

1 **P1791™/D9.0**
2 **Draft Recommended Practice for**
3 **Terminology used for Direct Current**
4 **Electric Transit Overhead Contact**
5 **Systems**

6 Sponsor
7 **Rail Vehicle Transit Interface Standards Committee**
8 of the
9 **IEEE Vehicular Technology Society**

10 Approved <XX MONTH 20XX>
11 **IEEE-SA Standards Board**
12

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1 **Abstract:** This recommended practice defines terms used for direct current electric transit
2 overhead contact systems.

3

4 **Keywords:** Dictionary, OCS, Overhead, Trolley, Celestial Knitting

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1 Introduction

2 This introduction is not part of IEEE P1791, Draft Recommended Practice for Direct Current Electric Transit Overhead
3 Contact Systems .

4 This document was inspired because of confusion in the meaning and use of words in OCS projects.

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5 **Ian Hays, Vice Chair**

6	7 Ron Bennell	11 Mike Cormiae	15 Moses Ramos
8	Herb Zwilling	12 Steve Norton	16 John Schlick
9	Kristy Gerig	13 Alan Blatchford	17 Suresh Shrimanle
10	Paul White	14 Ray Davis	

18
19
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55
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59 **<Name>, NIST Representative**

60
61 **<Name>**
62 **IEEE Standards Program Manager, Document Development**

63
64 **<Name>**
65 **IEEE Standards Program Manager, Technical Program Development**
66

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1 IEEE Draft Recommended Practice 2 for Terminology used for Direct 3 Current Electric Transit Overhead 4 Contact Systems

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13 1. Overview

14 1.1 Scope

15 This recommended practice defines terms used for direct current electric transit overhead contact systems.

16 1.2 Purpose

17 This recommended practice provides uniform terminology and definition of terms used for direct current
18 electric transit overhead contact systems.

19 1.3 Helpful Hints on the Use of the Document

20 This document is limited to technical terms used in OCS that supply direct current (dc) electrical power to
21 heavy rail, electric light rail vehicles (LRV) and streetcars with pantographs or trolley poles and to electric
22 trolleybuses (ETB) with trolley poles.
23

1 Terms given in this document are presently not given in *The IEEE Standards Dictionary: Glossary of*
2 *Terms & Definitions*¹, or are not defined in it with reference to Overhead Contact Systems (OCS). Some
3 terms given here are defined in *The IEEE Standards Dictionary*, and are so annotated. Terms used only in
4 OCS for trolley pole operations are in *italics*.

5
6 Terms, which in OCS are synonymous, are shown (Syn).
7 Where synonyms exist the NON-PREFERRED term has an asterisk (*).

8
9 OCS style can be either ‘Catenary’ where the contact wire is supported from a messenger wire by hangers,
10 or ‘Direct Suspension’ where the contact wire is directly supported by a cross-span, bridle, trapeze,
11 pendulum, resilient arm, bracket arm or cantilever.
12 Either style can be either ‘Fixed Terminated’ (FT) or ‘Auto-Tensioned’ (AT).
13 Terms that are exclusively to one style, are referenced FT or AT respectively.

14
15 All ETB’s use poles with swivel collector shoes to allow the trolleybus to deviate up to approximately
16 3 657 mm (12 feet) each side of the trolley wires.

17
18 LRV’s and streetcars with trolley poles use ‘fixed’ collector shoes, which allow them to track the correct
19 trolley wire at turnouts without the use of electric frogs.

20
21 For proprietary names see Suppliers Catalogs.

22
23 This document does NOT define terms for alternating current (ac) electrification OCS, but refers the
24 reader to American Railway Engineering and Maintenance-of-Way Association’s *Manual for Railway*
25 *Engineering*, Chapter 33, which are recommendations for ac OCS.
26

27

¹ *The IEEE Standards Dictionary: Glossary of Terms & Definitions* is available at <http://shop.ieee.org/>.

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2 **2. Acronyms**

3

4	AT	Auto-Tensioned
5	AREMA	American Railway Engineering and Maintenance-of-Way Association
6	ATM	Along-Track Movement
7	BIL	Basic Impulse Insulation Level
8	BW	Balance Weight
9	BWA	Balance Weight Assembly
10	CWH	Contact Wire Height
11	ETB	Electric Trolleybus
12	FT	Fixed Terminated
13	LRV	Light Rail vehicle
14	MOC	Master Overlap Chart
15	OCS	Overhead Contact Systems
16	OOR	Out-of-Running
17	POS, PS	Point of Switch
18	ROW	Right-of-way
19	TES	Traction Electrification System
20	TOR	Top of Rail
21	TPS	Traction Power System
22	TPSS	Traction Power Substations
23	TPFS	Traction Power Feeder System

24

1

2 **3. Definitions**

3

Acceptance Measurements	Final acceptance records of the installed contact wire heights and staggers at OCS supports and registrations, and at midspan.
Accessible Voltage*	See “Step and Touch Potential”
Actual Span Length	See “Span Length”
Adjustments	Placing the conductors to the specified wire heights and staggers.
Airbreak; Half-tension Airbreak	See “Sectionalizing”
Air gap	See “Sectionalizing”
Alignment	
Track alignment	The centerline or other reference line of the track or tracks in both plan and profile.
OCS alignment	The position of the contact wire relative to the (superelevated) centerline of the track.
Along Track Feeder*	See “Parallel Feeder”
Along-Track Movement (ATM) (AT Systems)	The migration of catenary (tensioned wires) induced by BWs or tensioners due to thermal expansion or contraction of the conductors
Ambient Temperature (OCS)	The weather related temperature of an OCS, which excludes temperature effects due to current in the conductors. See <i>The IEEE Standards Dictionary</i> for more detail.

Anchor	
Anchor Base Pole*	See “ Bolted-Base Pole ”.
Anchor Bolt*	See “ Foundation ”
Anchor Bracket	An attachment to the surface of a civil structure (tunnel soffits, bridge deck, tunnel portal, boat section, retaining wall, parapet, etc.) for anchoring OCS.
Anchor Plate or Dead-Man	See “ Foundation ”
Anchor Pole	OCS termination pole with or without down guy.
Anchor Rod	See “ Foundation ”
Pole Base Anchor	A pole that provides the ground level anchorage at its base or base-plate for a down guy.
Screw Anchor	A specialty device with a helical cutting blade that is ‘corkscrewed’ into the ground as an anchorage for a down-guy
Self Supporting Anchor Pole	An anchor pole without a down-guy.

<p>Arcing During Commutation</p>	<p>When associated with commutation between a current collector and contact wire, arcing is the electrical discharge at the interface point when the current collector is drawing current at speed. Arcing typically does more harm to the pantograph carbons than to the contact wire, weakening the surface of the carbon and causing it to be eroded.</p> <p>Notes. Arcing is typically caused at “hard spots” along the contact wire. See “Hard Spots”</p> <p>Arcing can be minimized by trains powering down before reaching known hard spots, and by avoiding getting into regeneration mode, which can be a source of current equal, if not greater, than normal traction current values.</p> <p>Arcing is preventable by avoiding designing hard-spots into the system due to the use of section insulators, direct push-off registrations, resilient arms and sharp changes in gradient.</p>
<p>Armor rod</p>	<p>A group of wires with a preformed twist that self lock around a conductor to prevent the breakage of the conductor strands due to fatigue or work hardening when moving through a pulley. Also used to repair stranded conductors with broken wire strands.</p> <p>Note: Line guard refers to plastic covers for conductor protection from abrasion of tree branches or other obstacles that can contact the conductor. Can be in one or two pieces and is sometimes referred to as “Tree Guard”.</p> <p>See also “Messenger Liner”</p>
<p>Assembly</p> <p>OCS Assembly</p>	<p>A discrete configuration of components used in an OCS, and identified in combination for ease of reference. See “Assembly Reference”</p> <p><i>Assemblies such as trolley wire switches, frogs, crossings and curve segments are usually referred to as “Special Work” in the industry.</i></p>
<p>Assembly Reference</p>	<p>An alphanumeric code assigned to a discrete group of components, which depends on the bill of material for one standard configuration, in which only the lengths of pipes or wires can vary.</p>
<p>Auto-Tensioned (AT)</p>	<p>OCS conductors terminated with balance weights, springs or hydraulic tensioning devices and appurtenances to maintain constant tension over a specified range of conductor temperatures by compensating for conductor thermal expansion and contraction.</p> <p>Also know as CT.</p>
<p>Auxiliary Messenger or Auxiliary*</p>	<p>A third conductor typically installed with hangers above the contact wire and beneath the messenger wire of a catenary system and forming ‘Compound Catenary’ style.</p>

Backbone	A span guy or along track span-wire between structural supports used primarily to align contact/trolley wires around a curve using a series of pull-offs attached along its length.
Backguy*	See “Guy”.
Balance Weight Assembly (BWA)	The tensioning equipment with weights and devices that are installed at each end of a tension length of an auto-tensioned OCS to maintain constant wire tensions over a known range of wire extension. See “Tension Length” and “Half Tension Length” Also know as CW*.
Balance Weight Stops, or Temperature Stops*	Mechanical means for preventing further movement of balance weights beyond a specified range of movement.
Barn Hanger	An insulated support more commonly used in pole operation, that is usually fixed directly to the underside of the protective troughing or sheeting that is customarily attached to a roof or soffit.
Basic Impulse Insulation Level (BIL, bil)	See <i>The IEEE Standards Dictionary</i> .
Bent	See “Bridge Bent”
Blow-off	Lateral displacement of the OCS conductors due to wind.
Boat section	Civil engineering term for an open concrete structure that is below the general ground level.
Body Span Wire	The center wire of a three-wire head span used mainly to carry the radial and wind loads exerted by the messenger wires.
Bolted Base Pole	A pole with baseplate for use on a foundation with anchor rods.
Bond	An electrical connection between metal hardware (rails, poles, rebar, etc) that minimizes voltage difference.
Cross Bond	Electrical connection between two rails or tracks.
Impedance Bond	An inductive device bridging an insulated rail joint for negative return for TPSS that allows passage of traction return current while preventing passage of signaling current
Rail Bond (traction)	An electrical connection around a bolted rail joint to permit passage of traction return current.
Structure Bond	An electrical connection between a structure and the rebar cage of the foundation and/or to a ground rod, or to a grounding circuit of a civil structure.
Bracket Arm or Mast Arm*	A ridged fixed frame usually supporting directly from a pole, a direct suspension single contact wire or trolley wire. (A bracket arm, which is hinged to a pole, has the preferred term “Cantilever”.)

Bracket	See “Pole Bracket” or “Anchor Bracket”
Break*	See “Section break” or “Airbreak”
Bridge Overpass Bent Bridge Barrier	See “Overpass” A Structural Engineering term for a portal frame or transverse framework, as used to support the deck of a bridge. The name given to a permanent protective shield on an overbridge spanning over electrified tracks or over trolley overhead wires, for the purpose of shielding the overhead conductors from vandals, and/or protecting people from electrical danger. Also see ‘Construction Barrier’.
Bridging	The act of connecting across sectionalization points by pantographs.
Bridle*	See “Backbone” and “Bridle Suspension”
Bridle Suspension, Bridle	A length of wire supported at its midpoint which supports a single wire from its end points (typically forming a delta shape).
Building Attachment	An eyebolt or other device mounted on a building to support the OCS.
Bull Ring	A steel ring usually 50.8 mm (2 inches) to 203.2 mm (8 inches) in diameter to which two or more aerial (span) guys may be attached.
<i>Bus Path</i>	<i>The locus of the center point of the front axle of a trolleybus along a transitway.</i> <i>NOTE. Not necessarily the centerline of the transitway.</i>
BW	Balance Weight
BWA	Balance Weight Anchor or Balance Weight Assembly
Bypass Switch	See “Switch”
Cable Outlet*	See “Feeder Spout”
Cadweld	A proprietary welding operation

Cantilever	A hinged bracket arm*
Back-to-back cantilevers	Cantilevers mounted on opposite sides of center poles.
Cantilever Assembly	An OCS support frame typically for mounting a messenger support or suspension fitting and a contact wire registration assembly that is mounted on a pole or portal beam drop bracket using hinge fittings.
Long-Reach Cantilever	A cantilever assembly whose reach is longer than system standard cantilever assembly and required additional support or bracing.
Multi-Track Bracket Arm	A frame rigidly attached to a pole and serving three or more tracks.
Reach	The dimension between the face of the pole and the contact wire or, in the case of several contact wires, the furthest contact wire from the pole.
Reduced Height Cantilever	A cantilever where the system height of the OCS is substantially reduced thereby requiring reconfiguration of the basic cantilever shape.
Twin Cantilevers	Two cantilevers installed side-by-side on spreaders on one pole, each supporting its own OCS, and with both OCS's serving the same track, having application in overlaps and at turnouts where two catenaries will normally have differential along-track movement.
Two-Track Bracket Arm	A frame rigidly attached to a pole that serves two tracks, where both tracks are on the same side of the pole.
Two-Track Cantilever	A single OCS cantilever frame serving two adjacent tracks to one side of its supporting pole, and allowing independent movement of the catenaries in AT systems.

<p>Catenary</p>	<p>The combination of two or more OCS conductors, hangers and in-span hardware, but not including supports and cantilevers.</p> <p>Note: <i>Catenary</i> is sometimes incorrectly used for the term OCS and should not be used.</p>
<p>Webster Dictionary (literal) Meaning</p>	<p>The curve assumed by a perfectly flexible cord of uniform weight and cross-section hanging freely between two fixed points.</p>
<p>Simple Catenary</p>	<p>Auto-Tensioned Simple Catenary (ATSC) and Fixed Terminated Simple Catenary (FTSC) styles each comprised of a contact wire supported from a messenger wire by hangers.</p>
<p>Compound Catenary</p>	<p>Comprising a contact wire supported by hangers or clips from an auxiliary wire, this, in turn, is supported from a messenger wire by hangers.</p>
<p>Stitched Catenary</p>	<p>An OCS Style in which a bridle or an ‘auxiliary messenger’ arrangement is located between the messenger wire and the contact wire at the support point of a simple catenary from which the contact wire is supported by auxiliary hangers..</p>
<p>Inclined Catenary</p>	<p>An arrangement of OCS conductors, where the messenger carries the horizontal (radial) load of the contact wire (and auxiliary wire) on curved tracks, in addition to providing vertical super elevated support, and in which the contact wire closely follows the centerline of the track</p>
<p>Low Profile Catenary</p>	<p>A version of simple catenary with a small system height which permits both conductors to be supported and registered from a single cross-span wire for reduced visual impact. As a consequence of the small system height the maximum span is limited.</p>
<p>Chordal Catenary</p>	<p>A catenary system in which the messenger (and auxiliary) are installed vertically above the contact wire. Also known as Tangent-Chord style.</p>
<p>Contenary</p>	<p>A Catenary style with two contact wires. OCS construction wherein the messenger of a simple catenary system is locally substituted with a contact wire, that can be installed alongside the primary contact wire to create an OCS of extremely small system height which is a practical solution for traversing under bridges and tunnels with very low clearances. Note . The pantograph must never be allowed to contact the centenary wire.</p>
<p>Catenary Dynamics</p>	<p>The interactive relationship between “current collectors” and contact/trolley wires at operating speeds.</p>

Chording of Curves	On curved route the propensity of the contact wire to “cut the curve” between points of registration.
Clamp	A fitting with bolts and nuts that can be fixed in position on a pipe or conductor, and yet can be removed (unbolted) and re-used at another position.
Contact Swivel or Fixed Clamp	See “Contact Wire Clamp”
Parallel Groove Clamp	A piece of hardware used to clamp two or more parallel wires together.
Pipe Clamp	A piece of hardware used to attach various types of components to a pipe.
Strain Clamp	A piece of hardware used for deadending or tension reducing a wire or conductor under tension.
Suspension Clamp	A piece of hardware used to support a tensioned conductor or cable in a hanging arrangement, the greater part of the applied load being due to conductor weight.
Clearance	See “Envelope – Structure Clearance”
Pole Clearance	The dimension from the face of the pole to the centerline of track.
Clipping In	Clamping OCS conductors at the supports and installing the hangers, after sagging (regulating) of the conductors to correct tension.
Collector Strip*	See “Contact Strip”
Commutation*	See “Current Collection”. See also “Bridging”
Commutation Performance*	See “Catenary Dynamics”
Component (OCS)	An item of OCS hardware as commonly supplied complete by manufacturers.
Compound Equipment	See “Catenary”
Compression Type Fittings* or Compression Fittings	Fittings that require a hydraulic press to crimp or otherwise form a mechanical joint usually with one or more conductor using a sleeve or ferrule. Fittings that require the forcing of one or more pins into a solid conductor in order to effect a mechanical connection.
Conductor Bar* or Conductor Beam*	See “Conductor Rail”

Conductor Joint Assemblies	OCS conductor joints carry full conductor tension and full conductor current. Factory jointing of conductors is performed before final extrusion of the finished conductor, and joint between the individual ‘stock’ bars may either be scarfed and braised or fusion butt-welded. Field joints are usually mechanical, being cone type couplings, compression fittings or splices.
Conductor Rail	Various shapes of rigid bar, “double lobe bar”, “flat bar”, “shape bar”, etc., used in maintenance shops and under bridges as an alternative to a contact wire or trolley wire. Not to be confused with third rail.
Constant Tension OCS*	See “Auto-tensioned equipment”
Construction Barrier	A temporary barrier serving the purpose of a bridge barrier during construction/reconstruction of an overbridge spanning electrified tracks.
Construction Overlap	An OCS overlap without provision for sectionalizing. An “Uninsulated Overlap”. See “Overlap”
Contact Bar* or Rail*	See “Conductor Rail”.
Contact Strip	<p>The wearing surface on the head of a pantograph that enables an electric vehicle to draw power from an OCS. Typically made of carbon or metalized carbon, the strip may be in one or more abutting pieces or in four or five abutting pieces.</p> <p>In the past, other materials, such as copper and steel have been used with or without an integral greasing system.</p>
Contact Wire (CW)	<p>The wire with which the pantograph or trolley pole makes contact for current collection. Normally made of copper or bronze, the wire is a single wire conductor usually with two grooves to which hangers and clamps may be fitted.</p> <p><i>See also “Trolley Wire” for trolley pole operations</i></p>
Contact Wire Along-Track Movement (ATM)	See “Along-Track Movement”

<p>Contact Wire Bridge</p>	<p>At track crossovers, crossings and turnouts, a rigid bar or piece of contact wire, up to 5 feet long, is attached to the in-running contact wire, and closely above it, to form a slot for a second contact wire to pass through, thereby preventing differential uplift of crossing contact wires. Also called a ‘wire cross*’.</p>
<p>Contact Wire Clamp</p> <p>For FT equipment</p> <p>For AT equipment</p>	<p>The fixed clamp on a registration or support fitting, which is fitted into the grooves of the contact wire or trolley wire.</p> <p>The swivel clamp at the end of a registration arm or a steady arm that is fixed into the groove of the contact wire to take the registration and wind loads. The swivel action is to accommodate the long-track movement of the contact wire due to angular displacement.</p>
<p>Contact Wire Creep</p> <p>Initial Creep</p>	<p>The ongoing stretch of a contact wire, which is under a sustained tension.</p> <p>It has been shown that when a conductor is subjected to its normal tension, it will creep at a greater rate for the first 15 days under load than it will after the first month or so.</p>
<p>Contact Wire Deviation</p>	<p>When contact wires are staggered on straight tracks or registered on curved tracks the contact wire changes direction at each clamp, through an angle, which is termed the ‘deviation angle’(also know as “Line Angle”[*]). As a consequence a radial load is imparted to the registration assembly.</p> <p><i>See also “Trolley Wire Deviation”.</i></p>
<p>Contact Wire Door Bridge</p>	<p>A device between sections of contact wire that is mounted on the transom of doorframes of a building that can be opened to allow roll-up doors to open and close. Such a design may have a bridge piece that laterally overlaps the contact wire conductor rail in which case it would not be suitable for use with trolley poles.</p> <p><i>See “Trolley Door Bridge”.</i></p>
<p>Contact Wire Droop or Contact Wire Fall*</p>	<p>The additional downward displacement of the contact wire due to temperature or ice. The increase in sag; not the actual sag.</p>

<p>Contact Wire Height (CWH)</p> <p>Minimum Contact Wire Height</p> <p>Maximum Contact Wire Height</p>	<p>The height of the underside of the contact wire above reference rail level or street (ETB) when not uplifted by the pantograph or trolley pole.</p> <p>The minimum allowable contact wire height, usually at mid span or under bridges, which takes due account of vehicle clearance envelope, vehicle bounce and track tolerances, OCS temperature effects and electrical clearances. May also take future track rising into account if so required.</p> <p>The maximum allowable contact wire height within the vertical operating range of the pantograph or trolley pole.</p>
<p>Contact Wire Rise</p>	<p>The rise of a static contact wire under its own weight and tension, from grade over a distance.</p> <p>The increase in the height of the contact wire at midspan, due to the combined effect of:</p> <p>A possible increase in contact wire tension at low temperature.</p> <p>Reduction in weight due to contact wire wear.</p> <p>See also “Uplift”.</p>
<p>Contactors (OCS)</p>	<p>A device normally fitted on a contact wire or a trolley wire for making or breaking a circuit, or instrumental to switching of other circuits, such as traffic signal pre-emption, or ETB route selection.</p>
<p>Contenary</p>	<p>See “Catenary – Contenary”.</p>
<p>Copper-clad Conductor, also known under the proprietary name “Copperweld”.</p>	<p>A wire with a steel center and layer of copper fused around it or a number of such wires stranded together.</p>
<p>Corrosion</p> <p>Electrolytic Corrosion</p> <p>Galvanic Corrosion</p>	<p>The deterioration of a substance (usually a metal) because of a reaction with its environment.</p> <p>The accelerated destructive chemical action to pipes, cables and other materials, caused by dc electrical currents often resulting from stray currents leaking from the traction return circuit.</p> <p>A chemical reaction causing the accelerated deterioration of metals occurring when dissimilar metals are in contact in a corrosive environment. Note: The contacting metals form a bimetallic couple because of their differing affinities to electrons. These different affinities create an electrical potential between the two metals, allowing current to flow. The more active (anodic) metal is consumed as it protects the more noble (cathodic) metal. The ratio of areas is extremely important. If the anode-to-cathode surface area S_{Aa}/S_{Ac} is small, the galvanic corrosion can be concentrated on a small area. The corrosion rate can then become very high. (e.g. Aluminum rivets should not be used with steel plates, Aluminum terminal lugs should not be used with copper wire).</p>

Counterpoise	A wire or a configuration of wires usually buried which provide a low resistance grounding system.
Counterweight* for AT equipment	See “Balance Weight”
Creep	The on-going permanent elongation of tensioned wires over time.
Crimp Type Fittings	Fittings that require the squeezing down with possible indenting, of a sleeve through which two or more wires pass. For small wires a hand tool may be used, but for larger sleeves and conductors a hydraulic press will normally be used.
“Crosby” wire rope grip (a proprietary name)	A type of clamp with a U-bolt and saddle that pinches two wires together so they hold tight.
Crossarm – Feeder	Typically a short cross bracket mounted high up on OCS poles that support feeders.
OCS Crossarm*	See “Cantilever”, “Bracket Arm”.
Cross Catenary*	See “Headspan”
Cross Contacts*	See “Contact Wire Bridge”
Cross Level	The plane through the tops of the rails of a track and spanning the tracks.
Cross Level Tolerance	See “Track Tolerances”.
<i>Crossover (Special Work)</i>	<i>An OCS assembly that permits two sets of trolley wires to cross each other, either at right angles, or a straight or curved skew angle.</i>
Cross-Span	A single wire fastened between two supports that crosses the track or roadway and supports one or more conductors. See also “Headspan”. See “Pantograph”. See “Trolley Pole”.
Current Collection	The transfer electrical power from overhead contact/trolley wire by pantograph or trolley pole.

Current Collector	Devices fitted on top of an electrically powered vehicle that provide electrical contact with an overhead contact / trolley wire. These devices are designed to compensate for the varying heights of contact / trolley wire while providing a relatively constant pressure against the underside of the wire through their normal operational range. A current collector can take the form of a spring loaded hinged frame which has a collector strip that is in touch with the contact wire. This device is commonly known as a pantograph. A current collector can also take the form of a single pole that has a spring mounting arrangement (Trolley Base) that will provide the upward force and a slotted shoe or wheel (Trolley Harp) that will come in touch with the trolley wire. See Trolley Pole.
<i>Curve Construction</i>	
<i>Inside Curve</i>	<i>An arrangement where OCS support poles are on the inside of the curve, necessitating the use of bracket arm construction.</i>
<i>Outside Curve</i>	<i>An arrangement where OCS support poles are on the outside of the curve.</i>
<i>Curve Hanger</i>	<i>See “Single and Double Curve Hanger.”</i>
<i>Curve Rail (Special Work)</i>	<i>A contact wire clamp of varying length used to maintain contact wire alignment in curves while placing parabolic curvature in the line angle.</i>
<i>Curve Segment (Special Work)</i>	<i>An OCS assembly used on trolley wire systems that permits the trolley poles to transfer to a curved runner in order to take an angle in the trolley wire with 5° to 48° deviation.</i>
<i>Curve Span</i>	<i>A cross-span on a curve with one or more double curve hangers or a curve segment.</i>
Curve Supports	
Inside Curve	An arrangement for an OCS where the poles are on the inside of the curve.
Outside Curve	An arrangement for an OCS where the poles are on the outside of the curve.
<i>Cut-In-Switch</i>	<i>A type of directional switch in the trolley wires where a section of trolley wire is cut out in order to insert the switch special work.</i>
CW	Contact wire
CWA	Contact wire anchor.
Deadend	A device to terminate aerial wires under tension.
Deadend Assembly*	See “Fixed Termination Assembly”. See “Foundation”.

Direct Suspension System	An OCS with direct support of a contact wire or trolley wire from a cross-span wire, bracket arm, resilient arm or resilient hanger in both AT and FT systems.
Disconnect Switch	See “Switch”
Door Bridge*	See “Contact Wire Door Bridge” or “Trolley Door Bridge”
<i>Double Curve Hanger</i>	<i>An overhead assembly used in cross-spans to support trolley wires in large radius curves. Each hanger typically provides up to 8° deviation in the trolley wires.</i>
Double Insulation (Safe Working Zone) (Double Insulators)	Insulation provided by two physically separated insulators, to create a safe working zone for maintenance staff between energized equipment and grounded equipment. A separation of at least 152.4 millimeter (6 feet) is preferred.
Down Guy	See “Guy”
Droop	Fall of a conductor from its height at normal temperature, due to temperature change and/or ice coating. Droop is an increase in sag, rather than the total sag of a conductor.
Drop Bracket	A fitting attached to the underside of a cantilever registration pipe that carries the steady arm or registration arm
Dropper*	See “Hanger” or sometimes used ambiguously as “Feeder”.
Drop Vertical or Drop Pipe	A steel frame or pipe rigidly attached to the underside of a portal or bridge deck for mounting an OCS support and/or registration assembly.
Dual-mode or Dual-Powered Bus, or a Hybrid Bus or Rail Vehicle.	An ETB or rail car designed to operate either by self-powered or by electricity taken from an OCS or third rail.
Dual Operation	Where an ETB and rail vehicle share the one OCS.
Dual Mode Operation	Where an ETB and rail vehicle share the same R-O-W.
Duct	An enclosed conduit i.e., pipe, etc. for electrical cables, typically underground, or mounted on, or embedded in, civil structures.
Duct Bank	Multiple ducts
Dynamic Load	See “Live Load”.
Dynamics	See “Catenary Dynamics”.

<i>Ear, Trolley Ear, or Line-Ear</i>	<i>The normal trolley wire clamp used to suspend the trolley wire. Also called a 'Clamp'. See manufacturers' catalogs.</i>
Elastic Arm For Direct Suspension For Catenary	An OCS support assembly vertical regulation typically used under decks or in tunnels where cross-spans and bridles cannot be installed. A combined registration and support assembly with a vertical regulation, used for support of catenary conductors in situations of restricted clearance, such as tunnels and overbridges, or for providing a soft contact wire suspension where a messenger or messenger bridle is not present.
Elastic Hanger	A form of elastic arm with a limited use due to being of lower strength than a normal resilient arm.
<i>Elastic System</i>	<i>A term applied to a trolley OCS where the trolley wires are free to lift under the pressure of the current collectors at the supports. Typified by the use of pendulum suspensions comprising one hanger or two articulated parallel hangers.</i>
<i>Electric Trolley Bus (ETB)</i>	<i>A trackless electrical powered rubber-tired vehicle which draws power from the trolley overhead conductors by means of two (positive and negative) trolley poles.</i>
Electrical Clearance Passing or Dynamic* Static	The dimensional mechanical clearance between the live part of either the vehicle (such as current collector) or OCS and grounded parts of the fixed structures, or during the passage of the vehicle. See AREMA Chapter 33. The dimensional mechanical clearance between live parts of the OCS and grounded parts of fixed structures, in the absence of current collectors. See AREMA Chapter 33.
Embedded Pole	An OCS pole without a baseplate, that is directly embedded in a concrete foundation during pouring of the concrete, or grouted into a prepared core hole of a previously cast concrete foundation, or directly embedded into the ground, with or without kicking block(s).
Encumbrance*	See "Pole Encumbrance".

Envelope	
Combined Vehicle Envelope	The rail vehicle dynamic envelope plus the effects of track alignment and cross-level tolerances.
Pantograph Clearance Envelope	The projected envelope as developed by moving the static pantograph envelope through its limits atop the combined vehicle envelope, including the effects of uplift of the OCS, plus the passing electrical clearance. (Note: the pantograph clearance envelope limits increase with pantograph operation height).
Structure Clearance Envelope	The combined vehicle envelope plus a safety clearance allowance typically 152.4 mm (6 in.) all round, into which no part of the fixed facilities e.g. bridges, stations, signal, trackside ‘houses’, etc. shall intrude.
<i>Trolley Pole Clearance Envelope</i>	<i>The dimensioned space around the vehicle trolley pole(s) depending upon the position of the trolley wire(s) and the vehicle.</i>
Vehicle Dynamic Envelope	The maximum envelope of a vehicle when it is free to lurch and sway.
Vehicle Static Envelope	The maximum envelope of a static vehicle
Equation – Stationing	See “Stationing Equation”.
Equivalent Span or Ruling Span*	A weighted average span of a given tension length of conductors used in sag-tensioned calculations.
Exclusive Right-of-Way	A right-of-way without at-grade crossings, which is grade-separated or protected by a fence of substantial barrier, as appropriate to the location. (Includes subways and aerial structures.)
Exothermic Welding	A type of welding where a ‘charge’ is ignited which burns with intense heat and melts adjacent sections of metal allowing them to fuse together.
Eye-Bolt	A threaded rod with a close loop on one end. See also “Building Attachment”.
Eye of Pullover*	See “Heel of Steady Arm”.
Eye Setting*	See “Heel Setting”.
Face of Pole	The absolute nearest part of a pole from the track for structure clearance purposes, excluding the base plate and top of foundation unless these are located significantly above the level of the rails and intrude into the clearance envelope.
Facing Turnout; Facing-Point Turnout	A track turnout that can be entered with point of switch entered first in the normal direction of travel (see also “Trailing Turnout”)

Factor of Safety	An additional multiplied factor, above the minimum requirements, applied solely to ensure safety.
Fall	See “Contact Wire Fall” or “Messenger Wire Fall”.
Feeder Spout or Feeder Outlet*	A short pipe installed through the wall of a tubular pole, through which a feeder cable exits the pole.
Feeders	Conductors that supply power to or augment the power-carrying capacity of the conductors in an OCS.
Final Adjustment	The positioning of an OCS to the correct alignment and wire height, tightening up of all components and any remedial work prior to final acceptance.
Finial*	See “Pole Cap”.
Fittings	Components used in OCS assemble.
Fixed End	The non-moving end of an AT type of OCS.
Fixed Tension*	See “Fixed Terminated, (FT) equipment.
Fixed Termination Assembly	An assembly for dead-ending a conductor.
Fixed-Terminated (FT) System	OCS with dead-ended conductors where tension varies with temperature. The FT system tension is higher at low temperatures and lower at high temperatures.
Single Contact Wire Style (FTSCW)	A style of Direct Suspension OCS FT equipment.
<i>Tramway Style Equipment*</i>	<i>A style of Direct Suspension OCS FT equipment.</i>
Floating Section	A section of OCS equipment between two insulators which is neither bonded to the live conductors, nor is bonded to ground, and whose line potential is unknown.

Foundation (OCS)	<p>Customarily a concrete block for the embedment or attachment of an OCS pole or down guy, or part of a civil structure (viaduct, overpass, tunnel, etc) for embedding or attaching an OCS pole, support bracket or down guy.</p> <p>Note: The most common type of foundation in the North America is a concrete pier with anchor rods. This is usually made by pouring concrete directly into an excavated hole with or without casing in which the anchor rods / reinforcing cage is already aligned.</p>
Anchor Rod	A rod inserted into a concrete foundation to form an attachment for a pole or support bracket.
Anchor Plate	A buried plate at the end of an anchor rod used with down guys.
Core-formed	A foundation that has been poured leaving a core hole which will accept an OCS pole without a base-plate firmly installed to line and level using grout.
Dead-Man	A mass buried in ground (usually a rectangular block of concrete) to which a down guy wire is directly or indirectly attached.
Earth-formed	Where the concrete is directly poured into an augered hole against the bare earth.
Gravity Foundation*	See “Spread Footing” below.
Guy Anchor Foundation	A foundation for a down guy.
Piled Foundations	Steel pile foundations using a steel casing or I-beams for anchor-base poles.
Precast Concrete	<p>Usually a pier type casting with anchor bolts, which is placed into an oversize earth-formed augered shaft and grouted or back-filled to line and level.</p> <p>Notes. Precast foundations can be manufactured under factory conditions with supervision and testing staff in attendance to ensure the required quality, both in dimensional accuracy and materials quality. Precast foundations avoid the problems of getting large quantities to remote track side locations, and avoid many site problems associated with winter and summer weather. On operating railroads, precast foundations should reduce the need for track occupation compared to cast-in-place foundations.</p>
Concrete Sleeve type	<p>High strength concrete sleeves (pipes), typically 457.2 mm (18 in) overall diameter, 63.5 mm (2 ½ in.) wall thickness and 3 048 mm (10 feet) long were directly embedded into a 762 mm (30 inch) diameter earth formed core hole using the excavated granular material as backfill. This was compacted around the sleeve using 101.6 mm (4in) diameter pneumatic hammers.</p> <p>Notes. A plain steel pole was inserted into the sleeve and clamped into line and level with a custom made jig that attached to the top of the sleeve. More of the granular material was compacted around the pole</p>

<p>Rock Foundation</p> <p>Spread Footing</p>	<p>leaving 152.4 mm (6 in) space at the top.</p> <p>This foundation type was very successfully used on a very large project in the Kalahari Desert. For this project, one bag of “concrete mix” was mixed up in a small portable concrete mixer, placed in the top of the sleeve, tamped and trowel finished with a watershed. The benefits of the sleeve are similar to those of pre-cast foundations, and the use of the excavated material and the low requirement for water in the remoteness of the desert were particularly good economies.</p> <p>When surface or sub-surface rock is encountered anchor bolts can be directly embedded into core hole drilled into the rock deep enough to carry the pole overturning moment but discounting the thickness of fractured rock.</p> <p>A shallow foundation typically 304.8 mm (1ft) to 609.6 mm (2ft) thick, but with a large area, typically 1 828.8 mm (6 ft) by 3 657.6 mm (12 ft) but can be larger or smaller depending upon overturning load and ground strength.</p>
<p><i>Frog (OCS)</i></p> <p><i>Fixed Frog</i></p> <p><i>Electric Frog</i></p> <p>Frog (track)</p>	<p><i>A solid metal device (casting) in the trolleywires that guides the direction of travel of a vehicle trolley pole at locations where two trolley wires diverge from a single wire.</i></p> <p><i>An electrically operated device that switches the ‘direction’ of the frog as required.</i></p> <p>See “Track Frog”</p>
<p>Gain</p>	<p>See “Pole Gain”</p>
<p>Galvanic Corrosion</p>	<p>See “Corrosion”</p>
<p>Gas Tensioner</p>	<p>A mechanical device comprising a long cylinder filled with gas, which with its associated parts is installed at one or each of the tension length to compensate to some extent for variations in conductor tension due to ambient temperature.</p>
<p>Glass Fiber Insulating Material</p>	<p>An insulating material used to form troughs and other insulating areas for protection of the trolley overhead from damage caused by dewired trolley poles or to provide a safety barrier for linemen working on live wires in close proximity to uninsulated overhead beams and pipes.</p>
<p>Grade Crossing</p>	<p>A crossing of a highway, railroad track, other fixed guideway, or pedestrian walkway or combination of these at the same level.</p>
<p>Grade Separation</p>	<p>The vertical separation at a highway, railroad track, other fixed guideway or pedestrian walkway from a rail track by the provision of a bridge or underpass.</p>

Gradient (Contact Wire)	The slope of the contact wire between two adjacent OCS supports relative to the track.
Grounding	The act of directly bonding a pole or structure to a ground rod by means of a cable, to prevent a voltage developing on a pole which might shock a person who might touch the pole.
Ground Rod	A conducting rod serving as an electrical connection with ground. Typically a less-than-one inch diameter copperclad steel rod 10 feet long driven into the soil. More than one rod may be required to achieve the low resistance value specified for any particular OCS installation.
Grounding Switch	An electrical switch typically between an OCS conductor and a ground rod, to enable the conductor to be grounded for safety when de-energized.
Ground Wire	The conductor installed for the purpose of providing lightning protection and electrical continuity between the supporting structure of the overhead contact system and the common return or grounding system.
Guy	A steadying or positioning wire or span wire.
Down Guy Or Back Guy*	A wire attached high on a pole and coming down at an angle to an anchor in the ground.
Guy Anchor	See “Foundation”
Guy Guard	A protective strip, often of light colored plastic which fits around the lower end of a down guy for increased visibility. Note: typically 10 feet long
Head Guy	A wire, usually between two pole tops, for the purpose of transferring an anchor load.
Pole-base Guy	A down guy attached at its lower end to a pole base.
Span Guy*	See “Cross Span”
Sidewalk Guy	A sidewalk guy is a down guy that is diverted to a vertical position for anchorage to the ground, by use of a horizontal strut braced against the pole. A sidewalk guy can be used wherever there is limited space for a normal down guy.
Half tension Length or Half Tension Section*	In AT equipment, the segment of OCS between a midpoint anchor and a BW, or between a fixed termination and a BW. See also “Tension Length”.
Hand Hole	An access opening in a pole, or duct-line, for cable installation or inspection

<p>Hanger</p> <p>For Direct Suspension</p> <p>For Catenary</p>	<p>A support for a contact wire or trolley wire normally used to support it from an OCS support.</p> <p>A light wire, light metal rope, light strap or light rod assembly for suspending the contact wire from the messenger wire at regular intervals in the range of every 4 572 mm (15 ft.) to 9 144 mm (30 ft).</p> <p>Note: Catenary hangers can be designed to be conducting or non-conducting.</p>
<p>Hard spot</p>	<p>Hard spots along the contact/trolley wire are typically points where the wire does not lift under the influence of the pressure of the current collector, as much as it does along the rest of the wire. As a consequence the shoe is momentarily forced down from its normal trajectory. See also “Arcing”</p> <p>Note: This may cause a separation of contact just beyond the hard spot due to the inertia of the collector, and the inability of the collector springing to quickly raise the shoe. As a consequence arcing may occur which is harmful to both the collectors and the contact wire.</p> <p>Hard spots are caused by kinks in the contact wire, by heavy fittings such as section insulators, and by direct push-off registrations, all of which should be avoided in the mainline OCS where vehicles travel at speed and draw normal levels of current.</p>
<p><i>Harp</i></p>	<p><i>Hardware mounted at the top end of a trolley collector pole that houses the trolley shoe or wheel.</i></p>
<p>Headspan Support or Cross Catenary*</p>	<p>An OCS support structure with two or more wires that straddles the tracks and supports several catenaries, or several direct suspension contact/trolley wires in multi-track area. See also “Cross-Span”, “Body Span”, “Steady Span”.</p>
<p>Headspan wires</p>	<p>In a two-wire headspan, the combination of headspan wire (top) and cross-span wire (bottom), and in a three-wire headspan, the combination of a headspan wire, steady span wire (middle) and cross-span wire, required for a complete headspan</p>
<p>Heel of Registration Arm or Steady Arm or Eye of Pullover* (Catenary)</p>	<p>The pivoted end which is attached to the principle OCS support of a steady arm.</p>
<p>Heel Setting Dimension (Catenary)</p>	<p>The dimensioned height of the pin or hinge at the heel of a steady arm or registration arm, above the horizontal plane of the contact wire measured vertically.</p> <p>Note: The heel setting is designed to minimize uplift of the contact wire due to the radial load in the registration arm caused by contact wire deviation.</p>
<p>Hog of Contact Wire</p>	<p>Arching of a contact wire between catenary supports. Note: Prevalent in FT systems at low temperatures – opposite of sag.</p>

Horns (pantograph)	The curved or angled downward ends of the pantograph head, which lift ‘out-of-running’ wires onto the contact strip, as they converge.
Hotel Power	Auxiliary electrical power taken by a vehicle for uses other than traction.
Hydraulic Tensioner	A mechanical device comprising a long cylinder filled with liquid and gas, which with its associated parts is installed at one or each of the tension length to compensate to some extent for variations in conductor tension due to ambient temperature.
Impedance Bond	See “Bond”
Inclined Catenary	See “Catenary”
<i>Inductive Switch</i>	<i>An electro-mechanical switch with an electronic receiver placed just above prior to diverging trolley wires that can receive transmitted signals from ETB’s in order to set the trolley wires for the route direction required.</i>
In-Running Contact Wire or Catenary	The catenary or contact wires for a track that has multiple catenaries (such as overlaps), which provides the passage for the pantograph.
Insert – Concrete	A mechanical screw socket-type component for direct embedment into concrete usually placed before pouring concrete.
Insert – Carbon	A carbon block fitted into a trolley shoe. Also see “Trolley Shoe”
Insulated Midpoint	See “Sectionalizing”
Insulated Overlap	See “Sectionalizing”

Insulator	Any material or substance provided and designed for the purpose of surrounding, supporting or interrupting an electrical conductor so as to restrict the flow of electricity to a desired path.
Bobbin*	A synthetic insulator that looks like a bobbin for thread.
Bell or Disc*	A bell-shaped insulator of ceramic or glass used singly or in strings.
Cut-in Insulator	A strain insulator installed at a point along a conductor for sectionalizing purposes or to provide an additional ‘level’ of insulation.
Johnny Ball or Porcelain Strain Insulator	A type of ceramic strain insulator, which has interlocking terminations for wires and is used primarily for guy, span wire or dead-end insulation.
Section Insulator, Section Isolator* or Sectionaler	A device for dividing a contact wire into two electrical sections while providing for the mechanical passage of a current collector.
Standoff	A insulator with bending and compressive strength.
Strain	An insulator or a string of disc insulators used in line in a tensioned conductor or guy.
Strut	A standoff insulator used in compression or tension members of cantilevers.
Suspension	A tension insulator or string of discs, supporting the load of a wire.
Synthetic	An insulator made from glass fiber, plastic or veriouir resin.
Jumper	Generally an electrical connection in the OCS; a short conductor installed to provide electrical continuity or one contact wire to another..
Continuity or Full Current	A jumper capable of carrying full line current from one catenary to another longitudinally at tensioning overlaps and track turnouts.
Equalizing	A light jumper in the catenary connecting the messenger to the contact wire to equalize the two wires. Note: Generally installed one in each span.
Kcmil, mcm* (Syn)	The measured cross-sectional area of a conductor in thousands of circular mils.
Kicking Block	A baulk of timber, a railroad tie or a stubby concrete beam, attached cross-wise below ground level to the front and/or back of a pole direct-embedded into ground, to increase the bearing area and hence resistance of the ground, thus increasing the ground’s ability to carry increased overturning moment.
Knuckle	A rigid connection between two adjacent messenger wires and/or between two adjacent contact wires for their reactive alignment. Note: May or may not be insulated.

Lightning Arrester* or Arrestor*	See “Surge Arrester”
<i>Line Ear</i>	<i>See “Trolley ear”</i>
Line Guard*	See “Armor Rod” See also “Messenger Liner”
Live Live Load (structural) Live Conductor (electrical)	A load or force that is temporary in nature such as wind, ice, tension due to temperature change and the dynamic uplift force of a passing current collector. A conductor carrying a voltage for power supply.
Load Gauge	See “Gauge”
<i>Long Turn Lane</i>	<i>A segment of trolley wire OCS (trolley wire pair) parallel to the ‘through’ trolley wires used by ETB’s in preparation for a right or left turn that allows ‘through’ ETB’s to overtake.</i>
Lug Crimped Terminal	An attachment to the end of non-tension wire or cable for an electrical connection using a gripping or crimping tool. A crimped, soldered or bolted metallic tag with a hole used to terminate a wire or cable on a stud to make an electrical connection.
<i>Magnetic Blow Out</i>	<i>As assembly attached to in-running section insulators that quenches power arcs drawn by collectors entering insulated runners. Note: Used mostly on trolley shoes.</i>
Mast Arm*	See “Bracket Arm”.

<p>Master Overlap Chart (MOC) or Master Wiring Diagram *</p>	<p>A diagram or drawing showing the physical arrangement each whole tension length of OCS wiring, relative to adjacent tension lengths. It documents the overall arrangement and lengths of physical wiring to be strung over the whole route to be wired.</p> <p>A Master Overlap Chart (MOC) maybe be prepared as a straight line diagram, usually drawn to a longitudinal scale, and may be diagrammatic in the across track direction. It may be expressed using one or more drawing sheets.</p> <p>Primary information includes proposed location of insulated overlaps, uninsulated overlaps, balance weight terminations, fixed terminations and OCS midpoints overlaid on background information.</p> <p>The background information may include track centerlines of all tracks to be wired, annotated with 30.48 meter (100 ft.) station marks, with any stationing equations, substation stationings, station platforms, tunnels and overpasses, underbridges and fly-overs, grade crossings, train speeds, track gradients and curvatures.</p> <p>.</p>
<p>Maximum Operating Wind Speed</p>	<p>The maximum crosswind gust wind speed in which vehicles will continue to be operated at their normal speed. The wind speed selected for pantograph security calculations. Note: A range of 88.5 km/h (55 mph) to 96.5 km/h (60 mph) for LRT Systems.</p>
<p>Maximum Sag</p>	<p>The sag of conductors either at maximum conductor temperature or under a given radial ice loading, whichever is greater.</p>
<p>MCM*</p>	<p>See “Kcmil”</p>
<p>Messenger or Messenger Wire</p>	<p>The uppermost conductor in a catenary system. The conductor, which hangs in the approximate shape of a catenary from which the contact wire is suspended by means of wire or loop hangers. A support wire under tension used to carry another wire or cable, or several wires or cables, such as communications cables, that are not themselves under tension.</p>
<p>Messenger Liner</p>	<p>A piece of insulating material inserted between messenger hanger saddles and messenger wires to prevent currents flowing through hangers.</p>
<p>Messenger Rise or Messenger Wire Rise</p>	<p>The increase in the height of the messenger wire at midspan, due to the combined effect of: An increase in messenger wire tension at low temperature. Wear of the contact wire. Uplift due to the pantograph or trolley collector pole pressure.</p>
<p>Middle Ordinate*</p>	<p>See “Stringline Value”</p>
<p>Midpoint Anchor Pole (AT)</p>	<p>A pole adjacent to the midpoint structure where the midpoint guy is terminated.</p>

Midpoint Guy (AT)	<p>The span guy that provides the midpoint restraint in AT equipment.</p> <p>The broadly horizontal guy wire, (preferably of galvanized strand for its light weight), that is anchored to the messenger wire at the midpoint (cantilever) of a tension length of auto-tensioned OCS.</p>
Midpoint Structure (AT)	The OCS support structure approximately midway between the two Balance Weights of a tension length of AT equipment where the OCS is anchored against along-track movement.
Midspan Offset	The deviation of the static contact wire from the superelevated centerline of track at midspan.
Mixed Operation*	See “Dual-mode Operation”
Negative Feeder	In a dc system, the traction current return cable connecting the track rails, center tap of an impedance bond or negative contact wire to the substation negative busbar.
No-Load Tension or Unloaded Stringing Tension*	The messenger stringing tension to be applied to a messenger alone so that, once the contact wire is suspended from the messenger, the messenger assumes the desired final sag and tension.
Non-Bridging, Non-Commutating*	The act of <u>not</u> connecting across sectionalization points by pantograph.
Non-Riding*	See “Out-of-Running”.
Normal Temperature, Normal Setting Temperature*.	The selected temperature at which all the cantilevers in an auto-tensioned OCS are perpendicular in a horizontal plane to the track.
Normal Tension	<p>The nominal selected normal tension for a conductor.</p> <p>The tension in a conductor of a fixed terminated OCS at “normal” temperature range.</p> <p>The tension in a conductor of an auto-tensioned OCS when tensioned by balance weights within the auto-tensioned temperature range.</p>
OCS Style	<p>The generic type of conductor configuration and tensioning system of a particular OCS.</p> <p>See “Catenary” and “Direct Suspension”.</p>
Offset	
Contact Wire/Trolley Wire Offset	The deviation of the contact wire/trolley wire in its static condition from the centerline of the track.
Pole Offset	The dimension of the face of the pole from the centerline of the track.
Out-of-Running (OOR)	Where more than one contact wires is installed above one track, OOR catenaries do not provide passage for the pantograph because they are higher than, or offset from, the in-running catenary.

Overhead Contact System (OCS)	The part of the traction electrical system comprising the overhead conductors (or single contact wire), aerial feeders, supports, foundations, balance weights and other equipment and assemblies, that delivers electrical power to electric vehicles.
Overlap	A span of the overhead contact system where the contact and messenger wires of two adjoining tension lengths overlap before terminating at opposite ends.
Overlap Poles	The structures that position the two contact wires in parallel within an overlap section.
Overlap Span	That portion of the overhead contact system between two structures, where the contact and messenger wires of two adjoining sections overlap, thus allowing pantographs to transition from one tension length to the next under power. See “Sectionalizing - Insulated Overlap”
Overpass, Bridge*, Overhead Bridge* or Overbridge* (Syn)	Where a street, pedestrian walkway or railway crosses over the OCS tracks. NOTE: ‘Bridge’, ‘Overhead Bridge’, and ‘Overbridge’ are ambiguous terms unless the location, under-rail or over-rail, are included. For the OCS dictionary, Overpass is the preferred term for a bridge over-rail and underpass is the preferred term for a bridge under-rail. See also “Viaduct”
Over-Run Protection	A design which is intended to prevent damage to OCS or current collectors due to inverted operation of an electrical train on an unwired track.
Pan	An alternative name for the “head” of a pantograph, which carries the rubbing strips/carbon collectors*. Also means overhead line pats.
Pantograph	A multi-link hinged apparatus that collects current from one or more overhead contact wires for use by the vehicle propulsion and auxiliary electrical systems. The collector head of the pantograph moves vertically to conform to changes in height of the overhead contact wire..
Pantograph Clearance Envelope	See “Envelope, Pantograph Clearance Envelope”.
Pantograph Head	The uppermost part of the pantograph that is fitted with the current collector.
Pantograph Static Force, Pantograph Pressure*	The vertical force exerted upward by the collector head on the OCS contact wire. This force is caused by the action of the pantograph raising device and the primary suspension, with the pantograph raised and with the vehicle at standstill. Note: Typically 18 to 22 pounds.

Pantograph Security Analysis	The analysis of the lateral relationship of the pantograph with the contact wire at a support/registration and at midspan, under prescribed operating conditions, including allowances for crosswind, track tolerances, vehicle sway, pantograph sway, temperature range and installation tolerances. Note: Based on these analyses, maximum stagger, maximum span length on tangent, and span lengths on curves are determined.
Pantograph Sway	Maximum lateral displacement of the pantograph induced by vehicle roll and lateral shock loads. Note: A value in the range 38.1 mm (1 ½ in.) to 50.8 mm (2 in.) each way (for OCS design this is independent of pantograph height), unless specified otherwise.
Pantograph Up-Lift	The distance the contact wire is lifted as a pantograph passes.
Pantograph Up-Thrust*	See “Pantograph Static Force”
Parallel Feeder	An along-track aerial bare or insulated cable mounted on the OCS poles; or an insulated cable installed in a trough or duct, which provides electrical power reinforcement to the OCS by means of feeder jumpers at regular intervals.
Parallel Running (Length)	The design length where the two parallel contact wires in an overlap are suspended at the same height.
<i>Pendulum Hanger</i>	<i>A type of suspension where the contact wire is supported from spans, bracket arm pipes or flat surfaces by a hanger wire or wires depending on the style of pendulum hanger employed. The contact wire is staggered in opposite directions and the hanger wire becomes inclined so that it rises as the current collector passes creating an elastic suspension. Single hanger wire pendulums are generally used for pantograph operation. Double wire pendulum hangers are trapezoidal and allow the contact wire to lift in such a way that the vertical axis of the contact wire always stays perpendicular to the track or road plane.</i>
Planted Pole*	See “Embedded Pole”
Point of Switch (POS, PS)	See AREMA for definition.
Pole (OCS) or Mast*	An independent slender vertical structure with or without guy, used to support some part of the OCS.
Pole-base Guy	See “Guy”
Pole Bracket	A connection or an assembly of small – part steel components by which a cantilever assembly or bracket arm assembly is attached to the pole.
Pole Cap	The attachment over the top of a pole to prevent intrusion of rainwater. Note: Decorative designs may be called “Finials”

Pole Encumbrance	The across-track outside dimension of a pole and its attachments at vehicle level.
Pole Face	The side of the pole to which the cantilever or bracket arm is attached. The side of the pole facing the track.
Pole Gain	The flattened part of a round pole ready to receive the mounting plate of a cross arm or bracket arm, or A metal or plastic molding type packer for interfacing between a round pole and a cross arm or mounting plate of a bracket arm. Note: Also know as Gain Block.
<i>Pole Guide*</i>	<i>See “Trolley Pole Guide”</i>
Pole Setout	The dimension of the centerline of the pole to the face of some fixed object, such as a wall or a bridge abutment with no apparent centerline.
Pole (Trolley)	See “Trolley Pole”
Portal (OCS)	A frame support structure or an arch structure consisting of vertical columns supporting each end of a horizontal beam. Two beams mounted on three columns would be termed a “compound portal”, etc.
Drop Bracket or Beam Bracket*	A fabricated frame mounted on a portal beam, primarily for the attachment of cantilever assemblies.
<i>Position Switch</i>	<i>A electro-mechanical switch for setting the route for ETB trolley collector poles at a turnout, that is operated by the interaction of two contactors judiciously placed in the trolleywire pair in advance of a trolleybus turn and triggered by the relative position of trolley shoes.</i>
Potential Equalizer (Jumper)	See “Jumper”
<i>Power On-Off Switch</i>	<i>A trolley overhead switch control system which operates in one position as the vehicle draws power from the overhead contact system and retracts to another position when the vehicle coasts through.</i>
Pre-Emption Device	A switch/contacter operated automatically by transit vehicles in city streets, which controls traffic signals to their favor.
Presag	The static difference between the average contact wire height at the end hangers in a span and the height at midspan. Note: Value of span/1000 or span/2000. Presag is a feature added to spans of high speed running tracks to compensate for contact wire rise due to fast pantographs.
Prestress (of conductors)	The tension applied to conductor for a day or two to reduce long-term “creep”, after which it is reduced to normal tension for operations. Note: Normally 30% to 50% of its breaking load.
Profile (OCS)	The vertical alignment of OCS conductors relative to the top of rail center line of track.

Pull-Off*	See “Wire Pull-off”
Pull-Off Arm*	See “Registration Arm”
Pull Off Cantilever	A cantilever that provides registration of the contact wire towards the pole in relation to the centerline of track.
Push Off Cantilever	A cantilever that provides registration of the contact wire away from the pole in relation to the centerline of track.
Pulley	A sheave. Note: Used in messenger support, bridal support, stitch, delta support in BW systems, etc.
Pull-over*	See “Registration Arm”
Radial Load	A horizontal load component of tension due to deviations of tensioned wires and / or conductors. Note: Generally measured at the attachment point.
Rail Bond	See “Bond”.
Rail Return	The combination of track rails, impedance bonds, and cables that provides the electrical return path for the traction current from the rail vehicle to the substation.
Rake	The installed backward lean of the pole from vertical, before loading, such that when loaded statically, the pole does not lean forward from the vertical.
<i>Range, Touring or Travel*</i> , of an ETB.	<i>The safe distance an ETB may move laterally away from its overhead wires. Note: In the range of 3.65 to 4.27 meter (12 to 14 feet)</i>
Range of Pantograph Working, Operating* Maximum	The operating height range for Pantographs to operate normally The range of a pantograph between its upper limit stop, and its lock-down height.
Reach	See “Cantilever Reach”
Registration or Alignment*	Lateral stabilizing (with or without support), of conductors to maintain a fixed horizontal location relative to the center line of the track.
Registration Arm or Steady Arm	The lateral restrainer on the contact wire at a structure or other point of registration, such as at a wire pull-off.
Registration Pipe	The lowest horizontal pipe of a cantilever, to which a steady arm or a registration arm is attached, with or without a drop bracket.
Regulation* or Regulating*	See “Adjustments”

Resilient Arm*	See “Elastic Arm”
Return Circuit	The circuit for the traction return current utilizing track rails or negative contact wire to a location near to a traction substation, where it is connected through the negative feeders to the substation negative busbar.
Rigid Contact System	<p>1. An overhead contact system using an un-tensioned contact wire relying on continuous support, (such as proprietary aluminum extrusions or “T”-bars) or “barn hangers” at close spacing to supply the necessary rigidity.</p> <p>2. An untensioned self-supporting (copper) conductor rail, such as “double lobe bar”.</p> <p>Note: Typically used in maintenance shops and at moveable bridges.</p>
Riser	A vertical conduit and cable supplying traction current from an underground feeder system to the OCS.
Right-of-Way (ROW)	A definition of land ownership or easement; the available space for a railway.
Rubbing Strip*	See “Contact Strip”
Ruling Span	See “Equivalent Span”.
Running Edge	The inside face of the rail heads of a track.
Saddle	The fitting that supports a hanger on the messenger wire. Note: Sometimes fitted with an insulated lining to prevent current entering the hanger.
Safe Working Zone	A zone around the energized conductors in which maintenance staff can undertake routine inspections, construction and maintenance as defined by the agency.
Sag	The difference between the average heights of a conductor at its adjacent supports and its height at the lowest point in the span relative to top of rails or street.
Sagging	The act of installing messengers and other conductors to the correct tension by measuring conductor sag.
Sag-Tension Charts	Charts referred to during wire stringing that give conductor tensions related to ambient temperature for use during the sagging operation.
Sag Rods	The long steel rods that support the center section of a portal beam from extensions to the portal columns or end of a cantilever beam.
Sectionalizing or Sectioning*	The division of the OCS into electrical sections.

Section Break	An electrical break in the overhead contact system. Note: When the adjacent section breaks are installed, the section of OCS between them can be isolated and energized or de-energized.
Half-Tension Airbreak	A sectionalization point in an OCS formed by two parallel contact wires, each at half tension, and cut into a single contact wire over a distance of 100 feet to 200 feet. Note: Half-tension airbreaks do not require additional contact wire anchor poles, thus making them a practical substitute for section insulators.
Insulated Overlap, Airbreak* or Air Gap*	A sectionalization point in an OCS formed by cutting insulation into the out-of-running sections of the two overlapping catenaries with at least minimum electrical clearance between them, which provide a continuous powered path for pantographs.
Section Insulator, Section Isolator* or Sectionaler	See “Insulator” .
Self Supporting Anchor Pole	An anchor pole without a down-guy.
Shoe*	See “Collector Head”, “Trolley Shoe”.
Sidewalk Guy	See “Guy”
Simple Catenary	See “Catenary”
Single Wire System*	See “Direct Suspension”
Sleeve	
Chaffing Sleeve	A sleeve around a conductor to reduce damage from abrasion.
Ground sleeve, Reinforcing Sleeve or “Dog Collar”	A steel sleeve placed around a steel pole at ground line to protect against corrosion damage.
Pipe Sleeve	A short length of smaller diameter pipe fitted into a larger diameter pipe to reduce the internal diameter of the larger pipe.
Repair Sleeve	A compressed copper or aluminum sleeve around a conductor to repair local electrical damage.
Sleeve Foundation	A precast custom-designed circular concrete tube placed in a drilled hole to provide a foundation for an embedded pole. See “Foundation-Concrete Sleeve Type”
Small Part Steelwork (SPS)	Fabricated steel brackets, frames, links, plates and yokes, etc, which are cut from stock steel sections for attachment of catenary assemblies, but not constituting part of a principal support structure.
Soffit	The underside of a tunnel roof or bridge deck.

Span Guy, or Span Wire	See “Guy”
Span Length	The distance along track between structures as determined by the difference in along track stationings.
Actual Span Length	The horizontal length of contact wire between two adjacent support points. Note: Not necessarily the distance or difference in stationing between the support structures.
Span Width	The distance across track or roadway (may be skewed) between the columns of a portal, headspan, or cross-span structure.
<i>Special Work</i>	<i>Generic description for the frogs, switches, crossovers and curve segments used in trolley wires for vehicles with trolley poles.</i>
Spiral (Track)	The transitions from tangent to curve track along which may have superelevation increases from zero to the selected value for the curve, and vice versa.
Spiral, Helical Guy Grip	Wrap-around type of dead end or guy grip.
Splice, Splicer*	A fitting for joining two conductors capable of carrying the full current capacity and the breaking load of the conductor. Note: The splice is a mechanical device using cones or setscrews, or use compression pins or a compressed sleeve, etc.
Spout	See “Feeder Spout”.
Sprawl	The versed sine of the contact wire on curved tracks with inclined catenaries. Note: Measured from the support point to support point.
Spreaders or Spreader Bars*	<p>(1). On a pole, the 1 219 mm (4 ft.) to 1 524 mm (5 ft.) long brackets made of small angle or channel sections mounted on the front of a pole and facing the track, a pair of which carry two or more cantilevers. Note: Each cantilever carries its own catenary, and the cantilevers are spaced sufficiently to allow independent along track movement of each catenary.</p> <p>(2). A device for maintaining a set distance between two ‘parallel’ conductors and used for registration purposes. See “Knuckle”.</p>
Spring Tensioner	A mechanical device comprising a long spring and associated parts installed in an OCS (usually at one or both terminations) which compensates to some extent for variations in conductor tension due to conductor temperature.
Stagger	The offset of the contact wire from the tangent or superelevated track centerline by registration at each support. Note: Stagger causes the contact wire to sweep side to side over the pantograph head during vehicle operation.

Stagger Change	Increase or decrease of wire stagger due to along-track movement. Note: This happens under the influence of AT devices, as wire temperature changes
Stagger Effect	The additional contact wire deviation above the normal value of wind blow-off in a span, whenever the staggers at each end of the span are unequal.
Stagger Gauge	A mechanical, optical or electronic device that can be placed on track rails for measuring contact and messenger wire heights and staggers.
Stagger Sweep	The total movement of the contact wire crossing the pantograph contact strip in inches per span length.
Stagger Sweep Rate	The rate at which the contact wire crosses the pantograph contact strip in inches per span length, with the purpose of setting minimum and maximum values. Note: Typically 25.4 mm (1 inch) in 6.096 meter (20 feet) would be an acceptable minimum, and 25.4 mm (1 inch) in 1.524 meter (5 feet) an acceptable maximum.
Stand-Off Insulator	See “Insulator”.
Static Load, Dead Load	The weight of the structure and any permanent load applied to it. Note: This will include wire tension loads at normal temperature. Loads due to temperature change are considered Live or dynamic.
Station	A station is a point where an observation is taken or a precisely located reference point.
Station Equation	Station equation is used where two different stationings meet. A station equation enables you to locate a point from one stationing in relation to the other, eliminating the need to re-station.
Stationing	Stationing is the procedure for computing the stations along a centerline, for the purpose of being able to assign a station to.
Steady Arm	See “Registration Arm”.
Steady Span	A cross span guy for contact wires in a head span. Note: usually the lower of two horizontal span guys.
Stops*	See “Balance Weight Stops.”
Stringing	The process of installing overhead wires. Note: Usually with temporary supports.
Stringline Value	The distance between the track arc and its chord between catenary support structures, measured at midspan.

Structure	A principal support for the OCS conductors, normally including foundation(s), pole(s), and cantilever(s)/bracket arm(s) or headspan/cross-span wires; or eyebolts and cross-span.
Structure Bonding	See “Grounding”
Structure Clearance Envelope	See “Envelope, Structure Clearance Envelope”
Structure Spacing Chart	A design table of span length and track curves that shows the maximum OCS span length for a track curve of a given radius.
Strut Pipe (of a cantilever)	The inclined pipe of a cantilever frame that supports the top pipe or top tie-wire at the end remote from the pole.
Stub-Ups	Conduit bends, cast into concrete foundations, for later use with or without extension risers, to accommodate feeder cables.
Subassembly (OCS)	A configuration of OCS components forming part of a larger OCS assembly.
Superelevation Effect For Rail Tracks <i>For ETB</i>	Displacement of the pantograph centerline from the vertical track centerline due to track superelevation. <i>Lateral displacement of trolley wires from a ground reference point, e.g. centerline of bus-path, due to roadway superelevation.</i>
Surge Arrester	A device typically mounted on OCS poles and other structures, vehicles, TPSS and is connected to ground on one side with the other side to OCS. It is designed to protect the OCS and adjacent equipment, e.g. traction power substations and feeder cables, against lightning. Note: Surge arresters typically provide a low resistance path to ground for over voltage spike.
Swath (Pantograph)	The swept area above railway tracks at contact wire level that is covered by the pantograph during vehicle operations, into which no part of the fixed facilities, except the contact wire, may intrude. Also see: “Envelope, Pantograph Clearance”
<i>Swath (ETB)</i>	<i>The swept area of the roadway covered by the plan area of the ETB when driving on a curved bus path.</i>
Sweep*	See “ Stagger Sweep’

Switch	Note: Disconnect switches are customarily mounted on OCS poles, but can also be pad-mounted or mounted on walls.
Disconnect Switch, Feeder Switch*	A switch typically installed at a sectionalizing point or at a traction power feeding point in the OCS or for isolating the feeder cable at a substation. Note: Such switch would be designed only to operate off-load, usually by hand, ‘hot’ stick or by motorized operation controlled remotely. Note: At traction power feeding points, pad-mounted disconnect switches may be located within the substation compound or on the adjacent feeder pole.
Bypass Switch	Bypass disconnect switches are installed at the sectionalizing points in the OCS. Note: They maybe open or closed depending on application for normal operations.
Grounding Switch	A permanently installed switch between an OCS conductor and an efficiently grounded connection (as per NESC). Note: This is mostly used in shops where the rails are efficiently grounded.
Load Break Switch	A switch typically installed at a sectionalizing point or at a traction power feeding point in the OCS or for isolating the feeder cable at a substation under load.
Motorized Switch	An electrically operated switch under command from the Agency Operations and Control Center.
Shorting Switch	A permanently installed switch between OCS conductor and a rail or negative contact wire.
<i>Special Work Switch</i>	<i>An electric frog or plane frog for ETB’s or streetcar to allow trolley poles to enter a diverging route.</i>
Synthetic Guy Strand	A synthetic rope material made out of aramid polyester fiber, used in cross-span guying and messenger bridles. Not normally used in trolley pole operation. Note: Can be used for electrical and vibration isolation.
System Height or System Depth*	The vertical distance between messenger and contact wires, at the support structure.
Tail Wire or Tail Guy*	The wire that is used in termination.
Tangent Chord Catenary	See “Catenary”
Temperature Stop*	See “Balance Weight Stop”
Tension Reducer	A strain reliever, usually a terminating guy connected at the shallow angle to a tensioned conductor to take up a portion of the tension.
Tension Length	A length of OCS between two corresponding terminations with automatic tensioning or fixed terminations. See also “Half Tension Length”

Tension Section*	See “Tension Length”, See also “Half Tension Length”
Tensioner	A device installed at one end or both ends of a conductor to maintain as constant a tension in the conductors as possible. Note: May be spring or hydraulic units or Balance Weight assemblies.
Tensioning	The process of establishing the correct tension. Note: May be done by sagging or the use of chain Hoist with tension meter.
Traction Electrification System (TES)	Comprising the Traction Power System (TPS) and the Overhead Contact System (OCS).
Traction Power System (TPS)	Comprising the Traction Power Substations (TPSS) and the Traction Power Feeder System (TPFS) (i.e. duct banks and traction power feeder and return cables).
Track Track Frog Track Crest Curve, Track Hog* Track Sag Track Switch, Track Turnout Track Profile, Track vertical alignment profile*	 A rail component used at the intersection of two running rails to provide support for vehicle wheels thus permitting wheels to cross over or join rails of other tracks. A vertical curve in the track profile producing a crest. A vertical curve in the track profile producing a dip. The arrangement of a track switch and a frog with closure rails by which rail vehicles can be diverted from one track to another. Also See “Point of Switch” The vertical geometry of the track.
Track Raising Allowance, Track maintenance allowance*	An allowance for future lifting of the track.
Track Tolerances Cross Level Tolerance Lateral Tolerance Track Gauge Tolerance Vertical Tolerance	Allowable variations from design dimensions. Allowable variation between the elevations of the two rails (or the designated difference in elevations on superelevated track). Allowable variation in the horizontal track alignment. Allowable variation from normal gauge. Allowable variation in track elevations.
Traction Power	The electrical power supply to the OCS and other current collection systems.

Trailing Turnout	Tracks converging with point of switch last in the normal direction of travel.
Tramway Equipment*	See “Direct Suspension System”
Transition Curve	A curve of continuously increasing radius that connects a curve to a tangent or to a curve of larger radius. See “Spiral”.
Trapeze*	See “Pendulum Support”
<i>Travel*</i>	<i>See “Range”</i>
Travelers, or Stringing Blocks	Sheaves used in pulling wires during stringing preferably with one “cheek” that can be opened for inserting wires and pull lines.
<i>Trolley Door Bridge</i>	<i>A bridging device between sections of trolley wire that is mounted on the soffit of the doorframes of maintenance shops that can be opened to allow the doors to open and close. Such a design must have a bridging piece or conductor bar aligned between the trolley wire dead-ends to provide a trolley ‘path’ for use with trolley poles. See “Contact Wire Bridge”</i>
<i>Trolley Ear</i>	<i>The name given in the days before grooved trolley wire was available, for the fitting that supported round trolley wire.</i>
<i>Trolley Pole or Collector Pole (Syn)</i>	<i>An electric power collector on a trolleybus or streetcar, which delivers current from the trolley wire to the vehicle.</i>
<i>Trolleybus*, Trolley Coach*, Trackless Trolley*</i>	See “Electric Trolley Bus”
<i>Trolley Funnel*</i>	See “Trolley Pole Guide”
<i>Trolley Harp*</i>	See “Trolley Shoe”
<i>Trolley OCS, Trolley Overhead*</i>	<i>The system of overhead trolley wires and their supports from which vehicles with trolley poles collect current See “Direct Suspension System”.</i>
<i>Trolley Pole, or Trolley Collector Poles*</i>	<i>The long shaft mounted on the roofs of trolley buses, streetcars and Light Rail Vehicles, with a shoe (current collector) at the top end that presses upwards against the underside of the trolley wire, to draw current.</i>
<i>Trolley Pole Guide or Funnel*</i>	<i>A device to steer the trolley pole collector shoe upward onto the trolley wire from the retracted position.</i>
<i>Trolley Shoe</i>	<i>A solid metal shoe or an assembly comprising a carbon or metal insert fitted into the holder attached to the harp at the top of a trolley collector pole to collect current.</i>
<i>Trolley Wire</i>	See “Contact Wire”
<i>Trolley Wire Pair</i>	<i>The two trolley wires providing electrical power and return for ETB’s.</i>

Tunnel support (assembly)	An OCS conductor support assembly for use in tunnels and normally mounted in the tunnel soffit.
Turnbuckle	A threaded device inserted in a tension member to provide minor adjustment of tension or sag. (<i>The IEEE Standards Dictionary</i>)
Turnout (Track)	See “Track Switch”
Twin Cantilevers	A support for carrying two OCS (such as at a track turnout or in an overlap), using two separate individual cantilevers each carrying one OCS, which are mounted on same side of an OCS pole.
Twin Contacts (Wires)*	Two contact wires in parallel in running. Not to be confused with “Contenary”.
Underbridge Supports	OCS supports used beneath overpasses and normally attached to their soffits.
Underpass or Underbridge*	A structure where a road or river crosses beneath the tracks.
Uninsulated Overlap	An OCS overlap without sectionalizing. A construction overlap is required to avoid possible excessive stagger change, due to excessively long tension lengths of AT wire.
Uplift	The difference in elevation of contact wire when at rest and when subjected to an upward force due to current collectors passing.
Variable Tension in OCS	A characteristic of Fixed Terminated OCS, where rise in conductor temperature due to traction current and/or ambient air temperature results in lowering of conductor tension due to the expansion of the conductors. Similarly low ambient temperatures cause contraction of the conductors resulting in a rise of conductor tensions. See “Auto-tensioned OCS” which is also termed “Constant Tension OCS”*.
Versed Sine* or Versine*	See String line
Wind Stay or Steady	A rod or wire used to prevent collapse in compression of lightly loaded registration arms due to wind forces.
Wire Cross*	See “Contact Wire Bridge”
Wire Gradient	See “Contact Wire Gradient”
Wire Pull-off	A pull-off using a registration arm attached to the end of a guy wire that does not support the contact wire although it can be lifted by the vertical component of the registration load.
Wire Run Length	The distance from anchorage to anchorage of an OCS conductor.
Wire Run Number	Discrete number is assigned to each specific wire run for materials control purposes.

Yoke	A steel plate or casting on which two or more wires terminate on one side and continue as one wire on the opposite side (usually yoke-shaped and with lever action to distribute loads from a Balance Weight to the messenger and contact wire).
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