

**COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS
STANDARD CONSTRUCTION AGREEMENT**

This Standard Construction Agreement ("Agreement") is made and entered into as of **November 30, 2026**, by and between the Coachella Valley Association of Governments, a California joint powers authority, with its principal place of business at 74-199 El Paseo, Suite 100, Palm Desert, California 92260 ("CVAG"), and **[CONTRACTOR LEGAL NAME]**, a **Choose an item.** with its principal place of business at **[CONTRACTOR ADDRESS]** ("Contractor"). CVAG and Contractor may each be referred to individually as a "Party" and collectively as the "Parties."

The Parties agree as follows:

ARTICLE 1. SCOPE OF WORK

Contractor shall perform and complete all Work for **CV Link Cable Railing Project** (the "Project"), in strict accordance with the Contract Documents identified in Article 5.

The Project consists of the following Work: **Installation of cable railing along the CV Link at Adams Street, together with all labor, materials, equipment, and incidental work necessary to complete the improvements in accordance with the Contract Documents. The Project also includes Additive Alternate Bid Items establishing unit pricing for potential additional cable railing installation of up to 1,000 linear feet at other CV Link locations, if authorized by CVAG..**

Contractor shall furnish all labor, supervision, materials, equipment, tools, transportation, traffic control, temporary facilities, utility services, permits, testing, documentation, and incidentals necessary to perform and complete the Work in accordance with the Contract Documents, except for items expressly identified in the Contract Documents as the responsibility of CVAG or another party.

Contractor and its Surety are responsible to CVAG for the faithful performance of the Contract and for all damages, costs, and other remedies arising from Contractor's failure to perform the Work in accordance with the Contract Documents, subject to the applicable bonds and applicable law. Contractor's independent-contractor status is stated in Article 11.

1.1 EXECUTIVE COMMITTEE APPROVAL

On **[DATE]**, the CVAG Executive Committee approved the award of this Agreement to Contractor.

ARTICLE 2. TIME FOR COMPLETION

Time is of the essence in the performance of the Work. Contractor shall not commence the Work before CVAG issues a written Notice to Proceed. Contractor shall commence the Work on the date specified in the Notice to Proceed or, if the Notice to Proceed specifies a period rather than a date, within the period specified therein.

For this Project, the initial Adams Street Work shall be completed within **60 Calendar Days** from the date established in the Notice to Proceed. The total Contract term shall be **365 calendar days** from the date established in the Notice to Proceed. Work authorized through individual Task Orders shall be completed within the timeframe specified in the applicable Task Order.

By executing this Agreement, Contractor acknowledges that it has reviewed the Contract Time, the Site, the nature, scope, and sequencing of the Work, and the requirements of the Contract Documents, and agrees that the Contract Time is adequate and reasonable for completion of the Work.

ARTICLE 3. CONTRACT PRICE

CVAG shall pay Contractor, as full compensation for the complete and satisfactory performance of the Work, the total sum of **[AMOUNT WRITTEN OUT]** Dollars (**[\$[AMOUNT]]**) ("Contract Price"). The Contract Price may be adjusted only by a Change Order or other written modification executed or authorized in accordance with the Contract Documents.

The Contract Price is based upon the prices set forth in the accepted Bid Schedule, including all applicable lump-sum and unit prices. Compensation for unit-price Work shall be determined using the actual quantities of Work performed and accepted, measured and paid for in accordance with the Contract Documents.

Progress payments, retention, withholding, final payment, and all other payment matters shall be governed by the General Conditions and the other applicable Contract Documents. No payment shall constitute acceptance of defective or nonconforming Work or a waiver of any requirement, right, or remedy under the Contract Documents.

The Contract Price includes all labor, supervision, materials, equipment, tools, transportation, traffic control, temporary facilities, utility services, permits, testing, documentation, taxes, fees, overhead, profit, bonds, insurance, and all other costs and incidentals necessary to perform and complete the Work in accordance with the Contract Documents, except for costs expressly identified in the Contract Documents as the responsibility of CVAG or another party.

ARTICLE 4. LIQUIDATED DAMAGES

Contractor acknowledges that CVAG will sustain actual damages for each Day that Final Completion is delayed beyond the Contract Time, as the Contract Time may be extended in accordance with the Contract Documents, and that it would be impracticable or extremely difficult to determine the amount of those damages. Pursuant, but not limited to Government Code section 53069.85, Public Contract Code section 7203, and other applicable California law, liquidated damages shall accrue beginning on the first **Calendar Day** after expiration of the Contract Time and continuing through the date of Final Completion.

The applicable daily liquidated-damages rate is **Three Thousand Six Hundred Dollars \$3,600** per **Calendar Day**. The Parties agree that this amount represents a reasonable estimate of CVAG's delay damages and constitutes liquidated damages and not a penalty or forfeiture.

CVAG may deduct accrued liquidated damages from progress payments, retention, or any other amounts due or to become due to Contractor, or may recover such damages directly from Contractor or, subject to the applicable bonds and applicable law, from its Surety or any other security available to CVAG.

Assessment or collection of liquidated damages shall not prevent CVAG from terminating the Contract for default or exercising any other right or remedy available under the Contract Documents or applicable law. CVAG may recover damages arising from matters other than the delay compensated by liquidated damages, but shall not obtain a duplicative recovery for the same damages. CVAG's acceptance of, use or occupancy of, or payment for the Work after the Contract Time shall not constitute a waiver of CVAG's right to assess or collect liquidated damages or to exercise any other right or remedy under the Contract Documents or applicable law.

ARTICLE 5. CONTRACT DOCUMENTS

The following documents, as applicable to the Project, are collectively the "Contract Documents" and are incorporated into and made part of this Agreement:

1. Notice Inviting Bids;
2. Instructions to Bidders;
3. Addenda;
4. Bid Forms and Required Certifications;
5. Accepted Bid and Bid Schedule;
6. Bid Bond or other accepted bid security;
7. This Agreement;
8. Performance Bond;

9. Payment Bond;
10. Insurance requirements; certificates of insurance and required endorsements are evidence of compliance only and do not amend the Contract Documents;
11. General Conditions;
12. Supplementary Conditions, if any;
13. Special Conditions or Special Provisions;
14. Technical Specifications;
15. Plans and Drawings;
16. Project permits, approvals, and environmental requirements;
17. Right-of-way, easement, right-of-entry, access, and similar property-use documents, to the extent expressly identified as applicable to the Work;
18. Appendices and expressly incorporated reference documents;
19. The Notice to Proceed, solely with respect to commencement, Contract Time, and other matters it is authorized to establish;
20. Approved and fully executed Change Orders and written Contract amendments;
21. Authorized directives and other written modifications issued in accordance with the Contract Documents; and
22. Any other document specifically identified as a Contract Document.

Published reference standards expressly incorporated into the Contract Documents shall mean the latest edition, including supplements and amendments, in effect as of the Bid Deadline, unless another edition or effective date is expressly stated. Any exclusions, modifications, or project-specific applications shall be identified in the Special Conditions, Specifications, or other Contract Documents. Reference standards apply only to the extent applicable to the Work and expressly incorporated.

The Contract Documents are intended to be complementary. Work required by one Contract Document shall be performed as though required by all, unless the context or an express provision clearly indicates otherwise. In the event of a conflict, ambiguity, or inconsistency, the order-of-precedence and interpretation provisions of the General Conditions shall govern.

The Contract Documents constitute the entire agreement between the Parties concerning the Work and supersede all prior or contemporaneous negotiations, representations, communications, and agreements concerning the same subject matter, except for documents expressly incorporated into the Contract.

Terms, exclusions, limitations, qualifications, or other vendor boilerplate contained in Contractor's Bid, quote, proposal, acknowledgment, invoice, or other document do not modify the Contract Documents unless expressly accepted in a written amendment signed by an authorized CVAG representative.

ARTICLE 6. PROVISIONS REQUIRED BY LAW AND PUBLIC WORKS COMPLIANCE

Each provision of federal, state, or local law required to be included in the Contract Documents is incorporated into the Contract as though fully set forth herein. Contractor shall comply with all laws, statutes, ordinances, regulations, rules, orders, permits, and governmental requirements applicable to the Work. Failure of the Contract Documents to identify a particular legal requirement shall not relieve Contractor of its obligation to comply with applicable law.

The Work constitutes a public work subject to the applicable provisions of the California Labor Code, including sections 1720 through 1861. Contractor and each Subcontractor shall pay not less than the applicable prevailing rates of wages, including applicable overtime and holiday rates, and shall comply with all posting, recordkeeping, payroll, apprenticeship, and enforcement requirements imposed by law and the Contract Documents.

Contractor and each Subcontractor shall remain registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 whenever registration is required. Contractor and each Subcontractor shall prepare, maintain, certify, and furnish payroll records pursuant to Labor Code section 1776; comply with the apprenticeship requirements of Labor Code sections 1777.5 through 1777.7; and comply with the working-hour and overtime requirements of Labor Code sections 1810 through 1815.

Contractor shall secure the payment of workers' compensation in accordance with Labor Code section 3700 and shall submit the certification required by Labor Code section 1861 before performing the Work.

Claims shall be submitted and resolved in accordance with the Contract Documents and applicable law, including Public Contract Code section 9204. The text of Public Contract Code section 9204, or a compliant summary, shall be included in the plans or specifications. No Contract procedure shall waive, conflict with, or impair the mandatory timeframes and procedures of section 9204. Contractor shall require each Subcontractor to comply with applicable claim-submission requirements and shall remain responsible for such compliance to the extent provided by law and the Contract Documents.

ARTICLE 7. FALSE CLAIMS

Contractor shall not knowingly submit, cause to be submitted, or assist in the submission of any false or fraudulent claim, invoice, certification, statement, record, or request for payment in connection with the Contract.

Contractor acknowledges that the submission of a false claim may subject Contractor to civil, administrative, or criminal liability under applicable law, including the California False Claims Act, Government Code sections 12650 et seq., and may result in penalties, damages, recovery of litigation costs and attorneys' fees, and debarment or other remedies available to CVAG or any other governmental entity.

Contractor shall promptly notify CVAG upon discovery of any material false statement, overpayment, or improper request for payment relating to the Contract and shall cooperate in correcting the matter.

ARTICLE 8. PERFORMANCE AND PAYMENT BONDS

As a condition precedent to CVAG's execution of this Agreement and issuance of the Notice to Proceed, Contractor shall furnish a Performance Bond and a Payment Bond within the time required by the Contract Documents. Each bond shall be executed on the applicable form included in the Contract Documents, without material alteration unless approved in writing by CVAG, and shall be in a penal sum equal to one hundred percent (100%) of the Contract Price.

Each bond shall be executed by an admitted surety insurer authorized to transact surety insurance in the State of California and acceptable to CVAG. Each bond shall be accompanied by a current and valid power of attorney establishing the authority of the person executing the bond on behalf of the Surety.

The Performance Bond shall secure the faithful performance of all obligations of Contractor under the Contract Documents, including completion of the Work, correction of defective or nonconforming Work, and performance of applicable warranty and correction-period obligations. The Payment Bond shall secure payment of claims for labor, materials, equipment, and other amounts protected under applicable law, including Civil Code section 9550 and related provisions.

The obligations of Contractor and Surety shall extend to the Contract Price and Contract Time as adjusted in accordance with the Contract Documents. To the extent permitted by law, the Surety shall consent to and waive notice of authorized changes in the Work, adjustments to the Contract Price or Contract Time, and other modifications made pursuant to the Contract Documents. Contractor shall

provide an increase, rider, replacement bond, or other additional security when required by CVAG or the Contract Documents.

If a Surety becomes insolvent, loses its authority to transact surety insurance in California, becomes subject to rehabilitation or liquidation, is no longer acceptable to CVAG, or is otherwise unable to perform its obligations, Contractor shall promptly furnish replacement bonds from an acceptable admitted surety insurer within ten (10) calendar days after written notice from CVAG. CVAG may suspend the Work, withhold payment, or exercise any other available right or remedy available under the Contract Documents or applicable law until compliant replacement bonds are furnished.

The penal sums of the bonds shall not limit Contractor's obligations or liability under the Contract Documents. The liability of each Surety shall be governed by the applicable bond and applicable law.

ARTICLE 9. INDEMNIFICATION

9.1 GENERAL INDEMNIFICATION

To the fullest extent permitted by law, Contractor shall immediately defend, indemnify, and hold harmless CVAG, each participating member agency expressly identified in the Contract Documents, and their respective governing board and committee members, officers, employees, agents, representatives, consultants, construction managers, engineers, inspectors, and authorized volunteers (collectively, the "Indemnified Parties"), from and against all claims, demands, causes of action, proceedings, liabilities, damages, losses, judgments, awards, penalties, fines, costs, and expenses, including attorneys' fees, expert fees, defense costs, consequential damages, and reasonable costs incurred to enforce this Article, arising out of, pertaining to, or relating to the performance or nonperformance of the Work or this Agreement, except to the extent indemnification or defense is prohibited by California Civil Code section 2782 or other applicable law.

9.2 COVERED CLAIMS

The obligations of this Article apply to claims arising out of or relating to bodily injury, sickness, disease, death, property damage, loss of use, damage to the Work, existing improvements, utilities, adjacent property, or the work of others; Defective Work; breach of the Contract; violations of laws, permits, or governmental requirements; construction means, methods, techniques, sequences, procedures, temporary works, Site safety, or protection of persons or property; Hazardous Materials or environmental contamination for which Contractor is responsible; intellectual-property infringement resulting from items or methods selected or provided by Contractor; failure to pay wages, taxes, benefits, Subcontractors, suppliers, laborers, or others entitled to payment, including Stop Payment Notices, liens, penalties, or assessments; accessibility or nondiscrimination claims arising from Contractor's Work or acts or omissions; and any other act or omission of Contractor or those for whom Contractor is legally responsible.

These obligations apply whether the claim, demand, allegation, suit, or proceeding is actual, alleged, threatened, false, fraudulent, or groundless, subject to the limitations imposed by applicable law.

9.3 LEGAL LIMITATIONS AND PASSIVE NEGLIGENCE

Subject to California Civil Code section 2782 and other applicable law, Contractor's obligations shall apply notwithstanding the passive negligence of an Indemnified Party. Contractor shall not be required to indemnify or defend an Indemnified Party to the extent a claim or liability is caused by that Indemnified Party's active negligence, sole negligence, willful misconduct, or other conduct for which indemnification or defense is prohibited by law.

9.4 DUTY TO DEFEND; COUNSEL; SETTLEMENT

Upon written tender by an Indemnified Party, Contractor shall promptly provide a defense through qualified counsel selected or approved by CVAG. The duty to defend is separate from and in addition to the duty to indemnify and shall apply to the fullest extent permitted by law. Contractor shall pay defense costs as incurred. If a conflict of interest prevents the same counsel from representing

Contractor and an Indemnified Party, or if CVAG reasonably determines that separate counsel is necessary, Contractor shall pay the reasonable fees and costs of separate counsel selected or approved by CVAG, to the extent permitted by law.

Contractor shall not settle a covered claim without CVAG's prior written consent if the settlement requires an admission by an Indemnified Party, imposes an obligation on an Indemnified Party, fails to provide a complete release of the Indemnified Parties, or otherwise adversely affects an Indemnified Party. Contractor shall pay and satisfy any covered judgment, award, decree, settlement, penalty, or other amount and shall reimburse reasonable costs incurred to enforce this Article.

9.5 DESIGN-PROFESSIONAL SERVICES

To the extent Contractor or a Subcontractor performs professional design services, indemnification arising from those services shall apply only to the extent caused by the negligence, recklessness, or willful misconduct of the design professional or those for whom the design professional is legally responsible, as required by California Civil Code section 2782.8 and other applicable law. This limitation does not reduce Contractor's responsibility for construction means, methods, coordination, supervision, or installation.

9.6 EMPLOYEE CLAIMS; INSURANCE; SURVIVAL

Contractor's obligations shall not be limited by any limitation on damages, compensation, or benefits payable under workers' compensation, disability, employee-benefit, or similar laws, to the extent such limitation or immunity may lawfully be waived. The obligations of this Article are independent of and shall not be limited by the availability, amount, or type of insurance; the failure of an insurer to provide coverage; CVAG's review or approval of insurance documents; or payment by an insurer.

The obligations of this Article shall survive completion, acceptance, Final Completion, final payment, suspension, and termination of the Contract, however caused. No progress payment, partial payment, occupancy, use, inspection, testing, acceptance, Substantial Completion, Final Completion, or final payment shall waive, release, or otherwise limit the obligations of this Article.

ARTICLE 10. INSURANCE

10.1 GENERAL REQUIREMENTS AND DURATION

Contractor shall, at its sole cost and expense, procure and maintain the insurance required by this Article from insurers and in forms acceptable to CVAG. Required insurance shall be in effect before Contractor or any Subcontractor commences Work and shall remain continuously in effect for the periods required by this Article and the Contract Documents.

Commercial General Liability and any Umbrella or Excess Liability coverage shall remain in effect throughout performance of the Work. Products and Completed Operations coverage shall remain in effect for not less than five (5) years after Final Completion, or for any longer period expressly required by the Contract Documents. Claims-made coverage shall be maintained for the applicable post-completion period stated in the relevant coverage subsection.

10.2 COMMERCIAL GENERAL LIABILITY

Contractor shall maintain Commercial General Liability insurance written on an occurrence basis and providing coverage at least as broad as ISO Form CG 00 01, with limits not less than **Two Million Dollars (\$2,000,000) per occurrence and Four Million Dollars (\$4,000,000) general aggregate, and Four Million Dollars (\$4,000,000) products and completed operations aggregate**. The general aggregate shall apply separately to the Project, or the general aggregate limit shall be not less than twice the required occurrence limit. Coverage shall include bodily injury, property damage, premises and operations, independent contractors, contractual liability, products and completed operations, personal and advertising injury, and explosion, collapse, and underground hazards when applicable. Coverage shall not contain exclusions or limitations that materially impair the coverage required by the Contract Documents.

10.3 AUTOMOBILE LIABILITY

Contractor shall maintain Automobile Liability insurance providing coverage at least as broad as ISO Form CA 00 01, covering any automobile used in connection with the Work, including owned, hired, leased, rented, borrowed, and non-owned automobiles, with a combined single limit of not less than **One Million Dollars (\$1,000,000) per accident for bodily injury and property damage.**

10.4 WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY

Contractor shall maintain workers' compensation insurance with statutory limits as required by the State of California and Employers' Liability insurance with limits not less than **One Million Dollars (\$1,000,000) for bodily injury by accident, each accident; One Million Dollars (\$1,000,000) for bodily injury by disease, each employee; One Million Dollars (\$1,000,000) for bodily injury by disease, policy limit.** Contractor shall require each Subcontractor to maintain workers' compensation and Employers' Liability insurance as required by applicable law for its employees. The workers' compensation policy shall be endorsed to waive subrogation in favor of the Indemnified Parties for all Work performed by Contractor and its employees, agents, and Subcontractors.

10.5 UMBRELLA OR EXCESS LIABILITY

Umbrella or Excess Liability insurance may be used to satisfy required liability limits only if it applies on a following-form basis and provides coverage at least as broad as the underlying policies. It shall incorporate, as applicable, the additional-insured, primary and noncontributory, waiver-of-subrogation, products-and-completed-operations, and other required terms of the underlying coverage.

10.6 BUILDER'S RISK OR INSTALLATION FLOATER

RESERVED

10.7 CONTRACTOR'S POLLUTION LIABILITY

RESERVED

10.8 PROFESSIONAL LIABILITY

RESERVED

10.9 EVIDENCE OF COVERAGE AND INSURER REQUIREMENTS

Contractor shall provide CVAG with certificates of insurance and all required endorsements within the time specified in the Contract Documents and before commencement of the Work. Contractor shall provide evidence of each renewal sufficiently in advance to prevent any lapse in coverage and shall provide complete certified copies of policies upon CVAG's request. Certificates of insurance do not amend, extend, or alter the coverage afforded by the policies.

Insurance shall be issued by insurers authorized to transact the applicable insurance in California, or by eligible surplus-line insurers acceptable to CVAG, with an A.M. Best rating of not less than A:VII unless otherwise approved in writing by CVAG. CVAG may reject any insurer, policy, endorsement, or form that does not satisfy the Contract Documents.

10.10 ADDITIONAL INSURED; PRIMARY COVERAGE; COMPLETED OPERATIONS

Commercial General Liability and any Umbrella or Excess Liability coverage used to satisfy the required limits shall name the Indemnified Parties as Additional Insureds for ongoing and completed operations.

Additional Insureds shall also include each public agency, utility, property owner, easement grantor, right-of-entry grantor, and other person or entity expressly identified in the Contract Documents or in a permit, easement, right-of-entry agreement, cooperative agreement, or other Project agreement furnished to Contractor before the Bid Deadline. The Special Conditions or other applicable Contract Documents shall identify the Project-specific Additional Insureds and any required forms, endorsements, or special coverage terms.

Additional Insured coverage shall be provided through endorsements acceptable to CVAG and at least as broad as ISO Form CG 20 10 for ongoing operations and CG 20 37 for completed operations, or equivalent forms. Coverage shall apply to liability arising out of or relating to Work performed by or on behalf of Contractor. Each Additional Insured shall be identified by its correct legal name when required by the applicable Project agreement. A blanket additional-insured endorsement is acceptable only if it provides the required coverage and satisfies the applicable Project agreement.

Contractor's insurance shall be primary and noncontributory with respect to insurance or self-insurance maintained by an Additional Insured. Primary and noncontributory coverage shall be at least as broad as ISO Form CG 20 01, or an equivalent endorsement. Contractor shall provide the endorsements and other evidence necessary to establish Additional Insured and primary and noncontributory status.

Products and Completed Operations coverage shall apply to Work performed by or on behalf of Contractor and shall be maintained for not less than five (5) years after Final Completion, or longer when expressly required by the Contract Documents. The applicable Additional Insureds shall remain Additional Insureds for completed operations throughout that period.

10.11 WAIVER OF SUBROGATION; SEPARATION OF INSURED

Required policies shall include waivers of subrogation benefiting the Indemnified Parties where commercially available and legally permitted. Coverage shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to policy limits.

10.12 DEDUCTIBLES, RETENTIONS, CANCELLATION, AND PROHIBITED LIMITATIONS

Contractor shall disclose all deductibles and self-insured retentions. CVAG may require reduction of an unacceptable retention, evidence of financial ability to fund it, a guarantee or bond, direct insurer responsibility for defense and indemnity without requiring CVAG to first satisfy the retention, or other acceptable security.

Policies or required endorsements shall provide that CVAG receive not less than thirty (30) days' prior written notice of cancellation, nonrenewal, or material reduction in coverage, and ten (10) days' prior written notice of cancellation for nonpayment of premium, to the extent commercially available. Contractor shall independently provide CVAG immediate written notice upon learning of any such cancellation, nonrenewal, or material reduction.

Required insurance shall not contain exclusions, endorsements, limitations, or other provisions that materially diminish the coverage required by the Contract Documents, including exclusions applicable to the type of Work being performed, unless expressly approved in writing by CVAG.

10.13 SUBCONTRACTOR INSURANCE; HIGHER LIMITS

Contractor shall require each Subcontractor to maintain insurance appropriate to its Work and risk and shall remain responsible for any deficiency in Subcontractor coverage. If Contractor or a Subcontractor maintains limits greater than those required, CVAG and the other Additional Insureds shall be entitled to the benefit of the higher limits. Contractor shall ensure that the Indemnified Parties are included as Additional Insureds on each Subcontractor's Commercial General Liability insurance for ongoing and completed operations, unless the Subcontractor is insured for those operations under Contractor's applicable policy.

10.14 CVAG RIGHTS; NON-WAIVER; NOTICE OF CLAIMS

Required insurance and policy limits shall not limit Contractor's obligations, indemnity, defense duties, or liability under the Contract Documents. CVAG's review, approval, acceptance, or failure to object to insurance documents shall not waive or reduce Contractor's obligations. Failure to maintain required insurance is a material breach. CVAG may withhold payment, suspend the Work, refuse Site access, procure coverage and charge the cost to Contractor when practicable, or exercise other contractual remedies.

Contractor shall promptly notify CVAG in writing of any claim, demand, suit, loss, circumstance likely to result in a claim, or insurer reservation-of-rights or coverage-denial communication affecting the Project, without requiring disclosure of privileged attorney-client communications.

ARTICLE 11. FEDERAL FUNDING REQUIREMENTS

RESERVED

ARTICLE 12. INDEPENDENT CONTRACTOR

Contractor is and shall at all times remain an independent contractor. Neither Contractor nor any of its Subcontractors, employees, agents, or representatives shall be deemed an employee, agent, partner, or joint venturer of CVAG. Contractor controls its personnel and construction operations, subject to the Contract Documents, and has no authority to incur obligations or make representations on behalf of CVAG unless expressly authorized in writing.

ARTICLE 13. RECORDS AND AUDIT

Contractor shall maintain complete and accurate books, records, payrolls, cost data, correspondence, Submittals, and other documentation relating to the Work for at least three (3) years after final payment, or longer when required by the Contract Documents, applicable law, a pending claim or audit, or a funding source. Contractor shall provide CVAG and authorized governmental representatives reasonable access to nonprivileged records for inspection, audit, and copying. For contracts subject to Government Code section 8546.7 or other audit requirements, Contractor shall preserve and make available all records for the required statutory period. These obligations shall survive Final Completion and termination.

ARTICLE 14. CONFLICT OF INTEREST AND IMPROPER INFLUENCE

Contractor shall avoid actual and apparent conflicts of interest and shall comply with all applicable conflict-of-interest, ethics, anti-kickback, and improper-influence laws. Contractor represents that it has disclosed to CVAG any financial, business, familial, or other relationship that could reasonably be expected to affect impartial performance of the Contract. No officer, employee, representative, or agent of CVAG shall receive compensation or any financial benefit from Contractor in connection with the Contract except as permitted by law and disclosed in writing to CVAG.

ARTICLE 15. NOTICES

Notices required under this Agreement shall be in writing and delivered personally, by nationally recognized overnight delivery service, or by United States certified or registered mail, return receipt requested, to the addresses below. Formal notices involving default, termination, claims, disputes, or legal rights sent by email shall also be sent by one of the foregoing methods. Routine project communications may be transmitted electronically as permitted by the General Conditions. Notice is effective upon personal delivery, on the next business day after deposit with an overnight service, or three business days after deposit in the United States mail. Either Party may change its notice address by notice given under this Article.

TO CVAG:

Coachella Valley Association of Governments
Attn: **Tom Kirk, Executive Director**
74-199 El Paseo, Suite 100
Palm Desert, CA 92260
Email: **tkirk@cvag.org**

TO CONTRACTOR:

[CONTRACTOR LEGAL NAME]
Attn: **[NAME/TITLE]**
[ADDRESS]
[CITY, STATE ZIP]
Email: **[EMAIL]**

ARTICLE 16. MISCELLANEOUS PROVISIONS

16.1 ASSIGNMENT AND SUBCONTRACTING

Contractor shall not assign, transfer, delegate, or otherwise dispose of this Agreement, any material obligation under it, any right to payment, or any controlling interest in Contractor without CVAG's prior written consent. Any attempted assignment or delegation without such consent is void to the extent permitted by law. Authorized Subcontracts do not constitute assignments, and no Subcontract shall relieve Contractor of responsibility for the acts, omissions, Work, or compliance of its Subcontractors and suppliers. CVAG may, in its sole discretion, assign or transfer this Agreement, in whole or in part, to any successor entity or participating member agency without Contractor's consent.

16.2 GOVERNING LAW AND VENUE

This Agreement shall be governed by the laws of the State of California, without regard to its conflict-of-laws principles. Any action or proceeding arising from the Contract shall be brought in a court of competent jurisdiction in Riverside County, California, unless applicable law requires another venue. Each Party irrevocably consents to the personal jurisdiction of and waives any objection to venue in or removal from, those courts.

16.3 WAIVER

No waiver of any breach or requirement shall be effective unless in writing and signed by the waiving Party. A waiver on one occasion shall not constitute a waiver of any later breach or requirement. Failure or delay in enforcing a right shall not constitute a waiver.

16.4 SEVERABILITY

If any provision of the Contract is held invalid, illegal, or unenforceable, the remaining provisions shall remain in effect to the fullest extent permitted by law. The invalid provision shall be interpreted or modified, if possible, to most closely effectuate the Parties' lawful intent.

16.5 AMENDMENTS AND CHANGES

This Agreement may be amended only by a written instrument executed by authorized representatives of both Parties, except for Change Orders, directives, and other modifications expressly authorized by the Contract Documents. Meeting notes, emails, oral instructions, and routine correspondence do not amend the Contract unless issued or executed through an authorized contractual mechanism.

16.6 AUTHORITY; COUNTERPARTS; ELECTRONIC SIGNATURES

Each person executing this Agreement represents that the person has authority to execute and deliver the Agreement on behalf of the entity identified in the signature block. This Agreement may be executed in counterparts, each of which is deemed an original and all of which together constitute one instrument. Electronic signatures and electronically transmitted counterparts shall have the same force and effect as original signatures to the extent permitted by law.

16.7 NO THIRD-PARTY BENEFICIARIES

Except for persons or entities expressly granted rights under the indemnification, insurance, bond, or other provisions of the Contract Documents, the Contract is for the sole benefit of CVAG and Contractor and creates no rights in any other person or entity.

16.8 INTERPRETATION

Headings are for convenience only and do not affect interpretation. The Contract shall be interpreted as a whole and not against either Party as drafter. Unless the context requires otherwise, the singular includes the plural, the plural includes the singular, and “including” means “including without limitation.” Defined terms shall have the meanings assigned in the Contract Documents.

16.9 SURVIVAL

Provisions concerning payment obligations, warranties, correction of Work, indemnification, insurance continuation, records, audits, dispute resolution, and other obligations that by their nature extend beyond completion or termination shall survive.

16.10 SUCCESSORS AND PERMITTED ASSIGNS

Subject to the restrictions on assignment, the Contract binds and benefits the Parties and their respective permitted successors and assigns.

16.11 CVAG POLICIES

Contractor shall comply with CVAG policies expressly identified in the Contract Documents or provided to Contractor and applicable to access, security, safety, conduct, or performance of the Work. A policy issued or materially revised after the Bid Deadline shall not alter the Contract Price, Contract Time, or scope of Work except through an authorized modification when an adjustment is warranted under the Contract Documents.

17.12 ATTORNEY’S FEES

Except as expressly provided in the indemnification, bond, or insurance provisions of the Contract Documents, or as otherwise required by applicable law, in any action or proceeding arising out of or relating to the Contract, the prevailing Party shall be entitled to recover from the non-prevailing Party its reasonable attorneys’ fees, expert fees, litigation costs, and other recoverable costs incurred in connection with such action or proceeding, including any appeal or post-judgment enforcement proceeding. Nothing in this Section limits, waives, or reduces CVAG’s right to recover attorneys’ fees, defense costs, and other amounts under Article 8 (Indemnification), the bonds, the insurance provisions of the Contract Documents, or applicable law.

[SIGNATURE PAGE FOLLOWS]

SIGNATURE PAGE
STANDARD CONSTRUCTION AGREEMENT
BETWEEN
COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS
AND
[CONTRACTOR LEGAL NAME]

IN WITNESS WHEREOF, the Parties have executed this Agreement through their duly authorized representatives as of the Effective Date stated above.

Each person executing this Agreement represents and warrants that the person is duly authorized to execute and deliver this Agreement on behalf of the entity identified below.

COACHELLA VALLEY ASSOCIATION OF GOVERNMENTS

By: _____
Name: **Tom Kirk**
Title: **Executive Director**
Date: _____

APPROVED AS TO FORM:

By: _____
CVAG General Counsel
Date: _____

[CONTRACTOR LEGAL NAME], a Choose an item.

By: _____
Name: _____
Title: _____
Date: _____

By: _____
Name: _____
Title: _____
Date: _____

BID GUARANTEE

BID BOND

[Note: Not required when other form of Bidder's Security, e.g. cash, certified check or cashier's check, accompanies Bid.]

The makers of this bond are, _____, as Principal, and _____, as Surety and are held and firmly bound unto the Coachella Valley Association of Governments (CVAG), a joint powers authority, organized under the laws of the State of California, with its principal place of business at 74-199 El Paseo, Suite 100, Palm Desert, California 92260, hereinafter called the City, in the penal sum of TEN PERCENT (10%) OF THE TOTAL BID PRICE of the Principal submitted to the City for the work described below, for the payment of which sum in lawful money of the United States, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal has submitted the accompanying bid dated _____, 20 ____, for **CV Link Cable Railing Project**, *****INSERT CONTRACT NUMBER*****.

If the Principal does not withdraw its Bid within the time specified in the Contract Documents; and if the Principal is awarded the Contract and provides all documents to the City as required by the Contract Documents; then this obligation shall be null and void. Otherwise, this bond will remain in full force and effect.

Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents shall affect its obligation under this bond, and Surety does hereby waive notice of any such changes.

In the event a lawsuit is brought upon this bond by the City and judgment is recovered, the Surety shall pay all litigation expenses incurred by the City in such suit, including reasonable attorneys' fees, court costs, expert witness fees and expenses.

IN WITNESS WHEREOF, the above-bound parties have executed this instrument under their several seals this _____ day of _____, 20____, the name and corporate seal of each corporation.

(Corporate Seal)

Contractor/ Principal

By _____

Title _____

(Corporate Seal)

Surety

By _____

Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Title _____

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA

COUNTY OF _____

On _____, 20____, before me, _____, Notary Public, personally appeared _____, who proved to me on the basis of satisfactory

Name(s) of Signer(s)

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

DESCRIPTION OF ATTACHED DOCUMENT

- ☐ Individual
☐ Corporate Officer

Title(s)

Title or Type of Document

- ☐ Partner(s) ☐ Limited
 ☐ General

Number of Pages

- ☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other:

Date of Document

Signer is representing:
Name Of Person(s) Or Entity(ies)

Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for Contractor/Principal.

Notary Acknowledgment

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA

COUNTY OF _____

On _____, 20____, before me, _____, Notary Public, personally appeared _____, who proved to me on the basis of satisfactory

evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

DESCRIPTION OF ATTACHED DOCUMENT

- ☐ Individual
☐ Corporate Officer

Title(s)

- ☐ Partner(s) ☐ Limited
 ☐ General

- ☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other:

Signer is representing:
Name Of Person(s) Or Entity(ies)

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of-Attorney to local representatives of the bonding company must also be attached.

END OF BID BOND

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS:

THAT WHEREAS, the **Coachella Valley Association of Governments (CVAG)** (hereinafter referred to as "Agency") has awarded to Vendor Name, (hereinafter referred to as the "Contractor") an agreement for **CV Link Cable Railing Project** (hereinafter referred to as the "Project").

WHEREAS, the work to be performed by the Contractor is more particularly set forth in the Contract Documents for the Project dated Click to enter Date, (hereinafter referred to as "Contract Documents"), the terms and conditions of which are expressly incorporated herein by reference; and

WHEREAS, the Contractor is required by said Contract Documents to perform the terms thereof and to furnish a bond for the faithful performance of said Contract Documents.

NOW, THEREFORE, we, Vendor Name, the undersigned Contractor and _____ as Surety, a corporation organized and duly authorized to transact business under the laws of the State of California, are held and firmly bound unto the Agency in the sum of Write Out Dollar Amount Dollars, (\$Enter Dollar Amount), said sum being not less than one hundred percent (100%) of the total amount of the Contract, for which amount well and truly to be made, we bind ourselves, our heirs, executors and administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that, if the Contractor, his or its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and well and truly keep and perform the covenants, conditions and agreements in the Contract Documents and any alteration thereof made as therein provided, on its part, to be kept and performed at the time and in the manner therein specified, and in all respects according to their intent and meaning; and shall faithfully fulfill all obligations including the one-year guarantee of all materials and workmanship; and shall indemnify and save harmless the Agency, its elected or appointed officers, and their respective agents, officials, employees, volunteers and representatives, as stipulated in said Contract Documents, then this obligation shall become null and void; otherwise it shall be and remain in full force and effect.

As a condition precedent to the satisfactory completion of the Contract Documents, unless otherwise provided for in the Contract Documents, the above obligation shall hold good for a period of one (1) year after the acceptance of the work by Agency, during which time if Contractor shall fail to make full, complete, and satisfactory repair and replacements and totally protect the Agency from loss or damage resulting from or caused by defective materials or faulty workmanship, Surety shall undertake and faithfully fulfill all such obligations. The obligations of Surety hereunder shall continue so long as any obligation of Contractor remains. Nothing herein shall limit the Agency's rights or the Contractor or Surety's obligations under the Contract, law, or equity, including, but not limited to, California Code of Civil Procedure section 337.15.

Whenever Contractor shall be, and is declared by the Agency to be, in default under the Contract Documents, the Surety shall remedy the default pursuant to the Contract Documents, or shall promptly, at the Agency's option:

- (1) Take over and complete the Project in accordance with all terms and conditions in the Contract Documents; or

Exhibit "C"

Contract No. _____

- (2) Obtain a bid or bids for completing the Project in accordance with all terms and conditions in the Contract Documents and upon determination by Surety of the lowest responsive and responsible bidder, arrange for a Contract between such bidder, the Surety and the Agency, and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the Agency under the Contract and any modification thereto, less any amount previously paid by the Agency to the Contractor and any other set offs pursuant to the Contract Documents.
- (3) Permit the Agency to complete the Project in any manner consistent with local, California and federal law and make available as work progresses sufficient funds to pay the cost of completion of the Project, less the balance of the contract price, including other costs and damages for which Surety may be liable. The term "balance of the contract price" as used in this paragraph shall mean the total amount payable to Contractor by the Agency under the Contract and any modification thereto, less any amount previously paid by the Agency to the Contractor and any other set offs pursuant to the Contract Documents.

Surety expressly agrees that the Agency may reject any contractor or subcontractor which may be proposed by Surety in fulfillment of its obligations in the event of default by the Contractor.

Surety shall not utilize Contractor in completing the Project nor shall Surety accept a bid from Contractor for completion of the Project if the Agency, when declaring the Contractor in default, notifies Surety of the Agency's objection to Contractor's further participation in the completion of the Project.

The Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project to be performed thereunder shall in any way affect its obligations on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the Contract Documents or to the Project, including but not limited to the provisions of sections 2819 and 2845 of the California Civil Code.

[SIGNATURES ON NEXT PAGE]

Contract No. _____

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____, 20____.

(Corporate Seal)

Contractor/ Principal

By _____

Printed name: _____

Title: _____

(Corporate Seal) Surety

By: _____

Printed Name: _____

Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Signatures of those signing for the Contractor and Surety must be notarized and evidence of corporate authority attached.

The rate of premium on this bond is _____ per thousand. The total amount of premium charges, \$ _____.

(The above must be filled in by corporate attorney.)

THIS IS A REQUIRED FORM

Any claims under this bond may be addressed to:

(Name and Address of Surety)

(Name and Address of Agent or Representative for service of process in California, if different from above)

(Telephone number of Surety and Agent or Representative for service of process in California)

NOTE: A copy of the Power-of-Attorney authorizing the person signing on behalf of the Surety to do so must be attached hereto.

Notary Acknowledgment

Contract No. _____

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA

COUNTY OF _____

On _____, 20____, before me, _____, Notary Public, personally appeared _____, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER**DESCRIPTION OF ATTACHED DOCUMENT**

- ☐ Individual
☐ Corporate Officer

Title(s) _____

Title or Type of Document _____

- ☐ Partner(s) ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other:

Number of Pages _____

Date of Document _____

Signer is representing:
Name Of Person(s) Or Entity(ies)

Signer(s) Other Than Named Above _____

NOTE: This acknowledgment is to be completed for Contractor/Principal.

Notary Acknowledgment

Contract No. _____

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STATE OF CALIFORNIA

COUNTY OF _____

On _____, 20____, before me, _____, Notary Public, personally appeared _____, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public**OPTIONAL**

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

- ☐ Individual
☐ Corporate Officer

Title(s)

- ☐ Partner(s) ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other:

Signer is representing:

Name Of Person(s) Or Entity(ies)

_____**DESCRIPTION OF ATTACHED DOCUMENT**_____
Title or Type of Document_____
Number of Pages_____
Date of Document_____
Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of-Attorney to local representatives of the bonding company must also be attached.

PAYMENT BOND

KNOW ALL PERSONS BY THESE PRESENTS That

WHEREAS, the Coachella Valley Association of Governments (CVAG) (hereinafter designated as the "Agency"), by action taken or a resolution passed Click to enter Date, has awarded to Vendor Name, hereinafter designated as the "Principal," a contract for the work described as follows:

CV Link Cable Railing Project (the "Project").; and

WHEREAS, the work to be performed by the Principal is more particularly set forth in the Contract Documents for the Project dated Click to enter Date, ("Contract Documents"), the terms and conditions of which are expressly incorporated by reference; and

WHEREAS, said Principal is required to furnish a bond in connection with said contract; providing that if said Principal or any of its Subcontractors shall fail to pay for any materials, provisions, provender, equipment, or other supplies used in, upon, for or about the performance of the work contracted to be done, or for any work or labor done thereon of any kind, or for amounts due under the Unemployment Insurance Code or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of said Principal and its Subcontractors with respect to such work or labor the Surety on this bond will pay for the same to the extent hereinafter set forth.

NOW THEREFORE, we, the Principal and _____ as Surety, are held and firmly bound unto the Agency in the penal sum of Write Out Dollar Amount Dollars, (\$Enter Dollar Amount) lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that if said Principal, his or its subcontractors, heirs, executors, administrators, successors or assigns, shall fail to pay any of the persons named in Section 9100 of the Civil Code, fail to pay for any materials, provisions or other supplies, used in, upon, for or about the performance of the work contracted to be done, or for any work or labor thereon of any kind, or amounts due under the Unemployment Insurance Code with respect to work or labor performed under the contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department or Franchise Tax Board from the wages of employees of the contractor and his subcontractors pursuant to Section 18663 of the Revenue and Taxation Code, with respect to such work and labor the Surety or Sureties will pay for the same, in an amount not exceeding the sum herein above specified, and also, in case suit is brought upon this bond, all litigation expenses incurred by Agency in such suit, including reasonable attorneys' fees, court costs, expert witness fees and investigation expenses.

This bond shall inure to the benefit of any of the persons named in Section 9100 of the Civil Code so as to give a right of action to such persons or their assigns in any suit brought upon this bond.

It is further stipulated and agreed that the Surety on this bond shall not be exonerated or released from the obligation of this bond by any change, extension of time for performance, addition, alteration or modification in, to, or of any contract, plans, specifications, or agreement pertaining or relating to any scheme or work of improvement herein above described, or pertaining or relating to the furnishing of labor, materials, or equipment therefore, nor by any change or modification of any terms of payment or extension of the time for any payment pertaining or

Contract No. _____

relating to any scheme or work of improvement herein above described, nor by any rescission or attempted rescission of the contract, agreement or bond, nor by any conditions precedent or subsequent in the bond attempting to limit the right of recovery of claimants otherwise entitled to recover under any such contract or agreement or under the bond, nor by any fraud practiced by any person other than the claimant seeking to recover on the bond and that this bond be construed most strongly against the Surety and in favor of all persons for whose benefit such bond is given, and under no circumstances shall Surety be released from liability to those for whose benefit such bond has been given, by reason of any breach of contract between the owner or Agency and original contractor or on the part of any obligee named in such bond, but the sole conditions of recovery shall be that claimant is a person described in Section 9100 of the Civil Code, and has not been paid the full amount of his claim and that Surety does hereby waive notice of any such change, extension of time, addition, alteration or modification herein mentioned and the provisions of sections 2819 and 2845 of the California Civil Code.

[SIGNATURES ON NEXT PAGE]

SAMPLE

Contract No. _____

IN WITNESS WHEREOF, we have hereunto set our hands and seals this _____ day of _____, 20__.

(Corporate Seal)

Contractor/ Principal

By _____

Printed name: _____

Title: _____

(Corporate Seal) Surety

By: _____

Printed Name: _____

Attorney-in-Fact

(Attach Attorney-in-Fact Certificate)

Signatures of those signing for the Contractor and Surety must be notarized and evidence of corporate authority attached. A Power-of-Attorney authorizing the person signing on behalf of the Surety to do so much be attached hereto.

NOTE: A copy of the Power-of-Attorney authorizing the person signing on behalf of the Surety to do so must be attached hereto.

Notary Acknowledgment

Contract No. _____

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

STATE OF CALIFORNIA

COUNTY OF _____

On _____, 20____, before me, _____, Notary Public, personally appeared _____, who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

CAPACITY CLAIMED BY SIGNER

- ☐ Individual
☐ Corporate Officer

Title(s) _____

- ☐ Partner(s) ☐ Limited
☐ General
☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other:

Signer is representing:
Name Of Person(s) Or Entity(ies)

DESCRIPTION OF ATTACHED DOCUMENT

Title or Type of Document

Number of Pages

Date of Document

Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for Contractor/Principal.

Notary Acknowledgment

Contract No. _____

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CAPACITY CLAIMED BY SIGNER**DESCRIPTION OF ATTACHED DOCUMENT**

- ☐ Individual
☐ Corporate Officer

- _____
Title(s)
- ☐ Partner(s) ☐ Limited
☐ General
- ☐ Attorney-In-Fact
☐ Trustee(s)
☐ Guardian/Conservator
☐ Other:

Title or Type of Document_____
Number of Pages_____
Date of Document

Signer is representing:
Name Of Person(s) Or Entity(ies)

Signer(s) Other Than Named Above

NOTE: This acknowledgment is to be completed for the Attorney-in-Fact. The Power-of-Attorney to local representatives of the bonding company must also be attached.

APPENDIX D - PLANS/REFERENCE DRAWINGS

Line measures 1 inch on full scale drawing, if not 1 inch scale accordingly.

Dwg filename: R:\Shared\PROJECTS\CV\Link\CV Link Team\CAD\Plan Set\BID SET_SEGMENTS 3-4-5\100_General\CVL_V1-102-G111.dwg Plot date: 9/29/2023 3:56 PM Plot style table: CVLINK.ctb

ABBREVIATIONS

A.B.C.	AGGREGATE BASE COURSE	LP	LOW POINT
AC	ASPHALT CONCRETE	LT	LEFT
ASPH	ASPHALT CONCRETE PAVEMENT	MAX	MAXIMUM
B.B.C.	BITUMINOUS BASE COURSE	MIN	MINIMUM
BC	BEGIN CURVE	MH	MANHOLE
BCR	BEGIN CURB RETURN	MW	MONITORING WELL
BLDG	BUILDING	NIC	NOT IN CONTRACT
BP	BEGINNING PROJECT (ALIGNMENT)	OC	ON CENTER
BTM	BOTTOM	PCC	PORTLAND CEMENT CONCRETE
CB	CATCH BASIN	PCCP	PORTLAND CEMENT CONCRETE PAVEMENT
C&G	CURB AND GUTTER	PP	POWER POLE
CIP	CAST-IN-PLACE	PT	POINT
C/L, CL	CENTER LINE	R	RIGHT, RADIUS
CO	CLEANOUT	RSP	ROCK-LINED SLOPE PROTECTION
CONC	CONCRETE	RT	RIGHT
CONDTs	CONDUITS	S	SLOPE
CONT	CONTINUOUS	SD	STORM DRAIN
CR-GUT	CROSS GUTTER	SF	SQUARE FOOT
D	DELTA	SHT	SHEET
DEMO	DEMOLITION	STA	STATION
DET	DETAIL	S/W	SIDEWALK
DIA	DIAMETER	TBD	TO BE DETERMINED
D/W	DRIVEWAY	TBV	TO BE VERIFIED
DWG	DRAWING	TELVLT	TELEPHONE VAULT
(E)	EXISTING	TYP	TYPICAL
EAC	EDGE OF ASPHALT	UC, U/C	UNDERCROSSING
EB	EASTBOUND	UVLT	UTILITY VAULT
EC	END CURVE	WB	WESTBOUND
ECR	END CURB RETURN	w/	WITH
EG	EXISTING GRADE	Ø or DIA	DIAMETER
EL	ELECTRIC		
ELEV	ELEVATION		
EOC	EDGE OF CONCRETE		
EP, EOP	END OF PROJECT (ALIGNMENT)		
	EDGE OF PAVEMENT		
EPB	ELECTRIC PULL BOX		
EQ.	EQUAL		
ETW	EDGE OF TRAVEL WAY		
EVLT	ELECTRIC VAULT		
EW	EACH WAY		
FG	FINISH GRADE		
FH	FIRE HYDRANT		
FL	FLOW LINE		
FND	FOUND		
FS	FINISH SURFACE		
GB	GRADE BREAK		
GV	GAS VALVE		
GRND	GROUND		
HH-MM-SS	HOUR, MINUTES, SECONDS (ANGLE)		
HMAC	HOT MIX ASPHALT CONCRETE		
HP	HIGH POINT		
IE	INVERT ELEVATION		
J	JUNCTION		
L	LEFT, LENGTH		
LF	LINEAL FOOT/FEET		

ABBREVIATIONS

HORIZONTAL CURVES

PC	POINT OF CURVATURE
PI	POINT OF INTERSECTION
PCC	POINT OF COMPOUND CURVE
PCR	POINT OF REVERSE CURVE
PT	POINT OF TANGENCY

ABBREVIATIONS

VERTICAL CURVES

BVCE	BEGINNING VERTICAL CURVE ELEVATION
BVCS	BEGINNING VERTICAL CURVE STATION
EVCE	END VERTICAL CURVE ELEVATION
EVCS	END VERTICAL CURVE STATION
K	RATE OF CURVATURE
LVC	LENGTH OF VERTICAL CURVE
PVI	POINT OF VERTICAL INTERSECTION

ABBREVIATIONS

AGENCY

CPS	CITY OF PALM SPRINGS
CVWD	COACHELLA VALLEY WATER DISTRICT
RCFC	RIVERSIDE COUNTY FLOOD CONTROL
& WCD	AND WATER CONTROL DISTRICT
U.P.R.R	UNION PACIFIC RAILROAD

LEGEND

EXISTING

	BUILDING
	CANOPY
	POOL
	POND
	SOLAR PANEL
	SIDEWALK
	DRIVEWAY
	DENSE VEGETATION
	DENSE TREE AREA
	LEVEE SLOPE PROTECTION
	RIP RAP
	CITY BOUNDARY
	RIGHT-OF-WAY
	PROPERTY LINE
	STREET CENTERLINE
	PERMANENT EASEMENT
	1-FT CONTOUR
	5-FT CONTOUR
	SURVEY MONUMENT

Z 9616
Δ

ABBREVIATIONS

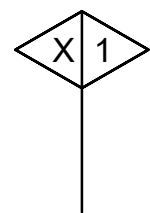
PROJECT SPECIFIC

CCWWBP	CATHEDRAL CITY WHITEWATER BIKE PATH
CV LINK	COACHELLA VALLEY MULTI-USE PATH
CVS	COACHELLA VALLEY STORMWATER CHANNEL
NEV	NEIGHBORHOOD ELECTRIC VEHICLE
WRS	WHITEWATER RIVER STORMWATER CHANNEL

PROPOSED

	CONCRETE PAVING
	PEDESTRIAN PATH DECOMPOSED GRANITE
	FLEXIBLE PAVEMENT
	GEOWEB
	CENTERLINE
	RAILING
	1-FT CONTOUR
	5-FT CONTOUR
	KEY NOTE

SECTION ASSEMBLY CALLOUT GUIDE



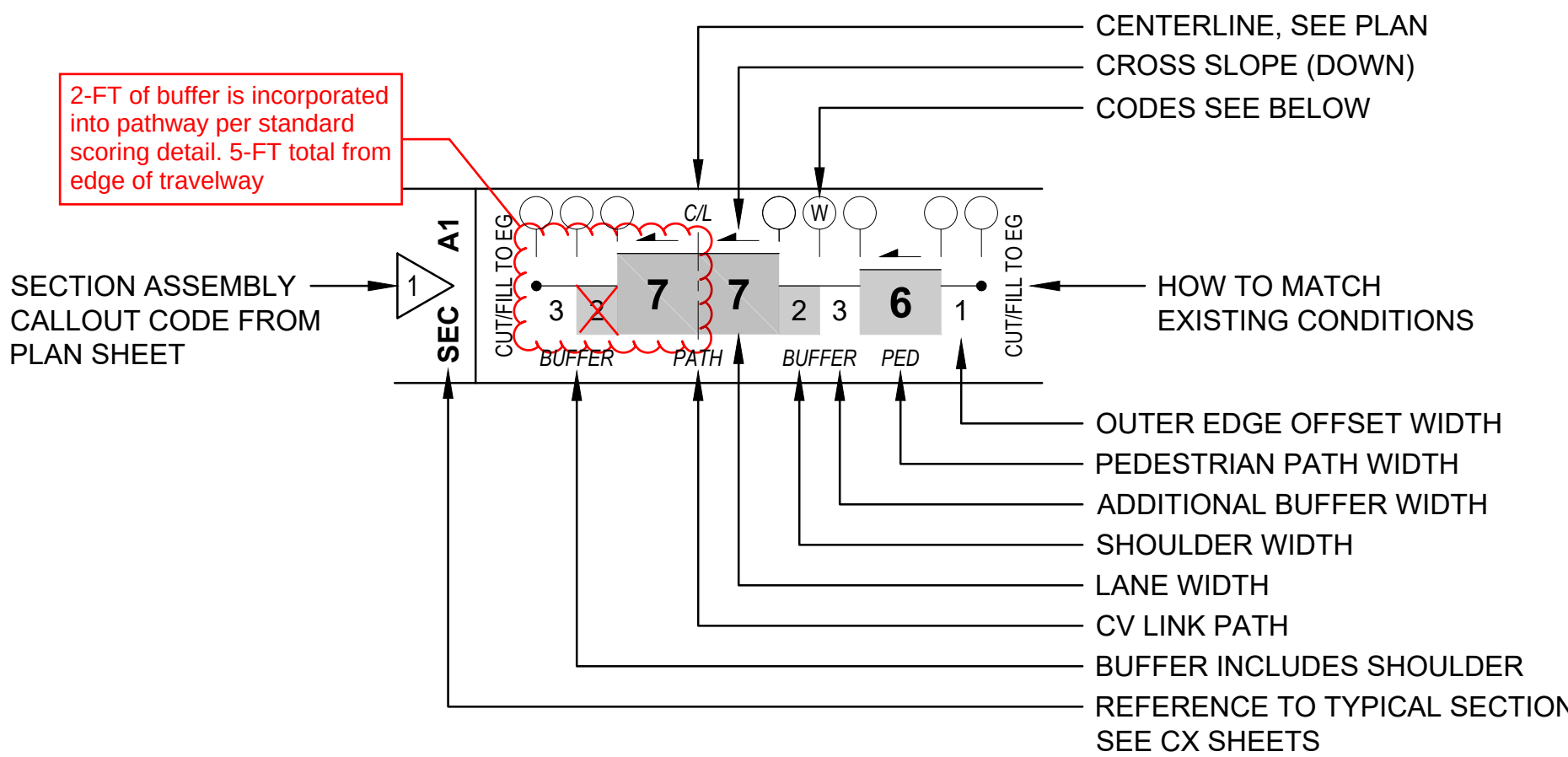
SECTION ASSEMBLY CALLOUT

SEE QUICK GLANCE PATH DIMENSIONS AND FEATURES IN SECTION ASSEMBLY ON SIDE OF SHEET

CODE:

#	SECTION ASSEMBLY NUMBER
B	BRIDGE BEGIN/END
P	ACCESS POINT PLAZA
T	TRANSITION OR TEE INTERSECTION
X	BEGIN/END OF ALIGNMENT OR SEGMENT, AND/OR INTERSECTION

SECTION ASSEMBLY GUIDE



SECTION ASSEMBLY CODES

CODE:	B	BARRIER	F	FENCE	S	SLOPE PROTECTION
	C	CURB	R	RAILING	W	WALL

NOTES:

- NOT ALL COMPONENTS MAY BE INCLUDED IN AN ASSEMBLY.
- TRANSITIONS MAY BE REQUIRED BETWEEN ADJOINING SECTIONS WHETHER SHOWN OR NOT.

SEGMENTS 3 / 4 / 5

ISSUE	MARK	DATE	DESCRIPTION

INFO	
PROJECT NO:	2015-093
CAD DWG FILE:	CVL_V1-102-G111
DESIGNED BY:	
DRAWN BY:	SRB
REVIEWED BY:	SBF
DATE:	9.29.2023
SCALE:	AS SHOWN

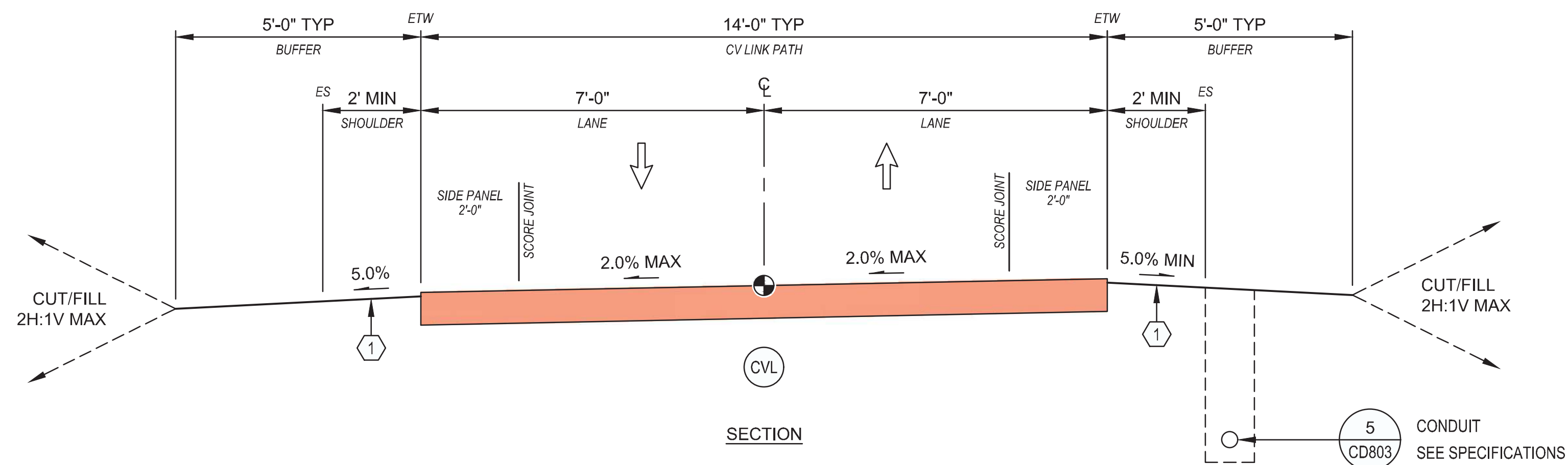


REFERENCE DRAWINGS

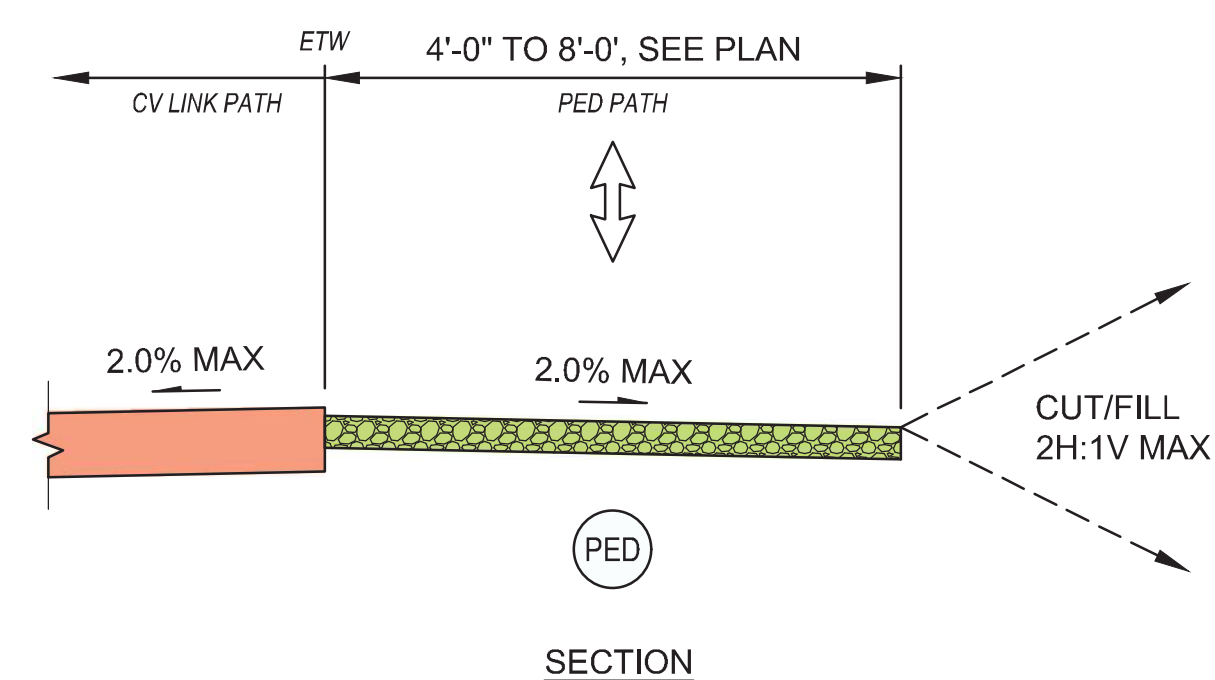


SHEET TITLE	
LEGEND ABBREVIATIONS AND NOTES	

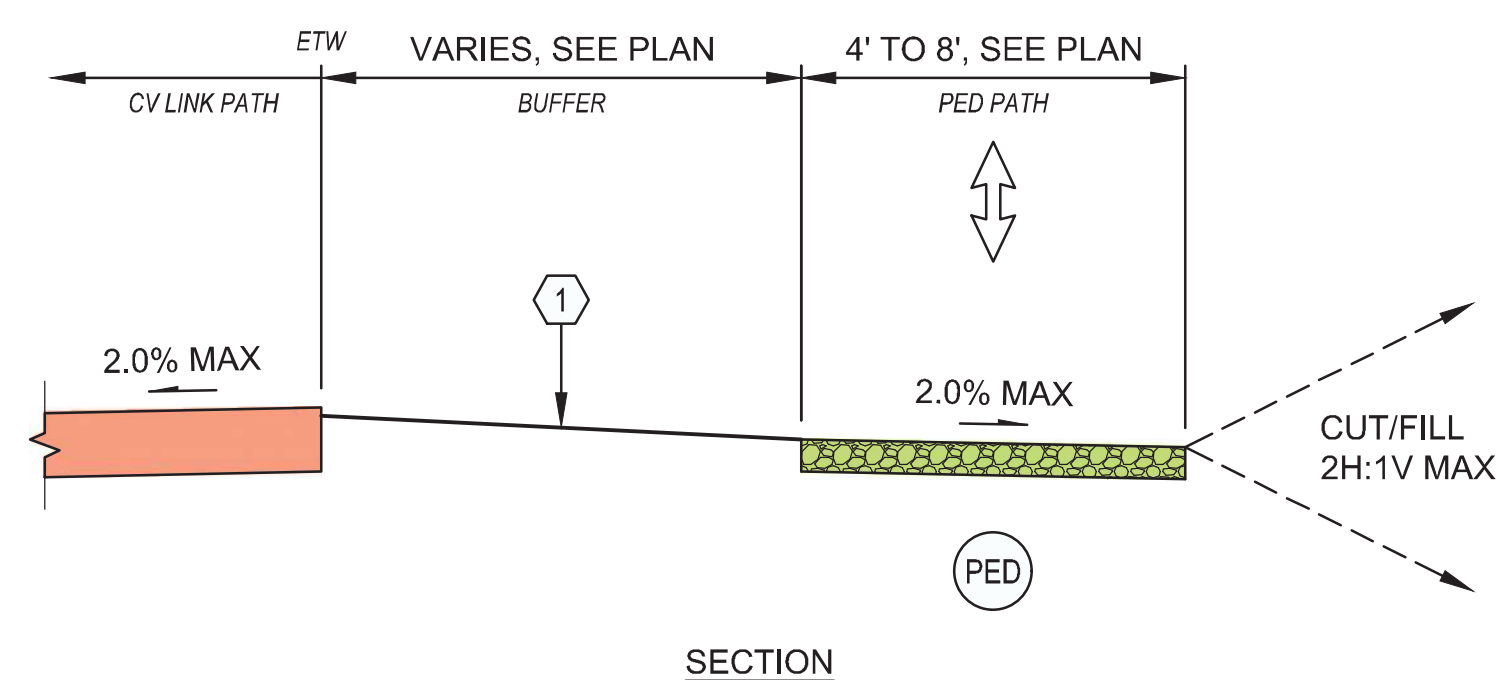
SHEET NO.	GI111
SHEET	OF



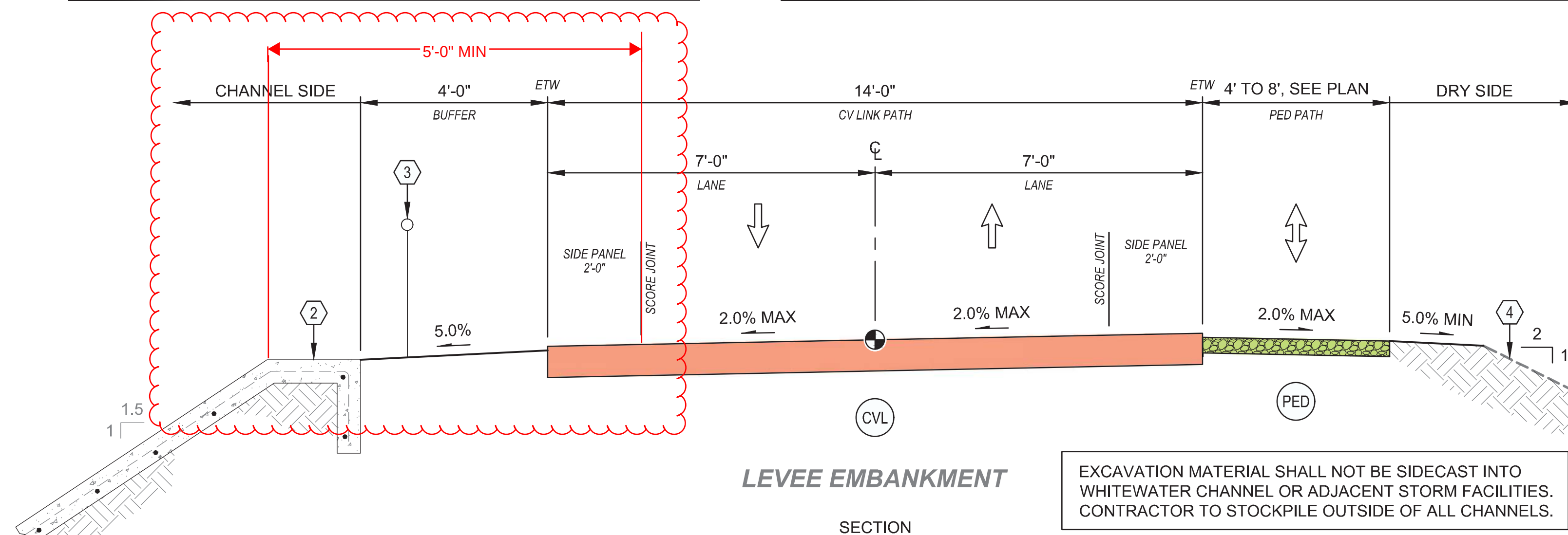
TYPICAL 14 FT WIDE CV LINK PATH



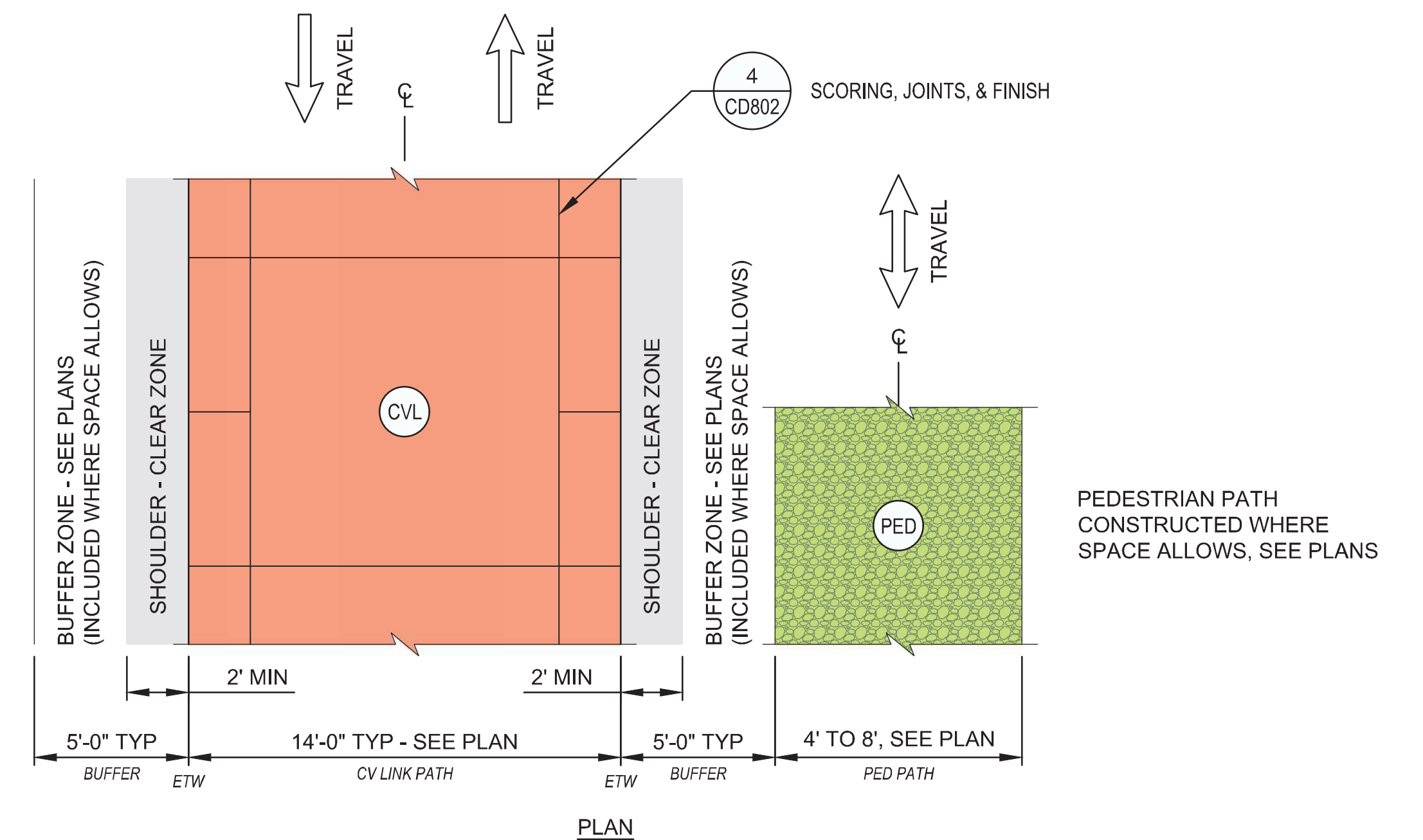
TYPICAL CV LINK PATH w/ PED PATH



TYPICAL CV LINK PATH w/ SEPARATED PED PATH



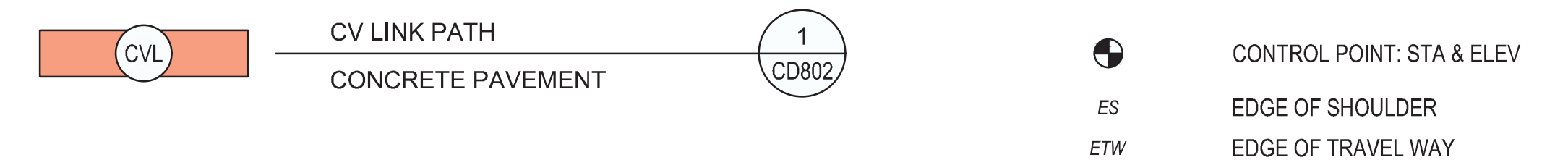
TYPICAL CV LINK PATH w/ PED PATH ON LEVEE



TYPICAL CV LINK PATH w/ SEPARATED PED PATH LAYOUT

SECTIONS AND PLAN SHOWN ARE TYPICAL AND MAY NOT SHOW ALL COMPONENTS
REQUIRED. SEE PLANS AND CX800 SERIES OF SECTIONS FOR ADDITIONAL INFORMATION.

LEGEND



KEYNOTES

1. SHOULDER AND BUFFER AREA SLOPES SHALL BE 2.0% MIN, 5.0% MAX FOR DRAINAGE AWAY FROM PATH AND SHALL BE CLEAR OF DEBRIS AND OBSTRUCTIONS.
2. PROTECT (E) REINFORCED CONCRETE SLOPE PROTECTION. LOCATION AND DIMENSIONS SHALL BE FIELD VERIFIED.
3. INSTALL SAFETY RAIL OR BARRIER WHERE SHOULDER WIDTH IS LESS THAN 3 FT AND THE ADJACENT FORESLOPE IS 3H:1V OR STEEPER THAN 4 FT, SEE PLANS FOR LOCATIONS.
4. PROTECT / RESTORE (E) LEVEE EMBANKMENT SLOPE. PLACE AND COMPACT NATIVE SOIL FREE OF DEBRIS AT MAXIMUM 2H:1V SLOPE. COMPACTION SHALL BE 90% MODIFIED PROCTOR.

ALL PATH CROSS SLOPES
SHALL BE 2.0% MAX

1 TYPICAL PATH LAYOUT AND SECTIONS

ISSUE			INFO	Underground Service Alert  DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG
			PROJECT NO: 2015-093	
			CAD DWG FILE: CVL_V8-306-CD801	
			DESIGNED BY: SRB	
			DRAWN BY: SRB	
			REVIEWED BY: SBF	
			DATE: 11.25.2019	
MARK	DATE	DESCRIPTION	SCALE: AS SHOWN	

Underground Service Alert

DIGALERT



DIAL TOLL FREE
1-800-422-4133
AT LEAST TWO WORKING DAYS
BEFORE YOU DIG

REFERENCE DRAWINGS



CV/Link
CONNECTING THE COACHELLA VALLEY

MULTI-MODAL TRANSPORTATION FACILITY
COACHELLA VALLEY - CALIFORNIA

	SHEET TITLE
--	-------------

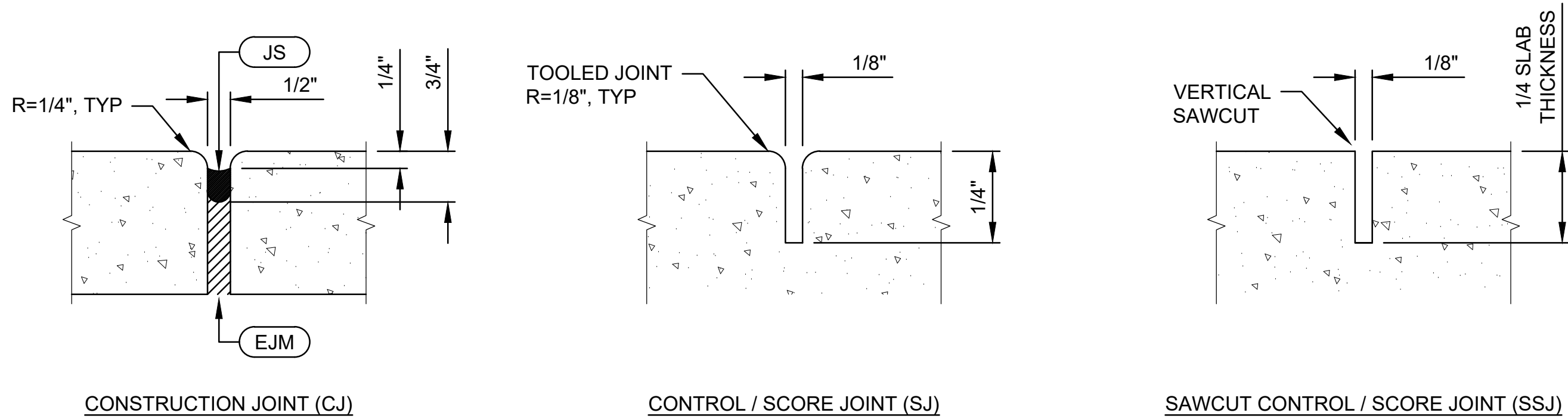
CIVIL DETAILS - 1

SHEET NO.

CD801

SHEET 3 OF 67

Dwg filename: R:\Shared\PROJECTS\Civil\Link\CV Link Team\CAD\Plan Set\08 DETAILS_Plan Set\01 DETAILS\06_CD\CVL_V8-306-CD803.dwg Last saved by: sachabankhuff Plt style table: CVLINK.ctb
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Line measures 1 inch on full scale drawing, if not 1 inch scale accordingly.

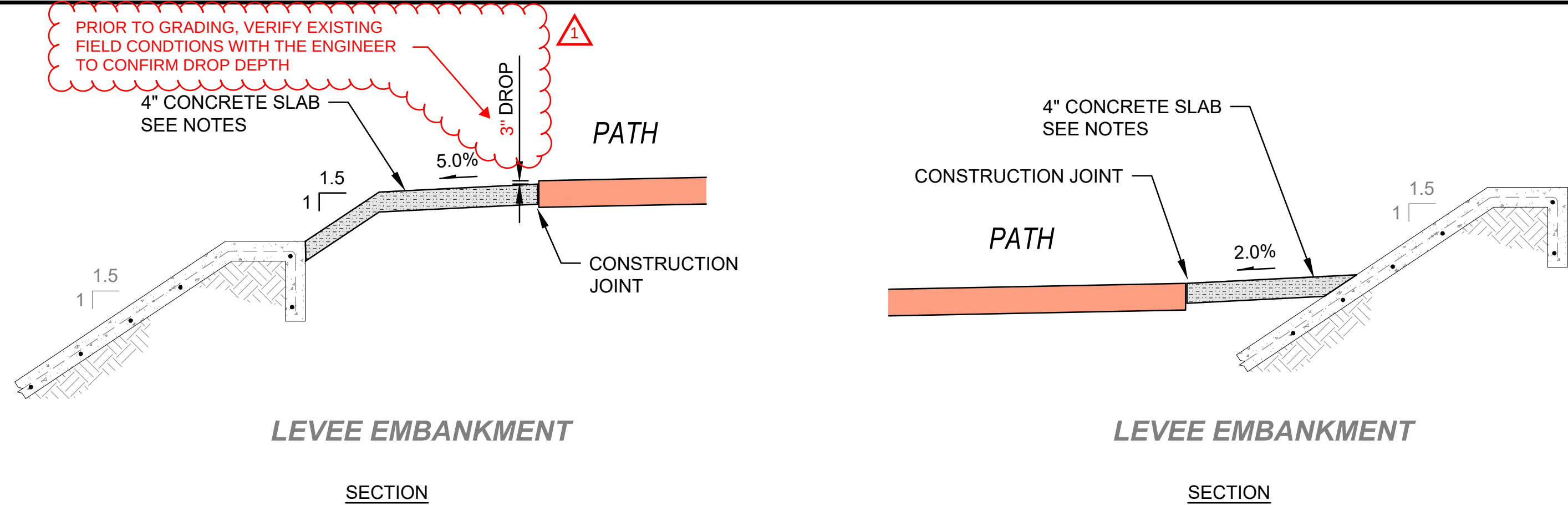


KEY:

- EJM EXPANSION JOINT MATERIAL, SEE CALTRANS STANDARD PLAN P20
- JS JOINT SEALANT, SEE CALTRANS STANDARD PLAN P20

NOTES:

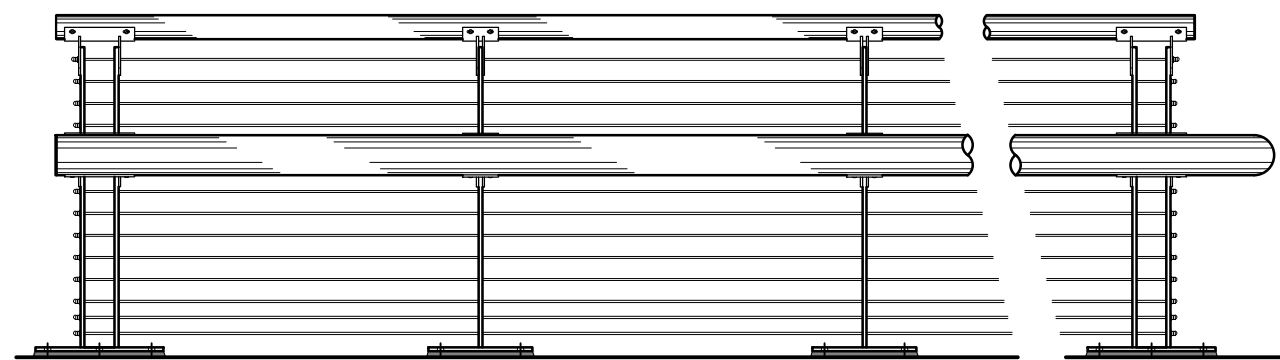
- SEE CALTRANS STANDARD PLAN P10 FOR ALL DOWEL CONSTRUCTION JOINT (DCJ) DETAILS.



NOTES:

- CONTRACTOR TO FIELD VERIFY DEPTH & LOCATION OF (E) CONC SLOPE PROTECTION (CSP).
- CONSTRUCT CONCRETE SHOULDER AS REQUIRED BETWEEN PATH AND (E) CSP. MAXIMIZE HORIZONTAL SHOULDER WIDTH AND MATCH TO (E) CSP WITH MAXIMUM 1.5H:1V AS REQUIRED.
- CONCRETE: SHALL BE CONSTRUCTION CLASS 560-C-3250, 3250 PSI PORTLAND CEMENT CONCRETE.
- CONCRETE SHALL HAVE SCORE JOINTS EVERY 10 FT PERPENDICULAR TO AND MATCHING JOINTS ON PATH.

1 CONCRETE JOINTS
NO SCALE

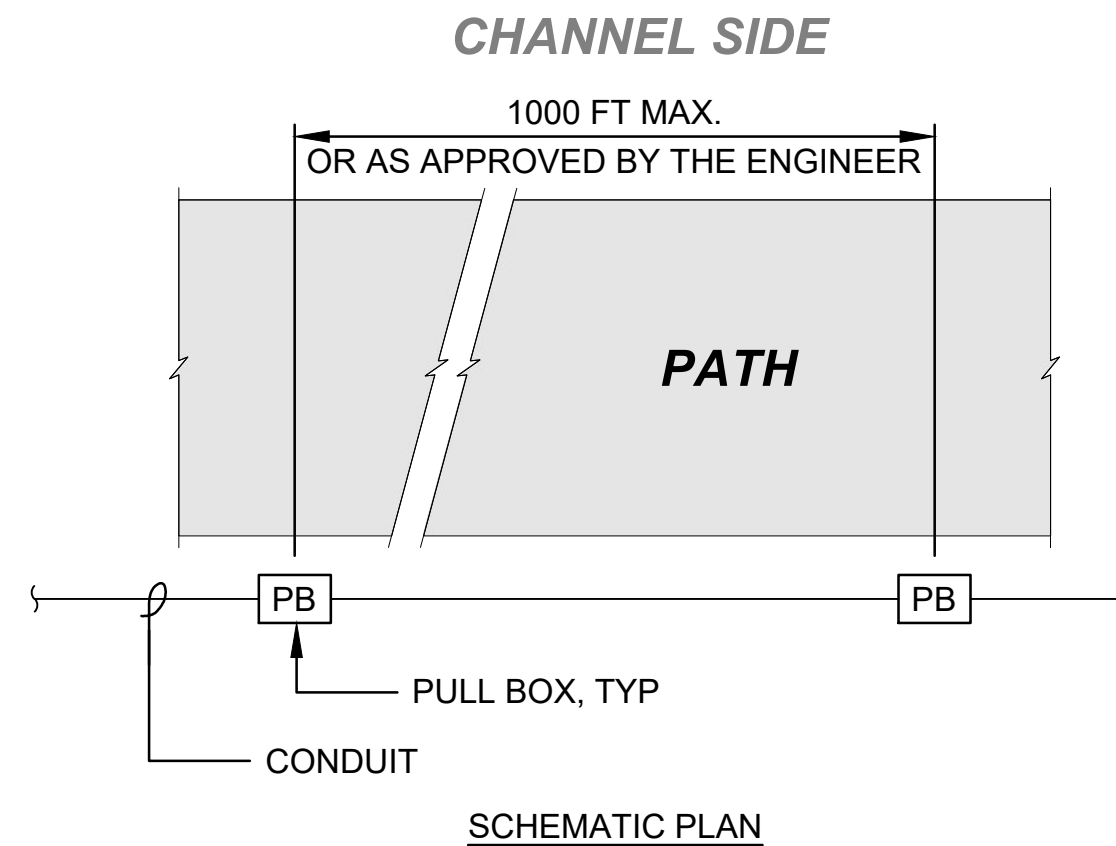


DETAIL SHOWN IS FOR GENERAL INFORMATION ONLY

NOTES:

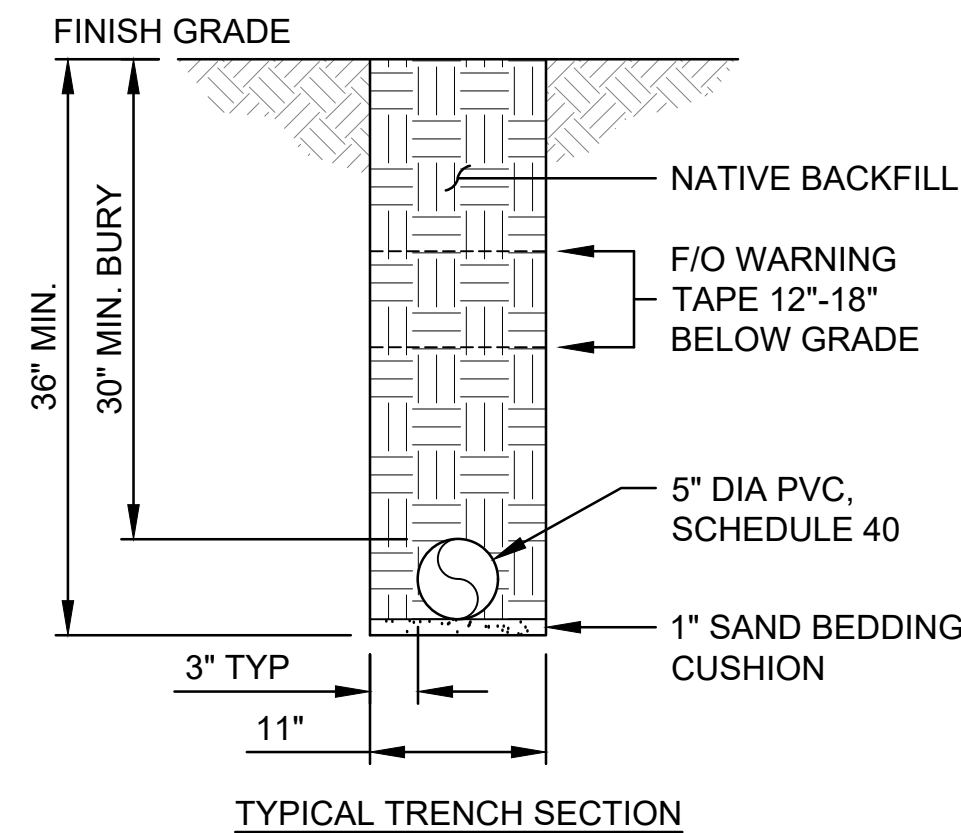
- RAILING, SEE VOLUME 8: DETAILS - BARRIER RAILING (BR) SHTS.
- SEE SHT S001 FOR RAILING ANCHORS AND ADDITIONAL NOTES.
- LOCATIONS SHOWN ON PLANS ARE DESIGN INTENT. CONTRACTOR SHALL FIELD VERIFY SITE CONDITIONS AND ADJUST LENGTHS AND OFFSETS AS REQUIRED.
- CONTRACTOR SHALL FIELD MARK START AND END OF RAILING AND APPROVED BY ENGINEER PRIOR TO FABRICATION AND INSTALLATION.

3 CONCRETE SHOULDER
NO SCALE



NOTES:

- CONTRACTOR SHALL PROVIDE PROPOSED PLAN SHOWING LOCATION OF CONDUIT AND TYPICAL TRENCH SECTION FOR APPROVAL PRIOR TO CONSTRUCTION.
- CONDUIT SHALL NOT BE INSTALLED ON CHANNEL SIDE OF LEVEE.
- ALL CONDUITS SHALL BE SCH 40 PVC.
- PULL STRINGS SHALL BE INCLUDED IN ALL CONDUIT RUNS.
- PULL BOXES SHALL BE CONCRETE AND PROVIDED WITH A STEEL TRAFFIC RATED LOCKING COVER AND A BOX EXTENSION TO A DEPTH OF 24 INCHES.
- ALL BOXES SHALL BE FURNISHED WITH A 6" DEPTH OF 1/2" MINUS DRAIN ROCK.



4 CABLE RAILING
NO SCALE

5 CONDUIT
NO SCALE

VOLUME 8

ISSUE	8-2-2024 TA ADJ. SHOULDER DETAIL	INFO
		PROJECT NO: 2015-093
		CAD DWG FILE: CVL_V8-306-CD803
		DESIGNED BY: SRB
		DRAWN BY: SRB
		REVIEWED BY: SBF
		DATE: 10.4.2023
		SCALE: AS SHOWN

Underground Service Alert

DIGALERT

DIAL TOLL FREE
1-800-422-4133
AT LEAST TWO WORKING DAYS
BEFORE YOU DIG

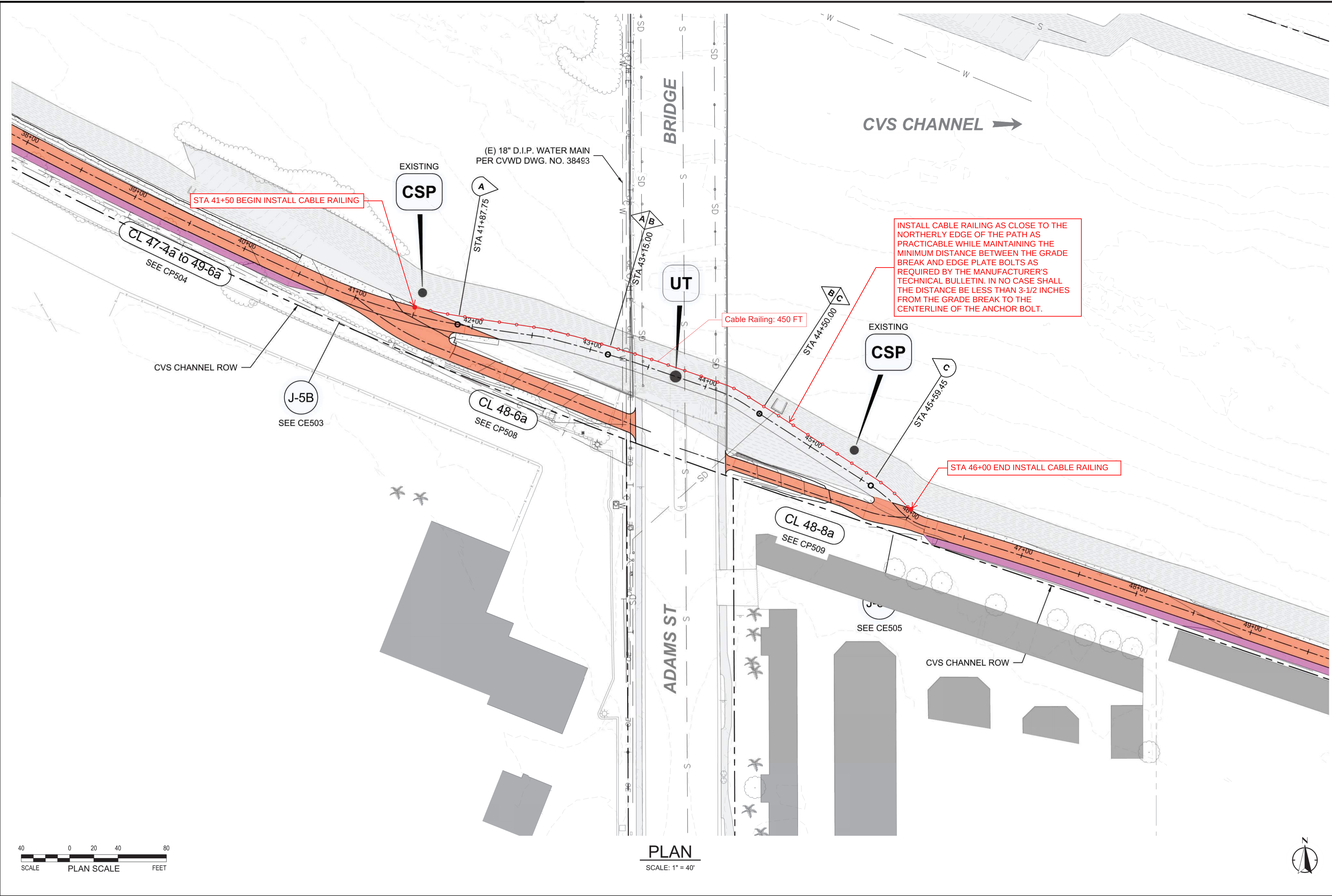
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SHEET TITLE	CIVIL DETAILS - 3	SHEET NO.	CD803
			SHEET 5 OF 70

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Line measures 1 inch on full scale drawing, 1 foot 1 inch scale accordingly.



GENERAL SHEET NOTES

1.

FIELD VERIFY EXISTING FEATURES AND UTILITIES AS REQUIRED.

2.

PROTECT ALL EXISTING FEATURES WHETHER SHOWN OR NOT.

3.

RIGHT-OF-WAY, PROPERTY, AND EASEMENT BOUNDARIES ARE NOT SHOWN FOR CLARITY. SEE CIVIL CP SHTS.

LEGEND

PATH JUNCTION

J-1A

SEE CE SHTS FOR GEOMETRY AND TIE-IN POINTS FOR PAVEMENT MARKINGS

CL 1-1 to 1-2

CENTERLINE ALIGNMENT NAME

CONCRETE SLOPE PROTECTION (CSP)

CSP

SEE CE SHTS FOR SLOPE PROTECTION PLAN & MATRIX

CONDUIT

CON

BURIED CONDUIT FOR FUTURE UTILITY

CONDUIT

CONDUIT

TERMINAL PULL BOX

TERMINAL PULL BOX

COMPLETE SYSTEM SHALL BE INSTALLED IN CONJUNCTION WITH CSP CONSTRUCTION. FOR ADDITIONAL NOTES SEE DETAIL 5/CD803.

ATTENTION

CONDUIT DESIGN IS SCHEMATIC AND SHOWN FOR INFORMATION ONLY.

UNDERCROSSING TREATMENT

UT

UNDERSIDE OF BRIDGE DECK & ADJACENT BRIDGE PIERS

TREATMENT MAY INCLUDE WAYFINDING PAINT, LIGHTS, AND ADDITIONAL ITEMS. FOR FULL SCOPE OF WORK, PLACEMENT PLANS, AND DETAILS SEE:

VOLUME 9: WAYFINDING & SIGNAGE

PAVEMENT MARKINGS

A

TYPE A - (RAMP DOWN) INCREASING CL STATIONING

AB

TYPE B - (BELOW BRIDGE)

C

TYPE C - (RAMP UP) INCREASING CL STATIONING

MARKINGS INCLUDE UNDERCROSSING THERMOPLASTIC BANDING (UTB) AND A CHANNEL-SIDE EDGE STRIPE

UTB BANDING (TYPE A & B) ALWAYS BEGINS AT THE HIGH SIDE OF EACH RAMP AND IS LAID OUT ALONG THE LENGTH OF THE RAMP TOWARD THE CHANNEL BOTTOM

FOR TYPICAL LAYOUT AND DETAILS SEE SHTS CD807 & CD808

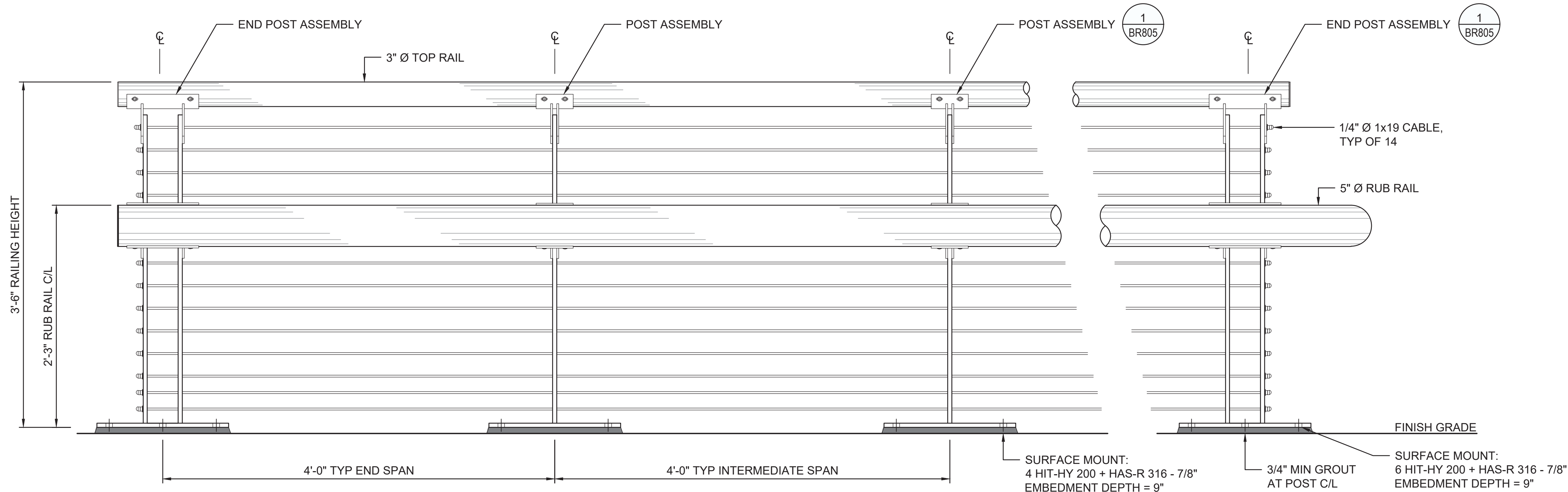
NOTE: LEGEND IS TYPICAL, NOT ALL ITEMS APPEAR ON SHEETS.

VOLUME 5

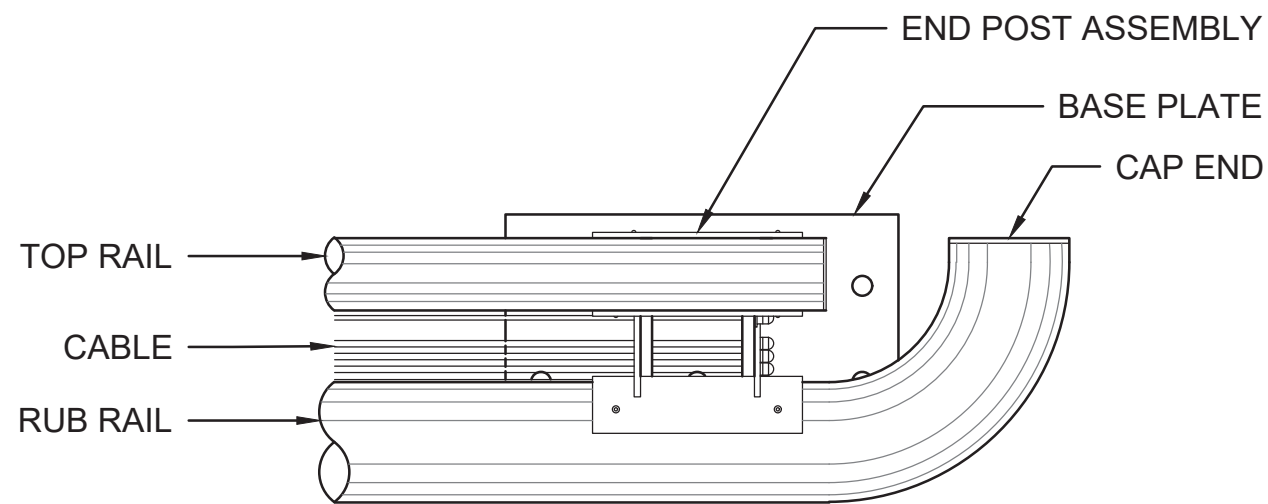
ISSUE <table><tr><th>MARK</th><th>DATE</th><th>DESCRIPTION</th></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr><tr><td> </td><td> </td><td> </td></tr></table>			MARK	DATE	DESCRIPTION													INFO PROJECT NO: 2015-093 CAD DWG FILE: CVL_V5-302-CE508 DESIGNED BY: SRB DRAWN BY: SRB REVIEWED BY: DATE: 11.18.2019 SCALE: AS SHOWN		Underground Service Alert DIGALERT DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG		REFERENCE DRAWINGS		CVLINK CONNECTING THE COACHELLA VALLEY CVAG MULTI-MODAL TRANSPORTATION FACILITY COACHELLA VALLEY - CALIFORNIA		SHEET TITLE LA QUINTA / RIVERSIDE COUNTY V5-LQ: LA QUINTA ADAMS ST UNDERCROSSING - UC 5-1 PLAN		SHEET NO. CE508 SHEET 35 of 55	
MARK	DATE	DESCRIPTION																											

45093

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ELEVATION



PLAN

END POST

NOTES:

1. RAILING SYSTEM SHALL BE CUSTOM FABRICATED AND CONSISTS OF WELDED AND MECHANICALLY FASTENED PIECES.
2. PROVIDE FULL SHOP DRAWINGS PRIOR TO FABRICATION OF ALL COMPONENTS. DRAWINGS SHALL INCLUDE ALL REQUIRED MOUNTING HARDWARE FOR A COMPLETE RAILING SYSTEM WHETHER SHOWN OR NOT ON THESE DRAWINGS.
3. SHOP DRAWINGS SHALL INCLUDE INSTRUCTIONS FOR PROPER FIELD INSTALLATION.
4. ALL POSTS SHALL BE INSTALLED PERPENDICULAR TO MATCH RUNNING SLOPE OF PATH AND GROUTED TO VERTICAL IN RESPECT TO PATH CROSS SLOPE.
5. CABLES SHALL BE 316L MARINE GRADE STAINLESS STEEL. MAXIMUM CABLE LENGTH PER INDUSTRY STANDARDS.
6. CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.
7. ALL HARDWARE SHALL BE 316 STAINLESS STEEL AND BE VANDAL AND THEFT RESISTANT.

PAINT SCHEDULE:

1. SEE BR809 FOR POST ASSEMBLY PAINT SCHEDULE.
2. ALL TOP & RUB RAILS SHALL BE GALVANIZED AND POWDER COATED [WHITE].
3. CABLES AND CABLE HARDWARE SHALL NOT BE PAINTED.

1 CABLE RAILING - TYPE A

1 1/2" = 1'-0"

VOLUME 8

ISSUE	MARK	DATE	DESCRIPTION	INFO	 Underground Service Alert DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG
				PROJECT NO: 2015-093	
				CAD DWG FILE: CVL_V8-605-BR801	
				DESIGNED BY: SRB	
				DRAWN BY: SRB	
				REVIEWED BY: DY	
				DATE: 11.22.2019	
				SCALE: AS SHOWN	

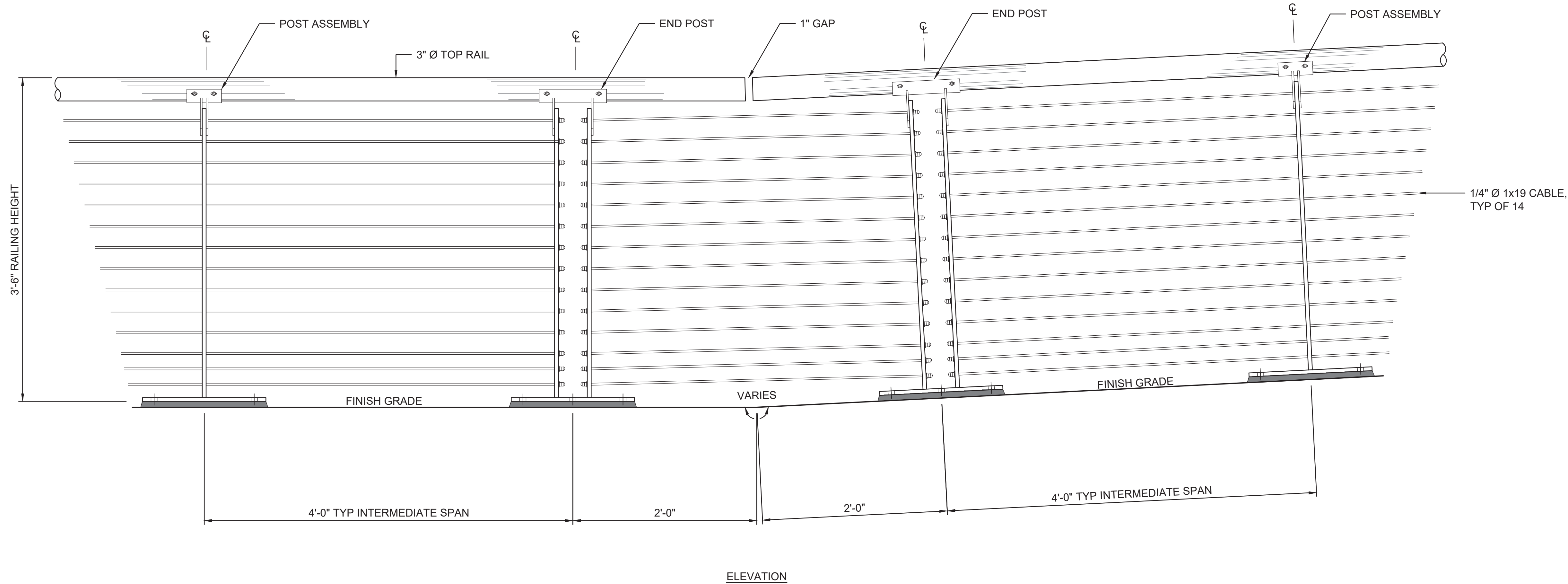
REFERENCE DRAWINGS



SHEET TITLE	SHEET NO.
CABLE RAILING - TYPE A DETAIL - 1 BARRIER RAILING DETAILS - 1	BR801
	SHEET 53 OF 67

Line measures 1 inch on full scale drawing. If not 1 inch scale accordingly.

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1 TYPICAL GRADE CHANGE

1 1/2" = 1'-0"

VOLUME 8

ISSUE	INFO		 Underground Service Alert DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG
	MARK	DATE	DESCRIPTION
			PROJECT NO: 2015-093
			CAD DWG FILE: CVL_V8-605-BR803
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			SCALE: AS SHOWN

REFERENCE DRAWINGS



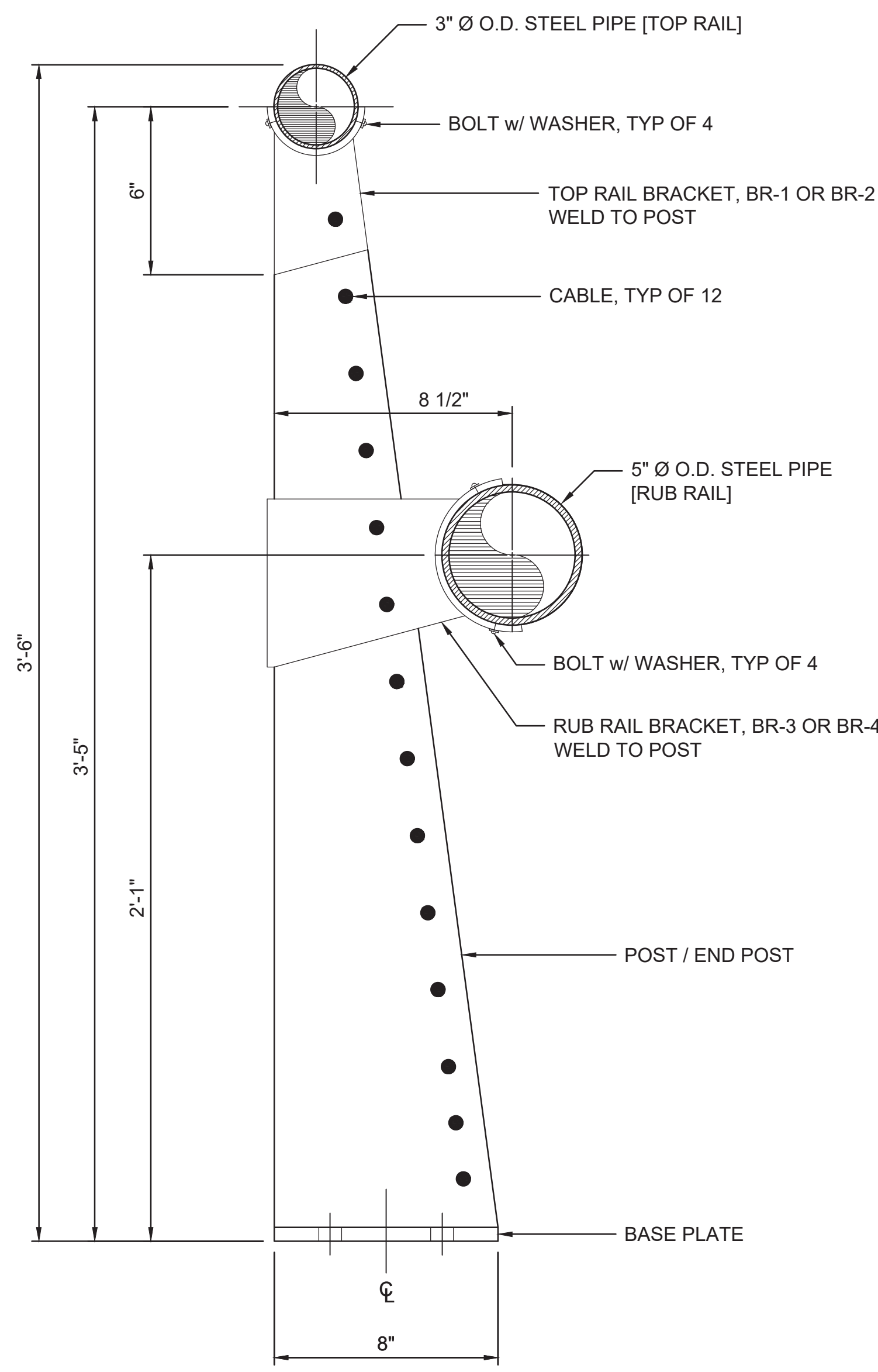
CVLINK
CONNECTING THE COACHELLA VALLEY
MULTI-MODAL TRANSPORTATION FACILITY
COACHELLA VALLEY - CALIFORNIA

SHEET TITLE
**CABLE RAILING -
TYPE A DETAIL - 2**
~~BARRIER RAILING
DETAILS - 3~~

SHEET NO.
BR803
SHEET 55 OF 67

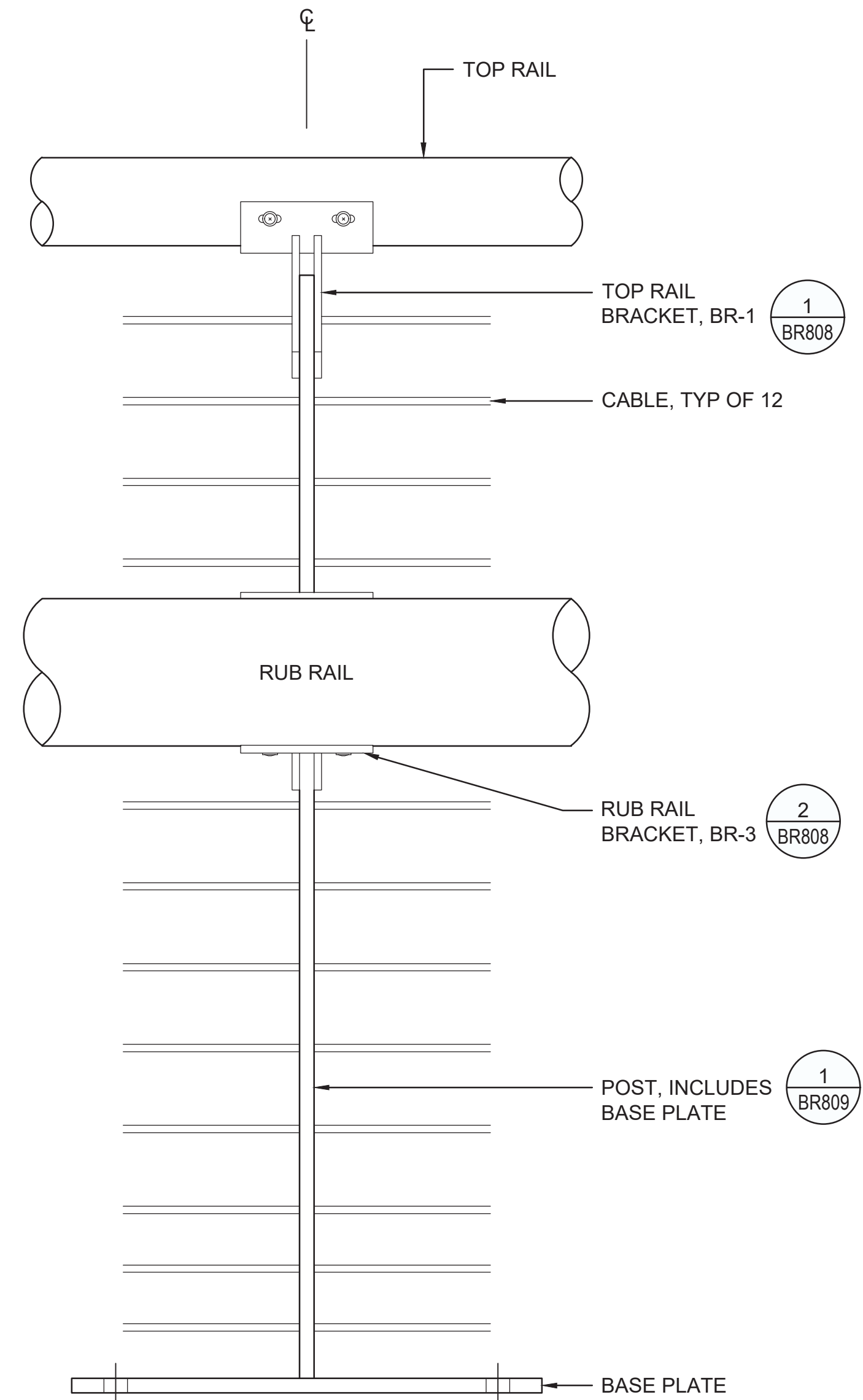
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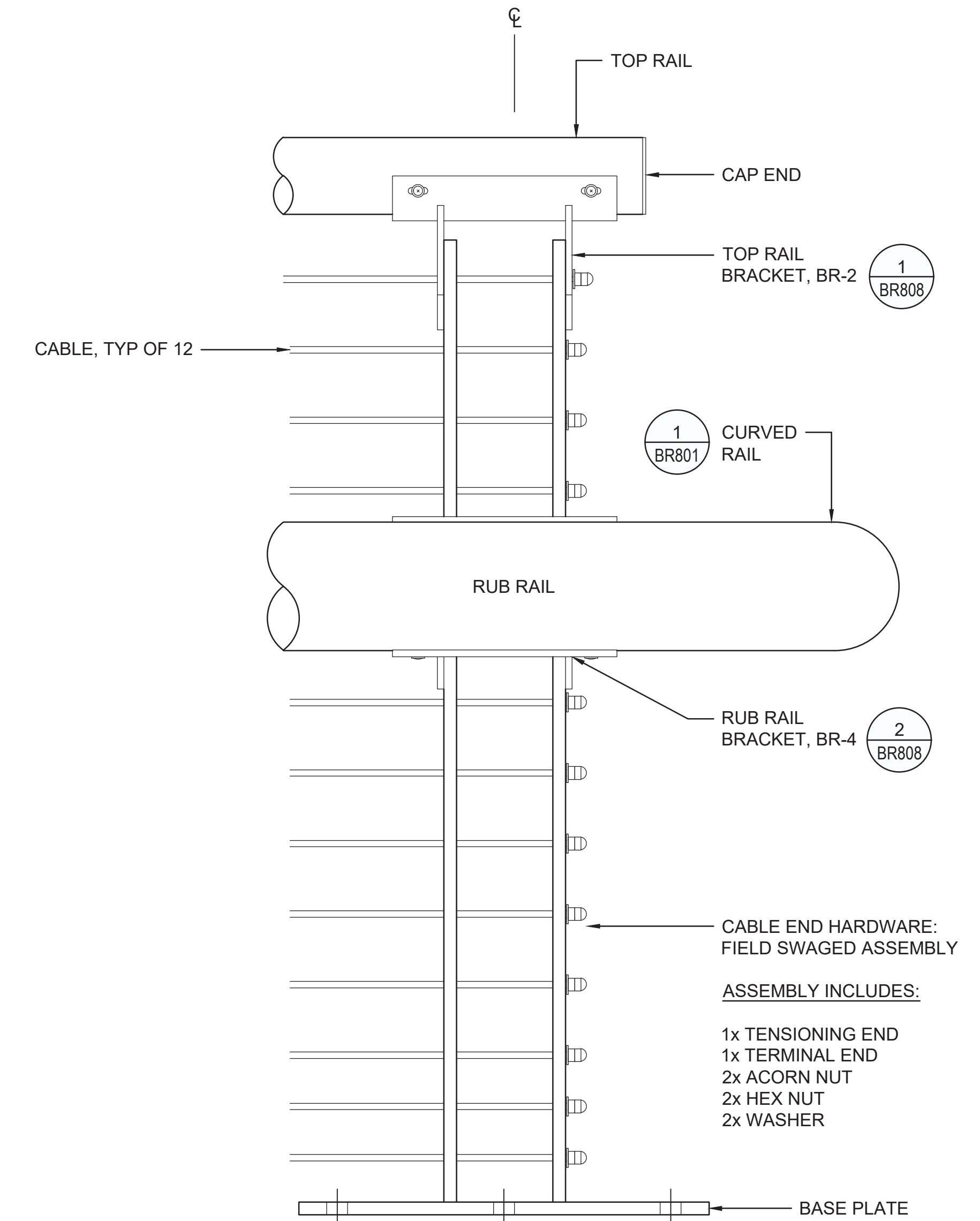
SIDE

POST / END POST



FRONT

POST



FRONT

END POST

1 POST ASSEMBLY - TYPE A
NO SCALE

VOLUME 8

ISSUE	MARK		DESCRIPTION	INFO	 Underground Service Alert DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG
	DATE				
				PROJECT NO: 2015-093	
				CAD DWG FILE: CVL_V8-605-BR804	
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REFERENCE DRAWINGS

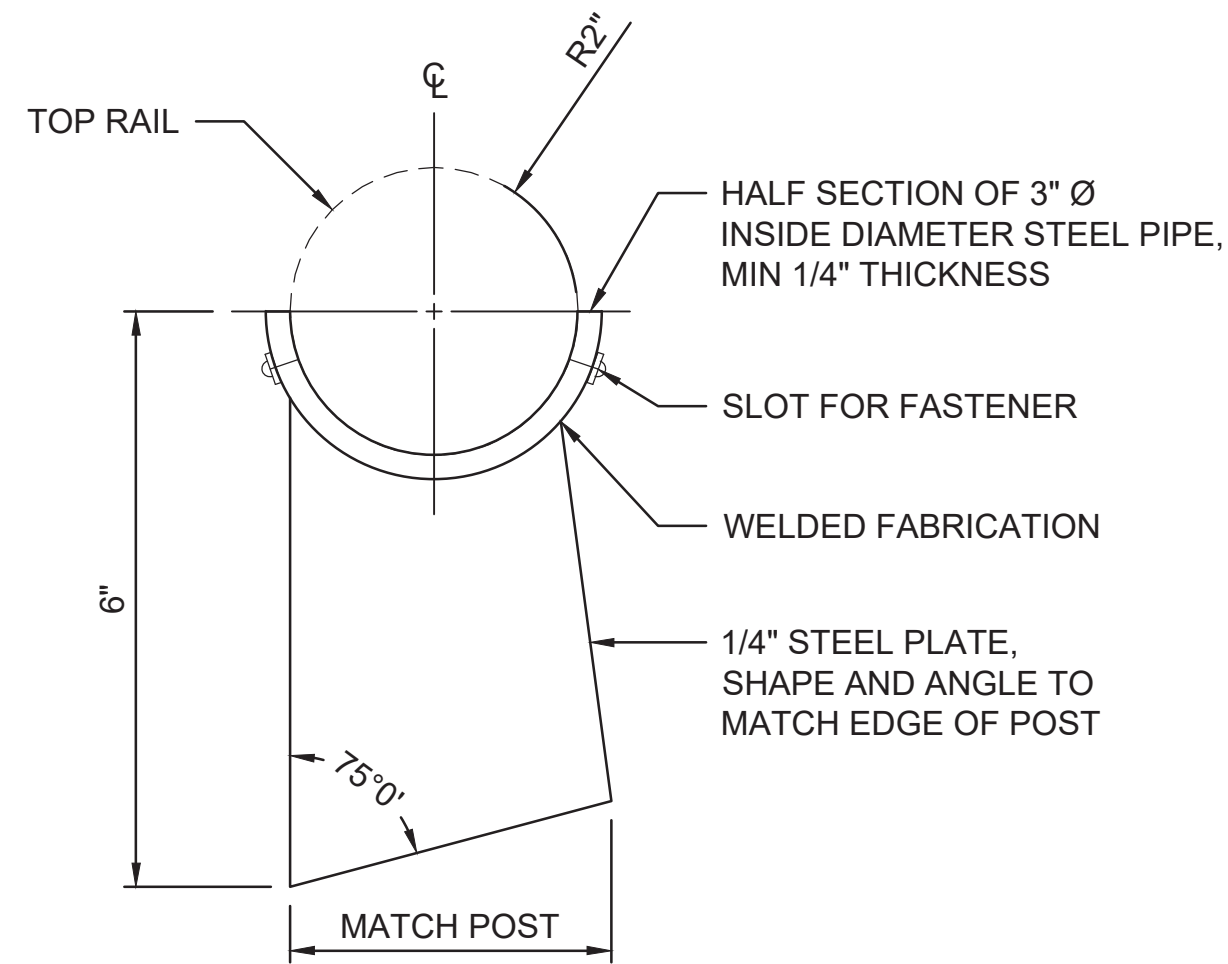


SHEET TITLE
~~CABLE RAILING - TYPE A DETAIL - 3~~
~~BARRIER RAILING DETAILS - 4~~

SHEET NO.
BR804
SHEET 56 OF 67

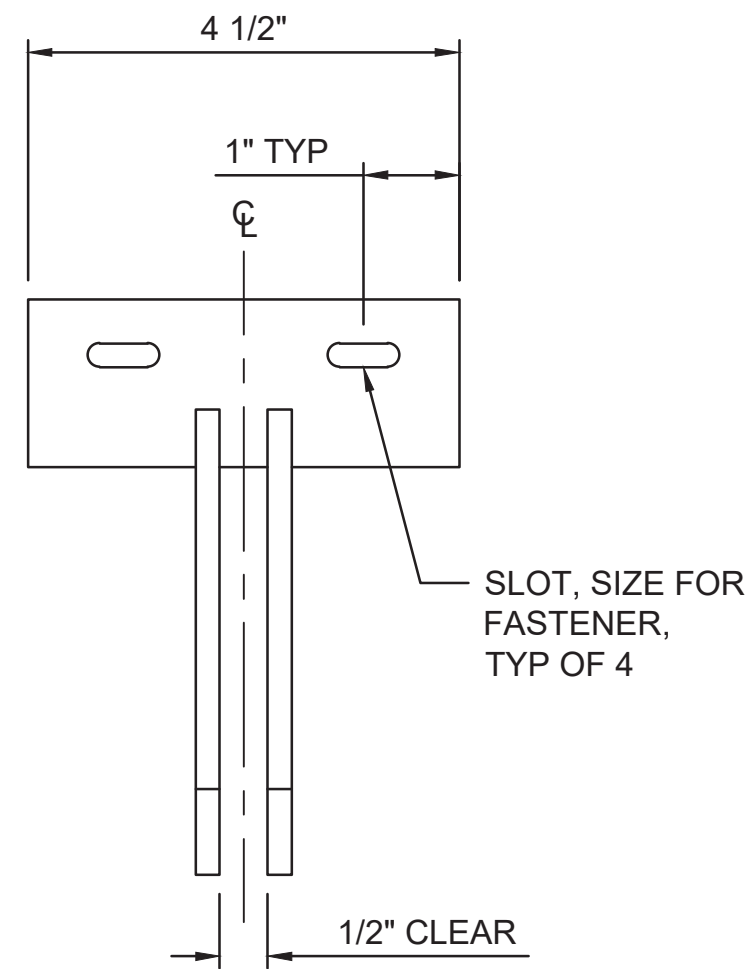
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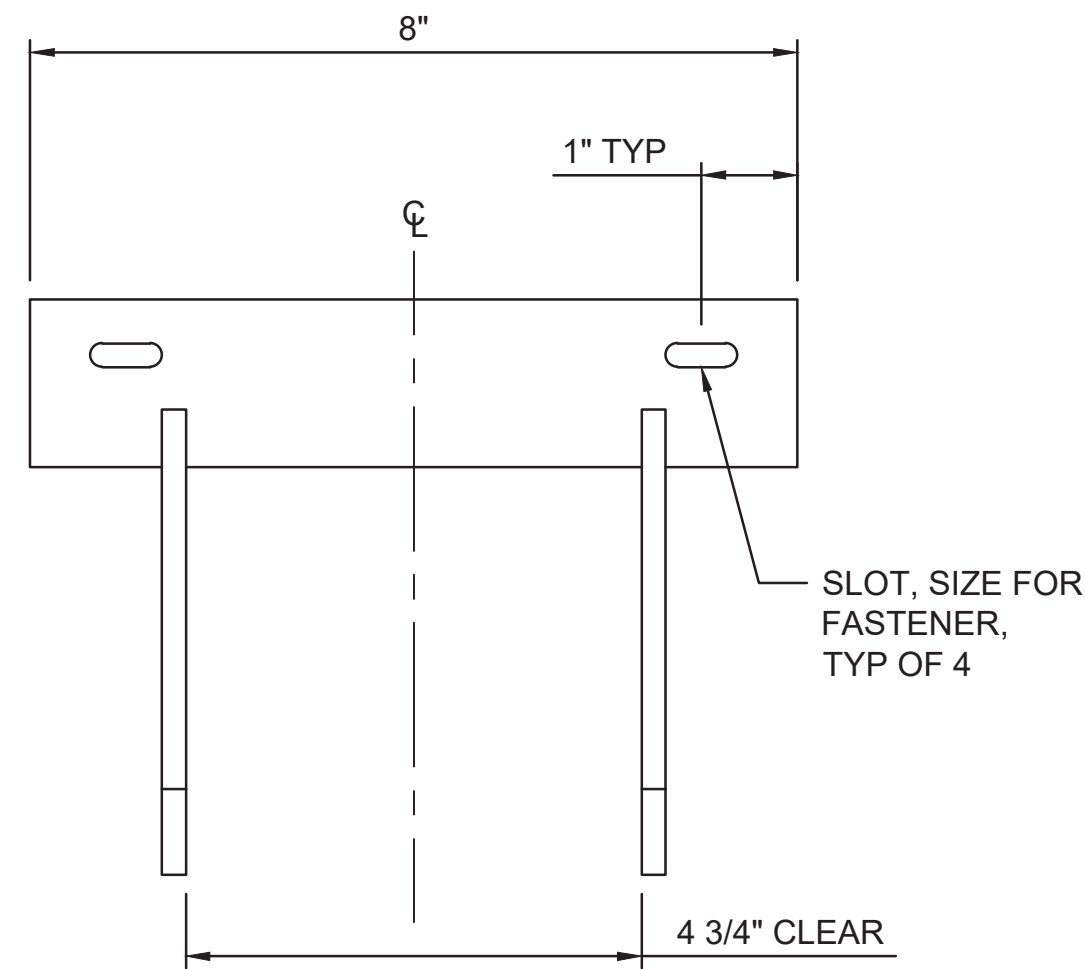
SIDE

BR-1 / BR-2



FRONT

BR-1 (POST)

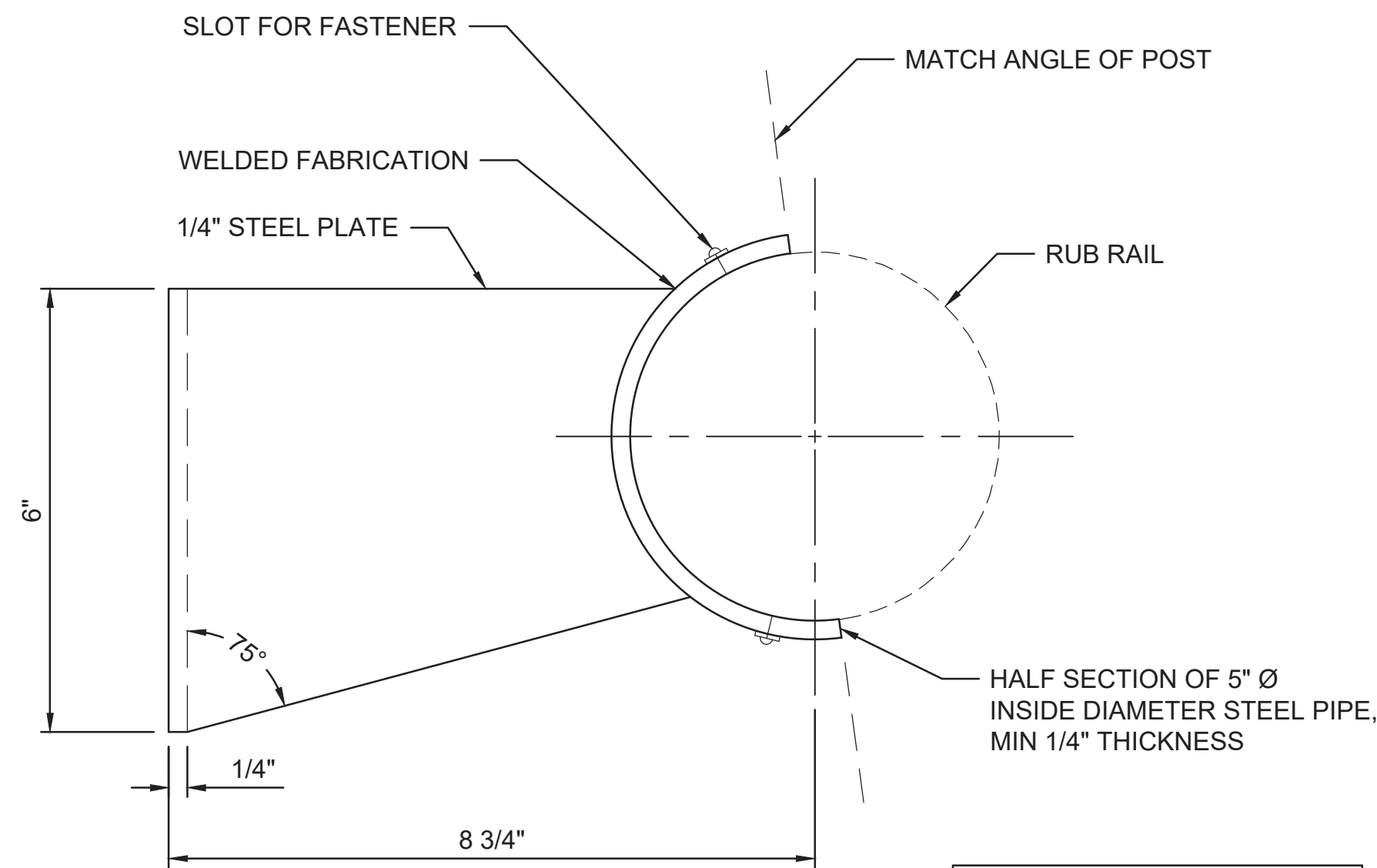


FRONT

BR-2 (END POST)

1 TOP RAIL BRACKET, BR-1 & BR-2

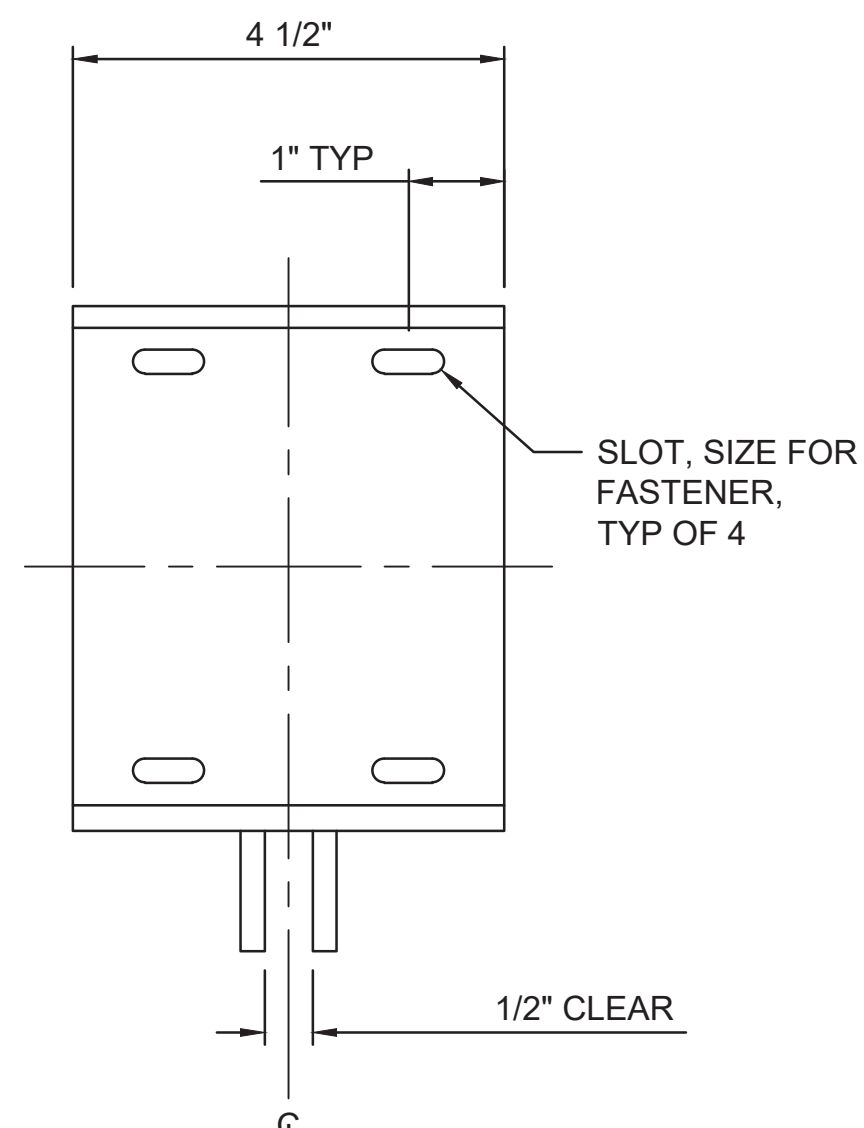
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SIDE

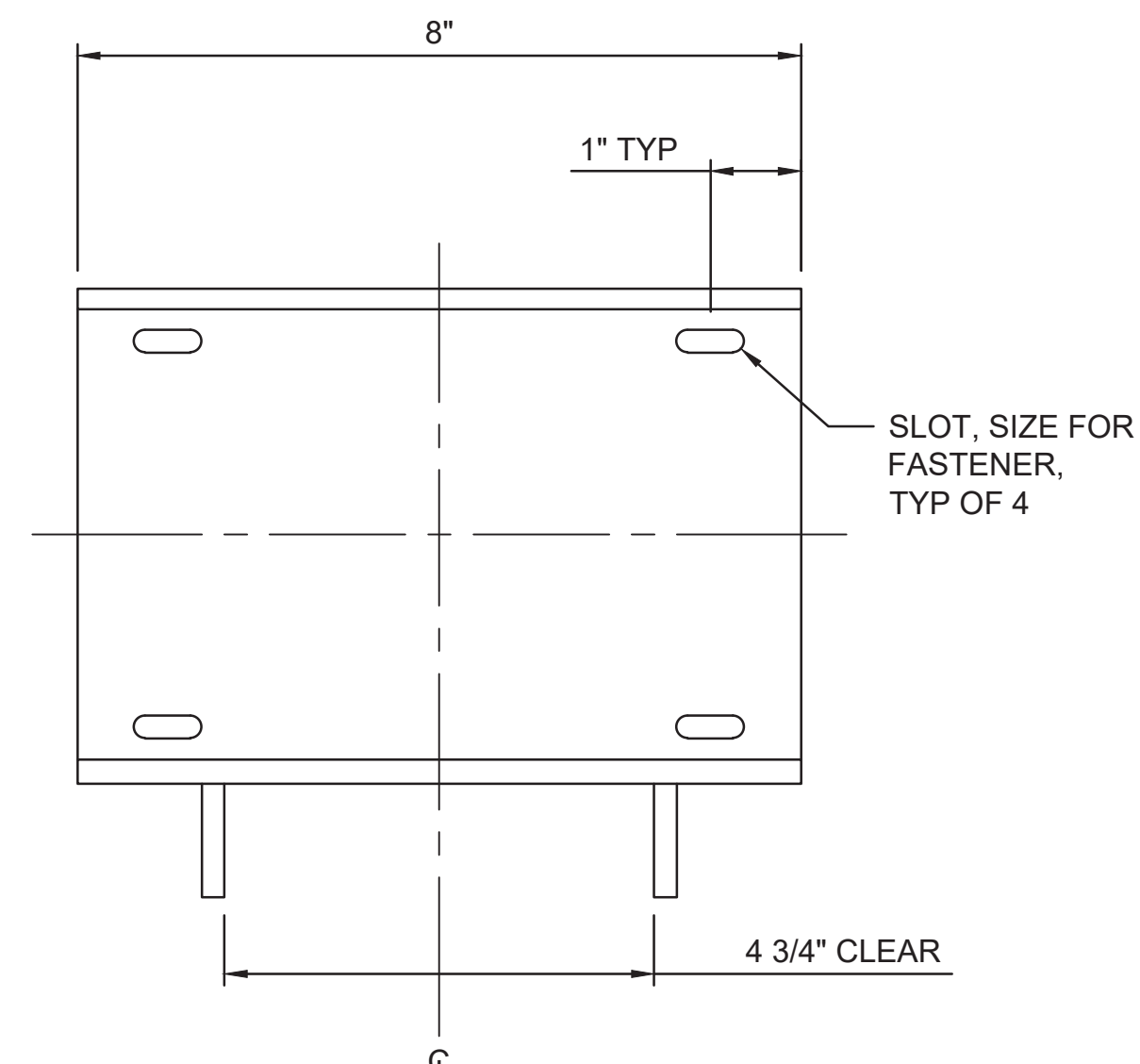
BR-3 / BR-4

NOTE:
BRACKET ONLY NEEDED
FOR TYPE A CABLE RAILING.
SEE 1/BR805.



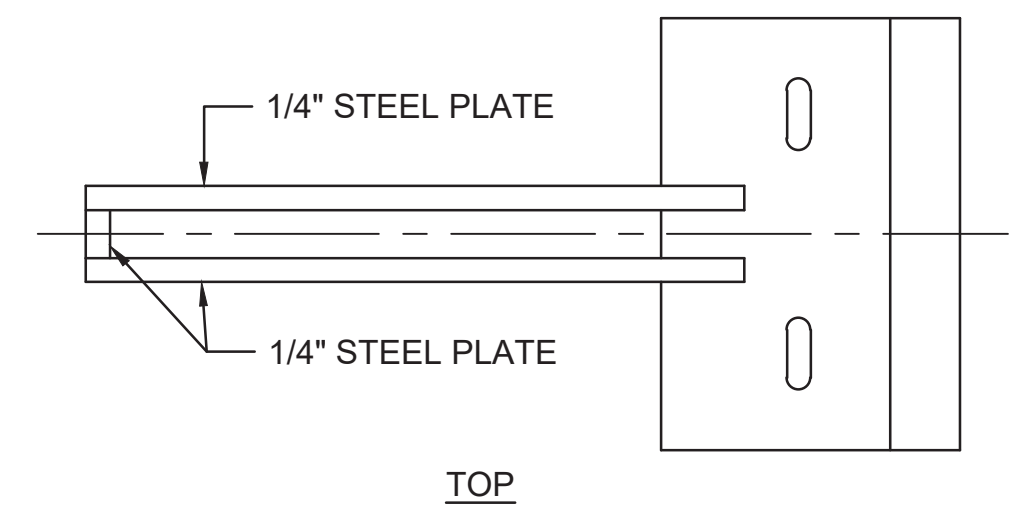
FRONT

BR-3 (POST)



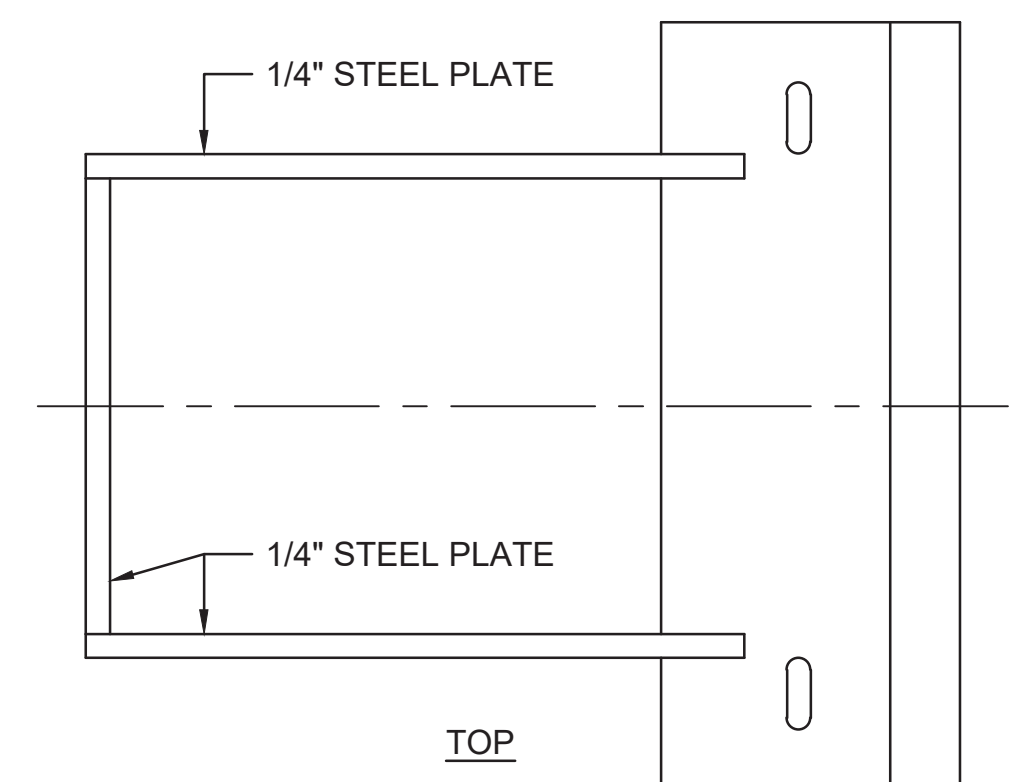
FRONT

BR-4 (END POST)



TOP

BR-3 (POST)



TOP

BR-4 (END POST)

2 RUB RAIL BRACKET, BR-3 & BR-4

NO SCALE

VOLUME 8

ISSUE			INFO	Underground Service Alert DIGALERT  DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG
			PROJECT NO: 2015-093	
			CAD DWG FILE: CVL_V8-605-BR807	
			DESIGNED BY: SRB	
			DRAWN BY: SRB	
			REVIEWED BY: DY	
			DATE: 11.23.2019	
			SCALE: AS SHOWN	

Underground Service Alert

DIAL TOLL FREE
1-800-422-4133
AT LEAST TWO WORKING DAYS
BEFORE YOU DIG

REFERENCE DRAWINGS



CVLINK
CONNECTING THE COACHELLA VALLEY

MULTI-MODAL TRANSPORTATION FACILITY
COACHELLA VALLEY - CALIFORNIA

SHEET TITLE

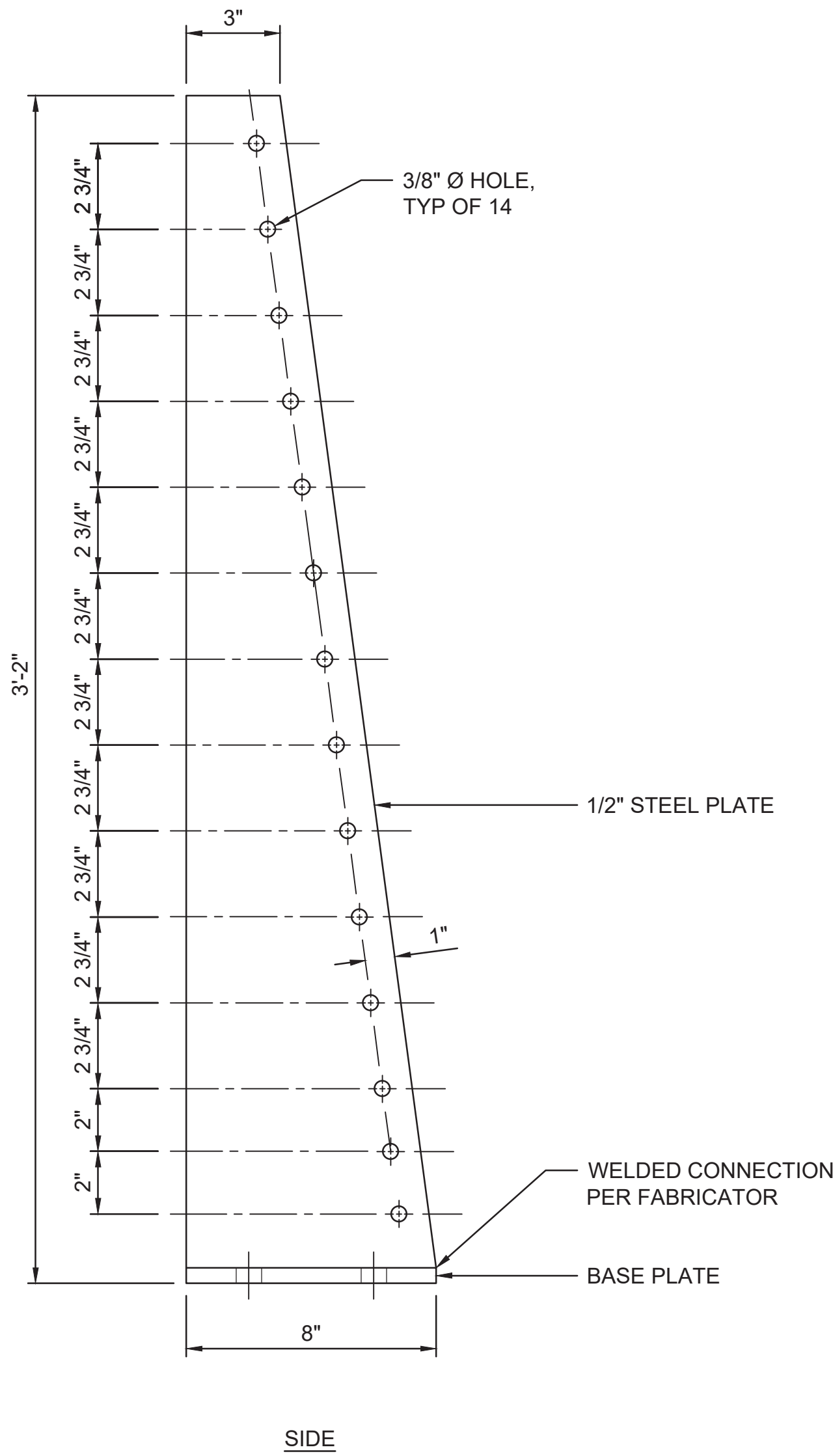
**CABLE RAILING -
TYPE A DETAIL - 4**

**BARRIER RAILING
DETAILS - 7**

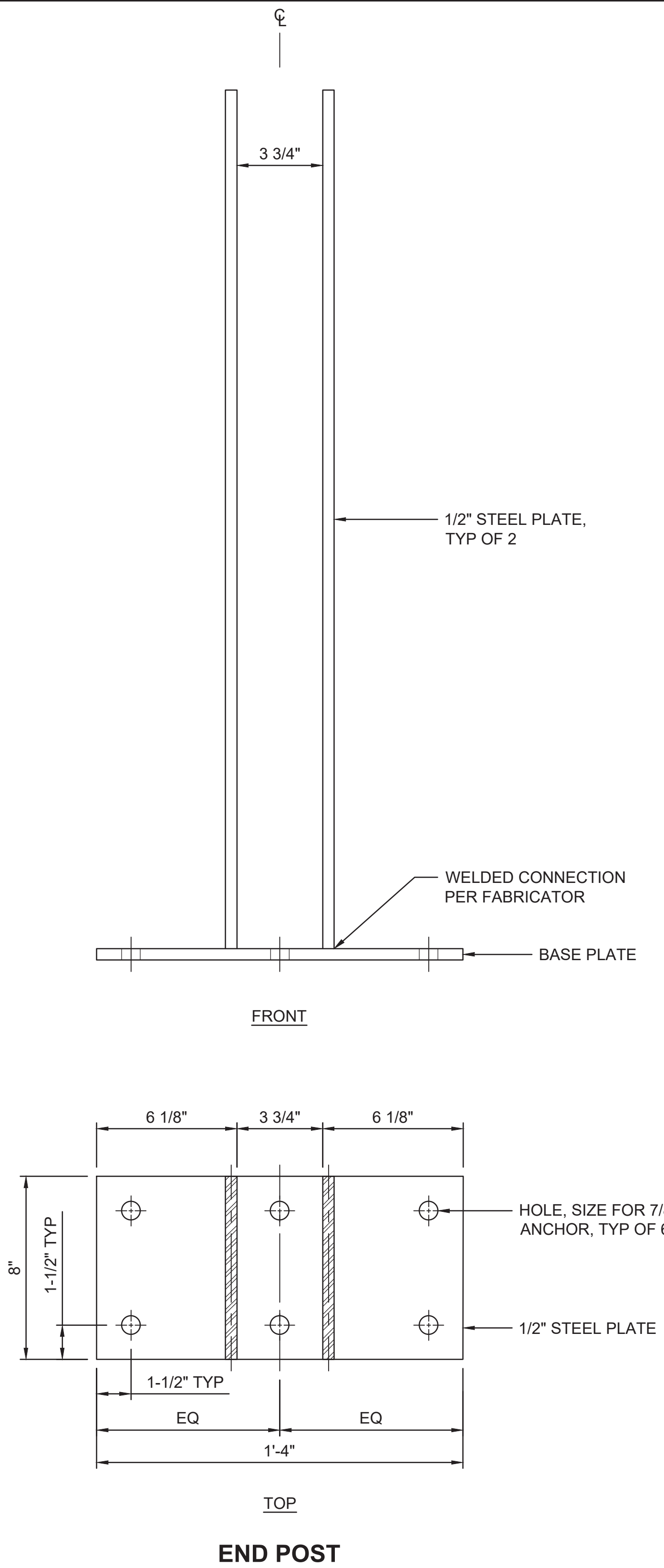
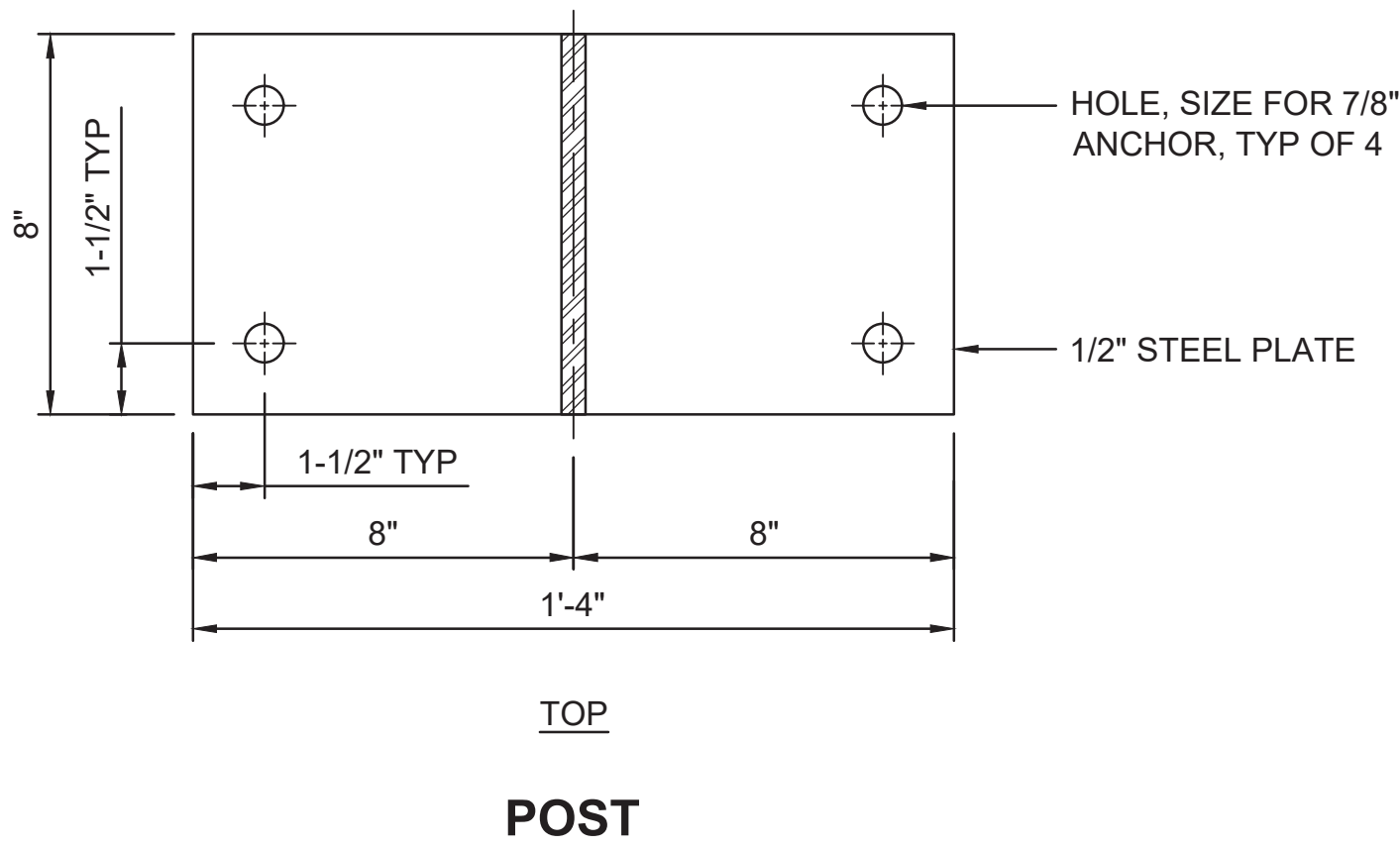
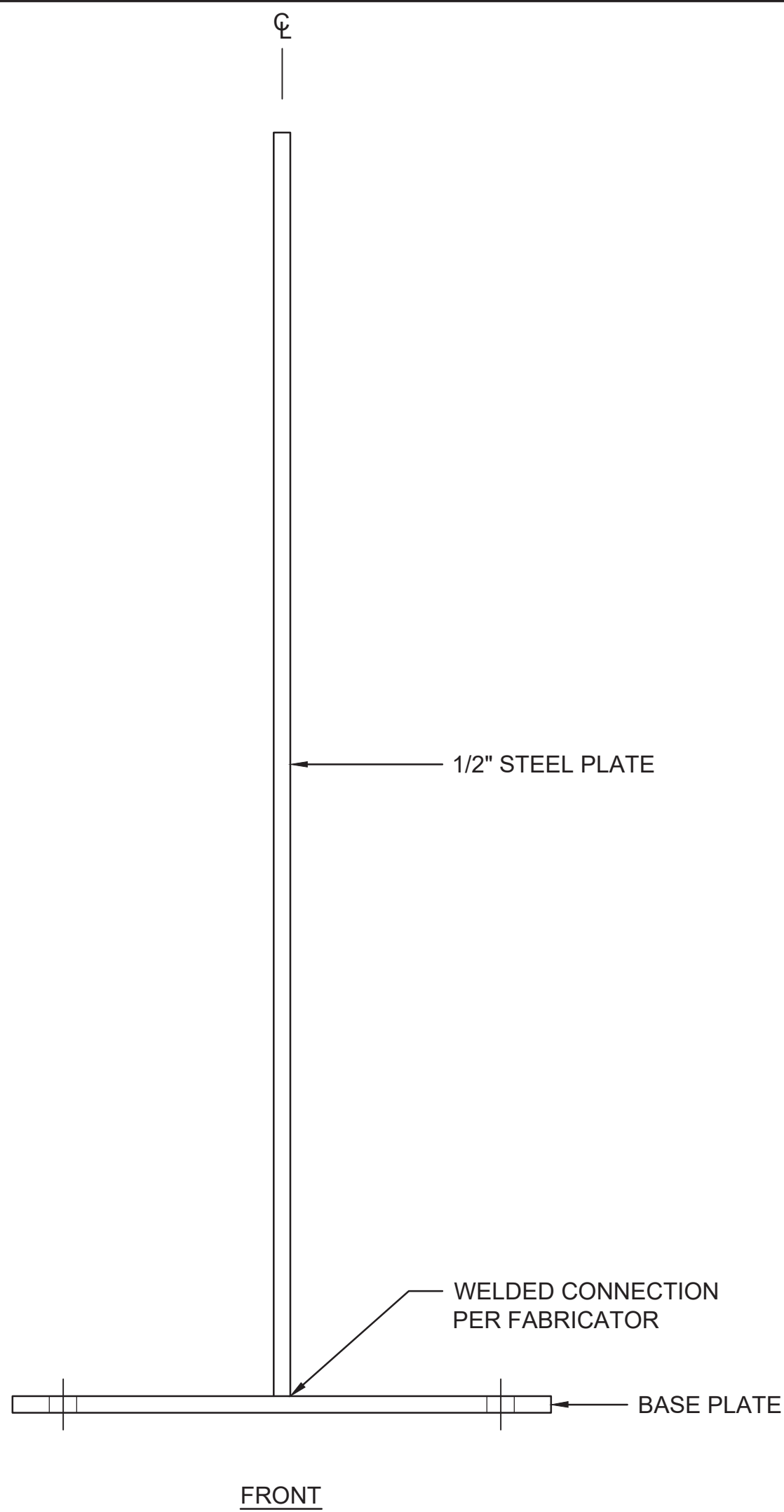
SHEET NO.

BR807

SHEET 59 OF 67



POST / END POST



1 POST / END POST DETAIL
NO SCALE

VOLUME 8

ISSUE			MARK		DATE	DESCRIPTION
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

INFO		 DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG
PROJECT NO:	2015-093	
CAD DWG FILE:	CVL_V8-605-BR808	
DESIGNED BY:	SRB	
DRAWN BY:	SRB	
REVIEWED BY:	DY	
DATE:	11.23.2019	
SCALE:	AS SHOWN	

REFERENCE DRAWINGS



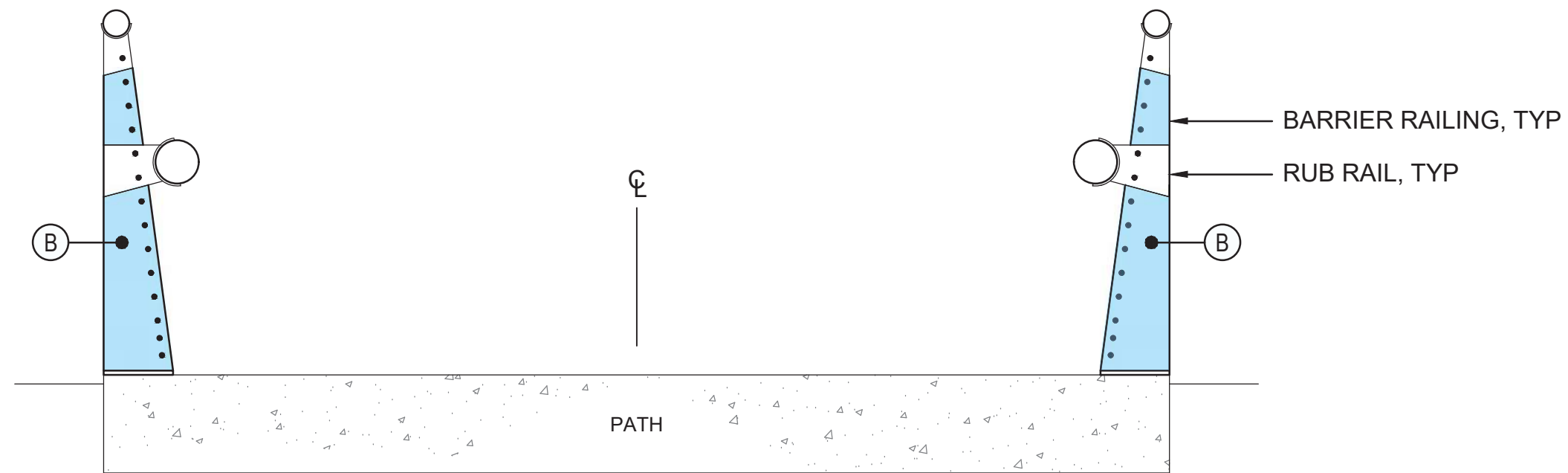
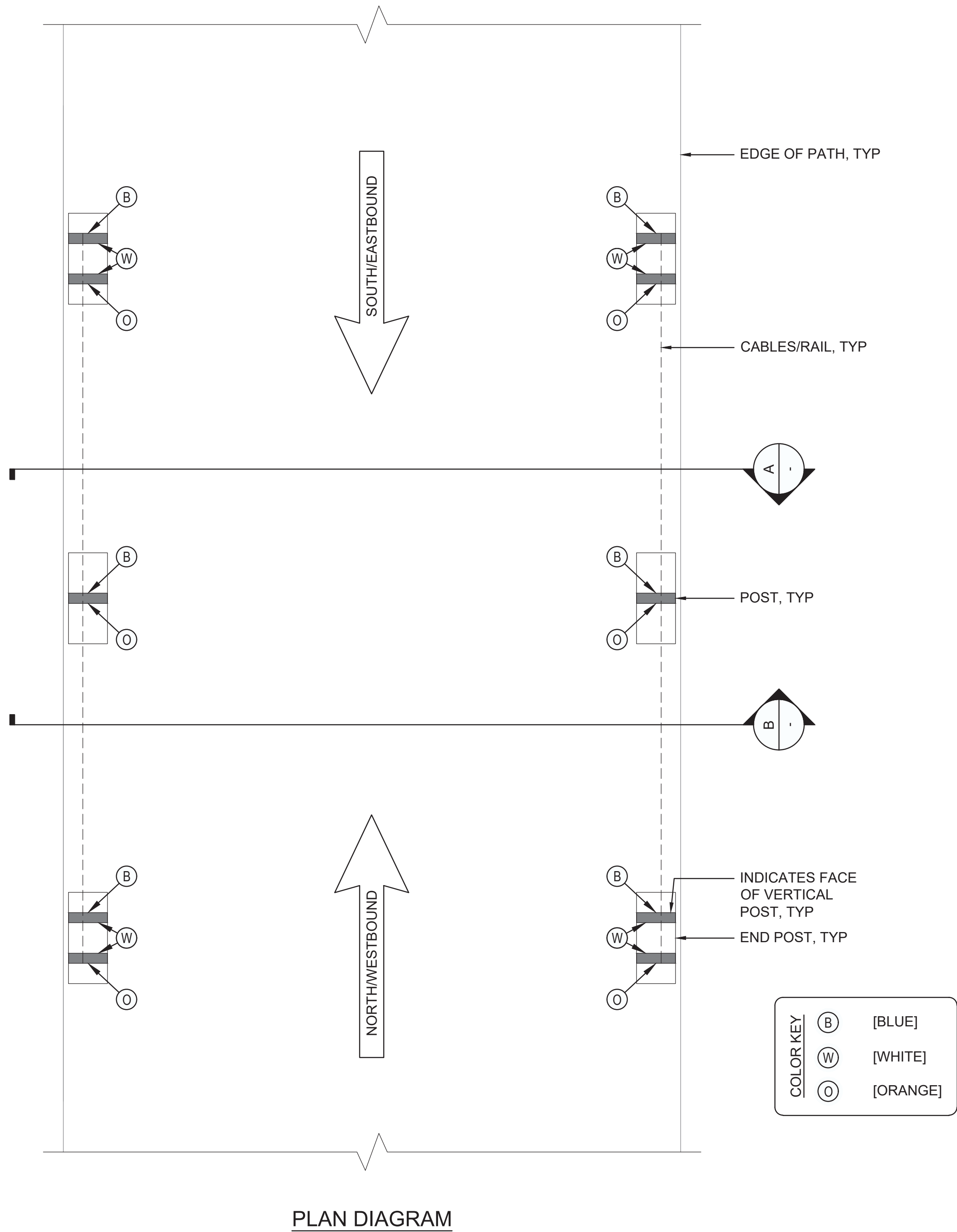
CVLINK
CONNECTING THE COACHELLA VALLEY
MULTI-MODAL TRANSPORTATION FACILITY
COACHELLA VALLEY - CALIFORNIA

SHEET TITLE	
CABLE RAILING - TYPE A DETAIL - 5 BARRIER RAILING DETAILS - 8	

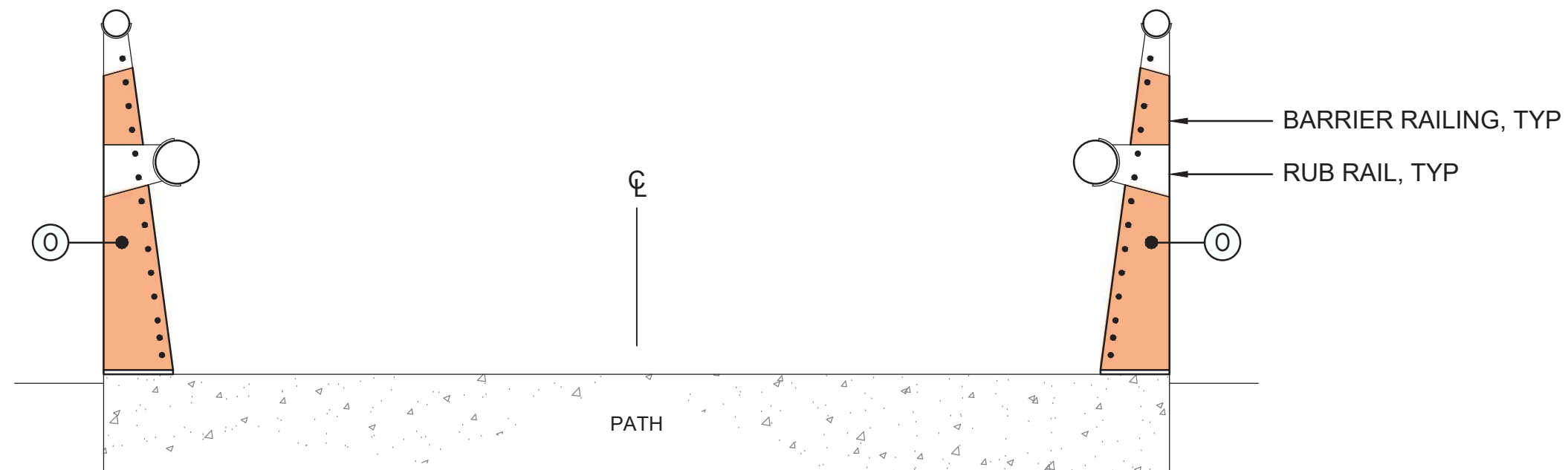
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BR808	
SHEET	60 OF 67

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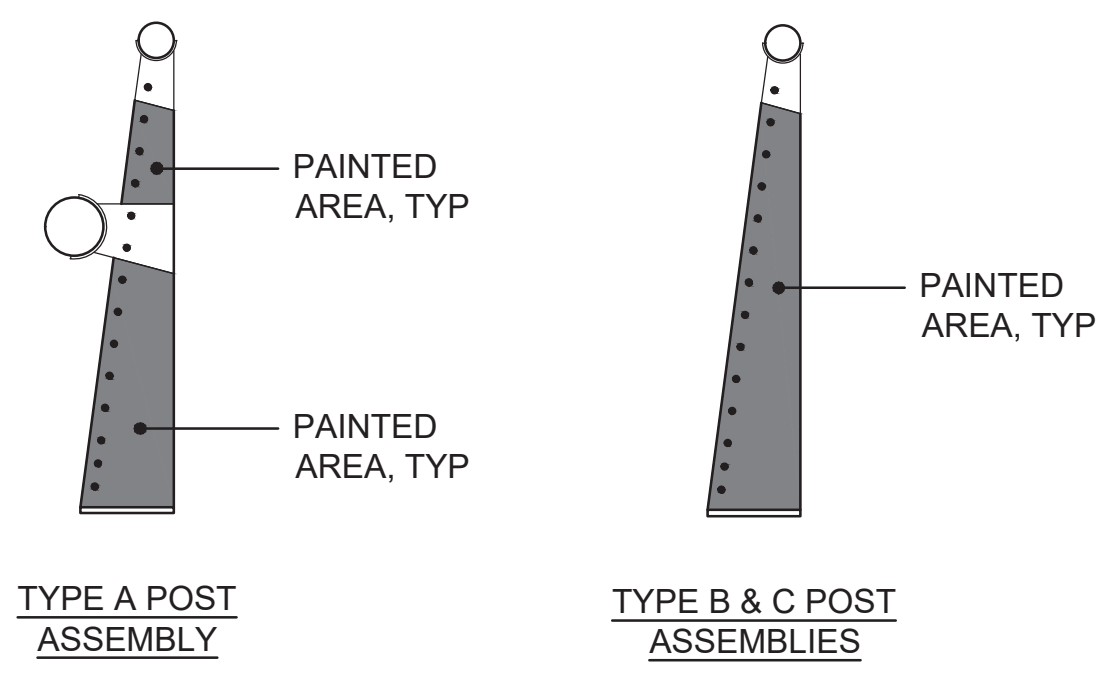
Line measures 1 inch on full scale drawing. If not 1 inch scale accordingly.



A TYPICAL SOUTH/EASTBOUND SECTION



B TYPICAL NORTH/WESTBOUND SECTION



POST ASSEMBLY TYPES

1 PAINT SCHEDULE

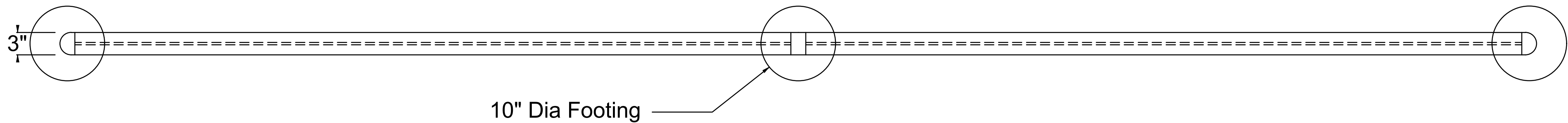
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VOLUME 8

ISSUE	MARK	DATE	DESCRIPTION	INFO PROJECT NO: 2015-093 CAD DWG FILE: CVL_V8-605-BR809 DESIGNED BY: SRB DRAWN BY: SRB REVIEWED BY: DY DATE: 11.23.2019 SCALE: AS SHOWN	 Underground Service Alert DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG		 CONNECTING THE COACHELLA VALLEY MULTI-MODAL TRANSPORTATION FACILITY COACHELLA VALLEY - CALIFORNIA	SHEET TITLE CABLE RAILING - TYPE A DETAIL - 6 BARRIER RAILING DETAILS - 9	SHEET NO. BR809

Line measures 1 inch on full scale drawing. If not 1 inch scale accordingly.

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NOTE: ALL RAILING WILL BE HOT-DIP GALVANIZED BEFORE POWDER COAT / PAINT

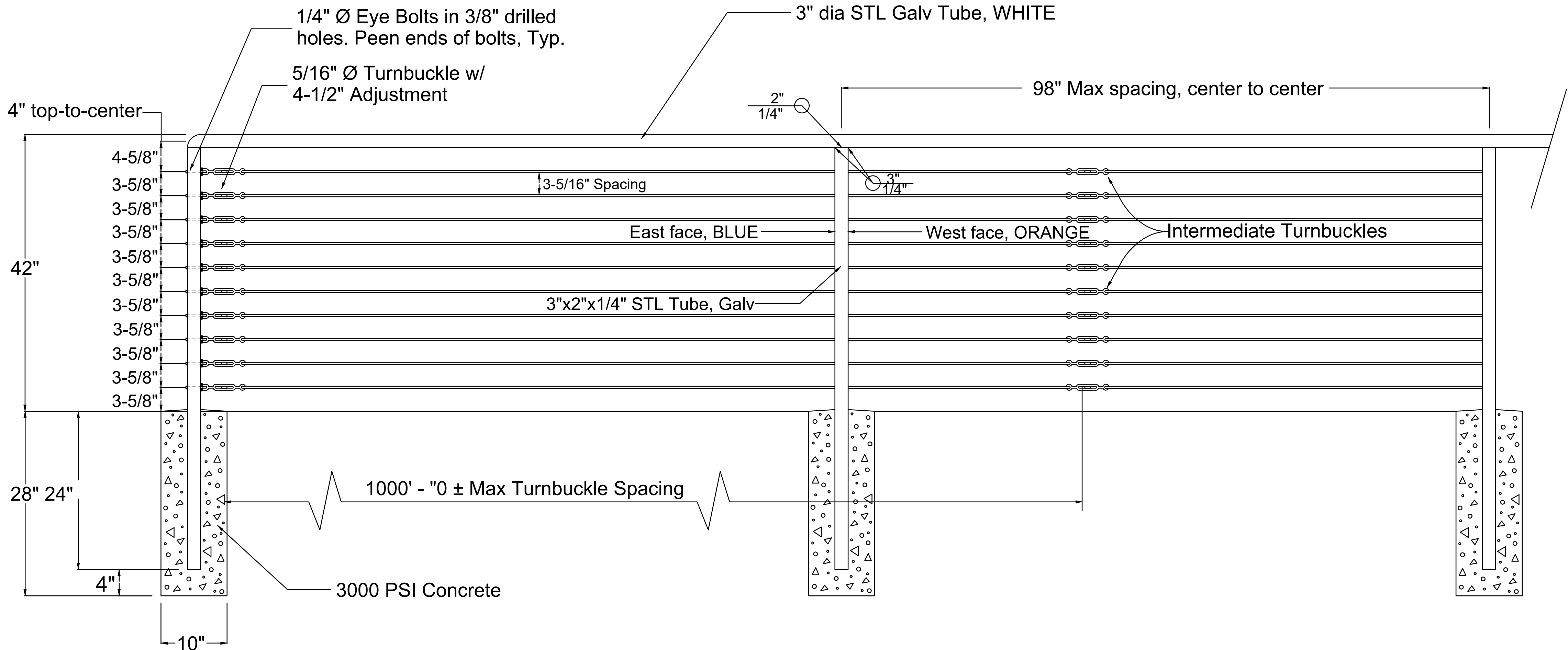
Plan View

NOTES:

- 1. RAILING SYSTEM SHALL BE CUSTOM FABRICATED AND CONSISTS OF WELDED AND MECHANICALLY FASTENED PIECES.
- 2. PROVIDE FULL SHOP DRAWINGS PRIOR TO FABRICATION OF ALL COMPONENTS. DRAWINGS SHALL INCLUDE ALL REQUIRED MOUNTING HARDWARE FOR A COMPLETE RAILING SYSTEM WHETHER SHOWN OR NOT ON THESE DRAWINGS.
- 3. SHOP DRAWINGS SHALL INCLUDE INSTRUCTIONS FOR PROPER FIELD INSTALLATION.
- 4. ALL POSTS SHALL BE INSTALLED VERTICAL. ALIGNMENT OF HOLES IN POST MAY VARY TO CONFORM TO SLOPE AND ALIGNMENT.
- 5. CABLES SHALL BE 316L MARINE GRADE STAINLESS STEEL. MAXIMUM CABLE LENGTH PER INDUSTRY STANDARDS.
- 6. CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.
- 7. ALL HARDWARE SHALL BE VANDAL AND THEFT RESISTANT.

PAINT SCHEDULE:

- 1. ONLY [ORANGE] PAINT IS TO BE VISIBLE WHILE TRAVELING ALONG THE PATH TOWARD THE MOUNTAINS (HEADING UPSTREAM ALONG THE CHANNEL) AND [BLUE] PAINT WHILE TRAVELING DOWNSTREAM TOWARD THE SALTON SEA.
- 2. ALL RAILS & POSTS SHALL BE POWDER COATED [WHITE].
- 3. CABLES AND CABLE HARDWARE SHALL NOT BE PAINTED.



1 METAL RAILING - OPTION B (10 CABLES)
NO SCALE

VOLUME 8

ISSUE	MARK	DATE	DESCRIPTION

INFO	
PROJECT NO:	2015-093
CAD DWG FILE:	CVL_V8-605-BR813
DESIGNED BY:	SRB
DRAWN BY:	SRB
REVIEWED BY:	DY
DATE:	4.5.2022
SCALE:	AS SHOWN

Underground Service Alert

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DIAL TOLL FREE
1-800-422-4133
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CV/LINK

CONNECTING THE COACHELLA VALLEY

MULTI-MODAL TRANSPORTATION FACILITY
COACHELLA VALLEY - CALIFORNIA

SHEET TITLE

CABLE RAILING -
TYPE B DETAIL
METAL RAILING
OPTION B
DETAILS

SHEET NO.

BR813

SHEET OF

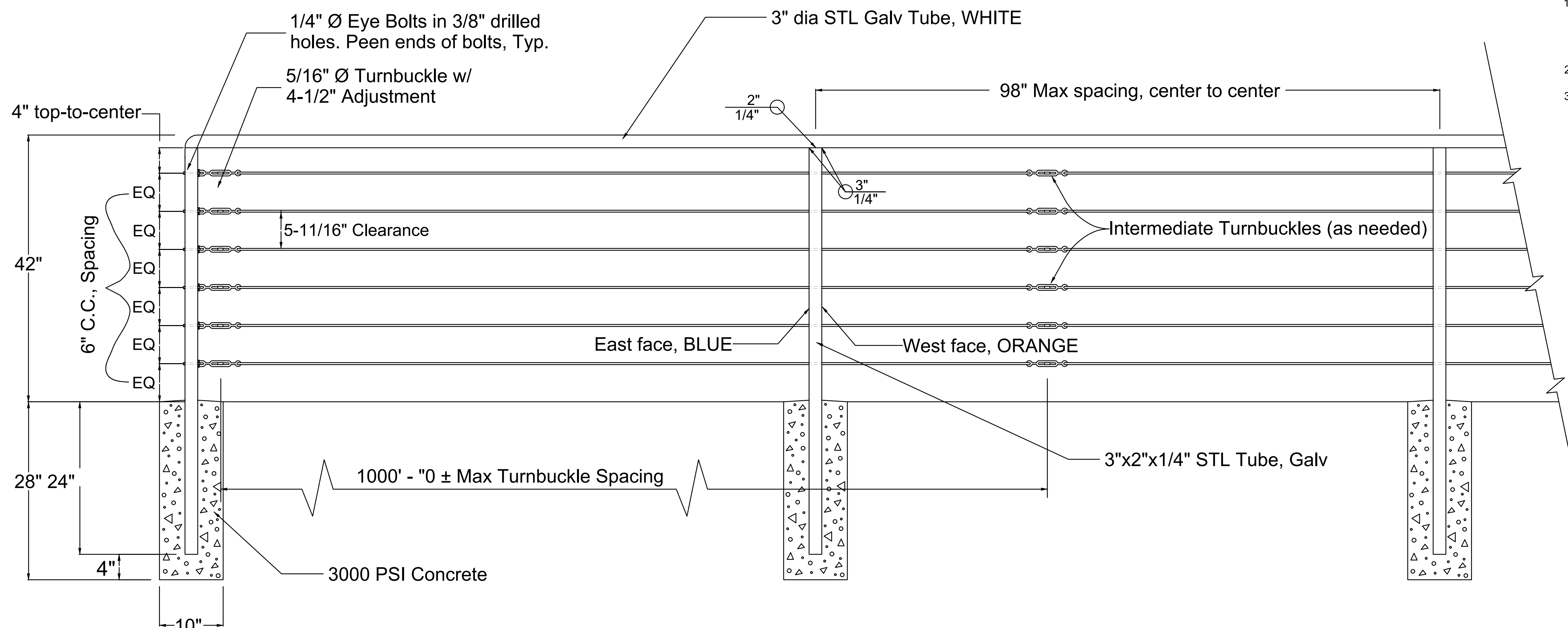


Plan View

1. RAILING SYSTEM SHALL BE CUSTOM FABRICATED AND CONSISTS OF WELDED AND MECHANICALLY FASTENED PIECES.
2. PROVIDE FULL SHOP DRAWINGS PRIOR TO FABRICATION OF ALL COMPONENTS. DRAWINGS SHALL INCLUDE ALL REQUIRED MOUNTING HARDWARE FOR A COMPLETE RAILING SYSTEM WHETHER SHOWN OR NOT ON THESE DRAWINGS.
3. SHOP DRAWINGS SHALL INCLUDE INSTRUCTIONS FOR PROPER FIELD INSTALLATION.
4. ALL POSTS SHALL BE INSTALLED VERTICAL. ALIGNMENT OF HOLES IN POST MAY VARY TO CONFORM TO SLOPE AND ALIGNMENT.
5. CABLES SHALL BE 316L MARINE GRADE STAINLESS STEEL. MAXIMUM CABLE LENGTH PER INDUSTRY STANDARDS.
6. CONTRACTOR SHALL VERIFY ALL DEPENDENT DIMENSIONS IN THE FIELD BEFORE ORDERING OR FABRICATING ANY MATERIAL.
7. ALL HARDWARE SHALL BE VANDAL AND THEFT RESISTANT.

PAINT SCHEDULE:

1. ONLY [ORANGE] PAINT IS TO BE VISIBLE WHILE TRAVELING ALONG THE PATH TOWARD THE MOUNTAINS (HEADING UPSTREAM ALONG THE CHANNEL) AND [BLUE] PAINT WHILE TRAVELING DOWNSTREAM TOWARD THE SALTON SEA.
2. ALL RAILS & POSTS SHALL BE POWDER COATED [WHITE].
3. CABLES AND CABLE HARDWARE SHALL NOT BE PAINTED.



1 METAL RAILING - OPTION A (6 CABLES)
NO SCALE

NO SCALE

ISSUE			INFO	Underground Service Alert  DIAL TOLL FREE 1-800-422-4133 AT LEAST TWO WORKING DAYS BEFORE YOU DIG
			PROJECT NO: 2015-093	
			CAD DWG FILE: CVL_V8-605-BR812	
			DESIGNED BY: SRB	
			DRAWN BY: SRB	
			REVIEWED BY: DY	
			DATE: 4.5.2022	
			SCALE: AS SHOWN	
	MARK	DATE	DESCRIPTION	

Underground Service Alert

DIGALERT



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1-800-422-4133
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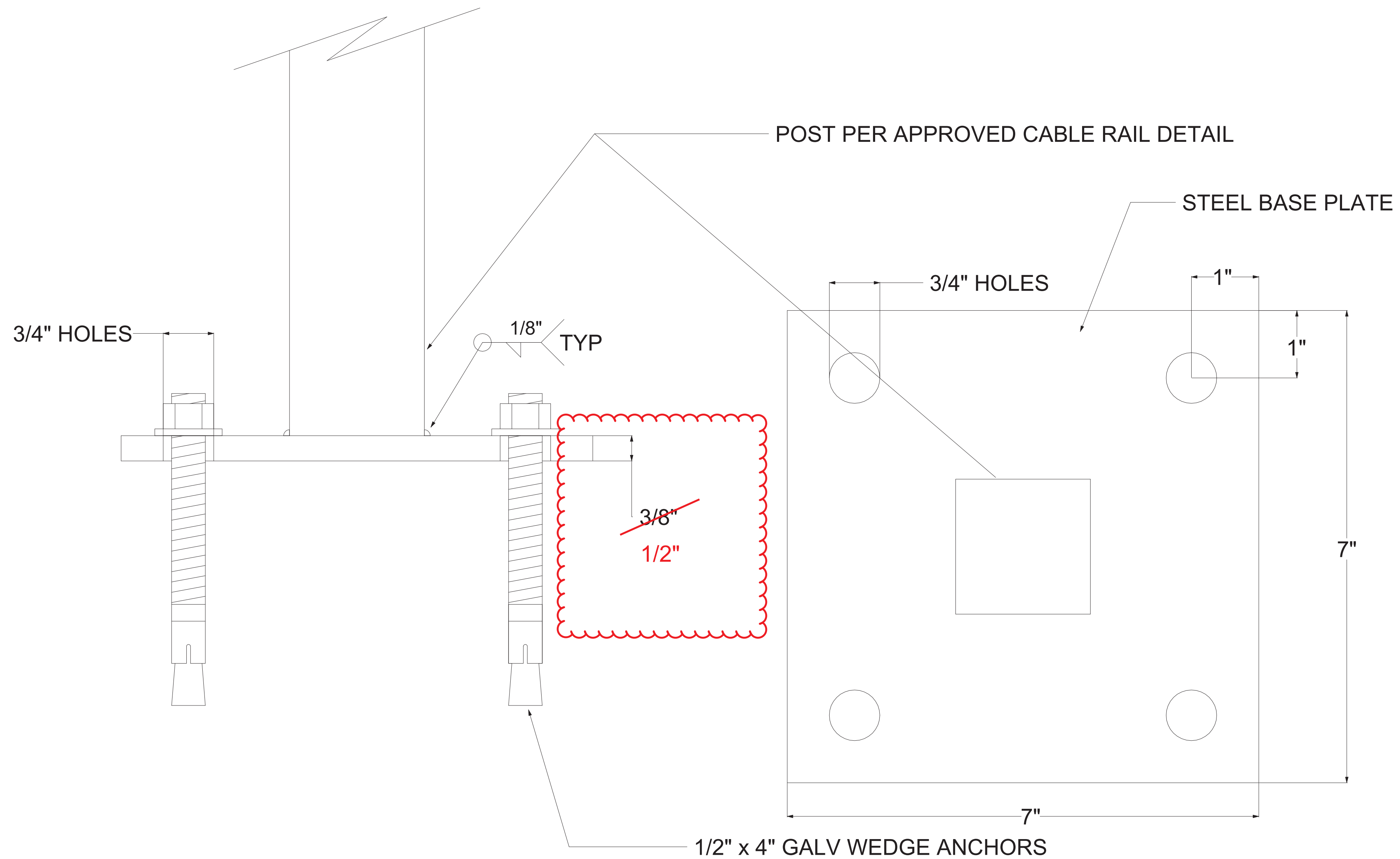
REFERENCE DRAWINGS



CV/ LINK
CONNECTING THE COACHELLA VALLEY

MULTI-MODAL TRANSPORTATION FACILITY
COACHELLA VALLEY - CALIFORNIA

SHEET TITLE	CABLE RAILING - TYPE C DETAIL METAL RAILING OPTION A DETAILS	SHEET NO.	BR812
		SHEET	



FOR CABLE RAIL ONLY

GALV STEEL WEDGE ANCHORS TO BE PEENED AFTER TIGHTENED



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Project:

**CV LINK
MULTIMODAL**

Contractor:

**AMES
CONSTRUCTION**

**CABLE RAIL BASE PLATE W/
WEDGE ANCHORS**

By:

John Fallon

Gate #

N/A

Date:

Dec. 9th, 2024

DWG #

**DWG: 01
Ref: NA**

Rev:

001

Scale:

NTS

APPENDIX E - SPECIFICATIONS

DIVISION IX TRAFFIC CONTROL DEVICES

83 RAILINGS AND BARRIERS

Replace Section 83-2.10 RESERVED with:

83-2.10 METAL RAILING (BRIDGE)

83-2.10A General

Section 83-2.10 includes specifications for fabricating and installing metal railing.

Metal railing must comply with section 83-1 and section 75-1.02.

83-2.10B Submittals

Submit shop drawings for metal railing. The shop drawings must include:

1. Details for venting and pickup holes in rails and sleeves.
2. Railing layout, sections, elevations, dimensions, and finish details.
3. Complete details for the construction of the work, including construction methods, sequence of shop and field assembly, and installation procedure.
4. All required mounting hardware for a complete railing system.
5. Openings and attachments for lighting system.

Submit 7 copies of the shop drawings. Allow 25 days for review. Upon authorization, the Engineer returns 2 copies to you for use during construction.

83-2.10C Materials

83-2.10C(1) Metal Components

Railing must be custom fabricated and consist of welded and mechanically fastened pieces.

The materials for metal railing components must comply with the specifications shown in the following table:

Material	Specification
Steel Plates	AASHTO M270, Grade 50
Steel Pipes	ASTM A53, Grade B
Round HSS	ASTM A500, Grade B
Steel Bars	ASTM A572, Grade 50
Anchor Rods	ASTM F1554, Grade 36
Nuts for Anchor Rods	ASTM A563
Washers for Anchor Rods	ASTM F436

The product number for the metal railing is VOL2525.

All rub rail and top rail mounting hardware must be stainless steel and tamper/theft resistant.

Rail tubes must be shop bent or fabricated to fit the horizontal curve if the radius is less than 900 feet. If the vertical radius of the railing is 30 feet or less, that portion of the railing must be shop bent.

The difference between out-to-out rail splice sleeve dimensions and the clear inside dimensions of the tubular steel rail elements must not exceed 3/16 inch after galvanizing.

Ferrous metal parts must be galvanized under section 75-1.02B.

Railings must conform to the curvature by means of a series of short chords, from center-to-center of rail posts, except (1) tubing for railings described as conforming to the curvature must be shop bent to fit the curvature and (2) tubing with a horizontal curve radius less than 900 feet must be shop bent or fabricated to fit the curvature. Joints must be matchmarked.

83-2.10C(2) Coatings

Organic zinc-rich primer used to paint the exposed anchor rod threads must be on the Authorized Material List for organic zinc-rich primers.

All top rails, rub rails, top brackets, rub rail brackets, 3/4" horizontal bars, and 1/2" x 2" flat vertical bars (at rail gaps) must be painted white (RAL 9016, Traffic White) after entire rail assembly has been galvanized.

The face of single plate posts that are visible in the eastbound direction must be painted blue (RAL 5015, Sky Blue) and the face visible in the westbound direction must be painted orange (RAL 2008, Bight Red Orange) after entire rail assembly has been galvanized.

The outside face of double plate posts that are visible in the eastbound direction must be painted blue (RAL 5015, Sky Blue) and the outside face visible in the westbound direction must be painted orange (RAL 2008, Bight Red Orange) after entire rail assembly has been galvanized. Inside faces of double plate posts must be painted white (RAL 9016, Traffic White).

83-2.10C Construction

Railings must present a smooth, uniform appearance in their final position, conforming closely to the horizontal and vertical lines shown and ordered.

All surfaces and welded joints of the grip portion of handrails must be ground smooth with no sharp corners. Gripping surfaces (tops or sides) must be uninterrupted by posts, other construction elements or obstructions. Edges must have a minimum radius of 1/8".

Welding must be in conformance with AWS Structural Welding Code (D1.1).

Hot-dip galvanize pipe rail assemblies after fabrication except as otherwise indicated. Zinc coating in accordance with ASTM A123. After galvanizing, railing must be painted. Galvanized surfaces to be painted must be prepared in accordance with ASTM D6386.

Anchor rods must be cast in fresh concrete. Installation in drilled holes is not an acceptable alternative.

Erect railings carefully and true to line and grade. Posts must be normal to the profile grade. Transverse to the profile grade, railings must be plumb within a tolerance not to exceed 0.02 foot in 10 feet. Adjacent rail elements must align with each other within 1/16 inch.

After installing the rail, paint the exposed anchor rod threads with 2 applications of organic zinc-rich primer.

83-2.10D Payment

The payment quantity for metal railing is the length measured along the face of the railing, including end and intermediate posts, with no deductions for gaps in the railing.

83-2.11 METAL RAILING (PATH)

83-2.11A General

Section 83-2.11 includes specifications for fabricating and installing metal railing.

Metal railing must comply with section 83-1 and section 75-1.02.

83-2.11B Submittals

Submit shop drawings for metal railing. The shop drawings must include:

1. Details for venting and pickup holes in rails and sleeves.

2. Railing layout, sections, elevations, dimensions, and finish details.
3. Complete details for the construction of the work, including construction methods, sequence of shop and field assembly, and installation procedure.
4. All required mounting hardware for a complete railing system.
5. Openings and attachments for lighting system.

Submit 7 copies of the shop drawings. Allow 25 days for review. Upon authorization, the Engineer returns 2 copies to you for use during construction.

83-2.11C Materials

83-2.11C(1) Cable Railing

Cable Railing Systems shall be GSI Highway Products or approved equal.

83-2.11C(2) Fasteners

Fasteners for anchoring railings to concrete: Inserts for cast-in-place concrete generally as indicated on the Drawings, of the type, grade, and class required to produce connections that are suitable for anchoring railing to concrete, and capable of withstanding design loadings. Fabricated from corrosion resistant materials with capability to sustain, without failure, the loads determined by local code requirements.

Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

Bolts shall be of the type indicated on the Drawings.

83-2.11C(3) Fabrication

1. Fabricate railing mechanical fasteners per drawings.
2. Form all changes in rail direction by mitered joints.
3. Cut materials square and remove burrs from all exposed edges, with no chamfer.
4. Make exposed joints butt tight and flush.
5. Close exposed visible ends of top rails by use of flat end cap.
6. Locate mid rails and vertical posts to provide the clearances indicated on the drawings.
7. Locate bottom rails to provide clearances indicated on drawings.
8. Verify dimensions on site prior to shop fabrication.

83-2.11C(4) Coatings

Organic zinc-rich primer used to paint the exposed anchor rod threads must be on the Authorized Material List for organic zinc-rich primers.

All top rails, rub rails, top brackets, rub rail brackets, 3/4" horizontal bars, and 1/2" x 2" flat vertical bars (at rail gaps) must be painted white (RAL 9016, Traffic White) after entire rail assembly has been galvanized.

The face of single plate posts that are visible in the eastbound direction must be painted blue (RAL 5015, Sky Blue) and the face visible in the westbound direction must be painted orange (RAL 2008, Bright Red Orange) after entire rail assembly has been galvanized.

The outside face of double plate posts that are visible in the eastbound direction must be painted blue (RAL 5015, Sky Blue) and the outside face visible in the westbound direction must be painted orange (RAL 2008, Bright Red Orange) after entire rail assembly has been galvanized. Inside faces of double plate posts must be painted white (RAL 9016, Traffic White).

83-2.11D Construction

Railings must present a smooth, uniform appearance in their final position, conforming closely to the horizontal and vertical lines shown and ordered.

83 RAILINGS AND BARRIERS

83-1 GENERAL

83-1.01 GENERAL

Section 83-1 includes general specifications for constructing railings and barriers.

Excavation and backfill must comply with section 19.

83-1.02 MATERIALS

83-1.02A General

Reserved

83-1.02B Steel Parts and Hardware

Welding must comply with AWS D1.1. Grind welds on exposed surfaces flush with the adjacent surfaces.

Galvanize completed steel parts and hardware for railings and thrie beam barrier under section 75-1.02B.

After galvanizing, the railing and barrier elements must be free of fins, abrasions, rough or sharp edges, and other surface defects and must not be kinked, twisted, or bent. If straightening is necessary, use an authorized method. Elements with kinks, twists, or bends may be rejected.

Clean and regalvanize (1) abraded or damaged galvanized surfaces of steel rail elements and posts and (2) ends of steel rail elements cut after galvanizing. If authorized, you may repair the surfaces under section 75-1.02B instead of regalvanizing.

83-1.02C Mortar

Mortar must comply with the specifications for mortar in section 51-1, except the mortar must consist of 1 part by volume of cement and 3 parts by volume of clean sand.

83-1.02D Markers

Markers must comply with section 82.

83-1.03 CONSTRUCTION

83-1.03A General

After constructing railings, barriers, terminal systems, crash cushions, and vegetation control, use the surplus excavated material to meet the grading requirements. Disposal of surplus material must comply with section 19-2.03B.

83-1.03B Mortar

Cure mortar by either the water method or the curing compound method using curing compound no. 6.

83-1.03C Median Barriers

Trim existing median plantings to clear the work area for median barrier construction. Dispose of the trimmings.

Do not remove an existing median barrier more than 500 feet in advance of the barrier being constructed.

At the end of each day's activities, reset the existing median barrier without mesh or glare screen and anchor the barrier in an authorized way such that no gap is left between the reset barrier and the barrier being constructed. You may place temporary barrier system instead of resetting the existing barrier.

83-1.03D Miscellaneous Construction

Where shown, paint the structure name, bridge number, year constructed, and other bridge identification information. Painting concrete must comply with section 78-4.03C(3).

Bridge identification on the bridge barrier must be (1) painted at each structure approach, (2) visible to approaching traffic, and (3) located near the paving notch, if applicable.

For open bridge barrier rails, paint bridge identification on the widest rail element.

For structures with adjacent retaining walls or approaches where metal beam bridge railings extend beyond the structure, paint bridge identification on the concrete end block of the barrier.

SECTION 83

RAILINGS AND BARRIERS

For bents and piers, paint bridge identification corresponding to the name and number shown, on the face of the bridge barrier directly above the centerline of each bent or pier.

83-1.04 PAYMENT

Except for midwest guardrail system and double midwest guardrail system, the payment quantity for railings is the length measured along the face of the railing, including end and intermediate posts, with no deductions for gaps in the railing for lighting and sign supports.

83-2 METAL RAILINGS AND BARRIERS

83-2.01 GENERAL

83-2.01A General

83-2.01A(1) General

Section 83-2.01 includes general specifications for constructing metal railings and barriers.

Locations shown are approximate. The Engineer will determine exact locations. Confirm layout with the Engineer prior to installation.

83-2.01A(2) Materials

W-beam elements, thrie beam elements, end caps, and return caps must comply with AASHTO M 180 for Class A, Type I, except within 0.5 miles of the coast the components must comply with AASHTO M 180 for Class A, Type II.

10-gauge rail elements for thrie beam elements and transition railings must comply with AASHTO M 180 for Class B, Type I, except within 0.5 miles of the coast the 10-gauge rail elements must comply with AASHTO M 180 for Class B, Type II.

Bolts, nuts, and other fittings for W-beam and thrie beam must comply with AASHTO M 180.

A W6 x 8.5 Steel post may be substituted for a W6 x 9 steel post.

Plastic blocks for midwest guardrail systems and thrie beam barrier must be on the Authorized Material List for highway safety features.

Grease used to coat the inside surfaces of foundation tubes to receive wood posts must not melt or run at a temperature of 149 degrees F.

83-2.01A(3) Construction

For midwest guardrail systems and thrie beam barrier, install posts, steel foundation tubes and soil plates in soil.

Cut off any excess bolt that extends more than 0.5 inch beyond the nut.

Metal beam railing must not be cut or modified in the field. Do not drill or punch new holes.

Steel or wood posts must not be cut in the field to reduce length.

Do not place posts in asphalt, concrete or structural section.

Do not install new wood posts or blocks with cracks wider than 1/4 inch with cracking evident through the wood to another side of the post or block.

Install posts no more than 1 inch per foot out of plumb unless otherwise described.

Place rub rail guardrail element when height of guardrail is more than 3 inches above standard placement height.

At locations exposed to traffic, schedule activities so that at the end of each day, no post holes are open and no posts are installed without the blocks and rail elements assembled and mounted. Anchor both leading and trailing ends of all guardrail or barriers to a permanent or temporary terminal system, end anchor assembly or anchor block. You may anchor to existing guardrail if connected using a standard bolted rail element splice.

Identify steel posts longer than 6 feet by painting the post length as a 2-inch-tall numeral in the web near the top of the post before installation. Before applying paint, ensure the post surface is free of all dirt, grease, oil, salt, or other contaminants by washing it with detergent or other suitable cleaner. Rinse thoroughly with fresh water and allow to fully dry. Use black metallic acrylic resin type paint.

83-2.01A(4) Payment

Not Used

83-2.01B Minor Concrete Vegetation Control

Reserved

83-2.02 MIDWEST GUARDRAIL SYSTEMS**83-2.02A General****83-2.02A(1) Summary**

Section 83-2.02 includes specifications for constructing midwest guardrail systems.

83-2.02A(2) Definitions

Reserved

83-2.02A(3) Submittals

Submit 2 certified copies of mill test reports as an informational submittal for each heat of steel from which the rail elements and steel posts are formed or fabricated.

For end anchor assemblies and rail tensioning assemblies, submit:

1. 2 certified copies of the mill test reports for each manufactured length of cable used.
2. 1 sample of the cable for testing. The cable must be 39 inches in total length and must be properly fitted with a swaged fitting and right-hand thread stud at both ends as specified in section 83-2.02B(2), including a clevis if shown.

83-2.02A(4) Quality Assurance

Reserved

83-2.02B Materials**83-2.02B(1) General****83-2.02B(1)(a) General**

Railing parts must be interchangeable with similar parts, regardless of the source.

The reinforcing steel in the concrete anchors for Type CA end anchor assemblies must comply with section 52.

83-2.02B(1)(b) Steel Components and Hardware

Workmanship for steel components and hardware must be equivalent to good commercial practice. Edges, bolt holes, and surfaces must be free of torn metal, burrs, sharp edges, and protrusions.

Fabricate the metal work in the shop. Do not punch, cut, or weld in the field.

Instead of the rolled steel section shown, you may substitute a welded section built up from structural steel plates if:

1. Depth, width, and average thicknesses of the welded section are at least equal to those of the rolled section
2. Steel plates of the welded section comply with ASTM A36/A36M
3. Flanges of the welded section are welded to the web with continuous fillet welds on each side of the web

The rail element metal must withstand a cold bend, without cracking, of 180 degrees around a mandrel of a diameter equal to 2.5 times the plate thickness.

If the radius of curvature of a rail element is 150 feet or less, shape the rail element in the shop. Stencil the radius of curvature on the back of each rail element in 2-1/2-inch-high numerals.

Fabricate steel posts from steel complying with ASTM A36/A36M.

Bolts must have shoulders of a shape that will prevent the bolts from turning. The holes in the rail elements must be of a shape similar to the bolt shoulder.

83-2.02B(1)(c) Wood Posts and Blocks

The grade and species of wood posts and blocks must be no. 1 timbers, also known as no. 1 structural, Douglas fir or no. 1 timbers Southern yellow pine. Wood posts and blocks must be graded under section 57-2.01B(2), except allowances for shrinkage after mill cutting must not exceed 5 percent of the American Softwood Lumber Standard, PS 20, minimum sizes when installed.

Wood posts and blocks must be rough or S4S. The size tolerance of rough sawn blocks in the direction of the bolt holes must not exceed $\pm 1/4$ inch.

After fabrication, the wood posts and blocks must be pressure treated under section 57-2.01 and AWP A U1, Use Category UC4A, Commodity Specification A.

83-2.02B(1)(d) Bolt Hole Grease

Grease used to fill bolt holes in wood posts and blocks must be recommended for corrosion protection by the manufacturer. The grease must not melt or run at a temperature of 149 degrees F.

83-2.02B(1)(e) Components for Connection to a Concrete Surface

Components for connecting midwest guardrail systems to vertical concrete surfaces, such as bridge railings, barriers, retaining walls, and abutments, must comply with the following requirements:

1. Metal box spacers and plate washers must be fabricated from steel complying with ASTM A36/A36M.
2. Metal box spacers must be fabricated from separate plates and welded or press-formed and welded.
3. HS bolts must comply with ASTM F3125, Grade A325/A325M, or ASTM A449, or be fabricated from steel rods complying with ASTM A449. The bolts or rods must comply with the mechanical requirements in ASTM F3125, Grade A325/A325M after galvanizing. The nuts and washers must comply with ASTM F3125, Grade A325/A325M.
4. For connecting guardrail to existing bridge railings or barriers, the epoxy adhesive used in the sand and the epoxy adhesive mixture for repairing spalled or damaged areas around the anchor bolt holes must be a 2-component, commercial-quality epoxy adhesive manufactured especially for making epoxy-sand mortar.
5. HSS sleeves must comply with ASTM A500/A500M, ASTM A501/A501M, or ASTM A1085/A1085M.

83-2.02B(2) End Anchor Assemblies and Rail Tensioning Assemblies

Section 83-2.02B(2) applies to end anchor assemblies and rail tensioning assemblies.

Concrete used to construct the anchors for end anchor assemblies must comply with the specifications for minor concrete.

Fabricate the metal components of anchor assemblies in compliance with good shop practice.

Fabricate the anchor plates, metal plates, foundation tubes, and soil plates from steel complying with ASTM A36/A36M.

Fabricate the anchor rods from steel complying with ASTM A36/A36M, ASTM A572, or ASTM A576, Grade 1018, 1019, 1021, or 1026. Hot forge the eyes or form the eyes with CJP welds. After fabricating and before galvanizing, thermally stress relieve anchor rods with eyes that were formed with any part of the eye below 1,600 degrees F during forming or with eyes that were closed by welding. The completed anchor rod after galvanizing must develop a strength of 50,000 lb.

Instead of using built-up fabrication, you may press-form the anchor plates from steel plate with or without welded seams.

Bolts and nuts must comply with ASTM A307.

Anchor cables must be 3/4-inch, preformed 6 x 19 wire strand core or independent wire rope core, galvanized under Federal Specification RR-W-410, right regular lay, manufactured from improved plow steel with a minimum breaking strength of 23 tons. The overall length of each cable anchor assembly must be at least 6.5 feet.

Use cable clips and a cable thimble to attach the cable to the anchor rod where shown. Thimbles must be commercial-quality, galvanized steel. Cable clips must be commercial-quality, drop-forged, galvanized steel.

Swaged fittings must be machined from hot-rolled steel bars complying with AISI C 1035 and annealed suitable for cold swaging. Galvanize the swaged fitting before swaging. To keep the stud in the proper position, drill a lock pin hole through the head of the swaged fitting and install a 1/4-inch plated steel spring pin. Stamp the manufacturer's identifying mark on the body of the swaged fitting.

Before galvanizing, mill a 3/8-inch slot in the stud end for the locking pin. Studs must comply with ASTM A449 after galvanizing.

The swaged fittings, stud, and nut assembly must develop the specified breaking strength of the cable.

Ship cable assemblies as a complete unit, including studs and nuts.

Clevises must be drop-forged galvanized steel and must develop the specified breaking strength of the cable.

For anchor rods to be buried in earth, coat the portions to be buried with a 20-mil minimum thickness of one of the following:

1. Coal tar enamel complying with AWWA C 203
2. Coal tar epoxy complying with either of the following:
 - 2.1. SSPC-Paint 16, Coal Tar Epoxy-Polyamide Black Paint
 - 2.2. U.S. Army Corps of Engineers Specifications, Formula C-200a, Coal Tar-Epoxy (Black) Paint

83-2.02B(3) Transition Railings

Reserved

83-2.02C Construction

83-2.02C(1) General

83-2.02C(1)(a) General

At locations where traffic is adjacent to midwest guardrail system work, all materials required to complete the guardrail work at a location must be available before you start work at the location.

Construct midwest guardrail systems using:

1. Steel or wood line posts.
2. Wood blocks for line posts. You may use plastic blocks for steel line posts where shown.
3. Only 1 type of post and block for any 1 continuous length of guardrail.

83-2.02C(1)(b) Posts

Drive wood posts with or without pilot holes, or place the posts in drilled holes. Backfill any space around the wood posts with selected earth that is free of rock. Place the earth in 4-inch-thick layers. Moisten and thoroughly compact each layer.

Drive steel posts with or without pilot holes. If pilot holes are used, backfill any space around the steel posts with dry sand or pea gravel after driving.

Drive steel foundation tubes with soil plates attached with or without pilot holes, or place them in drilled holes. Backfill any space around the foundation tubes with selected earth that is free of rock. Place the earth in 4-inch-thick layers. Moisten and thoroughly compact each layer. Coat the inside surfaces of the foundation tubes to receive wood terminal posts with grease. Insert the posts into the tubes by hand. Do not drive the posts. You may slightly round the post edges to facilitate insertion.

83-2.02C(1)(c) Bolt Holes in Wood Posts and Cuts in Blocks

If copper naphthenate, Alkaline Copper Quaternary ammonium compound, or copper azole is used to treat wood posts and blocks, before inserting the bolts, fill the bolt holes with grease.

You may field bore the 2-3/8-inch-diameter holes shown for wood guardrail terminal posts and wood rail tensioning assembly posts.

If you perform field cutting or boring after treatment, manually treat with preservative under section 57-2.01C(3)(b).

83-2.02C(1)(d) Rail Elements

The edges and center of the rail elements must contact each post block when bolted.

Lap the rail elements such that the exposed ends do not face approaching traffic.

The rail elements must have full bearing at joints.

Install end caps and return caps where shown. Install end caps flush with barrier face.

83-2.02C(1)(e) Connection to a Concrete Bridge Railing or Barrier

If connecting a midwest guardrail system to a new concrete bridge railing, AGT buttress, anchor block, or barrier, form holes using galvanized HSS sleeves.

If connecting a midwest guardrail system to an existing concrete bridge railing or barrier, drill anchor bolt holes in the concrete.

Repair any areas around the holes that were spalled or otherwise damaged during drilling using an epoxy adhesive and sand mixture in proportions of 1:4 to 1:6. The epoxy adhesive must comply with section 83-2.02B(1)(e). Mix the 2 components and the epoxy-sand mixture under the manufacturer's instructions.

83-2.02C(1)(f) Anchor Bolts Set With Epoxy

For anchor bolts set with epoxy, place the anchor bolts in holes filled with a 2-component epoxy mixture complying with the specifications for load bearing applications.

83-2.02C(2) End Anchor Assemblies

Place the concrete for end anchors for Type CA end anchor assemblies against the undisturbed material of the excavated holes. If ordered, form the top 12 inches of the holes.

Tighten the anchor cables for Type CA end anchor assemblies after the concrete anchor has cured for at least 5 days.

83-2.02C(3) Transition Railings

Construct AGT using wood blocks with steel posts.

83-2.02C(4) Buried Post End Anchors

Alignment and elevation of the buried post end anchor will be established by the Engineer.

Excavate into slope and extend rail elements until there is 1 foot minimum of cover over the anchor post. A partial element may be used if needed to achieve required cover.

Do not install blocks on posts where blocks will have contact with soil. Bolt the rail directly to the post.

Backfill buried post end anchors and grade as shown. Provide drainage and conform to adjacent grading and other features.

The guardrail element attached to the anchor post may be drilled in the field at the bolted connection.

For buried post end anchor Type B-S, install longer posts if needed to maintain 3-foot post embedment.

83-2.02D Payment

Except for midwest guardrail systems located within the pay limits of (1) a terminal system, (2) a transition railing, (3) an end anchor assembly, (4) a buried post end anchor, or (5) a railing tensioning assembly, the payment quantity for midwest guardrail system is the length measured along the face of the rail element

from end post to end post of the completed railing. The point of measurement at the end post is the center of the bolt attaching the rail element to the end post. If midwest guardrail system is connected to a structure, barrier, wall, or abutment, the point of measurement is the midpoint between the 2 bolts attaching the rail element to the structure, barrier, wall, or abutment.

Rub rail will be measured from the first post connected to the rub rail to the last post connected to the rub rail and will be paid as additional length of MGS.

The payment quantity for double midwest guardrail system is the length measured from end post to end post along the center line of the guardrail.

83-2.03 THRIE BEAM BARRIERS

83-2.03A General

Section 83-2.03 includes specifications for constructing thrie beam barrier.

Thrie beam barrier must comply with the specifications for midwest guardrail systems in section 83-2.02.

Thrie beam barrier work includes transition sections between W beam and thrie beam elements.

83-2.03B Materials

Use steel posts for thrie beam barrier Type M, except use wood posts for posts set in steel foundation tubes at trailing end anchors.

Use wood or plastic blocks with steel posts.

For thrie beam barrier on bridges:

1. Threaded rods must comply with ASTM A307
2. Anchor bolts must comply with ASTM F1554, Grade 55
3. Plates must comply with section 55

83-2.03C Construction

If median barrier delineation is shown, match the barrier marker spacing to the raised pavement marker spacing on the adjacent median edge line pavement delineation.

83-2.03D Payment

The payment quantity for single thrie beam barrier is the length measured from end post to end post along the face of the rail element of the installed barrier. The quantity does not include any portion of single thrie beam barrier within the pay limits of a transition railing.

The payment quantity for single thrie beam barrier constructed on each side of a bent underneath a structure or on each side of other obstructions is the length measured along each face of the installed barriers.

The payment quantity for double thrie beam barrier is the length measured from end post to end post along the center line of the installed barrier. The quantity does not include any portion of double thrie beam barrier within the pay limits of a transition railing.

The point of measurement at the end posts of single and double thrie beam barriers is the center of the bolt or rod attaching the rail element to the end post.

If a single thrie beam barrier is constructed on each side of a median obstruction and the single barriers merge into a double barrier, the post with 2 blocks attached is the end post for measuring the length of the single and double thrie beam barriers.

The division point for determining the payment quantities of double thrie beam barrier (bridge) and double thrie beam barrier is the face of the paving notch of the bridge.

83-2.04 TERMINAL SYSTEMS

83-2.04A General

83-2.04A(1) General

Section 83-2.04 includes general specifications for constructing terminal systems.

SECTION 83

RAILINGS AND BARRIERS

83-2.04A(2) Materials

Not Used

83-2.04A(3) Construction

Not Used

83-2.04A(4) Payment

Not Used

83-2.04B Alternative In-Line Terminal Systems

Reserved

83-2.04C Alternative Flared Terminal Systems

Reserved

83-2.04D–83-2.04H Reserved

83-2.05 CALIFORNIA BRIDGE RAILS

83-2.05A General

83-2.05A(1) Summary

Section 83-2.05 includes specifications for constructing California bridge rail.

California bridge rail consists of steel post and beam railing.

Concrete must comply with section 51.

Reinforcement must comply with section 52.

ST-75SW and ST-76SW California bridge rails include the handrailings.

Drill and bond the threaded rods using chemical adhesive systems under section 51-1.

83-2.05A(2) Definitions

Reserved

83-2.05A(3) Submittals

Submit shop drawings for the California bridge rail. The shop drawings must include:

1. Details for venting and pickup holes
2. Railing layout
3. Complete details for the construction of the work, including construction methods, sequence of shop and field assembly, and installation procedures

Submit 7 copies of the shop drawings. Allow 25 days for review. Upon authorization, the Engineer returns 2 copies to you for use during construction.

83-2.05A(4) Quality Assurance

Reserved

83-2.05B Materials

83-2.05B(1) General

Reserved

83-2.05B(2) Reinforced Concrete

In freeze-thaw areas:

1. Concrete must contain at least 675 pounds of cementitious material per cubic yard
2. Bar reinforcing steel must comply with section 52-2.02

83-2.05B(3) Metal Components

Structural shapes, structural tubing, plates, bars, bolts, nuts, and washers must comply with section 55-1.02. Other fittings must be commercial quality.

Formed steel sections must be uniform in appearance.

Stud bolts must comply with the specifications for studs in clause 9 of AWS D1.1.

Ferrous metal parts must be galvanized under section 75-1.02B.

Railings must conform to the curvature by means of a series of short chords, from center-to-center of rail posts, except (1) tubing for railings described as conforming to the curvature must be shop bent to fit the curvature and (2) tubing with a horizontal curve radius less than 900 feet must be shop bent or fabricated to fit the curvature. Joints must be matchmarked.

Anchor bolts and threaded rods must comply with ASTM F1554, Grade 105.

Cables must be galvanized and comply with ASTM A1023/A1023M.

Bridge rail post plates and base plates must comply with one of the following:

1. ASTM A709/A709M, Grade 36 or Grade 50
2. ASTM A572/A572M, Grade 42 or Grade 50
3. ASTM A36/A36M

Parapet shoe plates must comply with one of the following:

1. ASTM A709/A709M, Grade 50
2. ASTM A572/A572M, Grade 50

Structural steel tubing for bridge rail must comply with one of the following:

1. ASTM A500/A500M, Grade B or Grade C
2. ASTM A1085/A1085M

Thread-locking systems must comply with section 75-3.02B.

83-2.05B(4) Coatings

Organic zinc-rich primer used to paint the exposed bolt threads must be on the Authorized Material List for organic zinc-rich primers.

83-2.05C Construction

Railings must present a smooth, uniform appearance in their final position, conforming closely to the horizontal and vertical lines shown or ordered. Do not incorporate venting or pickup holes on the traffic side of railing.

Erect railings carefully and true to line and grade. Posts must be normal to the profile grade. Transverse to the profile grade, railings must be plumb within a tolerance not to exceed 0.02 foot in 10 feet. Adjacent rail elements must align with each other within 1/16 inch.

In freeze-thaw areas, cure concrete by the water method.

After installing the rail, paint the exposed bolt threads with 2 applications of organic zinc-rich primer.

83-2.05D Payment

The payment quantity for California bridge rail is the length measured from end to end along the face of the railing, including reinforced concrete end blocks and intermediate posts.

83-2.06 CHAIN LINK RAILINGS**83-2.06A General**

Section 83-2.06 includes specifications for constructing chain link railings.

83-2.06B Materials

Structural shapes, plates, bars, and bolts must comply with section 55-1.02.

Structural tubing steel must comply with ASTM A500/A500M or A501.

Frame members carrying electrical conductors must be rigid metal conduit manufactured of mild steel complying with UL 6, Electrical Rigid Metal Conduit - Steel. Hot dip galvanize the interior and exterior surfaces of the rigid metal conduit.

Truss rods, post tops, and other required fittings and hardware must be steel, malleable iron, or wrought iron. Post tops and other closures must be watertight. Fittings and hardware must fasten properly to the posts and other members.

Cable used in the frame must:

1. Be wire rope
2. Be 5/16 inch in diameter
3. Have a minimum breaking strength of 5,000 lb
4. Be galvanized under Federal Specification RR-W-410

Crimped sleeve clamps and stud socket assemblies must:

1. Be metal
2. Develop the strength of the cable
3. Be the same color as the cable

Tension wires must be at least 7-gauge coil spring steel.

Post clips must be at least 9-gauge steel.

Wire ties or hog rings must be 9-gauge, commercial-quality steel wire.

Galvanize the tension wires, post clips, wire ties, and hog rings under ASTM A116, Coating Type Z, Class 3.

You may substitute one of the following for the steel wire ties or hog rings:

1. 6-gauge (0.192-inch minimum diameter) aluminum wire ties complying with ASTM B211 or B211M, Alloy 1100-H18.
2. 6-gauge (0.192-inch minimum diameter) aluminum hog rings complying with ASTM B211 or B211M, Alloy 6061-T94 or Alloy 5052-H38.

Chain link fabric must be 11 gauge and must comply with one of the following:

1. AASHTO M 181, Type I, Class C
2. AASHTO M 181, Type IV, Class A
3. ASTM F1345, Class 2

Chain link fabric must be woven into approximately 1-inch mesh.

All of the railings for a single structure must be the same color.

83-2.06C Construction

Give wire ties at least 1 complete turn. Bend the wire tie ends away from pedestrian traffic.

Tighten truss rods and cables with turnbuckles or other fittings.

Install a thimble at each cable loop.

Stretch and fasten the chain link fabric securely to the posts, other members, and tension wires. Stretch the tension wires tightly.

Wherever necessary to conform to horizontal or vertical curvature, rework and fit the fabric to present a smooth, neat, and workmanlike appearance.

Provide openings in the fabric as required by other facilities. Reinforce the openings with at least 1 turn of 6-gauge wire.

SECTION 83

RAILINGS AND BARRIERS

Attach pipe handrailing to chain link railing where shown. Pipe handrailing must comply with section 83-2.09.

83-2.06D Payment

Not Used

83-2.07 CABLE RAILINGS

83-2.07A General

Section 83-2.07 includes specifications for constructing cable railings.

83-2.07B Materials

Concrete for the post footings must comply with the specifications for minor concrete.

Pipe for posts and braces must be standard steel pipe or pipe complying with section 80-3.02B.

Truss rods, post tops, cable clamps, eye bolts, thimbles, and other required fittings must be commercial-quality steel, malleable iron, or wrought iron. Post tops must be watertight. The eye of the eye bolts must be either drop forged or formed with a complete penetration weld. The eye must develop 100 percent of the bolt strength.

Turnbuckles must:

1. Be commercial quality
2. Have jaw or eye ends
3. Have a minimum breaking strength of 2,700 lb
4. Be steel pipe type or drop-forged steel

Crimped sleeve clamps and stop sleeve clamps must:

1. Be nonferrous metal
2. Develop the strength of the cable
3. Be the same color as the cable

Cables must be galvanized and comply with ASTM A1023/A1023M.

83-2.07C Construction

Tension the cables to provide taut railings between posts.

Install a thimble at each cable loop.

83-2.07D Payment

Not Used

83-2.08 TUBULAR RAILINGS

83-2.08A General

83-2.08A(1) Summary

Section 83-2.08 includes specifications for constructing tubular railings.

Tubular railing includes rail tubes, post tubes, plates, rail splice sleeves, and fasteners. For Type 85 concrete barrier, tubular bicycle railing includes the upper and lower tubular bicycle railing.

83-2.08A(2) Definitions

Reserved

83-2.08A(3) Submittals

Submit a certificate of compliance verifying that all components of the tubular railing comply with section 83-2.08B.

Submit shop drawings for tubular railing. Shop drawings must include:

1. Details for venting holes in rails, posts, and sleeves

2. Railing layout
3. Complete details for the construction of the work including methods of construction, sequence of shop and field assembly, galvanization, and installation procedures

Submit 7 copies of the shop drawings. Allow 25 days for review. Upon authorization, the Engineer returns 2 copies to you for use during construction.

83-2.08A(4) Quality Assurance

Reserved

83-2.08B Materials

The materials for tubular railing components must comply with the specifications shown in the following table:

Material	Specification
Rail and post tubes	ASTM A500/A500M, Grade B
Rolled bars and plates	ASTM A36/A36M
Rail splice sleeves	ASTM A36/A36M
Bolts	ASTM F3125, Grade A325/A325M, Type 1
Threaded rods	ASTM A449, Type 1 or ASTM F1554, Grade 55, Class 2A
Nuts for bolts and threaded rods	ASTM A563/A563M
Washers for bolts and threaded rods	ASTM F436/F436M, Type 1, including S1 supplementary

Rail tubes must be shop bent or fabricated to fit the horizontal curve if the radius is less than 900 feet.

If the vertical radius of the tubular railing is 30 feet or less, that portion of the railing must be either shop bent or built up from 1/4-inch-thick structural steel plates. The built-up tubular rail elements must match the seamless tubing in appearance.

The difference between out-to-out rail splice sleeve dimensions and the clear inside dimensions of the tubular steel rail elements must not exceed 3/16 inch after galvanizing.

Carefully handle the materials such that no parts are bent, broken, abraded, or otherwise damaged. Do not use manufacturing, handling, or installation methods that damage or distort the members or damage the galvanizing.

83-2.08C Construction

83-2.08C(1) General

Before the tubular railing parts are assembled, clean the bearing surfaces and surfaces to be in permanent contact. If the railing is mounted on a concrete surface, the post bases must be true and flat to provide uniform bearing.

Tubular railings must present a smooth, uniform appearance in their final position and conform closely to the horizontal and vertical lines as shown.

83-2.08C(2) Tubular Handrailing

Adjust the vertical position of the tubular handrailing to compensate for the camber and dead load deflection of the superstructure. The Engineer determines the adjustment amount before the railing is installed.

The metal railing posts to which the chain link railing attaches must fit the mounting brackets, pipe sleeves, and other connection fittings.

Where necessary, install shims at posts and rail elements to provide uniform bearing and conformance with the horizontal lines and vertical grade lines. Shims at steel posts must be commercial-quality, galvanized sheet steel.

83-2.08C(3) Tubular Bicycle Railing

If authorized as alternative to cast-in threaded rods, you may cast sleeves for the threaded rods, or drill and bond the threaded rods using chemical adhesive systems under section 51-1.

SECTION 83

RAILINGS AND BARRIERS

Erect railing true to line and grade. Posts must be normal to the profile grade. Transverse to the profile grade, railings must be plumb within a tolerance not to exceed 0.02 foot in 10 feet. Adjacent rail elements must align with each other within 1/16 inch.

83-2.08D Payment

Not Used

83-2.09 PIPE HANDRAILINGS

83-2.09A General

Section 83-2.09 includes specifications for constructing pipe handrailings.

83-2.09B Materials

Rail elements must be commercial-quality standard steel pipe.

Brackets, bolts, nuts, and other fittings must be commercial-quality structural steel, except standard steel pipe fittings may be used where shown.

83-2.09C Construction

Erect pipe handrailings carefully and true to line and grade.

83-2.09D Payment

Not Used

83-2.10–83-2.14 RESERVED

83-3 CONCRETE BARRIERS

83-3.01 GENERAL

83-3.01A Summary

Section 83-3 includes specifications for constructing concrete barriers and wildlife passage ways in concrete barriers.

Concrete must comply with section 51.

Reinforcement must comply with section 52.

Drill and bond dowels under section 51.

Concrete barrier work includes:

1. Bar reinforcing steel, including the length that extends from the barrier into decks, walls, and footings
2. Constructing Type L wildlife passage ways
3. Constructing steel plate barriers at overhead sign foundations, electroliers, drainage structures, and other locations shown

Thrie beam barrier elements, end caps, and hardware required to construct Type M wildlife passage ways must comply with section 83-2.03.

83-3.01B Definitions

Reserved

83-3.01C Submittals

If the extrusion or slip form method is to be used and the reinforcement is not fixed in place before placing the concrete, submit a QC plan for the extrusion or slip form construction method. The QC plan must include:

1. Contingency plan for correcting problems in production, transportation, or placement
2. Procedure for splicing concrete barrier reinforcement
3. Procedure for positioning reinforcement during extrusion or slip form operations
4. Test procedure for verifying the final positions of the longitudinal reinforcement

5. Test report form to be used that shows the station of the test, the position of the reinforcement relative to the top of the barrier, and the clearance cover from the faces of the barrier to the reinforcement

Submit the test report forms within 48 hours after constructing the concrete barrier.

Submit a certificate of compliance for a new or used Type 60K portable concrete barrier that is not cast on the job site.

If tubular railing is shown on concrete barrier, submit 2 copies of the threaded rod layouts before placing the barrier reinforcement.

83-3.01D Quality Assurance**83-3.01D(1) General**

Reserved

83-3.01D(2) Quality Control**83-3.01D(2)(a) General**

Reserved

83-3.01D(2)(b) Barrier Smoothness

Test the smoothness of the top and exposed faces of barriers using a 10-foot straightedge laid on the surfaces.

83-3.01D(2)(c) Barrier Reinforcement Positions

For the extrusion or slip form construction method, if the reinforcement is not fixed in place before placing the concrete, verify the final positions of the horizontal reinforcement at 100-foot intervals, evaluated a minimum of 20 feet behind the trailing extrusion or slip form edge, by testing the position of the reinforcement relative to the top of the barrier and the clearance cover from the faces of the barrier to the reinforcement.

83-3.01D(3) Department Acceptance

The Department rejects concrete barriers with any reinforcement that does not comply with section 83-3.03A(6)(c)(iii).

83-3.02 MATERIALS**83-3.02A General**

Reserved

83-3.02B Concrete**83-3.02B(1) General**

Concrete for Type 60M series concrete barriers must comply with the specifications for minor concrete, except the concrete must contain at least 550 pounds of cementitious material per cubic yard.

In non-freeze-thaw areas, concrete for concrete barriers other than Type 60M series must contain at least 590 pounds of cementitious material per cubic yard.

In freeze-thaw areas, concrete for concrete barriers must contain at least 675 pounds of cementitious material per cubic yard.

For Type 60MF, 60MGF, and 60MSF concrete barriers, the concrete paving between the tops of the 2 walls of the barrier and the optional concrete slab at the base between the 2 walls of the barrier must comply with the specifications for minor concrete.

83-3.02B(2) Concrete for Extrusion or Slip form Methods

Minor concrete for extruded or slip formed concrete barriers must comply with the following:

1. Maximum aggregate size must be no larger than 1-1/2 inches and no smaller than 3/8 inch.
2. If the 3/8-inch maximum size aggregate is used, the concrete must contain at least 675 pounds of cementitious material per cubic yard.

3. Combined aggregate gradation must produce concrete of the shape and surface texture specified.
4. Consistency must be such that after extrusion or slip forming, the concrete maintains the shape of the barrier without support.

You may make the concrete by continuously batching the materials by volume and mixing in a continuous mixer under the batching and mixing requirements in ASTM C685/C685M.

83-3.02C Bar Reinforcing Steel

In freeze-thaw areas, bar reinforcing steel for concrete barriers must be epoxy coated under section 52-2.02.

83-3.02D Steel Plates and Hardware

Structural steel plates must comply with section 55-1.02D.

Hardware, including concrete anchorage devices, must comply with section 75-3.

Galvanized structural steel plates and hardware must comply with section 75-1.02B.

83-3.02E Granular Backfill

For Type 60MF, 60MGF, and 60MSF concrete barriers, the granular material for backfill between the 2 walls of concrete barrier must:

1. Be earthy material suitable for the purpose intended
2. Have no rocks, lumps, or clods exceeding 1-1/2 inches in greatest dimension

83-3.02F Reserved

83-3.02G Connection of a Concrete Barrier to a Structure

Sheet metal, neoprene strip, and grease at the connection of a concrete barrier to a structure must comply with the following:

1. Sheet metal must be commercial-quality galvanized sheet steel that is smooth and free of kinks, bends, or burrs. Joints in the sheet metal must be butt joints sealed with plastic duct-sealing tape.
2. Neoprene strip must comply with the specifications for neoprene in section 51-2.04.
3. Grease must comply with SAE AS8660.

Expanded polystyrene at the connection of a concrete barrier to a structure and at a concrete barrier transition at a bridge column must comply with section 51-2.01B(1).

83-3.02H Type 60K Portable Concrete Barriers

Type 60K portable concrete barrier must consist of interconnected new or undamaged used PC portable concrete barrier units.

For Type 60K portable concrete barrier:

1. Concrete must comply with the specifications for minor concrete, except weighmaster certificates and certificates of compliance are not required
2. Steel plates must comply with ASTM A36/A36M. After fabrication, galvanize the steel plates under section 75-1.02B
3. Connection pins must be round bars complying with ASTM A36/A36M

83-3.03 CONSTRUCTION

83-3.03A General

83-3.03A(1) General

Reserved

83-3.03A(2) Closing Gaps in Concrete Barriers

During construction on highways open to traffic, if a gap is left in the concrete barrier, such as for equipment or special drainage features, close the gap by temporary or permanent means when work is not actively in progress at the location of the gap.

83-3.03A(3) Adjusting Barrier Height

If the concrete barrier height is adjusted, the Engineer determines the adjustment amount before the concrete is placed.

For a concrete barrier constructed on a recently completed bridge, adjust the barrier height to compensate for the camber and dead load deflection of the superstructure. Construct the barrier after the falsework has been released and as long after the superstructure construction as the progress of the work will allow.

For a concrete barrier constructed on existing or new pavement or on an existing or new structure, adjust the barrier height to compensate for irregularities in the existing grade.

83-3.03A(4) Locating Expansion Joints

Locate concrete barrier expansion joints at deck, pavement, and principal wall joints. The expansion joint filler material must be the same size as the joint or a minimum of 1/2 inch.

83-3.03A(5) Placing Barriers

The concrete barrier must present a smooth, uniform appearance in its final position, conforming closely to the horizontal and vertical lines shown or ordered. The barrier must be free of lumps, sags, or other irregularities.

You may place the portion of the barrier that is below finished grade to the neat lines of the excavation.

Construct concrete barrier footings on a minimum of 90 percent compacted material.

Construct concrete barrier on a minimum of 4 inches of AC or concrete.

83-3.03A(6) Barrier Construction Methods**83-3.03A(6)(a) General**

Construct Type 60 series concrete barriers by one of the following methods:

1. Cast-in-place-with-fixed-forms method
2. Extrusion or slip form method
3. Combination of both methods

Construct concrete barriers other than Type 60 series by the cast-in-place-with-fixed-forms method.

83-3.03A(6)(b) Cast-In-Place-with-Fixed-Forms Method

Concrete barriers constructed by the cast-in-place-with-fixed-forms method must comply with section 51.

Do not use PC mortar blocks to support the reinforcing steel on the traffic side of barriers.

83-3.03A(6)(c) Extrusion or Slip form Method**83-3.03A(6)(c)(i) General**

Reserved

83-3.03A(6)(c)(ii) Placing Concrete

For concrete barriers constructed using an extrusion or slip form machine or other similar type of equipment, the concrete must be well compacted and dense and the exposed surfaces must comply with section 51. You may be required to submit evidence of successful operation of the extrusion or slip form machine or other equipment.

Feed the concrete to the extrusion or slip form machine at a uniform rate. Operate the machine under enough uniform restraint to the forward motion to produce a well-compacted concrete mass free from surface pits larger than 1 inch in diameter and requiring no further finishing other than that specified in section 83-3.03A(7).

83-3.03A(6)(c)(iii) Placing Reinforcing Bars

For concrete barriers constructed using extrusion or slip form methods, place the horizontal reinforcing bars continuously.

If the reinforcement is not fixed in place before placing the concrete, the reinforcement must not deviate more than 1 inch from the positions shown when tested under section 83-3.01D(2)(c).

83-3.03A(6)(c)(iv) Maintaining Barrier Grades

The grade for the top of concrete barriers constructed using extrusion or slip form methods must be indicated by an offset guide line set from survey marks established by the Engineer. The forming portion of the extrusion or slip form machine must be readily adjustable vertically during the forward motion of the machine to conform to the predetermined grade line. A grade line gauge or pointer must be attached to the machine such that a continual comparison can be made between the barrier being placed and the established grade line as indicated by the offset guide line.

Instead of the above method for maintaining the barrier grade, the extrusion or slip form machine may be operated on rails or forms set at a uniform depth below the predetermined finished top of the barrier grade or on existing pavement or bridge decks.

83-3.03A(6)(c)(v) Constructing Expansion Joints

For concrete barriers constructed using extrusion or slip forming methods, construct expansion joints using one of the following methods:

1. Comply with section 51.
2. Saw through the barrier section to its full depth. On each end of a saw-cut joint for a Type 60M series concrete barrier that is slip-formed, the barrier must have a 10" deep by 10'-0" long foundation/footing on either side of the joint that also includes the additional reinforcing.

If the Type 60M series concrete barrier was poured without the 10" deep by 10'-0" long foundation/footing with the additional reinforcing as shown, do not saw-cut a joint at that location. Remove a sufficient section of the Type 60M series concrete barrier and re-do it with the 10" deep by 10'-0" long foundation/footing with the additional reinforcing and cast it with forms. If the joints are sawed or formed before the concrete has hardened, firmly support the adjacent portions of the barrier with close fitting shields.

If the joints are sawed or formed after applying curing compound, treat the exposed barrier faces in the vicinity of the joint with curing compound after sawing or forming the joints.

83-3.03A(7) Finishing

Before applying the curing compound, the surface finish of Type 60 series concrete barriers must be free from surface pits larger than 1 inch in diameter, and you must give the surface a soft brush finish with strokes parallel to the line of the barriers. Do not finish the surface with a brush application of grout.

To facilitate finishing, remove fixed forms for CIP Type 60 series concrete barriers as soon as possible after the concrete has set enough to maintain the barrier shape without support.

The surface finish of Type 60 series concrete barriers must be Class 1 surface finish if cured by the forms-in-place method.

At least 7 days after placing Type 60 series concrete barriers, give the exposed surfaces a final light abrasive blast finish to achieve a uniform appearance.

The final surface finish of concrete barriers other than Type 60 series must be a Class 1 surface finish. Any alternative method of final surface finishing must be authorized.

Class 1 surface finish must comply with section 51-1.03F(3).

83-3.03A(8) Curing

Cure the exposed surfaces of concrete barriers by the curing compound method using curing compound no. 6.

For concrete barriers on bridges and walls that do not support soundwalls, you may cure the formed surfaces of the barriers by keeping the forms in place for at least 12 hours after placing the concrete. No further curing is required after the forms are removed.

For Type 60 series concrete barriers not using the forms-in-place curing method, apply the curing compound using a mechanical sprayer capable of applying the curing compound to at least one entire side and the top of the concrete barrier in one application at a uniform rate of coverage. Protect the spray against wind.

In freeze-thaw areas, cure concrete barriers on bridges and walls by the water method.

For Type 85 and Type 86 series concrete barriers, cure the formed surfaces of the barriers by keeping the forms in place for at least 36 hours after placing the concrete. No further curing is required after the forms are removed.

83-3.03A(9) Smoothness

The top and exposed faces of barriers must comply with the following smoothness requirements when tested under section 83-3.01D(2)(b):

1. For Type 60 series concrete barriers, the top must not vary more than 0.02 foot from the edge of the straightedge and the faces must not vary more than 0.04 foot from the edge of the straightedge.
2. For concrete barriers other than Type 60 series, both the top and faces must not vary more than 0.02 foot from the edge of the straightedge.

83-3.03A(10) Installing Tubular Handrailings

For a tubular handrailing mounted on a Type 80SW concrete barrier, drill and bond the threaded rods under the specifications for drilling and bonding dowels in section 51-1.

83-3.03A(11) Installing Barrier Markers

Cement the markers to the barrier under the manufacturer's instructions. Match the barrier marker spacing to the raised pavement marker spacing on the adjacent median edge line pavement delineation.

83-3.03A(12) Reserved

83-3.03A(13) Placing Granular Backfill

For Type 60MF, 60MGF, and 60MSF concrete barriers, place the granular material for backfill between the 2 walls of the concrete barrier must be placed without compaction.

83-3.03B Concrete Barriers at Existing Structures

For a concrete barrier constructed on an existing structure, bond the dowels in drilled holes in the existing concrete.

For a concrete barrier constructed to the face of an existing concrete structure, match the existing weep holes.

83-3.03C Connection of a Concrete Barrier to a Structure

At the connection of a concrete barrier to a structure, apply a uniform film of grease to the upper surface of the neoprene strip before placing the sheet metal.

83-3.03D Concrete Barrier Transitions

For a concrete barrier transition:

1. Remove portions of the existing concrete barrier where shown
2. Roughen the contact surfaces of the existing concrete barrier
3. Drill and bond dowels into the existing concrete barrier

83-3.03E Type 60K Portable Concrete Barriers

Set Type 60K portable concrete barriers on a firm, stable foundation. Grade the foundation to provide uniform bearing throughout the entire barrier length.

Place and maintain the abutting ends of the PC concrete units in alignment without substantial offset to each other. Position the PC concrete units straight on tangent alignments and on a true arc on curved alignments. The minimum curve radius for horizontal alignments is 164 feet.

The final surface finish of Type 60K portable concrete barriers must comply with section 51-1.03F(2).

SECTION 83

RAILINGS AND BARRIERS

Place the fabrication date and your name or logo on each panel. The fabrication date and name or logo must be 4 inches or less in height and must be located 12 inches or less above the bottom of the rail panel.

Cure the exposed surfaces of concrete elements by the water method, the forms-in-place method, or the curing compound method. Curing compound must be curing compound no. 1.

83-3.03F Wildlife Passage Ways

Construct wildlife passage ways in concrete barriers where shown.

Construct the passage way opening by forming the opening in the concrete barrier or, after the concrete barrier is constructed, by saw cutting the outline of the opening and removing the concrete and bar reinforcing steel within the limits of the opening.

The completed opening for the wildlife passage way must be clear and unobstructed for the dimensions shown.

For a Type M wildlife passage way, you may be required to remove concrete barrier. Before removing the concrete barrier, make a saw cut of approximately 1 inch in depth on the face of the barrier along the removal limits.

83-3.04 PAYMENT

The payment quantity for concrete barriers other than Types 60MF, 60MGF, and 60MSF is the length measured along the top of the barrier.

The payment quantity for Type 60MF, 60MGF, and 60MSF concrete barriers is the length measured once along the centerline between the 2 walls of the barrier.

The payment quantity for concrete barriers includes the length of gaps in the concrete barrier where steel plate barrier is attached to the concrete barrier.

The payment quantity for concrete barriers includes barrier markers.

83-4 CRASH CUSHIONS

83-4.01 GENERAL

83-4.01A General

Section 83-4 includes specifications for constructing crash cushions.

83-4.01B Materials

Not Used

83-4.01C Construction

Not Used

83-4.01D Payment

Not Used

83-4.02–83-4.10 RESERVED

83-5–83-10 RESERVED

83-11 EXISTING RAILINGS AND BARRIERS

83-11.01 GENERAL

83-11.01A General

Section 83-11.01 includes general specifications for performing work on existing railings, barriers, terminal systems, and crash cushions.

83-11.01B Materials

Concrete must comply with the specifications for minor concrete.

Reinforcement must comply with section 52.

SECTION 83

RAILINGS AND BARRIERS

83-11.01C Construction

If a portion of a guardrail or thrie beam barrier is to remain in place, removing, salvaging, reconstructing, relocating, or resetting work includes:

1. Resetting end caps, return caps, and buried post anchors
2. Providing connections to existing and new facilities, including connections to concrete

83-11.01D Payment

The payment quantities for removing, salvaging, reconstructing, relocating, and resetting existing railings and barriers are measured as specified for measuring new railings and barriers.

83-11.02 EXISTING GUARDRAILS

83-11.02A General

83-11.02A(1) General

Section 83-11.02 includes specifications for performing work on existing guardrail.

83-11.02A(2) Materials

Not Used

83-11.02A(3) Construction

Not Used

83-11.02A(4) Payment

Not Used

83-11.02B Remove Guardrails

83-11.02B(1) General

Section 83-11.02B includes specifications for removing guardrail which includes specifications for removing terminal systems, end anchors, and transitions.

83-11.02B(2) Materials

Not Used

83-11.02B(3) Construction

Where removing guardrail, remove any concrete anchors and steel foundation tubes.

83-11.02B(4) Payment

The payment quantity for removing W-beam, thrie beam, a terminal system, end anchor, or transition is the length measured along the face of the rail elements.

83-11.02C Salvage Guardrails

83-11.02C(1) General

Section 83-11.02C includes specifications for salvaging guardrail.

83-11.02C(2) Materials

Not Used

83-11.02C(3) Construction

Remove, disassemble, clean, prepare, mark, bundle, package, tag, haul, and stockpile the guardrail to be salvaged.

Comply with the requirements for number per bundle for the guardrail components shown in the following table:

Component	Number per bundle
Rail	25
Steel posts	10
Plastic blocks	50

SECTION 83

RAILINGS AND BARRIERS

Tag incomplete bundles and show the quantity contained.

83-11.02C(4) Payment

Not Used

83-11.02D Reconstruct Guardrails

Reserved

83-11.02E Adjust Guardrails

Reserved

83-11.02F–83-11.02J Reserved

83-11.03 EXISTING METAL BRIDGE RAILINGS

83-11.03A General

83-11.03A(1) General

Section 83-11.03 includes specifications for performing work on existing metal bridge railings.

83-11.03A(2) Materials

Not Used

83-11.03A(3) Construction

Not Used

83-11.03A(4) Payment

Not Used

83-11.03B Reconstruct Metal Bridge Railings

83-11.03B(1) General

83-11.03B(1)(a) Summary

Section 83-11.03B includes specifications for reconstructing metal bridge railings.

83-11.03B(1)(b) Definitions

Reserved

83-11.03B(1)(c) Submittals

Submit 2 copies of shop drawings showing the details of the refabrication of the removed materials and the fabrication of the new materials. Include a list of the new materials, the type of metal, and the metal specifications.

83-11.03B(1)(d) Quality Assurance

Reserved

83-11.03B(2) Materials

Not Used

83-11.03B(3) Construction

Remove, refabricate, and install the metal bridge railing of the type shown.

Refabrication of removed material, fabrication of new material, and installation of the railing must comply with the specifications for a new metal bridge railing of the type being reconstructed.

Perform aluminum welding by the inert-gas-shielded arc welding process. Finish exposed aluminum welds to a neat surface.

Repair abraded and damaged galvanized surfaces on the removed material under section 75-1.02B.

83-11.03B(4) Payment

The payment quantity for reconstruct metal railing (bridge) is the length measured along the face of the reconstructed railing and includes the length of gaps in the railing for lighting and sign supports.

SECTION 83

RAILINGS AND BARRIERS

83-11.03C–83-11.03G Reserved

83-11.04–83-11.08 RESERVED

Strong-Bolt® 2 Design Information — Concrete



- Strong-Bolt 2 (STB2) has been tested per ACI 355.2 and AC193.
- These tables provide tension and shear capacities for design using strength level or allowable load capacities. The footnotes of each table further explain how the design strength capacities were calculated and what factors were used to calculate the allowable load capacities. For additional information, please refer to Anchor Designer software and or contact Simpson Strong-Tie.

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Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Tension Loads in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies:

- Static Load 10
- Wind Load 11
- Seismic Load 11

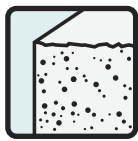
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Strong-Bolt® 2 Design Information — Concrete

Icons and Nomenclature

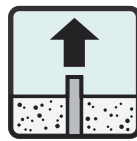
In order to facilitate easier identification of performance data, the following icon system has been incorporated into the sections of the technical bulletin with multiple load tables. These icons will appear in the heading of the table to promote easier visual identification of the type of load, insert type and substrate addressed in the table. Icons are intended for quick identification. All specific information regarding suitability should be read from the table itself.



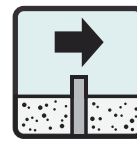
Normal-Weight
Concrete



Normal-Weight/
Lightweight Concrete
over Metal Deck



Tension Load



Shear Load



Valid for
International
Building Code

c_{ac}	Critical Edge Distance
c_{min}	Minimum Edge Distance
f'_c	Concrete Compressive Strength
h_{nom}	Nominal Embedment Depth
h_{min}	Minimum Concrete Thickness

Strong-Bolt® 2 Design Information — Concrete



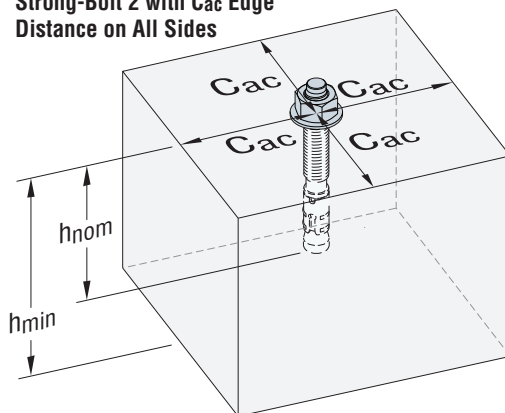
Zinc-Plated Carbon Steel Strong-Bolt® 2 Tension **Design Strengths** in Normal-Weight Concrete
($f'_c = 2,500$ psi)



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Tension Design Strength (lb.)							
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides			
					SDC A-B		SDC C-F		SDC A-B		SDC C-F	
					Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
1/4	1 3/4	3 1/4	2 1/2	1 3/4	1,435	—	—	—	1,070	—	—	—
3/8	1 7/8	3 1/4	6 1/2	6	1,435	845	1,075	635	1,325	845	990	635
	2 7/8	4 1/2	6	6	2,170	1,805	1,630	1,355	2,170	1,805	1,630	1,355
1/2	2 1/4 ⁸	4	6	6	1,805	—	—	—	1,805	—	—	—
	2 3/4	4	6	6	2,350	1,865	1,760	1,400	2,350	1,865	1,760	1,400
	3 7/8	6	7 1/2	4	3,415	3,240	2,560	2,430	2,740	2,875	2,055	2,155
5/8	2 3/4 ⁸	5 1/2	7 1/2	6 1/2	2,720	—	—	—	2,355	—	—	—
	3 3/8	5 1/2	7 1/2	6 1/2	3,555	2,520	2,665	1,890	3,085	2,520	2,310	1,890
	5 1/8	7 7/8	9	6 1/2	5,865	4,480	4,400	3,360	5,420	4,480	4,065	3,360
3/4	3 3/8 ⁸	6	6	4 1/4	3,730	—	—	—	2,640	—	—	—
	4 1/8	6	6	4 1/4	4,625	3,425	3,470	2,570	3,570	3,000	2,680	2,250
	5 3/4	8 3/4	8	4 1/4	5,765	5,525	4,325	4,145	5,570	4,210	4,180	3,155
1	5 1/4	9	18	8	4,600	4,235	3,450	3,175	2,800	4,235	2,100	3,175
	9 3/4	13 1/2	13 1/2	8	5,330	6,150	3,995	4,615	5,330	6,150	3,995	4,615

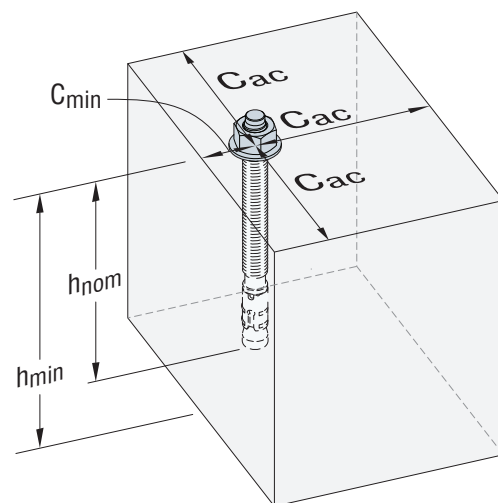
1. Tension design strengths (SD level) are based on the strength design provisions of ACI 318-14 Chapter 17.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Strength reduction factor, ϕ , is based on using a load combination from ACI 318-14 Section 5.3.
5. The tension design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
7. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
8. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
9. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with c_{ac} Edge Distance on All Sides



Flat Slab

Strong-Bolt 2 with c_{min} Edge Distance on One Side and c_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Tension Loads in Normal-Weight Concrete
($f'_c = 2,500$ psi) — Static Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)			
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides	
					Uncracked	Cracked	Uncracked	Cracked
1/4	1 3/4	3 1/4	2 1/2	1 3/4	1,025	—	765	—
3/8	1 7/8	3 1/4	6 1/2	6	1,025	605	945	605
	2 7/8	4 1/2	6	6	1,550	1,290	1,550	1,290
1/2	2 1/4 ⁴	4	6	6	1,290	—	1,290	—
	2 3/4	4	6	6	1,680	1,330	1,680	1,330
	3 7/8	6	7 1/2	4	2,440	2,315	1,955	2,055
5/8	2 3/4 ⁴	5 1/2	7 1/2	6 1/2	1,945	—	1,680	—
	3 3/8	5 1/2	7 1/2	6 1/2	2,540	1,800	2,205	1,800
	5 1/8	7 7/8	9	6 1/2	4,190	3,200	3,870	3,200
3/4	3 3/4 ⁴	6	6	4 1/4	2,665	—	1,885	—
	4 1/8	6	6	4 1/4	3,305	2,445	2,550	2,140
	5 3/4	8 3/4	8	4 1/4	4,120	3,945	3,980	3,005
1	5 1/4	9	18	8	3,285	3,025	2,000	3,025
	9 3/4	13 1/2	13 1/2	8	3,805	4,395	3,805	4,395

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.4$. The conversion factor α is based on the load combination 1.2D + 1.6L assuming 50% dead load and 50% live load: $1.2(0.5) + 1.6(0.5) = 1.4$.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
5. The Designer of Record is responsible for the foundation design.

Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Tension Loads in Normal-Weight Concrete
($f'_c = 2,500$ psi) — Wind Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)			
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides	
					Uncracked	Cracked	Uncracked	Cracked
1/4	1 3/4	3 1/4	2 1/2	1 3/4	860	—	640	—
3/8	1 7/8	3 1/4	6 1/2	6	860	505	795	505
	2 7/8	4 1/2	6	6	1,300	1,085	1,300	1,085
1/2	2 1/4 ⁴	4	6	6	1,085	—	1,085	—
	2 3/4	4	6	6	1,410	1,120	1,410	1,120
	3 7/8	6	7 1/2	4	2,050	1,945	1,645	1,725
5/8	2 3/4 ⁴	5 1/2	7 1/2	6 1/2	1,630	—	1,415	—
	3 3/8	5 1/2	7 1/2	6 1/2	2,135	1,510	1,850	1,510
	5 1/8	7 7/8	9	6 1/2	3,520	2,690	3,250	2,690
3/4	3 3/4 ⁴	6	6	4 1/4	2,240	—	1,585	—
	4 1/8	6	6	4 1/4	2,775	2,055	2,140	1,800
	5 3/4	8 3/4	8	4 1/4	3,460	3,315	3,340	2,525
1	5 1/4	9	18	8	2,760	2,540	1,680	2,540
	9 3/4	13 1/2	13 1/2	8	3,200	3,690	3,200	3,690

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
5. The Designer of Record is responsible for the foundation design.

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete



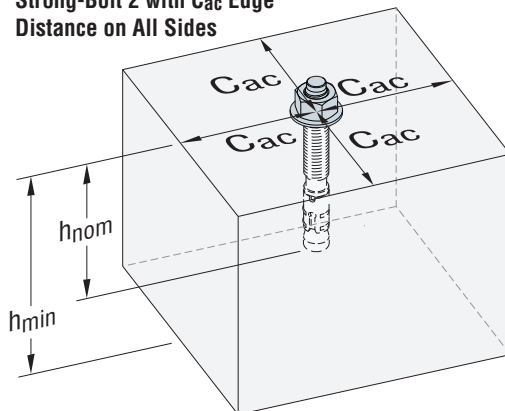
Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Tension Loads in Normal-Weight Concrete ($f'_c = 2,500$ psi) — Seismic Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)							
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides			
					SDC A-B		SDC C-F		SDC A-B		SDC C-F	
					Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
1/4	1 3/4	3 1/4	2 1/2	1 3/4	1,005	—	—	—	750	—	—	—
3/8	1 7/8	3 1/4	6 1/2	6	1,005	590	755	445	930	590	695	445
	2 7/8	4 1/2	6	6	1,520	1,265	1,140	950	1,520	1,265	1,140	950
1/2	2 1/4 ⁷	4	6	6	1,265	—	—	—	1,265	—	—	—
	2 3/4	4	6	6	1,645	1,305	1,230	980	1,645	1,305	1,230	980
	3 7/8	6	7 1/2	4	2,390	2,270	1,790	1,700	1,920	2,010	1,440	1,510
5/8	2 3/4 ⁷	5 1/2	7 1/2	6 1/2	1,905	—	—	—	1,650	—	—	—
	3 3/8	5 1/2	7 1/2	6 1/2	2,490	1,765	1,865	1,325	2,160	1,765	1,615	1,325
	5 1/8	7 7/8	9	6 1/2	4,105	3,135	3,080	2,350	3,795	3,135	2,845	2,350
3/4	3 3/8 ⁷	6	6	4 1/4	2,610	—	—	—	1,850	—	—	—
	4 1/8	6	6	4 1/4	3,240	2,400	2,430	1,800	2,500	2,100	1,875	1,575
	5 3/4	8 3/4	8	4 1/4	4,035	3,870	3,030	2,900	3,900	2,945	2,925	2,210
1	5 1/4	9	18	8	3,220	2,965	2,415	2,225	1,960	2,965	1,470	2,225
	9 3/4	13 1/2	13 1/2	8	3,730	4,305	2,795	3,230	3,730	4,305	2,795	3,230

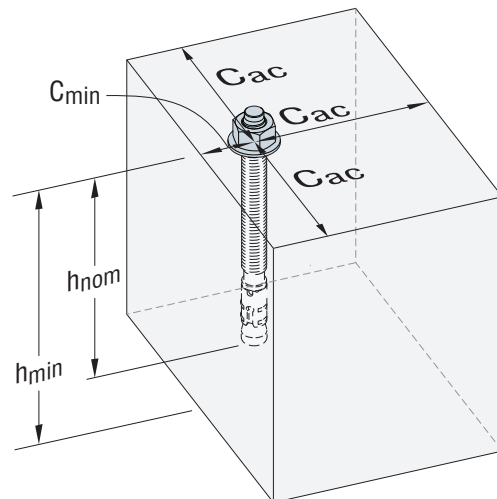
1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1/0.7 = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The allowable tension load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
5. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
6. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
7. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
8. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with c_{ac} Edge Distance on All Sides



Flat Slab

Strong-Bolt 2 with c_{min} Edge Distance on One Side and c_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

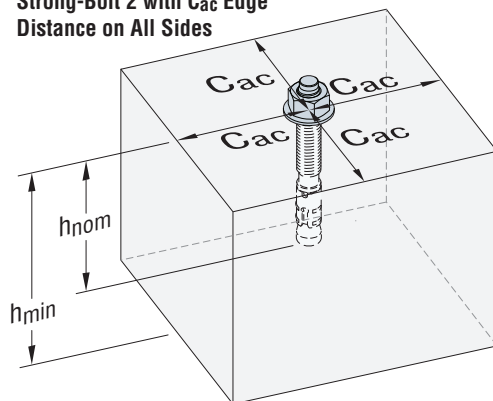
Zinc-Plated Carbon Steel Strong-Bolt® 2 Shear **Design Strengths** in Normal-Weight Concrete
($f'_c = 2,500$ psi)



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Shear Design Strength (lb.)											
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides							
					SDC A-B		SDC C-F		SDC A-B				SDC C-F			
					Uncracked	Cracked	Uncracked	Cracked	Uncracked		Cracked		Uncracked		Cracked	
									⊥ to edge	to edge	⊥ to edge	to edge	⊥ to edge	to edge	⊥ to edge	to edge
1/4	1 3/4	3 1/4	2 1/2	1 3/4	560	—	—	—	535	440	—	—	—	—	—	—
3/8	1 7/8	3 1/4	6 1/2	6	1,170	1,095	1,170	1,095	1,170	1,170	1,095	1,095	1,170	1,170	1,095	1,095
	2 7/8	4 1/2	6	6	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170	1,170
1/2	2 1/4 ⁸	4	6	6	1,935	—	—	—	1,935	1,935	—	—	—	—	—	—
	2 3/4	4	6	6	2,140	1,530	2,140	1,530	2,140	2,140	1,530	1,530	2,140	2,140	1,530	1,530
	3 7/8	6	7 1/2	4	3,555	2,540	3,555	2,540	2,845	2,345	2,030	1,675	2,845	2,345	2,030	1,675
5/8	2 3/4 ⁸	5 1/2	7 1/2	6 1/2	1,935	—	—	—	1,935	1,935	—	—	—	—	—	—
	3 3/8	5 1/2	7 1/2	6 1/2	3,490	2,495	3,490	2,495	3,490	3,130	2,495	2,235	3,490	3,130	2,495	2,235
	5 1/8	7 7/8	9	6 1/2	5,535	3,955	5,535	3,955	5,535	4,370	3,955	3,120	5,535	4,370	3,955	3,120
3/4	3 3/8 ⁸	6	6	4 1/4	3,055	—	—	—	3,055	2,380	—	—	—	—	—	—
	4 1/8	6	6	4 1/4	3,210	2,295	3,210	2,295	3,210	2,500	2,295	1,785	3,210	2,500	2,295	1,785
	5 3/4	8 3/4	8	4 1/4	5,450	3,890	5,450	3,890	3,805	3,620	2,715	2,585	3,805	3,620	2,715	2,585
1	5 1/4	9	18	8	9,010	9,010	9,010	9,010	7,130	7,130	6,175	5,575	7,130	7,130	6,175	5,575
	9 3/4	13 1/2	13 1/2	8	9,010	8,505	9,010	8,505	9,010	8,325	7,130	5,945	9,010	8,325	7,130	5,945

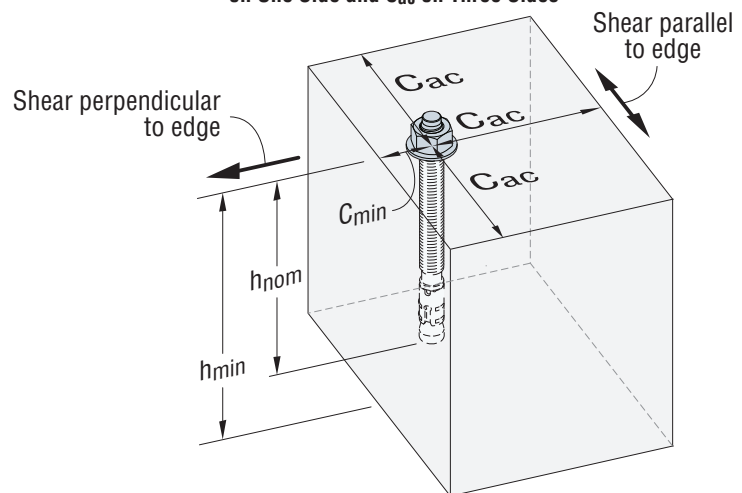
1. Shear design strengths (SD level) are based on the strength design provisions of ACI 318-14 Chapter 17.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Strength reduction factor, ϕ , is based on using a load combination from ACI 318-14 Section 5.3.
5. The shear design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the shear component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored shear load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
7. Shear design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
8. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
9. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with c_{ac} Edge Distance on All Sides



Flat Slab

Strong-Bolt 2 with c_{min} Edge Distance on One Side and c_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Shear Loads in Normal-Weight Concrete
($f'_c = 2,500$ psi) — Static Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Shear Load (lb.)					
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides			
					Uncracked	Cracked	Uncracked		Cracked	
							⊥ to edge	to edge	⊥ to edge	to edge
1/4	1 3/4	3 1/4	2 1/2	1 3/4	400	—	380	315	—	—
3/8	1 7/8	3 1/4	6 1/2	6	835	780	835	835	780	780
	2 7/8	4 1/2	6	6	835	835	835	835	835	835
1/2	2 1/4 ⁴	4	6	6	1,380	—	1,380	1,380	—	—
	2 3/4	4	6	6	1,530	1,095	1,530	1,530	1,095	1,095
	3 7/8	6	7 1/2	4	2,540	1,815	2,030	1,675	1,450	1,195
5/8	2 3/4 ⁴	5 1/2	7 1/2	6 1/2	1,380	—	1,380	1,380	—	—
	3 3/8	5 1/2	7 1/2	6 1/2	2,495	1,780	2,495	2,235	1,780	1,595
	5 1/8	7 7/8	9	6 1/2	3,955	2,825	3,955	3,120	2,825	2,230
3/4	3 3/8 ⁴	6	6	4 1/4	2,180	—	2,180	1,700	—	—
	4 1/8	6	6	4 1/4	2,295	1,640	2,295	1,785	1,640	1,275
	5 3/4	8 3/4	8	4 1/4	3,895	2,780	2,720	2,585	1,940	1,845
1	5 1/4	9	18	8	6,435	6,435	5,095	5,095	4,410	3,980
	9 3/4	13 1/2	13 1/2	8	6,435	6,075	6,435	5,945	5,095	4,245

1. Allowable shear loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.4$. The conversion factor α is based on the load combination 1.2D + 1.6L assuming 50% dead load and 50% live load: $1.2(0.5) + 1.6(0.5) = 1.4$.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
5. The Designer of Record is responsible for the foundation design.

Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Shear Loads in Normal-Weight Concrete
($f'_c = 2,500$ psi) — Wind Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Shear Load (lb.)					
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides			
					Uncracked	Cracked	Uncracked		Cracked	
							⊥ to edge	to edge	⊥ to edge	to edge
1/4	1 3/4	3 1/4	2 1/2	1 3/4	335	—	320	265	—	—
3/8	1 7/8	3 1/4	6 1/2	6	700	655	700	700	655	655
	2 7/8	4 1/2	6	6	700	700	700	700	700	700
1/2	2 1/4 ⁴	4	6	6	1,160	—	1,160	1,160	—	—
	2 3/4	4	6	6	1,285	920	1,285	1,285	920	920
	3 7/8	6	7 1/2	4	2,135	1,525	1,705	1,405	1,220	1,005
5/8	2 3/4 ⁴	5 1/2	7 1/2	6 1/2	1,160	—	1,160	1,160	—	—
	3 3/8	5 1/2	7 1/2	6 1/2	2,095	1,495	2,095	1,880	1,495	1,340
	5 1/8	7 7/8	9	6 1/2	3,320	2,375	3,320	2,620	2,375	1,870
3/4	3 3/8 ⁴	6	6	4 1/4	1,835	—	1,835	1,430	—	—
	4 1/8	6	6	4 1/4	1,925	1,375	1,925	1,500	1,375	1,070
	5 3/4	8 3/4	8	4 1/4	3,270	2,335	2,285	2,170	1,630	1,550
1	5 1/4	9	18	8	5,405	5,405	4,280	4,280	3,705	3,345
	9 3/4	13 1/2	13 1/2	8	5,405	5,105	5,405	4,995	4,280	3,565

1. Allowable shear loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
5. The Designer of Record is responsible for the foundation design.

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

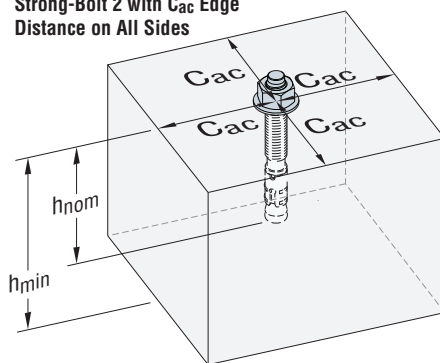
Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Shear Loads in Normal-Weight Concrete
($f'_c = 2,500$ psi) — Seismic Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Shear Load (lb.)											
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides							
					SDC A-B		SDC C-F		SDC A-B				SDC C-F			
					Uncracked	Cracked	Uncracked	Cracked	Uncracked		Cracked		Uncracked		Cracked	
									⊥ to edge	∥ to edge	⊥ to edge	∥ to edge	⊥ to edge	∥ to edge	⊥ to edge	∥ to edge
1/4	1 3/4	3 1/4	2 1/2	1 3/4	390	—	—	—	375	310	—	—	—	—	—	—
3/8	1 7/8	3 1/4	6 1/2	6	820	765	820	765	820	820	765	765	820	820	765	765
	2 7/8	4 1/2	6	6	820	820	820	820	820	820	820	820	820	820	820	820
1/2	2 1/4 ⁷	4	6	6	1,355	—	—	—	1,355	1,355	—	—	—	—	—	—
	2 3/4	4	6	6	1,500	1,070	1,500	1,070	1,500	1,500	1,070	1,070	1,500	1,500	1,070	1,070
	3 7/8	6	7 1/2	4	2,490	1,780	2,490	1,780	1,990	1,640	1,420	1,175	1,990	1,640	1,420	1,175
5/8	2 3/4 ⁷	5 1/2	7 1/2	6 1/2	1,355	—	—	—	1,355	1,355	—	—	—	—	—	—
	3 3/8	5 1/2	7 1/2	6 1/2	2,445	1,745	2,445	1,745	2,445	2,190	1,745	1,565	2,445	2,190	1,745	1,565
	5 1/8	7 7/8	9	6 1/2	3,875	2,770	3,875	2,770	3,875	3,060	2,770	2,185	3,875	3,060	2,770	2,185
3/4	3 3/8 ⁷	6	6	4 1/4	2,140	—	—	—	2,140	1,665	—	—	—	—	—	—
	4 1/8	6	6	4 1/4	2,245	1,605	2,245	1,605	2,245	1,750	1,605	1,250	2,245	1,750	1,605	1,250
	5 3/4	8 3/4	8	4 1/4	3,815	2,725	3,815	2,725	2,665	2,535	1,900	1,810	2,665	2,535	1,900	1,810
1	5 1/4	9	18	8	6,305	6,305	6,305	6,305	4,990	4,990	4,325	3,900	4,990	4,990	4,325	3,900
	9 3/4	13 1/2	13 1/2	8	6,305	5,955	6,305	5,955	6,305	5,830	4,990	4,160	6,305	5,830	4,990	4,160

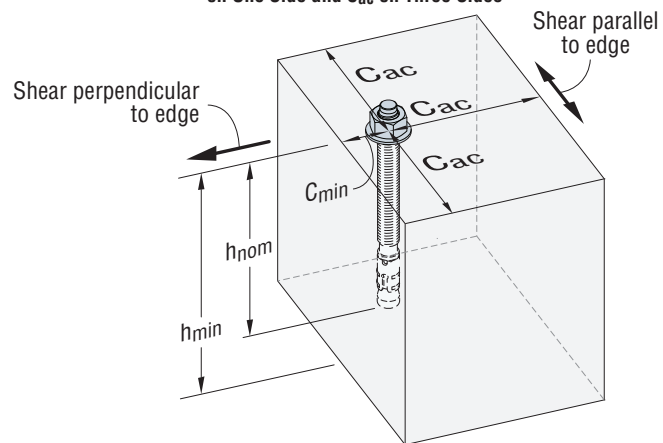
1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The allowable tension load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
5. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
6. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
7. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
8. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with c_{ac} Edge Distance on All Sides



Flat Slab

Strong-Bolt 2 with c_{min} Edge Distance on One Side and c_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Zinc-Plated Carbon Steel Strong-Bolt® 2 Tension **Design Strengths** in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies ($f'_c = 3,000$ psi)



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Minimum End Distance c_{min} (in.)	Tension Design Strength (lb.)							
			Lower Flute				Upper Flute			
			SDC A-B		SDC C-F		SDC A-B		SDC C-F	
			Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
3/8	2	3 1/4	1,145	675	860	505	1,480	870	1,110	655
	3 3/8	6	2,050	1,700	1,535	1,275	—	—	—	—
1/2	2 3/4	4 1/2	1,675	1,325	1,260	995	3,115	2,460	2,340	1,845
	4 1/2	8	2,495	1,775	1,870	1,330	—	—	—	—
5/8	3 3/8	5 1/2	2,395	1,700	1,795	1,275	—	—	—	—
	5 5/8	10	4,265	3,245	3,200	2,435	—	—	—	—
3/4	4 1/8	6 3/4	2,470	1,830	1,855	1,370	—	—	—	—

1. Tension design strengths (SD level) are based on the strength design provisions of ACI 318-14 Chapter 17.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Strength reduction factor, ϕ , is based on using a load combination from ACI 318-14 Section 5.3.
5. The tension design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
7. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
8. Installation must comply with Figure 1.

Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Tension Loads in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies ($f'_c = 3,000$ psi)
— Static Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Minimum End Distance c_{min} (in.)	Allowable Tension Load (lb.)			
			Lower Flute		Upper Flute	
			Uncracked	Cracked	Uncracked	Cracked
3/8	2	3 1/4	820	480	1,055	620
	3 3/8	6	1,465	1,215	—	—
1/2	2 3/4	4 1/2	1,195	945	2,225	1,755
	4 1/2	8	1,780	1,270	—	—
5/8	3 3/8	5 1/2	1,710	1,215	—	—
	5 5/8	10	3,045	2,320	—	—
3/4	4 1/8	6 3/4	1,765	1,305	—	—

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.4$. The conversion factor α is based on the load combination $1.2D + 1.6L$ assuming 50% dead load and 50% live load: $1.2(0.5) + 1.6(0.5) = 1.4$.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Installation must comply with Figure 1.

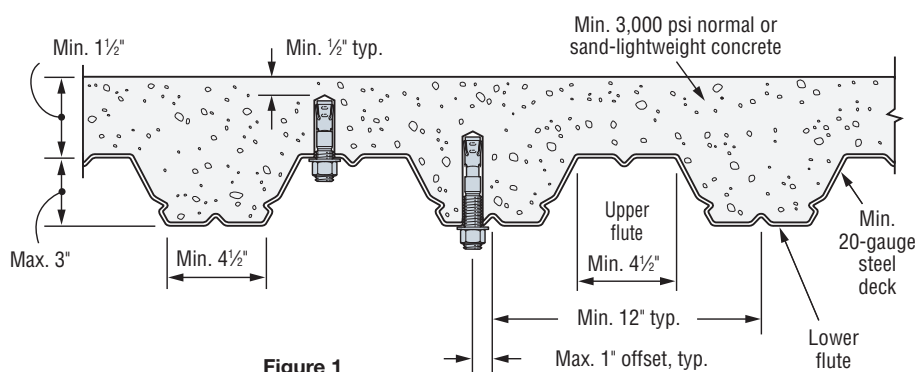


Figure 1

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Tension Loads in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies ($f'_c = 3,000$ psi)
— Wind Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Minimum End Distance c_{min} (in.)	Allowable Tension Load (lb.)			
			Lower Flute		Upper Flute	
			Uncracked	Cracked	Uncracked	Cracked
3/8	2	3 1/4	685	405	890	520
	3 3/8	6	1,230	1,020	—	—
1/2	2 3/4	4 1/2	1,005	795	1,870	1,475
	4 1/2	8	1,495	1,065	—	—
5/8	3 3/8	5 1/2	1,435	1,020	—	—
	5 5/8	10	2,560	1,945	—	—
3/4	4 1/8	6 3/4	1,480	1,100	—	—

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1/0.6 = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Installation must comply with Figure 1.

Zinc-Plated Carbon Steel Strong-Bolt® 2 **Allowable** Tension Loads in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies ($f'_c = 3,000$ psi)
— Seismic Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Minimum End Distance c_{min} (in.)	Allowable Tension Load (lb.)							
			Lower Flute				Upper Flute			
			SDC A-B		SDC C-F		SDC A-B		SDC C-F	
			Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
3/8	2	3 1/4	800	475	600	355	1,035	610	775	460
	3 3/8	6	1,435	1,190	1,075	895	—	—	—	—
1/2	2 3/4	4 1/2	1,175	930	880	695	2,180	1,720	1,640	1,290
	4 1/2	8	1,745	1,245	1,310	930	—	—	—	—
5/8	3 3/8	5 1/2	1,675	1,190	1,255	895	—	—	—	—
	5 5/8	10	2,985	2,270	2,240	1,705	—	—	—	—
3/4	4 1/8	6 3/4	1,730	1,280	1,300	960	—	—	—	—

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1/0.7 = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The allowable tension load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
5. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
6. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
7. Installation must comply with Figure 1.

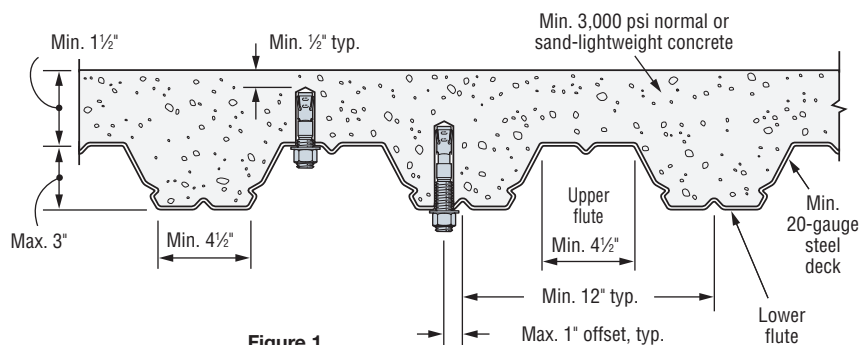


Figure 1

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

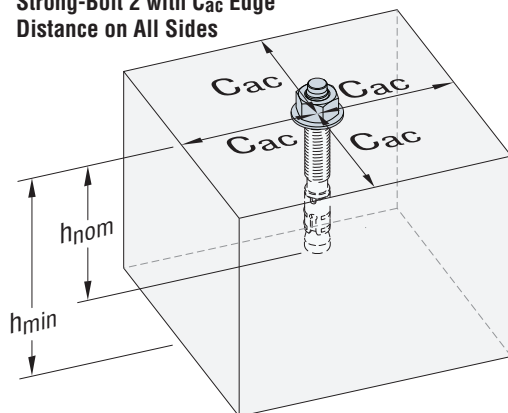
Stainless Steel Strong-Bolt® 2 Tension **Design Strengths** in Normal-Weight Concrete
($f'_c = 2,500$ psi)



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Tension Design Strength (lb.)							
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides			
					SDC A-B		SDC C-F		SDC A-B		SDC C-F	
					Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
1/4	1 3/4	3 3/4	2 1/2	1 3/4	1,250	—	—	—	1,070	—	—	—
3/8	1 7/8	3 3/4	6 1/2	6	1,435	1,015	1,075	760	1,325	1,015	990	760
	2 7/8	4 1/2	8 1/2	6	3,085	2,045	2,090	1,380	2,175	2,045	1,630	1,380
1/2	2 1/4 ⁸	4 1/2	6 1/2	6 1/2	1,415	—	—	—	1,415	—	—	—
	2 3/4	4 1/2	6 1/2	6 1/2	2,100	1,665	1,575	1,250	2,100	1,665	1,575	1,250
	3 7/8	6	7	5	2,920	2,800	2,190	2,100	2,920	2,800	2,190	2,100
5/8	2 3/4 ⁸	5 1/2	7 1/2	4	1,545	—	—	—	1,290	—	—	—
	3 3/8	5 1/2	7 1/2	4	3,555	2,520	2,665	1,890	1,910	2,640	1,430	1,845
	5 1/8	7 7/8	9	4	4,950	4,255	3,710	3,190	3,905	3,685	2,925	2,765
3/4	3 3/8 ⁸	6 3/4	8	6	3,315	—	—	—	2,485	—	—	—
	4 1/8	6 3/4	8	6	4,835	3,425	3,625	2,570	3,625	3,425	2,720	2,570
	5 3/4	8 3/4	8	6	6,255	5,350	4,690	4,010	6,255	5,225	4,690	3,920

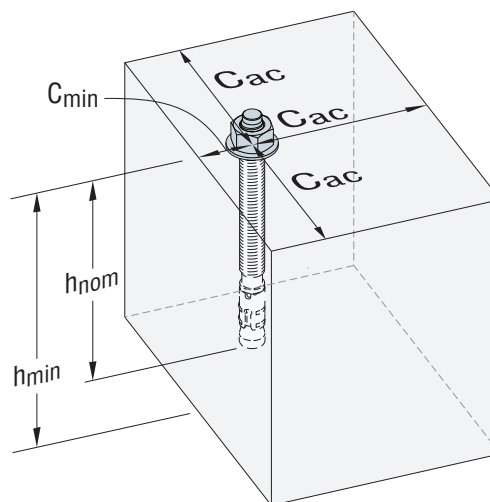
1. Tension design strengths (SD level) are based on the strength design provisions of ACI 318-14 Chapter 17.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Strength reduction factor, ϕ , is based on using a load combination from ACI 318-14 Section 5.3.
5. The tension design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
7. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
8. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
9. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with c_{ac} Edge Distance on All Sides



Flat Slab

Strong-Bolt 2 with c_{min} Edge Distance on One Side and c_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Stainless Steel Strong-Bolt® 2 **Allowable** Tension Loads in Normal-Weight Concrete ($f'_c = 2,500$ psi)
— Static Load



*

Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)			
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides	
					Uncracked	Cracked	Uncracked	Cracked
1/4	1 3/4	3 1/4	2 1/2	1 3/4	895	—	765	—
3/8	1 7/8	3 1/4	6 1/2	6	1,025	725	945	725
	2 7/8	4 1/2	8 1/2	6	2,205	1,460	1,555	1,460
1/2	2 1/4 ⁴	4 1/2	6 1/2	6 1/2	1,010	—	1,010	—
	2 3/4	4 1/2	6 1/2	6 1/2	1,500	1,190	1,500	1,190
	3 7/8	6	7	5	2,085	2,000	2,085	2,000
5/8	2 3/4 ⁴	5 1/2	7 1/2	4	1,105	—	920	—
	3 3/8	5 1/2	7 1/2	4	2,540	1,800	1,365	1,755
	5 1/8	7 7/8	9	4	3,535	3,040	2,790	2,630
3/4	3 3/8 ⁴	6 3/4	8	6	2,370	—	1,775	—
	4 1/8	6 3/4	8	6	3,455	2,445	2,590	2,445
	5 3/4	8 3/4	8	6	4,470	3,820	4,470	3,730

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.4$. The conversion factor α is based on the load combination $1.2D + 1.6L$ assuming 50% dead load and 50% live load: $1.2(0.5) + 1.6(0.5) = 1.4$.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
5. The Designer of Record is responsible for the foundation design.

Stainless Steel Strong-Bolt® 2 **Allowable** Tension Loads in Normal-Weight Concrete ($f'_c = 2,500$ psi)
— Wind Load



*

Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)			
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides	
					Uncracked	Cracked	Uncracked	Cracked
1/4	1 3/4	3 1/4	2 1/2	1 3/4	750	—	640	—
3/8	1 7/8	3 1/4	6 1/2	6	860	610	795	610
	2 7/8	4 1/2	8 1/2	6	1,850	1,225	1,305	1,225
1/2	2 1/4 ⁴	4 1/2	6 1/2	6 1/2	850	—	850	—
	2 3/4	4 1/2	6 1/2	6 1/2	1,260	1,000	1,260	1,000
	3 7/8	6	7	5	1,750	1,680	1,750	1,680
5/8	2 3/4 ⁴	5 1/2	7 1/2	4	925	—	775	—
	3 3/8	5 1/2	7 1/2	4	2,135	1,510	1,145	1,475
	5 1/8	7 7/8	9	4	2,970	2,555	2,345	2,210
3/4	3 3/8 ⁴	6 3/4	8	6	1,990	—	1,490	—
	4 1/8	6 3/4	8	6	2,900	2,055	2,175	2,055
	5 3/4	8 3/4	8	6	3,755	3,210	3,755	3,135

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
5. The Designer of Record is responsible for the foundation design.

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

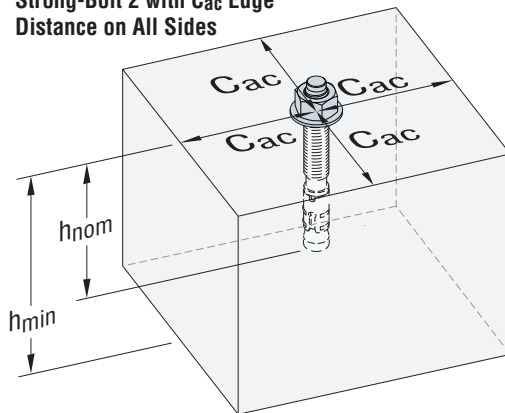
Stainless Steel Strong-Bolt® 2 **Allowable** Tension Loads in Normal-Weight Concrete ($f'_c = 2,500$ psi)
— Seismic Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)							
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides			
					SDC A-B		SDC C-F		SDC A-B		SDC C-F	
					Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
1/4	1 3/4	3 1/4	2 1/2	1 3/4	875	—	—	—	750	—	—	—
3/8	1 7/8	3 1/4	6 1/2	6	1,005	710	755	530	930	710	695	530
	2 7/8	4 1/2	8 1/2	6	2,160	1,430	1,465	965	1,525	1,430	1,140	965
1/2	2 1/4 ⁷	4 1/2	6 1/2	6 1/2	990	—	—	—	990	—	—	—
	2 3/4	4 1/2	6 1/2	6 1/2	1,470	1,165	1,105	875	1,470	1,165	1,105	875
	3 3/8	6	7	5	2,045	1,960	1,535	1,470	2,045	1,960	1,535	1,470
5/8	2 3/4 ⁷	5 1/2	7 1/2	4	1,080	—	—	—	905	—	—	—
	3 3/8	5 1/2	7 1/2	4	2,490	1,765	1,865	1,325	1,335	1,720	1,000	1,290
	5 1/8	7 7/8	9	4	3,465	2,980	2,595	2,235	2,735	2,580	2,050	1,935
3/4	3 3/8 ⁷	6 3/4	8	6	2,320	—	—	—	1,740	—	—	—
	4 1/8	6 3/4	8	6	3,385	2,400	2,540	1,800	2,540	2,400	1,905	1,800
	5 3/4	8 3/4	8	6	4,380	3,745	3,285	2,805	4,380	3,660	3,285	2,745

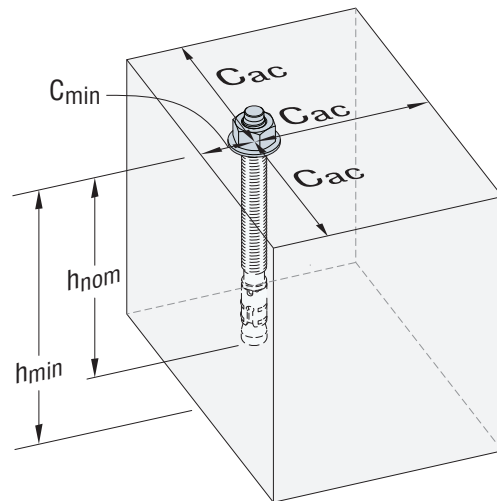
1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The allowable tension load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
5. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
6. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
7. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
8. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with c_{ac} Edge Distance on All Sides



Flat Slab

Strong-Bolt 2 with c_{min} Edge Distance on One Side and c_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete



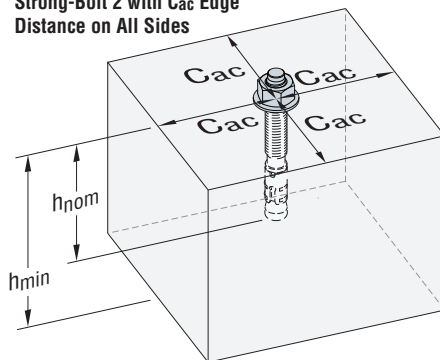
Stainless Steel Strong-Bolt® 2 Shear **Design Strengths** in Normal-Weight Concrete ($f'_c = 2,500$ psi)



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Shear Design Strength (lb.)							
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides			
					SDC A-B		SDC C-F		SDC A-B		SDC C-F	
					Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
									⊥ to edge	to edge	⊥ to edge	to edge
1/4	1 3/4	3 1/4	2 1/2	1 3/4	560	—	—	—	535	440	—	—
3/8	1 7/8	3 1/4	6 1/2	6	1,545	1,095	1,545	1,095	1,425	1,425	1,095	1,095
	2 7/8	4 1/2	8 1/2	6	2,005	2,005	2,005	2,005	2,005	2,005	1,675	2,005
1/2	2 1/4 ⁸	4 1/2	6 1/2	6 1/2	1,945	—	—	—	1,945	1,945	—	—
	2 3/4	4 1/2	6 1/2	6 1/2	2,460	1,755	2,460	1,755	2,460	2,460	1,755	1,755
	3 3/8	6	7	5	3,315	2,370	3,315	2,370	3,315	2,600	2,370	1,855
5/8	2 3/4 ⁸	5 1/2	7 1/2	4	2,600	—	—	—	1,390	1,390	—	—
	3 3/8	5 1/2	7 1/2	4	3,490	2,495	3,490	2,495	2,795	2,300	1,995	1,645
	5 1/8	7 7/8	9	4	5,535	3,955	5,535	3,955	3,220	3,330	2,380	2,380
3/4	3 3/8 ⁸	6 3/4	8	6	4,320	—	—	—	4,320	3,495	—	—
	4 1/8	6 3/4	8	6	4,540	3,245	4,540	3,245	4,540	3,675	2,625	2,625
	5 3/4	8 3/4	8	6	5,450	3,890	5,450	3,890	5,450	4,430	3,165	3,165

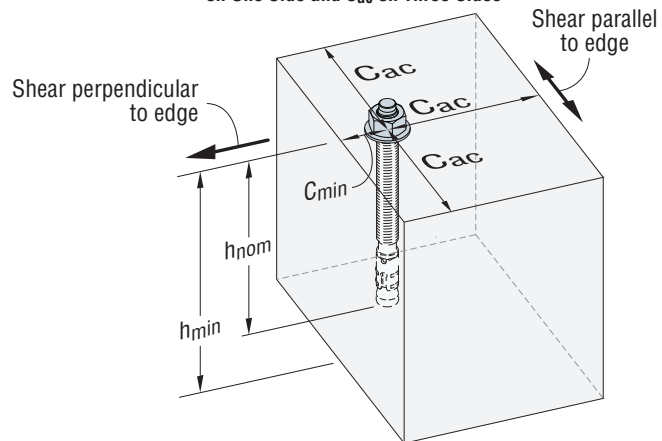
1. Shear design strengths (SD level) are based on the strength design provisions of ACI 318-14 Chapter 17.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Strength reduction factor, ϕ , is based on using a load combination from ACI 318-14 Section 5.3.
5. The shear design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the shear component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored shear load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
7. Shear design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
8. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
9. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with c_{ac} Edge Distance on All Sides



Flat Slab

Strong-Bolt 2 with c_{min} Edge Distance on One Side and c_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Stainless Steel Strong-Bolt® 2 **Allowable** Shear Loads in Normal-Weight Concrete ($f'_c = 2,500$ psi) — Static Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Shear Load (lb.)					
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides			
					Uncracked	Cracked	Uncracked		Cracked	
							⊥ to edge	to edge	⊥ to edge	to edge
1/4	1 3/4	3 1/4	2 1/2	1 3/4	400	—	380	315	—	—
3/8	1 7/8	3 1/4	6 1/2	6	1,105	780	1,020	1,020	780	780
	2 7/8	4 1/2	8 1/2	6	1,430	1,430	1,430	1,430	1,430	1,195
1/2	2 1/4 ⁴	4 1/2	6 1/2	6 1/2	1,390	—	1,390	1,390	—	—
	2 3/4	4 1/2	6 1/2	6 1/2	1,755	1,255	1,755	1,755	1,255	1,255
	3 7/8	6	7	5	2,370	1,695	2,370	1,855	1,695	1,325
5/8	2 3/4 ⁴	5 1/2	7 1/2	4	1,855	—	995	995	—	—
	3 3/8	5 1/2	7 1/2	4	2,495	1,780	1,995	1,645	1,425	1,175
	5 1/8	7 7/8	9	4	3,955	2,825	2,300	2,380	1,645	1,700
3/4	3 3/8 ⁴	6 3/4	8	6	3,085	—	3,085	2,495	—	—
	4 1/8	6 3/4	8	6	3,245	2,320	3,245	2,625	2,320	1,875
	5 3/4	8 3/4	8	6	3,895	2,780	3,895	3,165	2,780	2,260

1. Allowable shear loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.4$. The conversion factor α is based on the load combination 1.2D + 1.6L assuming 50% dead load and 50% live load: $1.2(0.5) + 1.6(0.5) = 1.4$.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
5. The Designer of Record is responsible for the foundation design.

Stainless Steel Strong-Bolt® 2 **Allowable** Shear Loads in Normal-Weight Concrete ($f'_c = 2,500$ psi) — Wind Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Shear Load (lb.)					
					Edge Distances = c_{ac} on all sides		Edge Distances = c_{min} on one side and c_{ac} on three sides			
					Uncracked	Cracked	Uncracked		Cracked	
							⊥ to edge	to edge	⊥ to edge	to edge
1/4	1 3/4	3 1/4	2 1/2	1 3/4	335	—	320	265	—	—
3/8	1 7/8	3 1/4	6 1/2	6	925	655	855	855	655	655
	2 7/8	4 1/2	8 1/2	6	1,205	1,205	1,205	1,205	1,205	1,005
1/2	2 1/4 ⁴	4 1/2	6 1/2	6 1/2	1,165	—	1,165	1,165	—	—
	2 3/4	4 1/2	6 1/2	6 1/2	1,475	1,055	1,475	1,475	1,055	1,055
	3 7/8	6	7	5	1,990	1,420	1,990	1,560	1,420	1,115
5/8	2 3/4 ⁴	5 1/2	7 1/2	4	1,560	—	835	835	—	—
	3 3/8	5 1/2	7 1/2	4	2,095	1,495	1,675	1,380	1,195	985
	5 1/8	7 7/8	9	4	3,320	2,375	1,930	2,000	1,380	1,430
3/4	3 3/8 ⁴	6 3/4	8	6	2,590	—	2,590	2,095	—	—
	4 1/8	6 3/4	8	6	2,725	1,945	2,725	2,205	1,945	1,575
	5 3/4	8 3/4	8	6	3,270	2,335	3,270	2,660	2,335	1,900

1. Allowable shear loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
5. The Designer of Record is responsible for the foundation design.

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

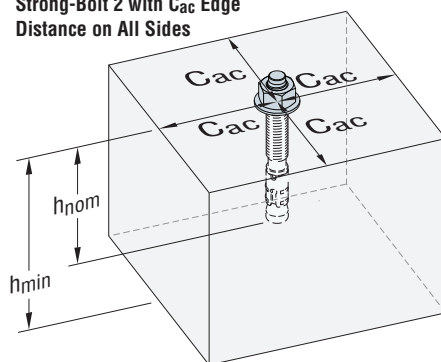
Stainless Steel Strong-Bolt® 2 Allowable Shear Loads in Normal-Weight Concrete
($f'_c = 2,500$ psi) — Seismic Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Shear Load (lb.)											
					Edge Distances = c_{ac} on all sides				Edge Distances = c_{min} on one side and c_{ac} on three sides							
					SDC A-B		SDC C-F		SDC A-B				SDC C-F			
					Uncracked	Cracked	Uncracked	Cracked	Uncracked		Cracked		Uncracked		Cracked	
									⊥ to edge	∥ to edge	⊥ to edge	∥ to edge	⊥ to edge	∥ to edge	⊥ to edge	∥ to edge
1/4	1 3/4	3 1/4	2 1/2	1 3/4	390	—	—	—	375	310	—	—	—	—	—	—
3/8	1 7/8	3 1/4	6 1/2	6	1,080	765	1,080	765	995	995	765	765	995	995	765	765
	2 7/8	4 1/2	8 1/2	6	1,405	1,405	1,405	1,405	1,405	1,405	1,405	1,175	1,405	1,405	1,405	1,175
1/2	2 1/4 ⁷	4 1/2	6 1/2	6 1/2	1,360	—	—	—	1,360	1,360	—	—	—	—	—	—
	2 3/4	4 1/2	6 1/2	6 1/2	1,720	1,230	1,720	1,230	1,720	1,720	1,230	1,230	1,720	1,720	1,230	1,230
	3 7/8	6	7	5	2,320	1,660	2,320	1,660	2,320	1,820	1,660	1,300	2,320	1,820	1,660	1,300
5/8	2 3/4 ⁷	5 1/2	7 1/2	4	1,820	—	—	—	975	975	—	—	—	—	—	—
	3 3/8	5 1/2	7 1/2	4	2,445	1,745	2,445	1,745	1,955	1,610	1,395	1,150	1,955	1,610	1,395	1,150
	5 1/8	7 7/8	9	4	3,875	2,770	3,875	2,770	2,255	2,330	1,610	1,665	2,255	2,330	1,610	1,665
3/4	3 3/8 ⁷	6 3/4	8	6	3,025	—	—	—	3,025	2,445	—	—	—	—	—	—
	4 1/8	6 3/4	8	6	3,180	2,270	3,180	2,270	3,180	2,575	2,270	1,835	3,180	2,575	2,270	1,835
	5 3/4	8 3/4	8	6	3,815	2,725	3,815	2,725	3,815	3,100	2,725	2,215	3,815	3,100	2,725	2,215

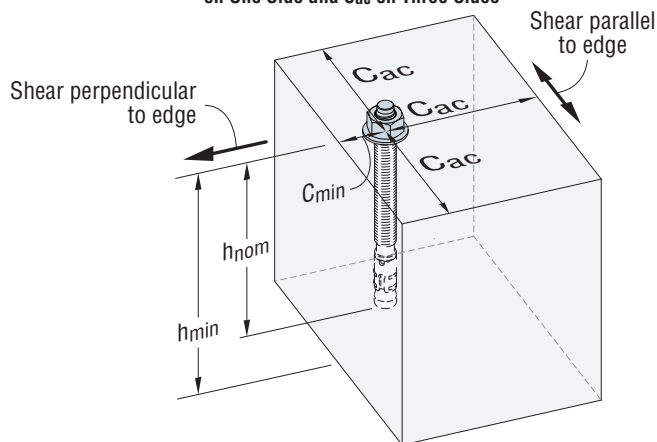
1. Allowable shear loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The allowable shear load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the shear component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored shear load on the anchor associated with the same load combination.
5. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
6. Shear design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
7. Tabulated values for this embedment depth are based on internal testing and they are not listed in ICC-ES ESR-3037.
8. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with c_{ac} Edge Distance on All Sides



Flat Slab

Strong-Bolt 2 with c_{min} Edge Distance on One Side and c_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Stainless Steel Strong-Bolt® 2 Tension **Design Strengths** in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies ($f'_c = 3,000$ psi)



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Minimum End Distance c_{min} (in.)	Tension Design Strength (lb.)							
			Lower Flute				Upper Flute			
			SDC A-B		SDC C-F		SDC A-B		SDC C-F	
			Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
$\frac{3}{8}$	2	$3\frac{1}{4}$	1,025	800	770	600	1,295	1,010	970	755
	$3\frac{3}{8}$	6	2,570	1,695	1,735	1,145	—	—	—	—
$\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{1}{2}$	1,610	1,295	1,205	970	1,665	1,335	1,250	1,000
	$4\frac{1}{2}$	8	1,730	1,660	1,295	1,245	—	—	—	—
$\frac{5}{8}$	$3\frac{3}{8}$	$5\frac{1}{2}$	1,605	1,135	1,205	855	—	—	—	—
	$5\frac{5}{8}$	10	3,250	2,615	2,440	1,960	—	—	—	—
$\frac{3}{4}$	$4\frac{1}{8}$	$6\frac{3}{4}$	2,780	1,970	2,085	1,475	—	—	—	—

1. Tension design strengths (SD level) are based on the strength design provisions of ACI 318-14 Chapter 17.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Strength reduction factor, ϕ , is based on using a load combination from ACI 318-14 Section 5.3.
5. The tension design strength listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
6. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
7. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
8. Installation must comply with Figure 1.

Stainless Steel Strong-Bolt® 2 **Allowable** Tension Loads in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies ($f'_c = 3000$ psi)
— Static Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Minimum End Distance c_{min} (in.)	Allowable Tension Load (lb.)			
			Lower Flute		Upper Flute	
			Uncracked	Cracked	Uncracked	Cracked
$\frac{3}{8}$	2	$3\frac{1}{4}$	730	570	925	720
	$3\frac{3}{8}$	6	1,835	1,210	—	—
$\frac{1}{2}$	$2\frac{3}{4}$	$4\frac{1}{2}$	1,150	925	1,190	955
	$4\frac{1}{2}$	8	1,235	1,185	—	—
$\frac{5}{8}$	$3\frac{3}{8}$	$5\frac{1}{2}$	1,145	810	—	—
	$5\frac{5}{8}$	10	2,320	1,870	—	—
$\frac{3}{4}$	$4\frac{1}{8}$	$6\frac{3}{4}$	1,985	1,405	—	—

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.4$. The conversion factor α is based on the load combination $1.2D + 1.6L$ assuming 50% dead load and 50% live load: $1.2(0.5) + 1.6(0.5) = 1.4$.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Installation must comply with Figure 1.

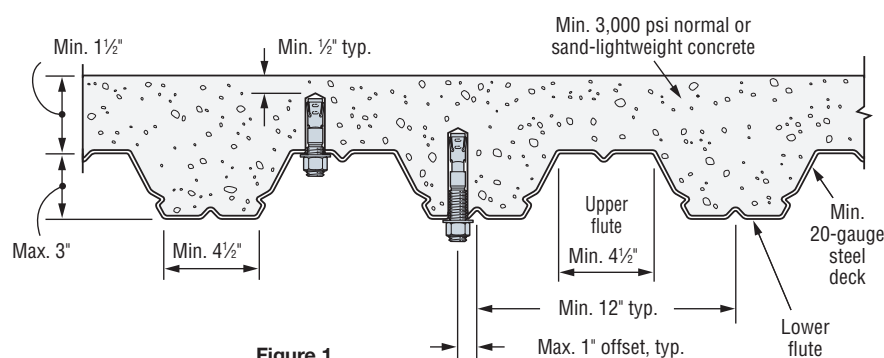


Figure 1

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Stainless Steel Strong-Bolt® 2 **Allowable** Tension Loads in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies ($f'_c = 3,000$ psi)
— Wind Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Minimum End Distance c_{min} (in.)	Allowable Tension Load (lb.)			
			Lower Flute		Upper Flute	
			Uncracked	Cracked	Uncracked	Cracked
3/8	2	3 1/4	615	480	775	605
	3 3/8	6	1,540	1,015	—	—
1/2	2 3/4	4 1/2	965	775	1,000	800
	4 1/2	8	1,040	995	—	—
5/8	3 3/8	5 1/2	965	680	—	—
	5 5/8	10	1,950	1,570	—	—
3/4	4 1/8	6 3/4	1,670	1,180	—	—

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Installation must comply with Figure 1 on page 18.

Stainless Steel Strong-Bolt® 2 **Allowable** Tension Loads in Soffit of Normal-Weight or Sand-Lightweight Concrete-Filled Profile Steel Deck Assemblies ($f'_c = 3,000$ psi)
— Seismic Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Minimum End Distance c_{min} (in.)	Allowable Tension Load (lb.)							
			Lower Flute				Upper Flute			
			SDC A-B		SDC C-F		SDC A-B		SDC C-F	
			Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked
3/8	2	3 1/4	720	560	540	420	905	705	680	530
	3 3/8	6	1,800	1,185	1,215	800	—	—	—	—
1/2	2 3/4	4 1/2	1,125	905	845	680	1,165	935	875	700
	4 1/2	8	1,210	1,160	905	870	—	—	—	—
5/8	3 3/8	5 1/2	1,125	795	845	600	—	—	—	—
	5 5/8	10	2,275	1,830	1,710	1,370	—	—	—	—
3/4	4 1/8	6 3/4	1,945	1,380	1,460	1,035	—	—	—	—

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-14 Chapter 17 using a conversion factor of $\alpha = 1.43$. The conversion factor α is based on the load combination assuming 100% seismic load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The allowable tension load listed for SDC (Seismic Design Category) A-B may also be used in SDC C-F when the tension component of the strength-level seismic design load on the anchor does not exceed 20% of the total factored tension load on the anchor associated with the same load combination.
5. When designing anchorages in SDC C-F, the designer shall consider the ductility requirements of ACI 318-14 Section 17.2.3.
6. Tension design strengths in SDC C-F have been adjusted by 0.75 factor in accordance with ACI 318-14 Section 17.2.3.4.4.
7. Installation must comply with Figure 1 on page 18.

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Mechanically Galvanized Carbon Steel Strong-Bolt® 2 Installation Information and Additional Data¹

Characteristic	Symbol	Units	Nominal Anchor Diameter, d _a (in.)								
			¼	⅜		½		⅝		¾	
Installation Information											
Nominal Diameter	d _a	in.	¼	⅜		½		⅝		¾	
Drill Bit Diameter	d	in.	¼	⅜		½		⅝		¾	
Baseplate Clearance Hole Diameter ²	d _c	in.	⅝ ₁₆	⅞ ₁₆		⅑ ₁₆		1 ¹ / ₁₆		7 ₈	
Installation Torque	T _{inst}	ft-lbf	4	20		45		60		90	
Nominal Embedment Depth	h _{nom}	in.	1¾	1⅞	3⅞	2¾	4½	3⅞	5½	4	6¾
Effective Embedment Depth	h _{ef}	in.	1½	1½	3	2¼	4	2¾	4⅞	3¼	6
Minimum Hole Depth	h _{hole}	in.	1⅞	2	3½	3	4¾	3⅝	5¾	4¼	7
Minimum Overall Anchor Length	ℓ _{anch}	in.	3¼	3	5	3¾	5½	4½	7	5½	8½
Critical Edge Distance	c _{ac}	in.	3½	7	4½	9	8	12	7⅝ ₁₆	8½	9
Minimum Edge Distance	c _{min}	in.	1½	3½		3½		3¾		4	
	for s ≥	in.	—	6		6		8		12	
Minimum Spacing	s _{min}	in.	1½	2½		2¾		3		3½	
	for c ≥	in.	—	6		8		8		8	
Minimum Concrete Thickness	h _{min}	in.	3⅝	3¼	4¾	4	6	4⅞	7	5¾	8½
Additional Data											
Yield Strength	f _{ya}	psi	56,000	92,000		85,000		85,000		70,000	
Tensile Strength	f _{uta}	psi	70,000	115,000		115,000		115,000		110,000	
Minimum Tensile and Shear Stress Area	A _{se}	in. ²	0.0318	0.0514		0.105		0.166		0.270	
Axial Stiffness in Service Load Range – Uncracked Concrete	β	lb./in.	186,460	431,485		1,265,880		545,505		669,405	

1. The information presented in this table is to be used in conjunction with the design criteria of ACI 318-19 Chapter 17, ACI 318-14 Chapter 17 or ACI 318-11 Appendix D.
2. The clearance must comply with applicable code requirements for the connected element.
3. Mechanically Galvanized Strong-Bolt 2 installation in cracked concrete is outside the scope of this technical engineering bulletin.

Strong-Bolt® 2 Design Information — Concrete

Mechanically Galvanized Carbon Steel Strong-Bolt® 2 Tension & Shear Strength Design Data¹

Characteristic	Symbol	Units	Nominal Anchor Diameter, d _a (in.)								
			1/4	3/8		1/2		5/8		3/4	
Anchor Category	1, 2 or 3	—	1								
Nominal Embedment Depth	<i>h_{nom}</i>	in.	1 3/4	1 7/8	3 3/8	2 3/4	4 1/2	3 3/8	5 1/2	4	6 3/4
Steel Strength in Tension (ACI 318-19 17.6.1, ACI 318-14 17.4.1 or ACI 318-11 Section D.5.1)											
Tension Resistance of Steel	<i>N_{sa}</i>	lb.	2,225	5,910		12,075		19,090		29,700	
Strength Reduction Factor – Steel Failure ²	<i>ϕ_{sa}</i>	—	0.75								
Concrete Breakout Strength in Tension (ACI 318-19 17.6.2, ACI 318-14 17.4.2 or ACI 318-11 Section D.5.2)											
Effective Embedment Depth	<i>h_{ef}</i>	in.	1 1/2	1 1/2	3	2 1/4	4	2 3/4	4 7/8	3 1/4	6
Critical Edge Distance	<i>c_{ac}</i>	in.	3 1/2	7	4 1/2	9	8	12	7 5/16	8 1/2	9
Effectiveness Factor – Uncracked Concrete	<i>k_{uncr}</i>	—	24	24		27	24	27	24	27	24
Strength Reduction Factor – Concrete Breakout Failure ²	<i>ϕ_{cb}</i>	—	0.65								
Pullout Strength in Tension (ACI 318-19 17.6.3, ACI 318-14 17.4.3 or ACI 318-11 Section D.5.3)											
Pullout Resistance – Uncracked Concrete (f' _c = 2,500 psi)	<i>N_{p,uncr}</i>	lb.	1,775 ⁵	2,170 ⁴	4,240 ⁶	N/A ³	9,090 ⁷	N/A ³	8,980 ⁴	N/A ³	11,560 ⁴
Strength Reduction Factor – Pullout Failure ²	<i>ϕ_p</i>	—	0.65								
Steel Strength in Shear (ACI 318-19 17.7.1, ACI 318-14 17.5.1 or ACI 318-11 Section D.6.1)											
Shear Resistance of Steel	<i>V_{sa}</i>	lb.	955	2,805		6,680		9,900		14,645	
Strength Reduction Factor – Steel Failure ²	<i>ϕ_{sa}</i>	—	0.65								
Concrete Breakout Strength in Shear (ACI 318-19 17.7.2, ACI 318-14 17.5.2 or ACI 318-11 Section D.6.2)											
Outside Diameter	<i>d_a</i>	in.	0.25	0.375		0.50		0.625		0.75	
Load-Bearing Length of Anchor in Shear	<i>ℓ_e</i>	in.	1.50	1.50	3.00	2.25	4.00	2.75	4.875	3.25	6.00
Strength Reduction Factor – Concrete Breakout Failure ²	<i>ϕ_{cb}</i>	—	0.70								
Concrete Pryout Strength in Shear (ACI 318-19 17.7.3, ACI 318-14 17.5.3 or ACI 318-11 Section D.6.3)											
Coefficient for Pryout Strength	<i>k_{cp}</i>	—	1.0	1.0	2.0	1.0	2.0	2.0		2.0	
Strength Reduction Factor – Concrete Pryout Failure ²	<i>ϕ_{cp}</i>	—	0.70								

- The information presented in this table is to be used in conjunction with the design criteria of ACI 318-19 Chapter 17, ACI 318-14 Chapter 17 or ACI 318-11 Appendix D, except as modified below.
- The strength reduction factor applies when the load combinations from the IBC or ACI 318 are used and the requirements of ACI 318-19 17.5.3, ACI 318-14 17.3.3 or ACI 318-11 D.4.3, as applicable, are met. If the load combinations of ACI 318-11 Appendix C are used, the appropriate strength reduction factor must be determined in accordance with ACI 318-11 D.4.4.
- N/A (not applicable) denotes that pullout resistance does not need to be considered.
- The characteristic pullout strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c/2,500)^{0.5}$.
- The characteristic pullout strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c/2,500)^{0.11}$.
- The characteristic pullout strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c/2,500)^{0.23}$.
- The characteristic pullout strength for greater concrete compressive strengths shall be increased by multiplying the tabular value by $(f'_c/2,500)^{0.24}$.
- Mechanically Galvanized Strong-Bolt 2 installation in cracked concrete is outside the scope of this technical engineering bulletin.

Strong-Bolt® 2 Design Information — Concrete

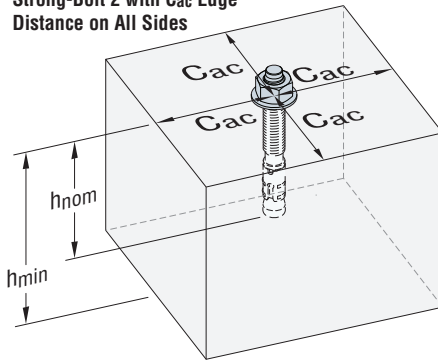
Mechanically Galvanized Carbon Steel Strong-Bolt® 2 Tension and Shear **Design Strengths** in Uncracked Normal-Weight Concrete ($f'_c = 2,500$ psi)



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance C_{ac} (in.)	Minimum Edge Distance C_{min} (in.)	Tension Design Strength (lb.)		Shear Design Strength (lb.)		
					Edge Distances = C_{ac} on all sides	Edge Distances = C_{min} on one side and C_{ac} on three sides	Edge Distances = C_{ac} on all sides	Edge Distances = C_{min} on one side and C_{ac} on three sides	
								⊥ to edge	to edge
1/4	1 3/4	3 1/8	3 1/2	1 1/2	1,155	690	620	450	490
3/8	1 7/8	3 1/4	7	3 1/2	1,410	715	1,545	770	770
	3 3/8	4 3/4	4 1/2	3 1/2	2,755	2,755	1,675	1,675	1,390
1/2	2 3/4	4	9	3 1/2	2,960	1,150	3,190	1,240	1,240
	4 1/2	6	8	3 1/2	5,910	3,240	3,920	2,405	2,345
5/8	3 3/8	4 7/8	12	3 3/4	4,000	1,275	5,260	2,465	2,740
	5 1/2	7	7 5/16	3 3/4	5,835	5,420	4,305	2,970	2,780
3/4	4	5 3/4	8 1/2	4	5,140	2,540	4,420	3,120	2,735
	6 3/4	8 1/2	9	4	7,515	6,900	6,300	3,530	3,790

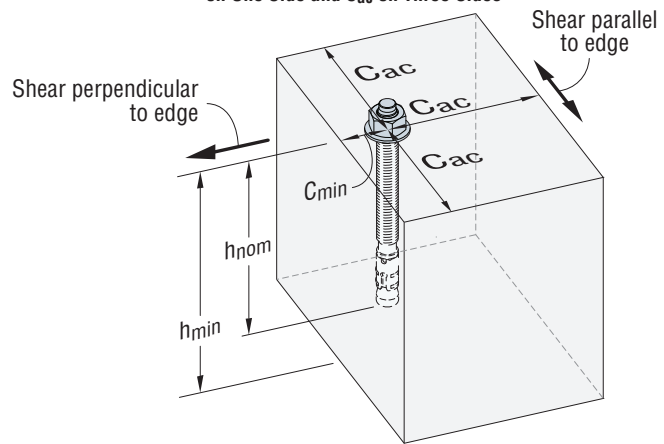
1. Tension and Shear design strengths (SD level) are based on the strength design provisions of ACI 318-19 Chapter 17.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. Strength reduction factor, ϕ , is based on using a load combination from ACI 318-19 Section 5.3.
5. The Designer of Record is responsible for the foundation design.

Strong-Bolt 2 with C_{ac} Edge
Distance on All Sides



Flat Slab

Strong-Bolt 2 with C_{min} Edge Distance
on One Side and C_{ac} on Three Sides



Flat Slab

* See page 3 for an explanation of the load table icons.

Strong-Bolt® 2 Design Information — Concrete

Mechanically Galvanized Carbon Steel Strong-Bolt® 2 **Allowable** Tension and Shear Loads in Uncracked Normal-Weight Concrete ($f'_c = 2,500$ psi) - Static Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)		Allowable Shear Load (lb.)		
					Edge Distances = c_{ac} on all sides	Edge Distances = c_{min} on one side and c_{ac} on three sides	Edge Distances = c_{ac} on all sides	Edge Distances = c_{min} on one side and c_{ac} on three sides	
								⊥ to edge	to edge
1/4	1 3/4	3 1/8	3 1/2	1 1/2	825	495	445	320	350
3/8	1 7/8	3 1/4	7	3 1/2	1,005	510	1,105	550	550
	3 3/8	4 3/4	4 1/2	3 1/2	1,970	1,970	1,195	1,195	995
1/2	2 3/4	4	9	3 1/2	2,115	820	2,280	885	885
	4 1/2	6	8	3 1/2	4,220	2,315	2,800	1,720	1,675
5/8	3 3/8	4 7/8	12	3 3/4	2,855	910	3,755	1,760	1,955
	5 1/2	7	7 5/16	3 3/4	4,170	3,870	3,075	2,120	1,985
3/4	4	5 3/4	8 1/2	4	3,670	1,815	3,155	2,230	1,955
	6 3/4	8 1/2	9	4	5,370	4,930	4,500	2,520	2,705

1. Allowable loads are calculated based on the strength design provision of ACI 318-19 Chapter 17 using a conversion factor of $\alpha = 1.4$. The conversion factor α is based on the load combination 1.2D + 1.6L assuming 50% dead load and 50% live load: $1.2(0.5) + 1.6(0.5) = 1.4$.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The Designer of Record is responsible for the foundation design.

Mechanically Galvanized Carbon Steel Strong-Bolt® 2 **Allowable** Tension and Shear Loads in Uncracked Normal-Weight Concrete ($f'_c = 2,500$ psi) - Wind Load



Anchor Dia. (in.)	Nominal Embed. Depth (in.)	Min. Concrete Thickness h_{min} (in.)	Critical Edge Distance c_{ac} (in.)	Minimum Edge Distance c_{min} (in.)	Allowable Tension Load (lb.)		Allowable Shear Load (lb.)		
					Edge Distances = c_{ac} on all sides	Edge Distances = c_{min} on one side and c_{ac} on three sides	Edge Distances = c_{ac} on all sides	Edge Distances = c_{min} on one side and c_{ac} on three sides	
								⊥ to edge	to edge
1/4	1 3/4	3 1/8	3 1/2	1 1/2	695	415	370	270	295
3/8	1 7/8	3 1/4	7	3 1/2	845	430	925	460	460
	3 3/8	4 3/4	4 1/2	3 1/2	1,655	1,655	1,005	1,005	835
1/2	2 3/4	4	9	3 1/2	1,775	690	1,915	745	745
	4 1/2	6	8	3 1/2	3,545	1,945	2,350	1,445	1,405
5/8	3 3/8	4 7/8	12	3 3/4	2,400	765	3,155	1,480	1,645
	5 1/2	7	7 5/16	3 3/4	3,500	3,250	2,585	1,780	1,670
3/4	4	5 3/4	8 1/2	4	3,085	1,525	2,650	1,870	1,640
	6 3/4	8 1/2	9	4	4,510	4,140	3,780	2,120	2,275

1. Allowable tension loads are calculated based on the strength design provision of ACI 318-19 Chapter 17 using a conversion factor of $\alpha = 1.67$. The conversion factor α is based on the load combination assuming 100% wind load.
2. Tabulated values are for a single anchor with no influence of another anchor.
3. Interpolation between embedment depths is not permitted.
4. The Designer of Record is responsible for the foundation design.

* See page 3 for an explanation of the load table icons.

APPENDIX F - EXISTING CONDITIONS PHOTOGRAPHS



PHOTOGRAPH 1 - ADAMS STREET UNDERCROSSING
LOOKING WEST

APPENDIX F - EXISTING CONDITIONS PHOTOGRAPHS



PHOTOGRAPH 2 - WEST OF ADAMS STREET UNDERCROSSING,
LOOKING WEST

APPENDIX F - EXISTING CONDITIONS PHOTOGRAPHS



PHOTOGRAPH 3 - WEST OF JEFFERSON STREET
UNDERCROSSING LOOKING EAST

APPENDIX F - EXISTING CONDITIONS PHOTOGRAPHS



PHOTOGRAPH 4 - BASE PLATE AT JEFFERSON STREET