

# **SYSTEM SAFETY GLOSSARY**

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## PREFACE

This glossary has been developed under the sponsorship and direction of the Urban Mass Transportation Administration (UMTA) Safety Training Task Force. It is intended to complement the course material presented in the Mass Transit Rail System Safety Training Course sponsored by UMTA.

The glossary is a training aid that provides an easily referenced listing of definitions to assist students who may not be familiar with system safety concepts or many of the terms associated with design and operation of rail transit systems. Definitions listed in this glossary have been gathered from the following sources:

APTA - Lexicon (Appendix A of Moving People Safely,  
3rd edition, 1977).

Product Safety Management and Engineering,  
Willie Hammer, 1980

Military Standard System Safety Program Requirements  
MIL-STD-882B, March 1984.

System Safety Engineering Analysis Handbook  
Boeing Company

BART System Safety Program Plan, 1978

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A

**ABSOLUTE BLOCK** (See **BLOCK**, **ABSOLUTE**) - A block which no train is permitted to enter while it is occupied by another train.

**ABSOLUTE STOP** (See **STOP**, **ABSOLUTE**) - A signal indication which requires a train to stop and not proceed.

**ACCEPTANCE TEST** - A test performed to determine whether or not delivered items of hardware satisfy predetermined standards.

**ACCIDENT** - An unforeseen event or occurrence which causes death, injury or damage to property.

**ACCELERATION RATE** (See **RATE**, **ACCELERATION**) - Time rate of change of speed of a vehicle.

**ACKNOWLEDGEMENT** - The positive confirmation of the completion of a specific action, event or function.

**ACQUISITION PHASE** - The design, specification, construction and testing phase of a project.

**ALARM CONDITION** - Any abnormal condition which requires the attention or intervention of responsible personnel or an individual monitoring the transit system operation.

**ANOMALY** - Deviation from nominal performance which does not cause a significant effect on system performance but does warrant investigation and/or repair.

**APPLICATION, BRAKE** - The application of brakes to achieve the desired rate of either service deceleration or emergency deceleration.

**APPROACH INDICATOR** (See **INDICATOR**, **APPROACH**) - An indicator used to indicate the approach of a train.

**APPROACH LOCKING** (See **LOCKING**, **APPROACH**) - Electric locking effective while a train is approaching a signal displaying an aspect to proceed, which prevents the movement of any interlocked or electrically locked switch, movable point frog, or derail in the route governed by the signal. Control is over a predetermined distance and incorporates a predetermined time release. (See also **INTERLOCKING** and **DETECTOR, TRACK CIRCUIT**)

**APPROACH SIGNAL** (See **SIGNAL**, **APPROACH**) - A fixed signal used in connection with one or more signals to govern the approach thereto.

**ASSEMBLY** - A number of parts or subassemblies or any combination thereof jointed together to perform a specific function.

**ASPECT** - The display or presentation of a wayside signal that provides an indication viewed from the direction of an approaching train; the appearance of a cab signal conveying an indication as viewed by an operator in the cab.

ASPECT, FALSE RESTRICTIVE - The aspect of a signal that conveys an indication more restrictive than intended.

ASPECT, SIGNAL (See ASPECT) - The display or presentation of a wayside signal that provides an indication viewed from the direction of an approaching train; the appearance of a cab signal conveying an indication as viewed by an operator in the cab.

AUDIO FREQUENCY TRACK CIRCUIT - Track circuit energized by electrical current in the audio frequency range.

AUDIT - Formal or official examination and verification.

AUTOMATIC - A term applied to a system, subsystem, or device which has the inherent capability to function without direct manual participation.

AUTOMATIC BLOCK SIGNAL SYSTEM (ABS) (See BLOCK, AUTOMATIC) - A series of consecutive blocks governed by block signals, cab signals, or both, actuated by train movement or by certain conditions affecting the use of a block.

AUTOMATIC BLOCK SIGNALING (See AUTOMATIC BLOCK SIGNAL SYSTEM)

AUTOMATIC CAB SIGNALING (See SYSTEM, AUTOMATIC CAB SIGNAL) - An automatic block signal system in which cab signals are provided.

AUTOMATIC CAR IDENTIFICATION (ACI) - A system providing positive recognition and the transmission of the individual number of a train automatically at specific line locations.

AUTOMATIC INTERLOCKING (See INTERLOCKING, AUTOMATIC) - An interlocking controlled by circuit logic so that movements succeed each other in proper sequence without need for manual control.

AUTOMATIC LINE SUPERVISION (See AUTOMATIC TRAIN SUPERVISION)

AUTOMATIC TRAIN CONTROL (ATC) - The system for automatically controlling train movement, enforcing train safety, and directing train operations. ATC includes subsystems for automatic train operation, train protection and line supervision.

AUTOMATIC TRAIN DISPATCHER (See DISPATCHER, AUTOMATIC TRAIN) - A programmable device whose function it is to dispatch trains on a predetermined schedule.

AUTOMATIC TRAIN OPERATION (ATO) - That subsystem within the automatic train control system which performs any or all of the functions of speed regulation, programmed stopping, door control, performance level regulation and other functions normally assigned to the train operator.

AUTOMATIC TRAIN PROTECTION (ATP) - That subsystem within the automatic train control system which maintains safe train operation through a combination of train detection, train separation, and interlocking.

**AUTOMATIC TRAIN STOP** (See SYSTEM, AUTOMATIC TRAIN STOP) - A system in which the train is brought to a stop through automatic brake application if imposed restrictions are ignored.

**AUTOMATIC TRAIN SUPERVISION (ATS)** - That subsystem within the automatic train control system which monitors the system status and provides the appropriate controls to direct the operation of trains in order to maintain intended traffic patterns and minimize the effect of train delays on the operating schedule.

**AVAILABILITY** - The probability that a system or system element will be operational when required. Mathematically, the ratio of the mean time between failure to the sum of mean time between failure plus mean down time.

**AVERAGE FAILURE RATE** - The average failure rate for a random variable  $t$  with reliability function  $R(t)$  and density  $h(t)$  over the interval of length  $h$  from  $t$  to  $t + h$  is the average rate at which failures occur during the interval, given survival to the start of the interval. The first order approximation for the exponential case is:

$$\frac{R(t) - R(t + h)}{h R(t)}$$

## B

**BACKUP** - An alternate means of accomplishing a function using software, hardware, circuits or operational procedures separate from those used for the primary method.

**BACKUP SYSTEM** - A redundant system that performs the principal functions of the primary system with minimum deviation from the performance of the primary system.

**BALLAST IMPEDANCE** (See IMPEDANCE, BALLAST) - The impedance shunting a track circuit due to the condition of the ballast.

**BALLAST LEAKAGE** - The leakage of current from one rail of a track circuit to the other through the ballast, ties, etc.

**BERTH, TRAIN** - The space designated for a train of given length to occupy when it is stopped at a station platform, in a terminal, on a transfer track, or at some other designated place.

**BLOCK** - A length of track of defined limits, the use of which is governed by block signals, cab signals, or both, or other set procedures.

**BLOCK, ABSOLUTE** - A block which no train is permitted to enter while it is occupied by another train.

**BLOCK, AUTOMATIC** (See **AUTOMATIC BLOCK SIGNAL SYSTEM**) - A series of consecutive blocks governed by block signals, cab signals, or both, actuated by train movement or by certain conditions affecting the use of a block.

**BLOCK, MANUAL** (See **SYSTEM, MANUAL BLOCK**) - A block signal system operated manually, usually based on information communicated by telegraph or telephone.

**BLOCK, PERMISSIVE** - A block which permits a train to enter while it is occupied by another train.

**BLOCK SIGNAL** (See **SIGNAL, BLOCK**) - A fixed signal at the entrance to a block to govern trains entering that block.

**BLOCK SIGNAL SYSTEM** (See **SYSTEM BLOCK SIGNAL**) - A method of governing the movement of trains into or within one or more blocks by block signals or cab signals.

**BOND, IMPEDANCE** - An iron core coil of low resistance and relatively high reactance, used to provide a continuous path for the return propulsion current around insulated joints and to confine the alternating current signaling energy to its own track circuit.

**BOND, INDUCTIVE COUPLED IMPEDANCE** - A device of low resistance and high reactance, used with jointless audio frequency track circuits to couple inductively and confine the signaling energy to its own track circuit and equalize the return propulsion current between rails without impeding its flow.

**BOND, PROPULSION** - A conductor of low resistance providing a path for the return propulsion current at noninsulated rail joints.

**BOND, SIGNAL** - A conductor of low resistance providing a path for track circuit current across noninsulated rail joints.

**BONDING (RAIL)** - The connection of rails or frogs to provide a continuous path for signal or propulsion current by use of bonds.

**BOOK OF RULES** - A set of codified regulations and procedures by which operating personnel are governed.

**BRAKE APPLICATION** - The application of brakes to achieve the desired rate of either service deceleration or emergency deceleration.

**BRAKE ASSURANCE** - The function provided by a subsystem within the automatic train operation system that will cause the emergency brakes of a vehicle to be applied when the actual braking rate of the vehicle is less than the braking rate requested by the automatic train control system.

**BRAKE CUTOUT** - A device which release the brakes of a vehicle or portion thereof.

**BRAKE PARKING** - A holding brake used to prevent movement of a stopped vehicle.



**BRAKE RATE** (See RATE, BRAKE) - The negative time rate of change of speed of a vehicle as produced solely by the action of its braking system(s).

**BRAKE SHOES** - The nonrotating, sacrificial portion of a tread or disc brake assembly.

**BRAKE VALVE** (See VALVE, BRAKE) - A separate operator's control for the purpose of applying and releasing pneumatic friction brakes.

**BRAKING, CLOSED LOOP** - Braking under continuous direction of the train control system.

**BRAKING, DYNAMIC** - An electric, primary braking system whereby the current derived from the motors, acting as generators, is modulated to provide controlled braking.

**BRAKING, EMERGENCY** - An irrevocable open-loop braking system designed to insure fail safe brake application.

**BRAKING, FULL SERVICE** - A nonemergency brake application which obtains the maximum brake rate consistent with the design of the primary brake system(s).

**BRAKING PROGRAMMED** - Closed-loop braking with the requirement that a stop be completed at a designated point within a specified distance.

**BRAKING, SERVICE** - Speed retardation produced by the primary train braking system.

**BRAKING RATE** (See RATE, BRAKE) - The negative time rate of change of speed of vehicle as produced solely by the action of its braking system(s).

**BRAKING SYSTEM** - Those elements on board a train and their interconnections that produce speed retardation in response to a control signal.

**BREAKDOWN** (See FAILURE) - An inability to perform an intended function.

**BUMPING POST SIGNAL** - A signal to advise that a bumping post at a temporary or permanent end of the track is ahead.

**BURN-IN** - A conditioning procedure involving the operation of items in specified environmental conditions for the purpose of eliminating early failures by aging or stabilizing the items prior to operational use.

## C

**CAB** - The compartment of a transit car from which control is achieved.

**CAB SIGNAL** (See SIGNAL, CAB) - A signal in the train operator's cab which conveys the automatic block aspects and indicates the prevailing speed command.

CAB SIGNAL DISPLAY (See CAB SIGNAL)

CAB SIGNAL MODE (See MODE, CAB SIGNAL) - A form of manual train control wherein the operator controls the speed of the vehicle in accordance with signal aspects displayed on the cab signal indicator.

CAPABILITY - The ability of equipment or systems to perform an intended task when in a non-failed state.

CAPABILITY, LINE - The number of vehicles per unit time, or passengers per unit time, that flow in one direction between two points along a line.

CAPABILITY, VEHICLE - The passenger capacity pertinent to specified loading conditions.

CATENARY - An overhead wire from which a transit vehicle collects propulsion and auxiliary power.

CENTRAL CONTROL - That place where train control or train supervision is accomplished for the entire transit system; the train command center.

CAR (See TRANSIT CAR, RAIL RAPID) - An electrically propelled and passenger carrying rail vehicle.

CENTRAL LINE SUPERVISION (See AUTOMATIC TRAIN SUPERVISION (ATS) - That subsystem within the automatic train control system which monitors the system status and provides the appropriate controls to direct the operation of trains in order to maintain intended traffic patterns and minimize the effect of train delays on the operating schedule.

CENTRALIZED TRAFFIC CONTROL (CTC) - A block signal system within which train movements are authorized by block signals whose indications are monitored and controlled at a central control.

CHARACTERISTICS, OPERATING - Those quantitative, measurable parameters pertinent to a specific system, subsystem, device or component that provide definition of performance.

CIRCUIT, CODED TRACK - A track circuit in which the energy is varied or interrupted periodically.

CIRCUIT, CHECK-IN/CHECK-OUT - An electrical circuit that detects and transmits the front end of the train entrance into, and the rear of the train departure from a block for the purposes of determining block occupancy.

CIRCUIT, NONVITAL - Any circuit which does not affect the safety of train operations.

CIRCUIT, SHUNT FOULING - The track circuit in the fouling section of a turnout, connected in multiple with the track circuit in the main track.

CIRCUIT, TRACK - An electrical circuit of which the rails of the track form a part.

CIRCUIT, VITAL - Any circuit which affects the safety of train operations.

**CIVIL SPEED LIMIT (See SPEED LIMIT, CIVIL)** - The maximum speed allowed in a specified section of track as determined by physical limitations of the track structure, train design, and passenger comfort.

**CLEARANCE DIAGRAM** - A diagram which establishes the minimum safe distance between all points on a moving vehicle and fixed wayside structures or appurtenances.

**CLEARANCES** - The distance between specified points along the tracks and specified points on moving vehicles.

**CLOSED CIRCUIT PRINCIPLE** - The principle of circuit design using a normally energized electric circuit which, on being interrupted or de-energized, will cause the controlled function to assume its most restrictive condition.

**CLOSED LOOP** - The principle of feedback control in which the response of a system is continuously compared with the controlling signal to generate an error signal.

**CODE, COMMAND** - A transmitted vital coded signal to initiate action.

**CODE, CONTROL (See CODE, COMMAND)**

**CODE, STANDARD** - The operating, block signal, and interlocking rules of the Association of American Railroads.

**COLOR LIGHT SIGNALS (See SIGNAL, COLOR LIGHT)** - Signals which display aspects by means of lighted color lenses.

**COMMAND CENTER (See CENTRAL CONTROL)** - That place from where train control or train supervision is accomplished for the entire transit system; the train command center.

**COMMUNICATION SYSTEM** - Those elements and their interconnection which permits voice, data, or video interchange of information between system functions separated by distance.

**COMPONENT** - An article which is a self-contained element of a complete operating unit and which performs a function necessary to the operation of that unit.

**COMPONENT AND PART RELIABILITY** - A component or part is reliable when it will operate to a predetermined level of probability under the maximum ratings at the most severe combination of environments for which it was designed and for the length of time or number of cycles specified.

**COMPONENT STRESS** - The stresses on component parts are those factors of usage or test which tend to affect the failure rate of these parts. These include voltage, power, temperature, frequency, rise time, etc; however, the principal stress, other than electrical, is usually the thermal-environmental stress.

**CONDUCTOR** - An onboard train attendant whose function is to operate doors and otherwise assist in passenger movement and safety.

**CONFIGURATION MANAGEMENT** - The discipline which assures that all equipment and software and items and their interfaces are positively identified by engineering data and that changes are controlled, verified and accounted for.

**CONSIST** - The number and specific identity of cars that make up a train.

**CONSTRUCTION SAFETY** - The optimum degree of safety within the constraints of construction effectiveness, time and cost through specific application of safety management throughout all phases of the construction.

**CONTACT** - A conducting part which co-acts with another conducting part to open or close an electrical circuit.

**CONTRACT RAIL (See THIRD RAIL)** - A rail mounted on insulators alongside the running rail which provides traction power for train propulsion.

**CONTROL, BRAKE** - That system which generates control signals to the braking system that result in a desired application of brakes.

**CONTROL CENTER (See CENTRAL CONTROL)** - That place from where train control or train supervision is accomplished for the entire transit system; the train command center.

**CONTROL, CONTINUOUS** - The continuous generation of, and response to, control signals.

**CONTROL, DEADMAN** - A pressure or activity actuated device to detect inattention or disability of a train operator.

**CONTROLLER, MASTER** - The device which generates local and trainlined signals to the vehicle control system.

**CONTROLLER, SWITCH CIRCUIT** - A device for opening and closing electric circuits, operated by a rod connected to a switch, derail, or movable point frog.

**CORRESPONDENCE** - Agreement between control commands and field indications.

**CRASHWORTHINESS** - The capacity of a vehicle to act as a protective container and energy absorber during potentially survivable impact conditions.

**CRITICAL DEFECT** - A defect that judgment and experience indicate could result in hazardous or unsafe conditions for individuals using or maintaining the product or could result in failure in accomplishment of the ultimate objective.

**CRITICALITY** - Assignment of relative importance to hardware or systems.

**CRITICAL FUNCTION LIST** - A listing of those functions whose failure would cause system degradation below an acceptable level.

**CROSS (EQUALIZER) BOND** - An electrical connection from one track to another track to distribute traction power return currents.

**CROSSING AT GRADE** - An intersection of two or more tracks at the same elevation: an intersection of one or more tracks with a roadway.

**CROSSOVER** - Two turnouts, with track between the frogs, arranged to form a continuous passage between two parallel tracks.

**CROSS PROTECTION** - A means to prevent the undesired (or unintended) operation of a signal switch, movable point frog, or derail as the result of a cross in electrical circuits.

**CURRENT, FOREIGN (STRAY CURRENT)** - Stray electric currents which are not a part of the system but which may affect a signaling system or contribute to galvanic corrosion.

**CURRENT, LEAKAGE** - An electric current which flows through or across the surface of insulation when a voltage is impressed across the insulation.

**CURRENT OR TRAFFIC (See DIRECTION, NORMAL)** - The designed predominant direction of train traffic as specified by the rules.

**CUT-SECTION** - A location other than a signal location where two adjoining track circuits end within a block.

## D

**DEADMAN CONTROL (See CONTROL, DEADMAN)** - A pressure or activity actuated device to detect inattention or disability of a train operator.

**DEAD SECTION (See SECTION, DEAD)** - A section of track, either within a track circuit or between two track circuits, the rails of which are not part of a track circuit.

**DECELERATION RATE (See RATE, DECELERATION)** - The net negative time rate of change of speed of a vehicle resulting from the summation of all forces acting upon it.

**DECODER** - A device which transforms a received signal into a data format.

**DEDUCTIVE ANALYSIS** - Analysis of a specific undesired event to determine possible causes of that event (Top down approach "What can cause a specific event to occur").

**DE-ENERGIZE** - To deprive an electro-receptive device of its operating current.

**DEFICIENCY, DESIGN** - Any design characteristic which does not meet specified criteria.

**DEGRADATION** - Falling from an initial level to a lower level in quality or performance.

**DEPARTMENT TEST** - Operational test made on complete train in a yard or on a transfer track before permitting train to operate on a main line.

**DERAIL** - A device designed to cause rolling equipment to leave the rails.

**DERAILMENT** - The condition of rolling equipment leaving the rails.

**DESIGN SAFETY** - Safety achieved by the integration of system design characteristics to prevent or minimize the probability of operation in an unsafe manner.

**DETECTION DEVICES** - Sensors used to detect and monitor the status of certain systems, eg., open or closed doors, component temperatures, flow rates, etc. The status is usually displayed on control consoles.

**DETECTOR, GROUND** - A device for detecting a ground on an electrical circuit.

**DETECTOR, TRACK CIRCUIT** - A track circuit, within an interlocking which, when occupied by a train, prevents the position of a track switch from being changed.

**DETECTOR, POINT** - A circuit controller which is part of a switch operating mechanism and operated by a rod connected to a switch, derail, or moveable point frog to indicate that the point is within a specified distance of the stock rail.

**DEVICE, ACKNOWLEDGING** - A manually operated device used to acknowledge an alarm condition.

**DIRECTION, NORMAL** - The designed predominant direction of train movement as specified by the rules.

**DIRECTION, REVERSE** - Train movement in the direction opposite the normal direction.

**DISPATCHER, AUTOMATIC TRAIN** - A programmable device whose function it is to dispatch trains on predetermined schedule.

**DISPATCHER, TRAIN (LINE SUPERVISOR, CENTRAL SUPERVISOR)** - An operating person, within a control center, whose function it is to dispatch trains, monitor train operations, and to intervene in the event of disruption of schedule or when any change in service or routing is required.

**DISPATCHING** - The process of starting a train into service from a terminal, yard, or transfer track.

**DISTANCE, STOPPING** - The maximum distance on any portion of any track which any train, operating on such portion of railroad at its maximum authorized speed, will travel during a full service application of the brakes, between the point where such application is initiated and the point where the train comes to a stop. (Also referred to as Safe Braking Distance)

**DOOR CONTROL** - Circuitry, including such safeguards and interlocks as required, which operates to open and close car doors.

**DOWN TIME (See TIME, DOWN)** - The total time during which the equipment is not in acceptable operating condition. Down time starts with a failure event and ends at the completion of repair and functional checks/inspections.

**DWELL TIME** - The total time from the instant that a train stops in a station until the instant it resumes moving.

## E

**EMERGENCY** - A situation which is life threatening or which causes damage on or in any transit facility, trainway or vehicle.

**EMERGENCY BRAKE APPLICATION** - An irrevocable open-loop braking system designed to insure fail safe brake application.

**EMPLOYEE, OPERATING** - The employee of a transit system having direct and supervisory responsibility for the movement of trains.

**ENCODER** - A device that transforms the format of the supplied data into the format required for transmission. (See also DECODER)

**ENVIRONMENT** - The aggregate of all conditions which externally influences the performance and life of an item.

**EQUIPMENT FAILURE** - The state in which equipment no longer meets the minimum acceptable specified performance and cannot be restored through operator adjustment of controls.

**EQUIPMENT RELIABILITY (See RELIABILITY)** - The characteristic which describes the ability of a component, subsystem, or system to perform its specified function without failure and within prescribed limits, expressed as a probability or mean failure rate.

**EQUIPMENT, WAYSIDE (See WAYSIDE EQUIPMENT)** - Train control or movement apparatus which is located along the track or wayside as opposed to the control center or other remote location.

## F

**FACING MOVEMENT (See MOVEMENT, FACING)** - The movement of a train over the points of a switch which face in a direction opposite to that in which the train is moving.

**FACING POINT SWITCH (See SWITCH, FACING POINT)** - A track switch the points of which face toward approaching traffic.

**FAILED COMPONENT** - A component which has ceased to perform its intended function.

**FAIL OPERATIONAL** - A characteristic design which permits continued operation in spite of the occurrence of a discrete failure.

**FAIL OPERATIONAL FAIL SAFE** - A system characteristic which permits continued operation on occurrence of a failure while remaining acceptably safe. A second failure results in the system remaining safe, but nonoperational.

**FAIL-SAFE SAFETY** - A characteristic of a system and its elements, the object of which is to ensure that any fault or malfunction will not result in an unsafe condition.

**FAIL-SAFE DESIGN** - A design principle in which each of the elements which make up a system is analyzed to determine the potential consequence of failure of that element, alone or in combination with any or all other elements of the system, to ensure that a failure or a combination of failures will not result in an unsafe condition.

**FAILED COMPONENT** - A component which has ceased to perform its intended function.

**FAILURE** - An inability to perform an intended function.

**FAILURE ANALYSIS** - The logical and systematic examination of a system to identify and analyze the probability, causes, and consequences of potential and real failure.

**FAILURE ASSESSMENT** - The process by which the cause, effect, responsibility, and cost of an incident (reported problem) in the transit system is determined and reported.

**FAILURE, CRITICAL** - A failure which could result in major injury or fatality to people or which could result in major damage to any system or loss of a critical function.

**FAILURE CRITICALITY ANALYSIS** - Study of the potential failures that might occur in any part of a system in relation to other parts of the system in order to determine the severity of effect of each failure in terms of a probable resultant safety hazard, and acceptable degradation of system performance.

**FAILURE EFFECT ANALYSIS** - The study of the potential failures that might occur in any part of a system in order to determine the probable effect of each on all other parts of the system.

**FAILURE, HUMAN** - Failure due to human error.

**FAILURE MANAGEMENT** - Decisions, policies and planning which identify and eliminate or control potential failures and implement corrective or control procedures following real failures.



**FAILURE MECHANISM** - The process which results in a part or equipment failure.

**FAILURE MODE** - The description of the manner in which a failure occurs, and the operating condition of the equipment at the time of the failure.

**FAILURE MODE ANALYSIS** - The study of a system and working interrelationships of the parts thereof under various anticipated conditions of operation (normal and abnormal) in order to determine probable location and mechanism where failures will occur.

**FAILURE MODE AND EFFECT ANALYSIS (FMEA)** - An inductive procedure in which potential malfunctions are identified and then analyzed as to their possible effects.

**FAILURE RATE** - Rate at which failures occur as a function of time. If the failure rate is constant, it is frequently expressed as the reciprocal of mean-time between-failure (MTBF).

**FALSE OCCUPANCY** - Indication of track occupancy when no train is present.

**FALSE RESTRICTIVE (See ASPECT, FALSE RESTRICTIVE)** - The aspect of a signal that conveys an indication more restrictive than intended.

**FAULT TREE ANALYSIS** - A deductive analysis procedure which graphically presents undesired events to determine possible causes of that event.

**FIXED SIGNAL (See SIGNAL, WAYSIDE)** - A signal of fixed location along the track right-of-way.

**FLAGMEN** - A person assigned to control movement of trains by the display of hand signals, flags, or lights.

**FLEETING** - Manually established route selection, not cancelled by the passage of a train.

**FOULING POINT** - The track location beyond which the train will block an adjacent track or roadway.

**FROG, MOVABLE POINT** - A frog equipped with points which are movable in the same manner as the points of a switch.

**FROG, TRACK** - A track structure used, at the intersection of two running rails, to provide support for wheels and passageways for their flanges, thus permitting wheels on either rail to cross the other.

**FULL SERVICE BRAKE APPLICATION (See BRAKING, FULL SERVICE)** - A nonemergency brake application which obtains the maximum brake rate consistent with the design of the primary brake system(s).

## G

GATE - Entrance to a block or route where signal information is conveyed.

GATE, FIXED (END OR CAB SIGNAL/TRAIN CONTROL TERRITORY) - The limit of an interlocked route past which automatic operation of trains is never permitted.

GROUND DETECTOR (See DETECTOR, GROUND) - A device for detecting a ground on an electrical circuit.

GUARD (See CONDUCTOR) - An onboard train attendant whose function is to operate doors and otherwise assist in passenger movement and safety.

## H

HAND BRAKE - A train braking device manually applied to prevent vehicle movement, or to provide emergency braking (See also BRAKE, PARKING).

HAND-THROWN SWITCH (See SWITCH, HAND OPERATED) - A switch which can only be operated manually.

HAND SIGNAL (See SIGNAL, HAND) - A manual signal used to govern the movement of trains.

HAZARD - Any real or potential condition that can cause injury or death, or damage to or loss of equipment or property.

HAZARD ANALYSIS - An analysis performed to identify hazardous conditions for the purpose of their elimination or control.

HAZARD CRITICALITY - The minimum hazard risk or index value which can be accepted for a given potential hazardous situation.

HAZARD SEVERITY - A qualitative measure or the worst potential consequences that could be caused by a specific hazard.

Category I - Catastrophic. May cause death or or system loss.

Category II - Critical. May cause severe injury, severe occupational illness, or major system damage.

Category III - Marginal. May cause minor injury, occupational illness, or system damage.

Category IV - Negligible. Will not result in injury, occupational illness, or system damage.

HAZARD INDEX - A quantitative measure, combining the numerical probability of occurrence with a hazard severity.

**HAZARD RESOLUTION** - The analysis and subsequent actions taken to reduce, to the lowest level practical, the risk associated with an identified hazard.

**HAZARD PROBABILITY** - The probability that a hazard will occur during the planned life of the system. Hazard probability may be expressed in quantitative or qualitative terms. An example of a hazard probability ranking system is:

- A Frequent
- B Probable
- C Occasional
- D Remote
- E Improbable
- F Impossible

**HEADWAY** - The time separation between two trains, both traveling in the same direction on the same track, measured from the time the head end of the leading train passes a given reference point to the time the head end of the train immediately following passes the same reference point.

**HEADWAY CONTROL** - The means by which the desired headway is maintained.

**HOLDING LIGHTS** - Indicators at wayside stations which, in conjunction with manual or automatic train dispatchers, are used to maintain scheduled train operation.

**HOME SIGNAL (See SIGNAL, HOME)** - A fixed signal at the entrance of a route or block to govern trains entering that route or block.

## I

**IMPEDANCE, BALLAST (See BALLAST IMPEDANCE)** - The impedance shunting a track circuit due to the condition of the ballast.

**IMPEDANCE BOND (See BOND, IMPEDANCE)** - An iron core coil of low resistance and relatively high reactance, used to provide a continuous path for the return propulsion current around insulated joints and to confine the alternating current signaling energy to its own track circuit.

**IMPEDANCE, SHUNT** - Impedance between rails presented by a train's wheels and axles and the wheel/rail interface.

**IN ADVANCE OF A SIGNAL** - The territory beyond a signal as seen from an approaching train.

**IN APPROACH OF A SIGNAL** - The territory to which a signal indication is conveyed.

**INCIDENT** - An unforeseen event or occurrence which does not necessarily result in injury or property damage.

INDICATION LOCKING (See LOCKING, INDICATION) - Electric locking of control circuits which prevents actions that would result in an unsafe condition for a train movement if a signal, switch, or other operative unit fails to make a movement corresponding to a control command.

INDICATION, SIGNAL - The information conveyed by the aspect of a signal.

INDICATOR, APPROACH - An indicator used to indicate the approach of a train.

INDICATOR, AUDIBLE (See SIGNAL, AUDIBLE) - A sound-producing device used for attracting attention.

INDICATOR, CAB (See SIGNAL, CAB) - A signal in the train operator's cab which conveys the automatic block aspects and indicates the prevailing speed command.

INDICATOR, CAB; AUDIBLE - An alerting device, located in cab equipped with cab signals, designed to sound when the cab signal changes and continues to sound until acknowledged.

INDICATOR, SPEED - An analog or digital speedometer mounted in cab.

INDICATOR, SWITCH (POSITION) - An indicator used to indicate the position of switch points.

INDUCTIVE ANALYSIS - An analysis which determines the impact of specific events or failures on a system (A bottom-up approach. What happens if a specific event or failure occurs).

INSULATED RAIL JOINT (See JOINT, RAIL; INSULATED) - A rail joint in which electrical insulation is provided between adjoining rails.

INTERFACE - The junction points or the points within or between systems or subsystems where matching or accommodation must be properly achieved in order to make their operation compatible with the successful operation of all other functional entities.

INTERLOCKED SWITCH (See SWITCH, INTERLOCKED) - A track switch within interlocking limits, the control of which is interlocked with other functions of the interlocking.

INTERLOCKING - An arrangement of signals and signal appliances so interconnected that their movements must succeed each other in proper sequence.

INTERLOCKING, AUTOMATIC - An interlocking controlled by circuit logic so that movements occur in the proper sequence without need for manual control.

INTERLOCKING LIMITS (See LIMITS, INTERLOCKING) - The tracks between the absolute signals of an interlocking.

**INTERLOCKING, MANUAL** - An interlocking operated manually from an interlocking machine interconnected by means of mechanical linkages or electrical circuits.

**INTERLOCKING SIGNAL** (See **SIGNAL, INTERLOCKING**) - A wayside signal which governs movements into or within interlocking limits.

## J

**JERK** - The time rate of change of acceleration.

**JOINT, RAIL; INSULATED** (See **INSULATED JOINT RAIL**) - A rail joint in which electrical insulation is provided between adjoining rails.

**JUNCTION** - A location where train routes converge or diverge.

## K

**KEY-BY** - The act of overriding a stop signal by activating a key operated relay.

## L

**LAP** - The position of a brake valve in which the pressure being controlled is being neither increased nor decreased.

**LAY-UP (STORAGE)** - The act of storing cars of a train.

**LIMITS, INTERLOCKING** - The tracks between the absolute signals of an interlocking.

**LIFE CYCLE** - The phases of development of a system, typically including the concept, design, development production and deployment efforts.

**LINE SUPERVISION** (See **AUTOMATIC TRAIN SUPERVISION; CENTRAL CONTROL**)

**LOCKING** - The electrical or mechanical establishment of a condition for a switch, interlocked route, speed limit or automatic function so that its state cannot be altered except by prescribed and inviolate sequence of unlocking.

## M

**MAINLINE** - Track over which passenger service is operated.

**MAINTAINABILITY** - The quality of the combined features of equipment design and installation that facilitates the accomplishment of inspection, test, checkout, servicing, repair, and overhaul with a minimum of time, skill, and resources in the planned maintenance environments.

**MAINTENANCE** - All actions necessary for retaining an item in or restoring it to an operable condition.

**MAINTENANCE, CORRECTIVE** - The action taken to restore a failed item of equipment to an operable state.

**MAINTENANCE, PREVENTIVE** - The actions performed in an attempt to retain an item in a specified condition by providing systematic inspection, detection and prevention of incipient failure.

**MAINTENANCE, SCHEDULED** - Programmed preventive maintenance.

**MAINTENANCE, UNSCHEDULED** - Maintenance action (unscheduled maintenance) initiated by the malfunction of equipment.

**MALFUNCTION** - Any anomaly or failure wherein the system, subsystem, or component fails to function as intended.

**MANAGING ACTIVITY** - The organizational element that will plan, organize, direct, contract, and control tasks and associated functions appropriate to the life cycle phase of the system.

**MANUAL BLOCK SIGNAL SYSTEM** (See **SYSTEM, MANUAL BLOCK**) - A block signal system operated manually, usually based on information communicated by telegraph or telephone.

**MANUAL TRAIN CONTROL** - An operating mode in which the train responds to the actions of its operator through manipulation of the brake valve or master controller.

**MAXIMUM AUTHORIZED SPEED** (See **SPEED, MAXIMUM AUTHORIZED**) - The highest speed limit which is authorized for a particular section of track.

**MASTER CONTROLLER** (See **CONTROLLER, MASTER**) - The device which generates local and trainlined signals to the vehicle control system.

**MEAN LIFE** - The arithmetic mean of time to wearout of all items in the test sample or population.

**MEAN CYCLES BETWEEN FAILURES (MCBF)** - The arithmetic mean of the number of cycles between successive failures of a repairable device.

**MEAN DISTANCE BETWEEN FAILURES (MDBF)** - The arithmetic mean of the distance traveled between successive failures of a repairable vehicle.

MEAN DOWN TIME (MDT) - The arithmetic means of the time that the device remains in an inoperable state after it has failed.

MEAN MAINTENANCE TIME - The arithmetic mean of the time required to perform a maintenance action.

MEAN TIME BETWEEN FAILURES (MTBF) - The arithmetic mean of the time between successive failures.

MEAN TIME BETWEEN SERVICES FAILURES (MTBSF) - The arithmetic mean of the time between failures which interrupt or impact service operations.

MEAN TIME BETWEEN SERVICE INTERRUPTING FAILURES (MTBSIF) - (See MTBSF)

MISHAP - An unplanned event or series of events that result in death, injury, occupational illness, or damage to or loss of equipment or property. (See also ACCIDENT)

MODE, AUTOMATIC TRAIN OPERATION (See AUTOMATIC TRAIN OPERATION) - That subsystem within the automatic train control system which performs any or all of the functions of speed regulation, programmed stopping, door control, performance level regulation and other functions normally assigned to the train operator.

MODE, CAB SIGNAL - A form of manual train control wherein the operator controls the speed of the vehicle in accordance with signal aspects displayed on the cab signal indicator.

MODE, MANUAL (See MANUAL TRAIN CONTROL) - An operating mode in which the train responds to the actions of its operator through manipulation of the brake valve or master controller.

MODE, WAYSIDE SIGNAL - A form of manual train control wherein the operator controls the speed of the vehicle in accordance with the indications given by wayside signals.

MOTORMAN (See OPERATOR) - That person having direct and immediate control of the movement of a train.

MOVEMENT, FACING - The movement of a train over the points of a switch which face in a direction opposite to that in which the train is moving.

MOVEMENT, TRAILING - The movement of a train over the points of a switch which face in a direction in which the train is moving.

MULTIPLE UNIT (MU) (OPERATION, CONTROL) - A method of controlling the actions of the propulsion, braking, and other systems of two or more cars of the train from a single cab.

## N

NAME, SIGNAL - The term used to describe the signal aspect.

NOISE, ELECTRICAL - Interference produced by undesirable or casual electrical occurrences.

**NORMAL DIRECTION** (See **DIRECTION, NORMAL**) - The designed predominant direction of train movement as specified by the rules.

**NORMAL POSITION** (See **POSITION, NORMAL**) - The position in which a switch is aligned for train movement continuing on the same track.

## O

**OPEN LOOP** - No feedback control.

**OPERATING EMPLOYEE** - The employee of a transit system having direct and supervisory responsibility for the movement of trains.

**OPERATING TIME** - The time period between turn-on and turn-off of a system, subsystem, component or part during which time operation is as specified. Total operating time is the summation of all operating time periods.

**OPERATIONAL PHASE** - The post construction phase where designed project function is achieved and maintenance requirements begin.

**OPERATIONAL HAZARD ANALYSIS (OHA)** - Identifies and evaluates hazards resulting from the implementation of operations or tasks performed by persons, considering: operation, test, maintenance, repair, transportation, handling, emplacement or removal of the system.

**OPERATOR** - That person having direct and immediate control of the movement of a train.

**OVERSPEED CONTROL** - That portion of the carborne automatic train control system which enforces speed limits.

## P

**PERFORMANCE LEVEL (TRAIN)** - A command, generally instituted by line supervision, which will vary train speed or running time from normal to achieve the desired schedule speed or headway.

**PHANTOM SIGNAL** - An unexplained aspect displayed by light signal different from the aspect intended.

**POINT DETECTOR** (See **DETECTOR, POINT**) - A circuit controller which is part of a switch operating mechanism and operated by a rod connected to a switch, derail, or movable point frog to indicate that the point is within a specified distance of the stock rail.

**POINTS** (See **SWITCH POINT**) - A movable tapered track rail, the point of which is designed to fit against the stock rail.



POSITION, NORMAL - The predetermined position in which a switch is aligned when not in use.

POSITION, REVERSE - The opposite to normal position.

POWER RAIL (See THIRD RAIL) - A rail mounted on insulators alongside the running rail which provides traction power for train propulsion.

POWER (TRACTION) SYSTEM - The substations, feeder cables, contact rails or wires, switch gear and other equipment interfacing with public utilities or other power generation equipment and providing the electrical power for the movement of the trains and the operation of their auxiliary systems.

PRELIMINARY HAZARD ANALYSIS (PHA) - An analysis performed to obtain an initial risk assessment of a concept or system.

PROCEED SIGNAL (See SIGNAL, PROCEED) - A wayside or cab signal displaying any aspect which conveys an indication which permits a train to move.

PROCEDURES - Established methods to perform a series of tasks.

PROGRAM STOP (See STOP, PROGRAMMED) - A train stop preceded by closed-loop braking such that the train is stopped at a designated point according to a predetermined speed-distance profile.

## Q

QUALITATIVE - Those inductive or deductive analytical approaches which are oriented toward relative, nonmeasurable and subjective values.

QUALITY ASSURANCE - The planned and systematic pattern of all actions necessary to provide adequate confidence that the end items will perform satisfactorily in actual operations.

QUALITY CONTROL - The discipline which insures the manufacture of a uniform product within specified defect limits in accordance with design requirements.

QUANTITATIVE - Those inductive or deductive analytical approaches which are oriented toward the use of numbers or symbols used to express a measureable quantity.

## R

**RAPID RAIL TRANSIT SYSTEM** - An electrified fixed guideway transportation system, utilizing steel rails, usually operating on an exclusive grade-separated right-of-way for the mass movement of passengers within a city or metropolitan area and consisting of its fixed way, transit vehicles and other rolling stock, power system, maintenance facilities, and other stationary and movable apparatus and equipment, and its operating practices and personnel.

**RATE, ACCELERATION** - Time rate of change of speed of a vehicle.

**RATE, BRAKE** - The negative time rate of change of speed of a vehicle as produced solely by the action of its braking system, or systems in combination.

**RATE, DECELERATION** - The net negative time rate of change of speed of a vehicle resulting from the summation of all forces acting upon it.

**REACTION TIME (See TIME, REACTION)** - The time used by equipment, operator, or both, that elapses between the moment an action is called for and when the desired result occurs.

**RECEIVER, TRACK CIRCUIT** - A device on the wayside which receives track signal currents for the purpose of occupancy detection.

**RECEIVER, TRAIN CONTROL** - A device on a vehicle so placed that it is in position to be influenced inductively or actuated by an automatic train control or cab signal roadway element.

**REDUNDANCY** - The existence in a system of more than one means of accomplishing a given function (see also Back-up).

**REGULATOR, SPEED** - An onboard vehicle subsystem, generally but not necessarily a part of the automatic train operation system, which controls acceleration and braking efforts in order for the vehicle to reach and maintain a desired speed within a desired tolerance.

**RELAY** - An electromagnetic device which is opened and closed to provide control system electrical signals.

**RELAY, VITAL** - A relay, meeting certain stringent specifications, so designed that the probability of its failing to return to the prescribed state upon de-energization is so low as to be considered, for all practical purposes, nonexistent.

**RELIABILITY** - The probability that the system or sub system will perform satisfactorily for a given period of time when used under stated conditions.

**RELIABILITY, ACHIEVED** - The reliability level which has actually been attained at some point in time.

RELIABILITY ASSESSMENT - An analytical determination of numerical reliability of a system or portion thereof without actual demonstration testing. Such assessments usually employ mathematical modeling, use of available test results, and some use of estimated reliability figures.

RELIABILITY BLOCK DIAGRAM - A schematic representation which portrays system operation by showing all possible success paths.

RELIABILITY GOAL - A preset reliability objective determined by consideration of operational needs, state-of-the-art capability, cost, time, etc. The goal can be a minimum acceptable level, an expected program accomplishment or an idealistic target.

REPAIR - The maintenance activity which restores a failed item to an operable state.

RESIDUAL HAZARD - A hazard that remains after system design and construction is completed.

RESISTANCE, BALLAST (See IMPEDANCE, BALLAST) - The impedance shunting a track circuit due to the condition of the ballast.

RESISTANCE, TRAIN SHUNT - The actual resistance in ohms from rail to rail through wheels and axles of a vehicle and the wheel/rail interface.

RESTRICTED SPEED (See SPEED, RESTRICTED) - Proceeding prepared to stop short of train ahead, switch not properly aligned, broken rail or other obstruction, at a speed established by individual transit systems but not to exceed 20 mph.

REVENUE SERVICE - The transportation of fare paying passengers.

REVERSE DIRECTION (See DIRECTION, REVERSE) - Train movement in the direction opposite to the normal direction.

REVERSE RUNNING - The operation of a train in the direction opposite to the normal direction.

REVERSIBLE TRACK (See TRACK, REVERSIBLE)

RISK - An expression of possible loss over a specific period of time or number of operational cycles. It may be indicated in terms of hazard severity and probability.

HAZARD MANAGEMENT (LOSS CONTROL) - An element of the system safety management function that evaluates the safety effects of potential hazards considering acceptance, control, or elimination of such hazards with respect to expenditure or resources. (The feasibility of hazard elimination must be considered in light of financial, legal, and human considerations.)

ROUTE - The path a train will travel between two controlled interlocking signals.

ROUTE, INTERLOCKED; INTERLOCKING - A route within interlocking limits.

ROUTES, CONFLICTING - Two or more routes, opposing, converging or intersecting, over which movements cannot be made simultaneously without possibility of collision.

RULE - A law or order authoritatively governing conduct or action.

## S

SAFE - Secure from danger or loss.

SAFETY - A reasonable degree of freedom from those conditions that can cause injury or death to personnel, damage to or loss of equipment or property; freedom from danger.

SAFETY CHECKLIST - A list for examining the safety aspects of equipment, procedures, and personnel.

SAFETY DEVICES - Protective devices which do not alter the fundamental nature of a hazard but which do control the extent of the hazard in some manner.

SAFETY CRITICAL - A designation placed on a system, subsystem, element, component, device, or function denoting that satisfactory operation of such is mandatory to assurance of patron, personnel, equipment, or facility safety. Such a designation dictates incorporation of special safety design features.

SCHEDULED MAINTENANCE (See MAINTENANCE, SCHEDULED) - Programmed preventive maintenance.

SECTION, DEAD - A section of track either within a track circuit or between two track circuits, the rails of which are not part of a track circuit.

SECTIONAL RELEASE (OF LOCKING) (SEE LOCKING, TRAILING RELEASE OF) - Locking so arranged that as a train clears a track section of the route, the locking affecting that section is released.

SERVICE BRAKE APPLICATION - Any nonemergency brake application.

SERVICE DEPENDABILITY - The combination of reliability and maintainability characteristics of a system that describes ontime system performance probability.

SERVICE BRAKE (See also BRAKING, SERVICE) - The primary train brake system(s).

SHUNT - A bypass in an electrical circuit.

SHUNT CIRCUIT - A low-resistance connection across the source of supply, between it and the operating unit.

SHUNT IMPEDANCE (See IMPEDANCE, SHUNT) - Impedance between rails presented by a train's wheels and axles and the wheel/rail interface.

SHUNTING SENSITIVITY - The maximum impedance in ohms which, when placed at the most adverse shunting location, will cause the track circuit to indicate the presence of a train.

SIGNAL - A means of communicating direction or warning.

SIGNAL, APPROACH - A fixed signal used in connection with one or more signals to govern the approach thereto.

SIGNAL, AUDIBLE - A sound-producing device used for attracting attention.

SIGNAL, AUTOMATIC - A signal activated without need for manual action.

SIGNAL, ASPECT (See ASPECT) - The display or presentation of a wayside signal that provides an indication viewed from the direction of an approaching train; the appearance of a cab signal conveying an indication as viewed by an operator in the cab.

SIGNAL BLOCK - A fixed signal at the entrance to a block to govern trains entering that block.

SIGNAL, CAB - A signal in the train operator's cab which conveys the automatic block aspects and indicates the prevailing speed command.

SIGNAL, CALL-ON - An interlocked signal aspect which permits a train to enter an occupied block at restricted speed.

SIGNAL, CLEARED - A signal which has been caused to display an aspect to proceed.

SIGNAL, COLOR LIGHT - Signals which display aspects by means of lighted color lenses.

SIGNAL, FIXED (See SIGNAL, WAYSIDE) - A signal of fixed location along the track right-of-way.

SIGNAL, HAND - A manual signal used to govern the movement of trains.

SIGNAL, HOME - A fixed signal at the entrance to a route or block to govern trains entering that route or block.

SIGNAL INDICATION (See INDICATION, SIGNAL) - The information conveyed by the aspect of a signal.

SIGNAL, INTERLOCKING - A wayside signal which governs movements into or within interlocking limits.

SIGNAL NAME (See NAME, SIGNAL) - The term used to describe the signal aspect.

SIGNAL, PROCEED - A wayside or cab signal displaying any aspect which conveys an indication which permits a train to move.

SIGNAL, STOP - A signal which displays the most restrictive aspect indicating stop.

SIGNAL, TIME - A signal which controls train speed by requiring that a certain time elapse in an approach block.

SIGNAL, WAYSIDE - A signal of fixed location along the track right-of-way.

SIGNALS, OPPOSING - Wayside signals which govern train movements in opposite directions of the same track.

SLIDE (WHEEL) - The condition wherein the wheel tread speed is less than train speed.

SLIP (WHEEL) - The condition wherein the wheel tread speed is greater than the train speed.

SLIP-SLIDE SYSTEM - An onboard system for detecting and correcting wheel slips and slides.

SPEED COMMAND - That speed limit being imposed upon a train at a given point in time by the automatic train control systems.

SPEED, CAR WASH - The speed prescribed for cars to move through a car wash; usually an automatic feature in the train control circuitry.

SPEED LIMIT - A prescribed maximum speed.

SPEED LIMIT, CIVIL - The maximum speed allowed in a specified section of track as determined by physical limitations of the track structure, train design, and passenger comfort.

SPEED, RESTRICTED - The speed during which train operation is conducted, prepared to stop short of train ahead, improperly aligned switch, broken rail or other obstruction. This speed is established by individual transit systems but it is not to exceed 20 mph.

SPEED, YARD - A speed, used within yard limits, that will permit stopping within one-half the range of vision.

SPEED MAINTAINING - The automatic action of a speed regulator.

SPEED PROFILE - A plot of speed against distance traveled.

SPEED REGULATION (See SPEED MAINTAINING) - The automatic action of a speed regulator.

**SPEED REGULATOR (See REGULATOR, SPEED)** - An onboard vehicle subsystem, generally but not necessarily a part of the automatic train operation system, which controls acceleration and braking effort in order for the vehicle to reach and maintain a desired speed within a desired tolerance.

**SPEED RECORDER** - A device for continuously recording the speed of a train.

**SPEED SENSOR** - A device which detects axle, gear, or motor speed, and produces a signal at a frequency proportional to that speed.

**SPOTTING** - Placing a train in a designated or specific location.

**SPRING SWITCH** - A track switch equipped with a spring mechanism arranged to restore points (if necessary) to a predetermined position after it has been trailed through.

**STATION** - A place designated for the purpose of loading and unloading passengers.

**STOCK RAIL** - The rail against which the point of a switch, derail, or movable point frog rests.

**STOPPING DISTANCE (See DISTANCE, STOPPING)** - The maximum distance on a portion of track, which any train, operating on such portion of track at its maximum authorized speed, will travel during a full service application of the brakes, between the point where such application is initiated and the point where the train comes to a stop. (Also referred to as Safe Braking Distance)

**STOP, ABSOLUTE** - A signal indication which requires a train to stop and stay stopped.

**STOP, EMERGENCY** - The stopping of a train by an emergency brake application which, after initiated, cannot be released until the train has stopped.

**STOP, PROGRAMMED** - A train stop produced by closed-loop braking such that the train is stopped at a designated point according to a predetermined speed-distance profile.

**STOP, SERVICE (FULL)** - A train stop achieved by a brake application, other than emergency, that develops the (maximum) brake rate.

**STOP, TRAIN PROTECTION** - A train stop, initiated by the automatic train protection system.

**STOP AND PROCEED** - A signal indication to stop and then proceed with certain cautions not to exceed a designated speed.

**STOP SIGNAL (See SIGNAL, STOP)** - A signal which displays the most restrictive aspect indicating stop.

**SUBSYSTEM** - A major functional subassembly or grouping of items or equipment which is essential to operational completeness of a system.

SUBSYSTEM HAZARD ANALYSIS (SSHA) - An analysis applied to some element of the system to identify hazards associated with component failures.

SWITCH, FACING POINT - A track switch, the points of which face toward approaching traffic.

SWITCH, HAND OPERATED - A noninterlocked switch which can be operated only manually.

SWITCH, INTERLOCKED - A track switch within the interlocking limits, the control of which is interlocked with other functions of the interlocking.

SWITCH INDICATOR (See INDICATOR, SWITCH (POSITION)) - An indicator used to indicate the position of switch points.

SWITCH POINT - A movable tapered track rail, the point of which is designed to fit against the stock rail.

SWITCH POSITION, NORMAL - The position in which a switch is aligned for train movement continuing in the same direction.

SWITCH POSITION, REVERSE - The opposite to normal position.

SWITCH, TRACK - A pair of switch points which, with their fastenings and operating rods, provide the means for establishing a route from one track to another.

SWITCH, TRAILING POINT (See TRAILING POINT SWITCH) - A track switch, the points of which face away from traffic approaching.

SYSTEM - A composite of people, procedures and equipment operating in a specific environment to accomplish, a specific mission or task.

SYSTEM, AUTOMATIC BLOCK SIGNAL (ABS) - A series of consecutive blocks governed by block signals, cab signals, or both, actuated by train movement or by certain conditions affecting the use of a block.

SYSTEM, AUTOMATIC CAB SIGNAL - An automatic block signal system in which cab signals are provided.

SYSTEM, AUTOMATIC TRAIN CONTROL - A system which enforces speed restrictions and prevents exceeding speed restrictions by automatic brake applications; may additionally encompass automatic train operation, automatic train protection, and automatic train supervision.

SYSTEM, AUTOMATIC TRAIN STOP - A system in which the train is brought to a stop through automatic brake application if imposed restrictions are ignored.

SYSTEM, BLOCK SIGNAL - A method of governing the movement of trains into or within one or more blocks by block signals and/or cab signals.

SYSTEM, MANUAL BLOCK SIGNAL - A block signal system operated manually, usually based on information communicated by telegraph or telephone.



**SYSTEM SAFETY** - The application of operating, technical and management techniques and principles to the safety aspects throughout system life to reduce hazards to the lowest level possible through the most effective use of available resources.

**SYSTEM SAFETY ANALYSES** - Inductive and deductive procedures in which hazards are identified and analyzed.

**SYSTEM HAZARD ANALYSIS (SHA)** - An analyses performed on subsystem interfaces to determine the safety problem areas of the total system.

**SYSTEM SAFETY ENGINEERING** - The application of scientific and engineering principles during the design, development, construction, and operation of a system to meet or exceed established safety goals by identifying and restoring hazards.

**SYSTEM SAFETY MANAGEMENT** - An element of management that defines the system safety requirements and ensures the planning, implementation and accomplishment of system safety tasks and activities.

**SYSTEM SAFETY PROGRAM** - The combined tasks and activities of system safety management and system safety engineering that enhance operational effectiveness by satisfying the system safety requirements in a timely, cost-effective manner throughout all phases of the system life.

## T

**THIRD RAIL** - A rail mounted on insulators alongside the running rail which provides traction power for train propulsion.

**THIRD-RAIL SHOE** - A truck-mounted power pickup device which slides on top of, on the side of, or under, the third rail.

**TIME, DOWN** - The total time during which the equipment is not in acceptable operating condition. Down time starts with a failure event and ends at the completion of repair and functional checks/inspections.

**TIME, REACTION** - The time used by equipment, operator, or both, that elapses between the moment an action is called for and when the desired result occurs.

**TIME, RELEASE** - A device used to prevent the operation of a unit until after the expiration of a predetermined time interval after the device has been actuated.

**TIME, UP** - The time during which equipment is either operating satisfactorily or is in an operable state and ready to be placed in operation. Up time is initiated by a completion of repair and is terminated by a failure event.

TRACK BRAKE - A friction brake, usually activated electromagnetically, which compresses against the running rails.

TRACK INDICATOR - A device used to indicate the occupancy of a given track section.

TRACK RELAY - A relay receiving all or part of its operating energy through conductors of which the track rails are an essential part.

TRACK SWITCH (See SWITCH, TRACK) - A pair of switch points which, with their fastenings and operating rods, provide the means for establishing a route from one track to another.

TRACK, TRANSFER - A track in a yard area where the transfer between main track and manual yard modes of operation takes place.

TRAFFIC DIRECTION (See DIRECTION, NORMAL) - The designed predominant direction of train movement as specified by the rules.

TRAILING MOVEMENT (See MOVEMENT, TRAILING) - The movement of a train over the points of a switch which face in a direction in which the train is moving.

TRAILING POINT SWITCH - A track switch, the points of which face away from traffic approaching.

TRAIN - A consist of one or more cars combined into an operating unit. (See also CONSIST)

TRAIN CONTROL RECEIVER (See RECEIVER, TRAIN CONTROL) - A device on a vehicle so placed that it is in position to be influenced inductively or actuated by an automatic train control or cab signal roadway element.

TRAIN DETECTION - A method by which the presence of a train in a block is known.

TRAIN IDENTIFICATION - A method of identifying trains using information such as train number, destination, length, or a combination of these elements. May be accomplished automatically for such functions as routing.

TRAIN LENGTH - The number of units (cars) in a train.

TRAINLINE - Circuits routed between cars by means of couplers or jumper cables so that power or control signals may be transmitted to other cars of the train.

TRAIN NUMBER - Numerical designation of a train.

TRAIN, OPPOSING - A train, the movement of which is in a direction opposite to and toward another train on the same track.

TRAIN ORDERS - Instructions, usually written, used to govern train operations manually.

**TRAIN PROTECTION (See AUTOMATIC TRAIN PROTECTION)** - That subsystem within the automatic train control system which maintains safe train operations through a combination of train detection, train separation, and interlocking.

**TRANSIT CAR, RAPID RAIL** - An electrically propelled passenger carrying rail vehicle.

**TRANSIT SYSTEM (See RAPID RAIL TRANSIT SYSTEM)** - An electrified fixed guideway transportation system, utilizing steel rails, usually operating on an exclusive grade-separated right-of-way for the mass movement of passengers within a city or metropolitan area and consisting of its fixed way, transit vehicles and other rolling stock, power system, maintenance facilities, and other stationary and movable apparatus and equipment, and its operating practices and personnel.

**TREAD BRAKE UNIT** - A unit composed of brake shoe and apparatus to apply the brake shoe to the wheel tread.

**TRIP COCK** - A mechanical device located on the train which, when hit by a trip stop, results in an emergency brake application.

**TRIP STOP (ARM)** - A mechanical arm located on the wayside which, when in the up (trip) position, initiates an emergency brake application on a train which passes it.

**TRIP STOP, FIXED** - A trip stop permanently positioned in the tripping position.

**TROLLEY WIRE (See CATENARY)** - An overhead wire from which a transit car collects propulsion and auxiliary power.

**TURNOUT** - An arrangement of a switch and frog with closure rails by means of which trains may be diverted from one track to another.

## U

**UNSAFE CONDITION** - Any condition which if not corrected, will endanger human life or property.

**UNSCHEDULED MAINTENANCE (See MAINTENANCE, UNSCHEDULED)** - Maintenance action initiated by the malfunction of equipment.

**UP TIME (See TIME, UP)** - The time during which an equipment is either operating satisfactorily or is in an operable state and ready to be placed in operation. Up time is initiated by a completion of repair and is terminated by a failure event.

UP TIME RATIO (STEADY STATE AVAILABILITY) - The ratio of system up time to the total time. It is also expressed in terms of means as:

$$\frac{MTBF}{MTBF + MTTR}$$

## V

VALVE BRAKE - A separate operator's control for the purpose of applying and releasing pneumatic friction brakes.

VEHICLE (See TRANSIT CAR) - An electrically propelled passenger carrying rail vehicle.

VITAL CIRCUIT (See CIRCUIT, VITAL) - Any circuit which affects the safety of train operations.

VITAL COMPONENT OR CIRCUIT - Any device, circuit or software module used to implement a vital function.

VITAL FUNCTION - A system, subsystem, equipment, or component that provides a function critical to safety.

## W

WARNING DEVICES - Sensors that monitor or detect conditions and provide visible and/or audible alerting signals as desired for selected events.

WAYSIDE EQUIPMENT (See EQUIPMENT, WAYSIDE) - Train control or movement apparatus which is located along the track or wayside as opposed to the control center or other remote location.

WAYSIDE SIGNAL (See SIGNAL, WAYSIDE) - A signal of fixed location along the track right-of-way.

WAYSIDE TRAIN STOP (See TRIP STOP) - A mechanical arm located on the wayside which, when in the up (trip) position, initiates an emergency brake application on a train which passes it.

## X

## Y

**YARD** - A system of tracks within defined limits for making up trains and storing cars.

**YARD SPEED** (See **SPEED, YARD**) - A speed, used within yard limits, that will permit stopping within one-half the range of vision.

