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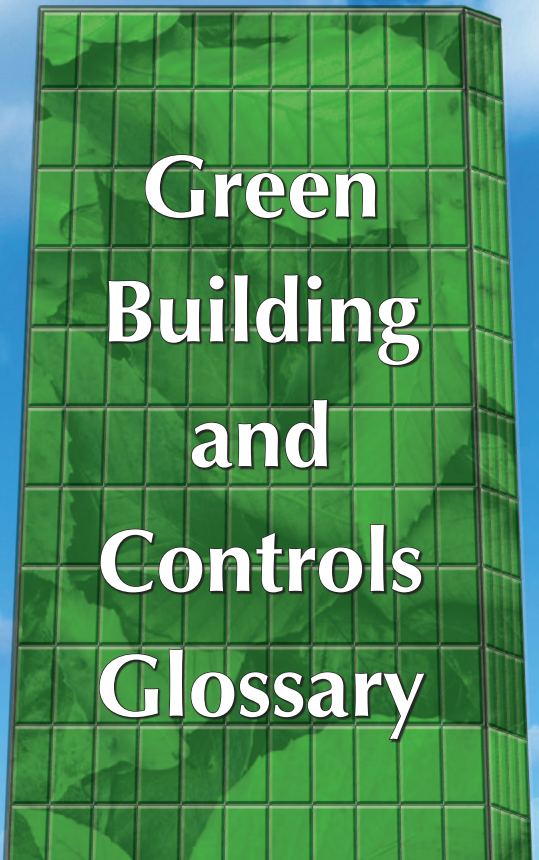

Green Building and Controls Glossary

Read First:

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Green Building and Controls Glossary

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Previous versions of this glossary won four awards for publication excellence:

- *It won in the 2009–2010 publications competition sponsored by the Chicago Chapter of the Society for Technical Communication as well as the 2011–2012 competition sponsored by the West Michigan Shores Chapter. It also went on to win at the 2011–2012 International Summit level. The Society for Technical Communication (STC) is a professional organization dedicated to advancing the arts and sciences of technical communication. It is the largest organization of its type in the world.*
- *It also won in the APEX 2009 publications competition. APEX Awards are based on excellence in graphic design, editorial content, and the ability to achieve overall communications excellence. The APEX 2009 competition had 3,785 entries.*

Contents

Introduction

Goal and Types of Terms

The goal of this glossary is to provide a common ground of understanding of various terms relating to aspects of green buildings. It lists **three types of related terms**:

- Important general terms relating to much of the **green building industry**.
- Terms specifically relating to **indoor environmental quality** and **energy management**.
- Terms relating to **HVAC and building automation systems**.

Terms that are better known by their acronyms are listed by their acronyms. Some terms may have different meanings in other contexts and industries. The over 1,100 definitions and cross-references listed here relate specifically to the HVAC and building industry.

A separate list of over 110 building controls acronyms and abbreviations is also included.

A hyperlinked Adobe Acrobat PDF of this document is available on the KMC Controls web site.

About (QR) Enhanced Content

On various pages, **QR (Quick Response) codes** provide optical hyperlinks to enhanced content on the KMC Controls web site (like this one leading to KMC's *Answers and Education* page). Some links go to KMC product or company information and some to general information related to green buildings and building automation systems.

- To access the topic-related content from a **printed** copy of this glossary, use either a smart phone or a computer with a web cam and a free QR reader application (such as from *www.quickmark.com.tw*) to follow the link to the web site.
- To access this content from an Adobe® Acrobat® **PDF** of this glossary, merely click on the code graphic. (Then click *Allow* at the Acrobat prompt.)

(Some smart phones may have limited compatibility with features on the KMC web site, which is optimized for Flash-enabled web browsers.)

Why Go Green?

Green is good for the triple bottom line (people, planet, and profits). Green buildings are good for occupants (healthier and more comfortable working space), good for our environment (reduced resource depletion and higher sustainability), and good for business (higher employee productivity, lower energy and life cycle costs, higher client attraction/retention, higher resale value, and enhanced public relations).

Although any building may be built or remodeled with various enhanced green characteristics, significant advantages exist in obtaining building certification by one of the "green" organizations, such as (among others) the U.S. Green Building Council's LEED (Leadership in Energy and Environmental Design) Green Building Rating System.® A certified building will not only have all the benefits of a green building, but compared to a noncertified building, it will also have enhanced recognition and public relations value, greater attraction and retention of clients, and higher resale value.

KMC "Green" Tools

The increased sustainability of green buildings reduces negative impact on resources and the environment and helps preserve the earth for future generations. At KMC Controls, we believe that people and the planet matter, and, long-term, what's good for people and the planet profits everyone. KMC can help you go green.

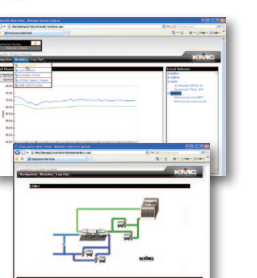
KMC products, for example, provide powerful tools toward achieving points for LEED certification. (See the next section for examples within LEED categories.) In many government, school, hospital, hotel, office, and other commercial buildings, our controls have been managing energy for decades—minimizing energy use while optimizing occupant comfort. Monitoring of air temperature, humidity, pressure, and CO/CO_2 levels provides for the controlling of conditions, sounding alarms, and recording trends. We also offer energy (including alternate energy sources) metering and monitoring to help provide

data for certification submission. Other applications include smoke control, lighting control, daylight harvesting, rainwater harvesting, and landscape irrigation.

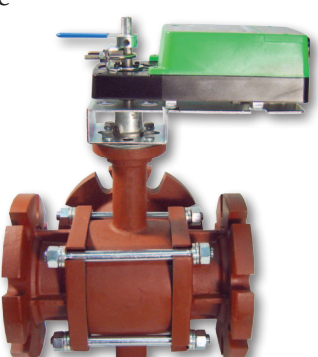
KMC's powerful hardware and software tools that help minimize operating costs, maximize comfort and productivity, and help gain "green" certification include the following devices and systems:

- Our open-standard native BACnet® or proprietary KMDigital® advanced application controllers and thermostats, along with setup and operating software, provide flexible control over entire HVAC, smoke control, and related systems.

- Sensors detect temperature, humidity, pressure, occupancy, CO_2, CO, smoke, and electrical current.



- Actuators, valves, relays, and other control devices perform the necessary electronic, electrical, and mechanical actions as directed by the controllers.
- Other network devices include routers, repeaters/ isolators, web servers, computer interfaces, and metering/ monitoring equipment.



LEED Points and KMC Products

The following shows the LEED categories (in New Construction and Major Renovation), the maximum points for a particular credit (prerequisites are required), and the relevant KMC Controls products that can contribute to achieving the points.

Sustainable Sites (20% of total points)

Credit 8: Light Pollution Reduction (1)—KMC lighting controllers, sensors, and software reduce unnecessary lighting.

Water Efficiency (7%)

Prerequisite 1: Water Use Reduction—20% Reduction (*)—KMC controllers, sensors, and software can control rainwater harvesting and landscape irrigation.

Credit 1: Water Efficient Landscaping (4)—KMC controllers, sensors, and software can control rainwater harvesting and landscape irrigation.

Energy and Atmosphere (25%)

Prerequisite 1: Fundamental Commissioning of Building Energy Systems (*)—KMC controllers, sensors, and software gather measured data into trend logs and other reports for verification of operation during commissioning.

Prerequisite 2: Minimum Energy Performance (*)—KMC HVAC and lighting controllers, sensors, and software help minimize energy usage while enhancing occupant comfort.

Prerequisite 3: Fundamental Refrigerant Management (*)—KMC refrigerant sight-glass monitor and alarm monitor safeguard against buildup of flash gas and moisture.

Credit 1: Optimize Energy Performance (19)—KMC HVAC and lighting controllers, sensors, and software help minimize energy usage while enhancing occupant comfort.

Credit 2: On-Site Renewable Energy (7)—KMC controllers, sensors, and software measure and record current generated by wind turbines, photovoltaic panels, or other clean energy sources.

Credit 3: Enhanced Commissioning (2)—KMC provided installation guides, operation guides, and software help systems facilitate training of operating personnel and occupants. Network software training classes are also available.

Credit 4: Enhanced Refrigerant Management (2)—KMC refrigerant sight-glass monitor and alarm monitor safeguard against buildup of flash gas and moisture.

Credit 5: Measurement and Verification (3)—KMC controllers, sensors, and software gather measured data into trend logs to ensure that optimum performance is maintained.

Credit 6: Green Power (2)—KMC controllers, sensors, and software measure and record current generated by wind turbines, PV panels, or other clean energy sources.

Indoor Environmental Quality (22%)

Prerequisite 1: Minimum Indoor Air Quality Performance (*)—KMC HVAC controllers, sensors, and software provide adequate ventilation as needed.

Prerequisite 2: Environmental Tobacco Smoke (ETS) Control (*)—KMC HVAC controllers, sensors, and software can exhaust air (without recirculation), maintaining negative pressure, from designated smoking areas.

Credit 1: Outdoor Air Delivery Monitoring (1)—KMC HVAC controllers, sensors, and software can monitor indoor CO_2 levels and fresh outdoor airflow.

Credit 2: Increased Ventilation (1)—KMC HVAC controllers, sensors, and software can increase fresh outdoor air ventilation rates to occupied spaces by at least 30% above the minimum rates required by ASHRAE Standard 62.1-2004.

Credit 3.2: Construction IAQ Management Plan—Before Occupancy (1)—KMC HVAC controllers, sensors, and software can provide flush-out sequence before occupancy.

Credit 5: Indoor Chemical and Pollutant Source Control (1)—KMC HVAC controllers, sensors, and software can exhaust air (without recircula-

tion), maintaining negative pressure, from areas containing possible pollution sources.

Credit 6.1: Controllability of Systems—Lighting (1)—KMC lighting controllers, sensors, and software provide individualized control of area lighting.

Credit 6.2: Controllability of Systems—Thermal Comfort (1)—KMC HVAC controllers, sensors, and software allow adjustment of setpoints within zones of space temperature and humidity to optimize comfort.

Credit 7.1: Thermal Comfort—Design (1)—KMC HVAC controllers, sensors, and software help to minimize energy usage while maintaining occupant comfort, and they provide reporting, monitoring, trending, and alarming of thermal comfort conditions.

Credit 7.2: Thermal Comfort—Verification (1)—KMC controllers, sensors, and software gather measured data into trend logs for analysis and corrective action.

NOTE:

- LEED prerequisites (*) are required.
- LEED credits are optional, and their points accumulate to the total needed for a certain level of certification (40 is the minimum for certification).
- Attaining the maximum possible points for any credit will require more processes and/or materials than KMC products alone.

About KMC Controls

KMC Controls (formerly Kreuter Manufacturing Company) has been designing and manufacturing building automation solutions, HVAC control products, and energy management solutions since 1969. KMC remains the only privately held controls manufacturer with a full line of digital, electronic, and pneumatic products in the United States. As a financially solid family-owned-and-operated entity, KMC Controls delivers a responsiveness and flexibility not found in larger companies and corporate mergers.

KMC is committed to taking an active role in protecting the environment. **Our mission statement is: "KMC Controls is committed to design energy saving and environmentally sustaining building automation products that are developed, manufactured, and supported by creative and dedicated people."**

KMC is dedicated to developing and maintaining controlled processes to competitively service our world-wide

customer base, with building control products that meet government regulations, international standards, and customer requirements. KMC has an ISO 9001:2008 registered quality system in place.

KMC's intellectual property includes dozens of patents, and professional affiliations include BACnet International and USGBC. KMC maintains regional sales offices throughout the U.S. and distributes its solutions and products through value-added, authorized installing contractors, wholesalers, and OEMs throughout North America as well as authorized distributors worldwide.

For more information about KMC Controls, our products, and what we can do for you, visit www.kmccontrols.com. For information particularly relevant to this glossary, download these brochures (among many others):

SB-048 Controlling Your Green Building Brochure

SB-052 KMC Corporate Capabilities Brochure

Web Resources

Additional information about green buildings and building automation can be found on the following web sites:

Advanced Buildings Technologies & Practices www.advancedbuildings.org

Alliance to Save Energy
www.ase.org

ASHRAE
www.ashrae.org

BACnet International
www.bacnetinternational.org

Building Energy Codes Program
www.energycodes.gov

Continental Automated Buildings Association www.caba.org

Canada Green Building Council
www.cagbc.org

DOE Office of Energy Efficiency and Renewable Energy www.eere.energy.gov

Efficiency Valuation Organization
www.evo-world.org

ENERGY STAR® Label
www.energystar.gov

EnOcean Alliance
www.enocean-alliance.org

Green Seal®
www.greenseal.org

GreenSpec®
www.buildinggreen.com

iGreenBuild.com
www.igreenbuild.com

KMC Controls
www.kmccontrols.com

Natural Resources Canada's Office of Energy Efficiency www.oee.nrcan.gc.ca

U.S. Green Building Council
www.usgbc.org

Whole Building Design Guide
www.wbdg.org

Zero Energy Commercial Buildings Consortium
www.zeroenergycbc.org

Acronyms/Abbreviations

@ = at

° = degrees

Ω = ohms

µs = microsecond

A = amperes

A/C = air conditioning

AAC = Advanced Application Controller

ABS = acrylonitrile butadiene styrene (plastic)

AC = alternating current

AHU = air handling unit

amp = amperes

ASHRAE = American Society of Heating, Refrigerating and Air-Conditioning Engineers

AWG = American Wire Gauge

BACnet = Building Automation Control network

BTL = BACnet Testing Laboratories

BTU = British Thermal Unit

C = Celsius

cfh = cubic feet per hour

cfm = cubic feet per minute

cm = centimeters

CO_2 = carbon dioxide

CO = carbon monoxide

CSA = Canadian Standards Association

CSFM = California State Fire Marshall

CT = current transducer

CUL = (UL certification to CSA requirements)

Cv = valve flow coefficient

DA = direct acting

DAT = discharge air temperature

DC = direct current

DPDT = double pole double throw

DPST = double pole single throw

EIA = Electronic Industries Alliance or U. S. Energy Information Administration

EOL = end of line

EP = electric to pneumatic

EPDM = ethylene propylene diene monomer (synthetic rubber)

ETL = Electrical Testing Laboratories

F = Fahrenheit

FACP = Fire Alarm Control Panel

FCU = Fan Coil Unit

FIU = Fan Induction Unit

FLA = full load amperes

fpm = feet per minute

FPT = female pipe thread

FS = full scale

FSCS = Firefighters' Smoke Control Station

FSO = full scale output

FST = fan status

ft-lb. = foot pound

g = grams

GBCI = Green Building Certification Institute

GHG = greenhouse gas

gpm = gallons per minute

GWP = Global Warming Potential

Hg = mercury

hp = horsepower

HPU = Heat Pump Unit

HVAC = heating ventilating and air conditioning

Hz = hertz

ID = inside diameter

in-lb. = inch pound

IP = Internet protocol or (in reference to enclosure ratings) ingress protection

kbps = kilobits per second

KMDigital = KMC Digital

kPa = kilopascals

kW = kilowatt

kWh = kilowatt-hour

LAT = leaving air temperature (= DAT)

LCD = liquid crystal display

LED = light emitting diode

LRA = locked rotor amperes

m = meters

mA = milliamperes

MAC = media access control

max. = maximum

MEA = Materials and Equipment Acceptance

MEP = mechanical, electrical, and plumbing

min. = minimum

mL/s = milliliters per second

mm = millimeters

MPT = male pipe thread

MS/TP = master-slave/token-passing

NC = normally closed

NEMA = National Electrical Manufacturers Association

NO = normally open

NPS = National Pipe Straight

NPT = National Pipe Tapered (Thread)

NTC = negative temperature coefficient

N•m = Newton meters

OAT = outside air temperature

OD = outside diameter

OLE = Object Linking and Embedding

OPC = OLE for Process Control

OSA = Open System Architecture (i.e., BACnet)

Pa = pascals

PE = pneumatic to electric (volts)

pF = picofarad

PI = pneumatic to current (amperes)

ppm = parts per million

psi = pounds per square inch

psid = pounds per square inch differential

psig = pounds per square inch gauge

PTC = positive temperature coefficient

PWM = pulse width modulation

RA = reverse acting

REC = Renewable Energy Certificate

RH = relative humidity

rms = root mean square

RTC = real time clock

RTU = Roof Top Unit

SAT = supply air temperature

scfh = standard cubic feet per hour

scim = standard cubic inches per minute

SPDT = single pole double throw

SPST = single pole single throw

stat = thermostat

UL = Underwriters Laboratories

USB = universal serial bus

USGBC = U.S. Green Building Council

UUKL = (a UL category for smoke control devices)

V = volts

VA = volt-ampere

VAC = volts alternating current

VAV = variable air volume

VDC = volts direct current

W = watts

wc = water column

wg = water gauge

XML = Extensible Markup Language

ZEB = Zero Energy Building

Definitions

Numbers

232—See *EIA-232*.

485—See *EIA-485*.

8802-2 and 8802-3—An international standard, ISO 8802-3 is commonly called "Ethernet." The 8802-3-style Ethernet, using the 8802-2 Link Service Access Point, is used by BACnet.

A

AAC (Advanced Application Controller)—See *BACnet Advanced Application Controller.*

Absolute Pressure—The sum of the gauge pressure reading and atmospheric pressure. See also *PSIA*.

A/C—See *Air Conditioning* and *Heating, Ventilating, and Air Conditioning*.

AC—See *Alternating Current*.

Accuracy—The maximum difference between the actual value of the measured variable and the indicated value.

ACE—See *Air Change Effectiveness*.

ACH—See *Air Changes per Hour*.

Action—In an HVAC system, the movement of a controller output signal in response to an input signal change. See *Direct Acting* and *Reverse Acting*.

Active Diffuser—An air supply outlet with a local fan to deliver air from the plenum through the diffuser into the conditioned space.

Active System—A traditional HVAC system that uses mechanical means to artificially condition (cool, heat, ventilate) the air supply in a building and that draws power for these processes from electricity or gas.

Actuator—A component or assembly of components that moves a device in a linear, rotary, or differential motion. Actuators (responding to digital, electrical, or pneumatic controller signals) may open and close valves and change the position of control air dampers.

Actuator, Linear—An electric or pneumatic device that sets a valve, damper, or linkage in a straight line motion.

Actuator, Rotary—An electric or pneumatic device that sets a valve, damper, or linkage in a circular or angular motion.

A/D—See *Analog to Digital*.

Addition Relay—A pneumatic switch that adds signals together to create an output to a controlled device.

Advanced Application Controller (AAC)—See *BACnet Advanced Application Controller*.

AEE (Association of Energy Engineers)—A trade organization for certification and information on energy efficiency, utility deregulation, facility management, plant engineering, and environmental compliance.

Aerosol—Liquid droplets or solid particles suspended in air and fine enough to remain dispersed for a period of time.

AHU—See *Air Handling Unit*.

AI—See *Analog Input or Output*.

AIC (Authorized Installing Contractor)—See *Authorized Contractor*.

Air Barrier—Material installed around a building frame to reduce the infiltration of air into the interior.

Air Change—The replacement of air contained within a room with an equivalent volume of fresh air.

Air Change Effectiveness (ACE)—The ability of an air distribution system to provide ventilation (outside) air at the breathing zone (where occupants breathe). It is defined as the age of air that would occur throughout the space if the air was perfectly mixed, divided by the average age of air where occupants breathe.

Air Changes per Hour (ACH)—A measure of the air exchange rate of a building or space.

Air Cleaner—A filtering device that actively removes impurities from the air.

Air Conditioning (A/C)—A system that extracts heat from an area using a refrigeration cycle. A complete system of heating, ventilation, and air conditioning is referred to as HVAC. See *Heating Ventilating and Air Conditioning*.

Air-Conditioning and Refrigeration Institute (ARI)—A trade association (represent-

ing manufacturers of more than 90 percent of the air conditioning and commercial refrigeration equipment installed in North America) that develops standards for and certifies the performance of these products.

Air Consumption—The volume of air required to operate a pneumatic device.

Air Diffuser/Diffusion—See *Diffuser*.

Air Distribution—The transportation of a specified air flow to or from the treated space or spaces, generally by means of ductwork.

Air Exchange Rate—A measure of the rate at which the volume of air contained within a space is replaced by supply (outside, conditioned, or re-circulated) air. It is expressed in terms of air changes per hour and found by dividing the airflow rate (volume per hour) by the volume of the space or building.

Air Flow—The movement of air within a room, duct, or plenum.

Air Flow Sensor—A device that measures air velocity (via differential pressure) inside a duct.

Air Flow Transducer—A unit that senses changes in air pressure and sends a proportional electrical signal to a controller.

Air Handler—See *Air Handling Unit (AHU)*.

Air Handling Unit (AHU)—An HVAC system component that conditions and delivers air through the system. It typically contains one or more supply and return fans, heating/cooling coils, and filters to condition the air. Conditioning may include particulate filtering, adding or removing heat, and adding or removing moisture. A varying portion of the return air from the conditioned space may be recirculated and mixed with incoming outside air for delivery to the conditioned space.

Air Inlet—An aperture (grille, diffuser, or louvered opening) through which air is intentionally drawn from a conditioned space.

Air Outlet—An aperture (grille, diffuser, or louvered opening) through which air is intentionally delivered to a conditioned space.

Air Quality Standard—A government-mandated regulation specifying the maximum contaminant concentration

beyond which health risks are considered to be unacceptable.

Air Retarder—See *Air Barrier*.

Air Supply Volume—The volume of supply air flowing through a cross-sectional plane of a duct per unit time, found by multiplying air velocity by the cross-sectional area of the duct.

Air-to-Air Heat Exchanger—See *Energy Recovery Ventilator*.

Air Velocity—The rate at which air travels in a given direction.

Alarm—An audible or visual message indicating a value is out of range or an abnormal condition is present.

Algorithm—A prescribed set of rules or processes for calculating the solution of a problem in a finite number of steps. DDC controllers use information from inputs and algorithms to calculate the most efficient control of outputs.

Allergen—A substance (also known as an antigen) that can trigger immune responses resulting in an allergic reaction.

Alternating Current (AC)—An electrical voltage that reverses polarity over time

and has positive and negative values. Contrast with *Direct Current*.

Alternative Energy—See *Green Power*.

Ambient Air—Air in the general surroundings of the space in question.

Ambient Temperature—The temperature of air or fluid which surrounds an object on its sides.

American National Standards Institute—See *ANSI*.

American Society of Heating, Refrigerating and Air-Conditioning Engineers—See *ASHRAE*.

American Wire Gauge—A system for specifying wire diameter sizes. The gauge number varies inversely with the wire diameter.

Analog—A system that generates, stores, and processes data in the form of continuously variable physical quantities. Contrast with *Digital*.

Analog Input or Output (AI or AO)—In HVAC system controllers, an analog signal, typically provided in 4–20 mA or 1–5 VDC input signals or 0–10 VDC output signals.

Analog to Digital (A/D)—An electronic process in which a continuously variable (analog) signal is changed, without altering its essential content, into a discrete multi-level (digital) signal.

ANSI (American National Standards Institute)—A private nonprofit organization overseeing the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. The organization also coordinates U.S. standards with international standards so that American products can be used worldwide.

Antigen—See *Allergen*.

AO—See *Analog Input or Output*.

Application Software—Programs that provide functions such as direct digital control, energy management, lighting control, event initiated operations, and other alarm and monitoring routines.

ARI—See *Air-Conditioning and Refrigeration Institute*.

ARP—See *Address Resolution Protocol*.

ASC (Application Specific Controller)—See *BACnet Application Specific Controller*.

ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers)—A world-wide organization that promotes the arts and sciences of heating, ventilation, air conditioning, and refrigeration and that publishes standards. Particularly important in relationship to green building construction is ASHRAE 90.1 *Energy Standard for Buildings Except Low-Rise Residential Buildings*, a code setting requirements for energy efficiency and methods of determining compliance.

ASHRAE Standard 55—Thermal Environmental Conditions for Human Occupancy is the standard that defines human thermal comfort.

ASHRAE Standard 62—Ventilation for Acceptable Indoor Air Quality is the standard that defines indoor air quality and ventilation rates.

ASHRAE Standard 90.1—Energy Standard for Buildings Except Low-Rise Residential Buildings, since being developed in response to the energy crisis in the 1970s, has become the basis for building codes and the standard for building design and construction throughout the United States.

ASHRAE Standard 135—BACnet—a Data Communication Protocol for Building Automation and Control Networks is the standard defining BACnet. See *BACnet*.

ASHRAE Standard 189.1—The Standard for the Design of High Performance, Green Buildings Except Low-Rise Residential Buildings is the first code-intended commercial green building standard in the United States. The energy efficiency goal is to provide significant energy reduction over that in Standard 90.1-2007.

Association of Energy Engineers—See *AEE*.

ASTM International (ASTM)—Originally known as the American Society for Testing and Materials, it is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

Atmospheric Pressure—The pressure due to the weight of the atmosphere (14.7 psi at sea level).

Authority—A setting that determines the effect of a secondary input signal (such as outdoor air temperature) that resets

or changes the setpoint on a pneumatic controller or two-input electronic controller. It is reported as a percentage of the primary input signal.

Authorized Installing Contractor (AIC)—See *Authorized Contractor*.

Authorized Contractor—A contractor authorized and trained by a manufacturer to install particular HVAC controls systems.

Authorized Representative—See *Authorized Contractor*.

Automatic Control System—A system that reacts to a change or imbalance in the variable it controls by adjusting other variables to restore the system to the desired balance.

Auxiliary Device—Equipment in automatic control systems that is not itself an automatic control (e.g., air compressor, transformer, thermometer).

Averaging Element—A sensor with multiple sampling points used for duct temperature control when a large temperature gradient exists across a duct.

Averaging Relay—A pneumatic unit used in applications that require the averaged

signal from two or more controllers as an output to a final control device.

AWG—See *American Wire Gauge*.

B

B-AAC—See *BACnet Advanced Application Controller*.

Backbone—A high-capacity network transporting traffic between segments.

BACnet® (Building Automation Control Network)—An interoperable, nonproprietary, communication protocol standard (ANSI/ASHRAE Standard 135), conceived by a consortium of building managers, system users, and manufacturers under the auspices of ASHRAE. BACnet defines how information is packaged for transportation between building automation system vendors.

BACnet Advanced Application Controller (B-AAC)—A control device intended for specific applications that do not require the resources of a B-BC. The

B-AAC must meet the requirements of the BACnet Standard for Advanced Application Controllers.

BACnet Application Specific Controller (B-ASC)—A controller intended for specific applications that do not require the resources of a B-AAC.

BACnet Broadcast Management Device (BBMD)—A device for transmitting BACnet broadcast messages across IP. Since global broadcast messages are usually inherently blocked by standard IP routers connecting separate IP subnets, BBMDs act as broadcast managers for networks of BACnet IP devices. Multiple BBMDs (on different subnets) may store a table of the IP addresses of each BBMD. When a global broadcast message is sent, all devices on the local subnet, including the BBMD, receive it, and the local BBMD forwards the broadcast message to the other subnets by way of their BBMDs.

BACnet Broadcast—A message intended for a group of devices on an inter-network. The three types of BACnet broadcasts are global (all devices in the *internetwork* get the message), remote (all devices in a *remote* network get the

message), and local (all devices in the *local* network get the message).

BACnet Building Controller (B-BC)—A general-purpose field-programmable device capable of a variety of building automation tasks, such as being a coordinator/controller of other BACnet devices.

BACnet Device—Any device, real or virtual, that supports digital communication using the BACnet protocol.

BACnet International—An industry organization encouraging the use of BACnet through interoperability testing, educational programs, and promotional activities. Members include companies involved in the design, manufacturing, installation, commissioning, and maintenance of BACnet control equipment.

BACnet Interoperability Building Block (BIBB)—One of a collection of BACnet services that function to define the interoperable capabilities of a BACnet device.

BACnet Operator WorkStation (B-OWS)—An operator interface with a BACnet system.

BACnet Smart Actuator (B-SA)—A simple control device intended for specific applications that meets the requirements of the BACnet standard for smart actuators.

BACnet Smart Sensor (B-SA)—A simple sensing device with very limited resources that meets the BACnet standard for smart sensors.

BACnet Testing Laboratories™ (BTL)—The testing agency formed by the BACnet Manufacturers Association to test building automation products and certify them as BACnet compliant.

BACstage™—KMC's configuration tool and user interface for small and cost-sensitive BACnet projects.

Baffle—An orifice placed in the duct or other opening to reduce the size.

Bakeout—A technique for reducing the exposure of occupants to emissions of new construction. The building temperature is raised to a high level (to enhance emissions of volatile compounds from new materials) for

several days before occupancy, while running the ventilation system at full capacity to exhaust the emissions. See also *Flushout*.

Balance Point—The outdoor temperature at which a building's heat loss to the environment is equal to internal heat gains from people, lights, and equipment.

Balancing—The process of adjusting air flow in duct systems or water flow in hydronic systems to provide optimal accuracy and control in an HVAC system.

Ball Valve—A valve that uses a rotating sphere, with a hole through its center, to control fluid flow. Such valves might have sweat, threaded, or flanged connections. Contrast with *Globe Valve*.

Bandwidth—The amount of information (including overhead) that can pass over a given data transmission line in a set amount of time. The larger the bandwidth, the more information can be transmitted in a given time period.

Bandwidth Utilization—The amount of total bandwidth currently in use, measured as a percentage of the whole.

Barometer—An instrument that measures atmospheric pressure.

BAS—See *Building Automation System*.

Baseline Building Performance—Total building energy costs annually. This value is compared with design cases to compute energy savings of proposed designs.

B-ASC—See *BACnet Application Specific Controller*.

Baud Rate—A reference to the speed at which a modem or other serial device can transmit data.

B-BC—See *BACnet Building Controller*.

BBMD—See *BACnet Broadcast Management Device*.

BCS—See *Building Control System*.

BI—See *Binary Input or Output*.

Bias—In a control device, the output signal when its input signal is equal to zero.

BIBB—See *BACnet Interoperability Building Block*.

Binary—A two-digit (base 2) numerical system, which digital systems use to store data and compute functions.

Binary Input or Output—In HVAC system controllers, a digital (on or off) signal, typically provided as 0 or 12 VDC signals for HVAC systems.

Bioaerosols—Airborne microbial contaminants, including viruses, bacteria, fungi, algae, and protozoa.

Biocontaminant—Contaminants that are either life forms (e.g., bacteria) or are derived from living things (e.g., rodent droppings).

Blower—A ducted fan for moving air through a system.

BLP—See *Branch Line Pressure*.

BMCS—See *Building Management and Control System*.

BMS—See *Building Management System*.

BO—See *Binary Input or Output*.

Body Rating—In a valve, the operating limit expressed as a function of temperature and pressure. See *Valve Body Rating, Actual/Nominal*.

B-OWS—See *BACnet Operator WorkStation*.

Branch Line—In pneumatic control systems, an air line connecting controllers to final devices such as actuators.

Branch Line Pressure (BLP)—In a pneumatic system, a varying air pressure signal from a controller to an actuator carried by the branch line.

Breathing Zone—In an occupied space, the region between three and six feet above the floor and at least two feet from walls or fixed air-conditioning equipment.

Bridge—A device that connects two LANs or two segments of the same LAN.

British Thermal Unit (BTU)—The quantity of heat necessary to raise one pound of water one degree Fahrenheit.

Broadcast Domain—All devices (on a LAN or VLAN) sharing the same subnet and gateway address that can directly communicate with each other without going through a routing device.

B-SA—See *BACnet Smart Actuator*.

B-SS—See *BACnet Smart Sensor*.

BTL—See *BACnet Testing Laboratories*.

BTU—See *British Thermal Unit*.

Building Automation Control Network—See *BACnet*.

Building Automation System (BAS)—An integration of digital, electronic, and/or pneumatic controls and devices to provide unattended and automatic operation of buildings systems. Systems may include HVAC, elevators, fire suppression, smoke control, security, lighting, and other subsystems.

Building Codes—Rules specifying the minimum acceptable levels of safety for buildings and other structures.

Building Control System (BCS)—See *Building Management System*.

Building Controller—See *BACnet Building Controller)*.

Building Ecology—The physical environment and systems found inside the building.

Building Envelope (or Shell)—The separation between the interior and exterior of the building, including all walls, windows, floor, and roof.

Building Management and Control System (BMCS)—See *Building Management System*.

Building Management System (BMS)—A system for centralizing and optimizing the monitoring, operating, and managing of a building. Services may include heating, cooling, ventilation, lighting, security, and energy management. See also *Building Automation System*.

Building-Related Illness—A diagnosable illness with identifiable symptoms that can be directly attributed to airborne pollutants within the building (e.g., Legionnaires disease).

Built Environment—Structures created by humans (as opposed to the natural environment).

Buoyancy—The tendency of warmer air or smoke to rise because cooler air is denser.

Butterfly Valve—A type of valve that uses a disc, rotating on an axis within the valve body, to control flow.

C

CABA (Continental Automated Buildings Association)—A nonprofit industry association that promotes advanced technologies for the automation of homes and buildings in North America.

Calibration Point—The temperature setpoint at which a control is calibrated.

Capacity Index—See *Valve Flow Coefficient*.

Carbon Monoxide (CO)—A colorless, odorless, very toxic gas, consisting of carbon and oxygen, that is formed as a product of the incomplete combustion of carbon.

Carbon Dioxide (CO_2)—A heavy, colorless gas, consisting of one carbon atom and two oxygen atoms, that is formed in animal respiration and in the decay or combustion of animal and vegetable matter. It is absorbed from the air by plants in photosynthesis and is an atmospheric greenhouse gas. See also *Demand Control Ventilation*.

Carbon Footprint—The impact human activities have on the environment in terms of the amount of greenhouse

gases produced, measured in units of carbon dioxide.

Carbon Neutral—A state of achieving net zero carbon emissions by balancing the amount of carbon dioxide released with an equivalent offset. This is typically attempted in practice by reducing carbon emissions as much as possible and then having trees planted to offset the remainder.

Carcinogen—A substance suspected or known to cause or promote propagation of cancer.

CAV—See *Constant Air Volume*.

Cavitation—A term used to describe the behavior of bubbles in a liquid. Bursting bubbles (e.g., in valves) produce shock waves that can cause noise, vibration, component damage, and efficiency loss. See also *Pressure Drop, Critical*.

Ceiling-Based Distribution System—See *Overhead Distribution System*.

Celsius Scale—The temperature scale with 0° representing the freezing point of water and 100° representing the boiling point of water under standard atmospheric conditions.

Centigrade Scale—See *Celsius Scale*.

Central Plant—An area or building in which the chillers and boilers for a building or group of buildings are located.

Certification—A means of providing a third-party verification and measure of achievement. A certification (such as LEED) for buildings provides quality assurance, performance verification, public relations value, and other benefits.

CFC (Chlorofluorocarbon)—A group of organic compounds containing carbon, chlorine, fluorine, and sometimes hydrogen that have been used as refrigerants, cleaning solvents, aerosol propellants, and in the manufacture of plastic foams. CFCs have been linked to the destruction of the ozone layer, and their use is being phased out. For LEED certification, new buildings may not use CFC-based refrigerants. See *HCFC* and *HFC*.

CFM (Cubic Feet per Minute)—A rate of flow of a gas or air volume into or out of a space.

Characterized Ball Valve—A ball valve with a special insert, forming a parabolic shaped opening, that provides equal percentage flow.

Charrette—A collaborative session in which a group, consisting of designers, architects, and/or other professionals, drafts solutions to construction design issues.

Chilled Beam—A system of cooling (or heating) using water circulating in coils embedded in the ceiling or in separate, suspended beams. "Active" beams also have ventilation incorporated with the coils.

Chiller—An A/C device that cools water (instead of air) for distribution via pipes through a building.

Chimney Effect—See *Stack Effect*.

Chlorofluorocarbon—See *CFC*.

CIM (Cubic Inches per Minute)—A rate of flow of a gas or air volume into or out of a space.

Client/Server—A network architecture in which stand-alone computers or devices on the network share information and resources through a common central site or server. The client sends requests to the server.

Climate Control—An HVAC system.

Closed Loop—A configuration that generates a response to maintain the controlled variable at its setpoint. It incorporates a feedback path between the control point of the process and the controller's input. See also *Control Loop*.

Close-Off Rating—The maximum pressure drop that a valve can withstand without leakage while in the fully closed position. It is a function of actuator power to hold the valve closed against pressure drop, but structural parts such as the stem can be the limiting factor.

CO—See *Carbon Monoxide*.

CO_2—See *Carbon Dioxide* and also *Demand Control Ventilation*.

Coaxial Cable—A round, flexible, two-conductor cable that consists of a copper wire (at the center), a layer of protec-

tive insulation, a braided mesh sleeve, and an outer shield or jacket.

Coil—(1) In an HVAC system, a connected series of pipes, tubing, or wires for the transfer of heat from or to the passing air. (2) A cylindrical wire winding, such as in a transformer, relay, or motor.

Combination Fire and Smoke Damper—A device that resists the passage of air, fire, and smoke and meets the requirements of UL 555, Standard for Fire Dampers, and UL 555S, Standard for Leakage Rated Dampers for Use In Smoke Control Systems.

Combined Heat and Power (CHP) or Cogeneration—Generating both electrical power and thermal energy from a single fuel source.

Combustion By-Products—Gases and small particles (e.g., carbon monoxide, nitrogen dioxide, carbon dioxide, sulphur dioxide, water vapor, particles, and unburned hydrocarbons) caused by the incomplete burning of fuels.

Comfort Criteria—Specific design conditions that take into account temperature, humidity, air speed, outdoor tem-

perature, outdoor humidity, seasonal clothing, and expected activity.

Comfort Envelope—See *Comfort Zone*.

Comfort Zone—The range of conditions in mechanically ventilated buildings in which the majority of occupants are likely to feel comfortable. ASHRAE's Standard 55 defines a comfort zone based on the six variables of air temperature, air velocity, relative humidity, radiant temperature, occupant's clothing insulation, and occupant's activity level.

Commissioning—A process of testing, verifying, and documenting that new building equipment and systems are installed and able to operate according to the design intent.

CommTalk®—A KMC series of protocol and communication interfaces for use in KMDigital networks. Some models act as modems and others as protocol interfaces with third-party devices.

Communication—In a network, the process of sharing information among devices.

Communications Protocol—A set of conventions used to govern the format and content of messages between devices.

Compensation Control—A process of automatically adjusting/resetting the control point of a given controller to compensate for changes in a second measured variable such as outdoor air temperature.

Compensation Sensor—A system element that senses a variable other than the controlled variable and resets the main control point.

Compressor—In an HVAC system, a pump that increases the pressure and temperature of a refrigerant gas by reducing its volume and then delivering it to a condenser.

Condensation—The change in matter of a substance to a denser phase, such as the deposit of water vapor from air on a cold surface that has a temperature below the dew point.

Condenser—An HVAC component used to convert a vapor or gas to a liquid.

Conditioned Air—Air that has been treated by altering temperature, humidity, cleanliness (filtering), and/or the mix of outside and recirculated air.

Conditioned Space—A space in which an HVAC system supplies conditioned air

to produce acceptable thermal comfort and indoor air quality conditions.

Conduction—The transfer of heat by contact from warmer to cooler in a medium or between two objects. See also *Convection* and *Radiation*.

Conductor—A material capable of the transmitting electricity, heat, or sound.

Conformal Coating—A protective finish applied to a device for prevention of corrosion or other degradation of performance.

Conformance Class—A description of the capabilities of a BACnet device for communicating data and interoperating with other BACnet devices.

Constant Air Volume (CAV)—A control strategy of an air supply system in which varying heating and cooling loads are met by adjusting the temperature of the supply air and keeping the air flow volume constant. Contrast with *Variable Air Volume*.

Constant Volume Controller—A device used to control the total air flow from mixing units in high-pressure, high-velocity, dual-duct air systems.

Contaminant—An impurity that may or may not be associated with adverse health or comfort effects. See also *Pollutant*.

Continental Automated Buildings Association—See *CABA*.

Control—The regulation of a device or process to make it perform in a desired manner.

Control Agent—The medium in which the manipulated variable exists. In steam heating systems, for example, the control agent is the steam and the manipulated variable is the flow of the steam. Contrast with *Controlled Medium*.

Control Basic—A program embedded in controllers that interprets a set of instructions. Control Basic programs are either written by the installer or supplied by the controller's manufacturer.

Control Differential—See *Dead Band*.

Control Loop—A circuit that regulates a process or system. It may be open loop (the output is simply set at a specific level, with no compensation for changes in variables, such as in

a simple timer), but most building HVAC controls are closed loop. See also *Closed Loop*.

Control Network—A collection of control systems (that may incorporate multiple protocols with appropriate routers and gateways).

Control Network Architecture—The various levels or tiers in a control network, ranging from field level devices to supervisory and/or management devices.

Control Point—The actual value of the controlled variable (the setpoint plus or minus the offset).

Control System—A collection of control devices that work together.

Control Valve—A device used to regulate the flow of a heating or cooling medium such as steam or water.

Controls—See *Controller*, *Direct Digital Control*, *Floating Control*, *Proportional Control*, and *Two-Position Control*.

Controls Contractor—See *Authorized Contractor*.

ControlSet®—An electronic KMC actuator line, designed primarily for controlling dampers and valves.

Controlled Medium—The medium in which the controlled variable exists. In a space temperature control system, the controlled variable is the space temperature and the controlled medium is the air within the space. Contrast with *Control Agent*.

Controlled Variable—The quantity or condition that is measured and controlled. See also *Controlled Medium*.

Controller—A device that changes its output based on some sensed condition (feedback). See also *Direct Digital Control*.

Convection—The transfer of heat by circulatory motion of the heated parts of the medium. See also *Conduction* and *Radiation*.

Converter—A device that changes a control signal from one type to another, such as pneumatic to voltage, current to voltage, analog to digital, or EIA-485 to USB.

Cooling Degree Day—A degree day above the standard temperature of 65° F (19°

C), used in estimating energy consumption in an HVAC system. See also *Degree Day* and *Heating Degree Day*.

Cooling Load—The amount of heat generated within a building space (from occupants, electrical equipment, artificial lighting, solar radiation, etc.) that the HVAC system must remove.

Cool Roof—A roofing system (often metal) with high solar reflectance (reflecting visible, infrared, and ultraviolet light) and high thermal emittance (releasing a large percentage of absorbed, or non-reflected, solar energy). This reduces heat transfer to the building and energy needed for cooling. See also *Green Roof*.

Cooling Tower—A structure outside or on top of a building used to extract heat from water that has been used for cooling.

Coordinated Universal Time (UTC)—An international time standard. Time zones around the world can be expressed as positive or negative offsets from UTC. Some control systems use the UTC offset value (in minutes and corresponding to the distance of the local time

zone to the zero degree meridian) for timekeeping and scheduling.

Corrective Action—The control action that results in a change of the manipulated variable. It is initiated when the controlled variable deviates from the setpoint.

Cradle-to-Cradle (C2C) Design—A holistic design approach that examines the environmental effect of the complete life cycle of a building and its materials from creation to eventual disposal.

Critical Pressure Drop—See *Pressure Drop, Critical*.

Cross-Ventilation—See *Ventilation, Cross*.

Cv—See *Valve Flow Coefficient*.

Cycle—(1) One complete execution of a repeatable process. (2) To turn a device off and back on.

Cycling—A periodic change in the controlled variable from one value to another.

Cycling Rate—The number of cycles completed per time unit, typically cycles per hour for a heating or cooling system.

Cycling, Short—Too frequent on-off cycling, which can harm electric motors, fans, and compressors.

D

D/A—See *Digital to Analog*.

DA—See *Direct Acting*.

Damper—A device that varies the volume of air flowing through a contained cross-section (e.g., a duct, inlet, outlet, or plenum) by varying the cross-sectional area through which the air flows (by adjusting the angle of blades or plates in the air stream). They are often installed on supply ducts, fresh air intakes, return air ducts, and exhaust ducts.

Damping—Any effect that reduces or impedes a reaction.

Daylighting—The placing of windows and reflective surfaces so that natural light can provide effective internal illumination during the day. This can enhance visual aesthetics and productivity while reducing energy usage from electric lighting.

Day-Night Thermostat—A thermostat that can be set to control at one temperature during the day and another temperature at night.

DC—See *Direct Current*.

DCS—See *Distributed Control System*.

DDC—See *Direct Digital Control*.

Dead-Air Space—An unventilated space in which the air does not circulate.

Dead Band—A signal range typically between the top of the heating range and bottom of the cooling range. The band ensures that one mode stops completely before the other begins. The incorporation of the delay reduces the possibility of the output repeatedly cycling when the control point is near the setpoint.

Decibel (dB)—A measure (on a logarithmic scale) of the relative loudness of a sound.

Dedicated Outdoor Air Systems (DOAS)—Separate units that treat (e.g., for particle filtration or humidity control) the outdoor air brought into a building for ventilation use.

Degree Day—A unit that represents one degree difference in the mean daily outdoor temperature from a given standard temperature.

Dehumidification—The reduction of water vapor in air by drawing air over a refrigerated coil. The air near the coil cools below the dew point, and the liquid water that condenses on the coil is drained away. The dehumidified air might then be reheated to maintain a certain temperature in the system if necessary.

Demand Control (or Controlled) Ventilation (DCV)—Ventilation provided in response to the *actual* (vs. the *design*) number of occupants and occupant activity, usually done by using CO_2 sensors to control an air handling system.

Demand Response (DR)—A system in which the utility company signals a building's automation system to temporarily reduce electrical demand from the building during times of critically high loads on the power grid. The building's controllers and thermostats

automatically reduce usage by pre-planned methods such as adjusting HVAC setpoints, dimming or shutting off lights, and other strategies.

Department of Energy (DOE)—A department of the United States government responsible for energy policy and nuclear safety, including setting industry efficiency standards and monitoring the consumption of energy sources.

Derivative Mode—The part of a control function that changes its output signal in response to the rate of change in the process error. This reduces the effects of fast process changes on the stability of the control loop by responding to the anticipated change in the process based upon its current rate of change. See *PID Control*.

Descriptors—A set of names that identify the programmable items in a digital system.

Desiccant—A drying agent, such as silica gel, which can be used to reduce humidity (and consequently the cooling load for the HVAC system).

Deviation—(1) The departure of a control point from a setpoint. (2) The difference between the setpoint and the

value of the controlled variable at any moment. Also called "offset."

Device Instance—In a BACnet system, a number that uniquely identifies a device on an internetwork. The device instance number is determined by the BACnet system designer, and data is exchanged between BACnet devices by reference to the device instance number.

Device—A piece of equipment or node installed on a network such as a sensor, actuator, or controller.

Dew Point—The temperature to which a given volume of air must be cooled, at constant barometric pressure, for water vapor to condense into liquid (dew). If that temperature is below freezing, frost is formed instead of liquid water.

Differential—(1) The difference between two sensed values. (2) The change in the controlled condition necessary to cause a two-position controller to move from one position to the other.

Differential Pressure Switch—A unit which senses low-pressure or vacuum differentials, such as pressure drops across filters, and responds to those changes by opening or closing.

Diffuser—An air flow device designed to discharge air in a spreading pattern, specific path, or particular direction.

Digital—A system that generates, stores, and processes information in terms of two states, such as 0 or 1, on or off, and closed or open. See also *Binary* and contrast with *Analog*.

Digital to Analog (D/A)—An electronic process in which a discrete multi-level (digital) signal is changed, without altering its essential content, to a continuously variable (analog) signal.

Dilution—The reduction of concentration of airborne contaminants through an increase in fresh air supplied to the space.

Direct Acting (DA)—The action of a controller that increases its output signal in response to a rise in sensed temperature or other variable. Contrast with *Reverse Acting*.

Direct Compensation—See *Positive Compensation*.

Direct Current (DC)—An electrical voltage that maintains the same polarity over time although the voltage levels may vary. Contrast with *Alternating Current*.

Direct Digital Control (DDC)—A microprocessor-based device or network of devices that controls a system or process such as an HVAC system. It may be a proprietary system or an open system, such as BACnet.

Direct Expansion (DX)—A common method of cooling air by passing it through a coil that contains refrigerant. The refrigerant expands prior to entering the coil, allowing it to absorb heat from the warmer air passing through the coil.

Dissipation Constant—In a thermistor, the ratio of the change in power dissipation to a corresponding change in body temperature.

Distributed Control System (DCS)—A collection of "smart" field controllers that can control their zones without supervision from a master controller.

Diurnal Flux—The difference between daytime and nighttime temperatures.

Discharge Pressure—See *Head Pressure*.

Displacement Ventilation—See *Ventilation, Displacement*.

Diverting Relay—In pneumatic controls, a device that diverts air pressure from a supply line to either of two branch lines or from either of two supply lines to one branch line.

Diverting Valve—A three-way valve with one inlet and two outlets. It can direct the full flow to either outlet or modulate the flow between the two outlets. See also *Valve*.

DOAS—See *Dedicated Outdoor Air Systems*.

DOE—See *Department of Energy*.

Domain—A logical grouping of devices that can communicate with each other over transmission media.

Double-Seated Valve—A globe valve with two seats, plugs, and discs that are suitable for applications where fluid pressure is too high to permit a single-seated valve to close. The discs in a double-seated valve are arranged so that in the closed position there is minimal fluid pressure forcing the stem toward the open or closed position.

Double-Pole Single-Throw, Double-Pole Double-Throw (DPST, DPDT)—Types of relay or switch contact configurations. Double-pole contacts control two

separate circuits. For each pole, single-throw contacts have two terminals, and the connection is either on or off. For each pole, double-throw contacts have a common terminal that is connected alternately with each of two other terminals.

DPST, DPDT—See *Double-Pole Single-Throw, Double-Pole Double-Throw*.

DR—See *Demand Response*.

Draft—The movement of air causing undesirable local cooling of a body because of low air temperature, high velocity, and/or inappropriate air flow direction.

Droop—(1) A sustained deviation between the control point and the setpoint in a two-position control system caused by a change in the heating or cooling load. (2) In time-proportional controllers, the difference in temperature between the setpoint and where the system temperature actually stabilizes due to the time-proportioning action of the controller.

Dry Bulb Temperature—Air temperature as indicated by an ordinary thermometer.

Dry Contacts—A switch or relay that has an (isolated) mechanical means (rather than an electronic means, such as in a triac) of switching a current.

Dual Thermostat—A two-temperature thermostat, equivalent to two separate thermostats inside one case with each having its own setpoint.

Duct—An encased conduit, typically constructed of galvanized steel or fiberglass, through which air moves around an HVAC system.

Ductwork—The network of ducts moving air through an HVAC system.

DX—See *Direct Expansion*.

E

Ecological Footprint—A measure of human impact on ecosystems. It compares human demand of resources with the planet's ecological capacity to regenerate them.

Economizer—An HVAC system that uses outside air, under suitable climate conditions, to reduce required mechanical cooling. When the outside air's en-

thalpy is less than the required supply air during cooling periods, an economizer allows a building's mechanical ventilation system to use up to 100% outside air.

EER (Energy Efficiency Rating)—See *SEER*.

Effective Temperature—A temperature representing the combined effect of ambient temperature, relative humidity, and air movement on the sensation of warmth or cold felt by the human body, equivalent to the dry-bulb temperature of still air at 50% relative humidity that induces an identical sensation.

Efficiency—The ratio of the amount of useful energy output to the energy input for a given device.

EIA-232—A serial communications standard that provides asynchronous communication capabilities, typically using 9-pin and/or 25-pin connectors. For personal computers, such connections are being superseded by USB. It was formerly known as RS-232.

EIA-485—A serial communications standard in which the voltage difference between two wires conveys the data. It is commonly used to network control-

lers via twisted-pair wiring. It was formerly known as RS-485.

Electric Control—A control circuit that uses an electromechanical means, such as a bimetallic strip or bellows, to perform control functions. See also *Electronic Control*.

Electric Pneumatic (EP) Relay—An electric-powered diverting valve designed to divert air from one pneumatic port to another.

Electric Utility—An entity owning and operating transmission and/or distribution facilities and delivering electric energy to customers.

Electricity—A property of matter that results from the presence or movement of electric charge.

Electromagnetic Radiation—A self-propagating wave in space with electric and magnetic components.

Electromagnetic Spectrum—The range of all possible electromagnetic radiation, extending from gamma rays to the longest radio waves and including visible light.

Electronic Ballast—A type of ballast for a fluorescent light which increases efficiency and reduces flicker and noise.

Electronic Control—A (typically analog) control circuit that uses solid-state components to amplify input signals and perform control functions. See also *Direct Digital Control*.

Electrostatic Air Cleaner—A device that has an electrical charge to trap particles traveling in the airstream.

Element—The component in a thermostat or other sensor that reacts to changes in the environment.

Embodied Energy—The combined energy required to grow, harvest, extract, manufacture, refine, process, package, transport, install, and dispose of a particular product or building material.

Emission—In indoor air quality, the release of airborne contaminants from a source.

Emission Rate—A measure of the quantity of a chemical released into the air from a given quantity of a source during a given amount of time.

Emission Standard—Either a voluntary guideline or a government regulation

that specifies the maximum rate at which a contaminant can be released from a source.

Emissivity—The ratio of energy radiated by a particular material compared to that of a black body at the same temperature. It measures the material's ability to radiate absorbed energy. Materials that are highly reflective generally have low emissivity. See *Solar Reflectance Index*.

EMS—See *Energy Management System*.

End Of Line (EOL)—Sets of switches or jumpers that indicate which controllers are at the ends of a network cable.

Energy—The capacity for doing work, a force applied through a distance.

Energy Audit—An analysis of building energy usage that identifies efficiency and cost-reduction opportunities.

Energy Conservation—Efficiency of energy use, production, transmission, or distribution that yields a decrease in energy consumption.

Energy Efficiency Rating (EER)—See *SEER*.

Energy Management System (EMS)—A system that optimizes the operation,

temperatures, and processes of an HVAC system within a building. It allows building owners to track energy usage, improve energy conservation, and manage their environmental compliance responsibilities. See also *Building Automation System*.

Energy Plus Building—A building that over a typical year produces more energy from on-site renewable energy sources than it consumes. See also *Zero Energy Building*.

Energy Recovery Ventilator (ERV)—An air-to-air heat exchanger or preconditioner designed to exchange temperature and moisture properties from one airstream to another and capturing the cooling or heating energy from the exhaust air before it leaves the building.

Energy (Simulation) Model—A computer-generated representation of the anticipated energy consumption of a building. It compares energy performance of proposed energy efficiency measures with the baseline.

ENERGY STAR®—A U. S. government program to promote energy efficient consumer products. It began as a voluntary labeling program designed to identify and promote energy-efficient products, and computer products were the first to be labeled. It has since expanded to major appliances, office equipment, lighting, home electronics, new homes, and commercial/industrial buildings.

Energy Use—The total energy consumed by a device or system in the course of its operation.

Enthalpy—A measure of the total heat content within a given sample of air. It is typically used to determine the amount of fresh outside air that can be added to recirculated air for the lowest heating/cooling cost.

Entrainment—The air motion effect created when air discharged from an outlet pulls (entrains) the surrounding air into its path where it mixes with the supply air.

Environmental Protection Agency (EPA)—A U. S. governmental regulatory agency charged with protecting human health

and with safeguarding the natural environment.

Environmental Testing Verification (ETV)—An Environmental Protection Agency program that develops testing protocols and verifies the performance of new technologies.

Environmental Tobacco Smoke (ETS)—Second-hand smoke from cigarettes, cigars, or pipes. In the LEED system, designated smoking rooms, if present, must have partitioning and dedicated exterior exhausts to eliminate possible ETS infiltration to other building areas.

EOL—See *End Of Line*.

EP Relay—See *Electric Pneumatic (EP) Relay*.

EPA—See *Environmental Protection Agency*.

Equal Percentage—A valve flow characteristic in which equal increments of opening increase the flow by an equal percentage over the previous value.

Error—In an HVAC system, the difference between the control point (actual value) and the setpoint (desired value) of a process.

ERV—See *Energy Recovery Ventilator*.

Ethernet—A family of local-area-network technologies that provides very high-speed networking features over various types of wiring media. The international standard ISO 8802-3 is commonly called "Ethernet."

ETV—See *Environmental Testing Verification*.

Evaporative Cooling—The drop in temperature occurring with the removal of latent heat that occurs when water evaporates.

Evaporator—In an HVAC system, the component in which the refrigerant absorbs heat from the building interior.

Event—An action or occurrence detected by a controller.

Event Notification—In a BACnet system, an indication that a key value has moved outside predetermined limits.

Exchange Rate—See *Air Exchange Rate*.

Exfiltration—The uncontrolled, unintentional flow of inside air out of a building, such as through cracks, closures that are not airtight, and the everyday use of windows and doors. See also *Infiltration*.

Exhaust Air—The air extracted from a space and discharged outside.

Expansion Valve—See *Thermostatic Expansion Valve*.

Extranet—An intranet that is partially accessible, with restricted access, to authorized outsiders.

F

Facilities Management System—The planning, control, and management of buildings for optimizing the use of real estate, interior environment, energy usage, mechanical infrastructure, communication networks, and maintenance. It considers the "life cycle" of the building (e.g., purchase, construction, operation, relocation, renovation, demolition, or sale). In the HVAC industry, the term is sometimes used in a more limited way that is synonymous with a BAS. See *Building Automation System*.

FACP—See *Fire Alarm Control Panel*.

Fahrenheit Scale—The temperature scale with 32° representing the freezing point of water and 212° representing

the boiling point of water under standard atmospheric conditions.

Fail-Safe—A position or process in which a device returns to a predefined orientation during a power failure.

Fan Coil Unit (FCU)—An HVAC device, consisting of a fan and a heating/cooling coil, that conditions the air in a single room or zone. FCUs may or may not have the ability to supply outside air to a space. See also *Unit Ventilator*.

Fan Terminal Unit (FTU)—A compartment containing an integral fan that delivers air to a space, often used in perimeter and other special zones where large and rapid changes in heating/cooling requirements occur. See also *Fan Coil Unit*.

Fan-Powered Mixing Box—A compartment containing an integral fan that mixes two air supplies before being discharged.

Faux Green—See *Green Wash*.

FCC—See *Federal Communications Commission*.

FCU—See *Fan Coil Unit*.

Federal Communications Commission (FCC)—An independent U. S. government agency that regulates use of the radio spectrum (including radio and television broadcasting), all interstate telecommunications (wire, satellite, and cable), as well as all international communications that originate or terminate in the United States.

Feedback—A feature of some controls that provides a true proportional relationship between the movement of a sensing element and the output signal produced.

Fenestration—An architectural term for openings in the building envelope, such as windows, doors, and skylights.

FFP—See *Fully Field Programmable*.

Fiber Optics—A communications technology that transmits data using radiant light through transparent fibers. Fiber-optic cable has a very high capacity and is immune to eavesdropping and electromagnetic interference.

Filter—A device for removing impurities from air or liquids.

Final Control Element—A device such as a valve or damper that acts to change the value of the manipulated variable.

Fire Alarm Control Panel (FACP)—A device for receiving and announcing the location of a fire, based upon input from smoke/flame/heat detectors, manual call points, or pull stations. It also sends a signal to the FSCS to initiate programmed smoke control procedures. See also *Firefighters' Smoke Control Station*.

Fire Damper—A thermally actuated damper arranged to automatically restrict the passage of fire and/or heat at a point where an opening violates the integrity of a fire partition or floor. A damper that meets the requirements of UL 555, Standard for Fire Dampers, and resists the passage of air or fire.

Firefighters' Smoke Control Station (FSCS)—A panel for use by the fire department for monitoring and overriding smoke-control systems and equipment. It receives fire/smoke information from an FACP and may initiate automatic pressurization and depressurization of appropriate zones to contain/exhaust smoke and allow for safe evacuation

of the building. See also *Fire Alarm Control Panel*.

Firewall—A security mechanism, or combination of mechanisms, designed for network access control and authentication.

First Costs—The initial costs involved in a building project, typically incurred during the construction and installation stages. Compare with *Life-Cycle Costs*.

FirstWatch™—A KMC noninvasive sight glass monitor for reporting excess moisture and flash gas in refrigerant when used with the Sporlan See-All® sight glass. The monitor can tie into any existing building automation system.

Flanged-End Connections—A valve that connects to a pipe by bolting a flange on the valve to a flange on the pipe.

Flash—(1) The rapid change of state of a liquid to a vapor because of a change in pressure. (2) A form of non-volatile memory that can be electrically erased and reprogrammed. (3) The process of programming or reprogramming a device containing flash memory.

Flash Memory—A special type of EEPROM (Electrically Erasable Programmable Read Only Memory) that can be erased and reprogrammed in blocks instead of one byte at a time. Flash memory gets its name because the microchip is organized so that a section of memory cells are erased in a single action or "flash." Flash memory is a nonvolatile memory device that retains its data after the power is removed.

FlexStat™—A KMC Controls series of flexible, intelligent temperature/humidity/occupancy-sensing thermostats that communicate on BACnet networks.

Floating Control—A system that drives an actuator in one direction or the other by applying power to the corresponding terminal. This is typically done with three terminals, one to drive the actuator open, one to drive it closed, and one for the common signal return. With no power applied to a terminal, the actuator stops at its present position. The actuator maintains that position until the controller senses a need

to adjust the output again. Contrast with *Two-Position Control* and *Proportional Control*.

Flow—The volume of a substance passing a point per unit time (e.g., gallons per hour).

Flow Coefficient—See *Valve Flow Coefficient*.

Flushout—Running a ventilation system on its highest settings to remove the airborne emissions from newly installed furnishings and carpeting. See also *Bakeout*.

Forced Air System—An HVAC system that uses air distributed through ductwork and vents as a heating/cooling medium.

Forced Ventilation—See *Ventilation, Mechanical*.

Form A—Normally open contacts.

Form B—Normally closed contacts.

Form C—Single-pole, single-throw contacts.

Form D—Make-before-break, single-pole, single-throw contacts.

Foreign Device—A BACnet device registered on a remote subnet BBMD. If an IP subnet has only a few BACnet IP devices, a local BBMD may be exces-

sive. In this case, each BACnet IP device can be registered as a foreign device with a particular BBMD on a remote subnet, and that BBMD then forwards broadcast messages.

Formaldehyde—A colorless, pungent-smelling material used as an adhering component of glues in many wood products. It may cause respiratory problems, chemical sensitivity, and other health problems.

FPM (Feet Per Minute)—A measure of air velocity.

Fresh Air—Outside air drawn into a space or HVAC system.

FSCS—See *Firefighters' Smoke Control Station*.

FTP (File Transfer Protocol)—A way of transferring files over the Internet from one computer to another.

FTU—See *Fan Terminal Unit*.

Fully Field Programmable (FFP)—BACnet devices that can be programmed on-site without routing information through a central operator station.

Full Duplex—A communications method that allows for the simultaneous trans-

mission and reception of data. Contrast with *Half Duplex*.

FullBAC™ Router—A KMC multi-port router designed for communications between BACnet IP, Ethernet, and MS/TP LANs.

Full Scale Range—The difference between the smallest and largest values reliably measured by a sensor.

Full-Wave Power Supply—A device for converting AC into DC that uses both halves of the AC sine wave. For low-current applications, such power supplies are more expensive than half-wave power supplies.

G

Gateway—(1) An IP device used for communicating between two IP subnets. (2) A device that connects two or more different communication protocols so that information can be passed from devices on one network to the other.

Gauge Pressure—A pressure reading above atmospheric pressure. See also *PSIG*.

GBCI (Green Building Certification Institute)—An organization spun off from the USGBC to handle LEED professional credentialing and building certification processes.

GHG—See *Greenhouse Gases*.

Glare—Harsh, dazzling light that interferes with visibility.

Global Climate Change—A significant alteration from one climatic condition to another, beyond the usual alterations in various climates throughout the globe, as the result of human activities. "Global warming" refers more specifically to temperature, and global climate change encompasses broader additional changes, such as shrinking glaciers and a rising sea level.

Global Warming—See *Global Climate Change*.

Global Warming Potential (GWP)—A measure, relative to carbon dioxide, of how much a gas is estimated to contribute to global warming.

Globe Valve—A valve with a disk-shaped plug that moves linearly when the stem is rotated. In the past, most globe valves had a spherical body, from

which they received their name. Such valves might have sweat, threaded, or flanged connections. Contrast with *Ball Valve*.

GPM (Gallons Per Minute)—A measure of fluid velocity.

Gradual Switch—A manual pneumatic switch that adjusts line pressure to any value from zero up to the main air pressure.

Graphical User Interface (GUI)—A computer interface that uses icons and pointing devices instead of merely entered text at a command prompt.

Green Building—A building constructed or renovated with design techniques, technologies, and materials that minimize its overall environmental impact (including reduced nonrenewable energy consumption, minimal site disruption, lower water consumption, and fewer pollutants used and released during construction and occupation).

Green Development—A development approach that integrates environmental responsiveness (benefiting the surrounding environment), resource efficiency (using resources in the construction, development, and opera-

tions of buildings and/or communities in ways that are not wasteful), and sensitivity to existing culture and community (fostering community in design, construction, and operations).

Green Electricity Provider—A utility or company that generates, purchases, and/or invests in electricity from renewable sources, such as wind or solar power, and sells it to customers for a small premium over standard electricity costs.

Green Globes—A green building rating system, originally developed in Canada, that is less complex and easier to use than the comparable, better-known LEED system.

Green Power—A source of regenerative or virtually inexhaustible energy considered to be non-polluting and environmentally friendly, such as geothermal, wind, water, biomass, and solar power. It is also known as alternative energy or renewable energy.

Green Roof—A building's roof that is partially or mostly covered with vegetation and soil (or a growing medium), planted over a waterproofing membrane. Such roofs reduce heating/cooling loads, reduce urban heat island

effect, and reduce storm-water runoff. They are also called eco-roofs, vegetated roofs, and living roofs. See also *Cool Roof*.

Green Seal®—An independent nonprofit organization that aims to safeguard the environment and transform the marketplace by promoting the manufacture, purchase, and use of environmentally responsible products and services.

Green Wash—To falsely claim a product is environmentally sound.

Greenhouse Gas (GHG)— A gas in the atmosphere that acts as a greenhouse's glass walls, trapping the sun's radiant heat in the atmosphere. Such gases include carbon dioxide, methane, nitrous oxide, ozone, and water vapor that naturally occur in earth's atmosphere but are artificially increased by human activities, as well as synthetic chemicals, such as halocarbons.

Grille—A perforated or louvered covering through which air passes.

Ground—The general term for a common connection in an electric or electronic circuit that is often the voltage refer-

ence point. See also *Ground, Circuit/Earth/Floating* and *Ground Loop*.

Ground, Circuit—The common connection for a particular circuit (which might be isolated from the earth ground).

Ground, Earth—The connection leading to the earth (such as to the grounded conductor in a power outlet or a stake driven deeply into the soil) that is of zero electrical potential.

Ground, Floating—A circuit ground not connected to earth ground.

Ground Loop—A circuit condition in which a small voltage potential between two or more "ground" connections introduces an unwanted current into a signal path, thereby adding noise to the signal.

Groups—A logical collection of nodes within a domain.

GUI—See *Graphical User Interface*.

H

Habitat—The normal physical conditions that surround a species, assemblage of species, or community.

Half Duplex—A communications method in which transmission and reception of data can occur in either direction but not simultaneously. Contrast with *Full Duplex*.

Half Router—A BACnet device that can participate as one partner in a point-to-point (PTP) connection. Two half routers form an active PTP connection and act as a single router.

Half-Wave Power Supply—A device for converting AC into DC that uses only one-half of the AC sine wave. For low-current applications, such power supplies are less expensive than full-wave power supplies.

Hand Control—An override setting that energizes the output. Some HVAC controls have "Hand, Off, Auto" settings. (If the output is a normally closed relay, however, the Hand setting output is then "off," and the Off setting output is then "on.") See also *Manual Control*.

HARDI—See *Heating, Air Conditioning, Refrigeration Distributors International*.

HCFC (Hydrochlorofluorocarbon)—A CFC replacement with a lower ozone deple-

tion potential, but its use is also being phased out. See *CFC* and *HFC*.

Head Pressure—The pressure measured at the discharge of an operating pump or compressor.

Heat Exchanger—A device that transfers heat from one medium (e.g., refrigerant or water) to another (e.g., air or water).

Heat Island Effect—The increase in ambient temperature that occurs over large paved areas compared to natural landscape. See also *Urban Heat Island*.

Heat Pump Unit (HPU)—A unit that uses direct expansion to remove or add heat to a space. On a call for heat, the heat pump pulls heat from a source such as outside air or the ground and puts it into a space. On a call for cooling, the process is reversed.

Heat Recovery Ventilator—See *Energy Recovery Ventilator*.

Heating, Air Conditioning, Refrigeration Distributors International (HARDI)—An industry group promoting the interests of the wholesale heating, refrigeration, and air conditioning industry.

Heating Degree Day—A degree day below the standard temperature of 65° F (19° C), used in estimating energy consumption in an HVAC system. (With internal heat generated from occupants, lighting, and other equipment, the average building is assumed to be thermally balanced at approximately this outdoor temperature and to not need heating or cooling.) See also *Degree Day* and *Cooling Degree Day*.

Heating Load—An hourly rate, in BTUs per hour, of net heat loss in an enclosed space.

Heating, Ventilating, and Air Conditioning (HVAC)—A term generally used to describe a building's comfort system. In older buildings, heating (radiators), ventilation (windows), and air conditioning (window units) may be separate, but usually these services are integrated into a single system that conditions and distributes air throughout the zones of building.

HEPA (High Efficiency Particulate Air) Filter—A classification of air filters that can remove a very high percentage of dust, pollen, mold, bacteria, and other airborne particles.

HFC (Hydrofluorocarbon)—A CFC or HCFC replacement refrigerant with a nearly zero ozone depletion potential. See *CFC, HCFC,* and *Refrigerants, Natural*.

Hierarchical Configuration—A system in which the processors and controllers are arranged in levels or tiers, with each tier having a definite rank or order in accessing and processing data.

High Limit—A safety feature that prevents operation of equipment when dangerous or unacceptable conditions (such as excessive temperature) would result.

High Side Pressure—See *Head Pressure*.

High-Performance Building—A building designed to be extremely energy efficient. A "green building" is also energy efficient, but it is also optimized for other environmental concerns, such as indoor environmental quality, recycled materials, water efficiency, and sustainability of the site. The two terms are sometimes used synonymously.

History Files—In building automation, a file of trend log data saved for long-term use.

Hospitality—The market consisting of hotels, motels, and resorts, which have

different HVAC needs compared to offices buildings because occupancy in hotel rooms is much more sporadic than in traditional 8-to-5 office spaces.

HPU—See *Heat Pump Unit*.

HSPF—See *Heating Seasonal Performance Factor*.

HTML (Hypertext Markup Language)—A common Internet display language for web pages.

HTTP (Hypertext Transfer Protocol)—The Internet rules for how a web server responds to requests for files.

Hub—A common connection point for devices in a network. A hub contains multiple ports, and when a data packet arrives at one port, it is copied to the other appropriate ports.

Human Comfort Zone—See *Comfort Zone*.

Humidifier—A device for maintaining or increasing the humidity of air in a space or building.

Humidistat—A device for measuring and controlling relative humidity.

Humidity—See *Relative Humidity*.

Humidity Control—A system for measuring and maintaining a specified moisture content in the air.

Hunting—Excessive or out-of-control cycling. See *Cycling*.

HVAC—See *Heating, Ventilating, and Air Conditioning*.

HVAC&R (Heating, Ventilating, Air Conditioning, and Refrigeration)—See *Heating, Ventilating, and Air Conditioning*.

Hydronic—The use of water as the heat-transfer medium in heating and cooling systems.

Hysteresis—A property of systems that do not instantly follow the forces applied to them, but instead react slowly or do not return completely to their original state.

I

I (Integral) Action—See *Integral Action*.

IAQ—See *Indoor Air Quality*.

IEEE (Institute of Electronic and Electrical Engineers)—An international, non-

profit, professional organization for the advancement of electricity-related technology. Numerous standards used in computer communications were developed by IEEE.

IEQ—See *Indoor Environmental Quality*.

Immersion Sensor/Thermostat—A sensor or thermostat with an extended probe that can be inserted into the medium.

Inches of Water Gauge (in wg) or Water Column (in wc)—A unit of air pressure measurement equal to the pressure exerted by a column of water 1 inch high.

InControl®—A Microsoft DOS program written by KMC Controls to view, program, and configure controllers on a KMC digital network. WinControl replaced InControl. See *WinControl*.

Individual Control—A system in which occupants are able to adjust the operating parameters according to their personal preferences.

Indoor Air Quality (IAQ)—A measure of the building's interior air in terms of the occupant's potential health

and comfort. Chemical, physical, and biological contaminants can cause symptoms ranging from discomfort to serious illness. Careful selection of building materials and sufficient ventilation increases air quality. See also *Indoor Environmental Quality*.

Indoor Environmental Quality (IEQ)—A measure of all aspects of an indoor environment on human health and performance, including indoor air quality, lighting, visual quality, and thermal comfort. See also *Indoor Air Quality*.

Induction Unit—A terminal unit in which (secondary) room air is drawn through a filter (by a pressure differential caused by the velocity of the primary inlet airstream) into the terminal unit. The two air streams are mixed in a mixing chamber, and the mixture passes through a heated or chilled coil.

Infiltration—The uncontrolled, unintentional, flow of outside air into a building, such as through cracks, closures that are not airtight, and the everyday use of windows and doors. See also *Exfiltration*.

Inputs—Physical values (e.g., temperature, humidity, pressure, velocity, motion,

or other measured values) read by a controller.

Input/Output (I/O)—The interface that different subsystems of an information processing system use to communicate with each other or the signals sent through that interface.

Insertion Sensor/Thermostat—See *Immersion Sensor/Thermostat*.

Institute of Electronic and Electrical Engineers—See *IEEE*.

Insulation—A material that prevents or reduces the transfer of electricity or heat.

Integral (I) Action—An action, to reduce or eliminate a deviation or offset, in which a continuous linear relationship exists between the amount of increase (or decrease) on the output to the final control element and the deviation of the controlled variable. See also *PID (Proportional Integral Derivative)*.

Integral Mode—The part of a control function that changes its output signal in response to the size and length of duration of a process error. This reduces the process error to zero before the control loop stabilizes. See *PID Control*.

Integral Windup—A situation in a PID controller in which the integral, or reset action, continues to integrate (ramp) indefinitely. It usually occurs when the controller's output, for some reason, can no longer adequately affect the controlled variable. See *PID Control*.

Integrated Design—A holistic process that considers the many disparate parts of a building project and examines the interaction between design, construction, and operations with the goal of optimizing the project's energy and environmental performance.

Integrated Project Delivery (IPD)—A project delivery method that integrates people, systems, business structures, and practices into a process that collaboratively harnesses the talents and insights of all participants. The goal is to optimize project results, increase value to the owner, reduce waste, and maximize efficiency through all phases of design, fabrication, and construction.

Integrated Systems—A combination of several operating systems into one that uses the same digital network and is controlled from the same workstation. Integration of different proprietary

systems typically requires the use of gateways.

Interface—The common communication boundary between two entities, such as between a user and a computer or between a network and another network.

International Code Council (ICC)—An association dedicated to building safety and fire prevention. Many local building codes are adopted from the international codes.

International Green Construction Code (IGCC)—An international building code from the ICC in cooperation with other organizations, including ASHRAE and the USGBC, that addresses sustainability. Unlike voluntary guidelines, such as LEED, this would be (where adopted) an enforceable code.

Internetwork—A collection of all BACnet networks that can communicate with each other.

Interoperability—In building automation, the condition that a group of functions (hardware or software) work together reliably and predictably to perform a given function or exchange across a

given set of vendors or applications. See also *Open System*.

Intranet—A network (based on TCP/IP) within an organization and accessible only to members of that organization. Intranets may look like any other web site, but a firewall and other security features fend off unauthorized access.

I/O—See *Input/Output*.

IP (Internet Protocol)—The protocol that handles the chunking of data messages into packets (called datagrams), the routing of the packets to a destination on the Internet, and the reassembling of the packets into the original data message.

IP Address—Unique identifiers for a computer or device on a TCP/IP network. A valid IP address is a 32-bit numeric address written as four numbers (0 to 255) separated by periods (e.g., 1.140.12.224).

IPMVP (International Performance Measurement and Verification Protocol)—A set of framework documents (produced by the Efficiency Valuation Organization) used to develop strategies and plans for quantifying energy and wa-

ter savings for building retrofits and new construction.

ISO (International Organization for Standardization)—An international standard-setting body composed of representatives from national standards bodies. It produces world-wide industrial and commercial standards. ISO is commonly misperceived as an acronym, but it comes from the Greek word *isos*, meaning "equal." Since the names in the two official languages would have different acronyms, IOS in English and OIN in French, the founders of the organization chose "ISO" as the universal short form of its name.

Isolator—A device that transfers a signal between elements of a circuit or network, while separating them electrically. This may help prevent unwanted conditions, such as excessive voltage, ground loops, and improper phasing, from being passed through a circuit or network.

Isothermal—Of constant temperature.

ISP (Internet Service Provider)—A service company that provides a user name, password, and access to the Internet.

J

Joule—The metric unit of energy, work, and heat. It is the work required to exert a force of one newton for a distance of one meter or the power of one watt for a duration of one second.

K

KMC—See *KMC Controls*.

KMD—See *KMDigital*.

KMC Controls—The only privately held controls manufacturer with a full line of digital, electronic, and pneumatic products in the United States.

KMDigital®—A KMC proprietary DDC network product line. Certain KMDigital models can serve as "gateways" to BACnet and Modbus networks, and KMC also offers a BACnet product line.

kW (Kilowatt)—The unit of power equal to 1,000 watts of electricity.

kWh (Kilowatt-Hour)—A unit of electrical energy equal to one kilowatt being consumed for one hour.

L

Lag—(1) A delay in the effect of a changed condition or data transmission. (2) The delay in response of the sensing element of a control because of the time required for the element to sense a change in the variable.

LAN (Local Area Network)—A collection of interconnected equipment that can share data, applications, and resources.

LAN Controller—A KMC intelligent, programmable direct digital controller and high-level LAN communications manager suitable for use in building automation systems.

LANLite™—A KMC Ethernet-ready Tier 1 DDC controller for a KMDigital network.

Last Panel—The highest numbered panel (controller) on a KMC KMDigital network as viewed in WinControl. (Last panel is not the same as end-of-line termination.)

Latency—(1) The amount of time between the initiation of an action and its completion. (2) The time required to go between a network source and destination or to go through a router.

Latent Heat—The quantity of heat absorbed or released by a substance during a change of phase (or change of state), such as liquid water changing to vapor, at a constant temperature and pressure. (For the substance, temperature remains constant while the state changes.) Contrast with *Sensible Heat*.

Leadership in Energy and Environmental Design—See *LEED*.

LED (Light Emitting Diode)—A solid-state illumination device commonly used as an indicator and increasingly used (in clusters) for area illumination because of its long life and low power requirements.

LEED® (Leadership in Energy and Environmental Design)—A U.S. Green Building Council consensus-based, voluntary certification program created to establish "green building" benchmarks and measure the environmental performance during the life cycle of a building.

License—The permission given to an end user for using a particular software product (or particular features within a product).

Life Cycle—The consecutive, interlinked stages of a product through its entire existence, including extracting and processing of raw materials, manufacturing, transportation, distribution, use, maintenance, recycling, reuse, and disposal.

Life-Cycle Assessment (LCA)—The investigation and valuation of the full range of environmental impacts of a given product or service in order to choose the least burdensome one. LCA assesses raw material production, manufacture, distribution, use, disposal, all intervening transportation steps, and how they may cause pollution, global warming, ozone depletion, habitat destruction, and human health issues. LCA is also known as life cycle analysis and cradle-to-grave analysis.

Life-Cycle Cost (LCC)—The total long-term cost of construction, maintenance, operation, and disposal of a building or system. Products that are initially more expensive than others may cost less over the lifetime of the building because of energy or other savings.

Light—Visually perceived radiant energy (a small part of the electromagnetic spectrum), whether from natural or artificial sources.

Light Pollution—Excessive or obtrusive artificial light that obscures view of the stars in the night sky, disrupts ecosystems, and has other negative effects. It can be reduced through using properly designed lighting fixtures and lighting controls.

Light Shelf—A daylighting strategy that allows natural light to bounce off a reflective shelf located in a window and onto the ceiling to bring light deep into a space.

Lighting Control—A system to manage building illumination, typically consisting of digital controllers and a variety of relays, sensors, and switches. The amount of artificial lighting turned on is controlled by schedules, motion sensors, and the amount of natural light available.

Limit Control—Used in a control system to keep the temperature, pressure, relative humidity, or other controlled variable within a preset limit.

Limit Sensor—A device sensing a variable that may be other than the controlled variable and overrides the main sensor at a preset limit.

Line Voltage—The normal electric supply voltage (e.g., 120 VAC) available from a wall outlet. Contrast with *Low Voltage*.

Linear—A characteristic of a sensor or control device in which a change in a condition or control action results in a directly proportional signal or result.

Linkage—A device or assembly connecting an actuator to a damper or control valve.

Load—(1) The demand for heat transfer or work placed on an HVAC system to maintain the desired conditions of thermal comfort in a building. (2) The demand on an electrical source.

Load, Inductive—An electrical load consisting of a stationary wire-wound coil (e.g., relay, solenoid, or transformer).

Breaking the circuit can result in heavy arcing across the contacts.

Load, Lamp—An electrical load consisting of a light (e.g., tungsten filament, fluorescent, mercury vapor). When switched on, tungsten-filament lights can draw an inrush current of over ten times the steady-state current.

Load, Motor—An electrical load consisting of a "moving" wire-wound coil (e.g., motor). Turning on the circuit can result in a heavy inrush current.

Load, Resistive—An electrical load consisting of resistance (e.g., electric heater).

Local Broadcast—A broadcast sent to the "local" network only.

Local Controller—A control unit designed for, and installed close to, a specific type of equipment or at the terminating point of an air system. Local controllers are used to control variable air volume units, heat pumps, fan coils, and air handlers.

Locally Sourced Materials—Materials obtained from within a defined radius around a project site. Materials supplied from nearby sources whenever feasible reduces the cost and environ-

mental impact of transportation of those materials. The LEED system, for example, gives points for using specified percentages of building materials that originate within 500 miles.

LON (Local Operating Network)—An intelligent control network developed by Echelon Corporation that facilitates communication between a group of devices that sense, monitor, communicate, and control.

LonTalk®—A communication protocol originally developed by Echelon Corporation, used for interoperable communications in LonWorks and LonMark LANs and as a carrier LAN for BACnet. The LonTalk protocol implements the entire seven layers of the OSI model using a mixture of hardware and firmware on a required device known as a Neuron chip developed by Echelon.

LonWorks—The collective hardware and software technology developed by Echelon to provide an off-the-shelf, peer-to-peer networking technology platform for designing and implementing interoperable control networks.

Louvers—A series of baffles used to direct air flow, prevent rain from entering an

intake or vent, or shield a light source from direct view.

Low Emissivity Windows—Windows with special coatings that transmit most of the sun's light but block heat radiation from passing through.

Low Voltage—Wiring or other electrical devices using 30 volts or less. Low-voltage control devices usually function on 24 VAC. Contrast with *Line Voltage*.

Lumens—A measure of the perceived power of light, the unit for luminous flux in the International System of Units. Luminous flux differs from radiant flux (the measure of the total power of light emitted) since luminous flux is adjusted to represent the sensitivity of the human eye.

Lumenaire—A complete lighting unit consisting of a lamp (or lamps) with the housing designed to distribute the light, mount and protect the lamp, and connect it to the power supply.

M

MAC (Media Access Control) Address—A unique hardware address that identi-

fies each device on a BACnet network. Each network type (Ethernet 802.3, IP, or MS/TP) has its own MAC addressing scheme. Some vendors refer to this address as a node number or TS (This Station).

Main Line—In a pneumatic system, the air line from the air supply system to pneumatic controllers and other devices that carry air at a constant supply pressure, usually 15 to 25 psig.

Mains—(1) The line voltage in a building. (2) For pneumatic systems, see *Main Line*.

MAMA (MAC Automatic MS/TP Addressing)—A method developed by KMC Controls for its BACnet controllers to automatically assign MAC addresses and device instance numbers to controllers on a network, eliminating the need to manually assign a MAC address to each controller.

Manual Control—Operation by direct human intervention. For HVAC controls, this mode is usually used only during

set-up, maintenance, or troubleshooting. See also *Hand Control*.

Master Controller—A controller that monitors certain conditions and, according to a specified setting, resets the setpoint of another controller. See also *Reset Volume Controller*.

Materials Safety Data Sheets—See *MSDS.*

Max Master—In a BACnet system, the highest MAC address a device will attempt to locate when polling for master devices on the local network.

MEA (Materials and Equipment Acceptance)—A New York City construction code.

Mean Radiant Temperature—The sum of temperatures received from (or lost to) surrounding surfaces by radiation.

Measurement and Verification Systems—Procedures and devices that monitor a building's performance over time and can notify owners of issues that need immediate repairs as well as routine maintenance. Sensors, trend logs, and alarms that are part of building automation systems can help keep building performance as high as possible.

Medium—A liquid or gas used to transfer heat in an HVAC system.

MERV (Minimum Efficiency Reporting Value)—A measurement to rate the effectiveness of air filters. On the scale of 1 (lowest) to 16 (highest), higher filter ratings capture more particles.

Metering—The process of calculating, analyzing, and reporting energy usage over time.

Milliamps (mA)—A measure of electrical current that is one-thousandth of an ampere.

Minimum Program Requirements (MPRs)—Descriptions of the minimum project compliance for LEED registration.

Mixed Air—A mixture of outdoor air and return air from the space or a blend of air from warm and cool air ducts.

Mixing Box—A chamber for controlled blending of air from warm and cool supply air ducts.

Mixing Systems—A system in which conditioned air is delivered to the space at velocities much greater than those acceptable to occupants. The incoming high-velocity air mixes rapidly with the room air by entrainment so

that its temperature and velocity are within an acceptable range when the air enters the occupied zone. Mixing systems are designed to maintain the entire volume of air in the space (floor-to-ceiling) at a relatively uniform temperature, humidity, and air quality condition. Conventional overhead air distribution is an example of a mixing system.

Mixing Valve—A three-way valve which has two inlets and one outlet. The valve is constructed so that fluids in two lines mix into one, in a controlled proportion, and exit through the common outlet.

Mixing-Type Air Distribution—See *Mixing Systems*.

Modbus—An open communications protocol originally developed in 1978 by Modicon Inc. for networking industrial programmable logic controllers.

Modulating—Smoothly adjusting a position, according to a varying signal, so that a damper or valve may be fully open, fully closed, or anywhere in between. Also called "proportional."

Motion Sensor—A device (also called occupancy sensor) that senses movement,

typically via passive infrared sensors, to determine occupancy of a space.

Motorized Damper—A damper with an actuator.

Motorized Valve—A valve with an actuator.

MS/TP (Master Slave/Token Passing)—A protocol (using the EIA-485 signaling standard) in which master devices can initiate requests for data but slave devices cannot (since slaves can only reply to messages from other devices). Master devices typically have more processing and memory capacity than slave devices. KMC BACnet controllers are all MS/TP master devices.

MSDS (Materials Safety Data Sheets)—OSHA-required documents supplied by manufacturers of potentially hazardous products that contain information regarding potentially significant airborne contaminants, precautions for inspection, health effects, odor description, volatility, expected contaminants from combustion, reactivity, and procedures for spill cleanup.

N

NAT (Network Address Translation)—A (fixed/static or dynamic) process of network address translation involving rewriting the source and/or destination addresses of IP packets as they pass through a router or firewall. It is often used to enable multiple hosts on a private network to access the Internet through a single public IP address (but NAT can work in either direction). See also *PAT (Port Address Translation)*.

National Fire Protection Association (NFPA)—An independent, voluntary-membership, nonprofit organization that is a leading source of technical background, data, and consumer advice on fire protection, problems, and prevention.

Native BACnet Device—A device that is fully BACnet compatible and uses BACnet as its primary, if not exclusive, method of communication.

Natural Ventilation—See *Ventilation, Natural*.

NC—See *Normally Closed*.

Negative Temperature Coefficient (NTC)—The amount by which the electrical resistance of a sensor component, such

as a thermistor, decreases when the temperature is raised.

NEMA (National Electrical Manufacturers Association)—The largest trade organization in the U.S. representing the interests of manufacturers of products used in electrical generation, transmission, distribution, control, and usage. It is responsible for providing many industry standards.

Net Metering—A metering and billing arrangement that allows on-site renewable electricity generation to sell excess electricity to the regional power grid.

Net Zero Energy Building—See *Zero Energy Building*.

NetSensor®—A KMC wall-mounted temperature sensor and intelligent interface device for use in a KMC KMDigital or BACnet system.

NetView®—A KMC operator interface designed for viewing and controlling a KMC KMDigital Tier 2 (subLAN) network.

Network—One or more controllers connected together electrically to share data.

Network Adapter—See *NIC*.

Network (Interface) Card—See *NIC.*

Network Numbers—A number from 1 to 65,534 that identifies specific BACnet networks. It is assigned by the BACnet system designer at the time a router is initialized for network operation. "0" sometimes refers to the "local network" and "65535" sometimes refers to "all networks."

Network Point—See *Want-Point*.

Network Segment—An electrically separate section of a network. In Ethernet, bridges, hubs, switches, and repeaters can couple multiple physical network segments into one logical network segment. Broadcast messages can be received by all devices within a logical segment.

NFPA—See *National Fire Protection Association*.

NIC (Network Interface Card)—An interface device (also called a network adapter, network card, or expansion card) that connects a computer or other device to a LAN.

Nighttime Ventilation—A strategy of flushing building structures with cool, nighttime air to minimize the next day's cooling load.

NO—See *Normally Open*.

Node—A network device (e.g., controller, router, workstation) that can create, receive, or repeat a message.

Nonrenewable Resources—A natural resource (e.g., fuel, metals, minerals) that cannot be easily remade or regrown.

Non-Symmetrical Loading—A multiple load system in which individual loads operate at different times or loading from others.

Normally Closed (NC)—A device that moves toward the closed position as the control signal (or power) decreases or disconnects.

Normally Open (NO)—A device that moves toward the open position as the control signal (or power) decreases or disconnects.

Notification, Event—See *Event Notification*.

NTC—See *Negative Temperature Coefficient*.

O

O & M (Operations and Maintenance)—A collection of materials relating to the

devices and materials installed during a building construction project. It is a record of what was installed and instructions for maintenance of the equipment. In more general terms, the procedures used to maintain building operation.

OAT—See *Outside Air Temperature*.

OBIX (Open Building Information Exchange)—A standard for web services-based interfaces to building control systems.

Object—In a BACnet network, a physical point such as an input or output or a logical grouping of data (such as a PID loop, schedule, or variable). Objects have a set of properties and a group of functions that can be applied to them. The BACnet standard defines a standard set of objects that include analog and binary inputs, outputs, and values as well as control loops and schedules.

Occupancy—The state of one or more people being within a space.

Occupancy Sensor—See *Motion Sensor*.

Occupant Control—See *Individual Control*.

Occupied Zone—The volume of a conditioned space containing the occupants

of the space, typically considered extending from floor level up to a height of 6 feet (1.8 m).

OEM—See *Original Equipment Manufacturer*.

Off-Gas—See *Out-Gas*.

Offset—A sustained deviation between the control point and the setpoint of a proportional control system under stable operating conditions. Also called "deviation."

OLE (Object Linking and Embedding)—A standard developed by Microsoft that supports the use of objects created by one application and linked to or embedded in another. Embedded objects become part of the host file and, once inserted, are no longer part of the source file. With linked objects, however, the host file contains only the link, and the source data is maintained in another file.

On/Off Control—A simple two-position control system in which the device being controlled is either fully on or fully off with no intermediate operating positions available.

One-Pipe—A pneumatic system or device that uses bleed-type, low-volume, sensing elements that require an externally restricted main air supply. Contrast with *Two-Pipe*.

OPC (OLE for Process Control)—A worldwide standard that defines data exchange in the Microsoft® Windows® environment. The standard defines a set of objects and interfaces to facilitate interoperability in process control and manufacturing automation applications.

Open System—(1) An architecture with specifications that are public. (2) A building automation platform, such as BACnet, that allows components from different manufacturers to share information and work together. See also *Interoperability* and *Proprietary*.

Operating System Software—The main set of programs that schedule and control the execution of all other programs in a microprocessor-based device.

Operations and Maintenance—See *O & M*.

Operator Workstation—A computer equipped with a graphical user interface that serves as a centralized

control point for a building automation system.

Original Equipment Manufacturer (OEM)—A company that produces products or components that are marketed under another company's brand.

OSHA (Occupational Safety and Health Administration)—An agency of the United States Department of Labor created to prevent work-related injuries, illnesses, and deaths by issuing and enforcing standards for workplace safety and health.

OSI (Open Systems Interconnection)—An ISO architectural model for the design of an open systems network. All communication functions are divided into seven standardized layers: Physical, Data-Link, Network, Transport, Session, Presentation, and Application.

Outdoor Air Temperature—See *Outside Air Temperature*.

Out-Gas—The emitting of fumes into the air that are unpleasant to breathe and may be hazardous to occupant health. Many new paints, carpeting, sealants, adhesives, and other building materials will do this for a time after installation.

Output—In building automation, a control signal sent to an external device.

Outside Air—Air surrounding the exterior of a building.

Outside Air Temperature (OAT)—A measure of the air temperature outside a building. The temperature and humidity of air inside and outside the building are used in enthalpy calculations to determine when outside air can be used for free heating or cooling.

Overhead Distribution System—A method of supplying air to and removing air from a conditioned space at ceiling level. Both supply and return grilles are located in the ceiling plane, above which there is a ceiling plenum of sufficient depth to accommodate ductwork and other building services.

OWS (Operator WorkStation)—See *BACnet Operator WorkStation*.

Ozone (O_3)—A molecule made of three oxygen atoms instead of the usual two. Ozone is a poisonous gas and an irritant at the earth's surface, capable of damaging lungs and eyes, but the ozone layer in the stratosphere shields life on earth from deadly ultraviolet radiation from the sun.

Ozone Depletion Potential (ODP)—A measure, relative to R-11/CFC-11, of how much a gas is estimated to contribute to ozone depletion.

P

Packaged System—An HVAC installation that provides both heating and cooling from one (typically outside) unit, such as many roof top units, heat pumps, and fan coil units.

Packaged Unit—See *Packaged System*.

Packet—In IP networks, a small quantity of data along with information about the source and destination. The complete data transmission from one host to another is typically made up of many packets. Packets are also known as datagrams.

PAD (Packet Assembler Disassembler) Router—A special BACnet router connecting two or more BACnet network segments that are separated by at least one IP-only router. A PAD router may monitor network traffic for BACnet messages addressed to the other subnet and repackage messages for passing through IP routers. A companion

PAD router unpacks and retransmits the message on the remote BACnet network.

Panel—A DDC controller as viewed from the software interface.

Particulates—Small airborne particles found in the environment.

Pascals (Pa)—A unit of air pressure. Standard atmospheric pressure is 101,325 Pascals.

Passive Building Design—Building configurations that take advantage of a natural, renewable resource (e.g., sunlight and cooling breezes) Passive design strategies typically do not involve any moving part or mechanical processes.

Passive Cooling—Using passive building strategies to relieve the cooling load of a building by capitalizing on such things as predictable summer breezes or by shading windows from direct summer sunlight.

Passive Diffuser—An air supply outlet, without a fan, that relies on pressurized plenum or duct air to deliver air into the conditioned space of the building.

Passive (Solar) Heating—Using the sun's energy (in the form of heat) to diminish a building's heating load, usually through the use of large window areas that permit light penetration upon some massive material to use the material's thermal storage capacity.

PAT (Port Address Translation)—A feature of a NAT that translates TCP or UDP connections made to a host/port on an "outside" network to a host/port on an "inside" network. This allows one single IP address to be used for many internal hosts (but PAT can work in either direction). See also *NAT (Network Address Translation)*.

PC (Personal Computer)—A microcomputer with price, size, and capabilities that make it suitable for personal usage. Common usage today indicates an IBM PC compatible that uses a Microsoft® Windows® operating system.

PE Relay—See *Pneumatic Electric Relay*.

Peer-to-Peer Communications—A network architecture in which each resource has equivalent capabilities, responsibilities, and access. By contrast, in client-server architecture, clients make requests and servers respond.

PEL—See *Permissible Exposure Limit*.

Perimeter Zone—The area adjacent to and within about 15 feet of the exterior wall. These spaces have heating and cooling loads that are significantly different from internal/core zone areas because of factors such as solar gain and heat loss through the building envelope.

Permeable—Open to passage of fluids or gases.

Permissible Exposure Limit (PEL)—The legal limit in the United States for personal exposure to a particular substance according to the standards set by OSHA.

Photovoltaics—A solar power technology consisting of devices or an array of devices that convert light into electricity.

PI (Proportional Integral)—See *PI Control*.

PI Control—A control algorithm that combines the proportional (proportional response) and integral (reset response) control algorithms. Reset response tends to correct the offset resulting from proportional control. It is also called "proportional plus reset" or "two-mode" control.

PICS (Protocol Implementation Conformance Statement)—A statement issued by a manufacturer that specifies exactly which portions of the BACnet Standard a device implements.

PID (Proportional Integral Derivative)—See *PID Control* and *PID Loop Controller*.

PID Control—A control algorithm that enhances the PI control algorithm by adding a component that is proportional to the rate of change (derivative) of the deviation of the controlled variable. In PID control, therefore, the proportional value determines the reaction to the current error, the integral value determines the reaction based on the sum of recent errors, and the derivative value determines the reaction based on the rate at which the error has been changing. The weighted sum of these three actions is used to regulate the process. PID control is also called "three-mode" or "rate reset" control.

PID Loop Controller—A controller with an algorithm that calculates an output value that is based on the sensed value and the required setpoint. PID loop controllers provide more accurate and stable control than simpler controllers.

Pilot Bleed Relay—A relay that translates the movement of the sensing element into a changing pressure signal transmitted to another pneumatic device.

Pilot Duty—An electrical device, contacts, or circuit used for control of a high-current circuit.

Pitot Tube—A tube inserted into a duct to measure total (or high) pressure and static (or low) pressure. It has separate connections so each pressure may be measured.

PLC (Power Line Carrier or Power Line Communication)—A system for data transmission on a conductor also used for electric power transmission. A modulated carrier signal is impressed on the wiring system for networking, control, or demand response applications.

PLC (Programmable Logic Controller)—A microprocessor used for automation, such as control of HVAC systems. Typically, inputs are various types of sensors, and outputs are actuators and relays.

Plenum—A contained space for moving air. This may be a large duct, the space

above a suspended ceiling, or beneath a raised floor.

Plenum Cable—A cable rated for use in plenums without requiring additional enclosures. The cable must meet rigorous fire safety test standards (high fire-resistance and low smoke-producing characteristics).

Plug—(1) A shaped electrical connector. (2) In a valve body, the part that varies the opening for the fluid to flow through.

Plug-In—A software or hardware module that adds a specific feature or service to the main device or application.

Plug (or Receptacle) Load—The total current drawn by all the equipment plugged into the electrical system.

PM—See *Preventive Maintenance*.

Pneumatic Control—A control circuit that operates on air pressure and uses mechanical means to perform control functions.

Pneumatic Electric (PE) Relay—An air-actuated device used to make or break

electrical contacts as part of a control system.

Pneumatics—See *Pneumatic Control*.

Point—Any hardware or software object configured in a digital controller. A point can be an input, output, variable, schedule, log, or PID controller loop. See also *Object*.

Point-To-Point (PTP)—A method of data transmission to provide communications between two devices, typically used for dial-up communications over modems or a portable computer connection to a controller.

Polling—A method for transmitting data on a network in which a device repeats queries for updates to one or more other devices.

Pollutant Pathway—Route of entry of an airborne contaminant from a source location into the occupant breathing zone through architectural or mechanical connections (e.g. through cracks in walls, vents, HVAC system ducts, and open windows).

Pollutant—A contaminant that is known to cause adverse health or comfort effects.

Port—(1) An opening in a device through which electrical or pneumatic signals pass. (2) The opening in the valve seat. (3) A physical or logical computer connection. Ports may include physical connections for disk drives, display screens, keyboards, and networks. In TCP/IP and UDP networks, ports are logical connections allowing different applications on the same computer to use network resources without interfering with each other. Logical port 80, for example, is the default port used for HTTP traffic.

Port Forwarding—The process of a device changing the destination (IP and/or port) of a packet to another address and sending the packet to the new address. In typical applications, port forwarding works in the opposite direction from NAT/PAT. With NAT/PAT, the user sets up a path from "inside to outside." In port forwarding, however, the user sets up a path from "outside to inside," and the "inside to outside" path is set-up as a result of this initial communications. See also *NAT (Network Address Translation)* and *PAT (Port Address Translation)*.

Positioner—See *Positive Positioner*.

Positive Positioner—A pneumatic device used to ensure the proper position of a pneumatic actuator regardless of the load on the actuator. It applies main air pressure to the actuator until the actuator moves to the desired position as measured by a lever and a feedback spring.

Positive Compensation—A compensating action in which an increase in the compensation variable has the same effect as an increase in the controlled variable.

Positive Positioning Relay—See *Positive Positioner*.

Positive Temperature Coefficient (PTC)—The amount by which the electrical resistance of a sensor component increases when the temperature is raised. See also *Negative Temperature Coefficient (NTC)*.

Power—The rate at which energy is consumed or produced.

Power Factor—The fraction of power actually used by electrical equipment when compared to the power available.

Pressure—The force per unit area applied on a surface in a direction that is

perpendicular to the surface. See also *Total*, *Velocity*, *Static*, *Absolute*, *Atmospheric*, *Vacuum*, *Discharge*, *Gauge*, and *Head Pressure*.

Pressure Drop—(1) The amount of pressure lost between any two points in a system. (2) The difference in upstream and downstream pressures of fluid flowing through a valve or air flowing through a filter.

Pressure Drop, Critical—A value equal to the maximum loss of pressure, resulting from fluid flow through a valve, that a valve can experience without creating noise and cavitation.

Pressure Sandwich—An application where only the zones adjacent to a smoke zone are pressurized and the fire zone is exhausted to limit the spread of smoke.

Pressure Transducer—A signal translator (pressure into electric) and transmitter between a pneumatic system and a building automation system.

Preventive Maintenance (PM)—The care and servicing of equipment and facilities in satisfactory operating condition by systematic inspection, detection, and correction of possible failures

either before they occur or before they develop into major defects. This may increase efficiency of the equipment as well as avoid costly downtime.

Priority Array—A programming table in BACnet devices used to control present values in certain objects/devices. Values written to higher priority slots override those of lower priority until the higher priority is relinquished to the next lowest priority value.

Private Address—The address used on the "inside" of an NAT and mapped to an "outside" public address. (Since NAT can work in either direction, the concept of "inside" or "outside" address depends on the application.) See also *NAT (Network Address Translation)* and *PAT (Port Address Translation)*.

Properties—A standard set of descriptions about a BACnet object and its current status. Certain properties of an object may be required, while others may be optional.

Proportional—Characteristics of paired values or actions that maintain constant ratios.

Proportional Band—See *Throttling Range*.

Proportional Control—(1) A control algorithm or method in which the final control element moves to a position proportional to the deviation of the value of the controlled variable from the setpoint. (2) A type of control in which a controlled device may operate at any position between fully closed to fully open. Within a specific range, the output response maintains a constant ratio to the input signal. Contrast with *Floating Control* and *Two-Position Control*.

Proportional Mode—The part of a control function that changes its output signal in proportion with the change in the process error. See *PID Control*.

Proportional Plus Reset Control—See *PI Control*.

Proprietary—A protocol, standard, property, or design that an individual or organization uses, produces, or markets under exclusive legal rights. Proprietary systems may offer higher performance and richer features than open systems that must adhere to strict interoperable requirements. Contrast with *Open System* and *Interoperability*.

Protocol—A definition or set of communication rules by which information is exchanged between devices on a network.

Protocol Implementation Conformance Statement—See *PICS*.

Psychrometer—An instrument for measuring atmospheric humidity consisting of a dry-bulb and web-bulb thermometer.

PSI (Pounds per Square Inch)—A measure of pressure in pounds of force per square inch.

PSIA (Pounds per Square Inch Absolute)—The gauge pressure plus local atmospheric pressure (14.7 psi at sea level). See also *Absolute Pressure*.

PSID (Pounds per Square Inch Differential)—The difference between two pressures.

PSIG (Pounds per Square Inch Gauge)—The reading with a pressure gauge calibrated to read zero at sea level (as most gauges are). This is usually referred to simply as psi. See also *Gauge Pressure*.

Psychrometric Charts—Graphs relating to psychrometry, the study of atmospheric conditions, particularly the level of moisture in air. Psychrometric charts illustrate the relationship between

properties such as wet- and dry-bulb temperatures, dew points, and relative humidities for HVAC systems.

PTC—See *Positive Temperature Coefficient (PTC)*.

PTP—See *Point-To-Point*.

Public Address—The address used on the "outside" of an NAT and mapped to a private address on the "inside." (Since NAT can work in either direction, the concept of "inside" or "outside" address depends on the application.) See also *NAT (Network Address Translation)* and *PAT (Port Address Translation)*.

Pump—A device that raises, transfers, or compresses fluids or gasses.

PV— See *Photovoltaics*.

Q

Quick Opening—A valve flow characteristic in which the maximum flow is reached quickly as the device begins to open.

R

RA—See *Reverse Acting*.

Radiant Barrier—A material (typically an aluminum foil) used to block the transfer of radiant heat across a space.

Radiant Energy—Energy in the form of electromagnetic waves that travels outward in all directions from its source.

Radiant Heating/Cooling—A commercial radiant heating system that uses coils of hot water to radiate heat over an area rather than using convection or forced air. The coils are typically built into the floor or ceiling. The same system can also be used for cooling by using chilled water instead of hot. For smaller spaces, electrical cables might be used instead of hot water. See also *Chilled Beam*.

Radiation—Transfer of energy by means of the straight-line passage of electromagnetic waves through a space (including a vacuum).

Radon—A radioactive, colorless, odorless gas that occurs naturally in soil in many areas. When trapped in buildings, concentrations build up and can cause health hazards.

Rainwater Harvesting/Reclamation/Reuse—A system for collecting and filtering rain runoff from roofs to use for flushing toilets and/or lawn irrigation.

Raised Floor—In underfloor air distribution systems, a platform structure typically consisting of concrete-filled steel floor panels supported on pedestals 8 to 18 inches above the concrete structural floor slab. Each panel can be independently removed for access to the underfloor plenum containing the air delivery system, electrical cables, and other services.

Range—Assigned units of a measure of an input, output, or variable.

Rangeability—The comparison of a valve's maximum flow rate to its minimum flow rate.

Rate Mode—See *Derivative Mode*.

Rate Reset Control—See *PID Control*.

Real Time Clock (RTC)—A device that keeps track of the current time in a controller even if power is interrupted for a period of time.

REC (Renewable Energy Certificate)—A tradable commodity (also known as

a green tag, renewable energy credit, or tradable renewable certificate) that demonstrates that a unit of electricity was generated from a renewable energy source. RECs represent the environmental, social, and other positive attributes of power generated by renewable resources.

Receiver Controller—A pneumatic device which converts a main air supply into a varying 3 to 15 psig output in response to a varying 3 to 15 psig input signal from one or more external devices.

Receptacle Load—See *Plug Load*.

Recirculated Air—Return air that is diverted from the exhaust route, mixed with incoming outside air, conditioned, and delivered to the conditioned space. Recycling the air circulating through an HVAC system reduces energy requirements.

Recool—The cooling of air that has been previously heated by an HVAC system serving the same building. This is done before the air leaves a particular duct (or ducts) to provide the proper temperature for that corresponding zone or space. See also *Reheat*.

Refrigerant—A liquid capable of vaporizing at a low temperature and used to transfer heat in AC systems.

Refrigerants, Natural—Non-synthetic substances that can be used as refrigerants and have zero ozone depletion potential. Propane, butane, CO_2, ammonia, water, and even air can be used as refrigerants. However, because they are less efficient than the CFCs and HCFCs they replace, they require more energy for operation and thus may indirectly contribute more to global warming.

Register—A damper-equipped grill through which conditioned air passes.

Reheat—The heating of air that has been previously cooled either by mechanical refrigeration or economizer cooling systems. See also *Recool*.

Relative Humidity (RH)—The ratio of the amount of water vapor in air to the maximum amount of water vapor that could be in the air if the vapor were at its saturation conditions.

Relay—A switch that opens and closes a circuit in response to the control of another (usually lower voltage/current) electrical circuit.

Remote Broadcast—A broadcast sent from one network to another network.

Remote Bulb Thermostat—A thermostat with a liquid or vapor-filled bulb element connected by flexible capillary tubing to a bellows or diaphragm.

Remote Setpoint—A means for adjusting the controller setpoint from a remote location instead of at the controller itself.

Renewable Energy—See *Green Power*.

Renewable Resources—Resources that are created or produced at least as fast as they are consumed, so that nothing is depleted.

Repeater—A network device used to regenerate analog or digital signals distorted by transmission loss and extend their transmission range.

Reset—(1) Returning a device to its default state. (2) Changing an HVAC device's setpoint according to a change in conditions in a secondary variable, such as a change in outside air temperature. (3) A control mode (also called "integral") in which output correction of a controller is changed based on error over time.

Reset Control—See *Compensation Control*.

Reset Sensor—See *Compensation Sensor*.

Reset Volume Controller—A submaster controller that can have its setpoint changed automatically by a master controller that is responding to changes in temperature, pressure, or humidity. See also *Master Controller*.

Resistance—The measure of the degree to which an object opposes the passage of air, fluid, or electric current.

Resolution—The smallest change in the measured variable required to produce a detectable change in the output of a device.

Respirable Suspended Particles (RSP)—Inhalable particulate matter in the air.

Restrictor—A device in an (air) line that limits the flow (of air).

Return Air—The air extracted from a conditioned space and then recirculated and/or exhausted to the outside.

Reverse Acting (RA)—The action of a controller that decreases its output signal in response to a rise in sensed temperature or other variable. Contrast with *Direct Acting*.

Reversing Relay—A device that reverses a proportional signal from a controlling device.

RH—See *Relative Humidity*.

Rigid Bulb—A term referring to the hard case surrounding a temperature sensing medium.

Roof Top Unit (RTU)—An HVAC unit that is supplied as a package and installed outside of a building.

Router—A device that connects two or more networks and chooses the best path for data packets.

RS-232/RS-485—See *EIA-232* and *EIA-485*.

RSP—See *Respirable Suspended Particles*.

RTC—See *Real Time Clock*.

RTD (Resistance Temperature Detector)—Temperature sensors, usually made of platinum, that change resistance according to temperature changes. See also *Thermistor*.

RTU—See *Roof Top Unit*.

R-Value—A unit of thermal resistance used for comparing insulating values of different materials. The higher the

R-value of a material, the greater its insulating properties.

S

SA (Smart Actuator)—See *BACnet Smart Actuator*.

Saturation—A condition in which air is unable to hold any more moisture at a given temperature.

SBS—See *Sick Building Syndrome*.

SCADA (Supervising Control and Data Acquisition)—A process control application that collects data from sensors and forwards them to a central computer for management and control.

Scan—In an HVAC controller, the period of time typically required for a processor to perform all of its Control Basic instructions and programs.

Screwed-End Connection—A valve with threaded pipe connections.

Seat—The stationary part of the valve body that has a raised lip to contact the valve disc when closing off flow of the controlled fluid.

SEER (Seasonal Energy Efficiency Ratio)—A measure of the efficiency of air conditioners with the BTU of cooling output during its normal annual usage divided by the total electric energy input in watt-hours during the same period. The higher the number, the more efficient the device.

Selector Relay—Relays used in applications in which one signal must be chosen from two signals and then transmitted.

Self-Contained Control—A control with a power source, sensing element, and final control device combined in a single unit.

Sensible Heat—The quantity of heat absorbed or released by a substance during a change of temperature without a change in phase. (For the substance, the state remains constant while the temperature changes.) Contrast with *Latent Heat*.

Sensible Load—The heating or cooling load required to meet the air temperature requirement for comfort.

Sensitivity—The ratio between a controller's response rate and each unit of change in the controlled variable.

Sensor—A device that responds to a physical stimulus, such as room temperature or air flow, with a corresponding signal. See also *Transmitter* and *Thermostat*.

Server—A computer that provides resources to requests from client computers. See also *Client/Server*.

Service Plenum—See *Plenum*.

Server-Side Execution—A server performing an action on a client's request, and the client getting the results.

Services—In BACnet, the means of controlling the transfer of information between BACnet devices. BACnet defines 26 standard services, which are generally described by the device's PIC statement.

Setback—Lowering the heating setpoint, according to the time of day or day of week, to reduce energy usage during times a room or building is typically unoccupied.

Setpoint—The desired value of temperature (or other variable) in a space or medium that a control device strives to maintain.

Setup—(1) Raising the cooling setpoint, according to the time of day or day of week, to reduce energy usage during times a room or building is typically unoccupied. (2) The equipment or software designed or configured for a particular purpose.

Short Cycling—See *Cycling, Short*.

Sick Building Syndrome (SBS)—A combination of ailments (e.g., headaches, dizziness, nausea, or eye/throat irritation) occupants experience in a building that may cease when the person leaves the building. The contributing factors may include combinations of indoor air pollution, artificial fragrance, thermal discomfort, poor lighting, poor acoustics, poor ergonomics, chemical contamination, and/or biological contamination.

Sight Glass—A transparent port through which the level or condition of a liquid or gas contained within may be checked.

Single-Pole Single-Throw, Single-Pole Double-Throw (SPST, SPDT)—Types of relay or switch contact configurations. Single pole contacts control a single circuit. For the circuit, single-throw contacts have two terminals, and the connection is either on or off. Double-throw contacts have a common terminal that is connected alternately with each of two other terminals.

Single Unit Control—An automatic system which is regulated by a single thermostat.

Single-Seated Valve—A globe valve with one seat, plug, and disc that are suitable for applications requiring tight shut-off. Since a single-seated valve has nothing to balance the force of the fluid pressure exerted on the plug, it requires more closing force than a double-seated valve of the same size.

Sink—In indoor air quality, a material with the property of absorbing a chemical or pollutant and with the potential of subsequent re-emission; sometimes called a "sponge."

SMACNA (Sheet Metal and Air Conditioning Contractors' National Association)—An international association of HVAC

contractors, which has set indoor air quality guidelines used to help manage air quality issues resulting from construction and renovation.

Smoke—The airborne solid and liquid particulates and gases produced by heated or burned materials and the quantity of air that is entrained or otherwise mixed into the mass.

Smoke Control System—A system that contains and/or exhausts smoke in a building to provide safety for the occupants, aid firefighters, and reduce property damage.

Smoke Control System, Active—A system that uses fans to produce airflows and pressure differences across smoke barriers to limit and direct smoke movement.

Smoke Control System, Passive—A system that shuts down fans and closes dampers to limit the spread of fire and smoke.

Smoke Control Zone—An indoor space enclosed by smoke barriers.

Smoke Damper—A damper arranged to control passage of smoke through an opening or a duct.

Smoke Management System—See *Smoke Control System*.

SMS (Short Messaging Service)—A service that is used by a mobile device to send or receive text messages. The text messages are short, up to 160 characters, and if a device is out of service, SMS holds the message until the device comes back on-line.

SMTP (Simple Mail Transport Protocol)—A protocol for sending email. Most servers on the Internet use SMTP to send email from one server to another.

Solar Reflectance Index (SRI)—A value that incorporates a material's solar reflectance and emittance, quantifying how hot a sunlit surface will get relative to standard black and white surfaces. Materials with higher SRI values stay cooler. See also *Emissivity*.

Sound Attenuators—Components inserted into an air distribution system and designed to reduce airborne noise propagated along the ducts.

Source Control—A preventive strategy for reducing airborne contaminant levels through the removal of the material or activity generating the pollutants.

Span—The difference between the lowest and highest values of a signal or setting.

Split System—An HVAC installation (also called an "indoor/outdoor system") that combines an outdoor unit (condensing unit or heat pump) with an indoor unit (evaporator or air handler). Split systems must be matched for optimum efficiency.

Sponge—See *Sink*.

SPST, SPDT—See *Single-Pole Single-Throw, Single-Pole Double-Throw*.

SQL (Standard Query Language)—A common relational database programming language.

SRI—See *Solar Reflectance Index*.

SS (Smart Sensor)—See *BACnet Smart Sensor*.

SSL (Secure Sockets Layer)—A protocol developed by Netscape for transmitting private documents via the Internet by establishing a secure connection between the server and the client.

Stack Effect—The ventilation in buildings or chimneys that results from thermal differences between indoor and outside temperature. The greater the thermal difference and the height of the structure, the greater the stack effect.

Stagnant Zone—An area where there is low air velocity and the potential for increased stratification and poorer air quality.

Static Pressure—The outward push of air at rest on the walls of a duct. In air distribution systems, static pressure is equal to the total pressure minus velocity pressure and represents the pressure exerted by the air at rest. See also *Total Pressure* and *Velocity Pressure*.

Steam, Dry—Saturated or superheated steam containing no moisture (water droplets).

Steam, Saturated—Water vapor at the temperature of the liquid boiling point corresponding to its pressure.

Steam, Superheated—Steam heated to a temperature above the boiling point that corresponds to its pressure.

Steam, Wet—Saturated or superheated steam that contains moisture (water droplets).

Stem—The shaft that runs through the valve bonnet and connects an actuator to the valve plug.

Step Control—A control method in which a multiple-switch assembly sequentially switches equipment (e.g., electric reheat, multiple chillers) as the controller input varies through the proportional band.

Standard Cubic Feet Per Minute (scfm)—The volumetric flow rate of a gas corrected to "standardized" conditions of temperature, pressure, and relative humidity, thus representing a precise mass flow rate.

Stratification—Creation of a series of horizontal air layers with different characteristics (e.g., temperature, pollutant concentration) within a conditioned space.

Stressor—Any biological, chemical, physical, psychological, or social factor that contributes to a complaint.

Subcooled Liquid—Liquid cooled below its saturation temperature (boiling point).

Subnet—A subdivision of an IP network, which has its own unique network identification.

Subnet Mask—A method of dividing a network of IP addresses into groups. Short for subnet*work* mask, it enables the recipient of IP packets to distinguish the network ID and host ID portions of the IP address.

Subtraction Relay—A pneumatic device that subtracts signals from two inputs to create an output to a controlled device.

Superheat—The additional heat contained in a vapor at a temperature higher than the saturation (boiling) temperature corresponding to the pressure of the vapor.

Superheated Vapor—Steam or refrigerant vapor heated above its saturation temperature (boiling point). If superheated, there is no liquid present.

Supervisory Controller—See *Tier 1 Controller*.

Supply Air—Conditioned air entering a space.

Supply Duct—Any duct through which supply air is delivered to the conditioned space.

Sustainability—The capacity to maintain (without depleting resources) a certain process, state, or lifestyle indefinitely.

Switch—(1) A device that changes the flow of electrical current in a circuit. (2) A device that filters and forwards packets between network segments.

Switching Hub—A special type of hub that forwards packets to the appropriate port, based on the packet's address. Also called a "switch."

System—(1) An assembly of related elements that compose a whole. (2) In building automation, all the components that combine to control a building (e.g., controllers, actuators, repeaters, modems, and computers).

System Impedance—In an airflow system, the resistance to the motion of air. Filters, grilles, and abrupt changes in flow direction increase impedance.

System Name—A description given to the entire network of controllers.

T

Tables—In building automation programs, charts for converting an input from one value to another or for converting a nonlinear input value into a linear one.

TAC (Task/Ambient Conditioning) System—A space conditioning system allowing occupants to individually control the thermal environment in the localized zone of their work space while still maintaining acceptable environmental conditions in the building's ambient spaces.

TCP/IP (Transmission Control Protocol and Internet Protocol)—Two separate protocols used together for Internet communications. The Internet Protocol standard defines how packets of information are sent out over networks. The Transmission Control Protocol ensures the reliability of data transmission across Internet-connected networks.

Temperature—The measure of warmth or coldness of an object or environment according to a standard.

Terminal Unit (TU)—In an HVAC distribution system, the final unit (often near the end of ductwork) capable of modifying the temperature in a conditioned space. It may contain dampers, coils, and/or fans to modify airflow and temperature.

Therm—A unit originally adopted by many gas companies for measuring and billing the gas to customers. One therm is equivalent to 100,000 BTU.

Thermal Comfort—The feeling of satisfaction with the thermal environment, which is influenced by both subjective and objective factors. Heat transfer between the human body and the environment is influenced by a combination of environmental factors (air temperature, radiant temperature, air velocity, and humidity) and personal factors (clothing and activity level). People who perceive they have control over their local thermal environment may also be more tolerant of temperature variations.

Thermal Expansion—The temporary increase in volume or linear dimensions of materials when heated.

Thermal Plume—The upward movement due to buoyancy forces of warm air above a heat source.

Thermal Shock—The strain produced in a material due to sudden changes in temperature.

Thermistor—A type of resistor that changes its resistance in response to changing temperatures. It is often used in temperature sensors.

Thermocouple—A type of temperature sensor consisting of two dissimilar metals that converts thermal potential difference into a small electric voltage.

Thermometer—An instrument for measuring temperature.

Thermostat—A device for controlling the temperature of a system that senses the current temperature in relation to the desired setpoint and activates a heating or cooling device accordingly. It incorporates a temperature sensor with a (usually simple) controller.

Thermostatic Expansion Valve—A metering valve that reduces the pressure and temperature of a refrigerant as it flows to an evaporator in an HVAC system.

Three-Mode Control—See *PID Control*.

Three Position—A type of switch with typically two separate "closed" positions separated by a middle "open" position.

Three Wire—A type of control input also referred to as "tri-state," "floating," or "floating point." See *Floating Control*.

Threshold—The contaminant dose or exposure level below which there is no expected significant effect.

Throttling Range—In a proportional controller, the control point range through which the controlled variable (e.g., temperature) must pass to move the final control element (e.g., a damper) through its full operating range. Also called "proportional band."

Tier 1 Controller—In KMC digital automation controls, a LAN controller that can have one or more Tier 2 networks connected to it. A Tier 1 controller may also have ports for connections to a computer, modem, or other equipment.

Tier 2 Controller—In KMC digital automation controls, a "subnet" or "sub-LAN" controller, which has built-in,

peer-to-peer, EIA-485 network communications.

Tight Shut-Off/Close-Off—A valve condition in which virtually no leakage of the controlled fluid occurs in the closed position. Only single-seated valves typically provide tight shut-off, and double-seated valves typically have a one to three percent leakage in the closed position.

Time Constant—The time required for a dynamic component, such as a sensor or a control system, to reach 63.2 percent of the total response to an instantaneous (or "step") change to its input.

Time-To-Live—The length of time a message can "live" in a network without being delivered.

Token—A virtual symbol of authority that is passed along a network. When a controller receives the token, it has permission to place data onto the network. The token is not needed to listen since a controller can receive data from a network at any time.

Token Ring Network—A network with data communication controlled by a token that is passed around the network in a predetermined sequence.

Ton—In HVAC units, a ton equals 12,000 BTU/hour. Heat pumps and air conditioners are generally sized in tons.

Topology, Network—The physical layout, pattern of links, or geometric arrangement of devices within a network.

Torque—The measure of force applied to produce rotational motion, usually reported in foot-pounds or Newton-meters.

TotalControl—A powerful, web-enabled building automation software system developed by KMC Controls for configuring and monitoring BACnet controllers, KMC proprietary controllers, and other types of systems.

Total Pressure—In air distribution systems, the force exerted per unit area by a gas or liquid equal to the sum of static pressure and velocity pressure. See also *Static Pressure* and *Velocity Pressure*.

Total Volatile Organic Compounds (TVOC)—A measure representing the sum of all VOCs present in the air.

Toxicity—The nature and degree of an agent's adverse effects on living organisms.

Transducer—A device for converting energy from one form to another. In HVAC controls, transducers are frequently used to convert pneumatic pressure signals to electrical signals.

Transformer—A device used to change voltage from one level to another.

Transmitter—A device that amplifies a sensor signal and sends the signal to a controlling or indicating device. Transmitters convert the sensor's input signal (physical or electrical) into an output form that can be sent over large distances. A varying thermistor resistance, for example, might be converted into a 0 to 5 VDC signal.

Trends—A history of sampled readings of particular values.

Triac (TRIode for Alternating Current)—An electronic component used for controlling AC circuits.

Trim—The parts of the valve that contact the controlled fluid, including the stem, packing, plug, disc, and seat, but not including the valve body.

Triple Bottom Line—An expanded spectrum of values and criteria (environmental and social as well as the usual economic ones) for measuring organizational and societal success. This is succinctly described as the three Ps of "people, planet, and profits" or the three Es of "ecology/environment, economy, and (social) equity."

Tri-State—A type of control input also referred to as Three-Wire, Floating, or Floating Point. See *Floating Control*.

TU—See *Terminal Unit*.

Turndown—The ratio of maximum flow to minimum controllable flow of a valve installed in a system.

TVOC—See *Total Volatile Organic Compounds*.

Twisted Pair Cable—Wiring in which two conductors are wound around each other in a way designed to cancel out electromagnetic interference. Multiple twisted pairs may be bundled together in a shielded or unshielded cable.

Two-Mode Control—See *PI Control*.

Two-Pipe—A pneumatic system or device with a main air supply and a high-vol-

ume output or branch line. Contrast with *One-Pipe*.

Two-Position Control—A type of control in which an actuator of a valve or damper moves to one of the extreme positions or the other (usually on/off). The valve or damper position then remains unchanged until conditions at the controller have moved through the entire range of the differential. Contrast with *Floating Control* and *Proportional Control*.

Two-Way Valve—A valve with one inlet port and one outlet port.

TXV—See *Thermostatic Expansion Valve*.

U

U.S. Green Building Council (USGBC)—A building industry coalition working to promote buildings that are environmentally responsible, profitable, and healthy places to live and work. This council developed the LEED standard for developing high-performance, sustainable buildings.

UDP/IP (User Datagram Protocol and Internet Protocol)—A connectionless protocol that runs on top of IP networks (like

TCP). Unlike TCP/IP, UDP/IP provides very few error recovery services.

UL (Underwriters Laboratories)—A testing laboratory that develops standards and test procedures for materials, components, assemblies, tools, equipment, and procedures that relate mainly to product safety and utility.

Underfloor Air Distribution—A system using an underfloor plenum (open space between the structural concrete slab and the underside of a raised floor system) to deliver conditioned air directly into the occupied zone of the building. Air is delivered through supply outlets typically located at floor level or integrated as part of the office furniture and partitions. Return grilles are located above the occupied zone. This upward convection of warm air is used to efficiently remove heat loads and contaminants from the space.

Unit Ventilator—A fan coil unit, often installed under a window, that provides ventilation as well as heating and cooling. See also *Fan Coil Unit*.

Unitary System—An HVAC installation installed as one unit (such as cabinet unit heaters and some air handling

units). See also *Packaged System* and *Split System*.

Urban Heat Island—The increase in ambient temperature that occurs in cities because paved areas and buildings absorb more heat from the sun than natural landscape and additional heat is generated by vehicles, lighting, and other equipment.

USB (Universal Serial Bus)—A versatile, popular, plug-and-play, high-speed, serial computer interface. A single four-pin USB port can be used to connect up to 127 peripheral devices such as a mouse, a modem, a keyboard, and printers.

USGBC—See *U.S. Green Building Council*.

UTC (Coordinated Universal Time)—See *Coordinated Universal Time (UTC)*.

UUKL Listing—An Underwriters Laboratories' category code under UL 864, Control Units and Accessories for Fire Alarm Systems. UUKL is for products covered under the description "Smoke Control System Equipment."

V

Vacuum Pressure—Pressure below atmospheric pressure.

Valve—A device that regulates the flow of fluids by opening, closing, diverting, or mixing ports. It may be controlled manually or by an actuator.

Valve, Actuated—A valve controlled by an actuator, usually electronic or pneumatic.

Valve Assembly—A valve with a mounted actuator. See *Valve, Actuated*.

Valve Body—A valve without a mounted actuator or handle.

Valve Body Rating, Actual—The correlation between safe, permissible flowing fluid pressure and flowing fluid temperature of the valve body (exclusive of the packing, disc, etc.).

Valve Body Rating, Nominal—The theoretical pressure rating, expressed in psi, of the valve body (exclusive of packing, disc, etc.). This rating is often cast on

the valve body and provides a way to classify the valve by pressure.

Valve Bonnet—A valve component that screws to the top of the valve body, containing the packing that seals and guides the valve stem.

Valve Flow Coefficient—The number of U.S. gallons per minute of 60° F water that will flow through a valve with a 1 psi pressure drop. Abbreviated Cv.

Valve, Manual—A valve controlled by a handle. Contrast with *Valve, Actuated*.

Vapor—The gaseous phase of a substance which exists as a liquid or solid under other conditions.

Vapor Barrier—A material that drastically reduces the passage of water in vapor form.

Vapor Retarder—See *Vapor Barrier*.

Variables—In building automation, virtual points that can represent temperatures, setpoints, offsets, multipliers, or digital values.

Variable Air Volume (VAV)—A method of temperature control in which the volume of constant temperature supply air exiting a duct is modulated

(via dampers) to maintain a temperature setpoint in an individual space. Contrast with *Constant Air Volume*.

Variable Frequency Drive (VFD)—A method of controlling the speed of an AC electric motor by controlling the frequency of the electrical power supplied to the motor.

Variable Speed Fan (VSF)—A van that provides variable air flow control for HVAC applications.

VAV—See *Variable Air Volume*.

VAV Box—A variable air volume control box. Typically, a VAV box connected to a duct uses a variable position damper to control the volume of air discharged from the unit.

VAV Controller—A device that varies the position of a damper in a VAV box to maintain a set temperature in a zone. See also *Reset Volume Controller*.

Velocity Pressure—The pressure exerted by the velocity of the moving air. It is typically determined by subtracting the static pressure value from the total

pressure value. See also *Static Pressure* and *Total Pressure*.

Vent—An opening through which air can pass.

Ventilation—The process of intentionally supplying fresh, outside air into a building to replace air that has been used or contaminated. It may be achieved by either natural or mechanical (forced) means.

Ventilation, Cross—The circulation of fresh air through openings on opposite sides of a space.

Ventilation, Displacement—Supplying air at low velocities to cause minimal induction and mixing. The displacement outlets are usually located at or near the floor. The system utilizes buoyancy forces (generated by heat sources such as people, lighting, and computers) in a room to move contaminants and heat from the occupied zone to the return or exhaust grilles above. Since air is supplied at higher temperatures (usually above 63° F) than in mixing systems, less energy is required for cooling.

Ventilation Effectiveness—The system's ability to remove pollutants generated

by internal sources in a space, zone, or building. In comparison, air change effectiveness describes the ability of an air distribution system to ventilate a space, zone, or building.

Ventilation, Mechanical—Using fans and intake and exhaust vents to mechanically distribute ventilation and other conditioned air. See also *Ventilation, Natural*.

Ventilation, Mixing—Supplying air in a manner that the air in the entire room is fully mixed. In cooling mode, the cool supply air, typically around 55° F, exits an outlet at high velocity, inducing room air to provide mixing and temperature equalization. Because the entire room is nearly fully mixed, temperature variations are small while the contaminant concentration is fairly uniform throughout the entire room. The air outlets and inlets are usually placed in the ceiling.

Ventilation, Natural—Using windows, vents, and building design to provide fresh air and temperature regulation to occupied spaces. Windows may be opened manually or automatically through a BAS, but air is not moved or conditioned by mechanical fans or air-

conditioning systems. Contrast with *Ventilation, Mechanical*.

Ventilator—See *Energy Recovery Ventilator* and *Unit Ventilator*.

Virtual Private Network (VPN)—A private communications network often used to communicate confidentially over a publicly accessible network.

VFD—See *Variable Frequency Drive*.

VLAN (Virtual Local Area Network)—A network of computers that behaves as if each computer is connected to the same wire, but they may actually be physically connected to different segments of a LAN.

Volatile Organic Compounds (VOCs)—Organic chemical compounds with high enough vapor pressures under normal conditions to significantly vaporize and enter the atmosphere. VOCs are a factor in indoor air quality issues. They are generated by photocopiers, carpets, paints, varnishes, furnishings, among many other materials.

Volume (Booster) Relay—A pneumatic device used to amplify the volume of control air and minimize system transmission lag.

Vortex Dampers—Inlet control vanes that give an initial spin (or vortex) to air entering a centrifugal fan.

VPN—See *Virtual Private Network*.

VSF—See *Variable Speed Fan*.

W

W (Watt)—A measurement describing a unit of electricity equal to one joule (the metric unit of energy) per second.

WAN (Wide Area Network)—A computer network covering a large area and involving many computers. WANs range in size from several LANs connected together to the Internet.

Want-Point—A point being requested from a network. A list of want-points is created in each controller when a point in another controller is referenced in a Control Basic program, system group, or trend log. See *Point*.

Water, Black (or Blackwater)—Waste water from toilets and urinals. Some local

codes also classify kitchen water as black water.

Water Gauge (wg) or Water Column (wc)—See *Inches of Water Gauge (in wg) or Water Column (in wc)*.

Water, Gray (or Graywater)—Waste water from such processes as showers and laundry that can be used to flush toilets or for irrigation. Local codes define acceptable gray water sources.

Water, Non-potable—Water that does not meet drinking water standards. Gray, black, and process waters are non-potable.

Water, Potable—Water of sufficient quality that it can be used for drinking.

Water, Process—Water used in building systems, such as in boilers and chillers.

Watt (W)—An SI unit of power, or rate of energy conversion, equal to volts times amperes.

WebLite™—A KMC KMDigital Tier 1 controller that features a built-in HTTP server that can serve up text-based and browser-viewable graphics to any Internet-ready device.

Wet Bulb (WB) Temperature—Air temperature indicated by a thermometer with a wet wick. When a wet wick is placed over a standard thermometer and air is blown across the surface, the water evaporates and cools the thermometer below the dry-bulb temperature. This cooler temperature (the wet-bulb temperature) depends on how much moisture is in the air.

Who-Is Service—A message sent by BACnet devices to determine device object identifier and network addresses of other devices on the network.

WinControl®—The KMC Controls operating software that enables users to view, program, and configure controllers on a proprietary KMDigital network.

Wind Power—The conversion of wind energy into electricity.

Workstation—A computer with an individual user and connected to a network.

Work—The application of a force through a distance. Power is the rate at which work is done or the rate of flow of energy.

X

XML (Extensible Markup Language)—A specification, designed especially for web documents, that uses custom tags to provide extensibility (a feature not available with HTML). XML is expected to eventually supplant HTML as the standard for web documents.

Z

Zero Energy Building (ZEB)—A building with a net energy consumption of zero over a typical year because the total energy provided by on-site renewable energy sources equals the energy used. Buildings approaching this goal may be called near zero energy buildings or ultra-low energy buildings. See also *Energy Plus Building*.

Zero Energy Commercial Buildings Consortium (ZECBC)—A public/private consortium, working with the DOE to develop and deliver technology, policies, and practices to achieve a market transition to zero net energy commercial buildings.

Zigbee—A popular "mesh" wireless communications protocol used in controls. It uses low-power radio signals for applications that require a low data rate, long battery life, and secure networking.

Zone—A space or group of spaces in a building having similar heating and cooling requirements throughout its occupied area, so that comfort conditions may be controlled by a single temperature sensor with corresponding controller.

Zone Control—A controlled area that is divided into two or more zones where each has its own individual thermostat/controller.

Zone Valve—A valve, typically controlled by a thermostat, which controls the flow of water or steam to parts of a building.

Zoning—The practice of dividing a building into smaller zones for increased comfort control by the HVAC system.

Notes

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