

# APPENDIX

## GLOSSARY

**Acceptance** – an action by an authorized representative of the owner by which the acquirer assumes ownership of products/services as a partial or complete performance of contract.

**Acceptance Criteria** – the criteria a product must meet to successfully complete a test phase or meet delivery requirements.

**Acceptance Test** – formal testing conducted to determine whether or not a system satisfies its acceptance criteria and to enable the acquirer to determine whether or not to accept the system.

**Accessible Pedestrian Signal** – a device that communicates information about pedestrian timing in nonvisual format such as audible tones, verbal messages, and/or vibrating surfaces.

**Active Grade Crossing Warning System** – the flashing-light signals, with or without warning gates, together with the necessary control equipment used to inform road users of the approach or presence of trains at highway-rail grade crossings or highway-light rail transit grade crossings.

**Actuated Operation** – the type of traffic signal operation that responds and adjusts to vehicle or pedestrian detection.

**Actuation** – the presence of a vehicle or pedestrian as indicated by an input to the controller from a detector or the action of a vehicle or pedestrian which causes a detector to generate a call to the signal controller.

**Acquirer** – an organization that procures products for itself or another organization.

**Added Initial Interval (or Portion)** – a volume density controller feature where an amount of time added to the minimum initial green time to accommodate to vehicles which arrived during the preceding Red Interval.

**Allowable Gap** – same as “Passage Time” in basic actuated operation. In volume density operation, it is the initially the Passage Time, but is reduced to the Minimum Gap during the Time to Reduce.

**All-Red Clearance Interval** – an optional interval that follows a Yellow Change Interval and precedes the next conflicting Green Interval, during which all signal indications at the intersection display RED indications.

**Anchor Bolt** – a steel bolt used to connect a pole to the foundation. It is threaded at one end and bent at the other to resist pullout.

**Approach** – all lanes of traffic that enter the intersection from the same direction.

**Approval** – written notification by an authorized representative of the acquirer that the developer's plans, design, or other aspects of the project appear to be sound and can be used as the basis for further work. Such approval does not shift responsibility from the developer to meet contractual requirements.

**Architecture** – the organizational structure of a system, identifying its components, their interfaces, and a concept of execution among them.

**Assembly** – a number of parts or sub-assemblies, or any combination thereof joined together, to perform a specific function and capable of disassembly.

**Audit** – an evaluation of a system, process, project. A procedure performed to ascertain the validity and reliability of information; and to provide an assessment of a system.

**Authentication** – the procedure (essentially approval) used by the approving authority in verifying that specification content is acceptable. Authentication does not imply acceptance or responsibility for the specified item to perform successfully.

**AWG** – American Wire Gauge. The standard measurements of wire size. It is based on the circular mil system. 1 Mil equals .001”

**Average Initial Illuminance** - The average level of horizontal illuminance on the pavement area of a traveled way at the time the lighting system is installed when lamps are new and luminaires are clean, expressed in average footcandles (lux) for the pavement area.

**Average Maintained Illuminance** - The average level of horizontal illuminance on the roadway pavement when the output of the lamp and luminaire is diminished by the maintenance factors; expressed in average footcandles (lux) for the pavement area.

**Background Cycle** – term used in coordination systems to identify the cycle lengths established by coordination unit and master control.

**Backplate** – a thin strip of material that extends outward from and parallel to a signal face on all sides of a signal housing to provide a background for improved visibility of the signal indications.

**Ballast** - A device used with an electric-discharge lamp to obtain the necessary circuit conditions (voltage, current, and waveform) for starting and operating.

**Bandwidth** – the amount of green time available to a platoon of vehicles in a signal system.

**Baseline** – an approved product at a point in time. Any changes made to this product must go through a formal change process.

**Beacon** – a highway traffic signal with one or more signal sections that operates in a flashing mode.

**Cable** – A group of separately insulated conductors wrapped together and covered with an outer jacket.

**Call (see Actuation also)** – a registration of a demand for right-of-way by traffic (vehicular or pedestrian) to a controller.

**Candela** – the unit of luminous intensity (the force generating the luminous flux). Formerly the term "candle" was used.

**Candela per square meter ( $\text{cd/m}^2$ )** - The International System (SI) unit of luminance (photometric brightness) equal to the uniform luminance of a perfectly diffusing surface emitting or reflecting light at the rate of one lumen per square meter, or the average luminance of any surface emitting or reflecting light at that rate. One candela per square meter equals 0.2919 footlambert.

**Candlepower (cp)** - candlepower (cp) luminous intensity expressed in candelas (not an indication of total light output.)

**Certification** – a process, which may be incremental, by which a contractor provides evidence to the owner that a product meets contractual or otherwise specified requirements.

**Channelizing Island** – curbed or painted area outside the vehicular path that is provided to separate and direct traffic movement, which also may serve as a refuge for pedestrians.

**Clearance Interval** – the interval from the end of the right-of-way of a phase to the beginning of a conflicting phase. This is usually the Yellow Change Interval plus any All Red timing for vehicles and flashing don't walk for pedestrians.

**Clear Zone** – the total roadside border area, starting at the edge of the traveled way that is available for an errant driver to stop or regain control of a vehicle. This area might consist of a shoulder, a recoverable slope, and/or a non-recoverable, traversable slope with a clear run-out area at its toe.

**Closed-Loop System** – a signal system capable of controlling some operation by implementing certain system strategies, receiving inputs which permit the rapid evaluation of the effects of the control, and then taking some action which modifies the strategy on the basis of the evaluation, all without the need for the operator input.

**Coefficient of utilization (CU)** - The ratio of the luminous flux (lumens) from a luminaire received on the surface of the roadway to the lumens emitted by the luminaire's lamps alone.

**Commercial off-the-shelf Software (COTS)** – commercially available applications sold by vendors through public catalogue listings, not intended to be customized or enhanced. (Contract-negotiated software developed for a specific application is not COTS software.)

**Components** – components are the named "pieces" of design and/or actual entities (sub-systems, hardware units, software units) of the system/sub-system. In system/sub-system architectures, components consist of sub-systems (or other variations), hardware units, software units, and manual operations.

**Computer Database** – see database.

**Computer Hardware** – devices capable of accepting and storing computer data, executing a systematic sequence of operations on computer data, or producing control outputs. Such devices can perform substantial interpretation, computation, communication, control, or other logical functions.

**Computer Program** – a combination of computer instructions and data definitions that enable computer hardware to perform computational or control functions.

**Computer Software** – see software.

**Concept Exploration** – the process of developing and comparing alternative conceptual approaches to meeting the needs that drive the project.

**Concept of Operations** – a document that defines the way the system is envisioned to work from multiple stakeholder viewpoints (Users including operators, maintenance, management).

**Concept (Project Concept)** – a high-level conceptual project description, including services provided and the operational structure.

**Conductor** – a medium for transmitting electrical current. A conductor usually consists of copper or other materials.

**Conduit** – a tube or enclosure for containing and protecting electrical wires or cables.

**Configuration Item (CI)** – a product such as a document or a unit of software or hardware that performs a complete function and has been chosen to be placed under change control. That means that any changes that are to be made must go through a change management process. A baseline is a configuration item.

**Configuration Management** – a discipline applying technical and administrative direction and surveillance to identify and document the functional and physical characteristics of Configuration Items (CI's); audit the CI's to verify conformance to specifications, manage interface control documents and other contract requirements control changes to CI's and their related documentation; and record and report

information needed to manage CI's effectively, including the status of proposed changes and the implementation status of approved changes.

**Configuration Management Plan** – a plan defining the implementation (including policies and methods) of configuration management on a particular program/project.

**Configuration Status Accounting (CSA)** – is the recording and reporting of information needed to manage configuration items effectively, including: 1) A record of the approved configuration documentation and identification numbers. 2) The status of proposed changes, deviations, and waivers to the configuration. 3) The implementation status of approved changes. 4) The configuration of all units of the configuration item in the operational inventory. 5) Discrepancies from Functional and Physical configuration audits.

**Conflicting Call** – a demand for service, which occurs on a conflicting phase not having the right-of-way at the time the demand for service is placed.

**Conflict Monitor** – see Malfunction Management Unit.

**Contract** – a mutually binding legal relationship obligating a seller to furnish the supplies or services (including construction) and a buyer to accept and pay for them. It includes all types of commitments, in writing, that obligate the buyer to an expenditure of appropriate funds. In addition to bilateral agreements, contracts include, but are not limited to, awards and notices of awards; job orders or task letters issued under purchase orders under which the contract becomes effective by written acceptance or performance; and bilateral modifications.

**Contractor** – an individual, partnership, company, corporation, association or other service, having a contract with a buyer for the design, development, manufacture, maintenance, modification, or supply of items under the terms of a contract.

**Controller (or Controller Unit)** – the device that determines which signal indications are to be illuminated at any given time. The controller is usually located in a cabinet near the intersection.

**Coordination (Coordinated Mode)** – the control of controller units in a manner to provide a relationship between specific green indications at adjacent intersections in accordance with a time schedule to permit continuous operation of groups of vehicles along the street at a planned speed.

**Cross-cutting Activities** – enabling activities used to support one or more of the life cycle process steps.

**Crosswalk** – that part of a roadway at an intersection that is included within the extensions of the lateral lines of the sidewalks on opposite sides of the roadway, measured from the curb line or, in the absence of curbs, from the edges of the roadway. Also, any portion of a roadway at an intersection or elsewhere that is distinctly indicated for pedestrian crossing by lines or other markings on the surface.

**Curb Ramp** – a ramp cutting through a curb or built up to it for pedestrians.

**Cycle length** – the time taken for a complete sequence of all phases at an intersection. This time is counted from the start of green for any phase until that same phase is started again. Pre-timed cycle lengths do not vary, but actuated cycle lengths do because of skipped phases, extensions, etc.

**Data** – recorded information, regardless of medium or characteristics, of any nature, including administrative, managerial, financial, and technical.

**Database** – a collection of related data stored in one or more computerized files in a manner that can be accessed by users or computer programs via a database management system.

**Database Management System** – an integrated set of computer programs that provide the capabilities needed to establish, modify, make available, and maintain the integrity of a database.

**Data Product** – information that is inherently generated as the result of work tasks cited in a Statement of Work (SOW) or in a source document invoked in the contract. Such information is produced as a separate entity (for example, drawing, specification, manual, report, records, and parts list).

**Delay** – time lost while traffic impeded in its movement by some element over which it has no control. Usually expressed in seconds per vehicle.

**Delayed Call** – a call from a detector whose output is delayed for a pre-determined length of time. Usually used in turn lanes where vehicles may frequently turn on a RED indication.

**Density** – a measure of the concentration of vehicles, stated as the number of vehicles per mile per lane.  $Density = Volume/Distance$

**Deployment Plan** – is the final step in the development of a system. It is developed based on a thorough analysis of the steps necessary to achieve the deployment goals of the project. It both serves to justify the strategy for deployment and to inform all deployment participants (and other stakeholders) of what will happen and what they will be required to do.

**Design** – those characteristics of a system or components that are selected by the developer in response to the requirements

**Design Specification** – describe how the system is to be built. Take the requirements (what the system will do) and translate them into a hardware and software design that can be built. Collectively, the purpose of these documents is to:

- Provide a documented description of the design of the system that can be reviewed and approved by the stakeholders;

- Provide a description of the system in enough detail that its component parts can be procured and built;
- Provide a description of the hardware and software system components in sufficient detail for them to be maintained and upgraded.

For most projects, two levels of design specifications are developed. The High Level Design Specification Document supports the project architecture, interfaces, and sub-system requirements and is typically developed along with the Concept of Operations. The Detailed Design Specification Document provide the build-to specification for software and hardware construction and is developed during the Preliminary Engineering phase.

**Detailed Design Document** – the product baseline used to develop the hardware and software components of the system.

**Detectable Warning** – a surface feature built in or applied to walking surfaces or other elements to warn of hazards on a circulation path.

**Detector** – a device used for determining the presence or passage of vehicles or pedestrians.

**Detector Mode** – a term used to describe the operation “pulse” or “presence” of a detector channel output when the detection of a vehicle or pedestrian occurs.

**Detection Zone** – that area of the roadway within which a vehicle will be detected by a vehicle detector. This area may also be called the “zone of detection” or “sensing zone.”

**Developer** – an organization that develops products (“develops” may include new development, modification, reuse, reengineering, maintenance, or any other activity that results in products) for itself or another organization.

**Development Model** – a specific portion of the life cycle model that relates to the definition, decomposition, development, and implementation of a system or a part of a system.

**Development Strategy** – the way the development and deployment of the overall system will be carried out. For example, an evolutionary development strategy means that the system will be developed and deployed in multiple segments over time. These pieces are complete functional units that will perform independently from other functional pieces. Incremental development is the development of pieces that are done concurrently or nearly concurrently by the same or different development teams.

**Dilemma Zone** – a distance or time interval related to the onset of the Yellow Change Interval. The term describes a portion of the roadway in advance of the intersection which a driver can neither stop prior to the stop line nor clear the intersection after the initiation of the Yellow Change Interval and before conflicting traffic is released.

**Disability glare** - Glare resulting in reduced visual performance and visibility— often accompanied by discomfort. See veiling luminance.

**Discomfort glare** - Glare producing discomfort. It does not necessarily interfere with visual performance or visibility.

**Elicitation** – the process to draw out, to discover and to make known so to gain knowledge and information, often used in defining needs.

**Emergency Vehicle Traffic Signal** – a special traffic signal that assigns the right-of-way to an authorized emergency vehicle.

**End Products** – products that perform the desired capability; e.g. the hardware, software, communications, and databases.

**Evaluation** – the process of determining whether an item or activity meets the specified criteria.

**Extendable Period (or Portion)** – that variable length part of the Green Interval which follows the initial portion in an actuated controller.

**Extension Limit** – the maximum time allowed for the extendable portion of the green in an actuated controller.

**Feasibility Assessment** – a pre-development activity to evaluate alternative system concepts, selects the best one, and verifies that it is feasible within all of the project and system constraints.

**Firmware** – the combination of a hardware device and computer instructions and/or computer data that resides as read-only software on the hardware device.

**Flasher** – a device used to turn traffic signal indications on and off at a repetitive rate of approximately once per second.

**Flashing Mode** – a mode of operation in which a traffic signal indication is turned on and off repetitively.

**Footcandle (fc)** - The unit of illumination when the foot is taken as the unit of length. It is the illumination on a surface one square foot in area on which there is a uniformly distributed flux of one lumen, or the illumination produced on a surface, all points of which are at a distance of one foot from a directionally uniform point source of one candela.

**Footlambert (fl)**. A unit of luminance (photometric brightness) equal to  $1/\pi$  candela per square foot, or to the uniform luminance of a perfectly diffusing surface emitting or

reflecting light at the rate of one lumen per square foot, or to the average luminance of any surface emitting or reflecting light at that rate. See luminance and candela per square meter.

**Force-Off** – a controller command that forces the termination of the right-of-way for a phase. Used in preemption and coordination.

**Free Flow** – traffic flow which is not impeded.

**Free Mode** – The operation of a traffic signal controller in an uncoordinated mode (opposite of coordinated mode). The controller may still be in a signal system, but does not operate in a coordinated mode at any time it is in free mode or isolated mode.

**Fully Actuated Operation** – a type of traffic signal operation in which all signal phases function on the basis of actuation.

**Gap** – the time interval time or distance from the back of one vehicle to the front of the following vehicle, usually measured in time.

**Gap Analysis** – a technique to assess how far current (legacy) capabilities are from meeting the identified needs, to be used to prioritize development activities. This is based both on how far the current capabilities are from meeting the needs (because of insufficient functionality, capabilities, performance or capacity) and whether the need is met in some places and not others.

**Gap Out** – in an actuated controller, the termination of a green phase due to an excessive time in between the actuation of vehicles arriving on the green.

**Gap Reduction** – a volume density controller feature whereby the Allowable Gap or allowed time spacing between successive vehicle actuations on the phase displaying the green in the extendable portion of the interval is reduced from the Passage Time to the Minimum Gap.

**Glare** - The sensation produced by luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort, or loss in visual performance and visibility. See disability glare and discomfort glare.

NOTE: The magnitude of the sensation of glare depends on such factors as they size, position, and luminance of a source, the number of sources, and the luminance to which the eyes are adapted.

**Green Interval** – the right-of-way portion of a traffic phase.

**Grounding** – a pole or cabinet attachment enabling a cable to make an electric connection from the pole or cabinet to earth.

**Hardware** – articles made of material, such as aircraft, ships, tools, computers, vehicles, fittings, and their components (mechanical, electrical, electronic, hydraulic, and pneumatic). Computer software and technical documentation are excluded.

**Headway** – the distance or (usually) time between vehicles measured from the front of one vehicle to the front of the next.

**Highway-Rail Grade Crossing** – the general area where a highway and a railroad's right-of-way cross at the same level, within which are included the railroad tracks, highway, and traffic control devices for highway traffic traversing that area.

**Highway Traffic Signal (Traffic Signal)** – any power operated traffic control device, other than a warning light or steady burning electric lamp, by which traffic is warned or directed to take some specific action, including traffic control signals, intersection beacons, emergency vehicle traffic control signals, ramps signals, warning beacons and others.

**Hold** – a controller command that retains the existing right-of-way for a phase.

**Illuminance** - The density of the luminous flux incident on a surface; it is the quotient derived by dividing the luminous flux by the area of the surface, when the latter is uniformly illuminated.

**Incandescent Signal** – a traffic signal head that uses incandescent lamp for illumination.

**Inductive Loop** – coiled wires in the pavement (usually sawcut), which create an electrical field that is processed by a detector unit in the traffic signal cabinet to register an actuation.

**Initial Interval** – See Minimum Green.

**Integrity** – a system characteristic that means that the system's functional, performance, physical, and enabling products are accurately documented by its requirements, design, and support specifications.

**Intelligent Transportation Systems** – a broad range of diverse technologies which, when applied to the current transportation system, can help improve safety, reduce congestion, enhance mobility, minimize environmental impacts, save energy, and promote economic productivity. ITS technologies are varied and include information processing, communications, control, and electronics.

**Interface** – the functional and physical characteristics required to exist at a common boundary - in development, a relationship among two or more entities (such as software-software, hardware-hardware, hardware-software, hardware-user, or software-user).

**Interface Control** – interface control comprises the delineation of the procedures and documentation, both administrative and technical, contractually necessary for identification of functional and physical characteristics between two or more configuration items that are provided by different contractors/acquiring agencies, and the resolution of the problems thereto.

**Intersection Control Beacon** – a flashing beacon used at an intersection to control two or more directions of travel.

**Interval** – any one of the several divisions of the cycle during which signal indications do not change.

**Interval Sequence** – the order of appearance of signal indications during successive intervals of a cycle.

**.Isolux line** - A line plotted on any appropriate coordinates to show all the points on a surface where the illumination is the same. For a complete exploration, the line is a closed curve. A series of such lines for various illumination values is called an isolux (isofootcandle) diagram.

**Item** – a non-specific term used to denote any product, including systems, sub-systems, assemblies, subassemblies, units, sets, accessories, computer programs, computer software, or parts

**J-Hook** – steel rod in the shape of a “J” to support wires.

**Lamp lumen depreciation factor (lld)** - The multiplier to be used in illumination calculations to relate the initial rated output of light sources to the anticipated minimum rated output based on the relamping program to be used. (see “Light Loss Factor” discussion earlier in Chapter 11).

**Lane-Use Control Signal** – a signal face displaying signal indications to permit or prohibit the use of specific lanes of a roadway or to indicate the impending prohibition of such use.

**Last Car Passage** – a feature that allows a full (non-reduced) passage period for the last vehicle extending the green during Gap Reduction.

**Lead-Lag Left Turn Phasing** – a phasing sequence where both a leading and lagging left turn signal phase is provided on the same street.

**LED Signal** – traffic signal head that uses light emitting diode modules for illumination.

**Legacy System** – the existing system to which the upgrade or change will be applied.

**Light standard (pole)** - A pole provided with the necessary internal attachments for wiring and the external attachments for the bracket and luminaire.

**Life Cycle** – the end-to-end process from conception of a system to its retirement or disposal.

**Life Cycle Model** – a representation of the steps involved in the development and other phases of an ITS project.

**Light-Loss Factor** – a design factor used to depreciate the output of a luminaire due to life-cycle output reduction of the lamp and the accumulation of dirt.

**Locator Tone** – a repeating sound that identifies the location of the pedestrian push button.

**Locking Memory** – a mode of a controller phase in which a call is retained by the controller even if the vehicle leaves the detector. Protected only turn phases are typically placed in locking memory.

**Lumen** – the unit of luminous flux (time rate of flow of light). A lumen is defined as the luminous flux emitted by a point source having a uniform luminous intensity of one candela.

**Luminaire** – a complete lighting fixture consisting of a lamp or lamps together with the ballast, reflector, refractor, photocell when required, and the housing.

**Luminance** – the luminous intensity of any surface in a given direction per unit of projected area of the surface as viewed from that direction, expressed in, candela per square meter.

**Lumen (lm)** - The unit of luminous flux. It is equal to the flux through a unit solid angle (steradian), from a uniform point source of one candela (candle), or to the flux on a unit surface all points of which are at unit distance from a uniform point source of one candela.

**Luminaire** - A complete fixture consisting of a lamp or lamps together with the parts designed to distribute the light, position and protect the lamps, and connect the lamps to the power supply.

**Luminous Efficacy (lm/W)** - Luminous efficacy of a source of light. The quotient of the total luminous flux emitted by the total lamp power input. It is expressed in lumens per watt.

**Lux (lx)** - The International System (SI) unit of illumination. It is the illumination on a surface one square meter in area on which there is a uniformly distributed flux of one lumen, or the illumination produced at a surface all points of which are at a distance of one meter from a uniform point source of one candela.

**Maintenance factor (MF)** - A factor formerly used to denote the ratio of the illumination of a given area after a period of time to the initial illumination on the same area.

**Malfunction Management Unit (MMU)** – a device used to detect and respond to improper or conflicting signal indications and improper operating voltages in a traffic controller assembly.

**Market Packages** – potential products or sub-systems that address specific services (as used in an ITS architecture).

**Mast Arm Pole** – a cantilever structure that permits the overhead installation of the signal faces without exposed messenger cables and signal wiring, which are run inside the arm structure.

**Master Controller Unit** – a device for supervising a system of local intersection controllers.

**Maximum Green** – a longest period of green time allowed when there is a demand on an opposing phase.

**Metrics** – measures used to indicate progress or achievement.

**Microwave Detection** – a method of detection that detects vehicles by transmitting a low power microwave signal toward a specific area.

**Minimum Gap** – a volume density controller setting that represents the minimum value to which allowable gap between actuations on phase with green can be reduced upon expiration of Time to Reduce.

**Minimum Green** – the first part of the Green Interval for a phase, which is not affected by actuation received during the Green Interval for that phase (the shortest green time allowed a phase).

**Model** – an abstraction of reality. Examples: A road map is an abstraction of the real road network. A globe is a model of the world. A simulation is a dynamic model of a time sequence of events.

**Module** – a self-contained part of a hardware item designed as a single replaceable unit, with a specific integral electronic function. It should require no installation other than mechanical mounting and completion of electrical connection.

**Mounting Height** – The vertical distance between the roadway surface and the center of the apparent light source of the luminaire.

**National ITS Architecture** – a general framework for planning, defining, and integrating ITS. It was developed to support ITS implementations over a 20-year time period in urban, interurban, and rural environments across the country. The National ITS Architecture is available as a resource for any region and is maintained by the USDOT independently of any specific system design or region in the nation.

**Needs Assessment** – an activity accomplished early in system development to ensure that the system will meet the most important needs of the project's stakeholders, specifically that the needs are well understood, de-conflicted, and prioritized.

**Non-conformance** – the failure of a unit or product to conform to specified requirements.

**Non-Locking Memory** – a mode of actuated-controller unit operation which will not retain a call if the calling vehicle leaves the detector.

**Offset** – the relationship in time between a point in the cycle at a particular intersection and a similar point in the cycle at another intersection or reference.

**Operational Baseline** – the system that is currently in use, including all of the design, development, test, support, and requirements documentation.

**Operational Concept** – the roles and responsibilities of the primary stakeholders and the systems they operate.

**Operation & Maintenance Plan** – a document prepared incrementally during system implementation, and revised as needed during on-going system operation. The first version should be produced as early in the project as possible, to ensure that operation and maintenance needs are understood and planned for. This initial version may be quite limited in content, focusing on issues such as staffing, funding, and documentation that need to be worked on well in advance of system startup. Details of specific operation and maintenance activities can be added as needed, and after the system is developed and its specific characteristics are known.

**Overhang** - The distance between a vertical line passing through the luminaire and the curb or edge of the roadway.

**Overlap** – a traffic phase that services two or more traffic phases at the same time.

**Partial Interchange Lighting** - Lighting consisting of a few luminaires located in the vicinity of some or all ramp terminals, intersections, or other decision-making areas.

**Part** – one piece, or two or more pieces joined together which are not normally subjected to disassembly without destruction or impairment of designed use (examples: gear, screws, transistors, capacitors, integrated circuits).

**Passage Time** – the time allowed for each vehicle actuation during the Green Interval.

**Pattern** – a set of controller cycles, splits, and off sets for a traffic signal system which determines the relative green indication sequencing of the intersections within the system.

**Pedestrian Access Route** – an accessible corridor for pedestrian use within the public highway right-of-way.

**Pedestrian Change Interval** – an interval during which the flashing UPRAISED HAND (symbolizing DON'T WALK) signal indication is displayed.

**Pedestrian Clearance Time** – the time provided for a pedestrian crossing in a crosswalk, after leaving the curb or shoulder, to travel to the far side of the traveled way or to a median.

**Pedestrian Phase** – a separate traffic phase allocated exclusively to pedestrian traffic.

**Pedestrian Signal Head** – a signal head, which contains the symbols WALKING PERSON (symbolizing WALK) and UPRAISED HAND (symbolizing DONT WALK), that is installed to direct pedestrian traffic at a traffic signal.

**Performance** – a quantitative measure characterizing a physical or functional attribute relating to the execution of a mission/operation or function.

**Permissive Movement** – a left or right turn traffic movement which must yield to pedestrians and/or oncoming traffic (during a CIRCULAR GREEN signal indication).

**Permissive Period** – the time period in which the controller unit is allowed to leave a coordinated phase under coordinated control and go to other phases.

**Phase** – the part of a cycle allocated to any combination of traffic movements receiving the right-of-way simultaneously during one or more intervals, i.e. a left turn phase.

**Phase Omit (Special skip, Force skip)** – a command that causes omission of a phase.

**Platoon** – a group of vehicles or pedestrians traveling together as a group, either voluntarily or involuntarily, because of traffic signal controls, geometrics, or other factors.

**Policy** – a guiding principle typically established by senior management, which is adopted by an organization or project to influence and determine decisions.

**Polycarbonate** – a lightweight thermoplastic with high strength used in some traffic signal housings and backplates and is lighter than similar aluminum products.

**Powder Coat** – an electrostatically applied dry powder coating that creates a fused adhesion.

**Preemption** – The transfer of the normal control of signals to a special signal control mode, i.e. to accommodate emergency vehicles.

**Presence Detector** – a vehicle detector that registers the presence of a vehicle for as long as the vehicle occupies the field of detection.

**Presence Mode** – the ability of a vehicle detector to register the presence of a vehicle for as long as the vehicle occupies the field of detection.

**Pre-Timed Operation** – type of traffic signal operation where the cycle length, phases, green times, and change intervals are all preset.

**Priority Control** – a means by which the assignment of right-of-way is obtained or modified.

**Process** – an organized set of activities.

**Product** – a product is a given set of items. The set could consist of system, sub-system, hardware or software items, and their documentation.

**Project** – an undertaking requiring concerted effort, which is focused on developing and/or maintaining a specific product. The product may include hardware, software, and other components. Typically, a project has its own funding, cost accounting, and delivery schedule with the acquirer (customer).

**Project Architecture** – defines ITS elements (stakeholders, equipment, facilities, etc.) and computerized data flows between these elements.

**Project Life Cycle** – see Life Cycle.

**Project Plan** – a description (what is to be done, what funds are available, when it will be done and by whom) of the entire set of tasks that the project requires.

**Protected Movement** – a left or right turn traffic movement which does not have to yield to pedestrians and/or oncoming traffic (when a left or right GREEN ARROW signal indication is displayed).

**Pulse Mode** – The ability of a vehicle detector to register the presence of a vehicle as a short output pulse when a vehicle enters the field of detection.

**Pushbutton** – a button to activate pedestrian timing.

**Qualification Testing** – testing performed to demonstrate to the acquirer that an item, system, or sub-system meets its specified requirements.

**Quality Assurance** – a planned and systematic pattern of all actions necessary to provide confidence that management, technical planning, and controls are adequate to establish correct technical requirements for design and manufacturing. Also, a planned and systematic pattern of actions to manage design activity standards, drawings, specifications, or other documents referenced on drawings, lists, or technical documents.

**Ramp Control Signal** – a highway traffic signal installed to control the flow of traffic onto a freeway at an entrance ramp or at a freeway-to-freeway ramp connection.

**Recall** – an actuated controller feature which causes the automatic return of the right-of-way to a phase whether or not there are calls for that phase.

**Red Clearance Interval** – See All Red.

**Red Interval** – the portion of a phase not including the Green Interval, the Yellow Change Interval and the All Red Clearance Interval. It is the portion of the phase that is serving the conflicting phases.

**Regional ITS Architecture** – a specific regional framework for ensuring institutional agreement and technical integration for the implementation of ITS projects in a particular region.

**Regression Testing** – a process that tests not only the area of change but also tests those areas that were not changed but are affected by the change.

**Requirements** – the total consideration as to WHAT is to be done (functional), HOW well it is to perform (performance), and under WHAT CONDITIONS it is to operate (Environmental and non-functional).

**Rest** – the state in which an actuated controller unit rest in a phase until it is called out of the phase by a call on a conflicting phase or system command.

**Reverse Engineering** – the process of documenting an existing Intelligent Transportation Systems functional (what it does – requirements), physical (how it does it – design), and support (the way it was built and maintained – enabling products) characteristics.

**Right-of-Way (Highway)** – land or property, usually in a corridor, that is acquired for or devoted to transportation purposes.

**Right-of-Way (Signal)** – the movement at an intersection that has a GREEN indication for which all other conflicting movements must yield to.

**Risk Management** – an organized process to identify what can go wrong, to quantify and assess associated risks, and to implement/control the appropriate approach for preventing or handling each risk.

**Roundabout** – a circular intersection that has yield control of entering traffic, channelized approaches, counterclockwise circulation, and appropriate geometric curvature to limit travel speeds on the circulatory roadway.

**Setback** - The horizontal distance between the face of a light pole and the edge of traveled way.

**Spacing** - For roadway lighting the distance between successive lighting units, measured along the center line of the street.

**Semi-Actuated Operation** – type of traffic signal operation in which at least one, but not all, signal phases function on the basis of actuation.

**Sidewalk** – that portion of a public highway right-of-way between the curb line or lateral line of a roadway and the adjacent property line that is improved for use by pedestrians.

**Signal Back Plate** – a thin strip of material that extends outward from and parallel to a signal face on all sides of a signal housing to provide a background for improved visibility of the signal indications.

**Signal Face** – that part of a signal head used for controlling traffic in a single direction. Turning indications may be included in a signal face.

**Signal Head** – an assembly of one or more signal sections.

**Signal Housing** – that part of a signal section that protects the light source and other required components (either aluminum or polycarbonate).

**Signal Indication** – the illumination of a traffic signal lens or equivalent device or a combination of several lenses or equivalent devices at the same time.

**Signal Lens** – that part of the signal section that redirects the light coming directly from the light source and its reflector, if any.

**Signal Louver** – a device that can be mounted inside a signal visor to restrict visibility of a signal indication from the side or to limit the visibility of the signal indication to a certain lane or lanes, or to a certain distance from the stop line.

**Signal Section** – the assembly of a signal housing, signal lens, and light source with necessary components to be used for providing one signal indication.

**Signal System** – two or more traffic signals operating in coordination.

**Skip** – a feature of an actuated traffic signal controller which omits operation of a phase or movement that does not have a call (opposite of Recall).

**Software** – computer programs and computer databases. Note: Although some definitions of software include documentation, it is now limited to the definition of computer programs and computer databases.

**Software Development** – a set of activities that result in software products. Software development may include new development, modification, reuse, re-engineering, maintenance, or any other activities that result in software products.

**Special Event Plan** – a timing plan stored in memory which is activated to compensate for unusual traffic flow caused by a special event (such as football game).

**Specification** – a document that describes the essential technical requirements for items, materials or services including the procedures for determining whether or not the requirements have been met.

**Speed Limit Sign Beacon** – a flashing beacon used to supplement a SPEED LIMIT sign.

**Split** – a division of the cycle length allocated to each of the various phases, normally expressed in percent.

**Splitter Island** – a flush or raised island that separates entering and exiting traffic in a roundabout.

**Stakeholders** – the people for whom the system is being built, as well as anyone who will manage, develop, operate, maintain, use, benefit from, or otherwise be affected by the system.

**Standby Mode** – an operational status of a local controller or system which is not under central computer control but is capable of responding to central computer control.

**Statement of Work** – a document primarily for use in procurement, which specifies the work requirements for a project or program. It is used in conjunction with specifications and standards as a basis for a contract. The SOW will be used to determine whether the contractor meets stated performance requirements.

**Stop Beacon** – a flashing beacon used to supplement a STOP sign, a DO NOT ENTER sign, or a WRONG WAY sign.

**Strain Pole** – a pole to which span wire is attached for the purpose of supporting the signal heads.

**Subcontractor** – an individual, partnership, corporation, or an association that contracts with an organization (i.e., the prime contractor) to design, develop, and/or manufacture one or more products.

**Subsystem** – any portion of a traffic signal system which can be controlled by a single timing pattern.

**Suppliers** – the term 'suppliers' includes contractors, sub-contractors, vendors, developers, sellers or any other term used to identify the source from which products or services are obtained.

**Surveillance** – the monitoring of traffic performance and signal system operation.

**Synthesis** – the translation of input requirements (including performance, function, and interface) into possible solutions (resources and techniques) satisfying those inputs. This defines a physical architecture of people, product, and process solutions for logical groupings of requirements (performance, functions, and interface) and their designs for those solutions.

**System** – an integrated composite of people, products, and processes, which provide a capability to satisfy a stated need or objective.

**System Detector** – a counting detector that is used for surveillance and measures data like occupancy, speed, volume and delay.

**System Elements** – a system element is a balanced solution to a functional requirement or a set of functional requirements and must satisfy the performance requirements of the associated item. A system element is part of the system (hardware, software, facilities, personnel, data, material, services, and techniques) that, individually or in combination, satisfies a function (task) the system must perform.

**Systems Engineering** – an inter-disciplinary approach and a means to enable the realization of successful systems. Systems engineering requires a broad knowledge, a mindset that keeps the big picture in mind, a facilitator, and a skilled conductor of a team.

**Systems Engineering Management Plan (SEMP)** – a document used when a project is deemed High Risk and may be needed to supplement the details of the Project Plan. When used, the SEMP focuses on the technical plan of the project and the systems engineering processes to be used for the project. Its purpose is to detail out those engineering tasks; especially to provide detailed information on the processes to be used.

**System Specification** – a top level set of requirements for a system. A system specification may be a system/sub-system specification, Prime Item Development Specification, or a Critical Item Development Specification.

**Tailoring** – planning systems engineering activities that are appropriate and cost-effective for the size and complexity of the project. It may be based on cost, size, the number of stakeholders, the supporting relationships between them, complexity of systems (large number of interfaces to other systems, a large number of functions to perform, or the degree of coupling between systems.), level of ownership of system

products (custom development of software owned by the agency or commercial off the shelf products), existing software products, resources, risks.

**Technical Reviews** – a series of system engineering activities by which the technical progress on a project is assessed relative to its technical or contractual requirements. The formal reviews are conducted at logical transition points in the development effort to identify and correct problems resulting from the work completed thus far before the problem can disrupt or delay the technical progress. The reviews provide a method for the contractor and procuring activity to determine that the identification and development of a CI have met contract requirements.

**Testable** – a requirement or set of requirements is considered to be testable if an objective and feasible test can be designed to determine whether each requirement has been met.

**Time-Base Coordination (TBC)** – traffic signal coordination which uses an electronic clock, rather than an interconnect cable.

**Time Before Reduction (TBR)** – a volume density controller feature that sets the amount of time before which the allowable gap is reduced from the value of passage time to minimum gap (before Time to Reduce starts), measured in seconds.

**Time-of-Day Pattern (TOD)** – a timing pattern (set of cycles, splits, and offsets) for a section which can be implemented at certain time(s) in the day.

**Time to Reduce (TTR)** – a volume density controller feature that sets the amount of time in which the allowable gap is reduced from the value of passage time to minimum gap, measured in seconds.

**Timing Plan** – a set of cycle lengths splits and offsets within a group of signals. The particular timing for each intersection may vary with time of day within the plan.

**Traceability** – ensures that user needs and concepts are addressed by a set of requirements and that the requirements are fulfilled by the high level and detailed design. Traceability also ensures that system and sub-system requirements are fully verified. Traceability supports impact analysis and configuration management for long term maintenance, changes & upgrades, and replacement to the system.

The following are three aspects of traceability:

- 1) Pre-Requirements Specification traceability (Pre-RS traceability) in which user needs are traced to a set of system requirements;
- 2) Post-Requirements Specification traceability (Post-RS traceability) in which traceability ensures compliance after the system requirements baseline has been established;

3) Post delivery traceability (Post-Delivery traceability) in which traceability is maintained after delivery of the system; supporting changes & upgrades, and replacement activities.

**Traceability Matrix** – is a table that lists the User Needs, functional requirements, technical requirements, and the technical features or specifications needed to fulfill the associated requirements.

This helps the project team visually determine the genealogy of a specific requirement. If a functional requirement can't be traced to a specific user need, then it should be removed from the project.

**Trade-off Study** – an objective evaluation of alternative requirements, architectures, design approaches, or solutions using identical ground rules and criteria.

**Traffic Control Signal** – See Traffic Signal.

**Traffic Management Center (TMC)** – a location that contains the computer equipment, displays and personnel which operate a computerized traffic control system.

**Traffic-Responsive** – a signal system mode of operation in which a master controller or computer selects or computes signal timing based on the real-time demands of traffic as sensed by detectors.

**Traffic Signal** – a type of highway traffic signal, manually, electrically, or mechanically operated by which traffic is alternately directed to stop and permitted to proceed.

**Transverse Roadway Line (TRL)** - Any line across the roadway that is perpendicular to the curb line.

**Uniformity of illuminance** - The ratio of average footcandles (lux) of illuminance on the pavement area to the footcandles (lux) at the point of minimum illuminance on the pavement, commonly called the uniformity ratio.

**Uniformity of luminance** - The ration average level-to-maximum point of luminance or the maximum-to-minimum point. The average to minimum method uses the average luminance of the roadway design area between two adjacent luminaires, divided by the lowest value at any point in the area. Maximum-tominimum point method uses the maximum and minimum values between the same adjacent luminaires. The luminance uniformity (avg./min. and max./min) considers traveled portion of the roadway, except for divided highways having different designs on each side.

**Unit Extension** – see Passage Time and Allowable Gap.

**User** – the organization(s) or persons within those organizations who will operate and/or use the system for its intended purpose.

**User Services** – a catalog of features that could be provided by an ITS project (as used in an ITS architecture).

**Utilization efficiency.** A plot of the quantity of light falling on a horizontal plane both in front of and behind the luminaire. It shows only the percent of bare lamp lumens that fall on the horizontal surface, and is plotted as ratio of width of area to mounting height of the luminaire.

**Validation** – the process of determining that the requirements are correctly defined that they form a complete set of requirements. This is done in the early stages of the development process. Validation of the end product or system determines if the system meets the users' needs.

**Variable Initial** – a volume density controller function consisting of the capability of adding initial green time to the Minimum Green based on the amount of traffic waiting.

**Vehicle Clearance Interval** – the period of time consisting of the Yellow Change Interval and an optional All Red Clearance Interval.

**Vehicle Extension** – see Passage Time and Allowable Gap

**Vehicular Phase** – a traffic phase allocated to vehicular traffic.

**Vendor** – a manufacturer or supplier of an item.

**Verification** – the process of determining whether or not the products of a given phase of the system/software life cycle fulfill the requirements established during the preceding phase.

**Vertical Lux** – Lux measured in a vertical plane.

**Video Detection** – a method of detection that uses pattern recognition to detect vehicles.

**Volume Density** – an actuated controller operation that will automatically adjust the timing of a phase by using variable initial and/or gap reduction.

**Walk Interval** – an interval during which the WALKING PERSON (symbolizing WALK) signal indication is displayed.

**Warning Beacon** – a flashing beacon used only to supplement an appropriate warning or regulatory sign or marker.

**Work Breakdown Structure** – a product-oriented listing, in family tree order, of the hardware, software, services, and other work tasks, which completely defines a product

or program. The listing results from project engineering during the development and production of a materiel item. A WBS relates the elements of work to be accomplished to each other and to the end product.

**Yellow Change Interval** – the first interval following the green right-of-way interval in which the signal indication for that phase is YELLOW, indicating that the right-of-way for that phase is about to terminate.

**Yellow Clearance Interval** – See Yellow Change Interval.

**Yellow Trap** – a condition in which a permitted left turn phase ends in one direction while the opposing through movement continues through the succeeding phase. A hazard is introduced because the left turning drivers tend to perceive the end of their phase as an opportunity to clear the intersection as a “sneaker,” while the green indication in the opposing direction is displayed continuously during the transition from one phase to the next..

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