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**Dictionary of
Engineering**

**Second
Edition**

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measure of its amount by action of sun's rays on blueprint paper. { 'hē-lē-ə,graf }

helio-stat [ENG] A clock-driven instrument mounting which automatically and continuously points in the direction of the sun; it is used with a pyrheliometer when continuous direct solar radiation measurements are required. { 'hē-lē-ə,stat }

heli-oscope [ENG] An instrument that reflects the sun's rays over long distances; used in geodetic surveys. { 'hē-lē-ə,trop }

heli-pad [CIV ENG] The launch and landing area of a heliport. Also known as pad. { 'hel-ə,pad }

heli-port [CIV ENG] A place built for helicopter takeoffs and landings. { 'hel-ə,pört }

helium-oxygen diving [ENG] Diving operations employing a breathing mixture of helium and oxygen. { 'hē-lē-əm,jäk-sə-jən 'div-ɪŋ }

helium refrigerator [MECH ENG] A refrigerator which uses liquid helium to cool substances to temperatures of 4 K or less. { 'hē-lē-əm ri'frij-ə,rād-ər }

helix angle [DES ENG] That angle formed by the helix of the thread at the pitch-diameter line and a line at right angles to the axis. { 'hē,liks ,əŋ-gəl }

helmet [ENG] A globe-shaped head covering made of copper and supplied with air pumped through a hose; attached to the breastplate of a diving suit for deep-sea diving. { 'hel-mət }

helmholtz [ELEC] A unit of dipole moment per unit area, equal to 1 Debye unit per square angstrom, or approximately 3.335×10^{-10} coulomb per meter. { 'helm,höłts }

Helmholtz free energy See free energy. { 'helm ,höłts ,frē 'en-ər-jē }

Helmholtz function See free energy. { 'helm,höłts ,fəŋk-shən }

Helmholtz potential See free energy. { 'helm,höłts ,pə'ten-čəl }

Helmholtz resonator [ENG ACOUS] An enclosure having a small opening consisting of a straight tube of such dimensions that the enclosure resonates at a single frequency determined by the geometry of the resonator. { 'helm,höłts ,rez-ən,əd-ər }

help-yourself system [IND ENG] A tool-crib system for temporary issue of tools employed in small shops; employees have access to tools in the crib and help themselves. { 'help yŭr'self ,sis-təm }

hemispherical pyrheliometer [ENG] An instrument for measuring the total solar energy from the sun and sky striking a horizontal surface, in which a thermopile measures the temperature difference between white and black portions of a thermally insulated horizontal target within a partially evacuated transparent sphere or hemisphere. { ,he-mē'sfir-ə-kəl ,pŭr,hē-lē'äm-əd-ər }

hemming [MECH ENG] Forming of an edge by bending the metal back on itself. { 'hem-ɪŋ }

hemp-core cable See standard wire rope. { 'hemp ,kôr ,kə-bəl }

Hengstbeck approximation [CHEM ENG] A

method of calculation to estimate the distribution of non-key components in distillation column products. { 'heng-stə-bek ə,präk-sə,mə-shən }

HEPA filter See high-efficiency particulate air filter. { 'hep-ə ,fil-tər }

hereditary mechanics [MECH] A field of mechanics in which quantities, such as stress, depend not only on other quantities, such as strain, at the same instant but also on integrals involving the values of such quantities at previous times. { ,hə'red-ə,ter-ē mi'kan-iks }

hermaphrodite caliper [DES ENG] A layout tool having one leg pointed and the other like that of an inside caliper; used to locate the center of irregularly shaped stock or to lay out a line parallel to an edge. { ,hər'maf-rəd-īt ,kal-ə-pər }

hermetic seal [ENG] An airtight seal. { ,hər'med-ik 'sæl }

herpolhode [MECH] The curve traced out on the invariable plane by the point of contact between the plane and the inertia ellipsoid of a rotating rigid body not subject to external torque. { ,hər-pəl'hod }

herpolhode cone See space cone. { ,hər-pəl'höd ,kôn }

herringbone gear [MECH ENG] The equivalent of two helical gears of opposite hand placed side by side. { 'her-ɪŋ,bôn ,gir }

Herschel-type venturi tube [ENG] A type of venturi tube in which the converging and diverging sections are cones, the throat section is relatively short, the diverging cone is long, and the pressures preceding the inlet cone and in the throat are transferred through multiple openings into annular openings, called piezometer rings. { 'hər-shəl ,tɪp ven'tür-ē ,tüb }

Hertz's law [MECH] A law which gives the radius of contact between a sphere of elastic material and a surface in terms of the sphere's radius, the normal force exerted on the sphere, and Young's modulus for the material of the sphere. { 'hərt-səs ,lə }

heterodyne [ELECTR] To mix two alternating-current signals of different frequencies in a non-linear device for the purpose of producing two new frequencies, the sum of and difference between the two original frequencies. { 'hed-ə-rə,dɪn }

heterodyne detector [ELECTR] A detector in which an unmodulated carrier frequency is combined with the signal of a local oscillator having a slightly different frequency, to provide an audio-frequency beat signal that can be heard with a loudspeaker or headphones; used chiefly for code reception. { 'hed-ə-rə,dɪn di'tek-tər }

heterodyne analyzer [ENG ACOUS] A type of constant-bandwidth analyzer in which the electric signal from a microphone beats with the signal from an oscillator, and one of the side bands produced by this modulation is then passed through a fixed filter and detected. { 'hed-ə-rə,dɪn 'an-ə,liz-ər }

heterodyne frequency meter [ELECTR] A frequency meter in which a known frequency, which

interaction balance method

interaction balance method See goal coordination method. { 'in-tə'rək-shən 'bal-əns ,meth-əd }

interaction prediction method [CONT SYS] A method for coordinating the subproblem solutions in plant decomposition, in which the interaction variables are specified by the second-level controller according to overall optimality conditions, and the subproblems are solved to satisfy local optimality conditions constrained by the specified values of the interaction variables. Also known as feasible method. { 'in-tə'rək-shən prə'dik-shən ,meth-əd }

interbase current [ELECTR] The current that flows from one base connection of a junction tetrode transistor to the other, through the base region. { 'in-tər,bās 'kə-rənt }

intercepting sewer [CIV ENG] A sewer that receives flow from transverse sewers and conducts the water to a treatment plant or disposal point. { ,in-tər'sep-tiŋ 'sü-ər }

interceptometer [ENG] A rain gage which is placed under trees or in foliage to determine the rainfall in that location; by comparing this catch with that from a rain gage set in the open, the amount of rainfall which has been intercepted by foliage is found. { ,in-tər'sep'tām-əd-ər }

interchange [CIV ENG] A junction of two or more highways at a number of separate levels so that traffic can pass from one highway to another without the crossing at grade of traffic streams. [ELEC] The current flowing into or out of a power system which is interconnected with one or more other power systems. { 'in-tər,čānŋ }

interchangeability [ENG] The ability to replace the components, parts, or equipment of one manufacturer with those of another, without losing function or suitability. { ,in-tər,čānŋ-ə'bil-əd-ē }

intercondenser [MECH ENG] A condenser between stages of a multistage steam jet pump. { 'in-tər-kən'den-sər }

interconnection [ELEC] A link between power systems enabling them to draw on one another's reserves in time of need and to take advantage of energy cost differentials resulting from such factors as load diversity, seasonal conditions, time-zone differences, and shared investment in larger generating units. { 'in-tər-kə'nek-shən }

intercooler [MECH ENG] A heat exchanger for cooling fluid between stages of a multistage compressor with consequent saving in power. { 'in-tər'kü-l-ər }

interface resistance [THERMO] 1. Impairment of heat flow caused by the imperfect contact between two materials at an interface. 2. Quantitatively, the temperature difference across the interface divided by the heat flux through it. { 'in-tər,fās ri'zis-təns }

interference fit [DES ENG] A fit wherein one of the mating parts of an assembly is forced into a space provided by the other part in such a way that the condition of maximum metal overlap is achieved. { ,in-tər'fir-əns ,fit }

interference time [IND ENG] Idle machine time

occurring when a machine operator, assigned to two or more semiautomatic machines, is unable to service a machine requiring attention. { ,in-ter'fir-əns ,tīm }

interferometric hydrophone [ENG] A hydrophone in which pressure changes act directly or indirectly to deform an optical fiber and thus produce a phase change in light from a laser or light-emitting diode; the phase change is detected in an interferometer. Also known as fiber-optic hydrophone. { ,in-tər'fir-ə'me-trik ,hi-drə,fōn }

interfit [ENG] The distance extended by the ends of one bit cone into the grooves of an adjacent one in a roller cone bit. Also known as intermesh. { 'in-tər,fit }

interior ballistics [MECH] The science concerned with the combustion of powder, development of pressure, and movement of a projectile in the bore of a gun. { 'in-tir-ē-ər bə'lis-tiks }

interlock [ENG] A switch or other device that prevents activation of a piece of equipment when a protective door is open or some other hazard exists. { 'in-tər,läk }

interlocking cutter [DES ENG] A milling cutter assembly consisting of two mating sections with uniform or alternate overlapping teeth. { 'in-tər'läk-iŋ 'kəd-ər }

intermediate frequency [ELECTR] The frequency produced by combining the received signal with that of the local oscillator in a superheterodyne receiver. Abbreviated i-f. { ,in-tər'mēd-ē-ət 'frē-kwən-sē }

intermediate-frequency amplifier [ELECTR] The section of a superheterodyne receiver that amplifies signals after they have been converted to the fixed intermediate-frequency value by the frequency converter. Abbreviated i-f amplifier. { ,in-tər'mēd-ē-ət 'frē-kwən-sē 'am-plə,fī-ər }

intermediate gear [MECH ENG] An idler gear interposed between a driver and driven gear. { ,in-tər'mēd-ē-ət 'gir }

intermediate material [IND ENG] A manufactured product that requires additional processing before it becomes finished goods. { ,in-tər'mēd-ē-ət mə'tir-ē-əl }

intermesh See interfit. { 'in-tər,mesh }

intermittent current [ELEC] A unidirectional current that flows and ceases to flow at irregular or regular intervals. { 'in-tər'mit-ənt 'kə-rənt }

intermittent defect [ENG] A defect that is not continuously present. { 'in-tər'mit-ənt 'dē ,fekt }

intermittent-duty rating [ENG] An output rating based on operation of a device for specified intervals of time rather than continuous duty. Also known as intermittent rating. { 'in-tər'mit-ənt 'düt-ē 'rād-iŋ }

intermittent firing [MECH ENG] Cyclic firing whereby fuel and air are burned in a furnace for frequent short time periods. { 'in-tər'mit-ənt 'fir-iŋ }

intermittent operation [ENG] Condition in which a device operates normally for a time, then becomes defective for a time, with the process

trail formation

semitrailer that is pulled by the tractor. { 'trā-lər }

trail formation [ENG] Vehicles proceeding one behind the other at designated intervals. Also known as column formation. { 'trāl fôr,mā-shən }

trailing edge [ELECTR] The major portion of the decay of a pulse. { 'trāl-īŋ 'ej }

train [ENG] To aim or direct a radar antenna in azimuth. { 'trān }

training aid [ENG] Any item which is developed or procured primarily to assist in training and the process of learning. { 'trān-īŋ ,āɪd }

training data [CONT SYS] Data entered into a robot's computer at the beginning of an operation. { 'trān-īŋ ,dād-ə }

training wall [CIV ENG] A wall built along the bank of a river or estuary parallel to the direction of flow to direct and confine the flow. { 'trān-īŋ ,wōl }

train shed [CIV ENG] **1.** A structure to protect trains from weather. **2.** The part of a railroad station that covers the tracks. { 'trān ,shed }

trajectory [MECH] The curve described by an object moving through space, as of a meteor through the atmosphere, a planet around the sun, a projectile fired from a gun, or a rocket in flight. { 'trə'jek-trē }

trajectory control [CONT SYS] A type of continuous-path control in which a robot's path is calculated based on mathematical models of joint acceleration, arm loads, and actuating signals. { 'trə'jek-trē kən,trol }

trajectory-measuring system [ENG] A system used to provide information on the spatial position of an object at discrete time intervals throughout a portion of the trajectory or flight path. { 'trə'jek-trē ,mezh-ə-riŋ ,sɪs-təm }

trammel [ENG] A device consisting of a bar, each of whose ends is constrained to move along one of two perpendicular lines; used in drawing ellipses and in the Rowland mounting. { 'tram-əl }

tramway [MECH ENG] An overhead rail, rope, or cable on which wheeled cars run to convey a load. { 'tram,wā }

transceiver [ELECTR] A radio transmitter and receiver combined in one unit and having switching arrangements such as to permit both transmitting and receiving. Also known as transmitter-receiver. { 'tran'sē-vər }

transcription [ENG ACOUS] A recording of a complete radio program, made especially for broadcast purposes. Also known as electrical transcription. { 'tranz'krip-shən }

transducer [ENG] Any device or element which converts an input signal into an output signal of a different form; examples include the microphone, phonograph pickup, loudspeaker, barometer, photoelectric cell, automobile horn, doorbell, and underwater sound transducer. { 'tranz 'dū-sər }

transfer caliper [DES ENG] A caliper having one leg which can be opened (or closed) to remove the instrument from the piece being measured;

used to measure inside recesses or over projections. { 'tranz-fər ,kal-ə-pər }

transfer case [MECH ENG] In a vehicle with more than one driving axle, a housing fitted with gears that distribute the driving power among the axles. { 'tranz-fər ,kās }

transfer chamber [ENG] In plastics processing, a vessel in which thermosetting plastic is softened by heat and pressure before being placed in a closed mold for final curing. { 'tranz-fər ,chām-bər }

transfer chute [ENG] A chute used at a transfer point in a conveyor system; the chute is designed with a curved base or some other feature so that the load be discharged in a centralized stream and in the same direction as the receiving conveyor. { 'tranz-fər ,shūt }

transfer constant [ENG] A transducer rating, equal to one-half the natural logarithm of the complex ratio of the product of the voltage and current entering a transducer to that leaving the transducer when the latter is terminated in its image impedance; alternatively, the product may be that of force and velocity or pressure and volume velocity; the real part of the transfer constant is the image attenuation constant, and the imaginary part is the image phase constant. Also known as transfer factor. { 'tranz-fər ,kän-stənt }

transfer factor See transfer constant. { 'tranz-fər ,fak-tər }

transfer function [CONT SYS] The mathematical relationship between the output of a control system and its input: for a linear system, it is the Laplace transform of the output divided by the Laplace transform of the input under conditions of zero initial-energy storage. { 'tranz-fər ,fəŋk-shən }

transfer grille [ENG] In an air-conditioning system, a grille that permits air to flow from one space to another; may be one of a pair if installed on opposite sides of a wall or door. { 'tranz-fər ,grɪl }

transfer machine [MECH ENG] **1.** Equipment that moves parts from one production location in a factory to another. **2.** A device that holds a workpiece and moves it automatically through the stages of a manufacturing process. { 'tranz-fər mə'shən }

transfer matrix [CONT SYS] The generalization of the concept of a transfer function to a multi-variable system; it is the matrix whose product with the vector representing the input variables yields the vector representing the output variables. { 'tranz-fər ,mā-trɪks }

transfer-matrix method [MECH] A method of analyzing vibrations of complex systems, in which the system is approximated by a finite number of elements connected in a chainlike manner, and matrices are constructed which can be used to determine the configuration and forces acting on one element in terms of those on another. { 'tranz-fər ,mā-trɪks ,meth-əd }

transfer molding [ENG] Molding of thermosetting materials in which the plastic is softened

MEK (methyl ethyl ketone) deoiling. { 'waks ,frak-shə'nā-shən }

wax manufacturing [CHEM ENG] A petroleum refinery process similar to wax fractionation for the manufacture of oil-free waxes by chilling and crystallization from a solvent. { 'waks ,man-ə'fak-chə-rɪŋ }

wax master See wax original. { 'waks 'mas-tər }

wax original [ENG ACOUS] An original recording made on a wax surface and used to make a master. Also known as wax master. { 'waks ə'rɪj-ən-əl }

way point See via point. { 'wa ,pɔɪnt }

ways [CIV ENG] **1.** The tracks and sliding timbers used in launching a vessel. **2.** The building slip or space upon which the sliding timbers or ways, supporting a vessel to be launched, travel. [MECH ENG] Bearing surfaces used to guide and support moving parts of machine tools; may be flat, V-shaped, or dovetailed. { wāz }

wear [ENG] Deterioration of a surface due to material removal caused by relative motion between it and another part. { wer }

wearing course [CIV ENG] The top layer of surfacing on a road. { 'wer-ɪŋ ,kɔrs }

weather bar See water bar. { 'weth-ər ,bār }

weathered joint See weather-struck joint. { 'weth-əd ,jɔɪnt }

weather observation radar See weather radar. { 'weth-ər ,əb-zər,və-shən 'rɑ,dār }

weatherometer [ENG] A device used to subject articles and finishes to accelerated weathering conditions; for example, a rich ultraviolet source, water spray, or salt water. { ,weth-ə'rām-əd-ər }

weatherproof [ENG] Able to withstand exposure to weather without damage. { 'weth-ər ,pruf }

weather radar [ENG] Generally, any radar which is suitable or can be used for the detection of precipitation or clouds. Also known as weather observation radar. { 'weth-ər 'rɑ,dār }

weather resistance [ENG] The ability of a material, paint, film, or the like to withstand the effects of wind, rain, or sun and to retain its appearance and integrity. { 'weth-ər rɪ,zɪs-təns }

weather strip [BUILD] A piece of material, such as wood or rubber, applied to the joints of a window or door to stop drafts. { 'weth-ər ,stri:p }

weather-struck joint [CIV ENG] A horizontal joint in a course of masonry in which the mortar at the upper edge has been pressed in, forming a convex surface that sheds water. Also known as weathered joint. { 'weth-ər ,strak ,jɔɪnt }

web [CIV ENG] The vertical strip connecting the upper and lower flanges of a rail or girder. [MECH ENG] For twist drills and reamers, the central portion of the tool body that joins the loads. { web }

web angle See chisel-edge angle. { 'web ,aŋ-gəl }

Webber number 3 [CHEM ENG] A dimensionless number used in interfacial area determination in distillation equipment, equal to the surface tension divided by the product of the liquid density, the acceleration of gravity, and the depth of

liquid on the tray under consideration. Symbolized N_{w3} . { 'vā-bər ,nəm-bər 'thrē }

web plate [ENG] A steel plate that forms the web of a beam, girder, or truss. { 'web ,plāt }

wedge [DES ENG] A piece of resistant material whose two major surfaces make an acute angle. [ENG] In ultrasonic testing, a device which directs waves of ultrasonic energy into the test piece at an angle. { weɪ }

wedge bit [DES ENG] A tapered-nose noncoring bit, used to ream out the borehole alongside the steel deflecting wedge in hole-deflection operations. Also known as bull-nose bit; wedge reaming bit; wedging bit. { 'weɪ ,bit }

wedge bonding [ENG] A type of thermocompression bonding in which a wedge-shaped tool is used to press a small section of the lead wire onto the bonding pad of an integrated circuit. { 'weɪ ,bænd-ɪŋ }

wedge core lifter [MECH ENG] A core-gripping device consisting of a series of three or more serrated-face, tapered wedges contained in slotted and tapered recesses cut into the inner surface of a lifter case or sleeve; the case is threaded to the inner tube of a core barrel, and as the core enters the inner tube, it lifts the wedges up along the case taper; when the barrel is raised, the wedges are pulled tight, gripping the core. { 'weɪ ,kɔr ,lɪf-tər }

wedge photometer [ENG] A photometer in which the luminous flux density of light from two sources is made equal by pushing into the beam from the brighter source a wedge of absorbing material; the wedge has a scale indicating how much it reduces the flux density, so that the luminous intensities of the sources may be compared. { 'weɪ fə'tām-əd-ər }

wedge reaming bit See wedge bit. { 'weɪ 'rēm-ɪŋ ,bit }

wedging [ENG] **1.** A method used in quarrying to obtain large, regular blocks of building stones; a row of holes is drilled, either by hand or by pneumatic drills, close to each other so that a longitudinal crevice is formed into which a gently sloping steel wedge is driven, and the block of stone can be detached without shattering. **2.** The act of changing the course of a borehole by using a deflecting wedge. **3.** The lodging of two or more wedge-shaped pieces of core inside a core barrel, and therefore blocking it. **4.** The material, moss, or wood used to render the shaft lining tight. { 'weɪ-ɪŋ }

wedging bit See wedge bit. { 'weɪ-ɪŋ ,bit }

weep hole [CIV ENG] A hole in a wood sill, retaining wall, or other structure to allow accumulated water to escape. { 'wep ,hɒl }

weighing rain gage [ENG] A type of recording rain gage, consisting of a receiver in the shape of a funnel which empties into a bucket mounted upon a weighing mechanism; the weight of the catch is recorded, on a clock-driven chart, as inches of precipitation; used at climatological stations. { 'wā-ɪŋ 'ræn gɑɪ }

weight [MECH] **1.** The gravitational force with