Oregon Department of Transportation

SECTION 1
Appendices

Revisions for the current edition are highlighted yellow. Deleted text is not marked.

Past editions of the Bridge Design Manual are available through our website.

APPENDIX – SECTION 1 – Glossary

A

Abutment – Supports at the end of the bridge used to retain the approach embankment and carry the vertical and horizontal loads from the superstructure. Current terminology is bent or end bent.

Access Control – The condition where the legal right of owners or occupants of abutting land to access a highway is fully or partially controlled by the Department of Transportation.

Advance Plans – 95-100% complete plans including special provisions, normally sent at 15 weeks.

Advertisement – The period of time between the written public announcement inviting proposals for projects and the opening of the proposals (bid or letting date).

Aggregate – Inert material such as sand, gravel, broken stone, or combinations thereof.

Aggregate, Coarse – Aggregates predominantly retained on the No. 4 sieve for portland cement concrete and those predominantly retained on the 1/4" for asphalt concrete.

Aggregate, Fine – Those aggregates which entirely pass the 3/8" sieve.

Aggregate, Dense Graded – A well-graded aggregate so proportioned as to contain a relatively small percentage of voids.

Aggregate, Open Graded – A well-graded aggregate containing little or no fines, with a relatively large percentage of voids.

Aggregate, Well-Graded – An aggregate possessing proportionate distribution of successive particle sizes.

Air-Entraining Agent – A substance used in concrete to increase the amount of entrained air in the mixture. Entrained air is present in the form of minute bubbles and improves the workability and frost resistance.

Allowable Headwater – The maximum elevation to which water may be ponded upstream of a culvert or structure as specified by law or design.

Allowable Span – The greatest horizontal distance permitted between supports.

Anchor Bolts – Bolts that are embedded in concrete which are used to attach an object to the concrete such as rail posts, bearings, steel girder-to-crossbeam connections, etc.

Annual Average Daily Traffic (AADT) – The average 24-hour traffic volume at a given location over a full 365 day year.

Anode – The positively charged pole of a corrosion cell at which oxidations occur.

Apron – The paved area between wingwalls at the end of a culvert.

Arch – A curved structure element primarily in compression, producing at its support reactions having both vertical and horizontal components.

Arch Pipe – A conduit in the form of a broad arch without a bottom.

Average Daily Traffic (ADT) – The average 24-hour traffic volume at a given location for some period of time, being the total volume during a stated period divided by the number of days in that period. Unless otherwise stated, the period is a year.

Axle Load – The load borne by one axle of a traffic vehicle.

Award – Written notification to the bidder that the bidder has been awarded a contract.

B

Backfill – Material used to replace or the act of replacing material removed during construction; also may denote material placed or the act of placing material adjacent to structures.

Backwater – The water upstream from an obstruction in which the free surface is elevation above the normal water surface profile.

Bar Chair – A device used to support horizontal reinforcing bars above the base of the form before the concrete is poured.

Bar Cutting Diagram – A diagram used in the detailing of bar steel reinforcement where the bar lengths vary as a straight line.

Base Course – The layer of specified material of designed thickness placed on a subbase or a subgrade to support a surface course.

Bascule Bridge – A bridge over a waterway with one or two leaves which rotate from a horizontal to a near-vertical position, providing unlimited clear headway.

Base Flood – Flood having 1% chance of being exceeded in any given year.

Battered Pile – A pile driven in an inclined position to resist horizontal forces as well as vertical forces.

Beam – Main longitudinal load carrying member in a structure, designed to span from one support to another (girder).

Bearings – Device to transfer girder reactions without overstressing the supports.

Bearing Capacity – The load per unit area which a structural material, rock, or soil can safely carry.

Bearing Failure – A crushing of material under extreme compressive load.

Bearing Seat – A prepared horizontal surface at or near the top of a substructure unit upon which the bearings are placed.

Bearing Stiffener – A stiffener used at points of support on a steel beam to transmit the load from the top of the beam to the support point.

Bedrock – The solid rock underlying soils or other superficial formation.

Bench Mark – A relatively permanent material object bearing a marked point whose elevation above or below an adopted datum is known.

Bent – Supports at the ends or intermediate points of a bridge used to retain approach embankments and vertical and horizontal loads from the superstructure.

Bicycle Lane – A lane in the traveled way designated for use by bicyclists.

Bicycle Path – A public way physically separated from the roadway, that is designated for use by bicyclists.

Bid Schedule – The list of bid items, their units of measurement, and estimated quantities, bound in the proposal booklet. (When a contract is awarded, the Bid Schedule becomes the Schedule of Contract Prices.)

Bidder – Any qualified individual or legal entity submitting a proposal in response to an advertisement.

Biennium – For the State of Oregon, a two-year period, always odd numbered years, starting July 1 and ending two years later on June 30.

Bleeding (Concrete) – The movement of mixing water to the surface of freshly placed concrete.

Bowstring Truss – A general term applied to a truss of any type having a polygonal arrangement of its top chord members conforming to or nearly conforming to the arrangement required for a parabolic truss.

Box Beam – A hollow structural beam with a square, rectangular, or trapezoidal cross-section.

Box Culvert – A culvert of rectangular or square cross-section.

Breakaway – A design feature that allows a device such as a sign, luminaire, or traffic signal support to yield or separate upon impact. The release mechanism may be a slip plane, plastic hinges, fracture elements, or a combination of these.

Bridge – A structure spanning and providing passage over a river, chasm, road, or the like, having a length of 20 feet or more from face to face of abutments or end bents, measured along the roadway centerline.

Bridge Approach – Includes the embankment materials and surface pavements that provide the transition between bridges and roadways.

Bridge Approach Slab – A reinforced concrete slab placed on the approach embankment adjacent to and usually resting upon the abutment back wall; the function of the approach slab is to carry wheel loads on the approaches directly to the abutment, thereby eliminating any approach roadway misalignment due to approach embankment settlement.

Bridging – A carpentry term applied to the cross-bracing fastened between timber beams to increase the rigidity of the floor construction, distribute more uniformly the live load and minimize the effects of impact and vibration.

Bridge Railing – A longitudinal barrier whose primary function is to prevent an errant vehicle from going over the side of the bridge structure.

Brush Curb – A curb 10" or less in width, which prevents a vehicle from brushing against the railing or parapet.

Buckle – To fail by an inelastic change in alignment as a result of compression.

Built-Up Member – A column or beam composed of plates and angles or other structural shapes united by bolting, riveting or welding.

Bulkhead – A partition built into wall forms to terminate each placement of concrete.

Buoyancy – Upward force exerted by the fluid in which an object is immersed.

Bushings – A lining used to reduce friction and insulate mating surfaces usually on steel hanger plate bearings.

Butt Splice – A splice where the ends of two adjoining pieces of metal in the same plane are fastened together by welding.

Butt Weld – A weld joining two abutting surfaces by combining weld metal and base metal within an intervening space.

C

Cable-Stayed Bridge – A bridge in which the superstructure is directly supported by cables, or stays, passing over or attached to towers located at the main piers.

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 – A predetermined vertical curvature built into a structural member, to allow for deflection and vertical grade.

Cast-in-Place – The act of placing and curing concrete within formwork to construct a concrete element in its final position.

Catch Basin – A receptacle, commonly box shaped and fitted with a grilled inlet and a pipe outlet drain, designed to collect the rain water and floating debris from the roadway surface and retain the solid material so that it may be periodically removed.

Catenary – The curve obtained by suspending a uniform rope or cable between two points.

Cathode – The negatively charged pole of a corrosion cell that accepts electrons and does not corrode.

Cathodic Protection – A means of preventing metal from corroding; this is done by making the metal a cathode through the use of impressed direct current and by attaching a sacrificial anode.

Catwalk – A narrow walkway to provide access to some part of a structure.

Chain Drag – A series of short medium weight chains attached to a T-shaped handle; used as a preliminary technique for inspecting a large deck area for delamination.

Chamfer – A beveled edge formed in concrete by a triangular strip of wood (chamfer strip) placed in a form corner.

Change Order – A written order issued by the Engineer to the contractor modifying work required by the contract and establishing the basis of payment for the modified work.

Chord – A generally horizontal member of a truss.

Clay – Soil passing a No. 200 sieve that can be made to exhibit plasticity (putty-like properties) within a range of water contents.

Clear Zone – Roadside border area, starting at the edge of the traveled way, that is available for safe use by errant vehicles. Establishing a minimum width clear zone implies that rigid objects and certain other hazards with clearances less than the minimum width should be removed and relocated outside the minimum clear zone, or remodeled to make breakaway, shielded, or safely traversable.

Closed Spandrel Arch – A stone or reinforced concrete arch span having spandrel walls to retain the spandrel fill or to support either entirely or in part the floor system of the structure when the spandrel is not filled.

Cobbles – Particles of rock, rounded or not, that will pass a 12" square opening and be retained on a 3" sieve.

Cofferdam – A barrier built in the water so as to form an enclosure from which the water is pumped to permit free access to the area within.

Cohesionless Soil – A soil that when unconfined has little or no strength when air-dried and that has little or no cohesion when submerged.

Cohesive Soil – A soil that when unconfined has considerable strength when air-dried and that has significant cohesion when submerged. Clay is a cohesive soil.

Commission – The Oregon Transportation Commission.

Composite Section – Two sections made of the same or different materials together to act as one integral section; such as a concrete slab on a steel or prestressed girder.

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.

Concept Plans – Plans to determine the basic features of a project including alignments, typical sections, slopes, preliminary drainage and TS&L bridge plans.

Concrete Overlay – 1.5" to 2" of concrete placed on top of the deck, used to extend the life of the deck and provide a good riding surface.

Contract – The written agreement between the Division and the contractor describing the work to be done and defining the obligations of the Division and the contractor.

Contract Plans – Detailed drawings and diagrams usually made to scale showing the structure or arrangement, worked out beforehand, to accomplish the construction of a project and object(s).

Contract Time – The number of calendar days shown in the proposal which is allowed for completion of the work.

Contraction Joint – A joint in concrete that does not provide for expansion but allows for contraction or shrinkage by the opening up of a crack or joint.

Contractor – The individual or legal entity that has entered into a contract with the Division.

Coordinates – Linear or angular dimensions designating the position of a point in relation to a given reference frame. It normally refers to the State Plane Coordinate System.

Core – A cylindrical sample of concrete removed from a bridge component for the purpose of destructive testing.

Counterfort Wall – A reinforced concrete retaining wall whose vertical stem has triangular-shaped ribs projecting into the soil and spaced at regular intervals to provide strength and stability.

Crash Cushion – An impact attenuator device that prevents an errant vehicle from impacting fixed object hazards by gradually decelerating the vehicle to a safe stop or by redirecting the vehicle away from the hazard.

Crash Tests – Vehicular impact tests by which the structural and safety performance of roadside barriers and other highway appurtenances may be determined. Three evaluation criteria are considered, namely (1) structural adequacy, (2) impact severity, and (3) vehicular post-impact trajectory.

Creep – Time dependent inelastic deformation under elastic loading of concrete or steel resulting solely from the presence of stress.

Cross-bracing – Bracing used between stringers and girders to hold them in place and stiffen the structure.

Cross-section – The exact image formed by a plane cutting through an object usually at right angles to a central axis.

Crown Section – Roadway section with the height of the center of the roadway surface above its gutters.

Culvert – Federal Highway Administration definition: "A structure not classified as a bridge having a span of 20 feet or less spanning a watercourse or other opening on a public highway"; a conduit to convey water through an embankment.

Curb – A vertical or sloping member along the edge of a pavement or shoulder forming part of a gutter, strengthening or protecting the edge, and clearly defining the edge of vehicle operators. A curb is a horizontal offset varying from 10" to less than 18". The surface of the curb facing the general direction of the pavement is called the "face".

Curing – The preparation of a material by chemical or physical processing for keeping or use; treating concrete by covering its surface with some material to prevent the rapid evaporation of water.

Cut-Off-Wall – A wall built at the end of a culvert apron to prevent the undermining of the apron.

D

Dead End – End of post-tensioned bridge where tendons are anchored but no jacking takes place (opposite of jacking end).

Dead Load – Structure weight including future wearing surface on deck and attachments.

Deadman – A concrete mass, buried in the earth behind a structure, that is used as an anchor for a rod or cable to resist horizontal forces that act on the structure.

Deck – Structural element of the bridge superstructure that directly supports vehicular and pedestrian traffic, distributing load to supporting elements.

Deformed Bars – Concrete reinforcement consisting of steel bars with projections or indentations to increase the mechanical bond between the steel and concrete.

Delamination – Subsurface separation of concrete into layers.

Department – The Department of Transportation of the State of Oregon.

Design Volume or Design Hourly Volume – A volume determined for use in design representing traffic expected to use the highway. Unless otherwise stated, it is an hourly volume.

Diaphragm – Structural: A structural member used to tie adjoining girders together and stiffen them in a lateral direction as well as to distribute loads.

Diamond Grinding – Process to abrade or remove a surface, such as concrete, by the cutting action of rotating circular blade with diamond-tipped teeth.

Direct Tension Indicator – Load-indicating washer for bolts.

Doby – A precast block of concrete of various sizes used to support or provide clearances between reinforcing bars and formwork.

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.

Draped Strands – Strand pattern for prestressing strands, where strands are draped to decrease the prestressing stress at the ends of the girder where the applied moments are small.

Drift Pin – A metal pin, tapered at both ends, used to draw members of a steel structure together by being driven through the corresponding bolt holes.

Drip Groove – A groove formed into the underside of a projecting concrete sill or coping to prevent water from following around the projection.

E

E – modulus of elasticity of a material; the stiffness of a material.

E&C – Engineering & Contingencies. Engineering costs are ODOT's costs to administer the construction contract. Contingencies are unforeseen costs due to construction extra work price agreements or types of problems caused by weather, accidents, etc. by the contract pay item.

Elastomeric Bearing Pads – Pads ½" and less in thickness made of all rubber-like material that supports girders and concrete slabs; pads over ½" in thickness consist of alternate laminations of elastomer and metal.

End-Bearing Pile – A pile which provides support primarily due to reaction at its tip.

Environmental Classes – Classes (1, 2 or 3)

Environmental Class I Environmental Impact Statement: Projects that normally involve significant changes in traffic capacities and patterns. These projects generally involve major right-of-way acquisitions. Both draft and final Environmental Impact Statements are required.

Environmental Class II Categorical Exclusions: Projects that normally involve the improvement of pavement conditions on traffic safety, but little, if any, change in traffic capacities or patterns. Right-of-way requirements must be minor. These projects are categorically excluded from further environmental documentation, unless permit requirements indicate otherwise.

Environmental Class III Environmental Assessment: Projects that do not clearly fall within Class I or Class II. These projects require assessments to determine their environmental significance.

Epoxy – A synthetic resin which cures or hardens by chemical reaction between components which are mixed together shortly before use.

Epoxy Coated Rebar – Steel reinforcement coated with a powdered epoxy resin, to prevent corrosion of the bar steel.

Expansion Bearings – Bearings that allow longitudinal movement of the superstructure relative to the substructure and rotation of the superstructure relative to the substructure.

Expansion Device – A device placed at expansion points in bridge superstructures to carry the vertical bridge loads without preventing longitudinal movement.

Expansion Joint – A joint in concrete that allows expansion due to temperature changes, thereby preventing damage to the structure.

Extra Work – Work not included in any of the contract items as awarded but determined by the Engineer necessary to complete the project according to the intent of the contract. This may be paid on a negotiated price, force account, or established price basis.

Extrados – The curved edge of an arch rib or barrel formed by the intersection of the top and side arch surfaces.

F

Falsework – A temporary construction work on which a main or permanent work is wholly or partially supported until it becomes self-supporting. For cast-in-place concrete or steel construction, it is a structural system to support the vertical and horizontal loads from forms, reinforcing steel, plastic concrete, structural steel, and placement operations.

Fatigue – The tendency of a member to fail at a lower stress when subjected to cyclical loading that when subjected to static loading.

Fatigue Crack – Any crack caused by repeated cyclic loading.

Federal-Aid System of Highways – The national system of interstate highways, Federal-aid highway system, system of secondary and feeder roads, Federal-aid grade crossing projects, federal forest highway systems and projects and other highway and related projects, all within the meaning of the Federal-Aid Road Act (1916), and all acts amendatory thereof and supplementary thereto, and the federal regulations issued under such acts.

Fender – A structure that acts as a buffer to protect the portions of a bridge exposed to floating debris and water-borne traffic from collision damage.

Fiscal Year – For the State of Oregon, July 1 through June 30 of the next year; for the Federal government, October 1 through September 30 of the next year. The Federal fiscal year (FY) is broken into quarters:

F1Q (October, November, December)

F2Q (January, February, March)

F3Q (April, May, June)

F4Q (July, August, September)

Felloe Guard – Timber curb, usually 10" x 12", bolted to timber deck and timber rail post. Sometimes called wheel guard.

Filler Plate – A steel plate or shim used for filling in space between compression members.

Fit Condition – Deflected girder geometry associated with a targeted dead load condition for which the cross-frames are detailed to connect to the girders.

Fixed Bearings – Bearings that do not provide for any longitudinal movement of the superstructure relative to the substructure, but allows for rotation of the superstructure relative to the substructure.

Flat Slab – A reinforced concrete superstructure that has a uniform depth throughout.

Flood Plain – An area that would be inundated by a flood.

Floodway – A stream channel plus any adjacent flood plain areas that must be kept free of encroachment so that the 100-year flood can be conveyed without substantial increases in flood heights.

Floor Beam – A transverse structural member that extends from truss to truss or from girder to girder across the bridge.

Flux – A material that protects the weld from oxidation during the fusion process.

Force Account Work – Items of extra work ordered by the Engineer that are to be paid for by material, equipment, and labor.

Forms – A structural system constructed of wood or metal used to contain the horizontal pressures exerted by plastic concrete and retain it in its desired shape until it has hardened.

Fracture Critical – See Nonredundant Steel Tension Members

Fracture Mechanics – Study of crack growth in materials.

Free-Standing Retaining Wall – A retaining wall that is not part of the bridge abutment walls.

Friction Pile – A pile that provides support through friction resistance along the surface area of the pile.

Functionally Obsolete Bridges – Those bridges which have deck geometry, load carrying capacity (comparison of the original design load to the current state legal load), clearance, or approach roadway alignment which no longer meet the usual criteria for the system of which they are a part as defined by the Federal Highway Administration.

G

Gabions – Rock-filled wire baskets used to retain earth and provide erosion control.

Galvanic Action – Electrical current between two unlike metals.

Galvanize – To coat with zinc.

Geotextiles – Sheets of woven or non-woven synthetic polymers or nylon used for drainage and soil stabilization.

Girder – Main longitudinal load carrying member in a structure (beam).

Glare Screen – A device used to shield a driver's eye from the headlights of an oncoming vehicle.

Grade Separation – A crossing of two highways or a highway and a railroad at different levels.

Gravity Wall – A retaining wall that is prevented from overturning by its weight alone.

Green Concrete – Concrete that has set but not appreciably hardened.

Grid Flooring – A steel floor system comprising a lattice pattern which may or may not be filled with concrete.

Grout – A mixture of cementitious material and water having a sufficient water content to render it a free-flowing mass, used for filling (grouting) the joints in masonry, for fixing anchor bolts and for filling post-tensioning ducts.

H

Hammerhead Pier – A pier that has only one column with a cantilever cap and is somewhat similar to the shape of a hammer.

Hanger Plate – A steel plate that connects the pins at hinge points thus transmitting the load through the hinge.

Haunch – An increase in depth of a structural member usually at points of intermediate support.

Haunched Slab – A reinforced concrete superstructure that is haunched (has an increased depth) at the intermediate supports.

Headwall – A concrete structure at the ends of a culvert to retain and protect the embankment slopes, anchor the culvert, and prevent undercutting.

High Performance Concrete (HPC) – Concrete with enhanced properties including higher strength, greater durability and decreased permeability.

High Performance Steel (HPS) – Steel with enhanced properties including increased durability and weldability.

Hinge – A device used to hold the ends of two adjoining girders together, but does not allow for longitudinal movement of the superstructure. A point in a structure where a member is free to rotate.

Holddown Device – A device used on bridge abutments to prevent girders from lifting off their bearings as a result of the passage of live load over the bridge.

Honeycomb – A surface or interior defect in a concrete mass characterized by the lack of mortar between the coarse aggregate particles.

Howe truss – A truss of the parallel chord type with a web system composed of vertical (tension) rods at the panel points with an X pattern of diagonals.

Hydration – The process by which cement combines with water to form a hard binding substance.

Hybrid Girder – A steel plate girder with the web steel having a lower yield strength than the steel in one or both flanges.

Hydrodemolition – Process to abrade or remove a surface, such as concrete, by streams of water ejected from a nozzle at high velocity.

I

Incidental Work – Work necessary for fulfillment of the contract but which is not listed as a pay item in the contract and for which no separate or additional payment will be made.

Initial Set (Concrete) – Initial stiffening of concrete, with time based upon penetration of a weighted test needle. In the field, it is commonly assumed to be the time when the dead weight of vibrator does not penetrate into the concrete.

Inlet Control – The case where the discharge capacity of a culvert is controlled at the culvert entrance by the depth of headwater and the entrance geometry, including barrel shape, cross-sectional area, and inlet edge.

Intermediate Stiffener – A vertical transverse steel member used to stiffen the webs of plate girders between points of support.

Internal File Number – Number assigned by the Bridge Front Office as part of office automation (computerized files) and used to track all files.

Invert – The bottom or lowest point of the internal surface of the transverse cross-section of a pipe.

Inventory Rating (Design Load) – Load level that produces normal design stresses in the structures. The inventory rated load is the load that can safely utilize an existing structure for an indefinite period of time.

International System of Units (SI) – The modernized metric system.

Intrados – The curved edge of an arch rib or barrel formed by the intersection of the bottom and side arch surfaces.

Isotropic – Have the same material properties in all directions, e.g., steel.

J

Jacking End – End of post-tensioned bridge where jacking takes place (opposite of dead end).

Jetting – Forcing water into holes in an embankment to settle or to compact the earth. Forcing water through holes in piles to install the piles to a specified depth before driving.

K

Key Number – Number assigned to a project by Program Section to identify it in the Project Control System (PCS). All structures in a project have the same key number.

Kilogram (kg) – The base unit for mass in the International System of Units (metric).

King Post Truss – Two triangular panels with a common center vertical; the simplest of triangular trusses.

L

Lacing – Small flat plates used to connect individual sections of built up members.

Laitance – A weak mortar that collects at the surface of freshly placed concrete, usually caused by an excess of mixing water or by excessive finishing.

Lamellar Tear – Incipient cracking between the layers of the base material (steel).

Lateral Bracing – Bracing placed in a horizontal plane between steel girders near the bottom or top flanges or both.

Latex Modified Concrete (LMC) – Emulsion of synthetic rubber or plastic obtained by polymerization used as a concrete additive to decrease permeability.

Leaf – The movable portion of a bascule bridge which forms the span of the structure.

Lenticular Truss – A truss having parabolic top and bottom chords curved in opposite directions with their ends meeting at a common joint; also known as a fish belly truss.

Level of Performance – The degree to which a longitudinal barrier, including bridge railing, is designed for containment and redirection of different types of vehicles.

Liquid Penetrant Inspection – Nondestructive inspection process for testing for continuities that are open to the surface, by using a liquid dye.

Live Load – Force of the applied moving load of vehicles and pedestrians.

Load Rating – Evaluation of the safe live load capacity of the weakest member of a bridge.

LRFD – Load Resistance Factor Design.

Longitudinal Stiffener – A longitudinal steel plate (parallel to girder flanges) used to stiffen the webs of welded plate girders. Normally thicker webs are used to eliminate longitudinal stiffeners.

Low Relaxation Strands – Prestressing tendons that are manufactured by subjecting the strands to heat treatment and tensioning causing a permanent elongation. This increases the strand yield strength and reduces strand relaxation under constant tensile stress.

M

Magnetic Particle Inspection (MT) – Nondestructive inspection process for testing for the location of surface cracks or surface discontinuities, by applying dry magnetic particles to a weld area or surface area that has been suitably magnetized.

Microsilica (Silica Fume) (MC) (SFC) – Very fine non-crystalline silica used as an admixture in concrete to improve the strength, permeability and abrasion resistance.

Minor Structure Concrete (MSC) – Nonstructural concrete furnished according to contractor proportioning, placed in minor structures and finished as specified. Previously called commercial concrete.

Modular Expansion Joints – Multiple, watertight joint assemblies for bridges requiring expansion movements greater than 4 inches.

Mud Sill – A timber platform laid on earth as a support for vertical members or bridge falsework.

Mylars – Full-size drawings on mylar. The final "legal" drawing used for signatures and printing contract plans.

N

NDT – Nondestructive testing, a method of checking the structural quality of materials that does not damage them.

Negative Moment – The moment causing tension in the top fibers and compression in the bottom fibers of a structural member.

Negative Reinforcement – Reinforcement placed in concrete to resist negative bending moments.

Newton (N) – The derived unit for force (mass times acceleration or kg times m/s^2) in the International System of Units (metric).

Nominal – Used to designate a theoretical dimension, size, or slope that may vary from the actual by a very small or negligible amount. Example: a 1" nominal diameter steel pipe has an actual 0.957" inside diameter.

Nominal Pile Resistance – LRFD term for the maximum axial pile bearing resistance. Equivalent to the ultimate pile capacity term used in allowable stress design.

Non-Redundant Structure – Type of structure with single load path, where a single fracture in a member can lead to the collapse of the structure.

Nonredundant Steel Tension Members (Previously Fracture Critical) – Members of a bridge where a single fracture in a member can lead to collapse.

Nosing – A bulkhead at the ends of bridges or at expansion joints made of a durable material to protect and reinforce the slab edge. It also provides a smooth edge or surface at expansion joints to facilitate installation and provide a better seal.

O

Operating Rating (Permit Loads) – The absolute maximum permissible stress level to which a structure may be subjected. It is that stress level that may not be exceeded by the heaviest loads

allowed on the structure. Issue special permits for heavier than normal vehicles only if such loads are distributed so as not to produce stress in excess of the operating stress.

Outlet Control – The case where the discharge capacity of a culvert is controlled by the elevation of the tail water in the outlet channel and the slope, roughness, and length of the culvert barrel, in addition to the cross-sectional area and inlet geometry.

Orthotropic – A description of the physical properties of a material that has pronounced differences in two or more directions at right angles to each other.

P

Parapet – A low concrete rail designed and placed to prevent traffic from passing over the edge of a bridge deck or end of box culvert.

Pascal (Pa) – The derived unit for pressure or stress ($Pa=N/m^2$) in the International System of Units (metric).

Paving Dam – (see Nosing) – A bulkhead at the ends of bridges or at expansion joints made of a durable material to protect and reinforce the slab edge and provide a stopping place for the wearing surface.

Paving Ledge – A ledge or corbel attached to the end beam of a bridge, to provide support for a current or future approach slab.

Performance Level – See Level of Performance.

Pier – Intermediate substructure unit of a bridge. Current terminology is bent.

Pile – A long, slender piece of wood, concrete, or metal to be driven, jetted, or cast-in-place into the earth or river bed to serve as a support or protection.

Pile Bent – A pier where the piles are extended to the pier cap to support the structure.

Pile Cap – A member, usually of reinforced concrete, covering the tops of a group of piles for the purpose of tying them together and transmitting to them as a group the load of the structure that they support.

Pipe Arch – A conduit in the form of a broad arch with a slightly curved integral bottom.

Plastic Deformation – Deformation of material beyond the elastic range.

Positive Moment – In a girder the moment causing compression in the top flange and tension in the bottom flange.

Post-Tensioning – Method of prestressing in which the tendon is tensioned after the concrete has cured.

Pot Bearing – A bearing type that allows for multi-directional rotation by using a neoprene or spherical bearing element.

Prestress Camber – The deflection in prestressed girders (usually upward) due to the application of the prestressing force.

Pratt Truss – A truss with parallel chords and a web system composed of vertical posts with diagonal ties inclined outward and upward from the bottom chord panel points toward the ends of the truss; also known as N-truss.

Preliminary Plans – 85-90% complete plans, normally sent at 20 weeks.

Prestressed Concrete – Concrete in which there have been introduced internal stresses (normally pretensioned steel) of such magnitude and distribution that the stresses resulting from given external loadings are counteracted to a desired degree

Pretensioned – Any method of prestressing in which the strands are tensioned before the concrete is placed.

Project Manager – The Engineer's representative who directly supervises the engineering and administration of a contract.

Proposal – A written offer by a bidder on forms furnished by the Division to do stated work at the prices quoted.

PS&E – Literally, Plans, Specifications, and Estimates. Usually it refers to the time when the plans, specifications, and estimates on a project have been completed and referred to FHWA for approval. When the PS&E has been approved, the project goes from the preliminary engineering phase to the construction phase.

Pumping – The ejection of mixtures of water, clay and silt along or through transverse or longitudinal joints, crack or payment edges, due to vertical movements of the roadway slab under traffic.

Q

Queen-post Truss – A parallel chord type of truss having three panels with the top chord occupying only the length of the center panel; unless center panel diagonals are provided, it is a trussed beam.

R

Radiographic Inspection – Nondestructive inspection process where gamma rays or X rays pass through the object and cast an image of the internal structure onto a sheet of film as the result of density changes.

Redundant Structure – Type of structure with multiple-load paths where a fracture in a single member cannot lead to the collapse of the structure.

Reflection Crack – A crack appearing in a resurfacing or overlay caused by movement at joints or cracks in the underlying base or surface.

Rehabilitation – Work required to restore the structural integrity of a bridge, or bridge element, as well as work necessary to correct major safety defects. Rehabilitation activities are considered bridge preservation.

Reinforced Pile Tip – Metal reinforcement fastened to the pile tip to protect it during driving.

Replacement – Total reconstruction of a structurally deficient or functionally obsolete bridge, or bridge element, with a new one constructed in the same vicinity. The replacement structure, or element, must comply with current design codes, policies and practices.

Residual Camber – Camber due to the prestressing force minus the dead load deflection of the girder.

Retrofit – Work required to upgrade a bridge, or bridge element, beyond its original intended purpose and design capacity. This work often includes strengthening to add structural capacity.

Right of Way – Land, property, or property interest, usually in a strip, acquired for or devoted to transportation purposes.

Riprap – A facing of stone used to prevent erosion. It is usually dumped into place, but is occasionally placed by hand.

Roadside Barrier – A longitudinal barrier used to shield roadside obstacles or non-traversable terrain features. It may occasionally be used to protect pedestrians from vehicle traffic.

Roadway – The portion of a highway, including shoulders, for vehicular use.

Rubble – Irregularly shaped pieces of varying size stone in the undressed condition obtained from a quarry.

S

Sacrificial Anode – The anode in a cathodic protection system.

Sand – Particles of rock that will pass a No. 4 sieve and be retained on a No. 200 sieve.

Scaffolding – Temporary elevated walkway or platform to support workmen, materials and tools.

Scarify – To loosen, break up, tear up, and partially pulverize the surface of soil, or of a road.

Scour – Erosion of a river bed area caused by water flow.

Scour Protection – Protection of submerged material by steel sheet piling, riprap, mattress, or combination of such methods.

Screeding – The process of striking off excess material to bring the top surface to proper contour and elevation.

Seal – A concrete mass (usually not reinforced) poured under water in a cofferdam that is designed to resist hydrostatic uplift. The seal facilitates construction of the footing in dry conditions.

Shear Connector – A connector used to joint cast-in-place concrete to a steel section and to resist the shear at the connection.

Shear Lag – Nonuniform stress pattern due to ineffective transmission of shear.

Shed Roof – Roadway section with the height of one gutter greater than the centerline and other gutter.

Sheet Pile – A pile made of flat or arch cross-section to be driven into the ground or stream bed and meshed or interlocked with like members to form a wall, or bulkhead.

Sheet Pile Cofferdam – A wall-like barrier composed of driven piling constructed to surround the area to be occupied by a structure and permit dewatering of the enclosure so that the excavation may be produced in the open air.

Shoofly – Detour alignment of temporary railroad track and bridge around the site of a permanent railroad bridge replacement.

Shotcrete – Mortar or concrete pneumatically projected at high velocity onto a surface.

Shoulders – The portions of the roadway between the traveled way and the inside edges of slopes of ditches or fills, exclusive of auxiliary lanes, curbs, and gutters.

Shy Distance (E-Distance) – The distance from the edge of the traveled way beyond which a roadside object will not be perceived as an immediate hazard by the typical driver, to the extent that the vehicle's placement or speed will be changed.

Shrinkage – Contraction of concrete due to drying and chemical changes, dependent on time.

Silt – Soil passing a No. 200 sieve that is non-plastic or exhibits very low plasticity.

Simple Spans – Spans with the main stress carrying members non-continuous, or broken, at the intermediate supports.

Skew or Skew Angle – The acute angle formed by the intersection of a line normal to the centerline of the roadway with a line parallel to the face of the abutments or piers, or in the case of culverts with the centerline of the culverts. Left hand forward skew indicates that, look up station, the left side of the structure is further up station that the right hand side. Right hand skew indicates that the right side of structure is further up station that the left side. See the *BCM* for how the skew angle is detailed on plans.

Slab – A structural concrete element that provides a flat horizontal surface to distribute loads into a pressure that can be supported by the bearing capacity of the underlying soil substrate.

Sleeper slab – Used at the roadway end of the approach slab to support the reinforced approach slab and provide a smooth connection to the pavement.

Slip Base – A structural element at or near the bottom of a post or pole that will allow release of the post from its base upon impact while resisting wind loads.

Slope – The degree of inclination to the horizontal. It is sometimes described by such adjectives as steep, moderate, gentle, mild or flat.

Slope Paving – Pavement placed on the slope in front of abutment to prevent soil erosion.

Soffit – The bottom surface of a beam or an arch rib or barrel.

Spandrel – The area between the roadway and the arch in the side view of an arch bridge.

Special Provisions – The special directions, provisions, and requirements peculiar to the project that augment the standard specifications. They are commonly referred to as "specials".

Specifications – The body of directions, provisions, and requirements, together with written agreements and all documents of any description, made or to be made, pertaining to the method or manner of performing the work, the quantities, and the quality of materials to be furnished under the contract.

Spread Footing – A footing that is supported directly by soil or rock.

Spur Dike – A wall or mound built or extended out from the upstream side of an abutment used for training the stream flow to prevent erosion of stream bank. May also be used where there is no bridge, but the stream flows along the side of highway embankment.

Stainless Steel Teflon Bearings – Incorporated stainless steel and teflon with steel to provide the necessary expansion movement.

St. Venant Torsion – Uniform torsion resulting in no deformation of the cross-section.

State Plane Coordinates – The plane-rectangular coordinate system established by the United States Coast and Geodetic Survey. Plane coordinates are used to locate geographic position.

Station – A distance of 100 feet measured horizontally.

Stirrup – Vertical U-shaped or rectangular shaped bars placed in concrete beams to resist the shearing stresses in the beam.

Strengthening – Work to add structural capacity to a bridge element or structure.

Stress Relieved Strands – Any prestressing tendons that are manufactured by relieving the high residual stresses that were introduced into the steel during the wire drawing and stranding operations. Stress relieving is not a heat treatment and does not change the strand yield strength.

Strip Seal Joint – Molded neoprene glands inserted and mechanically locked between armored interfaces of extruded steel sections.

Structurally Deficient Bridges – Those bridges which have been (1) restricted to light vehicles only, (2) closed, or (3) require immediate rehabilitation to remain open, as defined by the Federal Highway Administration.

Subgrade – The top surface of completed earthwork on which subbase, base, surfacing, pavement, or a course of other material is to be placed.

Substructure – Those parts of a structure which support the superstructure, including bents, piers, abutments, and integrally built wingwalls, up to the surfaces on which bearing devices rest. Substructure also includes portions above bearing surfaces when those portions are built integrally with a substructure unit (e.g. backwalls of abutments). When substructure and superstructure elements are built integrally, the division between substructure and superstructure is considered to be at the bottom soffit of the longitudinal or transverse beam, whichever is lower. Culverts and rigid frames are considered to be entirely substructure.

Sufficiency Rating (SR) – A method of evaluating data by calculating four separate factors to obtain a numeric value which is indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge.

Superelevation – The difference in elevation between the inside and outside edges of a roadway in a horizontal curve; required to counteract the effects of

centrifugal force.

Superplasticizer – A high range water-reducing admixture that increases the slump of freshly mixed concrete without increasing the water content.

Superstructure – Those parts of a structure above the substructure, including bearing devices.

Surcharge – Any load that causes thrust on a retaining wall, other than backfill to the level of the top of the wall. Also preloading of an embankment to minimize the time for initial consolidation of the subsurface soils.

Suspension Bridge – A bridge in which the floor system is supported by catenary cables which are supported upon towers and are anchored at their extreme ends.

Suspender – A wire cable, metal rod or bar connected to a catenary cable of a suspension bridge at one end and the bridge floor system at the other, thus transferring loads from the roadway to the main suspension members.

T

Tack Welds – Small welds used for temporary connections.

Telltale (Tattletale) – Any device designed to indicate movement of formwork or falsework.

Tendon – A name for prestressed reinforcing element whether wires, bars, or strands.

Tenon – A constant diameter extension welded to the tip of the tapered metal arm of a luminaire support pole to receive the luminaire.

Thixotropy – Property of a material that enables it to stiffen in a short period on standing, but to acquire a lower viscosity again on mechanical agitation. A property desirable for post-tensioning duct grout.

Three-Dimensional Finite Element Analysis – Analysis in which a three-dimensional continuum is modeled as an assemblage of discrete elements in three-dimensional space.

Three-Hinged Arch – An arch which is hinged at each support and at the crown.

Through Structure – A structure that has its floor connected to the lower portion of the main stress-carrying members, so that the bracing goes over the traffic. A structure whose main supporting members project above the deck or surface.

Tining – Is used on finished concrete deck or slab surfaces to provide friction and reduce hydroplaning. Grooves are placed in the plastic concrete or cut into the hardened concrete.

Torsional Stress – Shear stress on a transverse cross-section resulting from a twisting action.

Transformed Section – A hypothetical section of one material so as to have the same elastic properties as a section of two materials.

Transition – A section of barrier between two different barriers or, more commonly, where a roadside barrier is connected to a bridge railing or to a rigid object such as a bridge pier. The transition should produce a gradual stiffening of the approach rail so vehicular pocketing, snagging, or penetration at the connection can be avoided.

Traveled Way – The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.

Tremie – A pipe or tube through which concrete is deposited underwater.

Trial Batch – A batch of concrete prepared to establish or check proportions of the constituents.

Turnbuckle – A long, cylindrical, internally threaded nut used to connect the elements of adjustable rod and bar members.

Turn-of-the-Nut – A bolt-tightening method.

Two-hinged Arch – A rigid frame which may be arch-shaped or rectangular but is hinged at both supports.

U

Ultrasonic Inspection – A non-destructive inspection process where by an ultra-high frequency sound wave induced into a material is picked up in reflection from any interface or boundary.

Unbonded Strands – Strands so coated as to prevent their forming a bond with surrounding concrete. Used to reduce stress at the ends of a member.

Underpinning – The addition of new permanent support to existing foundations to provide additional capacity.

Uplift – A force tending to raise a structure or part of a structure and usually caused by wind and eccentric loads, or the passage of live-load over the structure.

Utility – A line, facility, or system for producing, transmitting, or distributing communications, power, electricity, heat, gas, oil, water, steam, waste, storm water not connected with highway drainage, or any other similar commodity which directly or indirectly serves the public. The

term utility shall also mean the utility company, district, or cooperative, including any wholly owned or controlled subsidiary.

V

Vierendeel Truss – A Pratt truss without diagonal members and with rigid joints between top and bottom chords and the verticals.

Vibrator – An oscillating device inserted at selected locations to consolidate fresh concrete.

W

Wales – Horizontal support members in close contact with a row of sheet piles in a cofferdam or shoring wall. Sometimes called whalers.

Warrants – The criteria by which the need for a safety treatment or improvement can be determined.

Warren Truss – A triangular truss consisting of sloping members between the top and bottom chords and no verticals; members form the letter W.

Water/Cement Ratio – The weight of water divided by the weight of cement in a concrete; ratio controls the strength of the concrete.

Waterproofing Membranes – Impervious material overlaid with bituminous concrete to protect decks from the infiltration of chlorides and resulting deterioration.

Wearing Surface – The top layer of a pavement designed to provide structural values and a surface resistant to traffic abrasion.

Weep Hole – A drain hole through a wall to prevent the building up of hydraulic pressure behind the wall.

Weld Inspection – Covers the process, written procedure, and welding in process. Post weld heat maintenance if required, post weld visual inspection and non-destructive testing as specified in contract and Standard Specifications.

Welded Wire Reinforcing – A two-way reinforcing mat, fabricated from cold-drawn steel wire, having parallel longitudinal wires welded at regular intervals to parallel transverse wires.

Well-Graded – An aggregate possessing a proportionate distribution of successive particle sizes.

Wetlands – Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Wheel Load – Half of an axle load.

Wingwall – A wall attached to the abutments of bridges or box culverts retaining the roadway fill. The sloping retaining walls on each side of the center part of a bridge abutment.

X

Y

Yield – Permanent deformation (permanent set) which a metal piece takes when it is stressed beyond the elastic limit.

Young's Modulus – modulus of elasticity of a material (E); or the stiffness of a material.

Z

APPENDIX – SECTION 1 – Abbreviations (Initialisms and Acronyms)

A

A&E	Architectural and Engineering
AADT	Annual Average Daily Traffic
AASHTO	American Association of State Highway and Transportation Officials (since 1973)
ABC	Accelerated Bridge Construction
AC	Asphalt Concrete
ACI	American Concrete Institute
ACP	Asphalt Concrete Pavement
ACT	Area Commission on Transportation
ACWS	Asphalt concrete wearing surface
ADA	Americans with Disabilities Act
ADT	Average daily traffic (see Definitions)
ADTT	Average Daily Truck Traffic
AEE	Association of Engineering Employees
AHP	Analytic Hierarchy Process
AISC	American Institute of Steel Construction
a.k.a.	Also known as
ANSI	American National Standards Institute
API	Area of Potential Impact
APJ	Asphaltic Plug Joint
APM	Area Project Manager Agency Project Manager
APWA	American Public Works Association
AREA	American Railway Engineering Association
AREMA	Manual for Railway Engineering of the American Railway Engineering and Maintenance-of-way Association
ARS	Accident Records System (Accident Data Unit, Transportation Research Section)
ASCE	American Society of Civil Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society

B

B-Team	Team of Bridge Engineering Section Supervisors & Engineers
BART	Biological Activity Reaction Test
BCM	Bridge CAD Manual
BDC	Bridge Design Coordinator
BDM	Bridge Design Manual
BDS	Bridge Design System (AASHTO software)
BDS	Bridge Data System (ODOT software)
BDWO	Bridge Design Work Order
BLT	Bridge Leadership Team
BMDM	Bridge Maintenance Design Manual
BMP	Best Management Practice
BNSF	Burlington Northern Sante Fe Railroad
BPR	Bureau of Public Roads (now FHWA)
BR	Bridge
BRASS	Bridge Rating and Analysis of Structural Systems (software)
Brg.	Bearing
BRSFUP	Bridge Rail Safety Features Upgrade Program
Bt.	Bent

C

C	Degrees Celsius Compression
CAD	Computer-aided drafting
CAFL	Constant Amplitude Fatigue Limit
CalTrans	California Department of Transportation
CBC	Conventional Bridge Construction
CBR	Major Steel Bridges
CF	Cubic feet
CFRP	Carbon Fiber Reinforced Polymer
CFS	Cubic Feet per Second
CG	Center of Gravity
CICS	Customer Information and Control System (Transportation inventory and Mapping Unit software on the mainframe)
CIP	Cast-in-place

CL	Centerline
	Clear
CMP	Construction Mitigation Plan
	Construction Management Plan
	Corrugated metal pipe
CMR	Change Management Request
CPM	Critical Path Method (method of scheduling)
	Consultant Project Manager
CQCR	Comments, Questions, Concerns and Requests
CQP	Consultant Quality Plan
CSL	Crosshole Sonic Log
CSZE	Cascadia Subduction Zone Earthquake
CTP	Continuous Trip Permit
Ctr.	Center
CUP	Conditional Use Permit
CWI	Certified Welding Inspector
CY	Cubic yard

D

D	Depth
DAP	Design Acceptance Plans
DAW	Design Acceptance Workshop
DBE	Disadvantaged Business Enterprises
DCSA	Bridge Design Criteria and Standards Assessment
DD	Bridge Design Deviation
DE	Design Exception
Dia.	Diameter
DIS	Dynamic Isolation System, Inc.
DL	Dead load
DOS	Disk Operating System for personal computers
DOT	Department of Transportation
DQP	Design Quality Plan

E

E&C	Engineering and Contingencies (used in cost estimates)

EAC	Emulsified Asphalt Concrete
EB	Eastbound
El.	Elevation
Elev.	Elevation
EOR	Engineer of Record
ESR	Evaluation Service Report
Extg.	Existing

F

F	Degrees Fahrenheit
FEMA	Federal Emergency Management Agency
FF	Far face (don't use for "fill face")
FFO	Full Federal Oversight
FHWA	Federal Highway Administration (formerly BPR)
FRP	Fiber Reinforced Polymer
ft-k	foot-kips
ft-lbs	foot-pounds
FWS	Future Wearing Surface

G

Galv.	Galvanized
GDM	Geotechnical Design Manual
GFRP	Glass Fiber Reinforced Polymer
GIS	Geographic Information System
GPR	Ground Penetrating Radar
GR	Grade
GSD	AASHTO Guide Specifications for Seismic Design
GTR	Geotechnical Report

H

HDM	Highway Design Manual Hydraulics Design Manual
HPC	High Performance Concrete
HPS	High Performance Steel
HQ	Headquarters

I

IBC	International Building Code
IC	Internal Curing
ID	Inside diameter Identification
IGA	Inter-Governmental Agreement
ISA	Internal Shear Anchor
ITS	Intelligent Transportation Systems

J

Jt.	Joint

K

k	Kilo, one thousand
K	Kip (kilopound, 1000 pounds)
kg	Kilogram, metric mass unit
km	Kilometer (1000 meters)
kN	KiloNewton, metric force unit
KSF	Kips per Square Foot
KSI	Kips per Square Inch

L

LAG	Local Agency Guidelines
Lbs	Pounds
LF	Linear feet
LL	Live load
LMC	Latex Modified Concrete
LPA	Local Public Agency
LRFD	Load Resistance Factor Design
LRFD	*AASHTO LRFD Bridge Design Specifications*
L.S.	Lump Sum

M

m	Meter, metric length unit
	Milli, one thousandth
M	Mega, one million
MASH	Manual for Assessing Safety Hardware
Max.	Maximum
MBJS	Modular Bridge Joint System
MBM	Major Bridge Maintenance
MC	Microsilica concrete
	Miscellaneous Channels
MCTD	Motor Carrier Transportation Division
Min.	Minimum
MP	Milepoint, milepost (even milepoint)
MPCO	Multi-Layer Polymer Concrete Overlay
MOT	Maintenance of Traffic
MSC	Minor structure concrete
MSCS	Management Scheduling Control System (to replace PCS)
MSE	Mechanically Stabilized Earth (retaining walls)
MT	Magnetic Particle

N

N	Newton, metric force unit
NACE	National Association of Corrosion Engineers
NBI	National Bridge Inventory
NBIS	National Bridge Inspection Standards
NCHRP	National Cooperative Highway Research Program (from the Transportation Research Board)
NDE	Non-destructive Evaluation
NDT	Non-destructive Testing
NEPA	National Environmental Protection Act of 1969
NHI	National Highway Institute
NHS	National Highway System
NLF	No Load Fit
NRST	Nonredundant Steel Members
NSBA	National Steel Bridge Alliance
NSM	Near Surface Mount
NTS	Not to Scale

O

OC	On Center (center-to-center)
OD	Outside Diameter
ODOT	Oregon Department of Transportation
ODLAP	ODOT Delivery of Local Agency Projects
OHWM	Ordinary High Water Mark
ORS	Oregon Revised Statutes
OSHA	Occupational Safety and Health Administration (U.S.)

P

Pa	Pascal, metric stress or pressure unit
PA	Price Agreement
PCC	Portland Cement Concrete
	Point on compound curve
PCF	Pounds per Cubic Foot
PCI	Prestressed Concrete Institute
PCS	Project Control System (to be replaced by MSCS)
PD	Project Delivery
PDG	Project Delivery Guide
PDLT	Project Delivery Leadership Team
PE	Professional Engineer (registered)
PFSJ	Precompressed Foam Silicone Joint
PL	Project Leader
	Plate
PM	Project Manager
POR	Professional of Record
PPC	Premixed Polymer Concrete
	Precast Prestressed Concrete
PQR	Pre-Qualification Request
	Public Relations
P/S	Prestressed Concrete
PS&E	Plans, Specifications & Estimate
PSBS	Project Specifications Bid System
PSDC	Project Specific Design Criteria

PSF	Pounds per Square Foot Precast Spread Footing
PSI	Pounds per Square Inch
P/T	Post-tensioned concrete
PVC	Polyvinyl chloride
PWS	Present Wearing Surface

Q

QA	Quality Assurance
QC	Quality Control
QPL	Qualified Products Listing

R

R	Radius
R, 1R	Resurfacing
R/W	Right of Way
RBI	Region Bridge Inspector
RBLE	Regional Bridge Lead Engineer
RCBC	Reinforced Concrete Box Culvert
RCDG	Reinforced Concrete Deck Girder
Rdwy.	Roadway
RE-CP	Resident Engineer – Consultant Projects
RFI	Request for Information
RFP	Request for Proposals
RR	Railroad
RRR, 3R	Resurfacing, Restoration and Rehabilitation
RRRR, 4R	Resurfacing, Restoration, Rehabilitation and Reconstruction
RT	Radiographic

S

SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy of Users of 2005
SDC	Seismic Design Category
SDCL	Simple for Dead and Continuous for Live Load
SDLF	Steel Dead Load Fit

SF	Square feet
SFC	Silica Fume Concrete
SFLMC	Silica Fume Latex-Modified Concrete
SHPO	State Historic Preservation Office
SIDL	Superimposed Dead Load
Sl.	Slope
SOW	Statement of Work
SP	*ODOT Construction Specifications*
Spcg.	Spacing
Spcs.	Spaces
SPMT	Self-Propelled Modular Transporters
SPT	Standard Penetration Test for soils
SR	Sufficiency Rating
Std.	Standard
STIP	State Transportation Improvement Program
STP	Single Trip Permit
STRUDL	Structural Design Language
SY	Square Yard

T

T&E	Threatened and Endangered
TCP	Traffic Control Plan
TcP	Time cost per person
TDLF	Total Dead Load Fit
TiAB	Titanium Alloy Bars
TIP	Thermal Integrity Profile
TL	Test Level
TP&DT	Temporary Protection and Direction of Traffic
TPAR	Temporary Pedestrian Accessible Routes
TPM	Transportation Project Manager
TS&L	Type, Size and Location (formerly called preliminary)
TSF	Tons per Square Foot (don't use)
Typ.	Typical

U

UBIT	Under Bridge Inspection Truck
UHPC	Ultra High Performance Concrete
UPRR	Union Pacific Railroad
USCG	United States Coast Guard
USGS	United States Geological Survey
UST	Underground Storage Tank
UT	Ultrasonic

V

Var.	Varies
VE	Value Engineering

W

WOC	Work Order Contract
WPS	Welding Procedure Specifications
WS	Wearing surface
WSDOT	Washington State Department of Transportation
WSC	Wire Strand Core (cables)
Wt.	Weight

X

Y

Z

APPENDIX – Section 1.2 – AASHTO/BDM Cross-Reference

Table A1.2-1 AASHTO/BDM Cross Reference

BDM Section	Title	LRFD Section	Title	Comments
2.14.7.2 2.18.3	Bridge Length	2.6.4.3	Bridge Waterway	BDM adds specific design floods and minimum freeboard to AASHTO specs.
2.18.2(2)	Structure Depth	2.5.2.6.3-1	Span to Depth Ratios	BDM gives span-to-depth ratios for concrete bridges but leaves span-to-depth ratios for steel bridges to AASHTO.
2.18.2(2)	Structure Depth	2.5.2.6.2	Criteria For Deflection	BDM states that AASHTO optional live load deflection criteria is not required for bridges that satisfy the span-to-depth ratios in BDM ~~2.5.2.6.3-1~~ 2.18.2(4)
2.17.1(1)	Bridge Types and Economics	4.6.2.1.4, 5.14.4.1, 9.7.1.4	Slab Edge Beam Requirements	BDM Yields to AASHTO Requirements. AASHTO requirements also apply to CIP voided slabs if design deviation is approved.
2.14.7.1	Hydraulics, General	2.6.4.4.2	Bridge Scour	BDM states that bottom of spread footings should be 6 feet below normal streambed. AASHTO states that the bottom of footing should be below the scour depth.
1.10.5.3	Spread Footing Foundation Design	10.6.1.2	Bearing Depth	BDM states that spread footings should be at least 6 feet below streambed and also below the scour depth for the 500-year flood event. AASHTO states that the footings should be located to bear below the maximum anticipated depth of scour.
1.10.5.3(2)	Nominal and Factored Bearing Resistances	10.5.5.2.2	Spread Footings	BDM resistance factors for bearing of spread footings are higher than those shown in Table 10.5.5.2.2 in the AASHTO Specs for extreme

BDM Section	Title	LRFD Section	Title	Comments
				event conditions of scour and earthquake loading.
1.10.5.3(4)	Spread Footing Stability	11.6.2.3	Overall Stability	BDM specifies a factor of safety 1.5 for overall stability. AASHTO specifies phi factors for stability = 0.75 or 0.65 depending on geotechnical information.
1.10.5.4.1(1)	Pile Resistance	10.7.3.8	Nominal Axial Pile Resistance	BDM refers specifically to AASHTO specs for determining axial pile capacity.
1.10.5.5.1(1)	Drilled Shaft Diameters and Requirements	10.8.1.3	Shaft Diameter	BDM states that smallest shaft diameter is 12 inches. AASHTO adds that if the shaft is to be manually inspected, the diameter should not be less than 30 inches.
1.10.5.5.1(1)	Column Diameter	10.8.1.3	Maximum Column Size	AASHTO states that columns on top of drilled shafts can be the same size as the drilled shaft, but BDM requires that columns be smaller than shafts by 6 inch or 1 foot depending on shaft diameter.
1.10.5.5.1(6)	Shaft Settlement	10.8.2.2	Shaft Settlement	BDM refers to AASHTO for the determination of drilled shaft settlement.
1.10.5.5.1(11)	Shaft Reinforcement	5.13.4.6.3	Volumetric Reinforcement Ratio and transverse rebar spacing	BDM overrides LRFD 5.13.4.6.3 because the shaft diameter is always larger than the column diameter.
1.10.5.5.1(11)	Shaft Reinforcement	5.13.4.6.3	Volumetric Reinforcement Ratio and transverse rebar spacing	BDM adds a formula for computing transverse reinforcement required in non-contact splice region.
1.10.5.5.1(1)	Shaft Reinforcement Cover	5.12.3-1	Cover for Main Reinforcing Steel	BDM provides specific reinforcement cover requirements for drilled shafts.

BDM Section	Title	LRFD Section	Title	Comments
1.3.2	Dead Loads	3.5.1-1	Unit Weights	BDM assumes 150 pcf for ACP, but AASHTO assumes 140 pcf.
1.3.4	Construction and Temporary Loads	3.4.3.1	Jacking Forces	BDM modified permanent load factor to 1.5 from AASHTO's 1.3.
1.3.7	Thermal Forces	3.12.2.1-1	Temperature Ranges	Temperature ranges vary slightly between BDM and AASHTO for Climates (Sections)
1.3.1	Ductility, Redundancy, and Operational Importance	1.3.3, 1.3.4, 1.3.5	Ductility, Redundancy, and Operational Importance	BDM requires State Bridge Engineer approval for Redundancy Factor less than 1.0, and it states that for the Operational Importance Factor, use a value of 1.0 for all bridges, assuming all bridges to be "typical".
1.3.5	Sidewalk Loading	3.6.1.6	Pedestrian Loads	BDM adds specific details for applying vehicular live load to curb mountable sidewalks.
1.11.2.3	Wingwall Design and Construction	11.6.1.5.2	Wingwalls	BDM adds bar extension requirements for abutments on stiff footings to distribute flexure. AASHTO does state that bar lengths should vary to avoid "planes of weakness"
1.17	Seismic Design	3.10, 5.10.11, 5.13.4.6, 11.6.5, 11.8.6, 11.10.7	Earthquake Effects	BDM specifies the use of AASHTO Guide Specifications for LRFD Seismic Bridge Design for projects initiated after May 1st 2009. For projects initiated before May 1st 2010, BDM specifies the use of AASHTO LRFD Bridge Design Specifications. Additional requirements and guidelines for both AASHTO documents are included in the BDM.
1.5.1	Concrete, General	5.4.2.1	Compressive Strength	BDM has independent concrete classes.
1.5.1	Concrete, General	5.4.2.4	Modulus of Elasticity	BDM and AASHTO have same formula

BDM Section	Title	LRFD Section	Title	Comments
1.5.5-2	Minimum Bar Covering	5.12.3	Concrete Cover	BDM and AASHTO have separate tables
1.5.5.1	Reinforcement for Shrinkage and Temperature	5.10.8	Shrinkage and Temperature Reinforcement	BDM bases reinforcement area on concrete thickness only, but AASHTO bases reinforcement area on ratio of volume of section to perimeter of section. AASHTO also has additional required minimum spacing for specific elements.
1.5.5.4	Minimum Bar Spacing	5.10.3	Spacing of Reinforcement	BDM specifies 2.5d for the bar spacing, but AASHTO specifies 1.5d for clear distance between bars. Both state 1.5 inches minimum clear between bars and 1.5(maximum aggregate size) for minimum clear between bars.
1.5.5.5	Compression Development Length	5.11.2.2.1	Compression Development Length	AASHTO gives two equations with the one that results in the lowest value controlling. BDM specifies the largest value from the equations.
1.5.6.1	Design of Precast Prestressed Elements	5.9.4.1.2-1, 5.9.4.2.2-1	Tensile Stress Limits	AASHTO allows 0.19sqrt(f'c) for certain situations but BDM allows only 0.0948sqrt(f'c)
1.5.8.6	Post-Tension Strand Duct Placement	5.10.3.3.2	Post-Tensioning Ducts C-C Spacing	AASHTO specifies spacing requirements; BDM doesn't call out spacing requirements.
1.14.1.2	Elastomeric Bearing Pads	14.7.5, 14.7.6	Elastomeric Pads and Steel Reinforced Elastomeric Pads	BDM specifies that AASHTO Method A should be used to design bearing pads unless there is a specific need to use AASHTO Method B.
1.14.1.3	Proprietary Pot, Disc, Slide, Radial, or Spherical Bearings	5.4.2.3	Shrinkage and Creep	BDM provides a simplified approach for determining creep and shrinkage coefficients.

BDM Section	Title	LRFD Section	Title	Comments
1.9.2.1.2	Reinforcing	9.7.2	Empirical Design of Decks	BDM excludes the use of the Empirical Method in AASHTO for deck design
1.9.2.1.2	Reinforcing	4.6.2.1	Decks	BDM STD details with deck design tables utilize AASHTO specifications from LRFD 4.6.2.1 to develop reinforcement values.
1.14.2.2	Deck Expansion Joint Seals	14.5.6.6	Compression and Cellular Seals	AASHTO specifies a maximum skew angle for compression joint seals equal to 20 degrees, but this limitation is not stated in the BDM or standard drawing.
1.13.1	Rail Selection	13.7.2	Test Level Selection Criteria	AASHTO Defines Test Level Criteria
1.13.1	Rail Selection	A13.2	Traffic Rail Design Forces	AASHTO provides design forces in rails in Table A13.2-1
1.6.2.8.3	Steel Girders	C6.13.6.1.4a	Flexural Members	BDM modifies this AASHTO comment to reflect moment of inertia of the smaller section rather than the smaller flange.
1.8.5	(Timber) Preservative Treatment	8.4.3.2	(Wood) Treatment Chemicals	AASHTO has specific requirements for the use of wood preservative chemicals on pedestrian bridges.
1.12.3	Sound walls, General	1-2.1.2 (AASHTO Guide Specs for Sound Barriers)	Wind Load	AASHTO Guide Specs for Sound Barriers provides wind load equations and exposure categories. Example designs are also provided
1.12.3	Sound wall Seismic Load	1-2.1.3 (AASHTO Guide Specs for Sound Barriers)	Seismic Load	AASHTO Guide Specs for Sound Barriers provides equations and factors for seismic loads on sound barriers.
1.12.3	Sound wall Overturning Factor of Safety	1-8.2 (AASHTO Guide Specs for Sound Barriers)	Spread Footings	BDM uses AASHTO factors of safety with slight modifications. (Ice and snow load not included)

BDM Section	Title	LRFD Section	Title	Comments
2.14.4.2	Roadway Clearances	2.3.3.3	Highway Horizontal Clearances	AASHTO calls out horizontal clearance requirements that are consistent with the values shown in BDM Figure 2.14.4.2A-B
1.16.3.3	Falsework	Figure 16 (AASHTO Construction Handbook for Bridge Temporary Works)	Bridge Deck Falsework	See AASHTO Figure 16 for conceptual layout of deck overhang falsework.
1.16.3.5.2	Cofferdams Seals	Page 71 (AASHTO Construction Handbook for Bridge Temporary Works)	Sealing and Buoyancy Control	AASHTO confirms that force from sheet pile friction should not be included in uplift resistance.
1.3.6	Vehicular Collision Forces	3.6.5	Vehicular Collision Force	BDM adds specific requirements for barriers in front of obstacle components.