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An American National Standard

Standard Terminology Pertaining to Metal Connector Plates[1]

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1. Scope

1.1 The definitions of terms pertaining to metal connector plates provide meanings and explanations of 46 technical terms which are in common use by both the technical expert, such as the plate fabricator and user, and the non-expert architect, engineer, specification writer, building code official, and others who deal with metal connector plates in one way or another.

1.2 This terminology does not cover terms relating to the mechanical properties of the materials used for fabricating metal connector plates nor does it cover their use.

1.3 The terms are listed in alphabetic sequence. Compound terms appear in the natural spoken order. Where the definitions are adopted verbatim from other sources, they are identified and fully referenced.

2. Referenced Documents

2.1 *ASTM Standards:*

A 653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process[2]

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[1] This terminology is under the jurisdiction of ASTM Committee ~~E-6~~ E06 on Performance of Buildings and is the direct responsibility of Subcommittee E06.13 on Structural Performance of Connections in Building Constructions.

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E 8 Test Methods for Tension Testing of Metallic Materials[3]
E 489 Test Method for Tensile Strength Properties of Metal Connector Plates[4]
F 547 Terminology of Nails for Use with Wood and Wood-Base Materials[5]

3. Terminology

3.1 *Definitions:*

angle of placement of metal connector plate—angle of inclination of lengthwise axis of metal connector plate parallel to longitudinal axis of coiled metal strip, that is, main direction of metal connector plate to direction of test-load application to wood member of connection; with *zero-degree angle* defined as that of lengthwise plate axis being parallel to load direction; and *angle greater than zero* defined as that of lengthwise plate axis being rotated clockwise away from the loading axis when facing the plated connection.

butted wood member—wood member with its squared end or side placed adjoining the squared end or side of another wood member; with both abutting members of same thickness and in a single plane.

connection, *n*—structural junction of two or more wood members, components, or assemblies, designed to be connected with mechanical fasteners, adhesives, welds, or a combination thereof, to transmit structural forces safely. Colloquially, the term *joint* is used in place of the term *connection*.

connector, *n*—within the restrictions of this terminology, abbreviation for **metal connector plate**.

connector hole—opening in metal connector plate, resulting from punching integral tooth from, or nail hole in, connector plate during its fabrication. Also called *slot* when opening is not round.

control plate—See **solid metal-coupon control specimen**.

control specimen—See **solid metal-coupon control specimen**.

fastener, *n*—integral tooth of connector plate and/or separate nail used to fasten connector plate to wood member.

finished metal connector plate—galvanized or chemically surfaced steel connector plate, with or without prepunched holes.

gross cross-sectional connector plate area—cross-sectional area of metal connector plate determined by multiplying gross thickness of plate by gross dimension of plate approximately perpendicular to direction of load application.

integral tooth of metal connector plate—plate projection punched from metal connector plate at approximately right angle to its surface which remains attached to plate and serves as a fastening element.

lateral resistance of metal connector plate—resistance to slip or pulling, or both, from wood, in direction of applied external shear force, of integral teeth or separate nails, or both, fastening connector plate to wood members. Also called *tooth holding resistance, grip resistance,* and *peel resistance* to cover specific events; yet, preferably called *lateral resistance*. See **shear strength of metal connector plate**.

length of metal connector plate—dimension of metal connector plate parallel to longitudinal axis of coiled metal strip from which plate was sheared during its fabrication, not necessarily along the long plate dimension. **E 489**

lumber, *n*—a sawn piece of wood smaller than 100 mm (4 in.) in its least dimension.

metal connector plate—finished (coated or galvanized) steel or bare stainless-steel plate of specified thickness with or without integral multiple plate projections (teeth) or nail holes, or a combination of both, with projections partially sheared from solid sheet during its fabrication and projecting from the plate in a single direction or both directions approximately perpendicular to the plate surface area; plate of specified thickness to which appropriate tolerances apply. Metal connector plates are manufactured from coiled strips of structural quality sheet metal, produced in various lengths and widths, and designed to connect wood members so as to transmit forces from one wood member (or section) to another one or more wood members (or sections). Other common terms include *plate, metal plate, metal-plate connector, nail plate, truss plate,* but the preferable term is **metal connector plate**.

metal connector plate with integral teeth—metal connector plate with integral multiple projections (teeth) partially sheared from solid sheet during its fabrication and projecting from the plate in a single direction or in both directions approximately perpendicular to the plate surface area. See **metal connector plate**.

mill certification—producing mill certificate or proof of conformance with specified minimum allowable stresses for heat identification number of metal coil(s) from which metal connector plates were fabricated.

nail, *n*—straight, slender fastener, usually pointed and headed; designed to be driven through connector plate or plates with or without nail holes; serving as separate supplementary or primary fastener. **F 547**

nail hole—round perforation in metal connector plate through which a nail can be driven to fasten plate to wood members (or sections) and to transmit shear loads; providing predetermined location for appropriately locating nails to be driven. See **plate hole**. **E 489**

nail-on plate—solid or prepunched (or predrilled) metal connector plate of specified thickness (gage); manufactured to various sizes, that is, lengths and widths; designed to be fastened with nails (or staples) to wood members and to transmit forces from

[2] *Annual Book of ASTM Standards,* Vol 01.06.
[3] *Annual Book of ASTM Standards,* Vol 03.01.
[4] *Annual Book of ASTM Standards,* Vol 04.11.
[5] *Annual Book of ASTM Standards,* Vol 15.08.

one wood member (or section) to another one or more wood members (or sections).

overpressed metal connector plate—metal connector plate with teeth, fully penetrating wood member, with tooth side of plate pressed more than one half of plate thickness below surface of wood member; in contrast to underpressed metal connector plate, the surface of which is not in contact with the surface of the wood members.

peeling resistance of metal connector plate with integral teeth—resistance to consecutive withdrawal of adjacent teeth of metal connector plate from wood member during shear load application starting at the last row of teeth and progressing toward the center of the connection. See **lateral resistance of metal connector plate**.

plate, *n*—abbreviated term for **metal connector plate**.

plate hole—opening in metal connector plate resulting from punching integral plate projection(s) from, or nail hole in, connector plate during its fabrication. See **nail hole**.

perforated metal connector plate—metal connector plate with prepunched or predrilled holes. Also called *punched metal connector plate*.

predrilled hole—hole drilled through metal connector plate during its fabrication.

prepunched hole—hole punched through metal connector plate during its fabrication.

shear strength of metal connector plate—resistance to shear force by net plate cross section, expressed as force per unit of length of full cross section of connector plate, when used in connections composed of pairs of plates.

shear transfer plate—metal connector plate with integral teeth projecting from plate in both directions approximately perpendicular to plate surfaces; designed to be placed between adjacent wood members and to connect and transmit forces from one wood member to another.

solid metal connector plate—metal connector plate without any prepunched or predrilled plate holes.

solid metal-coupon control specimen—solid metal connector plate sample of same material as metal connector plate under scrutiny of dimensions meeting the requirements of Test Methods E 8 (or other applicable standard or specification) without plate holes or integral plate projections. **E 489**

strength, *n*—resistance to external force or load or generation of internal strain, expressed in terms of units of force, newtons (pound-force).

DISCUSSION—Strength is the resistance to tensile, compressive, or shear forces, or a combination of these, as compared to stress which is expressed in terms of units of force per unit area. Also, common, all-encompassing term denoting, for example, a mechanical property or properties of materials, expressed in terms of unit of force per unit area, megapascals (pound-force per square inch).

stress, *n*—internal force developed by application of external force or load or generation of internal strain expressed in terms of unit of force per unit of area, megapascals (pound-force per square inch). When the forces are parallel to the plane on which it acts, the stress is called shear stress; when the forces are normal to the plane on which it acts, the stress is called normal stress; when the normal stress is directed toward the plane on which it acts, it is called compressive stress; when the normal stress is directed away from the plane on which it acts, it is called tensile stress. Sometimes referred to as unit stress.

stress ratio—ratio of ultimate stress of metal connector plate to ultimate stress of matched solid metal-coupon control specimen. Also called *effectiveness ratio* and *efficiency ratio*.

structural quality sheet coil—coiled sheet metal used for production of metal connector plates meeting minimum specified grade properties for yield and ultimate stresses and elongation. If Specification A 653/A 653M Grade 40 is specified, the steel properties shall exceed 16 pct for elongation for a 50 mm (2.0 in.) gage length of the 275 MPa (40 ksi) yield point and 380 MPa (55 ksi) ultimate tensile stress, according to Specification A 653/A 653M.

tensile strength of metal connector plate—resistance to tensile force by net plate cross section normal to the direction of load application, expressed as force per unit of width of full cross section of connector plate, when used in pairs of plates.

test piece—member of test specimen.

test specimen—sample connections to be tested to determine a particular plate strength characteristic; fabricated by connecting two or more butted wood members with two parallel metal connector plates at each connection, placed symmetrically on opposite sides along the butted ends.

tooth, *n*—integral projection of metal connector plate formed in direction approximately perpendicular to plate surface(s) during punching process. Also called prong, barb, plug, and nail, yet, preferably called tooth.

truss plate—See **metal connector plate**.

typical metal connector plate—metal connector plate representative of single shipment of plate to be tested; with plate manufacturing procedure simulating actual production conditions anticipated during plate fabrication as well as during member and component assembly.

ultimate strength—maximum resistance to external force, load, or generation of internal strain of a material, member, connection, component, or assembly at which failure occurs; expressed in terms of units of force, newtons (pound-force); as compared to ultimate stress which is expressed in units of force per unit of area. Often referred to as *maximum load, ultimate load, maximum strength,* or *nominal strength,* and incorrectly referred to as ultimate stress.

unilaterally punched metal connector plate—metal connector plate with integral teeth projecting from plate in single direction approximately perpendicular to plate surface area.

Von Mises yield theory—stated ratio between shear and tension yield stresses for an isotropic, solid material. Theoretical yielding

in shear is assumed to occur at a stress equal to 0.577 of the yield stress in tension.

width of metal connector plate—dimension of metal connector plate approximately perpendicular to longitudinal axis of coiled metal strip from which plate was sheared during its fabrication. **E 489**

yield stress—limit to internal force developed by application of external force or load or generation of internal strain to a material, member, connection, component, or assembly beyond which a marked increase in deformation occurs without an appreciable increase in load; expressed in terms of units of force per unit of area, megapascals (pound-force per square inch). When the initial rate of force is nonlinear, an agreed upon convention shall apply. Sometimes incorrectly referred to as yield strength and as **ultimate strength**.

4. Keywords

4.1 connector; definitions; metal

APPENDIX

(Nonmandatory Information)

X1. RELEVANT DOCUMENTS

X1.1 *ASTM Standards*:

A 924/A 924M Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process[6]

E 631 Terminology of Building Constructions[5]

E 767 Test Method for Shear Strength Properties of Metal Connector Plates[5]

F 592 Terminology of Collated and Cohered Fasteners and Their Application Tools[5]

Compilation of ASTM Standard Definitions, ASTM, Philadelphia, PA, 1986.

X1.2 *ISO Standards:*[7]

ISO 6891 (1983) Timber Structures—Joints Made with Mechanical Fasteners—General Principles for the Determination of Strength and Deformation Characteristics

ISO 8969 (1990) Timber Structures—Testing of Unilateral Punched Metal Plate Fasteners and Joints

ISO/TC165 N118 (1987) Timber Structures—Testing of Punched Metal Plate Fasteners

X1.3 *European Union of Agrément (UEAtc):*[8]

M.O.A.T. No. 16 (1979) Rule for the Assessment of Punched Metal Plate Timber Fasteners

X1.4 *International Union for Testing and Research Laboratories for Materials and Structures (RILEM):*[9]

RILEM/CIB 3TT (1981) Testing Methods for Joints with Mechanical Fasteners in Load-Bearing Timber Structures, Annex A: Punched Metal Plate Fasteners

X1.5 *Truss Plate Institute:*[10]

ANSI/TPI 1-1995 National Design Standard for Metal Plate Connected Wood Truss Construction

X1.6 *ITPA SfB G12-UDC 0691-11 Technical Handbook,*

International Truss Plate Association, Rowlands Castle, Hampshire, England, 1990.

[6] *Annual Book of ASTM Standards*, Vol 04.10.

[7] International Standards Organization, 1, rue de Varembe, Ch-1211 Geneva 20, Switzerland.

[8] European Union of Agrément, 4 Av du Recteur Poincare, F-73782 Paris CEDEX16, France.

[9] International Union of Testing and Research Laboratories for Materials and Structures, c/o Pavillon des Jardins, 61, ave. President Wilson, F-94235 Cachan Cedex, France.

[10] Truss Plate Institute, 583 D′Onofrio Dr., Madison, WI 53719.