THE ESSENTIAL BUILDING AUTOMATION GLOSSARY

KMC® CONTROLS

KMCControls.com

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About this Glossary

KMC Controls developed this glossary to provide a common ground of understanding for terms relating to intelligent buildings. It lists terms concerning:

- Building automation systems (BAS).
- HVAC (Heating, Ventilation and Air Conditioning).
- Green buildings, indoor environmental quality, and energy management.
- Internet of Things (IoT).

Note that:

- This list of more than 1,300 acronyms, definitions, and cross-references is far from exhaustive.
- Some terms have different meanings in other contexts and industries.
- Terms that are better known by their acronyms are listed by their acronyms.
- Acronyms are given a separate section to help give a quick reference to their meanings.
- Earlier editions of this glossary won four awards for publication excellence.

About KMC Controls

KMC Controls has been designing, engineering, and manufacturing building automation solutions, HVAC control products, and energy management solutions since 1969. KMC remains the only privately held American controls manufacturer with a complete offering of digital, electronic, and pneumatic products in the world. Family-owned-and-operated, KMC Controls delivers a responsiveness and flexibility unique in its industry.

KMC building automation system products provide important tools for attaining USGBC LEED certification of buildings. Controllers, sensors, actuators, and software help achieve prerequisites and credits in the categories of Energy and Atmosphere and Indoor Environmental Quality.

With this expertise and the future in mind, KMC spent years developing an IoT solution (KMC Commander) and working with tech giants like Intel and Dell to share the benefits of IoT across multiple industry verticals.

KMC's intellectual property includes dozens of patents and professional affiliations.

KMC is dedicated to developing and maintaining controlled processes to competitively service their world-wide customer base, with products that meet government regulations, international standards, and customer requirements.

KMC distributes its solutions and products through value-added, system integrators, wholesalers, OEMs, and IT providers throughout North America, and authorized distributors worldwide.

To find more about KMC Controls, visit www.kmccontrols.com.

Acronyms and Abbreviations

Ω	ohms
µs	microsecond
A/C	air conditioning
A/D	analog to digital
A	amperes
AAC	advanced application controller
ABS	acrylonitrile butadiene styrene
AC	alternating current
ACH	air changes per hour
ADR	auto demand response
AES	advanced encryption standard
AEE	Association of Energy Engineers
AHU	air handling unit
AI	analog input
AI	artificial intelligence
AMI	advanced metering infrastructure
amp	amperes
AO	analog output
AP	access point
API	application programming interface
ARI	Air Conditioning and Refrigeration Institute
APR	address resolution protocol

ASC	application specific controller
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASTM	American Society for Testing and Materials
avg.	average
AWG	American Wire Gauge
AWS	Amazon Web Services
B-AAC	BACnet Advanced Application Controller
B-ASC	BACnet Application Specific Controller
B-BC	BACnet Building Controller
B-OWS	BACnet Operator WorkStation
B-SA	BACnet Smart Actuator
B-SS	BACnet Smart Sensor
BACnet	Building Automation Control network
BAS	building automation system
BBMD	BACnet Broadcast Management Device
BCS	building control system
BI	binary input
BIBB	BACnet Interoperability Building Block
BLE	Bluetooth Low Energy
BLP	branch line pressure
BMCS	building management and control

	system
BMS	building management system
BO	binary output
BTL	BACnet Testing Laboratories
BTU	British Thermal Unit
BYOD	bring your own device
C	Celsius
C2C	Cradle-to-Cradle
CABA	Continental Automated Buildings Association
CAN	controller area network
CAV	constant air volume
CDMA	Code Division Multiple Access
CEA	controlled environment agriculture
CFC	chlorofluorocarbon
cfh	cubic feet per hour
CHP	combined heat and power
cfm	cubic feet per minute
cim	cubic inches per minute
cm	centimeters
CO_2	carbon dioxide
CO	carbon monoxide
COPE	corporate owned/personally enabled
CSA	Canadian Standards Association
CSFM	California State Fire Marshall
CT	current transducer

CUL	UL certification to CSA
Cv	valve flow coefficient
D/A	digital to analog
DA	direct acting
DAT	discharge air temperature
dB	decibel
DC	direct current
DCS	distributed control system
DCV	demand control ventilation
DDC	direct digital control
DDoS	distributed denial of service
DNS	domain name system
DOAS	dedicated outdoor air system
DOE	Department of Energy
DPDT	double pole double throw
DPST	double pole single throw
DR	demand response
DX	direct expansion
EER	energy efficiency rating
EFS	elastic file system
EIA	Electronic Industries Alliance or U. S. Energy Information Administration
EMS	energy management system
EOL	end of line
EP	electric to pneumatic
EPA	Environmental Protection Agency

EPDM	ethylene propylene diene monomer (synthetic rubber)
ERV	energy recovery ventilator
ESG	environmental sustainability governance
ETL	Electrical Testing Laboratories
ETS	environmental tobacco smoke
ETV	environmental testing verification
F	Fahrenheit
FACP	fire alarm control panel
FCC	Federal Communications Commission
FCU	fan coil unit
FFP	fully field programmable
FIU	fan induction unit
FLA	full load amperes
FOTA	firmware over-the-air
fpm	feet per minute
FPT	female pipe thread
FQDN	fully qualified domain name
FS	full scale
FSCS	firefighters' smoke control station
FSO	full scale output
FST	fan status
ft-lb.	foot pound
FTP	File Transfer Protocol

FTU	fan terminal unit
g	grams
GBCI	Green Building Certification Institute
GHG	greenhouse gas
gpm	gallons per minute
GPRS	general packet radio service
GSM	Global System for Mobile Communication
GUI	graphical user interface
GWP	global warming potential
HARDI	Heating, Air Conditioning, Refrigeration Distributors International
HCFC	hydrochlorofluorocarbon
HDMI	high-definition multimedia interface
HEPA	high efficiency particulate air
HFC	hydrofluorocarbon
Hg	mercury
hp	horsepower
HPU	heat pump unit
HSPF	heating seasonal performance factor
HTML	hypertext markup language
HTTP	hypertext transfer protocol
HTTPS	hypertext transfer protocol secure
HVAC	heating ventilating & air conditioning
Hz	hertz

I/O	input/output
IAQ	indoor air quality
IC	integrated circuit
ICC	International Code Council
ICS	industrial control system
ID	inside diameter
IEEE	Institute of Electronic and Electrical Engineers
IEQ	indoor environmental quality
IETF	Internet Engineering Task Force
IGCC	International Green Construction Code
IIoT	industrial internet of things
IMEI	International Mobile Equipment Identifier
in-lb.	inch pound
IoE	Internet of Everything
IoT	Internet of Things
IP	Internet Protocol or (in reference to enclosure ratings) ingress protection
IPD	integrated project delivery
IPMVP	International Performance Measurement and Verification Protocol
IPSEC	Internet protocol security
ISO	International Organization for Standardization
ISP	Internet service provider

IT	information technology
JACE	Java Application Control Engine
JSON	JavaScript Object Notation
kbps	kilobits per second
KMD	KMC Digital
kPa	kilopascals
kW	kilowatt
kWh	kilowatt-hour
L2TP	Layer 2 Tunneling Protocol
LAT	leaving air temperature (= DAT)
LAN	local area network
LCA	life-cycle assessment
LCC	life-cycle cost
LCD	liquid crystal display
LDAP	Lightweight Directory Access Protocol
LEAP	Lightweight Extensible Authentication Protocol
LED	light emitting diode
LEED	Leadership in Energy and Environmental Design
LiFi	light fidelity
LON	local operating network
LRA	locked rotor amperes
LTE	Long Term Evolution
m	meters
M2M	machine-to-machine

M2P	machine-to-person
mA	milliamperes
MAC	media access control
MAMA	MAC Automatic MS/TP Addressing
max.	maximum
MDN	mobile directory number
MEA	materials and equipment acceptance
MEID	mobile equipment identifier
MEMS	Micro-Electro-Mechanical Systems
MEP	mechanical, electrical, and plumbing
MERV	minimum efficiency reporting value
min.	minimum
ML	machine learning
mL/s	milliliters per second
mm	millimeters
MPRs	minimum program requirements
MPT	male pipe thread
MQTT	Message Queue Telemetry Transport
MS/TP	master-slave/token-passing
MSDS	materials safety data sheets
NAT	network address translation
NC	normally closed
NEMA	National Electrical Manufacturers Association
NFC	Near Field Communication
NFPA	National Fire Protection Association

NIC	network interface card
NO	normally open
NPS	National Pipe Straight
NPT	National Pipe Tapered (Thread)
NTC	negative temperature coefficient
N•m	Newton meters
O&M	operations and maintenance
OAT	outside air temperature
OBIX	open building information exchange
OD	outside diameter
ODP	ozone depletion potential
OEM	original equipment manufacturer
OLE	object linking and embedding
OPC	OLE for process control
OSA	open system architecture
OSI	open system interconnection
OSS	open source software
OT	operational technology
OWS	operator workstation
Pa	pascals
PAD	packet assembler disassembler
PAN	personal area network
PAT	port address translation
PC	personal computer
PCB	printed circuit board
PE	pneumatic to electric (volts)

PEAP	protected extensible authentication protocol
PEL	permissible exposure limit
pF	picofarad
PI	proportional integral
P/I	pneumatic to current (amperes)
PICS	protocol implementation conformance statement
PID	proportional integral derivative
PLC	programmable logic controller
PM	preventative maintenance
PoE	power over ethernet
ppm	parts per million
PPTP	Point-to-Point Tunneling Protocol
psi	pounds per square inch
psid	pounds per square inch differential
psig	pounds per square inch gauge
PTC	positive temperature coefficient
PTP	point-to-point
PV	photovoltaics
PWM	pulse width modulation
QoS	quality of service
RA	reverse acting
RADIUS	Remote Authentication Dial-In User Service
REC	renewable energy certificate
RH	relative humidity

rms	root mean square
RS	Recommended Standard
RTC	real time clock
RTD	resistance temperature detector
RTU	roof top unit
SA	smart actuator
SAAS	software as a service
SAT	supply air temperature
SBS	sick building syndrome
scfh	standard cubic feet per hour
scim	standard cubic inches per minute
SEER	seasonal energy efficiency ratio
SI	system integrator
SIM	subscriber identity module
SMA	SubMiniature version A
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SMS	short messaging service
SMTP	simple mail transport protocol
SOAP	Simple Object Access Protocol
SoC	system-on-a-chip
SPDT	single pole double throw
SPP	serial port profile
SPST	single pole single throw
SQL	standard query language
SRI	solar reflectance index

SS	smart sensor
SSH	secure shell
SSL	secure socket layer
stat	thermostat
TAC	task/ambient conditioning
TCP/IP	transmission control protocol and Internet protocol
TLS	transport layer security
TU	terminal unit
TVOC	total volatile organic compounds
TXV	thermostatic expansion valve
UDP/IP	user datagram protocol and internet protocol
UI	user interface
UL	Underwriters Laboratories
UX	user experience
US-CERT	United States Computer Emergency Readiness Team
USB	universal serial bus
USGBC	U.S. Green Building Council
UTC	coordinated universal time
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
VFD	variable frequency drive
VLAN	virtual local area network
VOC	volatile organic compounds
VPN	virtual private network
VSF	variable speed fan
VVT	Variable Volume and Temperature
W	watts
WAN	wide area network
WAP	wireless access point
WB	wet bulb
wc	water column
wg	water gauge
WWAN	wireless wide area network
XML	extensible markup language
ZEB	zero energy building
ZECBC	Zero Energy Commercial Buildings Consortium

NUMBERS

232—See ***EIA-232***.

485—See ***EIA-485***.

6LoWPAN—A communication protocol which compresses IPv6 packages for small, low power-devices to enable them to communicate within the IoT.

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***.

Accelerometer—Sensors used to measure acceleration, tilt, and vibration in electronic devices.

Access Control—The selective restriction of access to a place (e.g., with a lock) or other resource (e.g., with a login).

Access Point (AP or WAP)—A networking device that allows other Wi-Fi devices to connect to a wired network.

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, or rotary 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.

Address Resolution Protocol (ARP)—A communication protocol used to convert an IP address into a physical address. This way, computers can communicate with each other, despite only knowing each other's IP addresses, by sending an ARP request that informs them about the other computer's MAC address.

Addressability—The capacity for an entity to be targeted and found. To be addressable, an entity must be uniquely identifiable, which means that it must be associated with something

(typically an alphanumeric string not associated with anything else that exists within that system).

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

Advanced Encryption Standard (AES)—The specification for encryption of electronic data established in 2001. Operates on a public/private key system.

Advanced Metering Infrastructure (AMI)—An architecture for automated, two-way communication between a smart utility meter with an IP address and a utility company. The goal of an AMI is to provide utility companies with real-time data about power consumption.

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

AHU—See ***Air Handling Unit***.

AI—See ***Analog Input or Output***.

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).

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 Heating and Refrigeration Institute (ARI)—A trade association (representing 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 Gapping—A security measure that involves isolating a computer or network and preventing it from establishing an external connection. An air-gapped computer is physically segregated and incapable of connecting wirelessly or physically with other computers or network devices.

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—Grille, diffuser, or louvered opening through which air is intentionally drawn from a conditioned space.

Air Outlet—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. Digital 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***.

Amazon Web Services (AWS)—The name given to a collection of remote computing services, offered by Amazon.com, that combine to make a cloud computing platform.

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 2–10 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 Blacklisting—A network administration practice, sometimes

simply called blacklisting, used to prevent the execution of undesirable programs by maintaining a list of and rejecting such programs. Such programs include not only those known to contain security threats or vulnerabilities but also those that are deemed inappropriate within a given organization. Blacklisting is the method used by most antivirus programs, intrusion prevention/detection systems, and spam filters.

Application Programming Interface (API)—A collection of commands and protocols used to interact with an operating system, device, or specific software component. In IoT, an API lets the developer access the functionality of a device or sensor. APIs can be public or restricted to authorized users only.

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

Application Whitelisting—A network administration practice, sometimes simply called whitelisting, used to prevent unauthorized programs from

running by granting access only to approved programs. The purpose is primarily to protect computers and networks from harmful applications, and, to a lesser extent, prevent unnecessary demand for resources.

AppStat—A series of wall sensors manufactured by KMC Controls that provides a space-mounted equipment controller with the convenience of built-in temperature, humidity, and motion sensors.

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

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. 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.

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 or transformer).

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***.

AWS IoT (Amazon Web Services Internet of Things)—An Amazon Web Services platform that collects and analyzes data from Internet-connected devices and sensors and connects that data to AWS cloud applications. AWS IoT can collect data from billions of devices and connect them to endpoints for other AWS tools and services, allowing a developer to tie that data into an application.

Axon—AXON is eXtended Object Notation (AXON). It's a simple text based format for interchanging of objects, documents, and data. It combines the simplicity of JSON, the extensibility of XML, and the readability of YAML.

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

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

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. Contrast with ***Globe Valve***.

Band—A range of frequencies used by a technology for communication purposes. For example, the 2.4 MHz band is used for Wi-Fi and Bluetooth communication.

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.

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 ; measured as bits per second.

B-BC—See ***BACnet Building Controller***.

BBMD—See ***BACnet Broadcast Management Device***.

BCS—See ***Building Control System***.

Beacons—Low-cost devices that communicate with smartphone apps

in an indoor positioning system. Beacons use BLE and are key enablers for the smart retail category, triggering messages as consumers pass through locations or near products.

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***.

Big Data—The ever increasing volume of data available (from many sources) that is too large to fully process using traditional database and software techniques. If successfully mined for useful information, however, it helps organizations make faster, better decisions and improve operations.

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.

Biocontaminant—Contaminants that are either life forms (e.g., bacteria) or are

derived from living things (e.g., rodent droppings).

Black Hat—A hacker who breaks into a computer system or network with malicious intent. Unlike a white hat hacker, the black hat hacker takes advantage of the break-in, perhaps destroying files or stealing data for some future purpose. The black hat hacker may also make the exploit known to other hackers and/or the public without notifying the victim. This gives others the opportunity to exploit the vulnerability before the organization is able to secure it.

BLE—See ***Bluetooth Low Energy***.

Blockchain—A distributed database, based on a ledger of transactions, that powers cryptocurrencies like Bitcoin. Blockchains will allow IoT devices to communicate directly with each other instead of through a centralized cloud.

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

BLP—See ***Branch Line Pressure***.

Bluetooth Low Energy (Bluetooth LE or Bluetooth 4 or BLE)—A power-conserving variant of Bluetooth Personal Area Network (PAN)

technology, designed for use by Internet-connected machines and appliances. Also marketed as Bluetooth Smart, BLE was introduced in the Bluetooth 4.0 specification as an alternative to Bluetooth Classic. Like its predecessor, BLE uses frequency-hopping wireless technology in the 2.4 GHz unlicensed radio band to interconnect nearby devices. Unlike its predecessor, BLE maxes out at just 1 Mbps while consuming just 0.01 to 0.5 watts. That's up to one third of the speed of Bluetooth Classic, at no more than half the power.

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***.

Botnet—A collection of devices infected with malware that can be coordinated to perform tasks in massive volumes. Typical uses of botnets are the sending of bulk spam and DDoS attacks.

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.

Brick—Slang term for accidentally rendering a device inoperable by changing its configuration or shorting one of its circuits. The inert device sits there like a brick.

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

Bring Your Own Device (BYOD)—Enterprise term for allowing people or employees to bring their own Wi-Fi enabled devices into the corporate network.

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.

Brownfield—(1) In urban planning, previously developed land that is not currently in use and may potentially be contaminated by hazardous waste (making redevelopment more difficult). (2) In software development, the development and deployment of new software systems in the immediate presence of existing (legacy) software applications/systems. The new software architecture must take into account and coexist with live legacy software. See also ***Greenfield***.

BTL—See ***BACnet Testing Laboratories***.

BTU—See ***British Thermal Unit***.

Building Automation Control Network—See ***BACnet***.

Building Automation System (BAS)—An integration of 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.

Business Logic—The code in an application that processes and executes the functional requirements of the application. Typically sits between any data stores and the end-user experience. In IoT the end user may be another system.

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 controller is calibrated.

CAN Bus—A message-based, multi-master serial protocol for transmitting and receiving data within a Controller Area Network (CAN). Sometimes written as “CANbus,” the CAN Bus connects multiple Electronic Control Units (ECUs) also known as nodes. Designed

initially for automotive applications in 1983, the CAN Bus has been adapted to aerospace, commercial vehicles, industrial automation, and medical equipment.

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.

Card—A graphic used to represent platform data in the KMC Commander user interface.

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***.

CDMA (Code Division Multiple Access)—A digital cellular phone service method that separates multiple transmissions over a finite frequency allocation using Spread Spectrum techniques.

CE Marking—The CE marking is the manufacturer's declaration that the product meets the requirements of the applicable EC directives. The letters "CE" are the abbreviation of French

phrase “Conformité Européene” which literally means “European Conformity.”

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

Cellular Modem—Allows a device to receive Internet access over cellular mobile networks. Devices can also be configured to remotely connect to a server or device to enable off-site access and data collection.

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 Device—One of the two types of devices defined by the BLE standard. In contrast with the Peripheral Device, the Central has significantly greater processing capability and is usually either a powered device or one with a rechargeable battery.

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***.

CIA (Confidentiality/Integrity/Availability)—The security triad of needs, principles, policies, and methods for protected assets. Note that IT tends to be confidentiality-focused whereas OT is more focused on integrity and availability.

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

Client Authentication—End user authentication using HTTPS (HTTP over SSL) is a strong authentication mechanism. This mechanism requires the user to possess a Public Key Certificate (PKC). Currently, PKCs are useful in e-commerce applications and

also for a single-sign-on from within the browser.

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—Regulating indoor air quality metrics, like temperature and humidity, using 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.

Cloud or "The Cloud"—Cloud computing. The name "cloud" comes from the fluffy cloud imagery typically used

in Visio-style network diagrams to represent a connection to the Internet.

Cloud Communications—Communication services being provided by third parties that can be accessed and used through the Internet. Skype and Zoom are examples of cloud communications applications.

Cloud Computing—An approach where information technology capacities (such as storage or applications) are separated from the individual computer and are supplied through the Internet (or an Intranet-based service) at the user's demand. The "as-a-Service" moniker is sometimes used for cloud computing services, such as Software-as-a-Service, Platform-as-a-Service, and Infrastructure-as-a-Service. The backend for many IoT devices may be delivered via the cloud.

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 protective 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 temperature, 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.

(KMC) Commander™—An IoT solution that connects buildings and other devices to the cloud and provides meaningful data in real-time to a PC or mobile device. The KMC Commander platform consists of Dell gateway hardware plus KMC IoT software and cloud services. It simplifies IoT implementation to connect, visualize, and manage building, energy, and other systems.

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.

(KMC) Connect™—Configuration tool for rapid deployment and customization of KMC Conquest controllers.

(KMC) Connect Lite™—A mobile application, using NFC technology to configure KMC Conquest controllers while they're unpowered and still in factory packaging.

(KMC) Conquest™—A line of advanced building automation system products from KMC Controls.

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***.

Context Awareness—The ability of a system or system component to gather information about its environment at any given time and adapt behaviors accordingly. Contextual or context-aware computing uses software and

hardware to automatically collect and analyze data to guide responses.

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 hot water heating systems, for example, the control agent is the water and the manipulated variable is the flow of the water. 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 network of nodes that collectively monitor, sense, and control or enable control of an environment for a particular purpose. Examples include home automation networks to traffic light controls and city lighting systems. Control networks vary enormously in the number of nodes in the network and in their complexity. Unlike networks that people use to communicate with each other, control networks tend to be invisible. In the future, control networks are expected to become an important aspect of what is sometimes called ubiquitous computing.

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.

Controller Area Network (CAN)—See ***CAN Bus***.

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

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

Controlled Environment Agriculture (CEA)—A technology-based approach toward agriculture production to provide protection and maintain optimal growing conditions throughout the development of the crop. Production takes place within an enclosed growing structure such as a greenhouse or building.

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***.

(KMC) Converge™—An application for the rapid deployment and visualization of KMC controllers on the Niagara platform.

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

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***.

Cyberphysical Security—The protection of both hardware and software in an IoT environment. Blending IT and OT, cyberphysical security must both protect physical devices from threats coming in from the network and protect the network from threats coming from the attached devices.

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, such as 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.

Dashboard—A user interface that presents key information in a summarized form, often as graphs or other widgets. Derived from the classic automobile dashboard, the design of the interface depends on what information needs to be monitored or measured.

DAT (Discharge Air Temperature)—The temperature of the air leaving from the VAV box and entering the room. The SAT (Supply Air Temperature) is the temperature of the air in the duct supplied by the AHU or RTU and entering into the VAV box before any reheat is applied. Sometimes SAT and DAT are used interchangeably, but they are only equivalent if there is no reheat.

Data Cap—A service provider-imposed limit on the amount of data transferred by a user account at a specified level of throughput over a given time period.

Data Center—A collective term for the physical site, network elements, systems, etc., that supports computing and network services.

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.

DC—See ***Direct Current***.

DCV—See ***Demand Control Ventilation***.

DCS—See ***Distributed Control System***.

DDC—See ***Direct Digital Control***.

DDoS (Distributed Denial of Service)—A type of cyber attack where multiple machines are used to attack the target system.

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 or power of a signal.

Deck—A customizable collection of cards used to organize data in the

KMC Commander user interface. For example, a deck could be comprised of cards for each room in a particular building, or there could be a deck for each building floor.

Defense in Depth—A security philosophy where tools and policies are implemented at various levels of an organization and its infrastructure to thwart security breaches.

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.

De-identification—The stripping away of personally identifiable information from data prior to its use. The process must include the removal of both direct identifiers (name, SSN, email address, etc.) and the proper handling

of quasi-identifiers (sex, marital status, profession, postal code, etc.).

Delta or Δ—A difference in measured values (e.g., of temperature or pressure). See also ***Differential***.

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 preplanned methods such as adjusting HVAC setpoints, dimming or shutting off lights, and other strategies.

Denial of Service (DOS)—A common type of cyber attack whereby the target is hit with more messages than it normally handles, making its responsiveness to requests slow or nil.

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 Attack—An exploit that takes advantage of a vulnerable device to gain access to a network.

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.

DIN Rail—A metal rail used for mounting electrical equipment and racks.

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.

Discovery—A service to find unknown resources/entities/services based on a rough specification of the desired result. It may be utilized by a human or another service. Credentials for authorization are considered when executing the discovery.

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

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.

Domain Name Service (DNS)—The methods and services used to resolve a URL to an IP address, needed for connectivity. For instance, the URL www.kmccontrols.com resolves to IP address 66.170.45.71.

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.

Duct—An encased conduit, typically constructed of galvanized steel or fiberglass, through which air moves through 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 enthalpy 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.

Edge Computing—A distributed information technology (IT) architecture in which client data is processed at the periphery of the network, as close to the originating source as possible. The move toward edge computing is driven by mobile computing, the decreasing cost of computer components, and the sheer number of networked devices in the Internet of Things (IoT). Time-sensitive data in an edge computing architecture may be processed near the point of origin by an intelligent device, and data that is less time sensitive is sent to the cloud for analytics and storage.

Edge Device—A device which provides an entry point into enterprise or service provider core networks. Examples include routers, routing switches, integrated access devices (IADs), multiplexers, and a variety of metropolitan area network (MAN) and wide area network (WAN) access devices.

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

Elastic File System (EFS)—Data storage system provided by Amazon Web Services that dynamically expands as the footprint grows. Eliminates the need for pre-provisioned storage and expansion.

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.

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 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.

Embedded System—A computer system dedicated to a specific task or tasks, operating within a larger mechanical or electrical system. Program instructions written for embedded systems are referred to as firmware, contrasting with the general purpose computer systems programmable for multiple tasks. Embedded systems often operate in isolation.

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***.

Encryption—Methods used to secretly exchange information using a set of keys or passwords. The methods are normally designed to keep the information confidential, but some methods can also be used to identify users and indicate whether or not the data has been tampered. There are two types of key methodologies - asymmetric (using public and private keys) and symmetric (both parties use the same secret key).

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 Harvesting— The process by which energy is produced for a device from external sources (e.g., solar, wind, thermal, or kinetic energy). The energy source is in the device's ambient environment and provides a small amount of power for low-energy electronics (such as in wireless sensors).

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.

EnOcean—An energy-harvesting wireless technology and standard (ISO/IEC 14543-3-10) used primarily in building automation systems but also applied to smart homes and other industry and transportation applications. Modules based on EnOcean technology combine energy converters with ultra-low power electronics, and enable communications between wireless batteryless sensors, switches, and controllers.

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. 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.

Firmware Over-the-Air (FOTA)—The process of updating a mobile phone's operating system and software over the network, rather than having the consumer come into a service center for updates.

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

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 is 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 series of wall-mounted controllers with integrated internal temperature, humidity, motion, and CO^2 sensors designed for HVAC and building automation systems. They have built-in selectable/configurable applications and are also fully programmable. They have integrated schedules, alarms, and trends and communicate with BACnet networks via MS/TP or Ethernet connections.

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.

Fog Computing (Fogging or Fog Networking)—A decentralized computing infrastructure in which computing resources and application services are distributed in the most logical, efficient place at any point along the continuum from the data source to the cloud. The goal of fog computing is to improve efficiency and reduce the amount of data that needs to be transported to the cloud for data processing, analysis and storage. This is often done for efficiency reasons, but it may also be carried out for security and compliance reasons.

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, double-throw contacts.

Form D—Make-before-break, single-pole, double-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 excessive. 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.

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

FQDN (Fully Qualified Domain Name)—The complete domain name for a specific computer, or host, on the Internet. The FQDN consists of two parts: the hostname and the domain name. For example, an FQDN for a hypothetical mail server might be mymail.somecollege.edu.

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)—A description of 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 transmission and reception of data. Contrast with ***Half Duplex***.

FullBAC™ Router—A KMC Control 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.

Geofence—A virtual border applied to a physical space. For example, geofencing might be defined around a nursery, and when a mobile device crosses the nursery boundary, an alert is generated. Geofences may be dynamically created and in a telematics application can encompass entire neighborhoods or cities.

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 System for Mobile communication (GSM)—This is the most widely used digital cellular network and the basis for mobile communication such as phone calls and the short message service (SMS).

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. Contrast with ***Ball Valve***.

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

GPRS (General Packet Radio Service)—A wireless communications standard on 2G and 3G cellular networks that supports a number of bandwidths and provides data rates of 56-114 kbps. As cellular companies move to more advanced networks, GPRS networks may be more cost-effective for IoT networks.

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.

Gray Hat—A hacker who exploits a security weakness in a computer system or product in order to bring the weakness to the attention of the owners. Unlike a black hat, a gray hat acts without malicious intent. The goal of a gray hat is to improve system and network security. However, by publicizing a vulnerability, the gray hat may give other hackers the opportunity to exploit it. This differs from the white hat who alerts system owners and vendors of a vulnerability without actually exploiting it in public.

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 operations 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.

Greenfield—(1) In urban planning, undeveloped land used for agriculture, landscaping, or left to evolve naturally. (2) In software development, a project where no consideration of previous or legacy systems is needed. See also ***Brownfield***.

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

Haystack—A specification of semantic/meta data and web services/protocols, defined by the Haystack Project consortium, with the goal of making it easier to access smart and IoT devices.

HCFC (Hydrochlorofluorocarbon)—A CFC replacement with a lower ozone depletion 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.

Headless System—A computer that operates without a monitor, graphical user interface (GUI) or peripheral devices, such as keyboard and mouse.

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 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.

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 the 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.

Host—Computers that provide (or host) certain services or resources within a network that other participants within the network can then access and use. Hosts are the hardware basis for servers, as servers are run on hosts. Often times, they are the central point in a company's data processing process.

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.

HTTPS (Hypertext Transfer Protocol Secure)—Also called HTTP over TLS or HTTP over SSL, HTTPS is a protocol for secure communication over a computer network that is widely used on the Internet. HTTPS consists of communication over Hypertext Transfer Protocol (HTTP) within a connection encrypted by Transport Layer Security or its predecessor, Secure Sockets Layer. The main motivation for HTTPS is authentication of the visited website and protection of the privacy and integrity of the exchanged data.

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 (Heating, Ventilating, and Air Conditioning)—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.

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

Hybrid Cloud—A mix of public and private cloud. The distribution of services

through private or public channels is decided upon by the users.

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 Action—See ***Integral Action***.

IAQ—See ***Indoor Air Quality***.

ICS (Industrial Control System)—Devices and equipment used for production and control systems.

IEEE (Institute of Electronic and Electrical Engineers)—An international, nonprofit, professional organization for the advancement of electricity-related technology. Numerous standards used in computer communications were developed by IEEE.

IETF (Internet Engineering Task Force)—An open international community

of technologists that "define" recommendations on anything Internet.

IEQ—See ***Indoor Environmental Quality***.

IIoT (Industrial Internet of Things)—A subdiscipline of IoT, encompassing connected large-scale machinery and industrial systems such as factory-floor monitoring, HVAC, smart lighting, and security. This is M2M communication where, for example, equipment can send real-time information to an application so operators can better understand how efficiently that equipment is running. Also referred to as Industry 4.0.

IMEI—International Mobile Equipment Identifier (used in GSM).

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

IMSI—International Mobile Subscriber Identifier (used in GSM and CDMA).

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.

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***.

Indoor Positioning System—A system to locate persons or objects inside buildings, as opposed to GPS which works outdoors. IPS typically works with wall or ceiling mounted beacons combined with algorithms to determine location.

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.

Industrial Control System (ICS)—Computer hardware and software that monitor and control industrial processes that exist in the physical world, where operator-driven supervisory commands can be pushed to remote station devices. Industries such as electrical, water, oil, and gas are typical ICS users.

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.

Intelligent Buildings—See ***Smart Buildings***.

Intel Atom—Intel's family of x86 and x86-64 processors that are optimized for small computing devices, such as smartphones and mobile Internet devices (MIDs). Most netbooks on the market today run on Atom.

Intel Quark—An embedded system-on-a-chip (SoC) processor designed for smaller mobile devices like wearable computers. As with their counterparts in elementary particles, Quark is smaller than Atom. The Quark processor is said to be a fifth of the size of Atom and draws a tenth of the power.

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.

Internet of Everything (IoE)—The Internet of Everything (IoE) is a concept that extends the Internet of Things (IoT) emphasis on machine-to-machine (M2M) communications to describe a more complex system that also encompasses people and processes.

Internet of Things (IoT)—A system of interrelated computing devices, mechanical and digital machines, objects, animals, or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.

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).

IP Code—The IP Code, International Protection Marking, IEC standard 60529, sometimes interpreted as Ingress Protection Marking, classifies and rates the degree of protection provided against intrusion (body parts such as hands and fingers), dust, accidental contact, and water by mechanical casings and electrical enclosures.

IP Devices—All devices within a network which are labeled with an IP address.

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 water savings for building retrofits and new construction.

IPSEC (Internet Protocol Security)—A set of protocols that provide authentication and encryption to Internet Protocol (IP) packets, adding an extra layer of security on IP communications.

IPv6—The newest Internet protocol, which provides more addresses than the IPv4 protocol. An IPv6 address is an 128-bit alphanumeric string that identifies an endpoint device in the Internet Protocol Version 6 (IPv6) addressing scheme. An IPv6 address is 128 bits long and is arranged in eight groups, each of which is 16 bits. Each group is expressed as four hexadecimal digits and the groups are separated by colons. A standard IPv4 address looks like this: 66.170.45.71. A standard IPv6 address looks

something like this: 2001:0db8:0a0b:12f0:0000:0000:0000:0001.

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 misunderstood 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.

IT (Information Technology)—IT is the broad subject concerned with all aspects of managing and processing information, especially within a large organization or company. IT is generally not used in reference to personal or home computing and networking.

J

JACE (Java Application Control Engine)—A hardware device for running the Niagara framework that provides the physical connections to enable system integration.

Java—A multi-platform, object-oriented programming language, similar to C++, which is freely available to any and all software developers. It is particularly important in the development of Internet/Web and mobile applications.

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.

JSON (JavaScript Object Notation)—Used as a lightweight alternative to XML for organizing data, JSON is text-based and human-readable. The format uses “name : object” pairs to organize the data.

K

K-Factor—The amount of airflow, in cubic feet per minute (cfm) and based on duct size, needed to generate an inch of water column (1" WC) differential between the pressure in the duct and the pressure in the space being controlled. The K-factor is used as a differential to correct VAV positioning to ensure even pressure and balance in a system.

KMC Controls—A controls manufacturer with a full line of digital, electronic, pneumatic, and IoT solutions made in the United States. See the ***About KMC Controls*** section.

KMDigital® (KMD)—A KMC Controls proprietary DDC network product line. Certain KMDigital models can serve as “gateways” to BACnet and Modbus networks.

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

L2TP (Layer 2 Tunneling Protocol)—This is a tunneling protocol used to support virtual private networks (VPNs) or as part of the delivery of services by ISPs. It does not provide any encryption or confidentiality by itself, relying on an encryption protocol that it passes within the tunnel to provide privacy.

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)—Interconnected equipment that can share data, applications, and resources.

LAN Controller—A KMC Controls programmable direct digital controller and high-level LAN communications manager suitable for use in KMDigital networks.

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

Last Panel—The highest numbered panel (controller) on a KMC KMDigital network. (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 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 Area Network (LAN)—A network of devices in relatively close proximity, prior to the point of transmission over leased telecommunication lines. The two most common communications

technologies used in LANs are Ethernet and Wi-Fi.

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 environmental 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.

Long Term Evolution (LTE) / 4G—A cellular network type, offering superior data transfer speeds than its predecessor, 3G. Portable devices can now access data at high-speed broadband speeds through LTE.

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 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.

Lux—A unit of measure equal to one lumen per square meter.

M

M2M (Machine to Machine)—A broad label that can be used to describe any technology that enables networked devices to exchange information and perform actions without the manual assistance of humans.

M2P (Machine to Person)—Analytics for big data in a human readable form (e.g., dashboards).

MAC (Media Access Control) Address—A unique hardware address that identifies each device on a network. Each network type (e.g., Ethernet 802.3, IP, or MS/TP) has its own MAC addressing scheme.

Machine Authentication—The authorization of an automated machine to person (M2P) or machine to machine (M2M) communication through verification of a digital certificate or digital credentials. Unlike user authentication, the process does not involve any action on the part of a human.

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***.

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.

MDN (Mobile Directory Number)—Used in CDMA, conceptually similar to the MSISDN in GSM.

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.

Media Access Control (MAC)—See ***MAC (Media Access Control) Address***.

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

MEID (Mobile Equipment Identifier)—A globally unique number identifying a CDMA mobile device.

MEMS (Micro-Electro-Mechanical Systems)—The technology of microscopic devices, particularly those with moving parts.

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.

Mesh Networking—An ad-hoc network infrastructure where the nodes communicate directly with each other without the need to pass through a central structure. The only way to shut down a mesh network is to eliminate every node. The adaptivity of mesh networks makes them ideal for IoT applications.

Message Broker—A middleware program that translates a message from the messaging protocol of the sender into the messaging protocol of the receiver. This way a message broker makes it easier for two applications to communicate.

Message Queue Telemetry Transport (MQTT)—An open, lightweight M2M communications protocol for the transfer of telemetry messages.

Metadata—Information that describes what a certain data set represents or how it should be stored, transferred, or stored. Data about Data.

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 MS/TP controllers are all master devices.

MSDS (Material 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.

MSISDN (Mobile Station International Subscriber Directory Number)—The telephone number mapped to the SIM card in a GSM mobile phone.

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***.

Near Field Communication (NFC)—Short-range wireless communication between devices, used in applications such as contactless mobile payments, transport ticketing, and phone-as-key. Using NFC, KMC customers can program unpowered, boxed Conquest controllers. NFC has been overshadowed in IoT applications by other protocols such as BLE.

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 Controls wall-mounted temperature sensor and intelligent interface device for use with KMC Controllers.

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

Network Adapter—See ***NIC***.

Network (Interface) Card—See ***NIC***.

Network Layer Protocol Control Information (NPCI)—The first part of a Network Protocol Data Unit; establishes whether the Network Service Data Unit (NSDU) is a Network Layer Message or is packaged as Application Layer Protocol Data Units (APDU).

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.

NFC—See ***Near Field Communication.***

NFPA—See ***National Fire Protection Association***.

Niagara—A Java-based software platform, developed by Tridium, that integrates diverse systems and devices into a unified platform, which can be managed and controlled remotely.

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.

Non-Relational Model—A database that does not incorporate the table/key model that relational database management systems (RDBMS) promote. These kinds of databases require data manipulation techniques and processes designed to provide solutions to big data problems. The most popular emerging non-relational database is NoSQL.

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.

NoSQL (Not Only SQL)—A classification of data storage systems that are not primarily designed to be relationally accessed through the common SQL language. NoSQL systems are characterized by dynamic creation and deletion of key/value pairs, and are structured to be highly scalable to multiple computers.

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.”

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 world-wide 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 Source—A type of software where the source code is available and can be modified and freely redistributed. Open source is the opposite of closed, proprietary systems. Many developers insist that IoT must have open standards to reach its full potential.

Open Source Software (OSS)—Software that is released under a Software License that (1) permits each recipient of the software to copy and modify the software; (2) permits each recipient

to distribute the software in modified or unmodified form; and (3) does not require recipients to pay a fee or royalty for the permission to copy, modify, or distribute the software.

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***.

Open Trust Protocol—A secure architecture and code management system designed to protect connected devices.

Open VPN—An open-source software application that implements virtual private network (VPN) techniques for creating secure point-to-point or site-to-site connections in routed or bridged configurations and remote access facilities. This is a security method which can be implemented on devices such as cellular routers.

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

Operational Technology (OT)—As opposed to Information Technology (IT), this refers to technologies associated with control and automation. If IT helps run business processes, OT helps execute the physical interactions that control value creation.

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.

OT—See ***Operational Technology***.

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.

PAN (Personal Area Network)—Interconnected devices operating in the range of a single person, typically 10 meters. PANS are mostly or exclusively wireless, making the term basically indistinguishable from Wireless PANs (WPAN). WPAN is based on the IEEE 802.15 standard and does not necessarily require an uplink to the Internet.

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

Particulates—Small airborne particles found in the environment.

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

Passive Building Design—A building configuration that takes 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.

PCB—Printed Circuit Board.

PE Relay—See ***Pneumatic Electric Relay***.

PEAP (Protected Extensible Authentication Protocol)—A version of EAP, the authentication protocol used in wireless networks and Point-to-Point connections. PEAP is designed to provide more secure authentication for 802.11 WLANs (wireless local area networks) that support 802.1X port access control.

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***.

Penetration Testing (Pen Testing or Pentest)—A method of evaluating the security of a network or system from internal or external threats. This is part of a full security audit and typically exploits a combination of weaknesses to gain access and then evaluates the capability of the network's defenders to detect and respond to the penetration.

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.

Peripheral Device—One of the two types of devices defined by the BLE standard. Unlike the Central Device, the Peripheral exposes state or information and is assumed to be a low power device. In many applications, the Peripherals spend the majority of their time asleep, waking when only when data needs to be sent.

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.

Phishing—The act of defrauding an online account, in order to gain credentials or information, by masquerading as a legitimate interest to the account user. A typical method is an email that appears to be sent by a government, financial, or retail entity. About 90% of social engineering attacks are through phishing schemes.

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

Physical Internet—An open global logistics system that encapsulates physical items into modular containers (using the PI symbol) that borrow concepts from Internet data transfers. PI-containers can have a symbiotic relationship with IoT, since on-boarded Things have the capability to communicate.

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.

Platform—A major piece of technology or software upon which smaller applications or programs are built. A computer operating system (OS) is an example of a platform. A platform can be provided as-a-service (PaaS).

Platform as a Service (PaaS)—A platform that provides web developers with all the infrastructure they need to develop and run an application.

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***.

PoE (Power Over Ethernet)—The capability to deliver enough power to operate a device over an Ethernet connection. PoE is useful in certain low-voltage applications, such as passive IP cameras.

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.

PPTP (Point-to-Point Tunneling Protocol)—A method for implementing virtual private networks (VPNs).

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)***.

Private Cloud—A private cloud provides services with cloud characteristics but only within a single organization, for example, one company.

Project Haystack—An open source initiative to develop naming conventions and taxonomies for building equipment and operational data.

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***.

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***.

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

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)***.

Public Cloud—A cloud service that is made public and made available for everyone.

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

PuTTY—A terminal emulator program (think VT100) that uses various protocols to run Linux or Windows shell commands on a remote computer. It supports using various secure protocols.

PV—See ***Photovoltaics***.

Python—A widely used open-source programming language that can be implemented in a variety of ways, including in embedded applications. There is a large library base which can be used by Python applications, helping minimize code and speed up development time.

Python Script Interpreter—A tool that lets you run Python code, something which is now being seen embedded directly into devices such as cellular modules.

Q

Quality of Service (QoS)—Different services that regulate data transfer priorities to identify and control the quality with which a service can be accessed by users. This is especially important if a certain quality (for example, bandwidth) has to be guaranteed to ensure the functionality of a service.

Quantified Self—Sensors that monitor humans to compile data on moods, habits, diet, drug combinations, and virtually any human activity. Many refer to the concept as the "Quantified Self Movement," where an individual might set a goal such as weight loss, and use

the data gathered and IoT concepts to quantify their progress.

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).

Radio Frequency—The oscillation of electrical signals in the range of 3 kHz to 300 GHz. When referencing wireless communications, the term RF can be used synonymously with "radio."

RADIUS (Remote Authentication Dial-In User Service)—A client/server protocol and software that enables remote access servers to communicate with a central server to authenticate users and authorize their access to the requested system or service.

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.

Real-Time Location System—A system that can identify and track the current position and movement of persons or objects. RTLSs are almost exclusively

indoor, local applications and do not typically rely on GPS to operate.

Relational Model—A database in which inter-table relationships are primarily organized through common data columns that define a one-to-many relationship between a row of the primary key table and one or more rows of the matching foreign key table.

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 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.

Resource Description Framework—A general-purpose language for representing information in the Web.

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

REST (Representational State Transfer)—An architecture for web standards, especially for the HTTP protocol. It is supposed to simplify the design of network applications compared to, for example, SOAP.

RESTful Web Services—Web services that are realized within the REST architecture are called RESTful Web Services.

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***.

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

SaaS (Software as a Service)—A subscription-based model where a monthly fee is charged for using software, rather than an upfront purchase. SaaS (also spelled SAAS) and cloud computing can give cash-strapped enterprises and startups access to applications such as email and lead management that might otherwise be too expensive to purchase outright.

Salt—In cryptography, a salt is random data that is used as an additional input to a one-way function that "hashes" a password or passphrase. Salts are closely related to the concept of

nonce. The primary function of salts is to defend against dictionary attacks or against its hashed equivalent, a pre-computed rainbow table attack.

SAT (Supply Air Temperature)—The temperature of the air in the duct supplied by the AHU or RTU and entering into the VAV box before any reheat is applied. The DAT (Discharge Air Temperature) is the temperature of the air leaving from the VAV box and entering the room. Sometimes SAT and DAT are used interchangeably, but they are only equivalent if there is no reheat.

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.

Scalability—A software system is scalable when its performance and overall system throughput continues to improve as more computing resources

are made available for its use. This usually comes in the form of the number of CPUs and cores available in the computer on which the software system is run.

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

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 used to measure a specific characteristic of the surrounding environment, such as temperature. The use of sensors and actuators to connect things to the physical world is a key component of IoT. A properly implemented sensor ideally should be sensitive only to the characteristic being measured and should not interfere with what's being measured nor be influenced by other characteristics.

Serial Port Profile (SPP)—A hardware profile used with Bluetooth applications that includes custom AT commands and functionality dedicated

to wireless data connections and serial cable replacement.

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.

Shock Sensing—A MEMS concept referring to the detection of sudden impacts at a predetermined level. Typical applications include shut-off sensing, condition monitoring, and tap detection for data entry.

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.

SIM (Subscriber Identity Module)—A small piece of hardware (the "smart card") containing account information for a user on a GSM network. The SIM is inserted into a SIM holder in GSM cellular devices.

SimplyVAV—A KMC BACnet Application Specific controller designed for easy new or retrofit VAV installations.

Single Board Computer—A complete, functioning computer with all functions (I/O, processor, memory) located on one board.

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 is 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."

SMA (SubMiniature version A)—A type of connector commonly used with antenna, giving you male and female coaxial cable connectors that connect with a screw head.

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.

Smart Buildings—Buildings that try to minimize costs and environmental impact. This is achieved by connected systems and efficient use of energy through new, automated technology that intelligently responds to certain circumstances (available solar energy, temperature inside the building, etc.). See also ***Intelligent Buildings.***

Smart Grid—A general term referring to the application of networking capabilities and computer systems to the electric grid. A smart grid would include smart

meters at the point of delivery, allowing for real time monitoring of usage and the adjustment of power settings on some appliances.

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.

Smart Infrastructure—A smart system that uses sensors to collect and analyze data, which the system can then monitor, measure, analyze, communicate, and act upon. Different levels of smart systems exist. A system may collect usage and performance data to: help future designers produce the next, more efficient version; collect and process data; present information to help a human operator make decisions (for example, traffic systems that detect congestion and inform drivers); use collected data to take action without human intervention.

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.

SNMP (Simple Network Management Protocol)—A popular protocol for network management. It is used for collecting information from and configuring network devices, such as servers, printers, hubs, switches, and routers on an Internet Protocol (IP) network.

SOAP (Simple Object Access Protocol)—A protocol specification for exchanging structured information in the implementation of web services in computer networks.

SoC (System-on-a-Chip)—A microchip with all the necessary electronic circuits and parts for a given system, such as a smartphone or wearable computer, on a single integrated circuit (IC).

Social Engineering Attack—The act of manipulating someone in order to gain information from them that they may not want you to have. Many times this is in the form of emails, but in some cases is via telephone or in person.

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.

Spanning Tree Protocol—An Ethernet network protocol that uses a loop-free logical topology to prevent bridge loops.

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***.

SSH (Secure Shell)—A protocol and a utility program that are used to securely connect to a remote computer.

SSL (Secure Sockets Layer)—The standard security technology for establishing an encrypted link between a web server and a browser. This link ensures that all data passed between the web server and browsers remain private and integral.

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 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.

Supercapacitor—A high-capacity capacitor with a greater capacitance value and lower voltage limit than a traditional capacitor. A supercapacitor functions in a range between electrolytic capacitors and rechargeable batteries.

Supercapacitors are used in KMC Controls pneumatics actuators as fail-safes and in certain equipment controller models to retain clock time in the event of a power failure.

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—An assembly of related elements that compose a whole.

System Distributor (SD)—KMC partner that offers in-house design services, training, and expert advice to system integrators or end-users.

System Impedance—In an airflow system, the resistance to the motion of air. Filters, grilles, and abrupt changes in flow direction increase impedance.

System Integrator (SI)—KMC partner who designs, installs, manages, and supports project sites.

System Name—A description given to the entire network of controllers.

System on a Chip (SoC)—A single integrated circuit (IC) technology that contains all the necessary circuits and parts for a complete "system." A single microchip in a wearable device, for example, could contain an analog-to-digital converter, memory, logic control, I/O, etc.

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.

Tag—Label or object used to identify the physical entity to which it is attached.

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.

Telematics—An Information Technology concept regarding the long-distance transmission of data. In vehicles on the move, telematics refers to the integrated use of telecommunications and informatics, such as dashboard screens that show the vehicles' current positions on a map or in centralized tracking applications.

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.

Thread—A single, sequential execution of a computer program or program segment. A program can consist of one or more concurrently executing threads. Where multiple threads access the same data, some kind of synchronization method needs to be employed to ensure that the data is only accessed by one thread at a time.

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 KMDigital 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 KMDigital 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.

Tilt Sensing—A MEMS concept referring to the measurement of the inclination or angle of change with respect to gravity. Typical applications include industrial equipment platform stabilization and landscape/portrait detection on handheld devices.

Time-To-Live—The length of time a message can "live" in a network without being delivered.

TLS (Transport Layer Security)—Along with its predecessor, Secure Sockets Layer (SSL), both frequently referred to as "SSL", TLS is a cryptographic protocol that provides communications security over a computer network.

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.

Transceiver—Short for "transmitter-receiver," a transceiver both transmits and receives analog or digital signals. It is normally built into a network interface card (NIC).

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.

Transparent Computing—A characteristic of ubiquitous computing where smart devices respond to users' needs in the background. The devices are invisible ("transparent") in the sense that they operate without the conscious thought or interaction of the user.

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."

Trio (Text Record Input/Output)—A simple plain text format used for hand-authoring record definitions and other

Haystack tagged data. It is the primary format for authoring the tag definitions on the Project Haystack site itself.

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-volume 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.

Ubiquitous Computing—The concept of embedding microprocessors in everyday things so they can communicate information continuously. Ubiquitous devices are expected to be constantly connected. Utility smart meters are an example of ubiquitous computing,

replacing manual meter-readers with devices that can report usage and modify power settings on ubiquitous appliances.

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.

Unikernel—Specialized machine images created using library operating systems to run a specific application. Unikernels provide many benefits including improved security, smaller footprints, and faster boot times.

Unit Ventilator—A fan coil unit 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 roof top units or heatpumps). See also ***Packaged System*** and ***Split System***.

Universal Asynchronous Receiver/Transmitter—A microchip controlling a computer's interface to serial devices, converting the bytes it receives from the computer along parallel circuits into a single serial bit stream.

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.

URL (Uniform Resource Location)—A scheme that provides a unique string for a web server or file or any resource

that is available using web technology. For instance, www.kmccontrols.com is the address for the KMC Controls public web server.

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.

US-CERT (United States Computer Emergency Readiness Team)—A group of US government agencies that provides detailed and timely reports on cyber attacks and vulnerabilities on any computing device.

User Experience Design—The process of producing user interfaces (UIs) to products that maximize usability and satisfaction. Also known as UXD or UED. Since IoT primarily concerns itself with M2M, UXD for IoT has special considerations, such as the fact that devices may have intermittent or low-power network connections.

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***.

Variable Volume and Temperature (VVT)—A zone damper terminal air unit system typically used to create zoning when paired with packaged RTUs. Zone temperature is maintained by controlling both the air flow volume (via terminal dampers) and the temperature of supply air (via an RTU switching between heating and cooling according to the greatest need in the zones). In contrast with pressure-independent VAV, airflow in VVT is neither measured nor precisely controlled at the terminal unit. VVT may have a lower installation cost than VAV but does not control zone temperature or ventilation as well as VAV.

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***.

Vibration Sensing—A MEMS concept referring to the detection of periodic acceleration and deceleration. Typical applications include structural health monitoring, acoustic event triggering, and seismic equipment.

Video Motion Detection—A technology that analyzes image data and the differences in a series of images. VMD makes event-driven video surveillance possible, but the potential for false positives creates challenges in storage and alarm verification.

Virtual Machine—An emulation of a computer system. Virtual machines are based on computer architectures and provide the functionality of a physical computer. This may involve specialized hardware, software, or a combination thereof.

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***.

VVT—See Variable Volume and Temperature.

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.

Wearables—Technology that can be worn, typically to quantify a physical process (such as heartbeat monitoring) or to augment human capabilities.

Wearables may also be used to control external things, for example, with gestures. Wearables are almost universally wireless, using a variety of communication protocols such as BLE.

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.

White Hat—A hacker who identifies a security weakness in a computer system or network but, instead of taking malicious advantage of it, exposes the weakness in a way that will allow the system's owners to fix the breach before it can be exploited by others (such as black hat hackers).

Methods of telling the owners about it range from phone calls and email to leaving an electronic “calling card” in the system that makes it obvious that security has been breached.

Who-Is Service—A message sent by BACnet devices to determine device object identifier and network addresses of other devices on the network.

Wi-Fi—This is a common form of local area network operating on the 2.4 GHz band. Its popularity has led to a wide variety of devices becoming Wi-Fi enabled, including smartphones, cameras, vehicles, and household appliances. Wi-Fi can be embedded into a device through designing in a Wi-Fi module.

Wind Power—The conversion of wind energy into electricity.

WinSCP (Windows Secure Copy)—A program that is used on a Windows PC that uses various secure protocols (SFTP, SCP) to transfer files with a remote computer.

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.

WWAN (Wireless Wide Area Network)—A type of network that sends wireless signals beyond a single building or property. While local area networks often rely on Ethernet, twisted-pair cabling, or short-range wireless routers, a wireless WAN may use various types of cellular network systems to send signals over a longer distance. Data can consist of telephone calls, web pages, or streaming video.

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 replace HTML as the standard for web documents.

Z

Zero Day Vulnerability—A hole in software that is unknown to the vendor. This security hole is then exploited by hackers before the vendor becomes aware and hurries to fix it—this exploit is called a zero day attack.

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 short-range wireless networking protocol that primarily operates on the 2.4 GHz frequency spectrum. ZigBee devices connect in a mesh topology, forwarding messages from controlling nodes to slaves, which repeat commands to other connected nodes. Due to its low power consumption and low data rate, ZigBee has been used in applications such as traffic management, wireless light switches, and industrial device monitoring.

Zinc (Zinc Is Not CSV)—A plaintext syntax for serializing Haystack grids using an enhanced CSV format. Unlike CSV, Zinc supports typed scalar values (such as Bool, Int, Float, Str, Date, etc.) and arbitrary metadata at the grid and column level. Unlike JSON, Zinc results in much higher compression for tabular data.

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 a 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 that controls the flow of water to particular parts of a building.

Zoning—The practice of dividing a building into smaller zones for increased comfort control by the HVAC system.

Z-Wave—Wireless communication technology used in security systems and also business and home automation.

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SB-046J