

**A**

**ABUTMENT (ABUT.)** - A substructure which supports the end of a single span of the extreme end of a multi-span superstructure, retains the approach roadway embankment, and supports the end of the approach panel. Different types of abutments include pile bent abutments and parapet abutments.

- A. SINGLE LINE PILE BENT ABUTMENT** - Consists of a concrete cap on top of a single line of piles. Used only on small skewers and lengths under 100 meters (300 ft). Expansion and contraction allowed by deflection of piles.
- B. PARAPET ABUTMENT** - Consists of a large concrete seat which supports the beams, and a smaller parapet from the seat to the roadway, which retains the approach soil. Typically has two rows of piling with the front row battered. The abutment remains stationary and the superstructure moves on expansion bearings for temperature changes.

**ANCHORAGE (Anch.)** - A fastener or assemblage used to secure railings or other attachments to a concrete member. Also used to tie new concrete to in-place concrete on repair projects. Types of anchorages include mechanical, adhesive, grouted and cast in place.

**ANCHOR BOLT** - A threaded bolt fitted with nut and washer used to secure a beam or a bearing assembly to the substructure.

**ANCHOR ROD** - Threaded or non-threaded rods used to anchor barriers, light pole bases, and other structures to concrete base.

**APPROACH PANEL** - A reinforced concrete slab placed on the approach roadway which rests on the back wall of an abutment. It transfers wheel loads to the abutment and provides a smooth transition from the roadway to the bridge.

**APPROACH TREATMENT** - A well-graded, compacted granular fill placed behind an abutment to minimize settlement and to provide good drainage.

**B**

**BACK FACE (B.F.)** - The side of an abutment or retaining wall against the earth.

**BACKFILL** - Material placed next to an abutment, pier, footing, or wingwall to fill open areas of a foundation excavation.

**BACKSLOPE** - Portion of ground beyond the ditches which rejoins the in-place groundline.

**BALLAST** - Filler material used either to stabilize a structure (as in filling a crib) or to transmit a vertical load to a lower level (as with railroad track ballast).

**BAR CHAIR** - A device used to support reinforcing bars above the surface of the form before the concrete is poured.

**BASE PLATE** - A plate-shaped piece of steel made an integral part of the base portion of a column, pedestal or other member. It transmits and distributes load to the structure or to another member.

**BATTER** - The inclination of a surface in relation to a horizontal or a vertical plane or occasionally in relation to an inclined plane. Batter is designated upon bridge detail plans as X mm (in.) vertical to 1 mm (ft.) horizontal.

**BEAM (BM.)** - A structural member which supports the loads from a bridge deck. A beam is supported at its ends and/or at intermediate points by the piers and abutments.

- A. ROLLED STEEL BEAM** - Made in a steel mill with flanges continuously connected to web through a hot rolling process. Shapes include wide flange (W), American standard beams (S) and channels (C). Available in depths up to 920 mm (36 in.).
- B. WELDED BEAM** - Fabricated into an "I" shape by welding flange plates and web plates together. These are used when a rolled steel beam has insufficient capacity or becomes uneconomical for supporting the loads.
- C. PRESTRESSED CONCRETE BEAM (PCB)** - An "I" shaped concrete beam in which 13 mm (1/2 in.) or 15 mm (0.60 in.) diameter strands are pretensioned in the forms then concrete is poured and cured. The strands are then cut and the beam is placed in the desired location.

**D. POST-TENSIONED CONCRETE BEAM** - Post-tensioning is a method of prestressing in which conduits are placed in the beam form prior to casting. After the concrete has reached a specified strength, prestressing strands are inserted in the conduits and tensioning force is applied. These beams are cast in place at the desired location.

**E. REINFORCED CONCRETE BEAM** - Reinforced concrete beam is a method of construction where the tensile stresses (whether resulting from bending and/or shear) are by design carried by the metal reinforcement. The concrete takes compression (and some shear) only. It is commonly rectangular to Tee-shaped, with its depth dimension greater than its stem width.

**BEARING (BRG.)** - Structural assemblies used to transfer all reactions from the superstructure to the substructure. Fixed bearings resist both vertical and horizontal reactions or movements, and expansion bearings allow longitudinal and sometimes lateral movements of the superstructure.

**BENCH MARK (B.M.)** - A point of known elevation, either at a disk or at a field mark, such as a nail or chiseled "X" in concrete.

**BOLTED JOINT** - A connection in a steel or timber member that is fastened with bolts.

**BOND** - The grip of concrete on reinforcing bars, preventing slippage of the bars. Also the force developed between two concrete masses when one is cast against an in-place mass.

**BRIDGE SEAT** - The top surface of an abutment or pier upon which the bearings and the beams are placed and the superstructure supported.

**BRUSH CURB** - A poured concrete strip, usually 225 mm (9 in.) or less, which prevents a vehicle from brushing against the railing or parapet.

**BUTT WELD** - A weld joining the ends of two steel members to form one continuous member.

## C

**CAISSON** - A watertight box of wood or steel sheeting or a cylinder of steel and concrete used for the purpose of making an excavation. Caissons may be either open (open to free air) or pneumatic (under compressed air).

**CAMBER** - The slightly upward arched form in a beam or other member to compensate for dead load deflection and vertical curvature. This gives a better appearance than would a sagged member.

**CANTILEVER** - A projecting beam or slab supported at one end only, or a projecting end counterbalanced by the loads extending beyond the support in the opposite direction.

**CAST-IN PLACE CONCRETE PILE** - A pile formed by driving a steel shell and then filling the shell with concrete. Very thin shell piles can be driven with a temporary support called a mandrel. The mandrel is then removed and the shell filled with concrete.

**CHANNEL CHANGE** - A man-made change in the path of a waterway.

**CHANNEL PROFILE** - Longitudinal cross-section of a channel.

**CLEARANCE (CLR.)**

**A.** The unobstructed width and height of the roadway or waterway under a structure.

**B.** The clear space between reinforcement bars or between a reinforcing bar and a concrete surface.

**COEFFICIENT OF THERMAL EXPANSION** - The unit strain produced in a material by a change of one degree in temperature.

**COFFERDAM** - A temporary, watertight, dam-like enclosure, usually consisting of interlocking steel-sheet piles. It is constructed in rivers, etc., and then pumped dry so that the bridge foundation may be constructed in dry conditions.

**COLD JOINT** - A joint in a concrete structure made by placing fresh concrete against hardened or partially hardened concrete. A joint made by placing hot bituminous mixture against a bituminous mixture that has cooled.

**COLLISION STRUT** - A structural member on a pier designed to withstand an impact force from a train and/or car.

**COLUMN (COL.)** - An upright structural element which primarily supports compressive loads.

**COMPRESSION** - A force which causes a member to shorten in the direction of the applied force.

**COMPRESSION SEALS** - A preformed, compartmented, elastomeric (neoprene) device, which is capable of constantly maintaining a compressive force against the joint interfaces in which it is inserted.

**CONCRETE (CONC.)** - A composite material consisting of cement, fine and coarse aggregate, water and admixtures. When allowed to harden, the material becomes a solidified structural mass.

**CONSTRUCTION JOINT (CONSTR. JT.)** - A joint or break between successive pours of concrete, usually due to a change in concrete mix at that location or the limits of a single pour.

**CONTINUOUS SPAN** - A beam or truss type structure designed to extend continuously over one or more intermediate supports.

**CONTRACTION JOINT (CONTR. JT.)** - A plane of weakness which provides stress relief from expansion or contraction. It permits movement between sections of the structure without spalling or crushing of adjacent surfaces.

**CONTROL POINT** - Any station in a horizontal and vertical grid that is identified on a plan and used for correlating the data shown on that plan.

**CROSS FRAMES** - Transverse bracings between two main longitudinal members. See also DIAPHRAGM.

**CROWN (of a roadway)** - The highest point on a cross-section of a roadway, where the slope in either direction is downward. It is also a measure of the vertical distance between the crown point and the gutter.

**CURB** - A stone, concrete or wooden barrier paralleling the side limit of the roadway to guide the movement of vehicle wheels and safeguard bridge structures outside the roadway limit.

## D

**DEAD LOAD (D.L.)** - A static load due to the weight of the structure itself.

**DECK** - That portion of a bridge which provides direct support for vehicular and pedestrian traffic. The deck may be a reinforced concrete slab, timber flooring, steel plate or grating, or the top surface of abutting concrete members or units. While typically distributing load to a system of beams and stringers, a deck may also be the main supporting element of a bridge.

**DEFLECTION (DEFL.)** - Elastic movement or sagging of a loaded structural member.

**DEFLECTION JOINT (DEFL. JT.)** - A plane of weakness in the railing of a bridge which provides stress relief during expansion or contraction.

**DESIGN LOAD** - The combination of weight and/or other forces a structure is designed to sustain.

**DIAPHRAGM (DIAPH.)** - A reinforcing plate or member placed between beams to distribute stresses, improve strength and give rigidity. Diaphragms may be either steel or reinforced concrete.

**DOLPHINS** - A group of piles or sheet piling driven adjacent to a pier. Their purpose is to prevent extensive damage or possible collapse of a pier from a collision with a ship or barge. Circular sheet pile structures, filled with gravel or rock and capped with concrete are often used as dolphins.

**DOWEL (DWL.)** - A steel pin or bar which extends into two members of a structure (i.e. truss members, footing and column) or two pavement slabs to connect them together.

**DRAIN** - A channel or pipe which carries groundwater or surface water from a structure.

**DRIFT PIN** - A round, tapered metal rod that is driven into matching bolt holes of two metal members for bringing them into alignment.

**DRILLED SHAFT** - A foundation that provides structural support in the form of a cylindrical excavation filled with reinforced concrete.

**DRIP, V-DRIP** - A channel or groove on the underside of a coping or other protruding, exposed portion of a masonry structure. It is intended to arrest the downward flow of rain water and cause it to drip off freely, preventing contact with surfaces below the projection.

## E

**ELASTOMERIC** - Made of an elastomer, which is a natural or synthetic rubber-like material.

**ELASTOMERIC BEARING PAD** - A rectangular pad composed of alternating layers of steel plates and rubber-like material (chloroprene) used as a bearing with prestressed or steel beams. These pads deflect laterally to accommodate superstructure movement and transfer vertical loads evenly to the substructure.

**ELEVATION (ELEV. or El.)**

- A. A view looking at an object from the side;
- B. The height above sea level; sea level being 0.

**END BLOCK**

- A. A block of reinforced concrete at the end of a bridge deck that sits on top of the abutment parapet, usually holding one side of an expansion joint device.
- B. On a prestressed concrete beam, the thickening of the web or increase in beam width at the end to provide adequate anchorage bearing for the post-tensioning wires, rods, or strands. Sometimes called an "end web."

**END POST** - The enlarged section of railing at the corner of a bridge which serves to provide guardrail anchorage. A separate end post is required if an expansion joint is provided at the end of a bridge.

**EPOXY** - A synthetic resin which cures or hardens by chemical reaction between components which are mixed together shortly before use.

**EPOXY COATED REINFORCING BAR** - Refers to bar steel reinforcement, coated with a powdered epoxy resin, which prevents corrosion of the bar steel.

**EXPANSION BEARING (EXP. BRG.)** - A device which supports a beam and allows longitudinal movement without transmitting horizontal forces to the substructure. In general, provision is made for a movement equal to 32 mm in 30 m (1 1/4 in. 100 ft), allowing for temperature change and irregularities in field erection and adjustment.

**EXANSION JOINT (EXP. JT.)** - A joint designed to provide means for expansion and contraction movements produced primarily by temperature changes.

**F**

**FALSEWORK** - A temporary wooden or metal framework built to support (without appreciable settlement and deformation) the mass of a structure during its construction and until it becomes self-supporting. In general, the arrangement of its details are devised to facilitate the construction operations and provide for economical removal and salvaging of material suitable for reuse.

**FASCIA OR FACIA** - An outside covering member designed on the basis of architectural effect rather than strength and rigidity, although its function may involve both. Thus the "fascia beam" is the outside beam.

**FILL** - Material, usually earth, used to raise or change the surface contour of an area, or for constructing an embankment.

**FILLER PLATE** - In structural steel construction, a piece used to fill a space beneath a splice plate, gusset, connection angles, stiffener or other element.

**FILLET WELD** - A weld joining intersecting members by depositing weld metal to form a near-triangular or fillet shaped junction of the members so joined. This weld serves to unite the intersecting surface of two elements of a member.

**FILTER BLANKET** - A layer of porous material designed to let the water through while keeping the soil behind in its place. It is often placed in a 225 mm (9 in.) thick layer under 450 mm (18 in.) of random riprap to prevent erosion of the soil under the riprap.

**FINISHED GRADE** - See profile grade.

**FIXED BEARING (FIX. BRG.)** - A device designed to transmit to the substructure the vertical and horizontal loads from the superstructure, while not allowing horizontal movement.

**FLANGE** - The part of a rolled I-shaped beam or a welded beam extending transversely across the top and bottom edges of the web. The flanges carry the compressive and tensile forces that comprise the internal resisting moment of the beam, and may consist of angles, plates or both.

**FLAT SLAB** - A reinforced concrete superstructure that has a uniform depth throughout.

**FLOOR BEAM** - A beam located transversely to the general alignment of the bridge and having its ends framed upon the columns of bents and towers or upon the trusses or beams of a superstructure. A floor beam at the extreme end of a beam or truss span is commonly termed an "end floor beam."

**FLOOR SYSTEM** - The complete framework of floor beams, stringers or other members supporting the bridge deck dead load and live load.

**FLOW LINE (THALWEG)** - The line defining the lowest points along the length of a water course.

**FOOTING (FTG.)** - The enlarged, or spread-out, lower portion of a substructure which distributes the structure load either to the earth or to supporting piling.

**FORMS** - Wooden or metal framework used to hold concrete in place while it hardens.

**FOUNDATION** - The supporting material upon which the substructure portion of a bridge is placed, usually reinforced concrete.

**FOUNDATION SEAL** - A mass of concrete placed underwater within a cofferdam for the base portion of an abutment, pier, retaining wall or other structure to close or seal the cofferdam against incoming water from foundation springs, fissures, joints or other water carrying channels.

**FROST HEAVE** - The upward movement of, and force exerted by, soil due to alternate freezing and thawing of retained moisture.

**G**

**GRADE OR GRADIENT** - The rate of inclination of the roadway or sidewalk surface from horizontal. It is commonly expressed as a percentage relation of vertical to horizontal dimensions.

**GROUT** - A mortar having a sufficient water content to render it a free-flowing mass. It is used for filling (grouting) the spaces between the stone or the stone fragments (spalls) used in the "backing" portion of stone masonry, for fixing anchorages and anchor rods and for filling cored spaces in castings, masonry or other spaces where water may accumulate.

**GUARD RAIL (G.R.)** - A fence-like barrier or protection built within the roadway shoulder area. It is intended to function as a combined guide or guard for the movement of vehicular and/or pedestrian traffic and to prevent or hinder the accidental passage of such traffic beyond the berm line of the roadway.

**GUSSET** - A plate serving to connect the elements of a member or the members of a structure and to hold them in correct alignment or position at a joint.

**GUTTER LINE** - The edge of a roadway, usually delineated by the inside edge of a curb or a railing.

## H

**H-PILE** - A structural steel pile with an H-shaped cross section.

**HAMMERHEAD PIER** - A pier which has only one column with a cantilever cap and is somewhat similar to the shape of a hammer.

**HAND HOLE** - A hole provided in built-up box sections for construction and maintenance purposes.

**HAUNCH** - A deepening of a beam or column, the depth usually being greatest at the support and vanishing towards or at the center. The curve of the lower flange or surface may be circular, elliptic, parabolic, straight or stepped.

## I

**IMPACT** - Forces produced by the movement of a live load.

**INSERTS** - Metal devices put in a concrete member during casting to provide means for fastening other parts to the member later.

**INTERMITTENT WELD** - A noncontinuous weld commonly composed of a series of short welds with spaces in between them.

## J

**JOINT (JT.)** - A point at which concrete construction is discontinuous. It is placed to control cracks that result from changes in temperature, to separate concrete of different mixes, and to allow deflections between sections of the structure.

## K

**KEEPER** - A metal plate used to prevent the beam from separating or moving from the bearing assembly. The keeper plate is bolted or welded to the sole plate or base plate.

**KEYWAY** - A projection or depression designed to prevent movement of adjoining parts of a structure.

**KNEE BRACE** - A member, usually short in length, engaging at its ends two other members, which are joined to form a right angle or a near-right angle. It serves to strengthen and make the connecting joint more rigid.

## L

**LAMINATED TIMBER** - Wooden planks glued together to form a larger member.

**LAP** - The overlapping of two reinforcement bars to form a splice.

**LATERAL BRACING (Lateral System)** - A system of secondary structural members engaging the chords and inclined end posts of trusses and the flanges of the plate girder spans in the horizontal or inclined planes of these members. Its function is to resist the transverse forces resulting from wind, lateral vibration, and traffic movement.

**LATEX MODIFIED** - Concrete which has been altered by the addition of a chemical for increased strength.

**LIVE LOAD** - A load which moves, most commonly vehicular traffic.

**LOW SLUMP CONCRETE** - Concrete which has low slump and a low water/cement ratio for increased strength and durability.

### M

**MEDIAN** - The portion of a divided highway separating traffic in opposite directions.

**MOBILIZATION** - Preparatory work on project including the movement of personnel, equipment, and supplies to the project. It also includes the establishment of offices and other facilities at the project site.

**NORMAL** - Perpendicular, or at right angles.

### O

**OFFSET** - The distance between a straight line, which is tangent to a curve, and the curve. It is measured perpendicular to the straight line for a horizontal curve and vertically for a vertical curve.

**OUT TO OUT** - The outermost dimension of the length, width or other measurement of a member.

**OVERLAY** - A concrete or bituminous layer of varying or uniform thickness designed to provide a smooth roadway surface.

### P

**PANEL** - See approach panel.

**PARAPET (BACKWALL)** - The vertical wall above the bridge seat of an abutment used to retain the embankment at the ends of the beams. Also, a concrete barrier at the edge of a bridge which prevents traffic from falling over the side of the bridge.

**PAVING BRACKET** - A portion of the top of the parapet upon which the approach panel rests.

**PIER** - A structure which supports the superstructure of a bridge at intermediate points between the abutments.

**A. Column Pier** - A pier with round, square, or rectangular columns.

**B. Hammerhead Pier** - A pier with a wide shaft and a long cap.

**C. Pile Pier or Pile Bent** - A pier consisting of piles and a cap.

**D. Rigid Frame Pier** - A pier with two or more columns and a horizontal beam on top constructed to act like a frame.

**PIER CAP** - The top or horizontal portion of a pier on which the beams rest.

**PILE** - A shaft of steel, concrete, steel and concrete, or timber driven into the ground to transfer structure loads through weak soil to soil capable of supporting the loads.

**A. Bearing Pile** - A pile which is supported by soil or rock at the tip of the pile.

**B. Friction Pile** - A pile which is supported by the friction between the soil and the surfaces of the pile.

**C. Sheet Pile** - A wide, flat pile which interlocks with other sheet piles to form a wall.

**PILE SPLICE** - A means of connecting piles end-to-end to provide greater penetration length.

**PIN PLATE** - A steel plate attached to the web plate of girders at hinge points to strengthen the web of the girders at the hinge locations.

**PINTLE** - A small steel pin between two plates of a bearing which prevents horizontal movement, but allows rotation.

**PITCH** - The longitudinal spacing of bolts, studs, holes, rivets, etc.

**PLATE GIRDER** - An I-shaped beam composed of a solid web plate with either flange plates or flange angles bolted, riveted, or welded on its edges. Additional cover plates may be attached to the flanges to provide greater flange cross-sectional area.

**PLUG WELD** - A weld produced by depositing weld material within holes cut through one or more members.

**POINT OF COMPOUND CURVATURE (P.C.C.)** - The point of tangency common to two curves having different radii.

**POINT OF CURVATURE (P.C.)** - The point where alignment changes from a straight line to a circular curve.

**POINT ON CURVE (P.O.C.)** - A point on a circular curve.

**POINT OF INTERSECTION (P.I.)** - The point where two tangents or straight lines intersect.

**POINT OF TANGENCY (P.T.)** - The point where the alignment changes from a circular curve to a straight line.

**POINT ON TANGENT (P.O.T.)** - A point on a straight line.

**POST-TENSIONING** - A method of prestressing in which the tendon is tensioned after the concrete has cured.

**PRESTRESSED CONCRETE** - Reinforced concrete in which internal stresses (usually created by tensioned strands) have been introduced to reduce potential tensile stresses in concrete resulting from loads.

**PRETENSIONING** - Any method of prestressing in which the strands are tensioned before the concrete is placed.

**PRIME COAT (Base Coat)** - The first coat of paint applied to the metal or other material of a bridge. For metal structures this is quite commonly a fabrication shop application and is, therefore, termed the "shop coat."

**PROFILE GRADE (P.G.)** - A longitudinal line on a roadway at the finished surface of the roadway. It is formed by a combination of straight lines and vertical curves.

## R

**RADIAL DIMENSION** - A distance along the radius of a circle.

**RAILING** - A wall or fence-like structure at the edge of a bridge to prevent traffic from going over the side of the bridge.

**REBAR OR REINFORCING BAR** - A steel bar, plain or with a deformed surface, which bonds to the concrete and supplies tensile strength to the concrete.

**RETAINING WALL** - A structure designed to restrain a mass of earth. These structures are usually constructed of reinforced concrete.

**RIPRAP** - Brickbats, stones, or blocks of concrete which are deposited upon river or stream beds to prevent erosion and scour by water flow. Riprap is normally placed under a bridge which goes over a waterway, in particular, at the slopes which drop from the abutments to the river or stream banks.

**ROADWAY (RDWY.)** - The portion of a bridge deck surface from gutter line to gutter line which is intended for use by vehicular traffic.

**RUSTICATION** - A decorative treatment used on exposed concrete bridge surfaces to provide a more rustic or natural appearance. This is usually done by installing beveled or square wooden strips or boards to the inside of wooden concrete forms. After the concrete has cured and the forms are removed, the imprint of the rustication strips remains in the finished concrete surface. Common areas to receive this treatment are wingwalls, outside railing faces, and retaining wall surfaces.

## S

**SCOUR** - An erosion of a river, stream, tidal inlet, lake or other water bed area by a current, wash or other water in motion. Scour produces a deepening of the overlying water, or a widening of the lateral dimension of the flow area. This is a major problem with bridges because there is a tendency for water currents to wash away the river or stream bed from around and eventually underneath the bridge pier footings, thereby undermining the structure. To combat this effect, pier footings in stream beds are normally constructed quite deep beneath the river or stream bed.

**SHEAR** - A stress which occurs at a section where one part of a body tends to slide with respect to the adjacent part.

**SHEAR STUD** - Bolts which are welded to the top flange of a steel beam and act to resist shear forces between the beam and the concrete bridge slab.

**SHEET-PILE** - Interlocking steel sheets which are driven as piling to produce a wall-like barrier. These are used for various purposes: as a type of retaining wall or to form an enclosed cofferdam around an area to be occupied by a pier in a river. This provides a watertight seal and enables construction to take place in dry conditions.

**SKEW ANGLE** - As applied to oblique bridges: the skew angle, angle of skew or simply "skew" is the acute angle subtended by a line normal to the longitudinal axis of the structure and a line parallel to or coinciding with the alignment of its substructures.

**SLAB** - A reinforced concrete bridge deck, usually 225 mm - 250 mm (9 in. - 10 in.) thick which spans longitudinal beams to form a roadway for traffic.

**SLAB BRIDGE** - A bridge having a superstructure composed of a reinforced concrete slab constructed either as a single unit or a series of narrow slabs placed parallel with the roadway alignment and spanning the space between the supporting abutments or other substructure parts. The former is commonly constructed in place but the latter may be precast.

**SLOPE** - A change in elevation measured per linear meter (foot) perpendicular to the centerline of the roadway. Example: 0.010m/m (0.010 ft/ft).

**SLOPE PAVING** - Concrete slope protection.

**SLOPE PROTECTION** - A thin surfacing of stone (riprap), concrete, aggregate, or other material installed upon the sloped surface underneath a bridge. Slope paving runs from the front of the abutment down the river bed or roadway ditch.

**SOLE PLATE** - A plate attached to the bottom flange at the end of a beam distributing the reaction of the bearing to the beam.

**SPALL** - A circular or oval depression in concrete caused when roadway salt penetrates a concrete roadway causing corrosion of the steel reinforcement. The steel bar then expands, and forces the concrete to break apart. A spall may also be caused by freeze-thaw cycles of weak aggregate which absorbs moisture.

## SPAN

**A.** The length from one support to another, for example from pier to pier or beam to beam.

**B.** The structure between two supports.

**SPLICE** - Often reinforcement bars are joined longitudinally to produce a length in excess of the shorter bars. The length of the splice is determined by the diameter of the bar and design considerations. Steel beams are sometimes spliced to produce greater length. They are bolted together using splice plates.

**SPREAD FOOTING** - A footing that is directly supported by soil or rock.

**STAGE CONSTRUCTION** - A construction method used when uninterrupted traffic flow is a major consideration. It is usually used when widening or replacing an in-place bridge. A sequence is used whereby each stage of construction keeps lanes of traffic flowing over the in-place or new bridge deck sections.

**STATION (STA.)** - A distance measured in (one hundred meters) (one hundred feet) increments along the centerline of roadway used in referencing construction plans.

**STIFFENER** - Usually a plate or angle welded or bolted to the web of a welded beam to transfer loads and/or to prevent buckling or other deformation.

**STIRRUP** - In reinforced concrete, usually a U-shaped bar placed vertically in beams, slabs or similar construction to resist diagonal tension stresses.

**STOOL** - Thin layer of concrete (usually about 50 mm thick) (2") between the top of the beam and the bottom of the concrete deck slab which has the same width as the beam top flange. The stool allows for beam fabrication and construction tolerances and accommodates the variable dimension between profile grade and the cambered beams.

**STRANDS** - Wire ropes or cables which are stretched to a high state of stress in the manufacture of prestressed concrete.

**STRESS** - Internal force exerted by either of two adjacent parts of a body upon the other across an imagined plane of separation. When the forces are parallel to the plane, the stress is called shear stress; when the normal stress is directed toward the part on which it acts, it is called compressive stress; when it is directed away from the part on which it acts, it is called tensile stress. Unit stress is the amount of stress per unit of area as measured in Megapascal or Newton per square millimeter (pounds per square inch, psi).

**STRINGER** - A longitudinal beam supporting the bridge deck, and in large bridges or truss bridges, frames into or upon the floor beams.

**STRIP SEAL** - Waterproof expansion joint device consisting of steel extruded shapes embedded in the edge of the concrete deck slab which grip a neoprene gland that seals the expansion opening between the steel extrusions. The maximum expansion opening capacity is approximately 100 mm (4 inches).

**STRUCTURAL CONCRETE (STRUC. CONC.)** - A pay item usually followed by a concrete mix designation. Plans usually indicate the concrete mix for each portion of a structure [Structural Concrete (1A43) typical for footings] and the basis for payment cubic meters, square meters, (cubic yards or square feet).

**SUPERELEVATION (Curve Banking)** - The transverse inclination of the roadway surface within a horizontal curve and the adjacent transitions from the normal roadway crown. Superelevation allows a vehicle to safely negotiate curves at higher speeds by providing a means of resisting or overcoming higher centrifugal forces than would otherwise be possible. The sharper the curve, the greater the superelevation.

#### **SWAY BRACE**

- A.** A piece in an inclined position designed to add rigidity to an assemblage. It is bolted or otherwise secured to the side of a pile or frame bent between the cap and ground surface or the cap and sills.
- B.** An inclined member in a tier of bracing forming a part of a timber, metal, or reinforced concrete bent or tower.
- C.** One of the inclined members of the sway bracing system of a metal girder or truss span. In plate girder construction the term "X-brace" is sometimes used.

#### **T**

**TACK WELD** - Usually a small or intermittent fillet weld intended only to fix an element of a member or a member of a structure in correct adjustment and position prior to fully welding or final attachment by other means.

**TEMPORARY BRIDGE (TEMP. BR.)** - A structure built for interim or emergency use to replace a previously existing bridge or to provide bridge service for a relatively short time period until a new bridge is constructed. Mn/DOT temporary bridge number is 99XXX.

**TENSION** - An axial force or stress caused by equal and opposite forces pulling on a member, tending to cause elongation of the member.

**TEST PILES (T.P.)** - Test piles are used to determine the required or “authorized” length of the remaining piles for a structure or for a portion of a structure. They are always carried as a separate pay item (or items if more than one length or type are involved) in the contract. Information gained from driving test piles should be compared with the borings on the Bridge Survey Plan and Profile sheet or sheets of the plans to confirm planned foundation and estimated pile lengths.

**TOE OF SLOPE** - The line defined by the intersection of the sloped surface of a fill slope, embankment cut or other sloped area with the natural ground or finished ground surface.

**TRESTLE** - A bridge structure consisting of beam, girder, or truss spans supported on bents. The bents may be of the pile or of the frame type, composed of timber, reinforced concrete or metal. When of framed timbers, metal or reinforced concrete they may involve two or more tiers in their construction. Trestles structures are designated as “wooden,” “frame,” “metal,” “concrete,” “wooden pile,” “concrete pile,” etc., depending on the material and characteristics of their principal members.

## U

**UNDERPINNING** - The addition of new permanent support to existing foundations, to provide either greater capacity or greater depth.

## V

**VOIDED UNIT** - A precast concrete deck unit containing voids to reduce dead load.

## W

**WALE, WALE PIECE, WALER** - A wooden or metal piece, or an assemblage of pieces, placed inside, outside or both, inside and outside, the wall portion of a crib, cofferdam or similar structure, usually in a horizontal position, to maintain its shape and increase its rigidity, stability and strength.

**WEARING COURSE (W.C.)** - The top layer of material applied to the deck slab surface which directly receives the traffic loading. It is intended to protect the bridge deck from normal traffic wear and protect the slab reinforcement from salt and other de-icer chemicals.

**WEB** - The usually vertical portion of a beam, girder or truss located between and connected to the flanges or chords. The web primarily resists shear as compared to the flanges which primarily resist bending.

**WEEP HOLE** - An open hole or an embedded pipe in a retaining wall, abutment, arch or other portion of a concrete or masonry structure to provide means of drainage of the backfill or retained soil.

**WELD** - The process used to join metal parts by means of heat and pressure which causes fusion of the parts (resistance welding) or by heating the metal to the fusion temperature, with or without the addition of weld metal (fusion welding). Fusion welding usually employs either an electric arc or an oxyacetylene flame to heat the metal to fusion temperature. The electric arc is used for most structural welding. Welds are also classified according to their type (groove, fillet, plug and slot) and to the position of the weld during welding (flat, horizontal, vertical and overhead).

**WIDE FLANGE (W.F.)** - A rolled steel member having an H-shaped cross section as differentiated from an I-beam which has narrower flanges.

**WIND BRACING** - Usually diagonal members that do not carry primary gravity loads. These members form bracing systems in beam and truss spans and in towers and bents with the primary function of resisting wind loads.

**WINGWALL (W.W.)** - The retaining wall extension of an abutment intended to confine the side slope material of the roadway embankment at the ends of a bridge. Some general forms of wingwalls are:

- A. Straight - continuation of the main abutment backwall usually normal to the bridge centerline.
- B. Parallel - placed parallel to the alignment of the approach roadway.

C. Flared - forming an angle with the main abutment backwall and the approach roadway. Commonly, the angle is set at 45E.

**WORKING LINE** - Straight line established to facilitate the field layout of the bridge. For straight bridges it is usually at the centerline or survey line. For curved bridges, a line tangent to the centerline or survey line intersection with another survey line is usually used.

**WORKING POINTS (W.P.)** - The working points are used for field staking and layout. They are dimensioned throughout the plan for both substructure and superstructure units. Sheet 2 in most bridge plans shows a working point layout with stations, elevations and dimensions between working points. Three working points are usually defined at each substructure unit. The fascia beam centerline intersection with the centerline of substructure and the working line intersection with the centerline of substructure usually define the three points.