

**INTERNATIONAL ASSOCIATION OF PLUMBING AND
MECHANICAL OFFICIALS UNIFORM EVALUATION SERVICES****EVALUATION CRITERIA FOR****Cold-Formed Steel Shear Tab Connection at the****Steel-Concrete Interface of Composite and Non-****Composite Members****EC 033-2018
(Proposed November 2018)****1.0 INTRODUCTION**

- 1.1 Purpose:** The purpose of this evaluation criteria is to establish requirements for alternative methods of longitudinal shear transfer, other than welded, steel-headed stud anchors, at the interface between a concrete floor or roof slab or wall and supporting structural or non-structural steel or cold-formed steel member, to be recognized in an Evaluation Report independently reviewed and issued by an evaluation agency under the 2018, 2015 and 2012 *International Building Code*[®] (IBC). The basis for the recognition is IBC Section 104.11.

The reason for development of this evaluation criteria is to provide requirements for establishing the design standards for shear connection in the design of composite members. Currently, ANSI/AISC 360 and SJI-CJ provide the design criteria for proportioning shear connection strength using only steel headed stud anchors in ANSI/AISC 360 Section I8, and SJI-CJ Section 103.6(d), respectively. The purpose of this evaluation criteria is to provide design information for alternative forms of shear connectors that would replace the requirements of SJI-CJ Section 103.6(d) or ANSI/AISC 360 Section I8, as applicable, in their entirety, or provide independently evaluated and self-standing shear connection design methodology for members outside the scope of ANSI/AISC 360 or SJI-CJ. The criteria also provides requirements to establish the tensile capacity of the connection between a concrete panel and the supporting steel member when the two elements are designed as acting non-compositely under flexure.

- 1.2 Scope:** This evaluation criteria applies cold-formed steel shear tabs used for shear transfer at the interface of the concrete panel used as slab or wall element and the supporting steel member as an alternative to steel headed stud anchors, currently prescribed by ANSI/AISC 360, SJI-CJ, or other applicable specification. Cold-formed steel shear tabs provide shear resistance and are used to develop composite action between a structural concrete panel and the supporting steel member to resist bending moment induced by loads perpendicular to the plane of the member, whereby the extreme fiber of the concrete slab is in compression, while the extreme fiber of the supporting steel member is in tension. Additionally, the scope of the criteria also includes requirements to establish the capacity of shear tabs in tension in configurations where the concrete panel and the supporting steel member are designed as non-composite flexural members. The concrete panel may be supported by cold-formed steel deck or be formed to span directly between the supporting steel members. Composite and non-composite members where such connections are employed may be structural and non-structural in nature. Additionally, when other product characteristics, such as fire-resistance ratings, shall comply with the governing code provisions or IAPMO UES evaluation criteria, as applicable.

- 1.3 Definitions:** For terms not defined in this section, applicable codes, or referenced standards shall have the ordinary accepted definition for the context for which they are intended.

- 1.3.1 Base Steel:** The top chord, flange, or horizontal surface of a supporting steel member from which the shear tab is formed.



- 1.3.2 Base Steel Thickness:** The thickness of the base steel, exclusive of all coatings and galvanization.
- 1.3.3 Composite Shear Connection:** Structural elements of a composite connection at the interface of the concrete slab and the supporting steel joists, which includes embedded connection elements, concrete, and base steel. The connection strength and ductility shall be determined from the mechanical and geometric properties of the elements and the structural interaction among each element.
- 1.3.4 Cold-Formed Steel Shear Tab (Connector):** Mechanically cut and formed extrusion formed from the base steel resulting in an embedded steel element of a shear connection or a tension interface connection.
- 1.3.5 Nominal Strength:** Mean (average) strength of a structure or component (without a resistance factor or safety factor applied) to resist load effects, as determined in accordance with the applicable building code.
- 1.3.6 Steel Deck Profile:** A specific configuration of formed steel deck geometry, including deck height, thickness, flange widths, web angles, and bend radii.
- 1.3.7 Tensile Interface Connection:** Structural elements of a non-composite connection at the interface of the concrete slab and the supporting steel joists, which includes embedded connection elements, concrete, and base steel. The connection strength and ductility shall be determined from the mechanical and geometric properties of the elements and the structural interaction among them.

2.0 REFERENCED STANDARDS

Standards shall be applied consistent with the specific edition of the code(s) for which the Evaluation Report is prepared unless otherwise approved by UES.

2.1 American Concrete Institute

- Building Code Requirements for Structural Concrete, ACI 318

2.2 American Iron and Steel Institute

- North American Specification for the Design of Cold-Formed Steel Structural Members, AISI S100
- North-American Standard for Cold-Formed Steel Framing General Provisions, AISI S200
- North-American Standard for Cold-Formed Steel Structural Framing, AISI S240

2.3 American Institute of Steel Construction

- Specification for Structural Steel Buildings, ANSI/AISC 360

2.4 American Society for Testing and Materials

- Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings, ASTM A90/A90M
- Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, ASTM A123/A123M
- Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, ASTM A653/A653M
- Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members, ASTM A1003
- Standard Specification for Nonstructural Steel Framing Members, ASTM C645
- Standard Specification for Cold-Formed Steel Structural Framing Members, ASTM C955
- Standard Test Methods and Definitions for Mechanical Testing of Steel Products, ASTM A370
- Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality, ASTM A529/A529M
- Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete, ASTM C138/C138M

- 2.5 International Code Council**
- International Building Code, IBC

- 2.6 Steel Joist Institute**
- Standard Specification for Composite Steel Joists, SJI-CJ

3.0 BASIC INFORMATION

3.1 Description:

The following information shall be submitted:

- 3.1.1 Product Description:** The product description for the cold-formed shear steel tab connectors shall include:

3.1.1.1 Detailed description of the individual connector dimensional configuration, position on the base steel, spacing and orientation of multiple connectors forming each unique pattern along the length of the base steel.

3.1.1.2 Specifications for raw materials and for final products, including all aspects that affect the connector performance, such as provisions for chemical composition, mechanical properties, heat treatment, and coatings. The specifications shall be specific as to the requirements for each part of the connector. Where the connector is integral with the base steel and the material properties of the base steel and the connector are identical, specifications for the base steel will suffice.

3.1.1.3 Details or product drawings that describe dimensions and tolerances for each unique part of the connector.

3.1.1.4 Connector marking, if applicable. Where the connector is integral with a cold-formed steel stud, the marking requirements of AISI S240 for the 2018 IBC and AISI S200 for the 2015 and 2012 IBC shall apply, as applicable.

3.1.1.5 Sample connector (one of each unique applicable geometry). For connectors integral with the base steel, a sample member section comprising the entire applicable pattern of connectors shall suffice for this purpose.

3.1.1.6 Manufacturing process.

3.1.2 Installation Instructions: Manufacturer's published installation instructions shall be submitted and shall include all applicable installation requirements, such as description of the required tool, if applicable, the required tool operation, such as speed during installation, operator certification, and other criteria as applicable to each specific connector evaluated. The instructions shall be consistent with applicable requirements of the design standard to which the scope of the evaluation report applies, except as justified by the data specified in this criteria.

3.1.3 Packaging and Identification: The method of packaging, when applicable, and identifying the connectors shall be reported. The identifying information on each box or package of connectors shall include the applicable identifying information such as brand name and model number, nominal connector size (number, fraction or decimal equivalent), nominal connector embedment length (fraction or decimal equivalent), shape, gage or thickness, the evaluation report holder's name, Mark of Conformity, and the Evaluation Report number. When the connector is integral with a cold-formed steel supporting member, the identifying information in accordance with ASTM C645 and C955 for the member shall also be indicated.

- 3.2 Test Reports:** Test reports shall include all applicable information required in Section 3.1 of this criterion, the applicable test standard, UES Test Report Requirements Procedure No. ES-025 or equivalent, Annex A of this criteria, and the following:
- Detailed description and documentation, with illustrations, of test setup and specimens.
 - The source of the test specimens.
 - Test standard with date of issue and an explanation of any deviation from the standard.
 - Location of load points and gages.
 - Description of failure mode.
 - Method and amount of product sampling from the manufacturing site.
 - Identity of the personnel from the accredited laboratory who conducted or witnessed and verified construction of the assemblies.
 - Drawings, calculations, photographs, material specification, measured yield strength of the base steel, measured tensile strength of the base steel, base steel thickness, measured concrete compressive strength.
 - Interpretation of results.
 - Certificate showing testing laboratory is accredited as complying with ISO/IEC Standard 17025 for the testing reported issued by an accreditation body conforming to ISO/IEC 17011 that is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA).
- 3.3 Product Sampling:** The fabrication of the test assemblies shall be witnessed by or verified by the testing laboratory. The cold-formed shear steel tabs shall be representative of later production, and shall be proven to be identical, within specified tolerance limits, to production cold-formed steel shear tabs by confirming dimensions, material specifications, and performance requirements set forth in Sections 4.0 through 4.5 of this criteria, as applicable.

4.0 TESTING AND PERFORMANCE REQUIREMENTS

- 4.1 General:** Section 4.0 of this criteria describes tests required under this criterion, which include the following: testing of materials in Section 4.2 and testing of composite shear connections and tensile interface connections in Sections 4.3, 4.4, and 4.5 of this criteria. Section 4.4 of this criteria describes the conditions of acceptance for the push-out and pull-out tests, while Section 4.5 of this criteria describes the push-out and pull-out test process. The testing described shall be conducted on materials of the same heat and manufacturing batch for steel and the same mix design and the delivery for concrete from those of the assembly tests in Section 4.5 of this criteria.
- 4.2 Testing of Materials:**
- 4.2.1 Shear Connector (Cold-Formed Steel Shear Tabs):**
- 4.2.1.1 Dimensions:** The purpose of testing in this section is to determine the actual geometric properties of the shear tab connectors. All pertinent dimensions, such as length, width, thickness, tab spacing, radius of bent components, shall be measured on each unique configuration by the testing laboratory and compared with the nominal dimensions in the shear tab connector production drawings. If any dimension is outside the dimensional tolerances prescribed in the product drawings, the shear connector shall not be used for testing under this criterion. When the shear tab is integral with the supporting cold-formed steel stud, tolerance requirements shall be applied in accordance with AISI S240 for the 2018 IBC and AISI S200 for the 2015 and 2012 IBC, as applicable.
- 4.2.1.2 Materials:** Critical constituent materials shall be verified by the testing laboratory for conformance to mechanical and chemical specifications using direct tests, certified mill test reports for steels, or similar certified documents for other materials.

- 4.2.1.3 Other:** Surface finishes, coatings, and any markings shall be examined by the testing and evaluation agency for conformance to the drawings and specifications.
- 4.2.2 Base Steel:** Testing of supporting steel, whether or not the connector is integral therewith, such as coupons of a steel joist top chord or cold-formed steel flange, shall be conducted by a testing laboratory to ensure compliance with the joist top chord material standard, such as ASTM A529/A529M, or the cold-formed steel stud, such as ASTM A1003/A1003M. Material test reports from the manufacturer of the heat of steel utilized to produce the supporting steel member are an acceptable alternative, provided traceability to steel joist production is verified. The steel yield strength, tensile strength, elongation, and area of reduction shall be determined in accordance with ASTM A370. The dimensions of the supporting steel, including base steel thickness of the steel, shall be measured. Coating weight and thickness shall be determined in accordance with ASTM A90, A123 or A653.
- 4.2.3 Steel Deck:** When steel deck is used in any particular configuration, for each deck type and deck profile, geometrical dimensions such as depth of the steel deck profile, top flange width, web width, bottom flange width, and average concrete rib width shall be determined.
- 4.2.4 Concrete:** Concrete testing, mix and proportions, and reinforcement shall conform to the requirements of Chapter 19 of the IBC and ACI 318.
- 4.2.4.1** Strength tests shall be the average of the strengths of at least two cylinders made from the same sample of concrete. Two strength tests shall be performed and the average compressive strength reported. The two strength tests shall be conducted such that one test is within a 24-hour period immediately preceding and the other test immediately after the composite connection test series (minimum four cylinders). Each configuration of replicate test specimen shall be specific to a single nominal concrete weight (i.e., normal-weight, lightweight, or sand-lightweight) and the concrete weight shall be determined as defined in accordance with ASTM C138 and recorded.
- 4.2.5 Reinforcing Steel:** Welded wire reinforcement (WWR) or deformed reinforcing bar, as applicable, shall conform to specifications permitted by ACI 318.
- 4.3 Testing of Composite Shear Connections (Push-out Test) and Tensile Interface Connections (Pull-Out Test):** Push-out and pull-out tests shall be conducted in accordance with Section 4.5 of this criterion, on composite and non-composite connection assemblies, respectively, described in a test plan in accordance with Section 4.5.1 of this criterion. The result of push-out and pull-out tests shall satisfy the conditions of acceptance prescribed in Section 4.4 of this criterion to qualify the shear tab connectors as an alternative method of shear transfer based on push-out tests, or as a method of tensile transfer based on pull-out tests. The connection strengths are determined per the following sections.
- 4.4 Conditions of Acceptance for Push-out and Pull-out Tests:** Each set of replicate tests shall comply with the following requirements:
- 4.4.1 Nominal Capacity:** The nominal shear capacity, Q_n , is the average peak strength of the replicate push-out test specimens per connector. The nominal tensile capacity, T_n , is the average peak strength of the replicate pull-out test specimens per connector.
- 4.4.2 Coefficient of Variation:** The Coefficient of Variation (COV) of the tests performed shall not exceed 0.15 for the sample size including a group of at least three individual tests in accordance with Section K2 of AISI S100-16 or Section F1 of AISI S100-12, configured as indicated in this criterion, of the same mode of failure.

4.4.3 Available Capacity (Available Strength): The available flexural strength of a composite member shall be determined as the product of the nominal shear capacity, Q_n , as defined by Section 4.4.1 of this criterion, and the strength reduction factor for flexural available strength of the composite member as specified by ANSI/AISC 360, SJI-CJ or ANSI/AISI S100, as applicable. Available tensile strength, T_n , shall be determined in accordance with Chapter K of ANSI/AISI S100-16 or Chapter F of ANSI/AISI S100-12.

4.5 Push-out Testing:

4.5.1 General: Push-out tests shall be conducted on composite connection specimens, which include cold-formed shear tab connectors, concrete, supporting steel members, with or without steel deck panels.

A testing plan documenting all material elements of the tested configuration shall be submitted for approval to the evaluation agency prior to testing.

4.5.2 Number of Replicate Specimens: A minimum of three replicate specimens shall be tested for each combination of variables that affect the performance of the connection assembly, provided the deviation of the maximum strength of any individual test result from the average value does not exceed ± 15 percent. If such a deviation of maximum strength from the average value exceeds ± 15 percent, additional specimens of the same kind shall be tested until the deviation of any individual maximum strength from the average value obtained from the replicate tests does not exceed ± 15 percent or until at least three additional tests have been made. No test result shall be eliminated unless an appropriate rationale for its exclusion is given in accordance with Section F1.1(a) of AISI S100-12.

4.5.3 Preparation of Specimens:

4.5.3.1 Concrete slabs shall be cast in the horizontal position to ensure that concrete is properly cured and bonds to the surface of the embedded connector.

4.5.3.2 When steel deck is used in push-out test specimens, prior to placement of the steel deck or light gauge steel sheet on the flanges of the steel supporting member, the top flanges of the steel supporting member shall be greased. This grease reduces the static coefficient of friction between the steel supporting member and underside of the steel deck or light gauge sheet. There shall be no additional fastening of the steel deck panel to the steel support members of the test assemblies other than the shear tab connectors. Greasing is not required for the pullout tests.

4.5.3.3 All test specimens shall be stored and cured the same way as that of the corresponding concrete cylinders.

4.5.4 Test Procedure, Push-out Specimen: Once the concrete has reached its targeted compressive strength, as specified in the test plan, the two halves of the push-out test specimen shall be stood up and bolted together forming an "I" section. To assure the two concrete slabs have uniform bearing pressure across their entire edge surface area in contact with the floor, an elastomeric bearing pad shall be placed under each test specimen. Axial load shall be applied to the steel I-section, which induces shear force at the interface between concrete and the steel I-section, in such a manner that the load is equally applied to both halves of the push-out test specimen. Confirmation that equal load is being applied to both halves of the push-out test specimen is achieved by comparison of the slip measurements along each half of the specimen during the load application. If a deviation in slip exceeding 15 percent from one side to the other occurs, the specimen shall be unloaded and the centering of the loading apparatus checked and realigned as necessary. A normal load, perpendicular to the axial load direction and parallel to the connector embedment height, equal to 10 percent of the axial load shall be applied concurrently to the surface of the two concrete elements. Axial and normal load shall be applied until a load of approximately 80 percent of the expected capacity is reached. The load shall be applied in no more than 300 pound (1334 N) increments. From this point forward, slip control shall be

utilized, i.e., the load is applied until the slip increases in a fixed amount. During the displacement control phase, the load shall be applied such that the average slip increment does not exceed 0.030 inch (0.76 mm). The longitudinal slip between each concrete element and the steel section shall be measured continuously during loading or at each load increment. The load and slip will be measured at least until the load has dropped to 30 percent below the peak load. Mode of failure shall be noted and recorded on the test report. For cold-formed steel studs, the specimen may be configured in a single or a double-stud configuration, as applicable, in accordance with Figure 1 of this criteria. The test Specimen configuration is illustrated in Figure 1 of this criteria. The level of detail given in Figure 1 of this criteria shall be included in each evaluation report.

Test Procedure, Pull-out Specimen: Once the concrete has reached its targeted compressive strength, as specified in the test plan, the concrete element of the specimen shall be restrained so as to prevent vertical translation during the application of the load. The pull-out load shall be centered on the specimen and shall be applied until a load of approximately 80 percent of the expected capacity is reached. The load shall be applied in no more than 100 pound (445 N) increments. From this point forward, slip control shall be utilized, i.e., the load is applied until the slip increases in a fixed amount. During the displacement control phase, the load shall be applied such that the average slip increment does not exceed 0.050 inch (1.3 mm). The longitudinal slip between concrete element and the steel section shall be measured in the direction of the load and shall be measured continuously during loading or at each load increment. The load and slip will be measured at least until the load has dropped to 30 percent below the peak load. Mode of failure shall be noted and recorded on the test report. For cold-formed steel studs, the specimen may be configured in a single or a double-stud configuration, as applicable. The test Specimen configuration is illustrated in Figure 2 of this criteria. The level of detail given in Figure 2 of this criteria shall be included in each evaluation report.

5.0 QUALITY CONTROL

- 5.1 Quality documentation complying with the UES Minimum Requirements for Listee's Quality Assurance System (UES-010) shall be submitted.
- 5.2 Inspections of manufacturing facilities are required for this product, by agencies accredited for the required tasks in accordance with ISO/IEC 17020 or ISO/IEC 17065.

6.0 EVALUATION REPORT RECOGNITION

Evaluation reports shall include the following information:

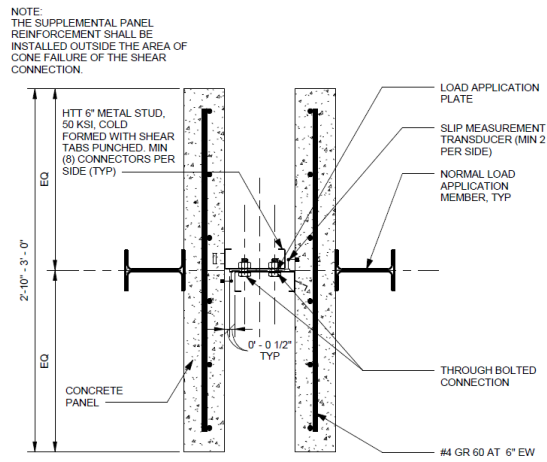
- 6.1 Basic summary product information, including assembly and component description, installation procedures and packaging and identification.
- 6.2 The evaluation report shall recognize only tested products, and identify the nominal shear strength, Q_n , nominal tensile strength, T_n , and the slip at nominal or design shear strength, for each tested fastener of each specific combination of fastener, concrete, steel deck (if applicable) and supporting steel. Nominal shear strength, Q_n , which is the mean tested strength of each unique configuration for the shear tab connection, shall be utilized as an alternative to Q_n , for a welded shear connector as outlined in SJI-CJ Section 103.6(d) or ANSI/AISC 360 Section I8, as applicable, or as a shear connector for a composite member designed in accordance with ANSI/AISI S100. Recognition of alternative combinations of connectors, concrete, steel deck, and supporting steel is permitted provided justification is submitted in a test plan proposal in accordance with Section 4.5.1 of this criteria and has been agreed upon by the evaluation agency prior to commencement of testing. Design tensile strength, ϕT_n , is a mean tested strength of each unique configuration for the shear tab connection multiplied by a strength reduction factor, shall be utilized as a connector between a steel and a concrete element acting as individual elements of a non-composite assembly.

- 6.3** Information described in Section 3.1 of this criteria.
- 6.4** A description of the elements of the shear-tab connections recognized in the evaluation report, including geometrical properties, material (mechanical) properties, including concrete specific weight determined per ASTM C138, and the arrangement of the elements in the composite connections.
- 6.5** A statement that the nominal load values for the shear-tab connectors and their connections are not permitted to be increased for short-duration loads.
- 6.6** The following statement: When required, calculations and details showing that the shear tab connections are adequate to resist the applied loads shall be submitted to the code official for approval. When required by the statutes of the jurisdiction in which the project is to be constructed, the calculations and the details shall be signed and sealed by a registered design professional.
- 6.7** For an evaluation based on push-out data, the following statement: This evaluation report addresses only a method of shear transfer that is an alternative to the code prescribed welded shear connectors under the auspices of SJI-CJ Section 103.6(d), an alternative to the code prescribed welded shear connectors under the auspices of ANSI/AISC 360 Section I8, and an alternative to shear connection for the designs under the auspices of ANSI/AISI S100, which are used to develop composite action between a structural concrete slab and the supporting steel members to resist bending induced by vertical loads.
- 6.8** For an evaluation based on pull-out data, the following statement: This evaluation report addresses only a method of tensile connections between concrete elements and the supporting steel members.
- The following statement: Conformance with other aspects of the code, such as requirements for a complete structural system and fire-resistance ratings, is outside of the scope of this evaluation report.
- 6.9** The following statement: Connectors and their connections shall be installed and constructed in accordance with the manufacturer's published instructions and this report. In the event of a conflict between this report and the manufacturer's published instructions, this report governs.
- 6.10** Guidance regarding allowable edge and end distances, orientation, and spacing of shear-tab connectors.
- 6.11** The following statement: Ductility of shear connection shall be considered in the design of composite members.
- 6.12** The following statement: Use of the shear tab connectors as part of the lateral force resisting system (wind or seismic) has not been evaluated and is beyond the scope of this report.

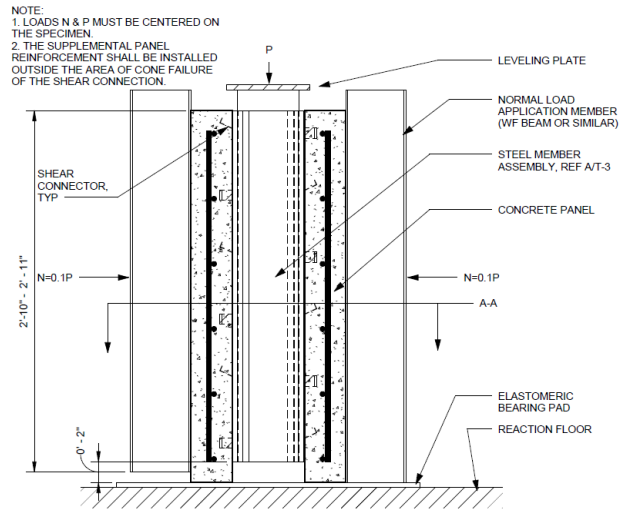
Annex A
Test Report Content

- 1.0** The services performed by the testing laboratory shall be documented by a retrievable report that accurately, clearly, objectively, and unambiguously presents measurements, observations, examinations, and test results in accordance with the reporting requirements of test method(s). Each test or inspection report also shall include the following unless the code, evaluation criteria, or the test standard requirements specify otherwise:
- 1.1** A title, for example, "Report of Shear Push-Out Tests of Cold-Formed Steel Shear Tabs" or "Report of Tensile Pull-out Tests of Cold-Formed Shear Tabs"
 - 1.2** The name, address, and contact information of the laboratory.
 - 1.3** A unique identification of the report (such as report number), the issue date, a sequential number for each page, and the total number of pages.
 - 1.4** The name and address of client.
 - 1.5** Description of, condition of, and clear identification of the item tested.
 - 1.6** Date test(s) were conducted.
 - 1.7** Identification of test standards or description of any non-standard methods used.
 - 1.8** Any deviations from, additions to, or exclusions from, the test standard and any other information relevant to the specific test, such as environmental conditions;
 - 1.9** Measurements, observations, examinations, and test results, supported by tables, graphs, sketches, and photographs, as appropriate, including a description of the failure mode or condition of item at conclusion of the tests;
 - 1.10** Conclusions or summary statements, including, when applicable, a statement indicating whether the product passed or failed the test;
 - 1.11** A statement the results apply only to the items tested;
 - 1.12** A statement that the report shall not be reproduced, except in full, without the prior written approval of the laboratory; and
 - 1.13** Name(s) of individual(s) performing the tests;
 - 1.14** A signature and title, or an equivalent identification, of the person(s) accepting responsibility for the content of the report on behalf of the laboratory.
 - 1.15** Identification of results obtained from tests subcontracted by the laboratory to others. The laboratory shall not represent the services of others as its own.
- 2.0** In addition to the requirements of Sections 1.0, 2.0 and 3.0 of Annex A, each test report, where necessary for the proper interpretation or understanding of the report, shall include the following:
- 2.1** Project title and reference designation.
 - 2.2** Reference to relevant code, evaluation criteria, or other requirement(s).
 - 2.3** A statement indicating compliance with relevant code, evaluation criteria, or other requirement(s).
 - 2.4** Other reporting requirements of the evaluation agency, the client, or relevant authority.

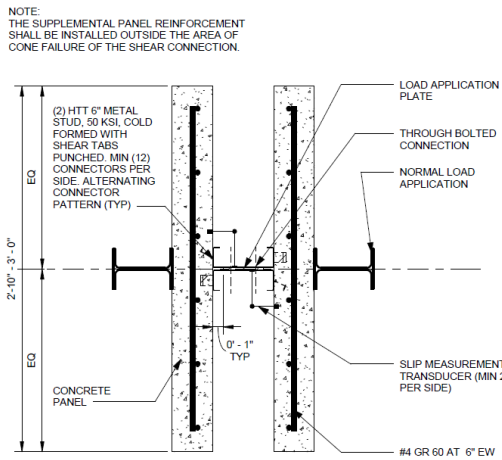
- 3.0** In addition to the requirements of Sections 1.0, 2.0, 3.0 and 4.0 of Annex A, test reports presenting results shall include the following with respect to sampling:
- 3.1** Date of sampling or date sample received, as applicable.
 - 3.2** Clear identification of the material sampled including manufacturer, brand name, lot number, source, or similar unique information, as applicable.
 - 3.3** Sampling location, where relevant, using an explicit description, diagram, sketch, or photograph, as applicable.
 - 3.4** Identification of sampling methods used, or sampling plan or procedure if a non-standard method was used.
 - 3.5** Deviations from, additions to, or exclusions from standard sampling methods or predetermined sampling plans or procedures.
 - 3.6** Details of environmental conditions present during the sampling such as rain or freezing weather that may have affected the testing of the sample or the interpretation of the test results.
 - 3.7** If assemblies are tested (structural assemblies, fire-rated assemblies, etc.), identification of the assemblies, preferably with illustrations. The report shall identify the parties constructing the assemblies and shall also address witnessing and/or verifying the construction.
- 4.0** When interpretations of tests are included in the report, the basis for the interpretations shall be clearly explained. Interpretations commonly include determination of compliance or noncompliance of the results with requirements of the test method or evaluation criteria.
- 5.0** Material revisions or additions to a report after initial issue shall be made in a further document clearly indicating the revised information and clearly referencing the original report identification. Such revisions or additions shall meet the relevant requirements of Section 2.0 of Annex A.
- 6.0** Transmission of test reports by electronic means shall follow documented procedures to ensure that the requirements of this evaluation criteria are met and that confidentiality is preserved.



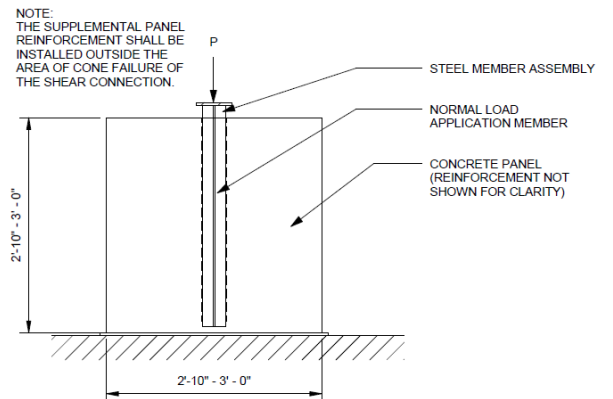
PUSHOUT SPECIMEN SECTION A-A
(SINGLE-STUD CONFIGURATION)



PUSHOUT SPECIMEN SIDE VIEW



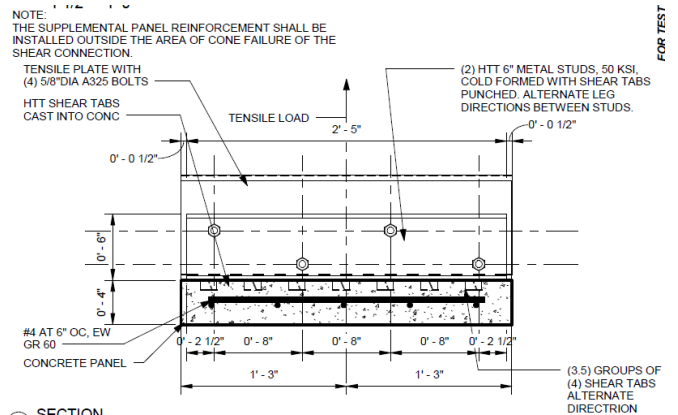
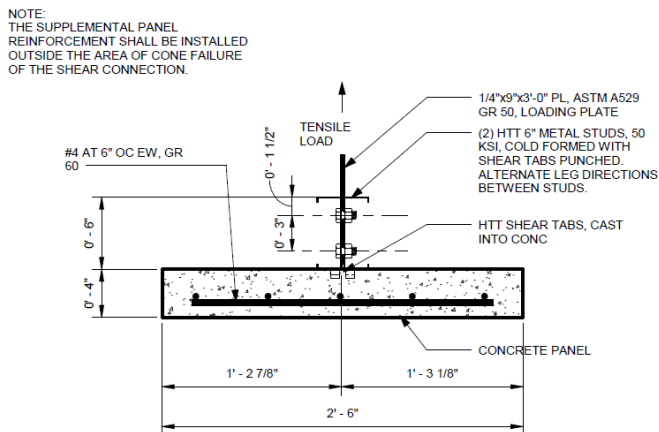
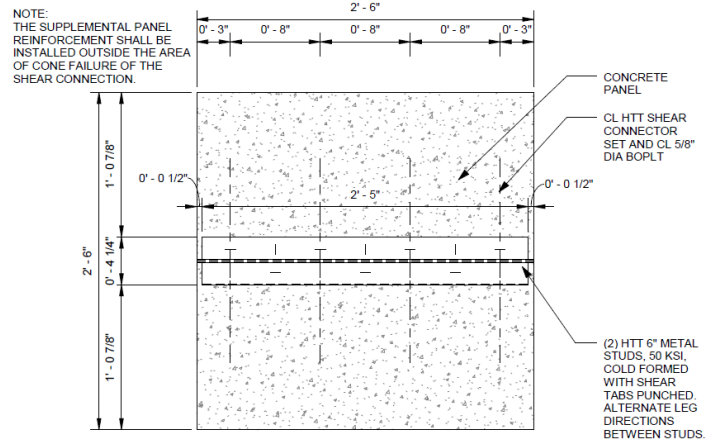
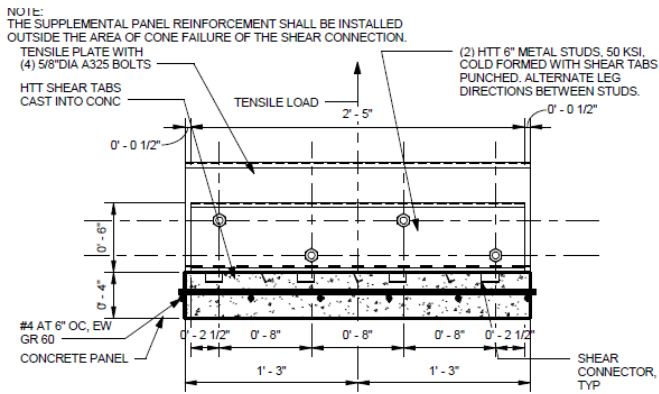
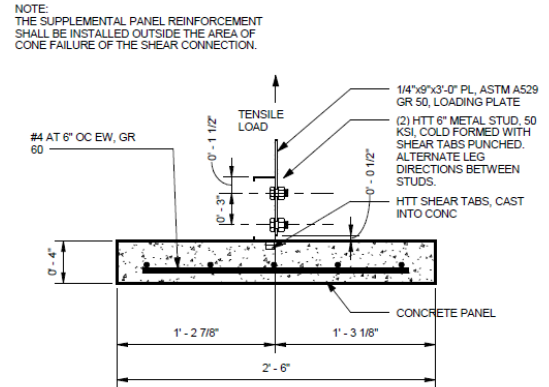
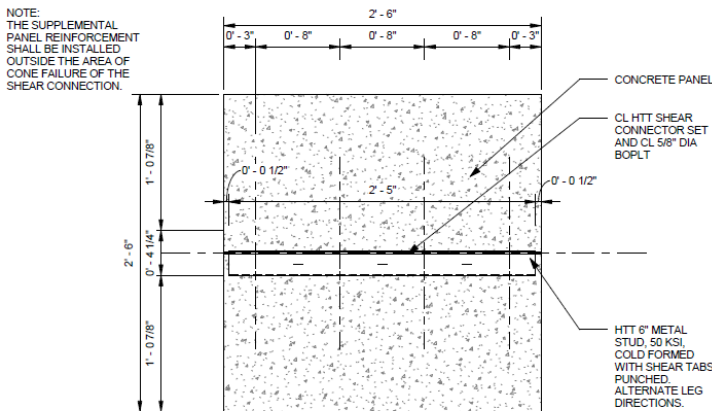
PUSHOUT SPECIMEN SECTION A-A
(DOUBLE-STUD CONFIGURATION)



PUSHOUT SPECIMEN FRONT VIEW

Note: This figure is for illustrative purposes only and shows the level of detail required to fully define each unique configuration to be tested. This level of detail is to be replicated within each evaluation report.

Figure No.1 – Push-out Test Specimen Diagram



Note: These figures are for illustrative purposes only and show the level of detail required to fully define each unique configuration to be tested. This level of detail is to be replicated within each evaluation report.

Figure No. 2 – Pull-out Test Specimen Diagram