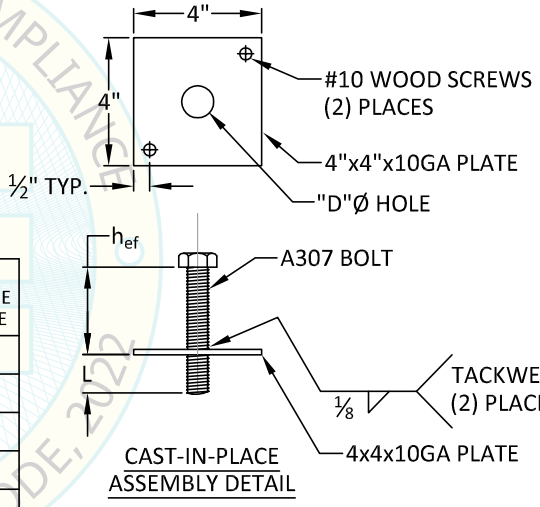
# HANGER ROD ATTACHMENT OPTIONS




| ATTACH-MENT TYPE | ROD & ANCHOR BOLT DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" MIN. CONC. THICKNESS | "$C_{min}$" MIN. EDGE DISTANCE | MAX BOLT TENSION |
|---|---|---|---|---|---|---|---|---|
| RRCE1 | 3/8" | HILTI | KB-TZ2 | 2-1/2" | 2" | 4" | 4-3/8" | 1586 lbs |
| RRCE2 | 1/2" | HILTI | KB-TZ2 | 2-1/2" | 2" | 4" | 5-1/2" | 1586 lbs |
| RRCE3 | 5/8" | HILTI | KB-TZ2 | 3-3/4" | 3-1/4" | 5-1/2" | 11-1/2" | 3285 lbs |
| RRCE4 | 3/4" | HILTI | KB-TZ2 | 4-1/2" | 4" | 6" | 10" | 4072 lbs |
| RRCE5 | 3/8" | DEWALT | SD2 | 2-3/8" | 2" | 4" | 6-1/2" | 1122 lbs |
| RRCE6 | 1/2" | DEWALT | SD2 | 2-1/2" | 2" | 4-1/2" | 8" | 1284 lbs |
| RRCE7 | 5/8" | DEWALT | SD2 | 3-7/8" | 3-1/4" | 5-3/4" | 8" | 2660 lbs |
| RRCE8 | 3/4" | DEWALT | SD2 | 4-1/2" | 3-3/4" | 7" | 12" | 3296 lbs |
| RRCE9 | 7/8" | DEWALT | SD1 | 4-1/2" | 3-1/2" | 10" | 11-1/2" | 2972 lbs |
| RRCE10 | 3/8" | SIMPSON | SB2 | 1-7/8" | 1-1/2" | 3-1/4" | 6-1/2" | 694 lbs |
| RRCE11 | 1/2" | SIMPSON | SB2 | 2-3/4" | 2-1/4" | 4-1/2" | 7" | 1532 lbs |
| RRCE12 | 5/8" | SIMPSON | SB2 | 3-3/8" | 2-3/4" | 5-1/2" | 7-1/2" | 2070 lbs |
| RRCE13 | 3/4" | SIMPSON | SB2 | 4-1/8" | 3-3/8" | 7-7/8" | 9" | 2814 lbs |




| ATTACH-MENT TYPE | ROD & ANCHOR BOLT DIA. | GRADE | "$h_{ef}$" NOMINAL EMBED. | "$h_{min}$" MIN. CONC. THICKNESS | "L" LENGTH | "D" HOLE Ø | MAX BOLT TENSION | "$C_{min}$" MIN. EDGE DISTANCE |
|---|---|---|---|---|---|---|---|---|
| RCIP1 | 3/8" | A307 | 2-1/2" | 4" | 5/8" | 7/16" | 2528 lbs | 4" |
| RCIP2 | 1/2" | A307 | 3" | 5" | 11/16" | 9/16" | 4141 lbs | 5" |
| RCIP3 | 5/8" | A307 | 4" | 6" | 13/16" | 11/16" | 6375 lbs | 7" |
| RCIP4 | 3/4" | A307 | 5" | 7-1/2" | 15/16" | 13/16" | 8910 lbs | 8" |
| RCIP5 | 7/8" | A307 | 6" | 9" | 1-1/8" | 15/16" | 11712 lbs | 9" |
| RCIP6 | 1" | A307 | 6-5/8" | 10" | 1-1/4" | 1-1/16" | 13589 lbs | 10" |

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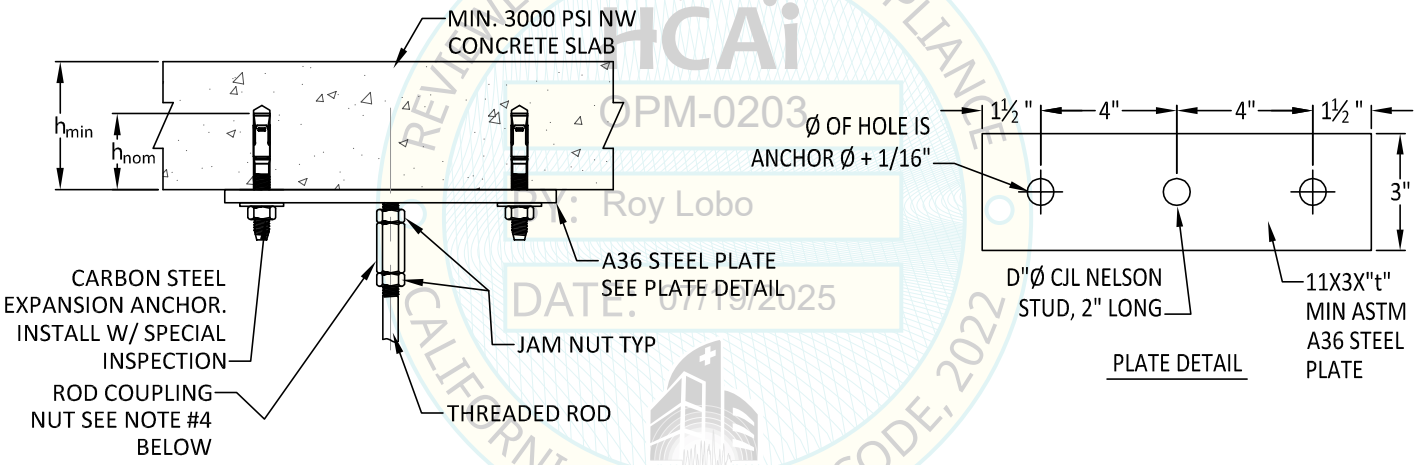
Date: February 5, 2025

# HANGER ROD ATTACHMENT OPTIONS

| ATTACH-MENT TYPE | ROD & ANCHOR BOLT DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" MIN. CONC. THICKNESS | "$C_{min}$" MIN. EDGE DISTANCE | MAX BOLT TENSION | "D" STUD DIA. | "t" PLATE THICKNESS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2RRCE1 | 1/2" | HILTI | KB-TZ2 | 2-1/2" | 2" | 4" | 5-1/2" | 3172 lbs | 3/8" to 1/2" | 1/2" |
| 2RRCE2 | 5/8" | HILTI | KB-TZ2 | 3-3/4" | 3-1/4" | 5-1/2" | 11-1/2" | 6052 lbs | 3/8" to 3/4" | 1/2" |
| 2RRCE3 | 3/4" | HILTI | KB-TZ2 | 4-1/2" | 4" | 6" | 10" | 6968 lbs | 3/4" to 1" | 1/2" |
| 2RRCE4 | 3/4" | HILTI | KB-TZ2 | 5-1/2" | 4-3/4" | 8" | 9" | 8944 lbs | 3/4" to 1" | 5/8" |
| 2RRCE5 | 1/2" | DEWALT | SD2 | 2-1/2" | 2" | 4-1/2" | 8" | 2568 lbs | 3/8" to 1/2" | 1/2" |
| 2RRCE6 | 5/8" | DEWALT | SD2 | 3-7/8" | 3-1/4" | 5-3/4" | 8" | 4842 lbs | 3/8" to 3/4" | 1/2" |
| 2RRCE7 | 3/4" | DEWALT | SD2 | 4-1/2" | 3-3/4" | 7" | 12" | 5640 lbs | 3/4" to 1" | 1/2" |
| 2RRCE8 | 3/4" | DEWALT | SD2 | 5-3/4" | 5" | 10" | 12" | 7782 lbs | 3/4" to 1" | 5/8" |
| 2RRCE9 | 3/8" | SIMPSON | SB2 | 1-7/8" | 1-1/2" | 3-1/4" | 6-1/2" | 1388 lbs | 3/8" to 1/2" | 3/8" |
| 2RRCE10 | 1/2" | SIMPSON | SB2 | 2-3/4" | 2-1/4" | 4-1/2" | 7" | 3064 lbs | 3/8" to 1/2" | 1/2" |
| 2RRCE11 | 5/8" | SIMPSON | SB2 | 3-3/8" | 2-3/4" | 5-1/2" | 7-1/2" | 2070 lbs | 3/8" to 3/4" | 1/2" |
| 2RRCE12 | 3/4" | SIMPSON | SB2 | 5-3/4" | 5" | 8-3/4" | 8" | 7782 lbs | 3/4" to 1" | 5/8" |
| 2RRCE13 | 3/4" | SIMPSON | SB2 | 9-3/4" | 9" | 13-1/2" | 13-1/2" | 10108 lbs | 3/4" to 1" | 3/4" |

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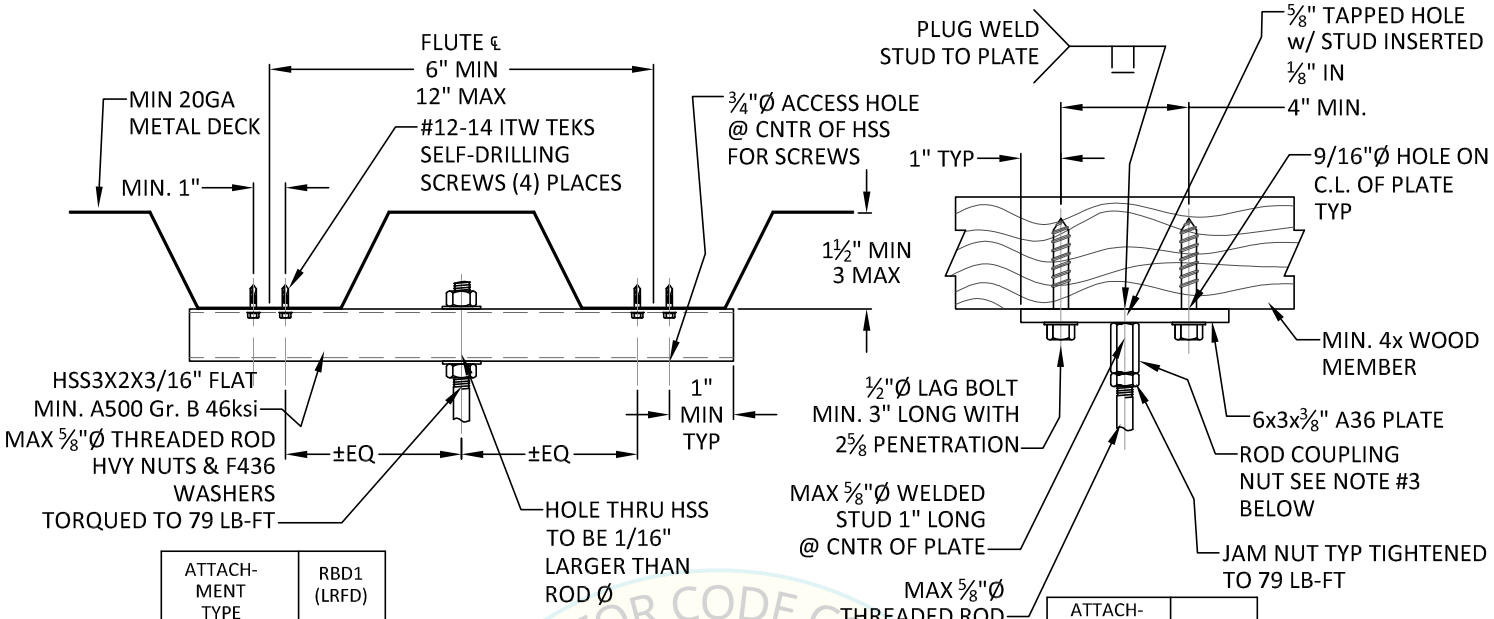
**California PE No. S6481**

**Page No.:** **3.35.1**

**Date:** **February 5, 2025**

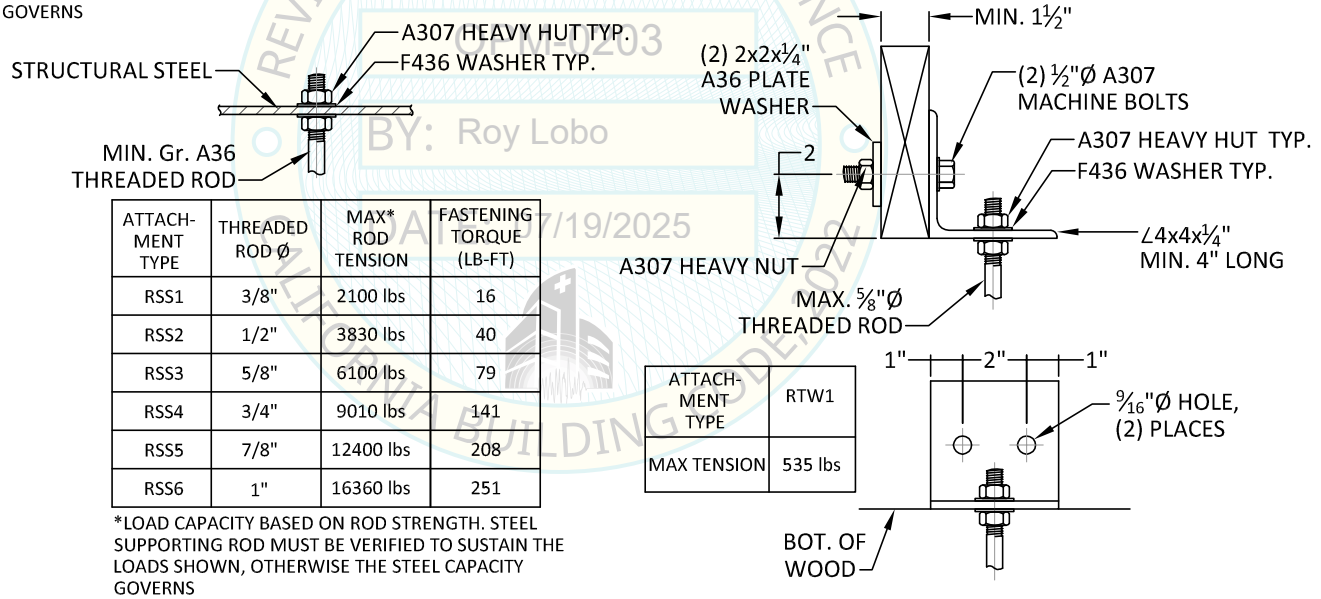
# HANGER ROD ATTACHMENT OPTIONS




| ATTACH-MENT TYPE | RBD1 (LRFD) |
|---|---|
| MAX TENSION* FOR 4 SCREWS | 594 lbs |

*LOAD CAPACITY BASED ON ATTACHMENT STRENGTH. DECK SUPPORTING ROD MUST BE VERIFIED TO SUSTAIN THE LOADS SHOWN, OTHERWISE THE DECK CAPACITY GOVERNS

| ATTACH-MENT TYPE | RSW1 |
|---|---|
| MAX TENSION FOR 2 BOLTS | 653 lbs |




| ATTACH-MENT TYPE | THREADED ROD Ø | MAX* ROD TENSION | FASTENING TORQUE (LB-FT) |
|---|---|---|---|
| RSS1 | 3/8" | 2100 lbs | 16 |
| RSS2 | 1/2" | 3830 lbs | 40 |
| RSS3 | 5/8" | 6100 lbs | 79 |
| RSS4 | 3/4" | 9010 lbs | 141 |
| RSS5 | 7/8" | 12400 lbs | 208 |
| RSS6 | 1" | 16360 lbs | 251 |

*LOAD CAPACITY BASED ON ROD STRENGTH. STEEL SUPPORTING ROD MUST BE VERIFIED TO SUSTAIN THE LOADS SHOWN, OTHERWISE THE STEEL CAPACITY GOVERNS




| ATTACH-MENT TYPE | RTW1 |
|---|---|
| MAX TENSION | 535 lbs |

NOTE(S):

1. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED LRFD DESIGN LOAD CAPACATIES.
2. BOLT HOLES FOR THRU BOLT SHALL BE BORED 1/16" LARGER THAN THE NOMINAL BOLT DIAMETER.
3. ROD COUPLING NUT MUST BE MIN. ASTM A194-2H HEAVY HEX OR A563-DH HEAVY HEX NUTS. ROD AND ANCHOR MUST HAVE A MIN. THREAD ENGAGEMENT INTO THE COUPLING NUT EQUAL TO THE DIAMETER OF THE ROD/ANCHOR. ROD AND ANCHOR MUST BE IN CONTACT W/ EACH OTHER WITHIN THE COUPLING NUT AND TIGHTENED ACCORDINGLY.
4. LOADS FOR LAG BOLT ATTACHMENTS AND THRU-BOLT ATTACHMENTS ARE DERIVED FROM CBC 2019 AND NDS 2018 FOR WOOD WITH A MINIMUM SPECIFIC GRAVITY = 0.50 (I.E. DOUGLAS FIR-LARCH OR EQUAL), ANY GRADE.
5. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.
6. MAX TENSION ALLOWED FOR HANGER ROD MAY BE LIMITED BY THE CAPACITIES OF THE ATTACHMENTS TO THE SUBSTRATE.

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 7/19/2025
CALIFORNIA BUILDING CODE

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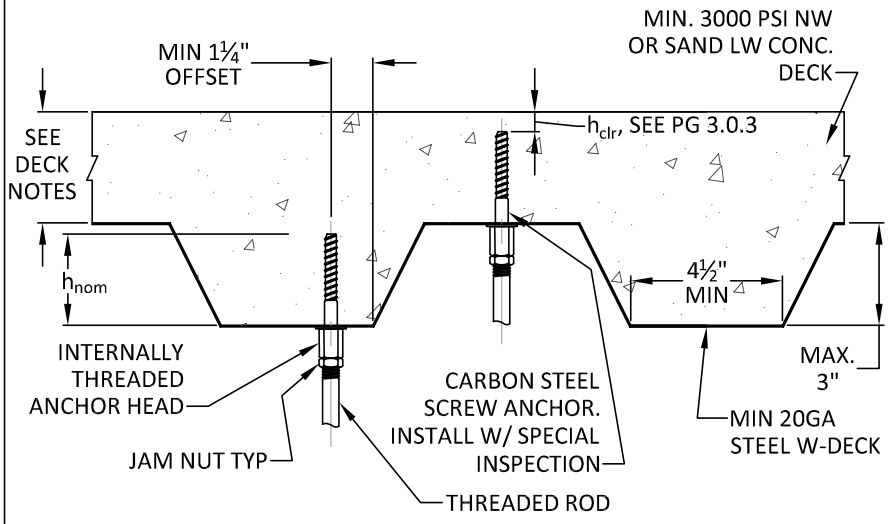
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **3.36**

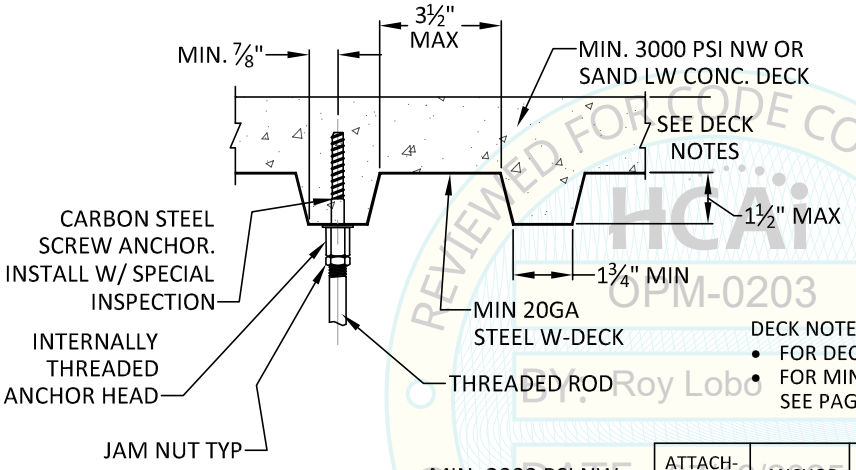
Date: February 5, 2025

# HANGER ROD ATTACHMENT OPTIONS




| ATTACH-MENT TYPE | ANCHOR BOLT DIA. | ROD DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. |
|---|---|---|---|---|---|
| RDS31 | 1/4" | 3/8" | HILTI | KH-EZ I | 2-1/2" |
| RDS32 | 3/8" | 3/8" & 1/2" | DEWALT | HANGER-MATE | 2-1/8" |
| RDS33 | 3/8" | 3/8" & 1/2" | SIMPSON | TITEN HD HANGER | 2-1/2" |

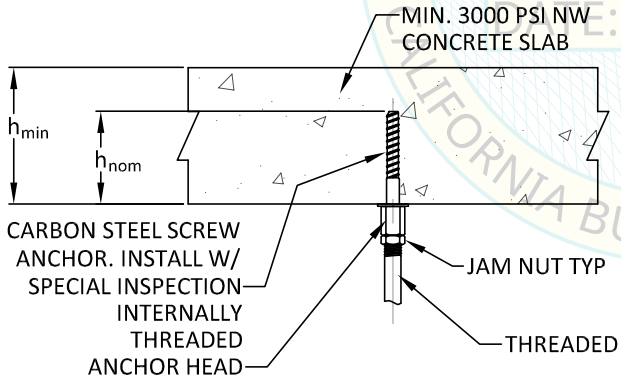
| ATTACH-MENT TYPE | "$h_{ef}$" | MAX BOLT TENSION | |
|---|---|---|---|
| | | UPPER FLUTE | LOWER FLUTE |
| RDS31 | 1-15/16" | 453 lbs | 475 lbs |
| RDS32 | 1-3/4" | 517 lbs | 517 lbs |
| RDS33 | 1-3/4" | - | 424 lbs |




| ATTACH-MENT TYPE | ANCHOR BOLT DIA. | ROD DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. |
|---|---|---|---|---|---|
| RDS1.51 | 3/8" | 3/8" & 1/2" | DEWALT | HANGER-MATE | 2-1/2" |

| ATTACH-MENT TYPE | "$h_{ef}$" | "$h_{min}$" | "$h_{clr}$" | MAX BOLT TENSION | |
|---|---|---|---|---|---|
| | | | | UPPER FLUTE | LOWER FLUTE |
| RDS1.51 | 1-3/4" | 2-1/2" | 3/4" | - | 424 lbs |

DECK NOTES:
- FOR DECK PROFILE DIMENSIONS SEE PAGE A.5 OF THE APPENDIX.
- FOR MIN. REQUIRED DIMENSIONS OF THE DECK FOR EACH ANCHOR SIZE SEE PAGE 3.0.3.




| ATTACH-MENT TYPE | ANCHOR BOLT DIA. | ROD DIA. | MAKE | TYPE | "$h_{nom}$" NOMINAL EMBED. | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" | MAX BOLT TENSION |
|---|---|---|---|---|---|---|---|---|
| RRCS1 | 1/4" | 3/8" | HILTI | KH-EZ I | 2-1/2" | 1-15/16" | 4-1/8" | 568 lbs |
| RRCS2 | 3/8" | 3/8" & 1/2" | DEWALT | HANGER-MATE | 2-1/2" | 1-3/4" | 4" | 579 lbs |
| RRCS3 | 3/8" | 3/8" & 1/2" | SIMPSON | TITEN HD HANGER | 2-1/2" | 1-3/4" | 4-1/4" | 602 lbs |

| ATTACH-MENT TYPE | "$C_{min}$" MIN. EDGE DISTANCE |
|---|---|
| RRCS1 | 3" |
| RRCS2 | 3" |
| RRCS3 | 2-11/16" |

NOTE(S):
1. OVER STRENGTH FACTOR $\Omega_0$ =2.0 PER ASCE 7-16, TABLE 13.6-1 IS INCLUDED FOR ANCHORAGE TO CONCRETE. WHEN DESIGNING ANCHORAGE AS SHOWN $\Omega_0$ MUST BE TAKEN INTO ACCOUNT IN DETERMINING THE FINAL DESIGN ROD TENSION (TYPICALLY FOR OVERTURNING ACTION OF SUSPENDED EQUIPMENT OR DUCT.)
2. INSTALL SCREW ANCHORS WITH SPECIAL INSPECTION PER THE ICC ESR-3027 (2023), ESR-3889 (2023), OR ESR-2713 (2023).
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOADS (LRFD).
4. WHEN INSTALLING ANCHORS IN REINFORCED CONCRETE, AVOID DAMAGING REINFORCING STEEL.
5. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS ARE ALONG THE FLUTE LENGTH.
6. WHEN INSTALLING ANCHORS IN PRESTRESSED CONCRETE, COORDINATE ALL WORK WITH STRUCTURAL ENGINEER OF RECORD AND X-RAY SLAB PRIOR TO INSTALLATION TO AVOID DAMAGING POST TENSION CABLES AND REINFORCING STEEL.
7. HOLE DIAMETER THROUGH METAL DECK MAY NOT EXCEED ANCHOR HOLE DIMENSION BY MORE THAT ⅛" PER ICC-ESR.
8. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 BY: Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

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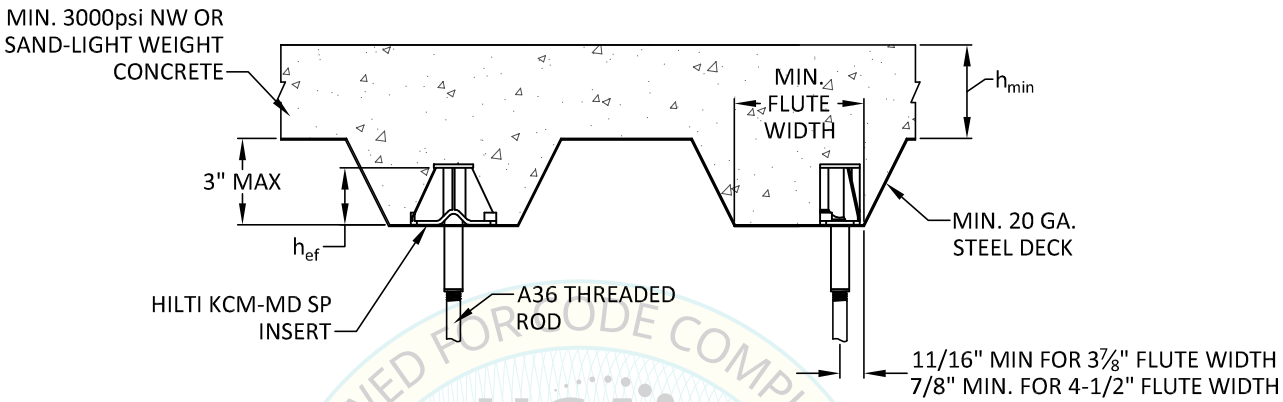
Page No.: **3.37**

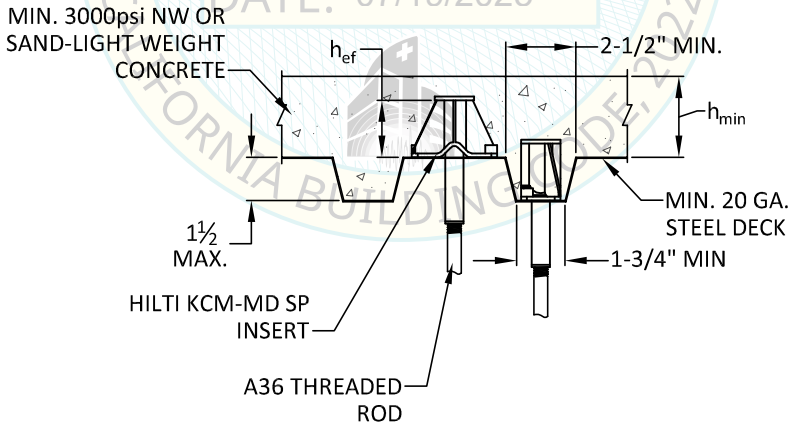
Date: **February 5, 2025**

# HANGER ROD ATTACHMENT OPTIONS

| ATTACH-MENT TYPE | ROD DIA. | ANCHOR DIA. | MAKE | INSERT COLOR | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" MIN. CONC. THICKNESS | MIN. FLUTE WIDTH | MAX ROD TENSION (UPPER FLUTE) | MAX ROD TENSION (LOWER FLUTE) |
|---|---|---|---|---|---|---|---|---|---|
| RKCM31 | 3/8" | 0.51" | HILTI | GREEN | 1.76" | 2-1/2" | 3⅞" | 1746 lbs | 840 lbs |
| RKCM32 | 1/2" | 0.67" | HILTI | ORANGE | 2" | 2-1/2" | 3⅞" | 2168 lbs | 1110 lbs |
| RKCM33 | 5/8" | 0.87" | HILTI | RED | 2.5" | 3-1/4" | 4½" | 2746 lbs | 1273 lbs |
| RKCM34 | 3/4" | 1.00" | HILTI | GREY | 2.5" | 3-1/4" | 4½" | 2746 lbs | 1273 lbs |




| ATTACH-MENT TYPE | ROD DIA. | ANCHOR DIA. | MAKE | INSERT COLOR | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" MIN. CONC. THICKNESS | MAX ROD TENSION (UPPER FLUTE) | MAX ROD TENSION (LOWER FLUTE) |
|---|---|---|---|---|---|---|---|---|
| RKCM1.51 | 3/8" | 0.51" | HILTI | GREEN | 1.76" | 2-1/2" | 1746 lbs | 362 lbs |
| RKCM1.52 | 1/2" | 0.67" | HILTI | ORANGE | 2" | 2-1/2" | 2168 lbs | 381 lbs |
| RKCM1.53 | 5/8" | 0.87" | HILTI | RED | 2.5" | 3-1/4" | 2746 lbs | 415 lbs |

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NOTE(S):
1. OVER STRENGTH FACTOR $\Omega_0$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS INCLUDED FOR ANCHORAGE TO CONCRETE. WHEN DESIGNING ANCHORAGE AS SHOWN $\Omega_0$ MUST BE TAKEN INTO ACCOUNT IN DETERMINING THE FINAL DESIGN ROD TENSION (TYPICALLY FOR OVERTURNING ACTION OF SUSPENDED EQUIPMENT OR DUCT.)
2. INSTALL ANCHOR INSERTS PER THE ICC ESR-4145 (2023). NO ANCHOR INSTALLS OVER FLUTE INCLINE.
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOADS.
4. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS ARE ALONG THE FLUTE LENGTH.
5. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.

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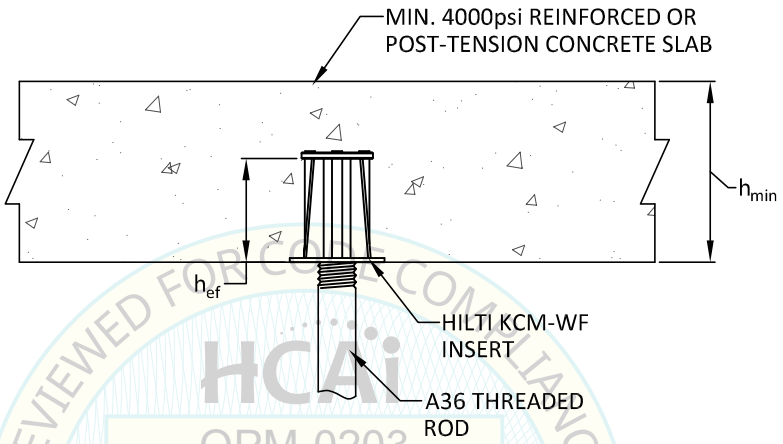
Page No.: **3.38**

Date: February 5, 2025

# HANGER ROD ATTACHMENT OPTIONS

| ATTACH-MENT TYPE | ROD DIA. | ANCHOR DIA. | MAKE | INSERT COLOR | "$h_{ef}$" EFFECTIVE EMBED. | "$h_{min}$" MIN. CONC. THICKNESS | "$C_{min}$" MIN. EDGE DISTANCE | MAX ROD TENSION |
|---|---|---|---|---|---|---|---|---|
| RKCMRC1 | 3/8" | 0.51" | HILTI | GREEN | 1.12" | 2-1/2" | 4" | 945 lbs |
| RKCMRC2 | 1/2" | 0.67" | HILTI | ORANGE | 1.63" | 2-1/2" | 5" | 1658 lbs |
| RKCMRC3 | 5/8" | 0.87" | HILTI | RED | 2.04" | 3" | 6" | 2322 lbs |
| RKCMRC4 | 3/4" | 1.00" | HILTI | GREY | 3.0" | 4" | 8" | 4141 lbs |

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NOTE(S):
1. OVER STRENGTH FACTOR $\Omega_0$ = 2.0 PER ASCE 7-16, TABLE 13.6-1 IS INCLUDED FOR ANCHORAGE TO CONCRETE. WHEN DESIGNING ANCHORAGE AS SHOWN $\Omega_0$ MUST BE TAKEN INTO ACCOUNT IN DETERMINING THE FINAL DESIGN ROD TENSION (TYPICALLY FOR OVERTURNING ACTION OF SUSPENDED EQUIPMENT OR DUCT.)
2. INSTALL ANCHOR INSERTS PER THE ICC ESR-4145 (2023).
3. STRUCTURAL ENGINEER OF RECORD SHALL VERIFY ADEQUACY OF THE STRUCTURE FOR THE TABULATED DESIGN LOADS.
4. WHEN CONCRETE ANCHORS ARE INSTALLED IN THE SOFFIT OF CONCRETE FILLED DECK, MINIMUM END DISTANCE AND SPACING REQUIREMENTS ARE ALONG THE FLUTE LENGTH.
5. DESIGN IS CONTROLLED BY SEISMIC FORCES. NON-SEISMIC FORCES SUCH AS GRAVITY ARE OUTSIDE THE SCOPE OF THIS OPM.

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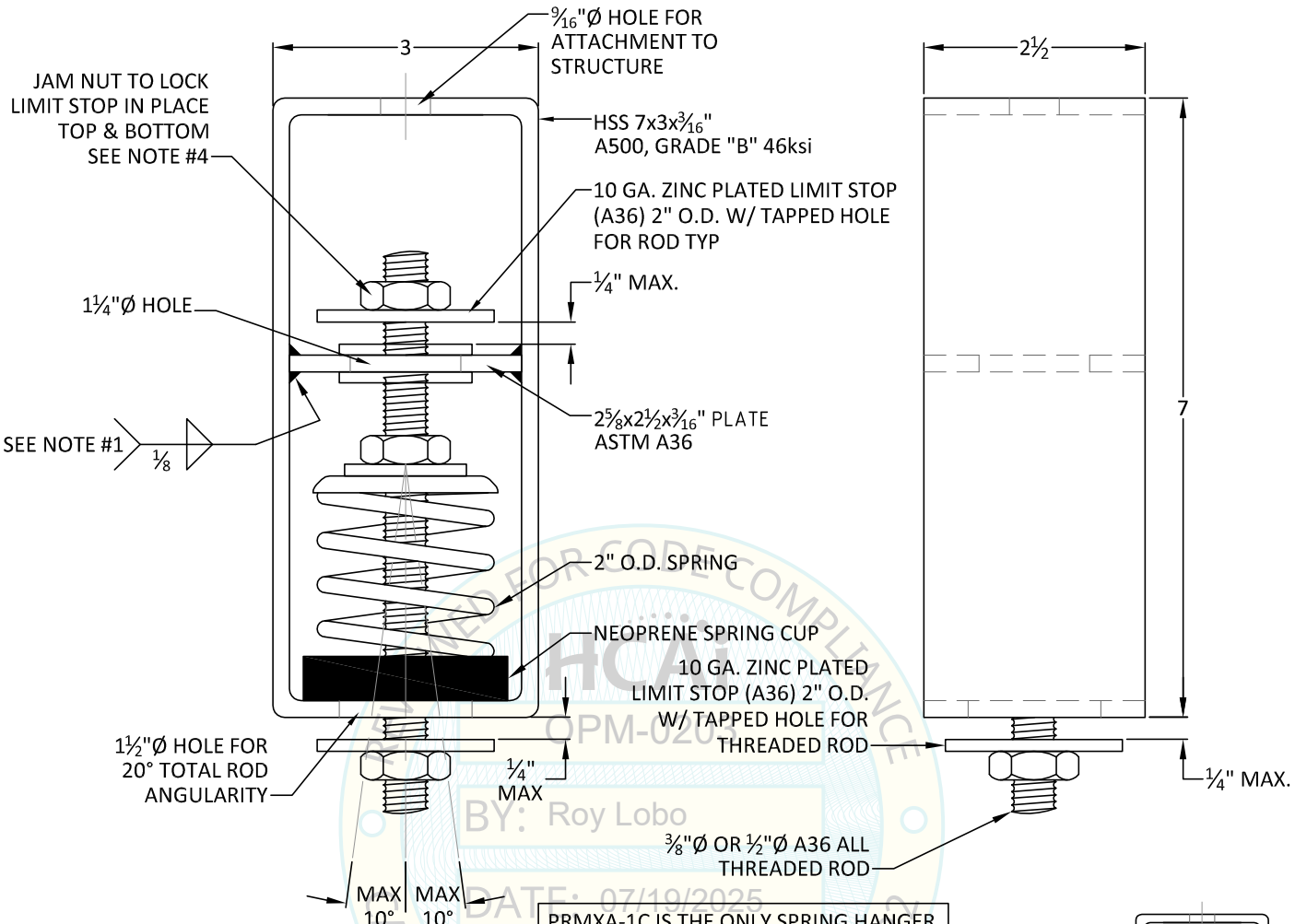
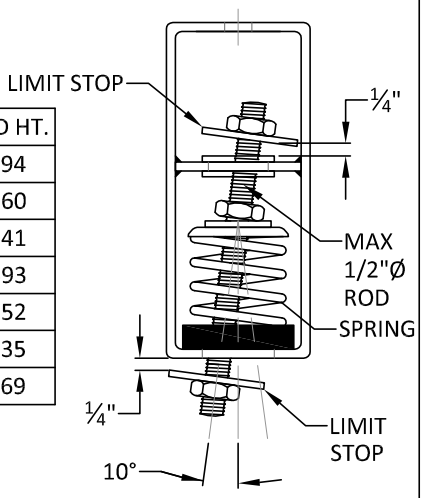
# PRMXA-1C HANGER BOX DETAIL




PRMXA-1C IS THE ONLY SPRING HANGER THAT MAY BE USED WITH OPM-0203-22.

| SPRING | COLOR | OD | DEFL | LOAD @ DEFL[5] | ASTM DESIGN.[6] | WIRE Ø | TOTAL COILS | FREE HT. | SOLID HT. |
|---|---|---|---|---|---|---|---|---|---|
| 2220 | YELLOW | 2" | 1" | 20 LBS | A229-17 | 0.125" | 4.75 | 2.25 | 0.594 |
| 2235 | PURPLE | 2" | 1" | 35 LBS | A229-17 | 0.135" | 4.10 | 2.25 | 0.560 |
| 2250 | RED | 2" | 1" | 50 LBS | A229-17 | 0.156" | 4.75 | 2.25 | 0.741 |
| 2275 | GREEN | 2" | 1" | 75 LBS | A229-17 | 0.156" | 3.8 | 2.25 | 0.593 |
| 22100 | PINK | 2" | 1" | 100 LBS | A229-17 | 0.177" | 4.25 | 2.25 | 0.752 |
| 22150 | WHITE | 2" | 1" | 150 LBS | A229-17 | 0.207" | 5 | 2.5 | 1.035 |
| 22225 | ORANGE | 2" | 1" | 225 LBS | A229-17 | 0.225" | 4.75 | 2.5 | 1.069 |




SPRING HANGER WITH MAX 10° ROD ANGULARITY

NOTE(S):
1. MAX. LOAD CAPACITY (DEAD): 225 LBS
2. MAX. SEISMIC LOAD RATING: 1,200 LBS (SEISMIC LRFD CAPACITY)
3. WELDING WILL BE DONE USING ER 70XX ELECTRODES.
4. THE LIMIT STOPS ARE TO BE ADJUSTED ONCE THE SPRING IS SET AT THE OPERATING DEFLECTION SO THE ¼" GAP IS ACHIEVED.
5. W/ DESIGN DEFL. @ 1", THE LOAD @ DEFL. IS ALSO THE SPRING RATE IN LBS/IN.
6. A229-17 WIRE USED IS MIN CLASS I (MIN. TENSILE STRENGTH IS 188ksi).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Structural Engineer: N. Tremblay
California PE No. S6481


Page No.: **4.1**

Date: **February 5, 2025**

# RS-1 - ROD STIFFENER DETAILS & REQUIREMENTS

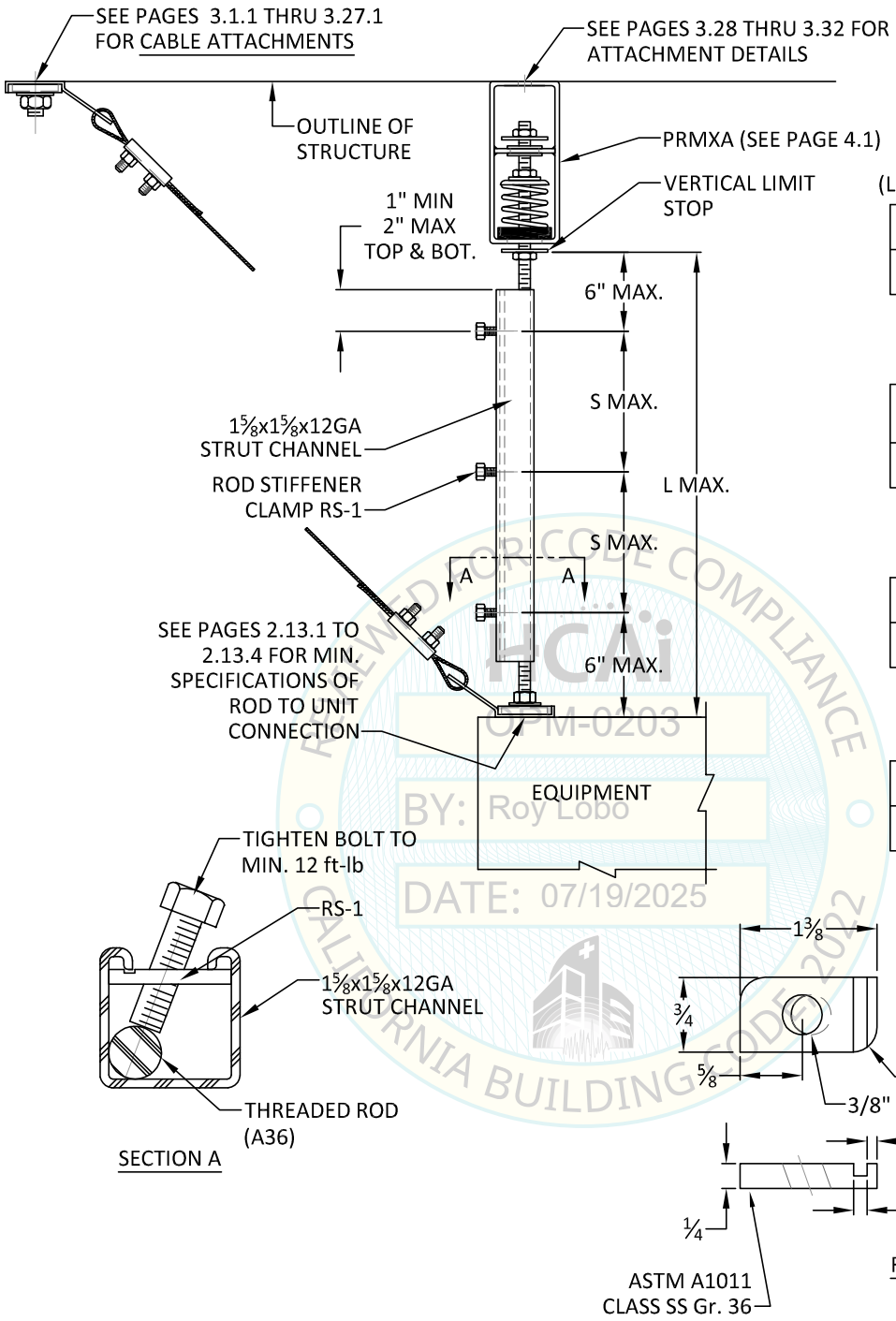


TABLE 1
(L MAX. WITHOUT ROD STIFFENER)

| ROD DIA. | 3/8" | 1/2" |
|---|---|---|
| L MAX. | 15" | 21" |

TABLE 2
(L MAX. WITH ROD STIFFENER)

| ROD STIFFENER | 1-5/8x1-5/8x12GA STRUT CHANNEL |
|---|---|
| L MAX. | 116" |

TABLE 3
(S MAX. WITH ROD STIFFENER)

| ROD DIA. | 3/8" | 1/2" |
|---|---|---|
| S MAX. | 15" | 21" |

TABLE 4
(MAX. ROD COMPRESSION lbs)

| ROD DIA. | 3/8" | 1/2" |
|---|---|---|
| P MAX. | 439 | 757 |

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BY: Roy Lobo
DATE: 07/19/2025
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NOTES:
1. SEE TABLE 1 FOR MAXIMUM LENGTH OF ⅜" AND ½"Ø RODS WITHOUT ROD STIFFENER.
2. SEE TABLE 2 FOR MAXIMUM LENGTH OF ⅜" AND ½"Ø RODS WITH ROD STIFFENER.
3. SEE TABLE 3 TO DETERMINE NUMBER OF ROD STIFFENER CLIPS REQUIRED.
4. PROVIDE ROD STIFFENING ONLY WHERE SEISMIC BRACKETS ARE ATTACHED TO THE ROD.
5. SEE SECTION 3 FOR STRUCTURAL ATTACHMENTS FOR HANGER BOX AND CABLE BRACING

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California PE No. S6481

# RS-1 - ROD STIFFENER DETAILS & REQUIREMENTS

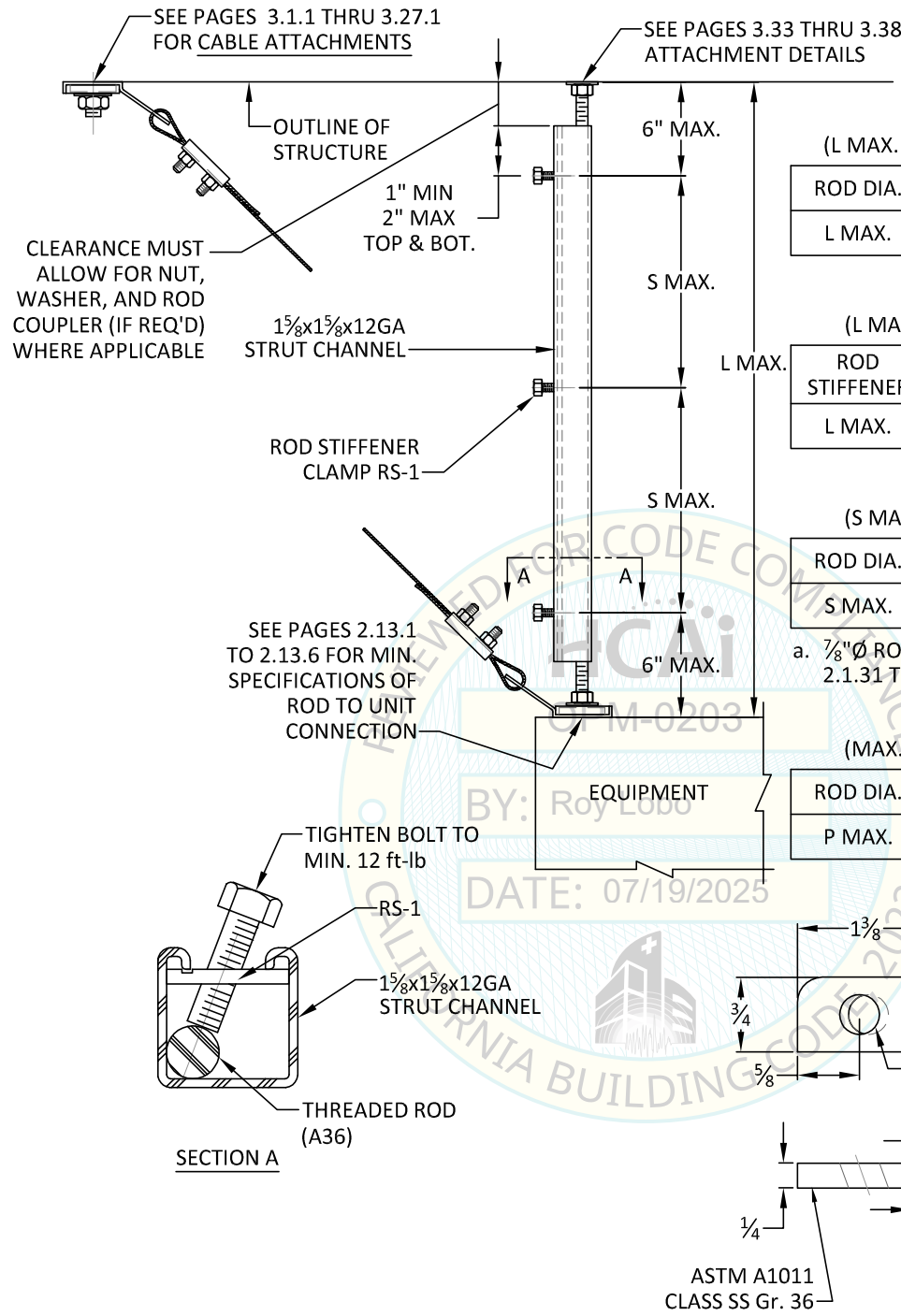


TABLE 1
(L MAX. WITHOUT ROD STIFFENER)

| ROD DIA. | 3/8" | 1/2" | 5/8" | 3/4" | 7/8"[a] |
|---|---|---|---|---|---|
| L MAX. | 15" | 21" | 26" | 32" | 38" |

TABLE 2
(L MAX. WITH ROD STIFFENER)

| ROD STIFFENER | 1-5/8x1-5/8x12GA STRUT CHANNEL |
|---|---|
| L MAX. | 116" |

TABLE 3
(S MAX. WITH ROD STIFFENER)

| ROD DIA. | 3/8" | 1/2" | 5/8" | 3/4" | 7/8"[a] |
|---|---|---|---|---|---|
| S MAX. | 15" | 21" | 26" | 32" | 38" |

a. ⅞"Ø ROD ONLY USED FOR HEAVY PIPE. SEE PAGES 2.1.31 THROUGH 2.1.36 FOR APPLICATIONS.

TABLE 4
(MAX. ROD COMPRESSION lbs)

| ROD DIA. | 3/8" | 1/2" | 5/8" | 3/4" | 7/8" |
|---|---|---|---|---|---|
| P MAX. | 439 | 757 | 1265 | 1836 | 2266 |

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NOTES:
1. SEE TABLE 1 FOR MAXIMUM LENGTH OF ⅜" THRU ⅞"Ø RODS WITHOUT ROD STIFFENER.
2. SEE TABLE 2 FOR MAXIMUM LENGTH OF ⅜" THRU ⅞"Ø RODS WITH ROD STIFFENER.
3. SEE TABLE 3 TO DETERMINE NUMBER OF ROD STIFFENER CLIPS REQUIRED.
4. PROVIDE ROD STIFFENING ONLY WHERE SEISMIC BRACKETS ARE ATTACHED TO THE ROD.
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# RS-1 - ROD STIFFENER DETAILS & REQUIREMENTS

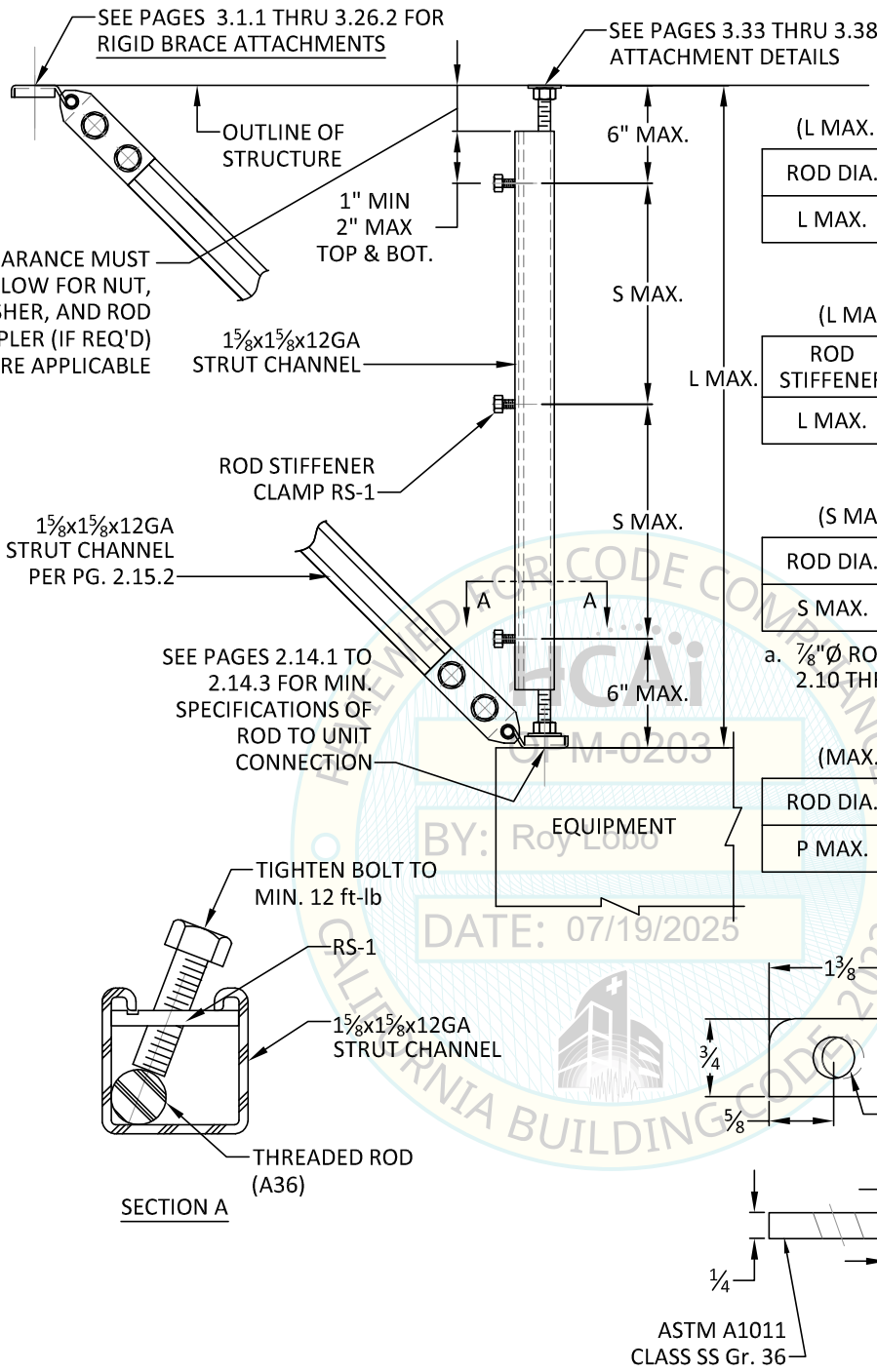


TABLE 1
(L MAX. WITHOUT ROD STIFFENER)

| ROD DIA. | 3/8" | 1/2" | 5/8" | 3/4" | 7/8"[a] |
|---|---|---|---|---|---|
| L MAX. | 15" | 21" | 26" | 32" | 38" |

TABLE 2
(L MAX. WITH ROD STIFFENER)

| ROD STIFFENER | 1-5/8x1-5/8x12GA STRUT CHANNEL |
|---|---|
| L MAX. | 116" |

TABLE 3
(S MAX. WITH ROD STIFFENER)

| ROD DIA. | 3/8" | 1/2" | 5/8" | 3/4" | 7/8"[a] |
|---|---|---|---|---|---|
| S MAX. | 15" | 21" | 26" | 32" | 38" |

a. ⅞"Ø ROD ONLY USED FOR HEAVY PIPE. SEE PAGES 2.10 THROUGH 2.15 FOR APPLICATIONS.

TABLE 4
(MAX. ROD COMPRESSION lbs)

| ROD DIA. | 3/8" | 1/2" | 5/8" | 3/4" | 7/8" |
|---|---|---|---|---|---|
| P MAX. | 439 | 757 | 1265 | 1836 | 2266 |


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DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022


NOTES:
1. SEE TABLE 1 FOR MAXIMUM LENGTH OF ⅜" THRU ⅞"Ø RODS WITHOUT ROD STIFFENER.
2. SEE TABLE 2 FOR MAXIMUM LENGTH OF ⅜" THRU ⅞"Ø RODS WITH ROD STIFFENER.
3. SEE TABLE 3 TO DETERMINE NUMBER OF ROD STIFFENER CLIPS REQUIRED.
4. PROVIDE ROD STIFFENING ONLY WHERE SEISMIC BRACKETS ARE ATTACHED TO THE ROD.
5. SEE SECTION 3 FOR STRUCTURAL ATTACHMENTS FOR RIGID BRACING.


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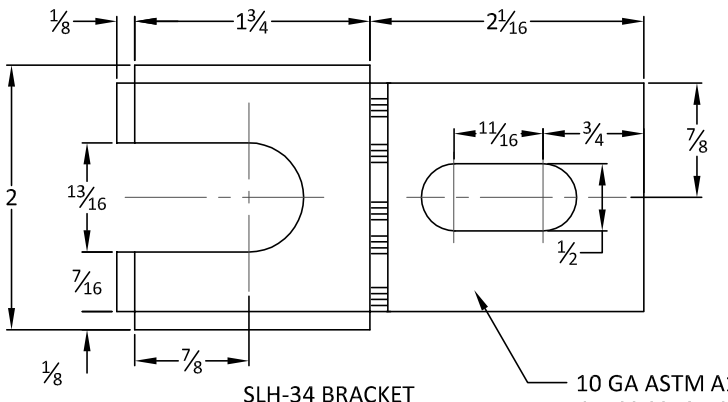
California PE No. S6481


Page No.: **4.3.2**

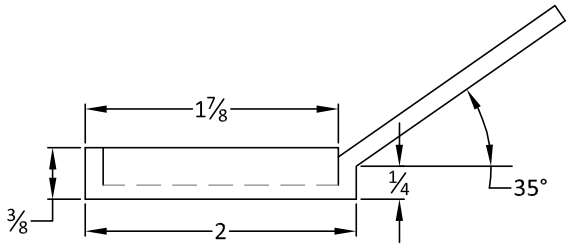
Date: **February 5, 2025**

# SLH-34 & SLW-38, 12, 58, & 34 DETAILS

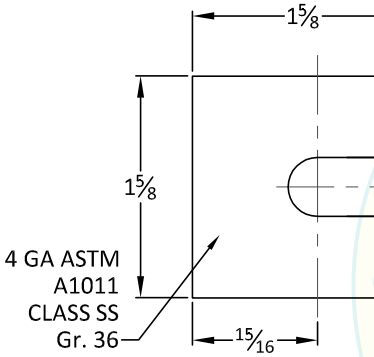



SLH-34 BRACKET
(FLAT)

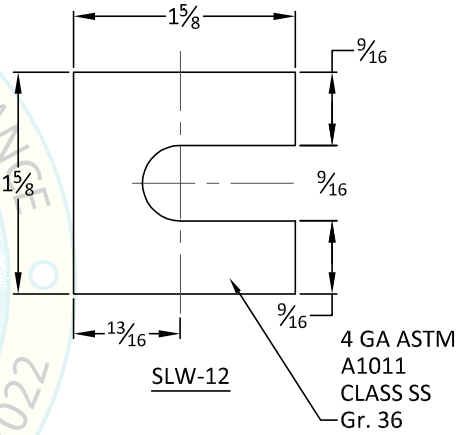
10 GA ASTM A1011
CLASS SS, Gr. 36
TOLERANCE : ±0.010



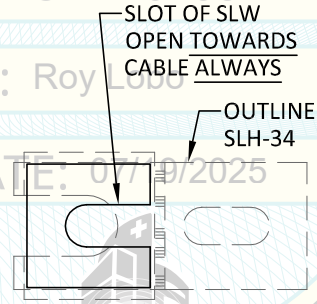

SLH-34 BRACKET
(ELEVATION)



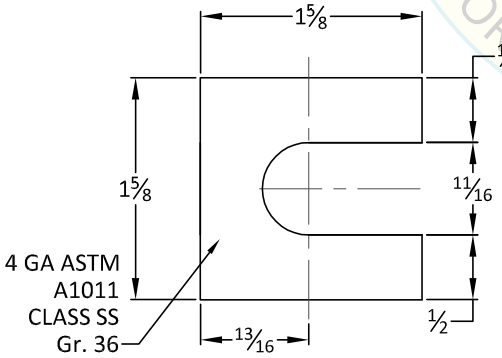

SLW-38



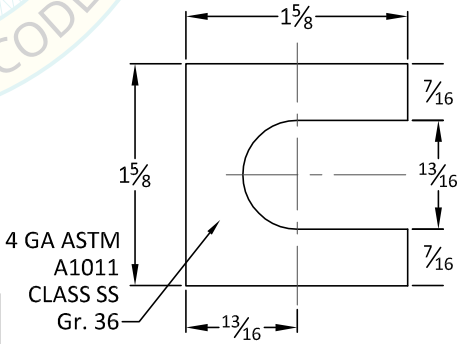

SLW-12




USE OF SLW WITH
SLH-34




SLW-58




SLW-34

| |
|---|
| USE SLW-38 WITH 3/8"Ø ROD |
| USE SLW-12 WITH 1/2"Ø ROD |
| USE SLW-58 WITH 5/8"Ø ROD |
| USE SLW-34 WITH 3/4"Ø ROD |

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California PE No. S6481

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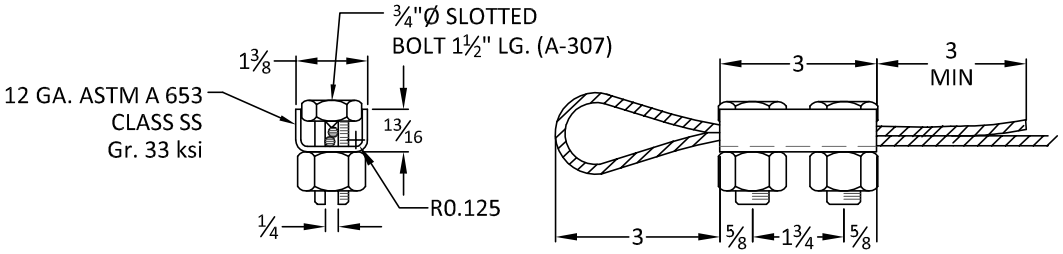
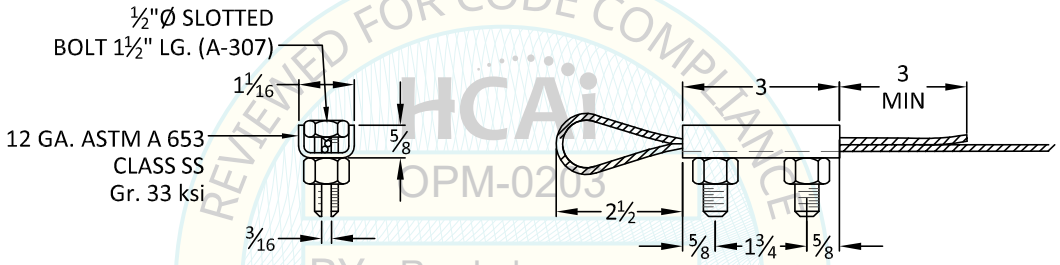
Date: February 5, 2025

# CABLE CLAMP DETAILS




3/16" CABLE CLAMP
PART# 315-1043

REQUIRED FASTENING
TORQUE: 15 ft-lbs




1/8" CABLE CLAMP
PART# 315-1042

REQUIRED FASTENING
TORQUE: 5 ft-lbs

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## CABLE INFORMATION

| CABLE Ø | CLASSIFICATION/ CONSTRUCTION | MIN. BREAKING STRENGTH |
|---|---|---|
| ⅛" | 7X19 | 2,000 LBS |
| 3/16" | 7X19 | 4,200 LBS |

CABLE IS SMALL DIA. (GALVANIZED) SPECIALTY CORD & MEETS ASTM A1023/A1023M STANDARDS & FEDERAL U.S. SPECIFICATION RR-W-410G, TYPE VI, CLASS 3.

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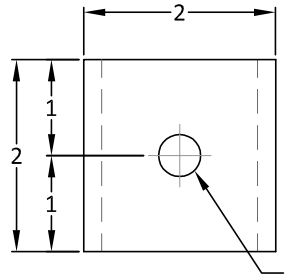
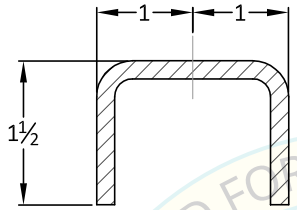
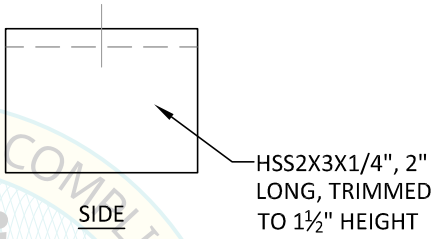
Date: February 5, 2025

# PIPE LUG PL-38 DETAILS




HSS USED FOR
PL-38 IS ASTM
A500 Gr. B 46ksi
CARBON STEEL




## PL-38 FOR 1-1/4"Ø TO 2"Ø PIPE

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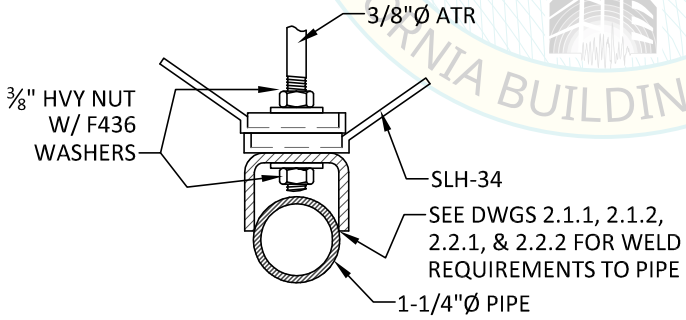
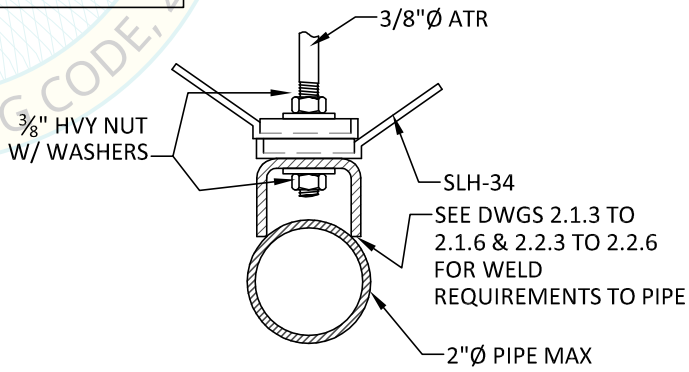
REQUIRED FASTENING TORQUE
FOR ⅜"Ø ROD: 16 ft-lbs




1-1/4"Ø PIPE ASSEMBLY DETAIL




1-1/2"Ø & 2"Ø PIPE ASSEMBLY DETAIL

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Structural Engineer: N. Tremblay
California PE No. S6481

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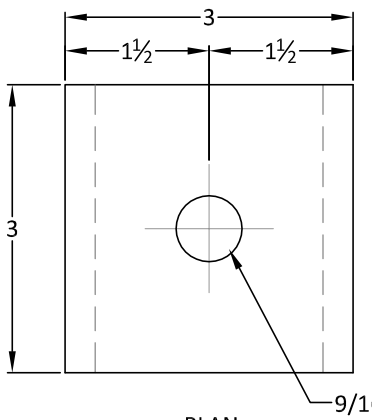
Date: February 5, 2025

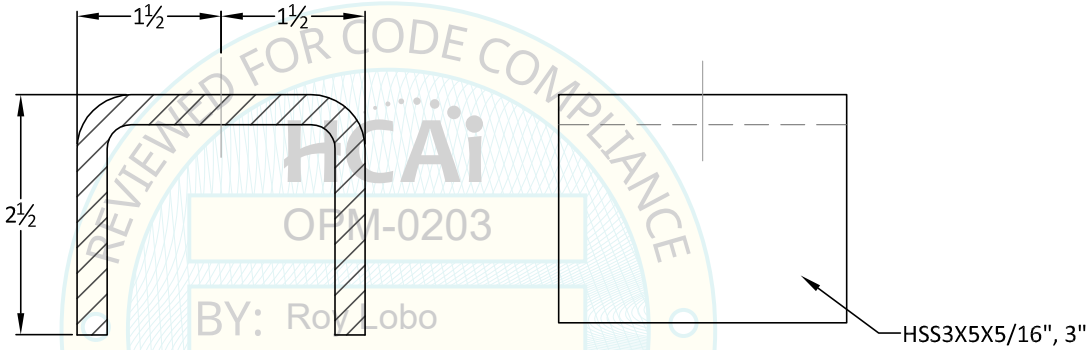
# PIPE LUG PL-12 & 58 DETAILS




HSS USED FOR PL-12 & PL-58 ARE ASTM A500 Gr. B 46ksi CARBON STEEL

9/16"Ø HOLE FOR 1/2"Ø ROD OR BOLT (PL-12)
11/16"Ø HOLE FOR 5/8"Ø ROD OR BOLT (PL-58)

PLAN




FRONT SIDE

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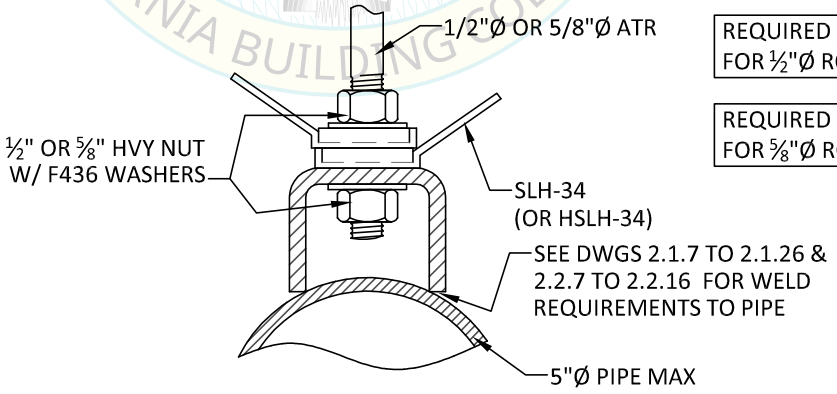
## PL-12 FOR 2-1/2"Ø TO 3-1/2"Ø PIPE
## PL-58 FOR 4"Ø & 5"Ø PIPE




REQUIRED FASTENING TORQUE FOR ½"Ø ROD: 40 ft-lbs

REQUIRED FASTENING TORQUE FOR ⅝"Ø ROD: 79 ft-lbs

2-1/2"Ø TO 5"Ø PIPE ASSEMBLY DETAIL

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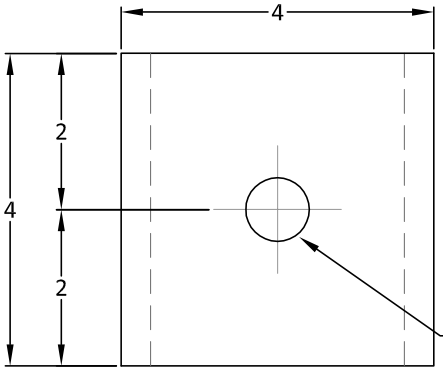
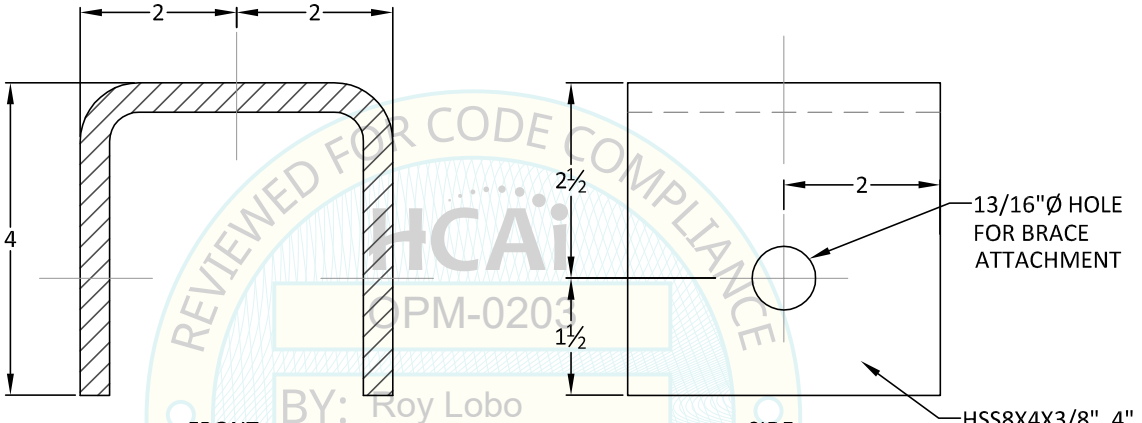
# PIPE LUG PL-34 DETAILS



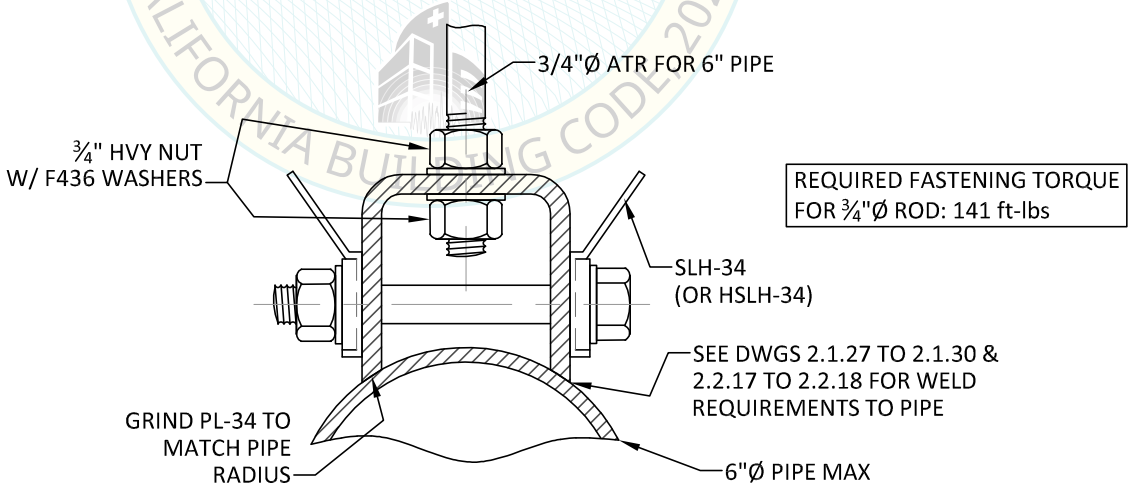

PLAN

HSS USED FOR PL-34
IS ASTM A500 Gr. B
46ksi CARBON
STEEL




FRONT SIDE

## PL-34 FOR 6"Ø PIPE




REQUIRED FASTENING TORQUE
FOR ¾"Ø ROD: 141 ft-lbs

6"Ø PIPE ASSEMBLY DETAIL

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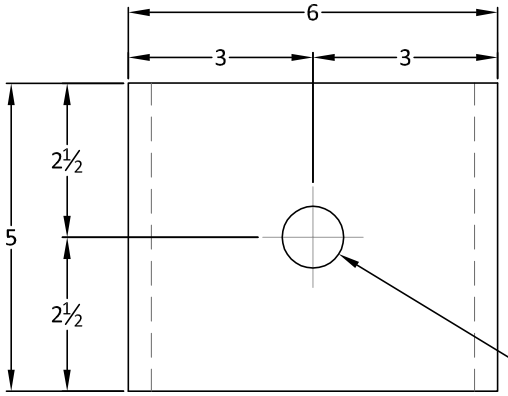
Date: February 5, 2025

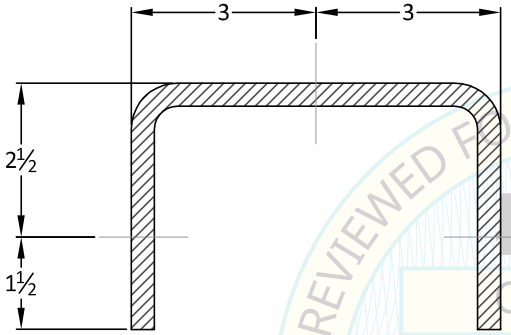
# PIPE LUG PL-78 DETAILS



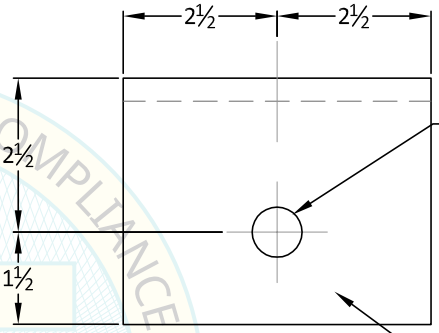

PLAN

HSS USED FOR PL-78
IS ASTM A500 Gr. B
46ksi CARBON
STEEL

15/16"Ø HOLE FOR 7/8"Ø ROD (PL-78)




FRONT

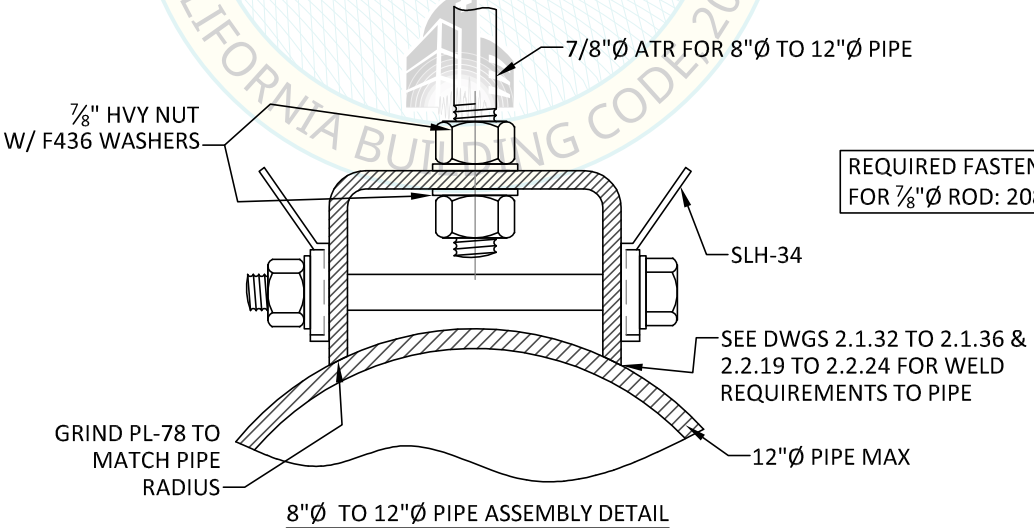



SIDE

13/16"Ø HOLE
FOR BRACE
ATTACHMENT

HSS8X6X3/8", 5"
LONG, TRIMMED
TO 4" HEIGHT

## PL-78 FOR 8"Ø TO 12"Ø PIPE




8"Ø TO 12"Ø PIPE ASSEMBLY DETAIL

REQUIRED FASTENING TORQUE
FOR ⅞"Ø ROD: 208 ft-lbs

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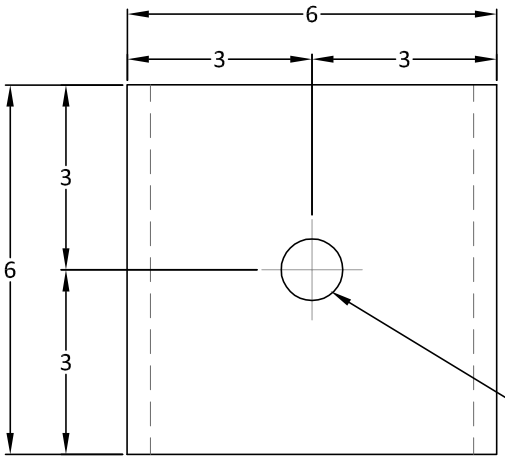
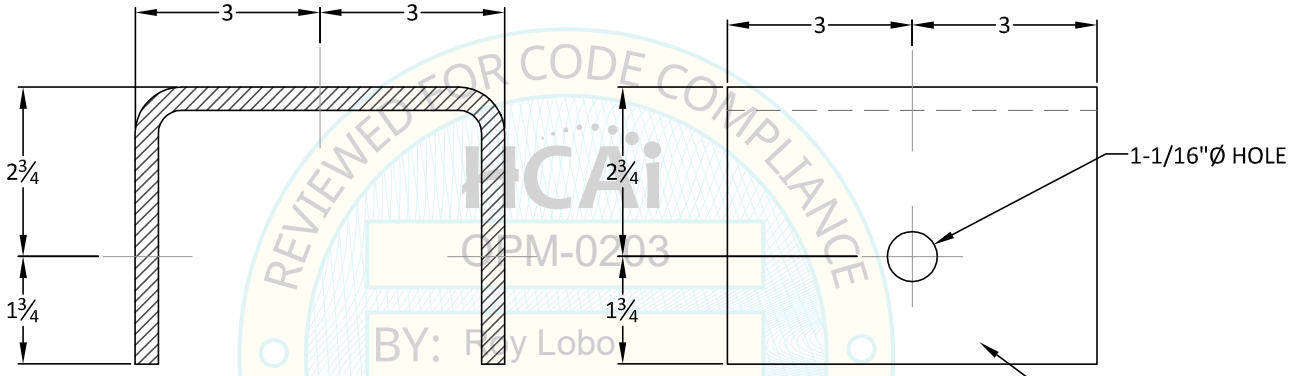
Date: February 5, 2025

# PIPE LUG PL-1 DETAILS

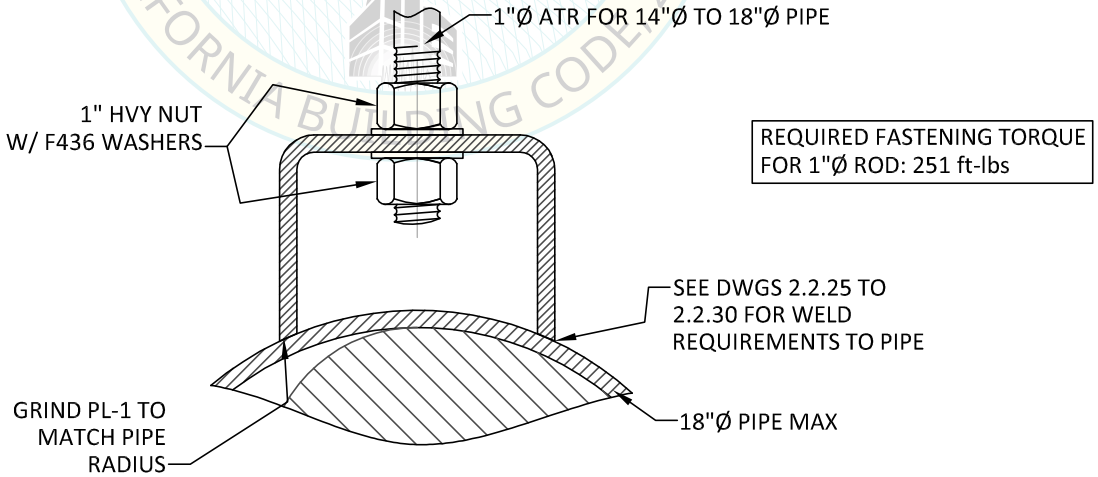



PLAN

HSS USED FOR PL-1
IS ASTM A500 Gr. B
46ksi CARBON
STEEL




## PL-1 FOR 14"Ø TO 18"Ø PIPE




REQUIRED FASTENING TORQUE
FOR 1"Ø ROD: 251 ft-lbs

14"Ø TO 18"Ø PIPE ASSEMBLY DETAIL

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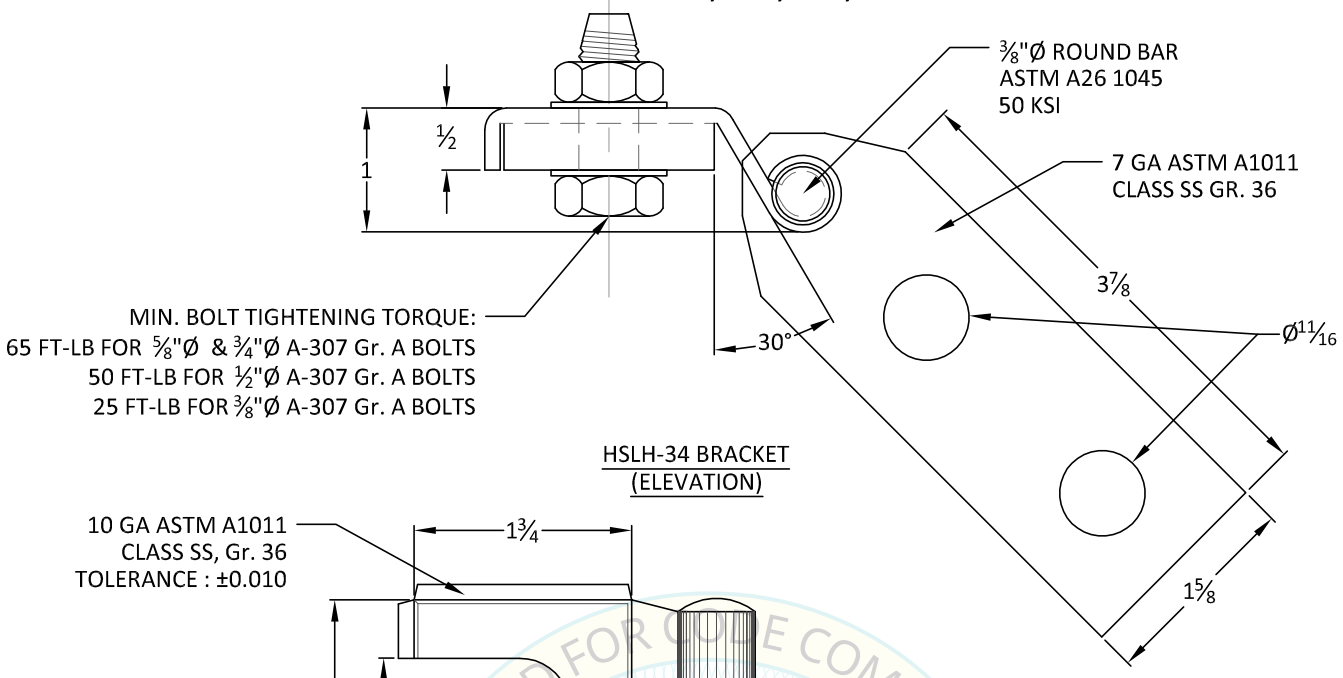
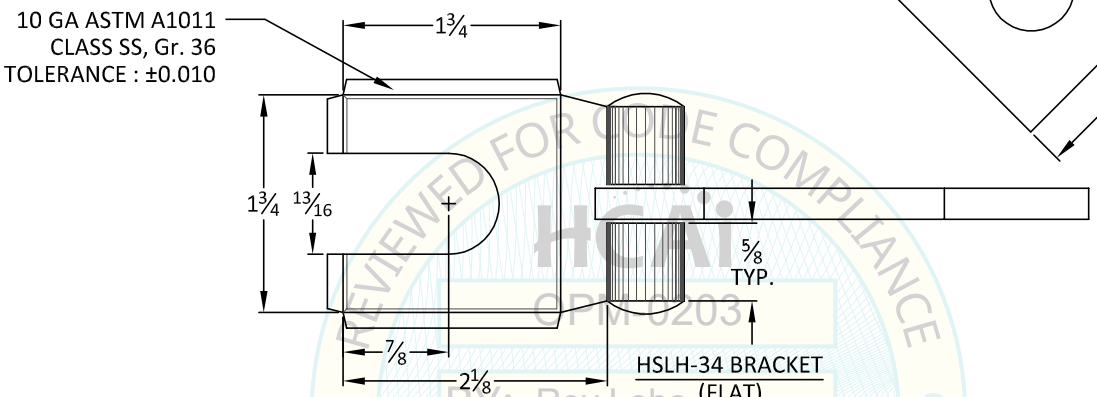
Date: February 5, 2025

# HSLH-34 & SLW-38, 12, 58, & 34 DETAILS




HSLH-34 BRACKET
(ELEVATION)




HSLH-34 BRACKET
(FLAT)

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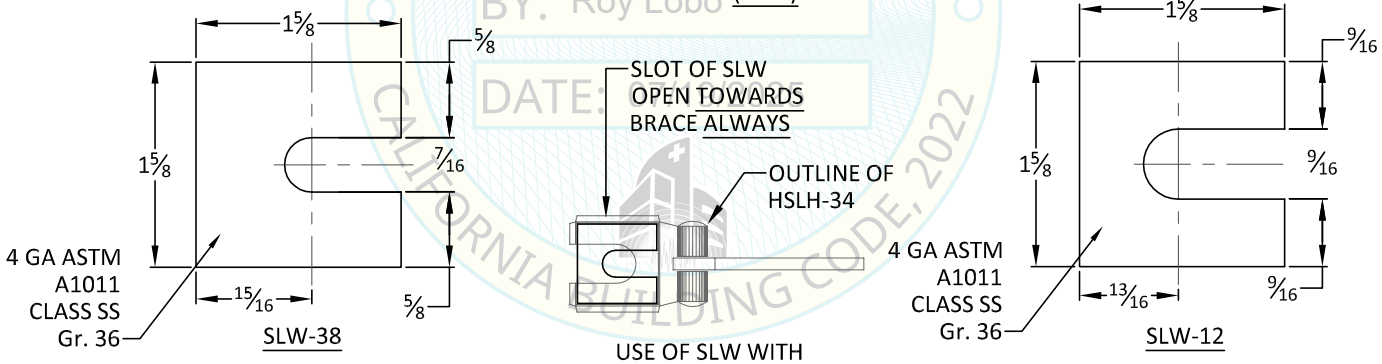
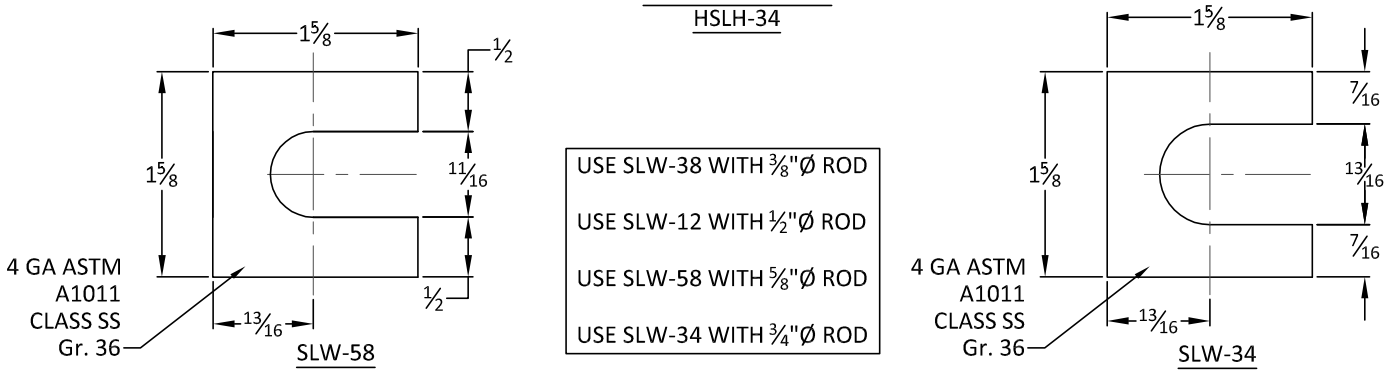



USE OF SLW WITH
HSLH-34




| |
|---|
| USE SLW-38 WITH 3/8"Ø ROD |
| USE SLW-12 WITH 1/2"Ø ROD |
| USE SLW-58 WITH 5/8"Ø ROD |
| USE SLW-34 WITH 3/4"Ø ROD |

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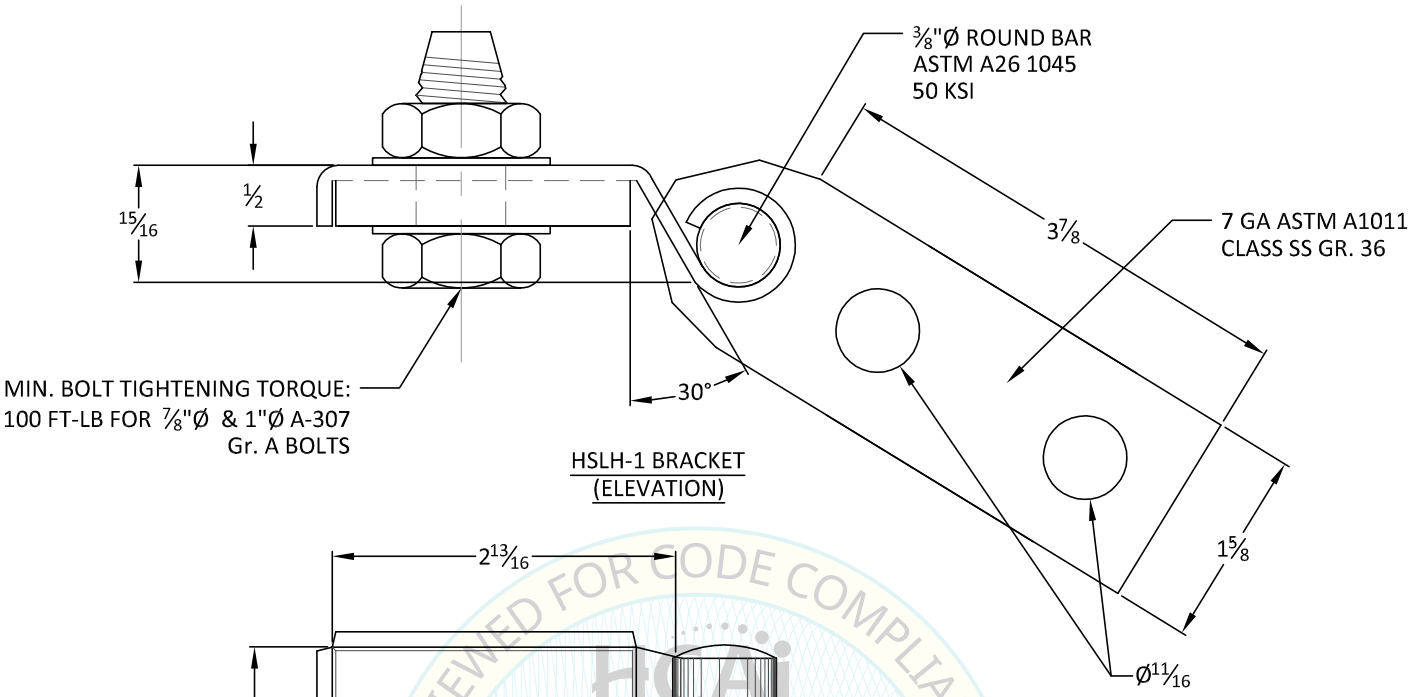
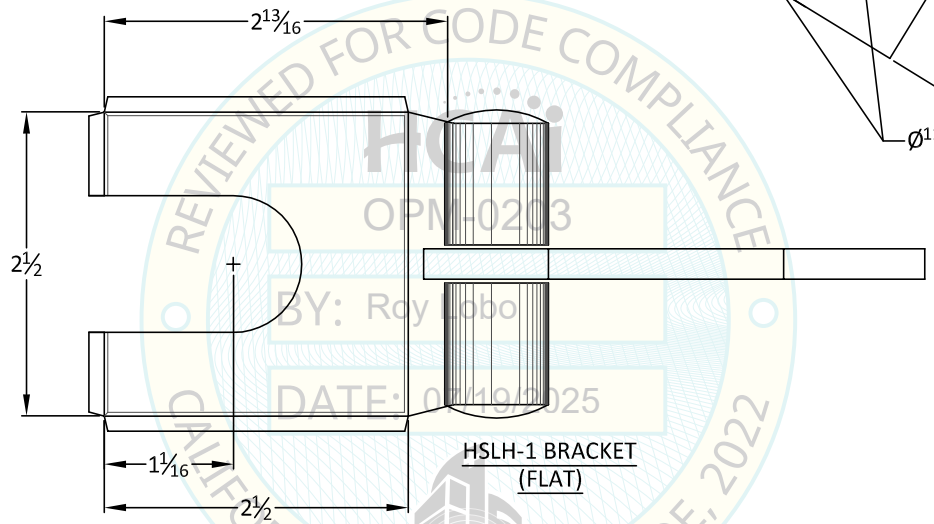
Date: February 5, 2025

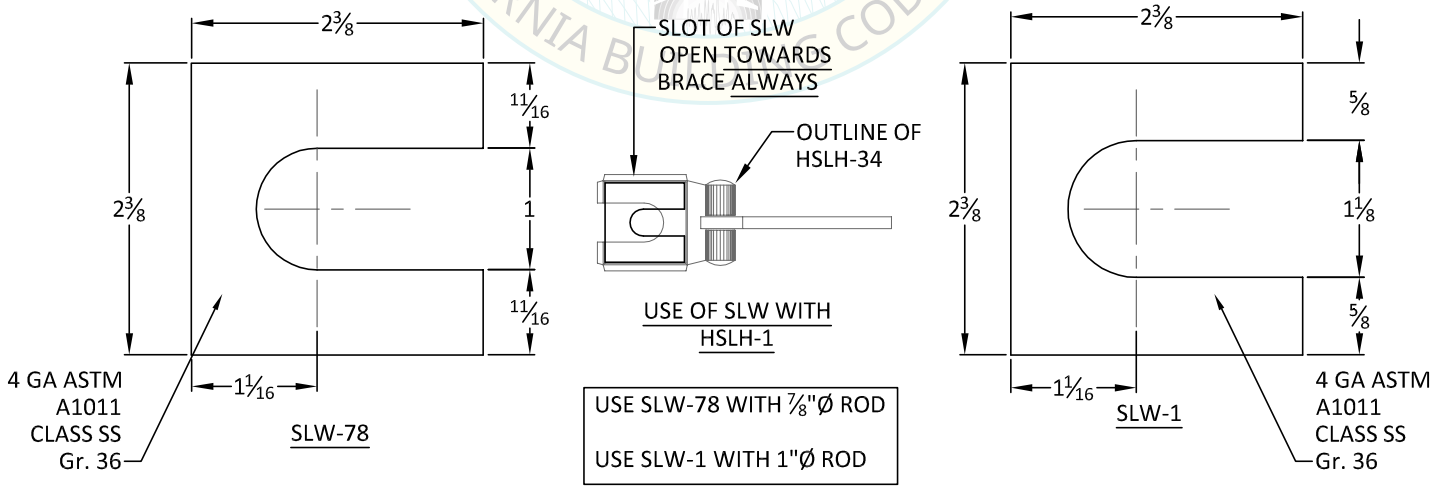
# HSLH-1 & SLW-78 & 1 DETAILS




HSLH-1 BRACKET
(ELEVATION)




HSLH-1 BRACKET
(FLAT)




USE SLW-78 WITH 7/8"Ø ROD

USE SLW-1 WITH 1"Ø ROD

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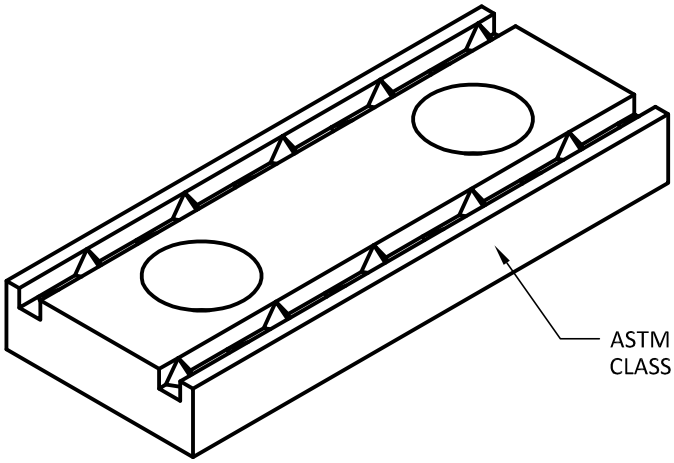
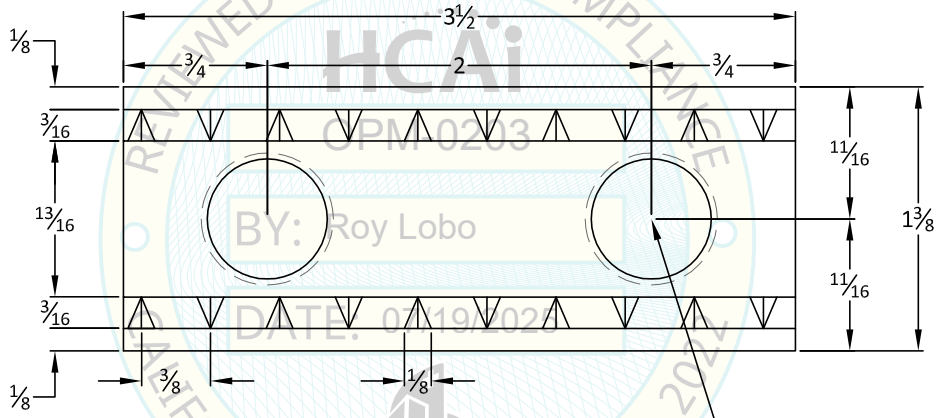
Date: February 5, 2025

# DSSN STRUT NUT DETAILS

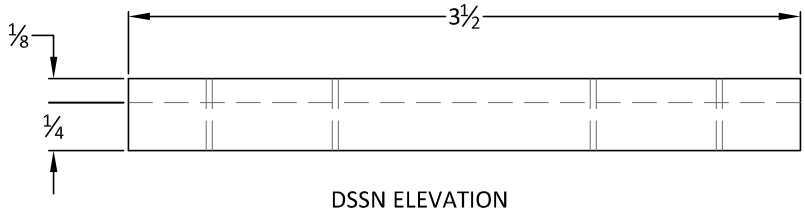



NOTE:
THE NEAREST BOLT TO THE END OF THE STRUT BRACE ARM MUST BE MIN. ¾" FROM THE END OF THE STRUT BRACE ARM.

DSSN ISOMETRIC VIEW




DSSN PLAN VIEW




DSSN ELEVATION VIEW

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HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050

Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: 4.13

Date: February 5, 2025

# CABLE BRACING KIT DETAIL SELECTION
# SCH. 40 STEEL PIPE W/ INSULATION & WATER

CABLE BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| PIPE DIAMETER (in) | LINEAR WT. (PLF) | STD.[1] SUPPORT SPACING (FT) | TRANSVERSE BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 1.25 | 3.6 | 7 | 2.1.1 | 2.1.1 | 2.1.1 | 2.1.1 | 2.1.1 | 2.1.1 | 2.1.1 | 2.1.1 | 2.1.1 | 2.1.1 | 2.1.1 |
| 1.50 | 4.3 | 9 | 2.1.3 | 2.1.3 | 2.1.3 | 2.1.3 | 2.1.3 | 2.1.3 | 2.1.3 | 2.1.3 | 2.1.3 | 2.1.3 | 2.1.3 |
| 2.0 | 6.0 | 10 | 2.1.5 | 2.1.5 | 2.1.5 | 2.1.5 | 2.1.5 | 2.1.5 | 2.1.5 | 2.1.5 | 2.1.5 | 2.1.5 | 2.1.5 |
| 2.5 | 8.8 | 11 | 2.1.7 | 2.1.7 | 2.1.7 | 2.1.7 | 2.1.7 | 2.1.9 | 2.1.9 | 2.1.9 | 2.1.9 | 2.1.9 | 2.1.9 |
| 3.0 | 11.9 | 12 | 2.1.11 | 2.1.11 | 2.1.11 | 2.1.13 | 2.1.13 | 2.1.13 | 2.1.13 | 2.1.13 | 2.1.13 | 2.1.13 | 2.1.13 |
| 3.5 | 14.6 | 13 | 2.1.15 | 2.1.15 | 2.1.17 | 2.1.17 | 2.1.17 | 2.1.17 | 2.1.17 | 2.1.17 | 2.1.17 | 2.1.17 | 2.1.17 |
| 4.0 | 17.6 | 14 | 2.1.19 | 2.1.21 | 2.1.21 | 2.1.21 | 2.1.21 | 2.1.21 | 2.1.21 | 2.1.21 | 2.1.21 | 2.1.21 | 2.1.21 |
| 5.0 | 24.8 | 16 | 2.1.25 | 2.1.25 | 2.1.25 | 2.1.25 | 2.1.25 | 2.1.25 | 2.1.25 | 2.1.25 | 2.1.25 | n/a | n/a |
| 6.0 | 33.3 | 17 | 2.1.27 | 2.1.29 | 2.1.29 | 2.1.29 | 2.1.29 | 2.1.29 | 2.1.29 | 2.1.29 | 2.1.29 | n/a | n/a |
| 8.0 | 52.5 | 19 | 2.1.31 | 2.1.31 | 2.1.31 | 2.1.31 | 2.1.31 | 2.1.31 | 2.1.31 | n/a | n/a | n/a | n/a |
| 10.0 | 77.4 | 22 | 2.1.33 | 2.1.33 | 2.1.33 | 2.1.33 | 2.1.33 | n/a | n/a | n/a | n/a | n/a | n/a |
| 12.0 | 101.7 | 23 | 2.1.35 | 2.1.35 | 2.1.35 | 2.1.35 | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

| PIPE DIAMETER (in) | LINEAR WT. (PLF) | STD.[1] SUPPORT SPACING (FT) | TRANSVERSE & LONGITUDINAL BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 1.25 | 3.6 | 7 | 2.1.2 | 2.1.2 | 2.1.2 | 2.1.2 | 2.1.2 | 2.1.2 | 2.1.2 | 2.1.2 | 2.1.2 | 2.1.2 | 2.1.2 |
| 1.50 | 4.3 | 9 | 2.1.4 | 2.1.4 | 2.1.4 | 2.1.4 | 2.1.4 | 2.1.4 | 2.1.4 | 2.1.4 | 2.1.4 | 2.1.4 | 2.1.4 |
| 2.0 | 6.0 | 10 | 2.1.6 | 2.1.6 | 2.1.6 | 2.1.6 | 2.1.6 | 2.1.6 | 2.1.6 | 2.1.6 | 2.1.6 | 2.1.6 | 2.1.6 |
| 2.5 | 8.8 | 11 | 2.1.8 | 2.1.8 | 2.1.8 | 2.1.8 | 2.1.10 | 2.1.10 | 2.1.10 | 2.1.10 | 2.1.10 | 2.1.10 | 2.1.10 |
| 3.0 | 11.9 | 12 | 2.1.12 | 2.1.12 | 2.1.12 | 2.1.14 | 2.1.14 | 2.1.14 | 2.1.14 | 2.1.14 | 2.1.14 | 2.1.14 | 2.1.14 |
| 3.5 | 14.6 | 13 | 2.1.16 | 2.1.16 | 2.1.18 | 2.1.18 | 2.1.18 | 2.1.18 | 2.1.18 | 2.1.18 | 2.1.18 | 2.1.18 | 2.1.18 |
| 4.0 | 17.6 | 14 | 2.1.20 | 2.1.22 | 2.1.22 | 2.1.22 | 2.1.22 | 2.1.22 | 2.1.22 | 2.1.22 | 2.1.22 | 2.1.22 | 2.1.22 |
| 5.0 | 24.8 | 16 | 2.1.26 | 2.1.26 | 2.1.26 | 2.1.26 | 2.1.26 | 2.1.26 | 2.1.26 | 2.1.26 | 2.1.26 | n/a | n/a |
| 6.0 | 33.3 | 17 | 2.1.28 | 2.1.30 | 2.1.30 | 2.1.30 | 2.1.30 | 2.1.30 | 2.1.30 | 2.1.30 | 2.1.30 | n/a | n/a |
| 8.0 | 52.5 | 19 | 2.1.32 | 2.1.32 | 2.1.32 | 2.1.32 | 2.1.32 | 2.1.32 | 2.1.32 | n/a | n/a | n/a | n/a |
| 10.0 | 77.4 | 22 | 2.1.34 | 2.1.34 | 2.1.34 | 2.1.34 | 2.1.34 | n/a | n/a | n/a | n/a | n/a | n/a |
| 12.0 | 101.7 | 23 | 2.1.36 | 2.1.36 | 2.1.36 | 2.1.36 | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

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OPM-0203
By: Roy Lobo
DATE: 07/19/2025

NOTES:
1. SUPPORT SPACING MUST NOT EXCEED THE MAXIMUM BRACE SPACING SPECIFIED ON PAGES D.2.1 & D.3.1.
2. SEE PAGES D.2.1 & D.3.1 FOR BRACE AND HANGER/ROD ATTACHMENT DETAIL TABLES.
3. DETAILS LISTED ABOVE APPLY FOR PIPES WITH WELDED, BOLTED, COUPLED, OR THREADED CONNECTIONS.
4. ▭ DENOTES CABLE KITS WITH $\frac{3}{16}$"Ø CABLE.

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Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **D.1.1**

Date: February 5, 2025

# RIGID BRACING KIT DETAIL SELECTION
# SCH. 40 STEEL PIPE W/ INSULATION & WATER

RIGID BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| PIPE DIAMETER (in) | LINEAR WT. (PLF) | STD.[1] SUPPORT SPACING (FT) | TRANSVERSE BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | TRANSVERSE & LONGITUDINAL BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 1.25 | 3.6 | 7 | 2.2.1 | 2.2.1 | 2.2.1 | 2.2.1 | 2.2.1 | 2.2.2 | 2.2.2 | 2.2.2 | 2.2.2 | 2.2.2 |
| 1.50 | 4.3 | 9 | 2.2.3 | 2.2.3 | 2.2.3 | 2.2.3 | 2.2.3 | 2.2.4 | 2.2.4 | 2.2.4 | 2.2.4 | 2.2.4 |
| 2.0 | 6.0 | 10 | 2.2.5 | 2.2.5 | 2.2.5 | 2.2.5 | 2.2.5 | 2.2.6 | 2.2.6 | 2.2.6 | 2.2.6 | 2.2.6 |
| 2.5 | 8.8 | 11 | 2.2.7 | 2.2.7 | 2.2.7 | 2.2.7 | 2.2.7 | 2.2.8 | 2.2.8 | 2.2.8 | 2.2.8 | 2.2.8 |
| 3.0 | 11.9 | 12 | 2.2.9 | 2.2.9 | 2.2.9 | 2.2.9 | 2.2.9 | 2.2.10 | 2.2.10 | 2.2.10 | 2.2.10 | 2.2.10 |
| 3.5 | 14.6 | 13 | 2.2.11 | 2.2.11 | 2.2.11 | 2.2.11 | 2.2.11 | 2.2.12 | 2.2.12 | 2.2.12 | 2.2.12 | 2.2.12 |
| 4.0 | 17.6 | 14 | 2.2.13 | 2.2.13 | 2.2.13 | 2.2.13 | 2.2.13 | 2.2.14 | 2.2.14 | 2.2.14 | 2.2.14 | 2.2.14 |
| 5.0 | 24.8 | 16 | 2.2.15 | 2.2.15 | 2.2.15 | 2.2.15 | 2.2.15 | 2.2.16 | 2.2.16 | 2.2.16 | 2.2.16 | 2.2.16 |
| 6.0 | 33.3 | 17 | 2.2.17 | 2.2.17 | 2.2.17 | 2.2.17 | 2.2.17 | 2.2.18 | 2.2.18 | 2.2.18 | 2.2.18 | 2.2.18 |
| 8.0 | 52.5 | 19 | 2.2.19 | 2.2.19 | 2.2.19 | 2.2.19 | 2.2.19 | 2.2.20 | 2.2.20 | 2.2.20 | 2.2.20 | 2.2.20 |
| 10.0 | 77.4 | 22 | 2.2.21 | 2.2.21 | 2.2.21 | 2.2.21 | 2.2.21 | 2.2.22 | 2.2.22 | 2.2.22 | 2.2.22 | 2.2.22 |
| 12.0 | 101.7 | 23 | 2.2.23 | 2.2.23 | 2.2.23 | 2.2.23 | 2.2.23 | 2.2.24 | 2.2.24 | 2.2.24 | 2.2.24 | 2.2.24 |
| 14.0 | 116.6 | 25 | 2.2.25 | 2.2.25 | 2.2.25 | 2.2.25 | 2.2.25 | 2.2.26 | 2.2.26 | 2.2.26 | 2.2.26 | 2.2.26 |
| 16.0 | 144.2 | 27 | 2.2.27 | 2.2.27 | 2.2.27 | 2.2.27 | 2.2.27 | 2.2.28 | 2.2.28 | 2.2.28 | 2.2.28 | 2.2.28 |
| 18.0 | 174.5 | 28 | 2.2.29 | 2.2.29 | 2.2.29 | 2.2.29 | 2.2.29 | 2.2.30 | 2.2.30 | 2.2.30 | 2.2.30 | 2.2.30 |

NOTES:
1. SUPPORT SPACING MUST NOT EXCEED THE MAXIMUM BRACE SPACING SPECIFIED ON PAGES D.2.2 & D.3.2.
2. SEE PAGES D.2.2 & D.3.2 FOR BRACE AND HANGER/ROD ATTACHMENT DETAIL TABLES.
3. DETAILS LISTED ABOVE APPLY FOR PIPES WITH WELDED, BOLTED, COUPLED, OR THREADED CONNECTIONS.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

Vibrex® vibration & seismic control systems
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Ph: (661) 257-3311 | Fax: (661) 257-6050
Structural Engineer: N. Tremblay
California PE No. S6481

# TRANSVERSE CABLE BRACING & HANGER/ROD ATTACHMENT DESIGNATION SELECTION
# FOR SCH. 40 STEEL PIPE W/ INSULATION & WATER

CABLE BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| PIPE DIAMETER (in) | BRACING ATTACHMENT DESIGNATION BASED ON "g" VALUE OF Fp[1] | | | | | | | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | |
| 1.25 | B1 | B1 | B2 | B2 | B2 | B3 | B3 | B3 | B3 | B3 | B3 | H1/R1 |
| 1.50 | B1 | B2 | B2 | B2 | B3 | B3 | B3 | B4 | B4 | B4 | B4 | H1/R1 |
| 2.0 | B2 | B2 | B3 | B3 | B4 | B4 | B5 | B5 | B6 | B6 | B6 | H1/R1 |
| 2.5 | B2 | B3 | B4 | B5 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 3.0 | B3 | B5 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 3.5 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 4.0 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R2 |
| 5.0 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R2 |
| 6.0 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R3 |
| 8.0 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R4 |
| 10.0 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R6 |
| 12.0 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R7 |

| PIPE DIAMETER (in) | MAXIMUM TRANSVERSE BRACE SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 1.25 | 19.6 | 19.0 | 18.4 | 17.7 | 16.4 | 15.3 | 14.3 | 13.5 | 12.7 | 12.1 | 11.5 |
| 1.50 | 21.6 | 21.0 | 20.4 | 19.7 | 18.3 | 17.1 | 16.0 | 15.1 | 14.3 | 13.6 | 13.1 |
| 2.0 | 25.2 | 24.7 | 23.9 | 23.2 | 21.3 | 19.8 | 18.6 | 17.6 | 16.7 | 15.9 | 15.0 |
| 2.5 | 29.5 | 28.8 | 27.6 | 26.3 | 24.2 | 22.5 | 20.8 | 17.3 | 14.8 | 13.0 | 11.5 |
| 3.0 | 32.5 | 31.9 | 30.3 | 28.8 | 23.2 | 17.4 | 13.9 | 11.6 | 9.9 | 8.7 | 7.7 |
| 3.5 | 34.7 | 33.9 | 32.1 | 26.5 | 17.7 | 13.3 | 10.6 | 8.8 | 7.6 | 6.6 | 5.9 |
| 4.0 | 36.7 | 35.7 | 27.6 | 20.7 | 13.8 | 10.4 | 8.3 | 8.5 | 7.1 | 8.5 | 7.1 |
| 5.0 | 40 | 33.0 | 22.0 | 16.5 | 11.0 | 8.2 | 5.3 | 4.4 | 3.8 | n/a | n/a |
| 6.0 | 40 | 30.3 | 20.2 | 15.1 | 10.1 | 7.6 | 6.1 | 5.0 | 4.3 | n/a | n/a |
| 8.0 | 40 | 21.0 | 14.0 | 10.5 | 7.0 | 5.2 | 4.2 | n/a | n/a | n/a | n/a |
| 10.0 | 24.9 | 12.4 | 8.3 | 6.2 | 4.1 | n/a | n/a | n/a | n/a | n/a | n/a |
| 12.0 | 16.6 | 8.3 | 5.5 | 4.1 | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

NOTES:
1. SEE PAGES D.9.1 THRU D.12.2 FOR SELECTION OF SPECIFIC BRACING ATTACHMENT DETAILS BASED ON THE SPECIFIED BRACING ATTACHMENT DESIGNATION ABOVE.
2. SEE PAGES D.13.1 THRU D.16.1 FOR SELECTION OF SPECIFIC HANGER/ROD ATTACHMENT DETAILS BASED ON THE SPECIFIED HANGER/ROD ATTACHMENT DESIGNATION ABOVE.
3. DETAILS AND SPACING VALUES LISTED ABOVE APPLY FOR WELDED, BOLTED, COUPLED OR THREADED CONNECTIONS.

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DATE: 07/19/2025
OSHPD PREAPPROVED BUILDING CODE COMPLIANCE

# TRANSVERSE RIGID BRACING & HANGER/ROD ATTACHMENT DESIGNATION SELECTION
# FOR SCH. 40 STEEL PIPE W/ INSULATION & WATER

RIGID BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| PIPE DIAMETER (in) | BRACING ATTACHMENT DESIGNATION BASED ON "g" VALUE OF Fp | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2,3] FOR CONCRETE ATTACHMENT ONLY (WITH $\Omega_o$) | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2,3] FOR STEEL & WOOD ATTACHMENT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 1.25 | B1 | B2 | B2 | B2 | B2 | R1 | R1 | R1 | R1 | R1 | R1 | R1 | R1 | R1 | R1 |
| 1.50 | B1 | B2 | B2 | B2 | B3 | R1 | R1 | R1 | R1 | R2 | R1 | R1 | R1 | R1 | R1 |
| 2.0 | B2 | B2 | B3 | B3 | B4 | R1 | R1 | R2 | R2 | R2 | R1 | R1 | R1 | R1 | R1 |
| 2.5 | B2 | B3 | B4 | B5 | B6 | R1 | R2 | R2 | R3 | R3 | R1 | R1 | R2 | R2 | R2 |
| 3.0 | B3 | B4 | B6 | B7 | B8 | R2 | R3 | R3 | R3 | R4 | R2 | R2 | R2 | R2 | R3 |
| 3.5 | B4 | B6 | B7 | B8 | B8 | R2 | R3 | R4 | R4 | R4 | R2 | R2 | R3 | R3 | R3 |
| 4.0 | B2 | B3 | B4 | B4 | B5 | R3 | R4 | R4 | R5 | R5 | R2 | R3 | R3 | R3 | R3 |
| 5.0 | B3 | B4 | B5 | B6 | B7 | R4 | R5 | R6 | R6 | R8 | R3 | R4 | R4 | R4 | R5 |
| 6.0 | B3 | B5 | B6 | B7 | B8 | R5 | R6 | R7 | R8 | R8 | R4 | R5 | R5 | R6 | R7 |
| 8.0 | B4 | B6 | B8 | B8 | B9 | R7 | R8 | R8 | R8 | R8 | R6 | R7 | R8 | R8 | R8 |
| 10.0 | B5 | B8 | B9 | B9 | B9 | R8 | R8 | R8 | R9 | R9 | R8 | R8 | R8 | R8 | R8 |
| 12.0 | B6 | B8 | B9 | B9 | B9 | R8 | R9 | R9 | R9 | R9 | R8 | R8 | R8 | R8 | R8 |
| 14.0 | B7 | B8 | B9 | B9 | B9 | R8 | R9 | R9 | R9 | R9 | R8 | R8 | R9 | R9 | R8 |
| 16.0 | B8 | B9 | B9 | B9 | B9 | R9 | R9 | R10 | R9 | R9 | R9 | R9 | R9 | R9 | R8 |
| 18.0 | B8 | B9 | B9 | B9 | B9 | R9 | R10 | R10 | R9 | R9 | R9 | R9 | R9 | R9 | R8 |

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE

| PIPE DIAMETER (in) | MAXIMUM TRANSVERSE BRACE SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 1.25 | 19.6 | 19.0 | 18.4 | 17.7 | 16.4 |
| 1.50 | 21.6 | 21.0 | 20.4 | 19.7 | 18.3 |
| 2.0 | 25.2 | 24.7 | 23.9 | 23.2 | 21.3 |
| 2.5 | 29.5 | 28.8 | 27.6 | 26.3 | 24.2 |
| 3.0 | 32.5 | 31.9 | 30.3 | 28.8 | 26.5 |
| 3.5 | 34.7 | 33.9 | 32.1 | 30.6 | 24.3 |
| 4.0 | 36.7 | 35.7 | 33.9 | 32.3 | 29.6 |
| 5.0 | 40 | 39.2 | 37.1 | 35.4 | 32.5 |
| 6.0 | 40 | 40 | 40 | 38.1 | 35 |
| 8.0 | 40 | 40 | 40 | 40 | 34.3 |
| 10.0 | 40 | 40 | 40 | 34.9 | 23.3 |
| 12.0 | 40 | 40 | 35.4 | 26.6 | 17.7 |
| 14.0 | 40 | 40 | 36.1 | 27.1 | 18.1 |
| 16.0 | 40 | 40 | 39.2 | 21.9 | 14.6 |
| 18.0 | 40 | 40 | 24.2 | 18.1 | 12.1 |

NOTES:
1. SEE PAGES D.9.1 THRU D.12.2 FOR SELECTION OF SPECIFIC BRACING ATTACHMENT DETAILS BASED ON THE SPECIFIED BRACING ATTACHMENT DESIGNATION ABOVE.
2. SEE PAGES D.13.1 THRU D.16.1 FOR SELECTION OF SPECIFIC HANGER/ROD ATTACHMENT DETAILS BASED ON THE SPECIFIED HANGER/ROD ATTACHMENT DESIGNATION ABOVE.
3. ROD DESIGNATION BASED ON LESSER OF STANDARD ROD SPACING OR BRACE SPACING.
4. DETAILS AND SPACING VALUES LISTED APPLY FOR WELDED, BOLTED, COUPLED OR THREADED CONNECTIONS.

Vibrex® vibration & seismic control systems
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Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: D.2.2

Date: February 5, 2025

# TRANSVERSE & LONGITUDINAL CABLE BRACING & HANGER/ROD ATTACHMENT DESIGNATION SELECTION
# FOR SCH. 40 STEEL PIPE W/ INSULATION & WATER

CABLE BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| PIPE DIAMETER (in) | BRACING ATTACHMENT DESIGNATION BASED ON "g" VALUE OF Fp[1] | | | | | | | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | |
| 1.25 | B2 | B2 | B3 | B3 | B4 | B5 | B6 | B6 | B6 | B6 | B6 | H1/R1 |
| 1.50 | B2 | B3 | B3 | B4 | B5 | B6 | B6 | B6 | B6 | B6 | B6 | H1/R1 |
| 2.0 | B2 | B3 | B4 | B5 | B6 | B6 | B6 | B6 | B6 | B6 | B6 | H1/R1 |
| 2.5 | B3 | B4 | B5 | B5 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 3.0 | B3 | B5 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 3.5 | B3 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 4.0 | B4 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R2 |
| 5.0 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | n/a | n/a | R2 |
| 6.0 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | n/a | n/a | R3 |
| 8.0 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | n/a | n/a | n/a | n/a | R4 |
| 10.0 | B7 | B7 | B7 | B7 | B7 | n/a | n/a | n/a | n/a | n/a | n/a | R6 |
| 12.0 | B7 | B7 | B7 | B7 | n/a | n/a | n/a | n/a | n/a | n/a | n/a | R7 |

| PIPE DIAMETER (in) | MAXIMUM TRANSVERSE & LONGITUDINAL BRACE SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 1.25 | 80 | 80 | 80 | 80 | 80 | 80 | 78.2 | 65.1 | 55.8 | 48.9 | 43.4 |
| 1.50 | 80 | 80 | 80 | 80 | 80 | 80 | 65 | 54.2 | 46.4 | 40.6 | 36.1 |
| 2.0 | 80 | 80 | 80 | 80 | 79 | 59.3 | 47.4 | 39.5 | 33.9 | 29.6 | 26.3 |
| 2.5 | 80 | 80 | 80 | 80 | 75.1 | 56.3 | 45.1 | 37.6 | 32.2 | 28.2 | 25 |
| 3.0 | 80 | 80 | 80 | 80 | 55.8 | 41.9 | 33.5 | 27.9 | 23.9 | 20.9 | 18.6 |
| 3.5 | 80 | 80 | 80 | 68.1 | 45.4 | 34.1 | 27.3 | 22.7 | 19.5 | 17.0 | 15.1 |
| 4.0 | 80 | 80 | 75.2 | 56.4 | 37.6 | 28.2 | 22.6 | 18.8 | 16.1 | 14.1 | 12.5 |
| 5.0 | 80 | 80 | 53.4 | 40 | 26.7 | 20 | 16 | 13.3 | 11.4 | n/a | n/a |
| 6.0 | 80 | 59.8 | 39.8 | 29.9 | 19.9 | 14.9 | 12 | 10 | 4.3 | n/a | n/a |
| 8.0 | 75.8 | 37.9 | 25.3 | 19 | 12.6 | 9.5 | 4.2 | n/a | n/a | n/a | n/a |
| 10.0 | 51.4 | 25.7 | 17.1 | 12.9 | 8.6 | n/a | n/a | n/a | n/a | n/a | n/a |
| 12.0 | 39.1 | 19.5 | 13 | 9.8 | n/a | n/a | n/a | n/a | n/a | n/a | n/a |

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BY: Roy Lobo
DATE: 07/19/2025
CITY OF PALO ALTO BUILDING CODE DIVISION

NOTES:
1. SEE PAGES D.9.1 THRU D.12.2 FOR SELECTION OF SPECIFIC BRACING ATTACHMENT DETAILS BASED ON THE SPECIFIED BRACING ATTACHMENT DESIGNATION ABOVE.
2. SEE PAGES D.13.1 THRU D.16.1 FOR SELECTION OF SPECIFIC HANGER/ROD ATTACHMENT DETAILS BASED ON THE SPECIFIED HANGER/ROD ATTACHMENT DESIGNATION ABOVE.
3. DETAILS AND SPACING VALUES LISTED ABOVE APPLY FOR WELDED, BOLTED, COUPLED OR THREADED CONNECTIONS.

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Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: D.3.1

Date: February 5, 2025

# TRANSVERSE & LONGITUDINAL RIGID BRACING & HANGER/ROD ATTACHMENT DESIGNATION SELECTION
# FOR SCH. 40 STEEL PIPE W/ INSULATION & WATER

RIGID BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| PIPE DIAMETER (in) | BRACING ATTACHMENT DESIGNATION BASED ON "g" VALUE OF Fp | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2,3] FOR CONCRETE ATTACHMENT ONLY (WITH $\Omega_o$) | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2,3] FOR STEEL & WOOD ATTACHMENT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 1.25 | B2 | B2 | B3 | B3 | B4 | R1 | R2 | R2 | R3 | R3 | R1 | R1 | R1 | R2 | R2 |
| 1.50 | B2 | B2 | B3 | B3 | B4 | R1 | R2 | R2 | R3 | R4 | R1 | R1 | R2 | R2 | R2 |
| 2.0 | B2 | B3 | B3 | B4 | B5 | R2 | R2 | R3 | R4 | R5 | R1 | R2 | R2 | R2 | R3 |
| 2.5 | B2 | B3 | B4 | B5 | B6 | R2 | R3 | R4 | R5 | R6 | R2 | R2 | R3 | R3 | R4 |
| 3.0 | B3 | B4 | B5 | B6 | B8 | R3 | R4 | R5 | R6 | R8 | R2 | R3 | R3 | R4 | R5 |
| 3.5 | B3 | B4 | B6 | B7 | B8 | R3 | R4 | R6 | R7 | R8 | R2 | R3 | R4 | R4 | R6 |
| 4.0 | B3 | B5 | B6 | B7 | B8 | R4 | R5 | R7 | R8 | R8 | R3 | R4 | R4 | R5 | R6 |
| 5.0 | B4 | B6 | B8 | B8 | B9 | R5 | R7 | R8 | R8 | R8 | R4 | R5 | R6 | R6 | R7 |
| 6.0 | B5 | B7 | B8 | B9 | B9 | R6 | R8 | R8 | R8 | R8 | R5 | R6 | R6 | R7 | R7 |
| 8.0 | B6 | B8 | B8 | B8 | B8 | R8 | R8 | R8 | R8 | R8 | R6 | R7 | R7 | R7 | R7 |
| 10.0 | B8 | B8 | B8 | B8 | B8 | R8 | R9 | R9 | R9 | R9 | R7 | R7 | R7 | R7 | R7 |
| 12.0 | B8 | B8 | B8 | B8 | B8 | R9 | R9 | R9 | R9 | R8 | R8 | R8 | R8 | R8 | R7 |
| 14.0 | B9 | B9 | B9 | B9 | B9 | R9 | R9 | R9 | R9 | R9 | R8 | R9 | R9 | R9 | R8 |
| 16.0 | B9 | B9 | B9 | B9 | B9 | R9 | R10 | R10 | R9 | R9 | R9 | R9 | R9 | R9 | R8 |
| 18.0 | B9 | B9 | B9 | B9 | B9 | R10 | R10 | R10 | R9 | R9 | R9 | R9 | R9 | R9 | R8 |

| PIPE DIAMETER (in) | MAXIMUM TRANSVERSE & LONGITUDINAL BRACE SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 1.25 | 80 | 80 | 80 | 80 | 80 |
| 1.50 | 80 | 80 | 80 | 80 | 80 |
| 2.0 | 80 | 80 | 80 | 80 | 80 |
| 2.5 | 80 | 80 | 80 | 80 | 80 |
| 3.0 | 80 | 80 | 80 | 80 | 80 |
| 3.5 | 80 | 80 | 80 | 80 | 80 |
| 4.0 | 80 | 80 | 80 | 80 | 80 |
| 5.0 | 80 | 80 | 80 | 80 | 64 |
| 6.0 | 80 | 80 | 80 | 71.6 | 47.8 |
| 8.0 | 80 | 80 | 56.1 | 42.1 | 28 |
| 10.0 | 80 | 57 | 38 | 28.5 | 19 |
| 12.0 | 80 | 43.4 | 28.9 | 21.7 | 14.5 |
| 14.0 | 80 | 54.2 | 36.1 | 27.1 | 18.1 |
| 16.0 | 80 | 43.8 | 29.2 | 21.9 | 14.6 |
| 18.0 | 72.5 | 36.2 | 24.2 | 18.1 | 12.1 |

NOTES:
1. SEE PAGES D.9.1 THRU D.12.2 FOR SELECTION OF SPECIFIC BRACING ATTACHMENT DETAILS BASED ON THE SPECIFIED BRACING ATTACHMENT DESIGNATION ABOVE.
2. SEE PAGES D.13.1 THRU D.16.1 FOR SELECTION OF SPECIFIC HANGER/ROD ATTACHMENT DETAILS BASED ON THE SPECIFIED HANGER/ROD ATTACHMENT DESIGNATION ABOVE.
3. ROD DESIGNATION BASED ON LESSER OF STANDARD ROD SPACING OR BRACE SPACING.
4. DETAILS AND SPACING VALUES LISTED ABOVE APPLY FOR WELDED, BOLTED, COUPLED OR THREADED CONNECTIONS.

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DATE: 07/19/2025
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California PE No. S6481

Page No.: D.3.2

Date: February 5, 2025

# TRANSVERSE BRACE SPACING LIMITS FOR SCH. 40 STEEL PIPE[1] BASED ON DEFLECTION AND PIPE STRESSES & η VALUES FOR MANUAL DESIGN APPROACH

| PIPE DIAMETER (in) | MAXIMUM TRANSVERSE BRACE SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 1.25 | 19.6 | 19.0 | 18.4 | 17.7 | 16.4 | 15.3 | 14.3 | 13.5 | 12.7 | 12.1 | 11.5 |
| 1.50 | 21.6 | 21.0 | 20.4 | 19.7 | 18.3 | 17.1 | 16.0 | 15.1 | 14.3 | 13.6 | 13.1 |
| 2.0 | 25.2 | 24.7 | 23.9 | 23.2 | 21.3 | 19.8 | 18.6 | 17.6 | 16.7 | 15.9 | 15.3 |
| 2.5 | 29.5 | 28.8 | 27.6 | 26.3 | 24.2 | 22.5 | 21.1 | 19.9 | 19.0 | 18.1 | 17.4 |
| 3.0 | 32.5 | 31.9 | 30.3 | 28.8 | 26.5 | 24.6 | 23.1 | 21.8 | 20.8 | 19.8 | 19.0 |
| 3.5 | 34.7 | 33.9 | 32.1 | 30.6 | 28.1 | 26.1 | 24.5 | 23.2 | 22.1 | 21.1 | 20.2 |
| 4.0 | 36.7 | 35.7 | 33.9 | 32.3 | 29.6 | 27.6 | 25.9 | 24.4 | 23.2 | 22.2 | 21.3 |
| 5.0 | 40 | 39.2 | 37.1 | 35.4 | 32.5 | 30.2 | 28.4 | 26.8 | 25.5 | 24.4 | 23.4 |
| 6.0 | 40 | 40 | 40 | 38.1 | 35.0 | 32.6 | 30.6 | 28.9 | 27.5 | 26.2 | 26.2 |
| 8.0 | 40 | 40 | 40 | 40 | 39.2 | 36.5 | 34.2 | 32.4 | 30.8 | 29.4 | 28.2 |
| 10.0 | 40 | 40 | 40 | 40 | 40 | 40 | 37.6 | 35.5 | 33.8 | 32.3 | 30.9 |
| 12.0 | 40 | 40 | 40 | 40 | 40 | 40 | 39.6 | 37.4 | 35.6 | 34.0 | 32.6 |
| 14.0[4] | 40 | 40 | 40 | 40 | 40 | -- | -- | -- | -- | -- | -- |
| 16.0[4] | 40 | 40 | 40 | 40 | 40 | -- | -- | -- | -- | -- | -- |
| 18.0[4] | 40 | 40 | 40 | 40 | 40 | -- | -- | -- | -- | -- | -- |

| η VALUE FOR MANUAL CABLE TENSION CALCULATIONS - TRANSVERSE KITS ONLY[2,3] | | | |
|---|---|---|---|
| PIPE DIAMETER (in) | η | | |
| | 30°≤ x <45° | 45°≤ x ≤60° | 60°< x ≤70° |
| 1.25 | 2.60 | 2.82 | 3.51 |
| 1.50 | 2.91 | 3.27 | 4.16 |
| 2.0 | 3.09 | 3.52 | 4.53 |
| 2.5 | 3.67 | 4.34 | 5.73 |
| 3.0 | 4.00 | 4.81 | 6.41 |
| 3.5 | 4.23 | 5.13 | 6.88 |
| 4.0 | 4.45 | 5.44 | 7.34 |
| 5.0 | 4.87 | 6.04 | 8.21 |
| 6.0 | 3.39 | 3.95 | 5.15 |
| 8.0 | 3.15 | 3.61 | 4.66 |
| 10.0 | 3.60 | 4.25 | 5.59 |
| 12.0 | 4.00 | 4.81 | 6.41 |

| η VALUE FOR MANUAL RIGID BRACE TENSION CALCULATIONS - TRANSVERSE KITS ONLY[2,3] | | | |
|---|---|---|---|
| PIPE DIAMETER (in) | η | | |
| | 30°≤ x <45° | 45°≤ x ≤60° | 60°< x ≤70° |
| 1.25 | 3.23 | 2.93 | 3.29 |
| 1.50 | 3.57 | 3.33 | 3.87 |
| 2.0 | 3.75 | 3.56 | 4.19 |
| 2.5 | 4.36 | 4.30 | 5.24 |
| 3.0 | 4.70 | 4.73 | 5.84 |
| 3.5 | 4.94 | 5.02 | 6.25 |
| 4.0 | 2.00 | 1.41 | 1.15 |
| 5.0 | 2.00 | 1.41 | 1.15 |
| 6.0 | 2.00 | 1.41 | 1.15 |
| 8.0 | 2.00 | 1.41 | 1.15 |
| 10.0 | 2.00 | 1.41 | 1.15 |
| 12.0 | 2.00 | 1.41 | 1.15 |
| 12.0 | 2.00 | 1.41 | 1.15 |
| 12.0 | 2.00 | 1.41 | 1.15 |
| 12.0 | 2.00 | 1.41 | 1.15 |
| 14.0 | 2.00 | 1.41 | 1.15 |
| 16.0 | 2.00 | 1.41 | 1.15 |
| 18.0 | 2.00 | 1.41 | 1.15 |

NOTES:
1. SPACING LIMITS ARE BASED 70% OF THE YIELD STRESS CAPACITY OF THE PIPE (INCLUDES THREADED, BONDED, WELDED, AND BOLTED PIPING), A MAXIMUM DEFLECTION OF L/60, AND 6", WHICHEVER YIELDS THE LEAST DISTANCE.
2. THE CABLE DEMAND TENSION IS CALCULATED AS $T_{cable} = F_p\eta$.
3. THE VALUE OF η ACCOUNTS FOR THE LOAD ECCENTRICITIES OF THE BRACE POINT ABOVE THE PIPE CENTER OF GRAVITY.
4. SINCE 14", 16", AND 18" NOT ISOLATED WITHIN THE SCOPE OF THIS OPM, MAXIMUM "g" VALUE IS 1.5.

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DATE: 07/19/2025
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Page No.: **D.3.3**

Date: January 19, 2024

# CABLE BRACING KIT DETAIL SELECTION
# RECTANGULAR SHEET METAL DUCTWORK W/ INSULATION

CABLE BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| LINEAR DUCT WT. (PLF), SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.3 | 2.7.3 | 2.7.3 |
| 20 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.3 | 2.7.3 | 2.7.3 | 2.7.3 | 2.7.3 | 2.7.3 |
| 30 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.1 | 2.7.3 | 2.7.3 | 2.7.3 | 2.7.3 | 2.7.3 | 2.7.3 | 2.7.3 |
| 40 | 2.7.5 | 2.7.5 | 2.7.5 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 |
| 50 | 2.7.5 | 2.7.5 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 |
| 60 | 2.7.5 | 2.7.5 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 | 2.7.7 |
| 70 | 2.7.9 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 |
| 80 | 2.7.9 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 |
| 90 | 2.7.9 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | n/a |
| 100 | 2.7.9 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | 2.7.11 | n/a | n/a |

| LINEAR DUCT WT. (PLF), STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE & LONGITUDINAL BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.4 | 2.7.4 | |
| 20 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.4 | 2.7.4 | 2.7.4 | 2.7.4 | 2.7.4 | 2.7.4 |
| 30 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.2 | 2.7.4 | 2.7.4 | 2.7.4 | 2.7.4 | 2.7.4 | 2.7.4 | 2.7.4 |
| 40 | 2.7.6 | 2.7.6 | 2.7.6 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 |
| 50 | 2.7.6 | 2.7.6 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 |
| 60 | 2.7.6 | 2.7.6 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 | 2.7.8 |
| 70 | 2.7.10 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 |
| 80 | 2.7.10 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 |
| 90 | 2.7.10 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | n/a |
| 100 | 2.7.10 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | 2.7.12 | n/a | n/a |

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NOTES:
1. SUPPORT SPACING MUST NOT EXCEED THE MAXIMUM BRACE SPACING SPECIFIED ON PAGE D.6.1.
2. SEE PAGE D.6.1 FOR BRACE AND HANGER/ROD ATTACHMENT DETAIL TABLES.
3. ▭ DENOTES CABLE KITS WITH $\frac{3}{16}$"Ø CABLE.

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# RIGID BRACING KIT DETAIL SELECTION
# RECTANGULAR SHEET METAL DUCTWORK W/ INSULATION

RIGID BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| LINEAR DUCT WT. (PLF), SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 2.8.1 | 2.8.1 | 2.8.1 | 2.8.1 | 2.8.1 |
| 20 | 2.8.1 | 2.8.1 | 2.8.1 | 2.8.1 | 2.8.1 |
| 30 | 2.8.1 | 2.8.1 | 2.8.1 | 2.8.1 | 2.8.1 |
| 40 | 2.8.3 | 2.8.3 | 2.8.3 | 2.8.3 | 2.8.3 |
| 50 | 2.8.3 | 2.8.3 | 2.8.3 | 2.8.3 | 2.8.3 |
| 60 | 2.8.3 | 2.8.3 | 2.8.3 | 2.8.3 | 2.8.3 |
| 70 | 2.8.5 | 2.8.5 | 2.8.5 | 2.8.5 | 2.8.5 |
| 80 | 2.8.5 | 2.8.5 | 2.8.5 | 2.8.5 | 2.8.5 |
| 90 | 2.8.5 | 2.8.5 | 2.8.5 | 2.8.5 | 2.8.5 |
| 100 | 2.8.5 | 2.8.5 | 2.8.5 | 2.8.5 | 2.8.5 |

| LINEAR DUCT WT. (PLF), STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE & LONGITUDINAL BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 2.8.2 | 2.8.2 | 2.8.2 | 2.8.2 | 2.8.2 |
| 20 | 2.8.2 | 2.8.2 | 2.8.2 | 2.8.2 | 2.8.2 |
| 30 | 2.8.2 | 2.8.2 | 2.8.2 | 2.8.2 | 2.8.2 |
| 40 | 2.8.4 | 2.8.4 | 2.8.4 | 2.8.4 | 2.8.4 |
| 50 | 2.8.4 | 2.8.4 | 2.8.4 | 2.8.4 | 2.8.4 |
| 60 | 2.8.4 | 2.8.4 | 2.8.4 | 2.8.4 | 2.8.4 |
| 70 | 2.8.6 | 2.8.6 | 2.8.6 | 2.8.6 | 2.8.6 |
| 80 | 2.8.6 | 2.8.6 | 2.8.6 | 2.8.6 | 2.8.6 |
| 90 | 2.8.6 | 2.8.6 | 2.8.6 | 2.8.6 | 2.8.6 |
| 100 | 2.8.6 | 2.8.6 | 2.8.6 | 2.8.6 | 2.8.6 |

NOTES:
1. SUPPORT SPACING MUST NOT EXCEED THE MAXIMUM BRACE SPACING SPECIFIED ON PAGE D.6.2.
2. SEE PAGE D.6.2 FOR BRACE AND HANGER/ROD ATTACHMENT DETAIL TABLES.

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CALIFORNIA BUILDING CODE, 2022
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025

Vibrex® vibration & seismic control systems
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Structural Engineer: N. Tremblay
California PE No. S6481

# CABLE BRACING KIT DETAIL SELECTION
# ROUND SHEET METAL DUCTWORK W/ INSULATION

CABLE BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| LINEAR DUCT WT. (PLF) STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.3 | 2.9.3 | 2.9.3 |
| 20 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.3 | 2.9.3 | 2.9.3 | 2.9.3 | 2.9.3 | 2.9.3 |
| 30 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.1 | 2.9.3 | 2.9.3 | 2.9.3 | 2.9.3 | 2.9.3 | 2.9.3 | 2.9.3 |
| 40 | 2.9.5 | 2.9.5 | 2.9.5 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 |
| 50 | 2.9.5 | 2.9.5 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 |
| 60 | 2.9.5 | 2.9.5 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 | 2.9.7 |
| 70 | 2.9.9 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 |
| 80 | 2.9.9 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 |
| 90 | 2.9.9 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | n/a |
| 100 | 2.9.9 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | 2.9.11 | n/a | n/a |

| LINEAR DUCT WT. (PLF) STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE & LONGITUDINAL BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.4 | 2.9.4 | 2.9.4 |
| 20 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.4 | 2.9.4 | 2.9.4 | 2.9.4 | 2.9.4 | 2.9.4 |
| 30 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.2 | 2.9.4 | 2.9.4 | 2.9.4 | 2.9.4 | 2.9.4 | 2.9.4 | 2.9.4 |
| 40 | 2.9.6 | 2.9.6 | 2.9.6 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 |
| 50 | 2.9.6 | 2.9.6 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 |
| 60 | 2.9.6 | 2.9.6 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 | 2.9.8 |
| 70 | 2.9.10 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 |
| 80 | 2.9.10 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 |
| 90 | 2.9.10 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | n/a |
| 100 | 2.9.10 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | 2.9.12 | n/a | n/a |

NOTES:
1. BRACE SPACING MUST NOT EXCEED THE MAXIMUM BRACE SPACING SPECIFIED ON PAGE D.6.1.
2. SEE PAGE D.6.1 FOR BRACE AND HANGER/ROD ATTACHMENT DETAIL TABLES.
3. ▭ DENOTES CABLE KITS WITH $\frac{3}{16}$"Ø CABLE.

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BY ROY LOBO
DATE: 07/19/2025

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Page No.: **D.5.1**

Date: February 5, 2025

# RIGID BRACING KIT DETAIL SELECTION
# ROUND SHEET METAL DUCTWORK W/ INSULATION

RIGID BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| LINEAR DUCT WT. (PLF), SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 2.10.1 | 2.10.1 | 2.10.1 | 2.10.1 | 2.10.1 |
| 20 | 2.10.1 | 2.10.1 | 2.10.1 | 2.10.1 | 2.10.1 |
| 30 | 2.10.1 | 2.10.1 | 2.10.1 | 2.10.1 | 2.10.1 |
| 40 | 2.10.3 | 2.10.3 | 2.10.3 | 2.10.3 | 2.10.3 |
| 50 | 2.10.3 | 2.10.3 | 2.10.3 | 2.10.3 | 2.10.3 |
| 60 | 2.10.3 | 2.10.3 | 2.10.3 | 2.10.3 | 2.10.3 |
| 70 | 2.10.5 | 2.10.5 | 2.10.5 | 2.10.5 | 2.10.5 |
| 80 | 2.10.5 | 2.10.5 | 2.10.5 | 2.10.5 | 2.10.5 |
| 90 | 2.10.5 | 2.10.5 | 2.10.5 | 2.10.5 | 2.10.5 |
| 100 | 2.10.5 | 2.10.5 | 2.10.5 | 2.10.5 | 2.10.5 |

| LINEAR DUCT WT. (PLF), STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE & LONGITUDINAL BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 2.10.2 | 2.10.2 | 2.10.2 | 2.10.2 | 2.10.2 |
| 20 | 2.10.2 | 2.10.2 | 2.10.2 | 2.10.2 | 2.10.2 |
| 30 | 2.10.2 | 2.10.2 | 2.10.2 | 2.10.2 | 2.10.2 |
| 40 | 2.10.4 | 2.10.4 | 2.10.4 | 2.10.4 | 2.10.4 |
| 50 | 2.10.4 | 2.10.4 | 2.10.4 | 2.10.4 | 2.10.4 |
| 60 | 2.10.4 | 2.10.4 | 2.10.4 | 2.10.4 | 2.10.4 |
| 70 | 2.10.6 | 2.10.6 | 2.10.6 | 2.10.6 | 2.10.6 |
| 80 | 2.10.6 | 2.10.6 | 2.10.6 | 2.10.6 | 2.10.6 |
| 90 | 2.10.6 | 2.10.6 | 2.10.6 | 2.10.6 | 2.10.6 |
| 100 | 2.10.6 | 2.10.6 | 2.10.6 | 2.10.6 | 2.10.6 |

NOTES:
1. SUPPORT SPACING MUST NOT EXCEED THE MAXIMUM BRACE SPACING SPECIFIED ON PAGE D.6.2.
2. SEE PAGE D.6.2 FOR BRACE AND HANGER/ROD ATTACHMENT DETAIL TABLES.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025

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# CABLE BRACING & HANGER/ROD ATTACHMENT DESIGNATION SELECTION FOR SHEET METAL DUCTWORK W/ INSULATION

CABLE BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| LINEAR DUCT WT. (PLF) | BRACING ATTACHMENT DESIGNATION BASED ON "g" VALUE OF Fp | | | | | | | | | | | HANGER DESIGNATION ALL "g" VALUES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | |
| 10 | B2 | B2 | B3 | B3 | B4 | B4 | B5 | B6 | B6 | B7 | B7 | H1/R1 |
| 20 | B2 | B3 | B4 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 30 | B3 | B4 | B5 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 40 | B3 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | H1/R1 |
| 50 | B3 | B5 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R1 |
| 60 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R2 |
| 70 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R2 |
| 80 | B4 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R3 |
| 90 | B5 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R3 |
| 100 | B5 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R4 |

| LINEAR DUCT WT. (PLF) | MAXIMUM TRANSVERSE BRACING SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 20 | 30 | 30 | 30 | 30 | 30 | 30 | 28.2 | 23.5 | 20.2 | 17.6 | 15.7 |
| 30 | 30 | 30 | 30 | 30 | 30 | 23.5 | 18.8 | 15.7 | 13.4 | 11.8 | 10.5 |
| 40 | 30 | 30 | 30 | 30 | 23.5 | 17.6 | 14.1 | 11.8 | 10.1 | 8.8 | 7.8 |
| 50 | 30 | 30 | 30 | 28.2 | 18.8 | 14.1 | 11.3 | 9.4 | 8.1 | 7.1 | 6.3 |
| 60 | 30 | 30 | 30 | 23.5 | 15.7 | 11.8 | 9.4 | 7.8 | 6.7 | 5.9 | 5.2 |
| 70 | 30 | 30 | 26.9 | 20.2 | 13.4 | 10.1 | 8.1 | 6.7 | 5.8 | 5.0 | 4.5 |
| 80 | 30 | 30 | 23.5 | 17.6 | 11.8 | 8.8 | 7.1 | 5.9 | 5.0 | 4.4 | 3.9 |
| 90 | 30 | 30 | 20.9 | 15.7 | 10.5 | 7.8 | 6.3 | 5.2 | 4.5 | 3.9 | n/a |
| 100 | 30 | 28.2 | 18.8 | 14.1 | 9.4 | 7.1 | 5.6 | 4.7 | 4.0 | n/a | n/a |

| LINEAR DUCT WT. (PLF) | MAXIMUM TRANSVERSE & LONGITUDINAL BRACING SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| 20 | 60 | 60 | 60 | 60 | 60 | 60 | 56.4 | 47 | 40.3 | 35.3 | 31.4 |
| 30 | 60 | 60 | 60 | 60 | 60 | 47 | 37.6 | 31.4 | 26.9 | 23.5 | 20.9 |
| 40 | 60 | 60 | 60 | 60 | 47 | 35.3 | 28.2 | 23.5 | 20.2 | 17.6 | 15.7 |
| 50 | 60 | 60 | 60 | 56.4 | 37.6 | 28.2 | 22.6 | 18.8 | 16.1 | 14.1 | 12.5 |
| 60 | 60 | 60 | 60 | 47 | 31.4 | 23.5 | 18.8 | 15.7 | 13.4 | 11.8 | 10.5 |
| 70 | 60 | 60 | 53.8 | 40.3 | 26.9 | 20.2 | 16.1 | 13.4 | 11.5 | 10.1 | 9.0 |
| 80 | 60 | 60 | 47 | 35.3 | 23.5 | 17.6 | 14.1 | 11.8 | 10.1 | 8.8 | 7.8 |
| 90 | 60 | 60 | 41.8 | 31.4 | 20.9 | 15.7 | 12.5 | 10.5 | 9.0 | 7.8 | n/a |
| 100 | 60 | 56.4 | 37.6 | 28.2 | 18.8 | 14.1 | 11.3 | 9.4 | 8.1 | n/a | n/a |

NOTES:
1. SEE PAGES D.9.1 THRU D.12.2 FOR SELECTION OF SPECIFIC BRACING ATTACHMENT DETAILS BASED ON THE SPECIFIED BRACING ATTACHMENT DESIGNATION ABOVE.
2. SEE PAGES D.13.1 THRU D.16.1 FOR SELECTION OF SPECIFIC HANGER/ROD ATTACHMENT DETAILS BASED ON THE SPECIFIED HANGER/ROD ATTACHMENT DESIGNATION ABOVE.

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OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
PERFORMANCE ORDER

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# RIGID BRACING & HANGER/ROD ATTACHMENT DESIGNATION SELECTION FOR SHEET METAL DUCTWORK W/ INSULATION

RIGID BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| LINEAR DUCT WT. (PLF) | BRACING ATTACHMENT DESIGNATION BASED ON "g" VALUE OF Fp | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2,3] FOR CONCRETE ATTACHMENT ONLY (WITH $\Omega_o$) | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2,3] FOR STEEL & WOOD ATTACHMENT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | B2 | B2 | B3 | B3 | B4 | R1 | R2 | R2 | R3 | R3 | R1 | R1 | R1 | R2 | R2 |
| 20 | B2 | B3 | B4 | B4 | B6 | R2 | R3 | R4 | R4 | R5 | R1 | R2 | R2 | R3 | R4 |
| 30 | B3 | B4 | B5 | B6 | B7 | R3 | R4 | R5 | R6 | R6 | R2 | R3 | R3 | R4 | R4 |
| 40 | B3 | B4 | B6 | B7 | B8 | R3 | R4 | R6 | R6 | R7 | R2 | R3 | R4 | R4 | R6 |
| 50 | B3 | B5 | B7 | B8 | B8 | R4 | R5 | R6 | R7 | R7 | R3 | R4 | R4 | R5 | R6 |
| 60 | B4 | B6 | B7 | B8 | B9 | R4 | R6 | R7 | R7 | R8 | R3 | R4 | R5 | R6 | R6 |
| 70 | B4 | B6 | B8 | B8 | B9 | R5 | R6 | R7 | R7 | R8 | R4 | R5 | R6 | R6 | R6 |
| 80 | B4 | B7 | B8 | B9 | B9 | R5 | R6 | R7 | R8 | R8 | R4 | R5 | R6 | R6 | R6 |
| 90 | B5 | B7 | B8 | B9 | B9 | R5 | R7 | R7 | R8 | R8 | R4 | R5 | R6 | R7 | R7 |
| 100 | B5 | B8 | B8 | B9 | B9 | R6 | R7 | R8 | R8 | R8 | R4 | R6 | R6 | R7 | R7 |

| LINEAR DUCT WT. (PLF) | MAXIMUM TRANSVERSE BRACING SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 30 | 30 | 30 | 30 | 30 |
| 20 | 30 | 30 | 30 | 30 | 30 |
| 30 | 30 | 30 | 30 | 30 | 30 |
| 40 | 30 | 30 | 30 | 30 | 30 |
| 50 | 30 | 30 | 30 | 30 | 30 |
| 60 | 30 | 30 | 30 | 30 | 30 |
| 70 | 30 | 30 | 30 | 30 | 30 |
| 80 | 30 | 30 | 30 | 30 | 30 |
| 90 | 30 | 30 | 30 | 30 | 30 |
| 100 | 30 | 30 | 30 | 30 | 30 |

| LINEAR DUCT WT. (PLF) | MAXIMUM TRANSVERSE & LONGITUDINAL BRACING SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 60 | 60 | 60 | 60 | 60 |
| 20 | 60 | 60 | 60 | 60 | 60 |
| 30 | 60 | 60 | 60 | 60 | 60 |
| 40 | 60 | 60 | 60 | 60 | 60 |
| 50 | 60 | 60 | 60 | 60 | 60 |
| 60 | 60 | 60 | 60 | 60 | 60 |
| 70 | 60 | 60 | 60 | 60 | 60 |
| 80 | 60 | 60 | 60 | 60 | 60 |
| 90 | 60 | 60 | 60 | 60 | 60 |
| 100 | 60 | 60 | 60 | 60 | 60 |

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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

NOTES:

1. SEE PAGES D.9.1 THRU D.12.2 FOR SELECTION OF SPECIFIC BRACING ATTACHMENT DETAILS BASED ON THE SPECIFIED BRACING ATTACHMENT DESIGNATION ABOVE.
2. SEE PAGES D.13.1 THRU D.16.1 FOR SELECTION OF SPECIFIC HANGER/ROD ATTACHMENT DETAILS BASED ON THE SPECIFIED HANGER/ROD ATTACHMENT DESIGNATION ABOVE.
3. ROD DESIGNATION BASED ON LESSER OF STANDARD ROD SPACING OR BRACE SPACING.

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Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: D.6.2

Date: February 5, 2025

# CABLE BRACING KIT DETAIL SELECTION FOR CABLE TRAY/RACEWAY

CABLE BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| ELECTRICAL TRAY LINEAR WEIGHT (PLF), STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.3 | 2.11.3 | 2.11.3 |
| 20 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.1 | 2.11.3 | 2.11.3 | 2.11.3 | 2.11.3 | 2.11.3 | 2.11.3 |
| 30 | 2.11.5 | 2.11.5 | 2.11.5 | 2.11.5 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 |
| 40 | 2.11.5 | 2.11.5 | 2.11.5 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 |
| 45 | 2.11.5 | 2.11.5 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 | 2.11.7 |
| 50 | 2.11.9 | 2.11.9 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 |
| 60 | 2.11.9 | 2.11.9 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 |
| 70 | 2.11.9 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 |
| 80 | 2.11.9 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 |
| 85 | 2.11.9 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 | 2.11.11 |

| ELECTRICAL TRAY LINEAR WEIGHT (PLF), STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE & LONGITUDINAL BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.4 | 2.11.4 | 2.11.4 |
| 20 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.2 | 2.11.4 | 2.11.4 | 2.11.4 | 2.11.4 | 2.11.4 | 2.11.4 |
| 30 | 2.11.6 | 2.11.6 | 2.11.6 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 |
| 40 | 2.11.6 | 2.11.6 | 2.11.6 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 |
| 45 | 2.11.6 | 2.11.6 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 | 2.11.8 |
| 50 | 2.11.10 | 2.11.10 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 |
| 60 | 2.11.10 | 2.11.10 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 |
| 70 | 2.11.10 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 |
| 80 | 2.11.10 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 |
| 85 | 2.11.10 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 | 2.11.12 |

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NOTES:
1. SUPPORT SPACING MUST NOT EXCEED THE MAXIMUM BRACE SPACING SPECIFIED ON PAGE D.8.1.
2. SEE PAGE D.8.1 FOR BRACE AND HANGER/ROD ATTACHMENT DETAIL TABLES.
3. ▭ DENOTES CABLE KITS WITH $\frac{3}{16}$"Ø CABLE.

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Structural Engineer: N. Tremblay
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# RIGID BRACING KIT DETAIL SELECTION FOR CABLE TRAY/RACEWAY

RIGID BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| ELECTRICAL TRAY LINEAR WEIGHT (PLF), STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 2.12.1 | 2.12.1 | 2.12.1 | 2.12.1 | 2.12.1 |
| 20 | 2.12.1 | 2.12.1 | 2.12.1 | 2.12.1 | 2.12.1 |
| 30 | 2.12.3 | 2.12.3 | 2.12.3 | 2.12.3 | 2.12.3 |
| 40 | 2.12.3 | 2.12.3 | 2.12.3 | 2.12.3 | 2.12.3 |
| 45 | 2.12.3 | 2.12.3 | 2.12.3 | 2.12.3 | 2.12.3 |
| 50 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 |
| 60 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 |
| 70 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 |
| 80 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 |
| 85 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 | 2.12.5 |

| ELECTRICAL TRAY LINEAR WEIGHT (PLF), STD. SUPPORT SPACING 10'-0" O.C.[1] | TRANSVERSE & LONGITUDINAL BRACING KIT DETAIL PAGE No. BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 2.12.2 | 2.12.2 | 2.12.2 | 2.12.2 | 2.12.2 |
| 20 | 2.12.2 | 2.12.2 | 2.12.2 | 2.12.2 | 2.12.2 |
| 30 | 2.12.4 | 2.12.4 | 2.12.4 | 2.12.4 | 2.12.4 |
| 40 | 2.12.4 | 2.12.4 | 2.12.4 | 2.12.4 | 2.12.4 |
| 45 | 2.12.4 | 2.12.4 | 2.12.4 | 2.12.4 | 2.12.4 |
| 50 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 |
| 60 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 |
| 70 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 |
| 80 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 |
| 85 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 | 2.12.6 |

NOTES:
1. SUPPORT SPACING MUST NOT EXCEED THE MAXIMUM BRACE SPACING SPECIFIED ON PAGE D.8.2.
2. SEE PAGE D.8.2 FOR BRACE AND HANGER/ROD ATTACHMENT DETAIL TABLES.

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BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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# CABLE BRACING & HANGER/ROD ATTACHMENT DESIGNATION SELECTION
# CABLE TRAY/RACEWAY

CABLE BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| ELECTRICAL TRAY LINEAR WEIGHT[3] (PLF) | BRACING ATTACHMENT DESIGNATION BASED ON "g" VALUE OF Fp | | | | | | | | | | | HANGER DESIGNATION ALL "g" VALUES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 | |
| 10 | B2 | B2 | B3 | B3 | B4 | B4 | B5 | B6 | B7 | B7 | B7 | R1 |
| 20 | B2 | B3 | B4 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | R1 |
| 30 | B3 | B4 | B5 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R1 |
| 40 | B3 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R1 |
| 45 | B3 | B5 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R1 |
| 50 | B3 | B5 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R2 |
| 60 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R2 |
| 70 | B4 | B6 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R3 |
| 80 | B4 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R3 |
| 85 | B5 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | B7 | R4 |

| LINEAR TRAY WT. (PLF) | MAXIMUM TRANSVERSE BRACING SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 30 |
| 20 | 30 | 30 | 30 | 30 | 30 | 30 | 28.2 | 23.5 | 20.2 | 17.6 | 15.7 |
| 30 | 30 | 30 | 30 | 30 | 30 | 23.5 | 18.8 | 15.7 | 13.4 | 11.8 | 10.5 |
| 40 | 30 | 30 | 30 | 30 | 23.5 | 17.6 | 14.1 | 11.8 | 10.1 | 8.8 | 7.8 |
| 45 | 30 | 30 | 30 | 30 | 20.9 | 15.7 | 12.5 | 10.5 | 9.0 | 7.8 | 7.0 |
| 50 | 30 | 30 | 30 | 28.2 | 18.8 | 14.1 | 11.3 | 9.4 | 8.1 | 7.1 | 6.3 |
| 60 | 30 | 30 | 30 | 23.5 | 15.7 | 11.8 | 9.4 | 7.8 | 6.7 | 5.9 | 5.2 |
| 70 | 30 | 30 | 26.9 | 20.2 | 13.4 | 10.1 | 8.1 | 6.7 | 5.8 | 5.0 | 4.5 |
| 80 | 30 | 30 | 23.5 | 17.6 | 11.8 | 8.8 | 7.1 | 5.9 | 5.0 | 4.4 | 3.9 |
| 85 | 30 | 30 | 22.1 | 16.6 | 11.1 | 8.3 | 6.6 | 5.5 | 4.7 | 4.2 | 3.7 |

| LINEAR TRAY WT. (PLF) | MAXIMUM TRANSVERSE & LONGITUDINAL BRACING SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 2.0 | 2.5 | 3.0 | 3.5 | 4.0 | 4.5 |
| 10 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| 20 | 60 | 60 | 60 | 60 | 60 | 60 | 56.4 | 47 | 40.3 | 35.3 | 31.4 |
| 30 | 60 | 60 | 60 | 60 | 60 | 47 | 37.6 | 31.4 | 26.9 | 23.5 | 20.9 |
| 40 | 60 | 60 | 60 | 60 | 47 | 35.3 | 28.2 | 23.5 | 20.2 | 17.6 | 15.7 |
| 45 | 60 | 60 | 60 | 60 | 41.8 | 31.4 | 25.1 | 20.9 | 17.9 | 15.7 | 13.9 |
| 50 | 60 | 60 | 60 | 56.4 | 37.6 | 28.2 | 22.6 | 18.8 | 16.1 | 14.1 | 12.5 |
| 60 | 60 | 60 | 60 | 47 | 31.4 | 23.5 | 18.8 | 15.7 | 13.4 | 11.8 | 10.5 |
| 70 | 60 | 60 | 53.8 | 40.3 | 26.9 | 20.2 | 16.1 | 13.4 | 11.5 | 10.1 | 9.0 |
| 80 | 60 | 60 | 47 | 35.3 | 23.5 | 17.6 | 14.1 | 11.8 | 10.1 | 8.8 | 7.8 |
| 85 | 60 | 60 | 44.3 | 33.2 | 22.1 | 16.6 | 13.3 | 11.1 | 9.5 | 8.3 | 7.4 |

CRITICAL SPACING NOTE

CABLE TRAY MUST BE APPROVED ON A PROJECT SPECIFIC BASIS OR PREAPPROVED BY OSHPD. DO NOT EXCEED MAXIMUM SPACING LIMITS OF THE CABLE TRAY SPECIFIED BY ITS MANUFACTURER. THE SPACING LIMITS SHOWN ARE BASED SOLELY ON THE STRENGTH OF THE CABLE KITS AS SHOWN IN SECTION 2.

NOTES:

1. SEE PAGES D.9.1 THRU D.12.2 FOR SELECTION OF SPECIFIC BRACING ATTACHMENT DETAILS BASED ON THE SPECIFIED BRACING ATTACHMENT DESIGNATION ABOVE.
2. SEE PAGES D.13.1 THRU D.16.1 FOR SELECTION OF SPECIFIC HANGER/ROD ATTACHMENT DETAILS BASED ON THE SPECIFIED HANGER/ROD ATTACHMENT DESIGNATION ABOVE.
3. LINEAR WEIGHT SHOWN INCLUDES CONTENT WEIGHT (WIRE, CABLE, ETC.).

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DATE: 07/19/2025
FOR OSHPD BUILDING CODES

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Page No.: D.8.1

Date: February 5, 2025

# RIGID BRACING & HANGER/ROD ATTACHMENT DESIGNATION SELECTION CABLE TRAY/RACEWAY

RIGID BRACING ANGLE "x" AT 45° to 60° (1:1 to 1.7:1) SLOPE (ANGLE FROM VERTICAL AXIS)

| ELECTRICAL TRAY LINEAR WEIGHT[3] (PLF) | BRACING ATTACHMENT DESIGNATION BASED ON "g" VALUE OF Fp | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2,3] FOR CONCRETE ATTACHMENT ONLY (WITH $\Omega_o$) | | | | | HANGER/ROD DESIGNATION ALL "g" VALUES[2,3] FOR STEEL & WOOD ATTACHMENT | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | B2 | B2 | B3 | B3 | B4 | R1 | R2 | R2 | R3 | R3 | R1 | R1 | R1 | R2 | R2 |
| 20 | B2 | B3 | B4 | B4 | B6 | R2 | R3 | R4 | R4 | R5 | R1 | R2 | R2 | R3 | R4 |
| 30 | B3 | B4 | B5 | B6 | B7 | R3 | R4 | R5 | R6 | R6 | R2 | R3 | R3 | R4 | R5 |
| 40 | B3 | B4 | B6 | B7 | B8 | R3 | R4 | R6 | R6 | R7 | R2 | R3 | R4 | R4 | R6 |
| 45 | B3 | B5 | B6 | B7 | B8 | R3 | R5 | R6 | R7 | R7 | R3 | R3 | R4 | R5 | R6 |
| 50 | B3 | B5 | B7 | B8 | B8 | R4 | R5 | R6 | R7 | R7 | R3 | R4 | R4 | R5 | R6 |
| 60 | B4 | B6 | B7 | B8 | B9 | R4 | R6 | R7 | R7 | R8 | R3 | R4 | R5 | R6 | R7 |
| 70 | B4 | B6 | B8 | B8 | B9 | R5 | R6 | R7 | R7 | R8 | R4 | R5 | R6 | R6 | R7 |
| 80 | B4 | B7 | B8 | B9 | B9 | R5 | R6 | R7 | R8 | R8 | R4 | R5 | R6 | R6 | R7 |
| 85 | B5 | B7 | B8 | B9 | B9 | R5 | R7 | R7 | R8 | R8 | R4 | R5 | R6 | R7 | R7 |

| LINEAR TRAY WT. (PLF) | MAXIMUM TRANSVERSE BRACING SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 30 | 30 | 30 | 30 | 30 |
| 20 | 30 | 30 | 30 | 30 | 30 |
| 30 | 30 | 30 | 30 | 30 | 30 |
| 40 | 30 | 30 | 30 | 30 | 23.5 |
| 45 | 30 | 30 | 30 | 30 | 20.9 |
| 50 | 30 | 30 | 30 | 28.2 | 18.8 |
| 60 | 30 | 30 | 30 | 23.5 | 15.7 |
| 70 | 30 | 30 | 26.9 | 20.2 | 13.4 |
| 80 | 30 | 30 | 23.5 | 17.6 | 11.8 |
| 85 | 30 | 30 | 22.1 | 16.6 | 11.1 |

| LINEAR TRAY WT. (PLF) | MAXIMUM TRANSVERSE & LONGITUDINAL BRACING SPACING IN FEET BASED ON "g" VALUE OF Fp | | | | |
|---|---|---|---|---|---|
| | 0.25 | 0.50 | 0.75 | 1.0 | 1.5 |
| 10 | 60 | 60 | 60 | 60 | 60 |
| 20 | 60 | 60 | 60 | 60 | 60 |
| 30 | 60 | 60 | 60 | 60 | 60 |
| 40 | 60 | 60 | 60 | 60 | 47 |
| 45 | 60 | 60 | 60 | 60 | 41.8 |
| 50 | 60 | 60 | 60 | 56.4 | 37.6 |
| 60 | 60 | 60 | 60 | 47 | 31.4 |
| 70 | 60 | 60 | 53.8 | 40.3 | 26.9 |
| 80 | 60 | 60 | 47 | 35.3 | 23.5 |
| 85 | 60 | 60 | 44.3 | 33.2 | 22.1 |

NOTES:

1. SEE PAGES D.9.1 THRU D.12.2 FOR SELECTION OF SPECIFIC BRACING ATTACHMENT DETAILS BASED ON THE SPECIFIED BRACING ATTACHMENT DESIGNATION ABOVE.
2. SEE PAGES D.13.1 THRU D.16.1 FOR SELECTION OF SPECIFIC HANGER/ROD ATTACHMENT DETAILS BASED ON THE SPECIFIED HANGER/ROD ATTACHMENT DESIGNATION ABOVE.
3. LINEAR WEIGHT SHOWN INCLUDES CONTENT WEIGHT (WIRE, CABLE, ETC.).

CRITICAL SPACING NOTE

CABLE TRAY MUST BE APPROVED ON A PROJECT SPECIFIC BASIS OR PREAPPROVED BY OSHPD. DO NOT EXCEED MAXIMUM SPACING LIMITS OF THE CABLE TRAY SPECIFIED BY ITS MANUFACTURER. THE SPACING LIMITS SHOWN ARE BASED SOLELY ON THE STRENGTH OF THE CABLE KITS AS SHOWN IN SECTION 2.

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# CABLE BRACE ATTACHMENT INDEX FOR 3" STEEL DECK WITH 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B1 MAX CABLE TENSION: 100 LBS 30°<Φ ≤ 45° | TZ2D31 | 3.1.1 |
| | KHD31 | 3.3.1 |
| | KHD32 | 3.3.1 |
| | KHD34 | 3.3.1 |
| | KHD35 | 3.3.1 |
| | SD2D31 | 3.4.1 |
| | SD2D32 | 3.4.1 |
| | SCD31 | 3.6.1 |
| | SCD32 | 3.6.1 |
| | SCD34 | 3.6.1 |
| | SCD37 | 3.6.1 |
| | SCD38 | 3.6.1 |
| | SB2D31 | 3.7.1 |
| | SB2D38 | 3.7.1 |
| | SB2D39 | 3.7.1 |
| | THD31 | 3.9.1 |
| | THD32 | 3.9.1 |
| | THD33 | 3.9.1 |
| | THD35 | 3.9.1 |
| | 2THD31 | 3.10.1 |
| B2 MAX CABLE TENSION: 300 LBS 30°<Φ ≤ 45° | TZ2D32 | 3.1.1 |
| | TZ2D33 | 3.1.1 |
| | TZ2D34 | 3.1.1 |
| | TZ2D35 | 3.1.1 |
| | TZ2D36 | 3.1.1 |
| | KHD33 | 3.3.1 |
| | KHD36 | 3.3.1 |
| | KHD37 | 3.3.1 |
| | KHD39 | 3.3.1 |
| | 2KHD31 | 3.3.1 |
| | 2KHD32 | 3.3.1 |
| | 2KHD34 | 3.3.1 |
| | SD2D33 | 3.4.1 |
| | SD2D34 | 3.4.1 |
| | SD2D36 | 3.4.1 |
| | SCD33 | 3.6.1 |
| | SCD35 | 3.6.1 |
| | SCD39 | 3.6.1 |
| | SCD310 | 3.6.1 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B2 MAX CABLE TENSION: 300 LBS 30°<Φ ≤ 45° | 2SCD31 | 3.6.1 |
| | 2SCD37 | 3.6.1 |
| | SB2D32 | 3.7.1 |
| | SB2D33 | 3.7.1 |
| | SB2D34 | 3.7.1 |
| | SB2D35 | 3.7.1 |
| | SB2D37 | 3.7.1 |
| | 2SB2D31 | 3.8.1 |
| | THD34 | 3.9.1 |
| | THD36 | 3.9.1 |
| | 2THD32 | 3.10.1 |
| | 2THD33 | 3.10.1 |
| | 4THD31 | 3.10.2 |
| B3 MAX CABLE TENSION: 600 LBS 30°<Φ ≤ 45° | TZ2D37 | 3.1.1 |
| | TZ2D38 | 3.1.1 |
| | 2TZ2D31 | 3.1.1 |
| | KHD38 | 3.3.1 |
| | 2KHD35 | 3.3.1 |
| | 4KHD31 | 3.3.2 |
| | 4KHD34 | 3.3.2 |
| | SD2D35 | 3.4.1 |
| | 2SD2D31 | 3.4.1 |
| | 2SD2D32 | 3.4.1 |
| | SCD36 | 3.6.1 |
| | 2SCD32 | 3.6.1 |
| | 2SCD34 | 3.6.1 |
| | 2SCD38 | 3.6.1 |
| | SB2D36 | 3.7.1 |
| | 2SB2D33 | 3.8.1 |
| B4 MAX CABLE TENSION: 900 LBS 30°<Φ ≤ 45° | 2TZ2D32 | 3.1.1 |
| | 2TZ2D33 | 3.1.1 |
| | 2TZ2D34 | 3.1.1 |
| | 2KHD33 | 3.3.1 |
| | 2KHD36 | 3.3.1 |
| | 2KHD37 | 3.3.1 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B4 MAX CABLE TENSION: 900 LBS 30°<Φ ≤ 45° | 2KHD39 | 3.3.1 |
| | 4KHD32 | 3.3.2 |
| | 2SCD33 | 3.6.1 |
| | 2SCD35 | 3.6.1 |
| | 4SCD31 | 3.6.2 |
| | 4SCD37 | 3.6.2 |
| | 2SB2D32 | 3.8.1 |
| | 2SB2D35 | 3.8.1 |
| | 4SB2D31 | 3.8.2 |
| | 2THD34 | 3.10.1 |
| | 4THD32 | 3.10.2 |
| | 4THD33 | 3.10.2 |
| B5 MAX CABLE TENSION: 1200 LBS 30°<Φ ≤ 45° | 4TZ2D31 | 3.1.2 |
| | 2SD2D33 | 3.4.1 |
| | 2SD2D34 | 3.4.1 |
| | 2SD2D36 | 3.4.1 |
| | 4SD2D31 | 3.4.2 |
| | 2SCD39 | 3.6.1 |
| | 4SCD32 | 3.6.2 |
| | 4SCD34 | 3.6.2 |
| | 2SB2D34 | 3.8.1 |
| | 2SB2D37 | 3.8.1 |

NOTES:
1. THE VALUE OF Φ IS THE ANGLE OF THE CABLE MEASURED FROM THE HORIZONTAL PLANE FOR THE ATTACHMENTS.
2. TO FIND Φ : Φ = 90° - x, WHERE x IS THE CABLE ANGLE FROM THE VERTICAL USED FOR THE BRACING DETAILS.
3. MAX LOAD DOES NOT INCLUDE $\Omega_0$.

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Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE, 2022

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California PE No. S6481

Page No.: **D.9.1**

Date: February 5, 2025

# CABLE BRACE ATTACHMENT INDEX FOR 3" STEEL DECK WITH 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B6<br>MAX CABLE TENSION:<br>1500 LBS<br>$30° < \Phi \leq 45°$ | 2TZ2D35 | 3.1.1 |
| | 2TZ2D36 | 3.1.1 |
| | 4TZ2D32 | 3.1.2 |
| | 4TZ2D34 | 3.1.2 |
| | 2KHD38 | 3.3.1 |
| | 4KHD35 | 3.3.2 |
| | 4SD2D32 | 3.4.2 |
| | 2SCD36 | 3.6.1 |
| | 2SCD310 | 3.6.1 |
| | 4SCD33 | 3.6.2 |
| | 4SCD35 | 3.6.2 |
| | 4SCD38 | 3.6.2 |
| | 4SB2D33 | 3.8.2 |
| B7<br>MAX CABLE TENSION:<br>2000 LBS<br>$30° < \Phi \leq 45°$ | 2TZ2D37 | 3.1.1 |
| | 2TZ2D38 | 3.1.1 |
| | 4TZ2D33 | 3.1.2 |
| | 4KHD33 | 3.3.2 |
| | 4KHD36 | 3.3.2 |
| | 4KHD37 | 3.3.2 |
| | 4KHD39 | 3.3.2 |
| | 2SD2D35 | 3.4.1 |
| | 4SD2D33 | 3.4.2 |
| | 4SD2D34 | 3.4.2 |
| | 4SD2D36 | 3.4.2 |
| | 4SCD39 | 3.6.2 |
| | 4SCD310 | 3.6.2 |
| | 2SB2D36 | 3.8.1 |
| | 4SB2D32 | 3.8.2 |
| | 4SB2D34 | 3.8.2 |
| | 4SB2D35 | 3.8.2 |
| | 4SB2D37 | 3.8.2 |
| | 4THD34 | 3.10.2 |

NOTES:
1. THE VALUE OF $\Phi$ IS THE ANGLE OF THE CABLE MEASURED FROM The HORIZONTAL PLANE FOR THE ATTACHMENTS.
2. TO FIND $\Phi$ : $\Phi = 90° - x$, WHERE x IS THE CABLE ANGLE FROM THE VERTICAL USED FOR THE BRACING DETAILS.
3. MAX LOAD DOES NOT INCLUDE $\Omega_0$.

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Roy Lobo
DATE: 07/19/2025
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Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: D.9.2

Date: February 5, 2025

# RIGID BRACE ATTACHMENT INDEX FOR 3" STEEL DECK WITH 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B1 MAX BRACE LOAD: 100 LBS 30°<Φ ≤ 45° | TZ2DR31 | 3.1.3 |
| | KHDR31 | 3.3.3 |
| | KHDR32 | 3.3.3 |
| | KHDR34 | 3.3.3 |
| | KHDR35 | 3.3.3 |
| | SD2DR31 | 3.4.3 |
| | SD2DR32 | 3.4.3 |
| | SCDR31 | 3.6.3 |
| | SCDR32 | 3.6.3 |
| | SCDR34 | 3.6.3 |
| | SCDR37 | 3.6.3 |
| | SCDR38 | 3.6.3 |
| | SB2DR31 | 3.7.2 |
| | THDR31 | 3.9.2 |
| | THDR32 | 3.9.2 |
| | THDR33 | 3.9.2 |
| | 2THDR31 | 3.10.3 |
| B2 MAX BRACE LOAD: 300 LBS 30°<Φ ≤ 45° | TZ2DR32 | 3.1.3 |
| | TZ2DR33 | 3.1.3 |
| | TZ2DR34 | 3.1.3 |
| | TZ2DR35 | 3.1.3 |
| | KHDR33 | 3.3.3 |
| | KHDR36 | 3.3.3 |
| | KHDR37 | 3.3.3 |
| | KHDR39 | 3.3.3 |
| | 2KHDR31 | 3.3.3 |
| | 2KHDR32 | 3.3.3 |
| | 2KHDR34 | 3.3.3 |
| | SD2DR33 | 3.4.3 |
| | SD2DR34 | 3.4.3 |
| | SD2DR36 | 3.4.3 |
| | SCDR33 | 3.6.3 |
| | SCDR35 | 3.6.3 |
| | SCDR39 | 3.6.3 |
| | SCDR310 | 3.6.3 |
| | 2SCDR31 | 3.6.3 |
| | 2SCDR34 | 3.6.3 |
| | 2SCDR37 | 3.6.3 |
| | SB2DR32 | 3.7.2 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B2 MAX BRACE LOAD 300 LBS 30°<Φ ≤ 45° | SB2DR33 | 3.7.2 |
| | SB2DR34 | 3.7.2 |
| | SB2DR35 | 3.7.2 |
| | SB2DR37 | 3.7.2 |
| | 2SB2DR31 | 3.8.2 |
| | THDR34 | 3.9.2 |
| | 2THDR32 | 3.10.3 |
| | 2THDR33 | 3.10.3 |
| | 4THDR31 | 3.10.4 |
| B3 MAX BRACE LOAD 600 LBS 30°<Φ ≤ 45° | TZ2DR36 | 3.1.3 |
| | TZ2DR37 | 3.1.3 |
| | TZ2DR38 | 3.1.3 |
| | 2TZ2DR31 | 3.1.3 |
| | KHDR38 | 3.3.3 |
| | 2KHDR35 | 3.3.3 |
| | 4KHDR31 | 3.3.4 |
| | 4KHDR34 | 3.3.4 |
| | SD2DR35 | 3.4.3 |
| | 2SD2DR31 | 3.4.3 |
| | 2SD2DR32 | 3.4.3 |
| | SCDR36 | 3.6.3 |
| | 2SCDR32 | 3.6.3 |
| | 2SCDR33 | 3.6.3 |
| | 2SCDR38 | 3.6.3 |
| | SB2DR36 | 3.7.2 |
| | 2SB2DR33 | 3.8.3 |
| | 4THDR32 | 3.10.4 |
| B4 MAX BRACE LOAD: 900 LBS 30°<Φ ≤ 45° | 2TZ2DR32 | 3.1.3 |
| | 2TZ2DR33 | 3.1.3 |
| | 2TZ2DR34 | 3.1.3 |
| | 2KHDR33 | 3.3.3 |
| | 2KHDR36 | 3.3.3 |
| | 2KHDR37 | 3.3.3 |
| | 2KHDR39 | 3.3.3 |
| | 4KHDR32 | 3.3.4 |
| | 2SCDR35 | 3.6.3 |
| | 4SCDR31 | 3.6.4 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B4 MAX BRACE LOAD: 900 LBS 30°<Φ ≤ 45° | 4SCDR34 | 3.6.4 |
| | 4SCDR37 | 3.6.4 |
| | 2SB2DR35 | 3.8.3 |
| | 4SB2DR31 | 3.8.4 |
| | 2THDR34 | 3.10.3 |
| | 4THDR33 | 3.10.4 |
| B5 MAX BRACE LOAD: 1200 LBS 30°<Φ ≤ 45° | 4TZ2DR31 | 3.1.4 |
| | 2SD2DR33 | 3.4.3 |
| | 2SD2DR34 | 3.4.3 |
| | 2SD2DR36 | 3.4.3 |
| | 4SD2DR31 | 3.4.4 |
| | 4SD2DR32 | 3.4.4 |
| | 2SCDR39 | 3.6.3 |
| | 2SCDR310 | 3.6.3 |
| | 4SCDR32 | 3.6.4 |
| | 2SB2DR32 | 3.8.3 |
| | 2SB2DR37 | 3.8.3 |

NOTES:
1. THE VALUE OF Φ IS THE ANGLE OF THE BRACE ARM MEASURED FROM THE HORIZONTAL PLANE FOR THE ATTACHMENTS.
2. TO FIND Φ : Φ = 90° - x, WHERE x IS THE CABLE ANGLE FROM THE VERTICAL USED FOR THE BRACING DETAILS.
3. MAX LOAD DOES NOT INCLUDE $\Omega_0$.

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Page No.: **D.9.3**

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# RIGID BRACE ATTACHMENT INDEX FOR 3" STEEL DECK WITH 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B6 MAX BRACE LOAD: 1500 LBS $30°<\Phi\leq 45°$ | 2TZ2DR35 | 3.1.3 |
| | 2TZ2DR36 | 3.1.3 |
| | 2TZ2DR38 | 3.1.3 |
| | 4TZ2DR32 | 3.1.4 |
| | 4TZ2DR33 | 3.1.4 |
| | 4TZ2DR34 | 3.1.4 |
| | 2KHDR38 | 3.3.3 |
| | 4KHDR35 | 3.3.4 |
| | 4KHDR37 | 3.3.4 |
| | 2SD2DR35 | 3.4.3 |
| | 2SCDR36 | 3.6.3 |
| | 4SCDR33 | 3.6.4 |
| | 4SCDR35 | 3.6.4 |
| | 4SCDR38 | 3.6.4 |
| | 2SB2DR34 | 3.8.3 |
| | 4SB2DR33 | 3.8.4 |
| | 4THDR34 | 3.10.4 |
| B7 MAX BRACE LOAD: 2000 LBS $30°<\Phi\leq 45°$ | 2TZ2DR37 | 3.1.3 |
| | 4TZ2DR35 | 3.1.4 |
| | 4KHDR33 | 3.3.4 |
| | 4KHDR36 | 3.3.4 |
| | 4KHDR38 | 3.3.4 |
| | 4KHDR39 | 3.3.4 |
| | 4SD2DR33 | 3.4.4 |
| | 4SD2DR34 | 3.4.4 |
| | 4SD2DR36 | 3.4.4 |
| | 4SCDR39 | 3.6.4 |
| | 4SCDR310 | 3.6.4 |
| | 2SB2DR36 | 3.8.3 |
| | 4SB2DR32 | 3.8.4 |
| | 4SB2DR35 | 3.8.4 |
| | 4SB2DR37 | 3.8.4 |
| B8 MAX BRACE LOAD: 3200 LBS $30°<\Phi\leq 45°$ | 4TZ2DR36 | 3.1.4 |
| | 4TZ2DR37 | 3.1.4 |
| | 4TZ2DR38 | 3.1.4 |
| | 4SD2DR35 | 3.4.4 |
| | 4SCDR36 | 3.6.4 |
| | 4SB2DR34 | 3.8.4 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B9 MAX BRACE LOAD: 4500 LBS $30°<\Phi\leq 45°$ | 4SB2DR36 | 3.8.4 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

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Page No.: **D.9.4**

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# CABLE BRACE ATTACHMENT INDEX FOR 1-1/2" STEEL DECK WITH 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B1<br>MAX BRACE LOAD:<br>100 LBS<br>30°<Φ ≤ 45° | TZ2D1.51 | 3.2.1 |
| | TZ2D1.53 | 3.2.1 |
| | SD2D1.51 | 3.5.1 |
| | SD2D1.52 | 3.5.1 |
| | SCD1.51 | 3.6.5 |
| | SCD1.52 | 3.6.5 |
| | SCD1.53 | 3.6.5 |
| | SCD1.54 | 3.6.5 |
| B2<br>MAX CABLE TENSION:<br>300 LBS<br>30°<Φ ≤ 45° | TZ2D1.52 | 3.2.1 |
| | TZ2D1.54 | 3.2.1 |
| | TZ2D1.55 | 3.2.1 |
| | 2TZ2D1.51 | 3.2.1 |
| | 2SCD1.51 | 3.6.5 |
| B3<br>MAX CABLE TENSION:<br>600 LBS<br>30°<Φ ≤ 45° | 2TZ2D1.53 | 3.2.1 |
| | 2SD2D1.51 | 3.5.1 |
| | 2SD2D1.52 | 3.5.1 |
| | 2SCD1.52 | 3.6.5 |
| | 2SCD1.53 | 3.6.5 |
| | 2SCD1.54 | 3.6.5 |
| | 4SCD1.51 | 3.6.6 |
| B4<br>MAX CABLE TENSION:<br>900 LBS<br>30°<Φ ≤ 45° | 2TZ2D1.52 | 3.2.1 |
| | 2TZ2D1.54 | 3.2.1 |
| | 4TZ2D1.51 | 3.2.2 |
| | -- | -- |
| B5<br>MAX CABLE TENSION:<br>1200 LBS<br>30°<Φ ≤ 45° | 2TZ2D1.55 | 3.2.1 |
| | 4SD2D1.51 | 3.5.2 |
| | 4SCD1.52 | 3.6.6 |
| | 4SCD1.54 | 3.6.6 |
| | -- | -- |
| B6<br>MAX CABLE TENSION:<br>1500 LBS<br>30°<Φ ≤ 45° | 4TZ2D1.53 | 3.2.2 |
| | 4SD2D1.52 | 3.5.2 |
| | 4SCD1.53 | 3.6.6 |
| | -- | -- |
| | -- | -- |
| B7<br>MAX CABLE TENSION:<br>2000 LBS<br>30°<Φ ≤ 45° | 4TZ2D1.52 | 3.2.2 |
| | 4TZ2D1.54 | 3.2.2 |
| | 4TZ2D1.55 | 3.2.2 |
| | -- | -- |

NOTES:
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Page No.: **D.10.1**

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# RIGID BRACE ATTACHMENT INDEX FOR 1-1/2" STEEL DECK WITH 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B1<br>MAX BRACE LOAD:<br>100 LBS<br>30°<Φ ≤ 45° | TZ2DR1.51 | 3.2.3 |
| | TZ2DR1.53 | 3.2.3 |
| | SD2DR1.51 | 3.5.3 |
| | SD2DR1.52 | 3.5.3 |
| | SCDR1.51 | 3.6.7 |
| | 2SCDR1.51 | 3.6.7 |
| | 2SCDR1.52 | 3.6.7 |
| | 2SCDR1.54 | 3.6.7 |
| B2<br>MAX BRACE LOAD:<br>300 LBS<br>30°<Φ ≤ 45° | TZ2DR1.52 | 3.2.3 |
| | TZ2DR1.54 | 3.2.3 |
| | TZ2DR1.55 | 3.2.3 |
| | 2TZ2DR1.51 | 3.2.3 |
| | 2SD2DR1.51 | 3.5.3 |
| | 2SCDR1.51 | 3.6.7 |
| | 2SCDR1.52 | 3.6.7 |
| | 2SCDR1.54 | 3.6.7 |
| B3<br>MAX BRACE LOAD:<br>600 LBS<br>30°<Φ ≤ 45° | 2TZ2DR1.52 | 3.2.3 |
| | 2TZ2DR1.53 | 3.2.3 |
| | 2SD2DR1.52 | 3.5.3 |
| | 2SCDR1.53 | 3.6.7 |
| | 4SCDR1.51 | 3.6.8 |
| B4<br>MAX BRACE LOAD<br>900 LBS<br>30°<Φ ≤ 45° | 4TZ2DR1.51 | 3.2.4 |
| | 4SD2DR1.51 | 3.5.4 |
| | 4SCDR1.52 | 3.6.8 |
| | 4SCDR1.54 | 3.6.8 |
| B5<br>MAX BRACE LOAD:<br>1200 LBS<br>30°<Φ ≤ 45° | 2TZ2DR1.54 | 3.2.3 |
| | 2TZ2DR1.55 | 3.2.3 |
| | 4SD2DR1.52 | 3.5.4 |
| | -- | -- |
| | -- | -- |
| B6<br>MAX BRACE LOAD:<br>1500 LBS<br>30°<Φ ≤ 45° | 4TZ2DR1.52 | 3.2.4 |
| | 4TZ2DR1.53 | 3.2.4 |
| | 4TZ2DR1.54 | 3.2.4 |
| | 4SCDR1.53 | 3.6.8 |
| B7<br>MAX BRACE LOAD:<br>2000 LBS<br>30°<Φ ≤ 45° | 4TZ2DR1.55 | 3.2.4 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

NOTES:
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Page No.: **D.10.2**

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# CABLE BRACE ATTACHMENT INDEX FOR MIN. 3000psi NW REINFORCED CONCRETE

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B1 MAX CABLE TENSION: 100 LBS 30°<Φ ≤ 45° | KHRC1 | 3.13.1 |
| | KHRC4 | 3.13.1 |
| | SCRC1 | 3.17.1 |
| | SCRC2 | 3.17.1 |
| | SCRC4 | 3.17.1 |
| | SB2RC1 | 3.19.1 |
| | THRC1 | 3.21.1 |
| B2 MAX CABLE TENSION: 300 LBS 30°<Φ ≤ 45° | TZ2RC1 | 3.11.1 |
| | TZ2RC2 | 3.11.1 |
| | TZ2RC3 | 3.11.1 |
| | TZ2RC4 | 3.11.1 |
| | KHRC2 | 3.13.1 |
| | KHRC3 | 3.13.1 |
| | KHRC5 | 3.13.1 |
| | KHRC7 | 3.13.1 |
| | 2KHRC1 | 3.14.1 |
| | SD2RC1 | 3.15.1 |
| | SD2RC2 | 3.15.1 |
| | SCRC3 | 3.17.1 |
| | SCRC5 | 3.17.1 |
| | SCRC8 | 3.17.1 |
| | 2SCRC1 | 3.18.1 |
| | SB2RC2 | 3.19.1 |
| | SB2RC3 | 3.19.1 |
| | THRC2 | 3.21.1 |
| | THRC3 | 3.21.1 |
| | THRC5 | 3.21.1 |
| B3 MAX CABLE TENSION: 600 LBS 30°<Φ ≤ 45° | TZ2RC5 | 3.11.1 |
| | KHRC6 | 3.13.1 |
| | KHRC9 | 3.13.1 |
| | 2KHRC2 | 3.14.1 |
| | 2KHRC4 | 3.14.1 |
| | SD2RC3 | 3.15.1 |
| | SD2RC4 | 3.15.1 |
| | SCRC6 | 3.17.1 |
| | SCRC7 | 3.17.1 |
| | SCRC9 | 3.17.1 |
| | SCRC10 | 3.17.1 |
| | 2SCRC2 | 3.18.1 |
| | 2SCRC4 | 3.18.1 |
| | SB2RC4 | 3.19.1 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B3 MAX CABLE TENSION: 600 LBS 30°<Φ ≤ 45° | SB2RC5 | 3.19.1 |
| | 2SB2RC1 | 3.20.1 |
| | THRC4 | 3.21.1 |
| | 2THRC1 | 3.22.1 |
| B4 MAX CABLE TENSION: 900 LBS 30°<Φ ≤ 45° | TZ2RC6 | 3.11.1 |
| | TZ2RC7 | 3.11.1 |
| | KHRC8 | 3.13.1 |
| | SD2RC5 | 3.15.1 |
| | SD2RC6 | 3.15.1 |
| | 2SD2RC1 | 3.16.1 |
| | 2SCRC7 | 3.18.1 |
| | SB2RC6 | 3.19.1 |
| | SB2RC7 | 3.19.1 |
| | 2SB2RC2 | 3.20.1 |
| | THRC6 | 3.21.1 |
| | THRC7 | 3.22.1 |
| B5 MAX CABLE TENSION: 1200 LBS 30°<Φ ≤ 45° | TZ2RC8 | 3.11.1 |
| | TZ2RC9 | 3.11.1 |
| | 2TZ2RC1 | 3.12.1 |
| | KHRC10 | 3.13.1 |
| | 2KHRC3 | 3.14.1 |
| | 2KHRC5 | 3.14.1 |
| | 2KHRC7 | 3.14.1 |
| | SD2RC7 | 3.15.1 |
| | 2SD2RC2 | 3.16.1 |
| | 2SCRC3 | 3.18.1 |
| | 2SCRC5 | 3.18.1 |
| | SB2RC8 | 3.19.1 |
| | 2SB2RC3 | 3.20.1 |
| | THRC8 | 3.21.1 |
| | 2THRC2 | 3.22.1 |
| | 2THRC3 | 3.22.1 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B6 MAX CABLE TENSION: 1500 LBS 30°<Φ ≤ 45° | 2TZ2RC2 | 3.12.1 |
| | 2TZ2RC4 | 3.12.1 |
| | 2KHRC9 | 3.14.1 |
| | 2SCRC8 | 3.18.1 |
| | 2THRC4 | 3.22.1 |
| | 2THRC5 | 3.22.1 |
| B7 MAX CABLE TENSION: 2000 LBS 30°<Φ ≤ 45° | 2TZ2RC3 | 3.12.1 |
| | 2KHRC6 | 3.14.1 |
| | 2KHRC8 | 3.14.1 |
| | 2SD2RC3 | 3.16.1 |
| | 2SD2RC4 | 3.16.1 |
| | 2SD2RC5 | 3.16.1 |
| | 2SD2RC6 | 3.16.1 |
| | 2SCRC6 | 3.18.1 |
| | 2SCRC9 | 3.18.1 |
| | 2SCRC10 | 3.18.1 |
| | 2SB2RC4 | 3.20.1 |
| | 2SB2RC5 | 3.20.1 |
| | 2SB2RC7 | 3.20.1 |
| | 2THRC6 | 3.22.1 |
| B8 MAX CABLE TENSION: 3200 LBS 30°<Φ ≤ 45° | 2TZ2RC5 | 3.12.1 |
| | 2TZ2RC7 | 3.12.1 |
| | 2KHRC10 | 3.14.1 |
| | 2SD2RC7 | 3.16.1 |
| | 2SB2RC6 | 3.20.1 |
| | 2SB2RC8 | 3.20.1 |
| | 2THRC7 | 3.22.1 |
| | 2THRC8 | 3.22.1 |
| B9 MAX CABLE TENSION: 4500 LBS 30°<Φ ≤ 45° | 2TZ2RC6 | 3.12.1 |
| | 2TZ2RC8 | 3.12.1 |
| | 2TZ2RC9 | 3.12.1 |
| | -- | -- |
| | -- | -- |

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# RIGID BRACE ATTACHMENT INDEX FOR MIN. 3000psi NW REINFORCED CONCRETE

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B1 MAX BRACE LOAD: 100 LBS 30°<Φ ≤ 45° | KHRCR1 | 3.13.2 |
| | KHRCR4 | 3.13.2 |
| | SCRCR1 | 3.17.2 |
| | SCRCR4 | 3.17.2 |
| | SB2RCR1 | 3.19.2 |
| B2 MAX BRACE LOAD: 300 LBS 30°<Φ ≤ 45° | TZ2RCR1 | 3.11.2 |
| | TZ2RCR2 | 3.11.2 |
| | TZ2RCR3 | 3.11.2 |
| | TZ2RCR4 | 3.11.2 |
| | KHRCR2 | 3.13.2 |
| | KHRCR3 | 3.13.2 |
| | KHRCR5 | 3.13.2 |
| | KHRCR7 | 3.13.2 |
| | 2KHRCR1 | 3.14.2 |
| | SD2RCR1 | 3.15.2 |
| | SD2RCR2 | 3.15.2 |
| | SCRCR2 | 3.17.2 |
| | SCRCR3 | 3.17.2 |
| | SCRCR5 | 3.17.2 |
| | SCRCR7 | 3.17.2 |
| | SCRCR8 | 3.17.2 |
| | 2SCRCR1 | 3.18.2 |
| | SB2RCR2 | 3.19.2 |
| | SB2RCR3 | 3.19.2 |
| | THRCR1 | 3.21.2 |
| | THRCR2 | 3.21.2 |
| | THRCR3 | 3.21.2 |
| B3 MAX BRACE LOAD: 600 LBS 30°<Φ ≤ 45° | 2TZ2RCR1 | 3.12.2 |
| | KHRCR6 | 3.13.2 |
| | KHRCR9 | 3.13.2 |
| | 2KHRCR2 | 3.14.2 |
| | 2KHRCR4 | 3.14.2 |
| | SD2RCR3 | 3.15.2 |
| | SD2RCR4 | 3.15.2 |
| | SCRCR6 | 3.17.2 |
| | SCRCR9 | 3.17.2 |
| | SCRCR10 | 3.17.2 |
| | 2SCRCR2 | 3.18.2 |
| | 2SCRCR4 | 3.18.2 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B3 MAX BRACE LOAD: 600 LBS 30°<Φ ≤ 45° | SB2RCR4 | 3.19.2 |
| | SB2RCR5 | 3.19.2 |
| | 2SB2RCR1 | 3.20.2 |
| | THRCR4 | 3.21.2 |
| | THRCR5 | 3.21.2 |
| | 2THRCR1 | 3.22.2 |
| B4 MAX BRACE LOAD: 900 LBS 30°<Φ ≤ 45° | TZRCR5 | 3.11.2 |
| | TZRCR6 | 3.11.2 |
| | 2TZ2RCR2 | 3.12.2 |
| | KHRCR8 | 3.13.2 |
| | 2KHRCR5 | 3.14.2 |
| | SD2RCR6 | 3.15.2 |
| | 2SD2RCR1 | 3.16.2 |
| | 2SD2RCR2 | 3.16.2 |
| | 2SCRCR5 | 3.18.2 |
| | 2SCRCR7 | 3.18.2 |
| | SB2RCR7 | 3.19.2 |
| | SB2RCR9 | 3.19.2 |
| | 2SB2RCR2 | 3.20.2 |
| | THRCR6 | 3.21.2 |
| | 2THRCR2 | 3.22.2 |
| | 2THRCR3 | 3.22.2 |
| B5 MAX BRACE LOAD: 1200 LBS 30°<Φ ≤ 45° | TZ2RCR7 | 3.11.2 |
| | TZ2RCR8 | 3.11.2 |
| | TZ2RCR9 | 3.11.2 |
| | 2TZ2RCR3 | 3.12.2 |
| | 2TZ2RCR4 | 3.12.2 |
| | KHRCR10 | 3.13.2 |
| | 2KHRCR3 | 3.14.2 |
| | 2KHRCR7 | 3.14.2 |
| | SD2RCR5 | 3.15.2 |
| | SD2RCR7 | 3.15.2 |
| | 2SCRCR3 | 3.18.2 |
| | 2SCRCR8 | 3.18.2 |
| | SB2RCR6 | 3.19.2 |
| | SB2RCR8 | 3.19.2 |
| | SB2RCR10 | 3.19.2 |
| | 2SB2RCR3 | 3.20.2 |
| | THRCR7 | 3.21.2 |
| | THRCR8 | 3.21.2 |
| | 2THRCR5 | 3.22.2 |

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B6 MAX BRACE LOAD: 1500 LBS 30°<Φ ≤ 45° | 2KHRCR6 | 3.14.2 |
| | 2KHRCR9 | 3.14.2 |
| | 2SD2RCR3 | 3.16.2 |
| | 2SCRCR9 | 3.18.2 |
| | 2SB2RCR4 | 3.20.2 |
| | 2SB2RCR5 | 3.20.2 |
| | 2THRCR4 | 3.22.2 |
| B7 MAX BRACE LOAD: 2000 LBS 30°<Φ ≤ 45° | | |
| | | |
| | | |
| | 2TZ2RCR5 | 3.12.2 |
| | 2TZ2RCR6 | 3.12.2 |
| | 2TZ2RCR7 | 3.12.2 |
| | 2TZ2RCR8 | 3.12.2 |
| | 2KHRCR8 | 3.14.2 |
| | 2KHRCR10 | 3.14.2 |
| | 2SD2RCR4 | 3.16.2 |
| | 2SD2RCR5 | 3.16.2 |
| | 2SD2RCR6 | 3.16.2 |
| | 2SCRCR6 | 3.18.2 |
| | 2SCRCR10 | 3.18.2 |
| | 2SB2RCR6 | 3.20.2 |
| | 2SB2RCR7 | 3.20.2 |
| | 2SB2RCR9 | 3.20.2 |
| | 2THRCR6 | 3.22.2 |
| | 2THRCR7 | 3.22.2 |
| B8 MAX BRACE LOAD: 3200 LBS 30°<Φ ≤ 45° | 2TZ2RCR9 | 3.12.2 |
| | 2SD2RCR7 | 3.16.2 |
| | 2SB2RCR8 | 3.20.2 |
| | 2THRCR8 | 3.22.2 |
| B9 MAX BRACE LOAD: 4500 LBS 30°<Φ ≤ 45° | 2SB2RCR10 | 3.20.2 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

NOTES:
1. THE VALUE OF Φ IS THE ANGLE OF THE BRACE ARM MEASURED FROM THE HORIZONTAL PLANE FOR THE ATTACHMENTS.
2. TO FIND Φ : Φ = 90° - x, WHERE x IS THE CABLE ANGLE FROM THE VERTICAL USED FOR THE BRACING DETAILS.
3. MAX LOAD DOES NOT INCLUDE $\Omega_0$.

REVIEWED FOR CODE COMPLIANCE
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
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Ph: (661) 257-3311 | Fax: (661) 257-6050
Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **D.11.2**

Date: February 5, 2025

# CABLE BRACE ATTACHMENT INDEX FOR WOOD, STEEL, & CAST-IN-PLACE

## TO MIN. 20GA BARE STEEL DECKING

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B2 MAX CABLE TENSION: 300 LBS 30°<Φ ≤ 45° | BD1 | 3.23.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B3 MAX CABLE TENSION: 600 LBS 30°<Φ ≤ 45° | BD2 | 3.23.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B4 MAX CABLE TENSION: 900 LBS 30°<Φ ≤ 45° | BD3 | 3.23.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

## TO STRUCTURAL STEEL FRAMING

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B6 MAX CABLE TENSION: 1500 LBS 30°<Φ ≤ 45° | SS1 | 3.24.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B7 MAX CABLE TENSION: 2000 LBS 30°<Φ ≤ 45° | SS2 | 3.24.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

NOTES:
1. THE VALUE OF Φ IS THE ANGLE OF THE CABLE MEASURED FROM THE HORIZONTAL PLANE FOR THE ATTACHMENTS.
2. TO FIND Φ : Φ = 90° - x, WHERE x IS THE CABLE ANGLE FROM THE VERTICAL USED FOR THE BRACING DETAILS.
3. MAX LOAD DOES NOT INCLUDE $\Omega_0$ FOR CONCRETE ATTACHMENTS.

## TO WOOD MEMBERS/BLOCKING WITH LAG BOLTS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B2 MAX CABLE TENSION: 300 LBS 30°<Φ ≤ 45° | LBW1 | 3.25.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B3 MAX CABLE TENSION: 600 LBS 30°<Φ ≤ 45° | LBW2 | 3.25.1 |
| | 2LBW1 | 3.25.1 |
| | -- | -- |
| | -- | -- |
| B4 MAX CABLE TENSION: 900 LBS 30°<Φ ≤ 45° | LBW3 | 3.25.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B5 MAX CABLE TENSION: 1200 LBS 30°<Φ ≤ 45° | LBW4 | 3.25.1 |
| | 2LBW2 | 3.25.1 |
| | -- | -- |
| | -- | -- |
| B6 MAX CABLE TENSION: 1500 LBS 30°<Φ ≤ 45° | 2LBW3 | 3.25.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B7 MAX CABLE TENSION: 2000 LBS 30°<Φ ≤ 45° | 2LBW4 | 3.25.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

## TO WOOD MEMBERS/BLOCKING WITH THRU BOLTS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B3 MAX CABLE TENSION: 600 LBS 30°<Φ ≤ 45° | TBW1 | 3.26.1 |
| | TBW2 | 3.26.1 |
| | TBW3 | 3.26.1 |
| | -- | -- |
| B5 MAX CABLE TENSION: 1200 LBS 30°<Φ ≤ 45° | 2TBW1 | 3.26.1 |
| | 2TBW2 | |
| | -- | -- |
| | -- | -- |
| B6 MAX CABLE TENSION: 1500 LBS 30°<Φ ≤ 45° | 2TBW3 | 3.26.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

## CAST-IN-PLACE FOR NORMAL REINFORCED & PT CONCRETE SLAB & MEMBERS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B2 MAX CABLE TENSION: 300 LBS 30°<Φ ≤ 45° | CIP1 | 3.27.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B3 MAX CABLE TENSION: 600 LBS 30°<Φ ≤ 45° | CIP2 | 3.27.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B6 MAX CABLE TENSION: 1500 LBS 30°<Φ ≤ 45° | CIP3 | 3.27.1 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B7 MAX CABLE TENSION: 2000 LBS 30°<Φ ≤ 45° | CIP4 | 3.27.1 |
| | CIP5 | 3.27.1 |
| | -- | -- |
| | -- | -- |

REVIEWED FOR CODE COMPLIANCE HCAi OPM-0203 Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

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Structural Engineer: N. Tremblay
California PE No. S6481

Page No.: **D.12.1**

Date: February 5, 2025

# BRACE ATTACHMENT INDEX FOR WOOD, STEEL, & CAST-IN-PLACE

## TO MIN. 20GA BARE STEEL DECKING

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B2 MAX BRACE LOAD: 300 LBS 30°<Φ ≤ 45° | BDR1 | 3.23.2 |
| | BDR4[4] | 3.23.3 |
| | -- | -- |
| | -- | -- |
| B3 MAX BRACE LOAD: 600 LBS 30°<Φ ≤ 45° | BDR2 | 3.23.2 |
| | BDR5[4] | 3.23.3 |
| | -- | -- |
| | -- | -- |
| B4 MAX BRACE LOAD: 900 LBS 30°<Φ ≤ 45° | BDR3 | 3.23.2 |
| | BDR6[4] | 3.23.3 |
| | -- | -- |
| | -- | -- |

## TO STRUCTURAL STEEL FRAMING

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B6 MAX BRACE LOAD: 1500 LBS 30°<Φ ≤ 45° | SSR1 | 3.24.2 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B8 MAX BRACE LOAD: 3200 LBS 30°<Φ ≤ 45° | SSR2 | 3.24.2 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B9 MAX BRACE LOAD: 4500 LBS 30°<Φ ≤ 45° | SSR3 | 3.24.2 |
| | SSR5[4] | 3.24.3 |
| | SSR6[4] | 3.24.3 |
| | -- | -- |

## TO WOOD MEMBERS/BLOCKING WITH LAG BOLTS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B2 MAX BRACE LOAD: 300 LBS 30°<Φ ≤ 45° | LBWR1 | 3.25.2 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B3 MAX BRACE LOAD: 600 LBS 30°<Φ ≤ 45° | LBWR2 | 3.25.2 |
| | 2LBWR1 | 3.25.2 |
| | -- | -- |
| | -- | -- |
| B4 MAX BRACE LOAD: 900 LBS 30°<Φ ≤ 45° | LBWR3 | 3.25.2 |
| | 2LBWR2 | 3.25.2 |
| | -- | -- |
| | -- | -- |
| B5 MAX BRACE LOAD: 1200 LBS 30°<Φ ≤ 45° | LBWR4 | 3.25.2 |
| | 2LBWR2 | 3.25.2 |
| | -- | -- |
| | -- | -- |
| B6 MAX BRACE LOAD: 1500 LBS 30°<Φ ≤ 45° | 2LBWR3 | 3.25.2 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B7 MAX BRACE LOAD: 2000 LBS 30°<Φ ≤ 45° | 2LBWR4 | 3.25.2 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

NOTES:
1. THE VALUE OF Φ IS THE ANGLE OF THE BRACE ARM MEASURED FROM THE HORIZONTAL PLANE FOR THE ATTACHMENTS.
2. TO FIND Φ : Φ = 90° - x, WHERE x IS THE BRACE ANGLE FROM THE VERTICAL USED FOR THE BRACING DETAILS.
3. MAX LOAD DOES NOT INCLUDE $\Omega_0$ FOR CONCRETE ATTACHMENTS.
4. ATTACHMENT DESIGNATIONS FOR HSLH-1 ANCHOR BRACKET (⅞" & 1" ROD OR BOLT).

## TO WOOD MEMBERS/BLOCKING WITH THRU BOLTS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B3 MAX BRACE LOAD: 600 LBS 30°<Φ ≤ 45° | TBWR1 | 3.26.2 |
| | TBWR2 | 3.26.2 |
| | -- | -- |
| | -- | -- |
| B4 MAX BRACE LOAD: 900 LBS 30°<Φ ≤ 45° | TBWR3 | 3.26.2 |
| | TBWR4 | 3.26.2 |
| | TBWR5 | 3.26.2 |
| | -- | -- |
| B6 MAX BRACE LOAD: 1500 LBS 30°<Φ ≤ 45° | 2TBWR1 | 3.26.2 |
| | 2TBWR2 | 3.26.2 |
| | -- | -- |
| | -- | -- |
| B7 MAX BRACE LOAD: 2000 LBS 30°<Φ ≤ 45° | 2TBWR3 | 3.26.2 |
| | -- | -- |
| | -- | -- |
| | -- | -- |

## CAST-IN-PLACE FOR NORMAL REINFORCED & PT CONCRETE SLAB & MEMBERS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| B4 MAX BRACE LOAD: 600 LBS 30°<Φ ≤ 45° | CIPR1 | 3.27.2 |
| | CIPR2 | 3.27.2 |
| | -- | -- |
| | -- | -- |
| B6 MAX BRACE LOAD: 1500 LBS 30°<Φ ≤ 45° | CIPR3 | 3.27.2 |
| | -- | -- |
| | -- | -- |
| | -- | -- |
| B7 MAX BRACE LOAD: 2000 LBS 30°<Φ ≤ 45° | CIPR4 | 3.27.2 |
| | CIPR5 | 3.27.2 |
| | -- | -- |
| | -- | -- |
| B8 MAX BRACE LOAD: 3200 LBS 30°<Φ ≤ 45° | CIPR6 | 3.27.2 |
| | CIPR7 | 3.27.2 |
| | -- | -- |
| | -- | -- |

HCAi OPM-0203 Reviewed for Code Compliance by Roy Lobo DATE: 07/19/2025 CALIFORNIA BUILDING CODE 2022

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California PE No. S6481

Page No.: **D.12.2**

Date: February 5, 2025

# PRMXA-1C HANGER ATTACHMENT INDEX FOR ALL CONDITIONS

## TO 3" STEEL DECK WITH MIN. 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| H2 MAX LOAD: 700 LBS | HDE32 | 3.28 |
| | HDE33 | 3.28 |
| | -- | -- |
| H3 MAX LOAD: 1000 LBS | HDE31 | 3.28 |
| | 2HDE31 | 3.28 |
| | 2HDE32 | 3.28 |
| | 2HDE33 | 3.28 |
| | 2HDS31 | 3.30 |
| | 2HDS32 | 3.30 |
| | 2HDS33 | 3.30 |

*MAX LOAD DOES NOT INCLUDE $\Omega_0$.

## TO 1.5" STEEL DECK WITH MIN. 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| H2 MAX LOAD: 700 LBS | HDE1.51 | 3.29 |
| | HDE1.52 | 3.29 |
| | -- | -- |
| H3 MAX LOAD: 1000 LBS | 2HDE1.51 | 3.29 |
| | 2HDE1.52 | 3.29 |
| | -- | -- |

*MAX LOAD DOES NOT INCLUDE $\Omega_0$.

## TO NORMAL REINFORCED CONC. SLAB OR MEMBER

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| H2 MAX LOAD: 700 LBS | HRCS31 | 3.30 |
| | HRCS32 | 3.30 |
| | HRCS33 | 3.30 |
| H3 MAX LOAD: 1000 LBS | HRCE31 | 3.31 |
| | HRCE32 | 3.31 |
| | HRCE33 | 3.31 |

*MAX LOAD DOES NOT INCLUDE $\Omega_0$.

## TO PT CONCRETE SLAB OR MEMBER

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| H3 MAX LOAD: 1000 LBS | HCIP1 | 3.31 |
| | -- | -- |
| | -- | -- |

*MAX LOAD DOES NOT INCLUDE $\Omega_0$.

## TO MIN. 20GA BARE STEEL DECKING

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| H1 MAX LOAD: 350 LBS | HBD1 | 3.32 |
| | -- | -- |
| | -- | -- |

## TO STRUCTURAL STEEL FRAMING

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| H3 MAX LOAD: 1000 LBS | HSS1 | 3.32 |
| | -- | -- |
| | -- | -- |

## TO WOOD MEMBERS/BLOCKING WITH LAG BOLTS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| H3 MAX LOAD: 1000 LBS | HSW1 | 3.32 |
| | -- | -- |
| | -- | -- |

## TO WOOD MEMBERS/BLOCKING WITH THRU-BOLTS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| H1 MAX LOAD: 350 LBS | HTW1 | 3.32 |
| | -- | -- |
| | -- | -- |

FCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
FOR CODE COMPLIANCE
CALIFORNIA BUILDING CODE

# ROD ATTACHMENT INDEX FOR 3" & 1-1/2" STEEL DECK WITH 3000psi SAND LW CONCRETE FILL

## TO 3" STEEL DECK WITH MIN. 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| R1 MAX LOAD: 300 LBS | RDS31 | 3.37 |
| | RDS32 | 3.37 |
| | RDS33 | 3.37 |
| | RDE37 | 3.33 |
| R2 MAX LOAD: 600 LBS | RKCM31 | 3.38 |
| | RDE32 | 3.33 |
| | RDE33 | 3.33 |
| | RDE34 | 3.33 |
| | RDE35 | 3.33 |
| | RDE38 | 3.33 |
| R3 MAX LOAD: 1000 LBS | RKCM32 | 3.38 |
| | RKCM33 | 3.38 |
| | RKCM34 | 3.38 |
| | RDE31 | 3.33 |
| | RDE39 | 3.33 |
| R4 MAX LOAD: 1500 LBS | RDE36 | 3.33 |
| | -- | -- |
| | -- | -- |
| R7 MAX LOAD: 3000 LBS | 2RDE31 | 3.33 |
| | 2RDE32 | 3.33 |
| | 2RDE33 | 3.33 |
| | -- | -- |
| R8 MAX LOAD: 7500 LBS | 4RDE31 | 3.33.1 |
| | 4RDE32 | 3.33.1 |
| | 4RDE33 | 3.33.1 |

## TO 1.5" STEEL DECK WITH MIN. 3000psi SAND LW CONCRETE FILL

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| R1 MAX LOAD: 300 LBS | RDS1.51 | 3.37 |
| | RKCM1.51 | 3.34 |
| | RKCM1.52 | 3.34 |
| | RKCM1.53 | 3.34 |
| R2 MAX LOAD: 600 LBS | RDE1.52 | 3.34 |
| | RDE1.54 | 3.34 |
| | RDE1.55 | 3.34 |
| R3 MAX LOAD: 1000 LBS | RDE1.51 | 3.34 |
| | RDE1.53 | 3.34 |
| | -- | -- |
| R6 MAX LOAD: 2500 LBS | 2RDE1.51 | 3.34 |
| | 4RDE1.52 | 3.34.1 |
| | -- | -- |
| R7 MAX LOAD: 3000 LBS | 4RDE1.51 | 3.34.1 |
| | -- | -- |
| | -- | -- |

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Page No.: **D.14.1**

Date: February 5, 2025

# ROD ATTACHMENT INDEX FOR NORMAL REINFORCED AND POST-TENSIONED CONCRETE SLAB & MEMBERS

## POST INSTALLED TO NORMAL REINFORCED CONCRETE SLAB/MEMBER

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| R1 MAX LOAD: 300 LBS | RRCS2 | 3.37 |
| | -- | -- |
| | -- | -- |
| R2 MAX LOAD: 600 LBS | RRCE10 | 3.35 |
| | RRCS1 | 3.37 |
| | RRCS3 | 3.37 |
| | -- | -- |
| R3 MAX LOAD: 1000 LBS | RRCE5 | 3.35 |
| | RRCE6 | 3.35 |
| | 2RRCE9 | 3.35.1 |
| | -- | -- |
| | -- | -- |
| R4 MAX LOAD: 1500 LBS | RRCE1 | 3.35 |
| | RRCE2 | 3.35 |
| | RRCE11 | 3.35 |
| R5 MAX LOAD: 2000 LBS | RRCE12 | 3.35 |
| | 2RRCE1 | 3.35.1 |
| | 2RRCE11 | 3.35.1 |
| R6 MAX LOAD: 2500 LBS | RRCE7 | 3.35 |
| | RRCE9 | 3.35 |
| | RRCE13 | 3.35 |
| | 2RRCE5 | 3.35.1 |
| R7 MAX LOAD: 3000 LBS | RRCE3 | 3.35 |
| | RRCE4 | 3.35 |
| | RRCE8 | 3.35 |
| | 2RRCE2 | 3.35.1 |
| | 2RRCE3 | 3.35.1 |
| | 2RRCE6 | 3.35.1 |
| | 2RRCE7 | 3.35.1 |
| | 2RRCE10 | 3.35.1 |
| R8 MAX LOAD: 7500 LBS | 2RRCE4 | 3.35.1 |
| | 2RRCE8 | 3.35.1 |
| | 2RRCE12 | 3.35.1 |
| | 2RRCE13 | 3.35.1 |

## CAST-IN-PLACE TO NORMAL & POST-TENSIONED CONCRETE SLAB/MEMBER

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| R2 MAX LOAD: 600 LBS | RKCMRC1 | 3.38.1 |
| | -- | -- |
| | -- | -- |
| R4 MAX LOAD: 1500 LBS | RKCMRC2 | 3.38.1 |
| | -- | -- |
| | -- | -- |
| R5 MAX LOAD: 2000 LBS | RKCMRC3 | 3.38.1 |
| | -- | -- |
| | -- | -- |
| R6 MAX LOAD: 2500 LBS | RCIP1 | 3.38.1 |
| | -- | -- |
| | -- | -- |
| R7 MAX LOAD: 3000 LBS | RCIP2 | 3.35 |
| | RCIP3 | 3.35 |
| | RKCMRC4 | 3.38.1 |
| R8 MAX LOAD: 7500 LBS | RCIP4 | 3.35 |
| | RCIP5 | 3.35 |
| | -- | -- |
| R9 MAX LOAD: 12500 LBS | RCIP6 | 3.35 |
| | -- | -- |
| | -- | -- |

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BY: Roy Lobo
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Page No.: **D.15.1**

Date: February 5, 2025

# ROD ATTACHMENT INDEX FOR WOOD, STEEL, & CAST-IN-PLACE

## TO MIN. 20GA BARE STEEL DECKING

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| R2 MAX LOAD: 600 LBS | RBD1 | 3.36 |
| | -- | -- |
| | -- | -- |

## TO STRUCTURAL STEEL FRAMING

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| R5 MAX LOAD: 2000 LBS | RSS1 | 3.36 |
| | -- | -- |
| | -- | -- |
| R7 MAX LOAD: 3000 LBS | RSS2 | 3.36 |
| | RSS3 | 3.36 |
| | -- | -- |
| | -- | -- |
| R8 MAX LOAD: 7500 LBS | RSS4 | 3.36 |
| | RSS5 | 3.36 |
| | -- | -- |
| R10 MAX LOAD: 12500 LBS | RSS6 | 3.36 |
| | -- | -- |
| | -- | -- |

## TO WOOD MEMBERS/BLOCKING WITH LAG BOLTS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| R2 MAX LOAD: 600 LBS | RSW1 | 3.36 |
| | -- | -- |
| | -- | -- |

## TO WOOD MEMBERS/BLOCKING WITH THRU-BOLTS

| DESIGNATION | ATTACHMENT TYPE | DETAIL PAGE # |
|---|---|---|
| R1 MAX LOAD: 300 LBS | RTW1 | 3.36 |
| | -- | -- |
| | -- | -- |

REVIEWED FOR CODE COMPLIANCE
HCAi
OPM-0203
BY: Roy Lobo
DATE: 07/19/2025
CALIFORNIA BUILDING CODE 2022

Vibrex® vibration & seismic control systems
M.W. Saussé & Co., Inc.
28744 Witherspoon Parkway | Valencia, CA 91355
Ph: (661) 257-3311 | Fax: (661) 257-6050

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Page No.: **D.16.1**

Date: February 5, 2025

# APPENDIX A

# FOR REFERENCE ONLY

## Unit Conversion Chart

| Convert From | To | Multiply By |
|---|---|---|
| Angle | | |
| degree | radian (rad) | 0.017453 |
| radian | degree (°) | 57.29578 |
| Area | | |
| sq. feet ($ft^2$) | sq. meter ($m^2$) | 0.092903 |
| sq. inch ($in^2$) | sq. meter ($m^2$) | 0.000645 |
| sq. centimeter ($cm^2$) | sq. inch ($in^2$) | 0.001077 |
| sq. meter ($m^2$) | sq. feet ($ft^2$) | 10.7639 |
| sq. meter ($m^2$) | sq. inch ($in^2$) | 1550 |
| Temperature | | |
| degree Fahrenheit (°F) | degree Celsius (°C) | t°C = (t°F-32)/1.8 |
| degree Celsius (°C) | degree Fahrenheit (°F) | t°F = 1.8t°C+32 |
| Kelvin (K) | degree Celsius (°C) | t°C = t°K+273.15 |
| Force | | |
| Pound-force | Newton (N) | 4.4482 |
| Kip (1000 lbs) | kilo Newton (kN) | 4.4482 |
| pound-foot (lb-ft) | Newton-meter (N-m) | 1.355818 |
| Length | | |
| foot (ft) | meter (m) | 0.3048 |
| inch (in) | centimeter (cm) | 2.54 |
| mil | inch (in) | 0.001 |
| meter (m) | foot (ft) | 3.28084 |
| centimeter (cm) | inch (in) | 0.393701 |
| micrometer (µm) | inch (in) | 3.93701e-5 |
| Volume | | |
| cubic foot ($ft^3$) | cubic meter ($m^3$) | 0.02832 |
| cubic inch ($in^3$) | cubic centimeter ($cm^3$) | 16.3871 |
| cubic centimeter ($cm^3$) | cubic inch ($in^3$) | 0.061024 |
| cubic meter ($m^3$) | cubic foot ($m^3$) | 35.3147 |
| gallon (US Liquid) | cubic foot ($ft^3$) | 0.13368 |
| Liter (L) | gallon (US Liquid) | 0.26417 |
| Liter (L) | cubic foot ($ft^3$) | 0.035315 |

## Unit Conversion Chart (continued)

| Convert From | To | Multiply By |
|---|---|---|
| <u>Mass</u> | | |
| pound (lb) | Kilogram (kg) | 0.45359 |
| Kilogram (kg) | pound (lb) | 2.20462 |
| <u>Mass/Length</u> | | |
| lb/ft | kg/m | 1.48816 |
| lb/in | kg/m | 17.85797 |
| kg/m | lb/ft | 0.671969 |
| kg/m | lb/in | 0.055997 |
| <u>Mass/Volume</u> | | |
| $lb/ft^3$ | $kg/m^3$ | 16.0185 |
| $lb/in^3$ | $kg/m^3$ | 2767.99 |
| $kg/m^3$ | $lb/ft^3$ | 0.062478 |
| $kg/m^3$ | $lb/in^3$ | 0.000036127 |
| $lb/ft^3$ | $lb/in^3$ | 1728.0 |
| <u>Mass/Area or Pressure</u> | | |
| pascal (Pa) | lbs/sq. inch (psi) | 0.000145 |
| kilopascal (kPa) | lbs/sq. inch (psi) | 0.145038 |
| megapascal (MPa) | kips/sq. inch (ksi) | 0.145038 |
| $lb/ft^2$ | $kg/m^2$ | 0.204816 |
| $kg/m^2$ | $lb/ft^2$ | 4.882427 |
| lb/in (psi) | $lb/ft^2$ | 144 |
| kip/in (ksi) | MPa | 6.894759 |

# Pipe, Duct, & Cable Tray Weights

| STEEL PIPE | | | | | |
|---|---|---|---|---|---|
| PIPE DIA. | PIPE SCH. | Weight per Foot (lbs) | | | |
| | | Steel | Water | 1½" Insul.[2] | Total |
| 1" | 40 | 1.68 | 0.375 | 0.61 | 2.67 |
| 1¼" | 40 | 2.27 | 0.648 | 0.68 | 3.61 |
| 1½" | 40 | 2.72 | 0.882 | 0.74 | 4.34 |
| 2" | 40 | 3.65 | 1.454 | 0.84 | 5.95 |
| 2½" | 40 | 5.80 | 2.075 | 0.95 | 8.82 |
| 3" | 40 | 7.58 | 3.203 | 1.08 | 11.87 |
| 3½" | 40 | 9.12 | 4.284 | 1.19 | 14.59 |
| 4" | 40 | 10.80 | 5.516 | 1.30 | 17.62 |
| 5" | 40 | 14.63 | 8.669 | 1.53 | 24.83 |
| 6" | 40 | 18.99 | 12.52 | 1.76 | 33.27 |
| 8" | 40 | 28.58 | 21.68 | 2.19 | 52.45 |
| 10" | 40 | 40.52 | 34.17 | 2.65 | 77.35 |
| 12" | [1]STD | 49.61 | 49.01 | 3.09 | 101.7 |
| 14" | [1]STD | 54.62 | 58.69 | 3.36 | 117.7 |
| 16" | [1]STD | 62.64 | 77.79 | 3.79 | 145.6 |
| 18" | [1]STD | 70.66 | 99.58 | 4.23 | 176.2 |
| 20" | [1]STD | 78.67 | 126.1 | 4.66 | 209.4 |
| 22" | [1]STD | 86.69 | 153.7 | 5.09 | 245.5 |
| 24" | [1]STD | 94.71 | 184.0 | 5.53 | 284.2 |

| COPPER PIPE | | | | | |
|---|---|---|---|---|---|
| PIPE DIA. | TYPE | Weight per Foot (lbs) | | | |
| | | Copper | Water | 1½" Insul.[2] | Total |
| ½" | L | 0.285 | 0.101 | 0.46 | 0.85 |
| ¾" | L | 0.456 | 0.210 | 0.51 | 1.18 |
| 1" | L | 0.656 | 0.358 | 0.57 | 1.58 |
| 1¼" | L | 0.885 | 0.545 | 0.62 | 2.05 |
| 1½" | L | 1.145 | 0.771 | 0.68 | 2.59 |
| 2" | L | 1.754 | 1.341 | 0.79 | 3.88 |
| 2½" | L | 2.483 | 2.068 | 0.89 | 5.44 |
| 3" | L | 3.331 | 2.952 | 1.00 | 7.29 |
| 3½" | L | 4.299 | 3.992 | 1.11 | 9.4 |
| 4" | L | 5.576 | 5.169 | 1.22 | 11.96 |
| 5" | L | 7.622 | 8.088 | 1.44 | 17.15 |
| 6" | L | 10.22 | 11.627 | 1.65 | 23.50 |

PIPE NOTES:

1. STD. designation means the wall thickness for 12" pipe and larger is 0.375".
2. Insulation weight per foot varies greatly depending on the type used. Insulation density used for the above table is 6.622 lb/ft$^3$.

| ROUND DUCT WEIGHT | | | | | | |
|---|---|---|---|---|---|---|
| DUCT DIA. | 1 ½" INSUL[1] | Weight in lb/ft per Gage | | | | Cross Section Area, ft$^2$ |
| | | 26 | 24 | 22 | 20 | |
| 24" | 0.63 | 4.8 | 6.4 | 8.0 | 9.6 | 3.1 |
| 26" | 0.67 | 5.2 | 6.9 | 8.7 | 10.4 | 3.7 |
| 28" | 0.72 | 5.6 | 7.5 | 9.4 | 11.2 | 4.3 |
| 30" | 0.77 | 6.0 | 8.0 | 10.0 | 12.0 | 4.9 |
| 32" | 0.82 | 6.4 | 8.6 | 10.7 | 12.8 | 5.6 |
| 34" | 0.87 | 6.8 | 9.1 | 11.4 | 13.6 | 6.3 |
| 36" | 0.92 | 7.2 | 9.6 | 12.0 | 14.4 | 7.1 |
| 38" | 0.97 | 7.6 | 10.2 | 12.7 | 15.2 | 7.9 |
| 40" | 1.02 | 8.0 | 10.7 | 13.4 | 16.0 | 8.7 |
| 42" | 1.07 | 8.4 | 11.2 | 14.1 | 16.8 | 9.6 |
| 44" | 1.12 | 8.8 | 11.8 | 14.7 | 17.6 | 10.6 |
| 46" | 1.17 | 9.2 | 12.3 | 15.4 | 18.4 | 11.5 |
| 48" | 1.21 | 9.6 | 12.8 | 16.1 | 19.2 | 12.6 |
| 50" | 1.26 | 10.0 | 13.4 | 16.7 | 20.0 | 13.6 |
| 52" | 1.31 | 10.5 | 13.9 | 17.4 | 20.8 | 14.7 |
| 54" | 1.36 | 10.9 | 14.4 | 18.1 | 21.6 | 15.9 |
| 56" | 1.41 | 11.3 | 15.05 | 18.7 | 22.4 | 17.1 |
| 58" | 1.46 | 11.7 | 15.5 | 19.4 | 23.3 | 18.3 |
| 60" | 1.51 | 12.1 | 16.0 | 20.1 | 24.1 | 19.6 |
| 62" | 1.56 | 12.5 | 16.6 | 20.7 | 24.9 | 21.0 |
| 64" | 1.61 | 12.9 | 17.1 | 21.4 | 25.7 | 22.3 |
| 66" | 1.66 | 13.3 | 17.6 | 22.1 | 26.5 | 23.8 |
| 68" | 1.71 | 13.7 | 18.2 | 22.8 | 27.3 | 25.2 |
| 70" | 1.75 | 14.1 | 18.7 | 23.4 | 28.1 | 26.7 |
| 72" | 1.80 | 14.5 | 19.2 | 24.1 | 28.9 | 28.3 |

DUCT NOTE

1. Insulation type used for this weight table is Type 75 ASTM C518-76.

| RECTANGULAR DUCT WEIGHT | | | | | | |
|---|---|---|---|---|---|---|
| DUCT PERI-METER | 1 ½" INS[1] | Weight in lb/ft per Gage | | | | Max Section Area, ft$^2$ |
| | | 26 | 24 | 22 | 20 | |
| 48" | 0.38 | 3.1 | 4.1 | 5.1 | 6.1 | 1.0 |
| 56" | 0.44 | 3.6 | 4.8 | 6.0 | 7.1 | 1.4 |
| 64" | 0.50 | 4.1 | 5.4 | 6.8 | 8.2 | 1.8 |
| 72" | 0.56 | 4.6 | 6.1 | 7.7 | 9.2 | 2.3 |
| 80" | 0.63 | 5.1 | 6.8 | 8.5 | 10.2 | 2.8 |
| 88" | 0.69 | 5.6 | 7.5 | 9.4 | 11.2 | 3.4 |
| 96" | 0.75 | 6.1 | 8.2 | 10.2 | 12.3 | 4.0 |
| 104" | 0.81 | 6.7 | 8.8 | 11.1 | 13.3 | 4.7 |
| 112" | 0.88 | 7.2 | 9.5 | 11.9 | 14.3 | 5.4 |
| 120" | 0.94 | 7.7 | 10.2 | 12.8 | 15.3 | 6.3 |
| 128" | 1.00 | 8.2 | 10.9 | 13.6 | 16.3 | 7.1 |
| 136" | 1.06 | 8.7 | 11.6 | 14.5 | 17.4 | 8.0 |
| 144" | 1.13 | 9.2 | 12.3 | 15.3 | 18.4 | 9.0 |
| 152" | 1.19 | 9.7 | 12.9 | 16.2 | 19.4 | 10.0 |
| 160" | 1.25 | 10.2 | 13.6 | 17.0 | 20.4 | 11.1 |
| 168" | 1.31 | 10.7 | 14.3 | 17.9 | 21.4 | 12.3 |
| 176" | 1.38 | 11.3 | 15.0 | 18.7 | 22.5 | 13.4 |
| 184" | 1.44 | 11.8 | 15.7 | 19.6 | 23.5 | 14.7 |

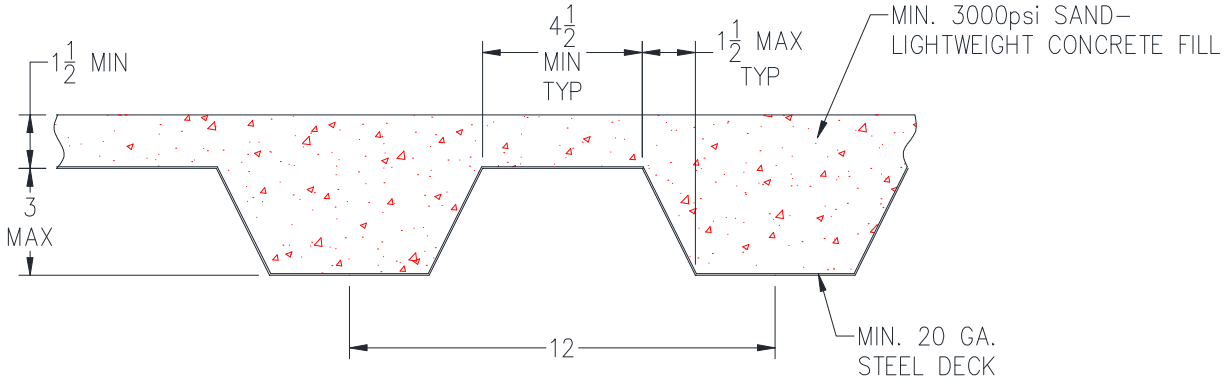
DUCT NOTE

1. Insulation type used for this weight table is Type 75 ASTM C518-76.

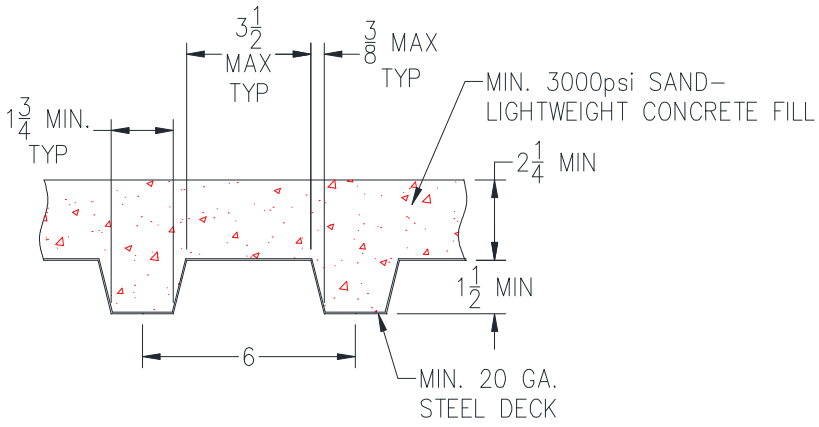
| CABLE TRAY WEIGHTS W/ DATA CABLE | | | | | | | |
|---|---|---|---|---|---|---|---|
| TRAY DEPTH (in) | TRAY WIDTH | | | | | | |
| | 6" (lb/ft) | 9" (lb/ft) | 12" (lb/ft) | 18" (lb/ft) | 24" (lb/ft) | 30" (lb/ft) | 36" (lb/ft) |
| 2 | 5 | 7 | 9 | 14 | 17 | 21 | 27 |
| 3 | 7 | 10 | 14 | 21 | 26 | 32 | 41 |
| 4 | 9 | 13 | 18 | 27 | 35 | 43 | 54 |
| 5 | 12 | 17 | 23 | 34 | 43 | 53 | 68 |
| 6 | 14 | 20 | 27 | 41 | 52 | 64 | 81 |

| CABLE TRAY WEIGHTS W/ POWER CABLE | | | |
|---|---|---|---|
| TRAY WIDTH | | | |
| 6" (lb/ft) | 9" (lb/ft) | 12" (lb/ft) | 18" (lb/ft) |
| 23 | 35 | 45 | 70 |

## Steel Deck with Concrete Fill




STANDARD 3" STEEL DECK WITH CONCRETE FILL




TYPE "B" 1½" STEEL DECK WITH CONCRETE FILL

Note:
The details above are typical for all concrete anchor bolts with ICC Evaluation Service Reports (ESR's) where applicable. See section 3 for deck profiles specific to each anchor (not all anchors are approved for the TYPE "B" decking)