



ADDENDA

**ANSI/ASHRAE Addendum cn to
ANSI/ASHRAE Standard 135-2020**



A Data Communication Protocol for Building Automation and Control Networks

Approved by the ASHRAE Standards Committee on June 28, 2024, and by the American National Standards Institute on June 28, 2024.

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[This foreword, the table of contents, the introduction, and the “rationales” on the following pages are not part of this standard. They are merely informative and do not contain requirements necessary for conformance to the standard.]

FOREWORD

The purpose of this addendum is to present a proposed change for public review. These modifications are the result of change proposals made pursuant to the ASHRAE continuous maintenance procedures and of deliberations within Standing Standard Project Committee 135. The proposed changes are summarized below.

135-2020cn-1 Clarify Engineering Units, p. 3

In the following document, language to be added to existing clauses of ANSI/ASHRAE Standard 135-2020 is indicated through the use of *italics* and deletions are indicated by ~~striketrough~~. Where entirely new subclauses are proposed to be added, plain type is used throughout. Only this new and deleted text is open to comment at this time. All other material in this document is provided for context only and is not open for public review comment except as it relates to the proposed changes.

The use of placeholders such as XX, YY, ZZ, X1, X2, NN, x, n, ? etc. should not be interpreted as literal values of the final published version. These placeholders will be assigned actual numbers/letters only after final publication approval of the addendum.

135-2020cn-1 Clarify Engineering Units

Rationale

The BACnetEngineeringUnits enumeration lacks some metric units. It is also unclear, in some cases, what actual unit was intended. In other cases, the meaning of particular units is a local matter.

Engineering units are clarified and complemented for equivalent sets of scales for units of both the Inch-Pound (I-P) and Système International (SI) units systems.

Additional units are added for gas metering.

[Note to Reviewer: Some engineering units have been reorganized to make grouping consistent. The textual name for “joule-per-hour” was deemed erratum and has been updated to “joules-per-hour” in this document.]

[Insert new Clause 12.1.X, after current 12.1.9, p. 168]

12.1.10 Engineering Units Ambiguities

The BACnetEngineeringUnits enumeration, defined in Clause 21, includes some units that are potentially ambiguous. These fall into three categories:

- Units originally defined in BACnet with an implied but ambiguous meaning as to which real unit was intended.
- Units that were originally defined in BACnet with the intention that their meaning would be site-specific, but that site-specificity was never called out in the standard.
- Units that are, by their nature, commonly used but based on different implied standards that are not uniform in different locales or applications.

12.1.10.1 Ambiguous Unit: Ton

Units that were defined and included the word “tons” in their name could have been used for American Short Tons, Imperial Long Tons, or Metric Tonnes. There are now separate units defined for those different definitions. The ambiguous uses of the word “tons” are being left in to avoid impacting sites that have implemented those units and agreed on the contextual meaning.

12.1.10.2 Intentionally Site-Specific Units

The enumerations currency1 to currency10, volume1 to volume10, and volumetric-flow1 to volumetric-flow10, and site-unit1 to site-unit10, are explicitly intended to have a site-specific meaning. Use of these ranges in a device must be configurable and cannot have fixed values.

Any BACnet property value whose engineering unit is a currency and makes use of currency1 through currency10 shall have a site-specific meaning as to which actual currency is equivalent to those 10 units for that site. The assignment and administration of those equivalencies shall be a local matter.

Units of volume and volumetric flow, such as cubic-feet or cubic-feet per second, can have different meanings depending on the locale or their application. The volume of a room, for example, is normally a constant. There are some applications, such as gas volume, where simply saying “cubic-feet” is ambiguous, because the volume depends on knowing the temperature and pressure. There may also be other cases of ambiguity for units beyond the specific instances of currency, volume, and volumetric flow that have not yet been identified. Prior to Protocol Revision 26, the meaning was ambiguous in those applications that used any of these units. When such units are used, the meaning of the value and its unit are a local matter. Any BACnet property value whose engineering unit may be ambiguous due to application or locale and makes use of volume1 to volume10, volumetric-flow1 to volumetric-flow10, or site-unit1 to site-unit10 shall have a site-specific meaning as to which actual unit definition is equivalent to those intentionally site-specific units for that site. The assignment and administration of those equivalencies shall be a local matter.

[Change Clause 21, BACnetEngineeringUnits Production, p. 892]

BACnetEngineeringUnits ::= ENUMERATED { -- See below for numerical order

-- Acceleration

meters-per-second-per-second (166),

--Area

square-meters (0),
 square-centimeters (116),
 square-feet (1),
 square-inches (115),

--Currency, *determined by the installation.*

currency1 (105),
 currency2 (106),
 currency3 (107),
 currency4 (108),
 currency5 (109),
 currency6 (110),
 currency7 (111),
 currency8 (112),
 currency9 (113),
 currency10 (114),

--Efficiency

btu-per-hour-per-watt (47898), -- *Energy Efficiency Ratio (EER)*
btu-per-watt-hour-seasonal (47899), -- *Seasonal Energy Efficiency Ratio (SEER),*
 -- *cooling/watt-hour*
 -- *or Heating Seasonal Performance Factor (HSPF),*
 -- *heat/watt-hour*
coefficient-of-performance (47900), -- *energy transferred per energy consumed (COP)*
coefficient-of-performance-seasonal (47901), -- *energy transfer per energy consumed over a season (SCOP)*
kilowatt-per-ton-refrigeration (47902), -- *cooling efficiency using short tons refrigeration*
lumens-per-watt (47903),

--Electrical

milliamperes (2),
 amperes (3),
 amperes-per-meter (167),
 amperes-per-square-meter (168),
 ampere-square-meters (169),
 decibels (199),
 decibels-millivolt (200),
 decibels-volt (201),
 farads (170),
 henrys (171),
 ohms (4),
 ohm-meter-squared-per-meter (237),
 ohm-meters (172),
 milliohms (145),
 kilohms (122),
 megohms (123),
 microsiemens (190),
 millisiemens (202),
 siemens (173),

siemens-per-meter	(174),
<i>microsiemens-per-centimeter</i>	(47909),
<i>millisiemens-per-centimeter</i>	(47910),
<i>millisiemens-per-meter</i>	(47911),
teslas	(175),
volts	(5),
millivolts	(124),
kilovolts	(6),
megavolts	(7),
volt-amperes	(8),
kilovolt-amperes	(9),
megavolt-amperes	(10),
volt-amperes-reactive	(11),
kilovolt-amperes-reactive	(12),
megavolt-amperes-reactive	(13),
volts-per-degree-kelvin	(176),
volts-per-meter	(177),
degrees-phase	(14),
power-factor	(15),
webers	(178),

--Energy

ampere-seconds	(238),
volt-ampere-hours	(239), -- i.e. VAh
kilovolt-ampere-hours	(240),
megavolt-ampere-hours	(241),
volt-ampere-hours-reactive-hours	(242), -- i.e. varh VARh
kilovolt-ampere-hours-reactive-hours	(243),
megavolt-ampere-hours-reactive-hours	(244),
volt-square-hours	(245),
ampere-square-hours	(246),
joules	(16),
kilojoules	(17),
kilojoules-per-kilogram	(125),
megajoules	(126),
<i>gigajoules</i>	(47925),
<i>terajoules</i>	(47926),
watt-hours	(18),
kilowatt-hours	(19),
megawatt-hours	(146),
<i>gigawatt-hours</i>	(47927),
watt-hours-reactive-hours	(203),
kilowatt-hours-reactive-hours	(204),
megawatt-hours-reactive-hours	(205),
<i>gigawatt-reactive-hours</i>	(47928),
btus	(20), -- <i>British thermal units</i>
kilo-btus	(147),
mega-btus	(148),
therms	(21), -- <i>100,000 British thermal units</i>
ton-hours	(22), -- <i>short tons refrigeration by time</i>
<i>active-energy-pulse-value</i>	(47910), -- i.e., $1/(Wh)$
<i>reactive-energy-pulse-value</i>	(47919), -- i.e., $1/(VARh)$
<i>apparent-energy-pulse-value</i>	(47920), -- i.e., $1/(VAh)$
<i>volt-squared-hour-pulse-value</i>	(47921), -- i.e., $1/(V^2h)$
<i>ampere-squared-hour-pulse-value</i>	(47922), -- i.e., $1/(A^2h)$

--Enthalpy	
joules-per-kilogram-dry-air	(23),
kilojoules-per-kilogram-dry-air	(149),
megajoules-per-kilogram-dry-air	(150),
btus-per-pound-dry-air	(24),
btus-per-pound	(117),
--Entropy	
joules-per-degree-kelvin	(127),
kilojoules-per-degree-kelvin	(151),
megajoules-per-degree-kelvin	(152),
joules-per-kilogram-degree-kelvin	(128),
-- Force	
newton	(153),
--Frequency	
cycles-per-hour	(25),
cycles-per-minute	(26),
hertz	(27),
kilohertz	(129),
megahertz	(130),
<i>per-day</i>	(47823),
per-hour	(131),
per-minute	(100),
per-second	(101),
<i>per-millisecond</i>	(47824),
--Humidity	
grams-of-water-per-kilogram-dry-air	(28),
percent-relative-humidity	(29),
--Length	
micrometers	(194),
millimeters	(30),
centimeters	(118),
kilometers	(193),
meters	(31),
inches	(32),
feet	(33), -- <i>international foot</i>
<i>yards</i>	(47825), -- <i>3 international feet</i>
<i>miles</i>	(47826), -- <i>international mile, 1609.344 meters</i>
<i>nautical-miles</i>	(47827), -- <i>international nautical mile, 1852 meters</i>
--Light	
candelas	(179),
candelas-per-square-meter	(180),
watts-per-square-foot	(34),
watts-per-square-meter	(35),
lumens	(36),
luxes	(37),
foot-candles	(38),
--Mass	
<i>nanograms</i>	(47828),

<i>micrograms</i>	(47829),
milligrams	(196),
grams	(195),
kilograms	(39),
pounds-mass	(40),
tons	(41), -- <i>ambiguous ton unit</i>
<i>metric-tonnes</i>	(47830), -- <i>Metric tonne, 1000 kilograms</i>
<i>short-tons</i>	(47831), -- <i>U.S. short ton, 2000 pounds, 907.18474 kilograms</i>
<i>long-tons</i>	(47832), -- <i>Imperial long ton, 1016.0469088 kilograms</i>

--Mass Flow

grams-per-second	(154),
grams-per-minute	(155),
<i>grams-per-hour</i>	(47833),
<i>grams-per-day</i>	(47834),
kilograms-per-second	(42),
kilograms-per-minute	(43),
kilograms-per-hour	(44),
<i>kilograms-per-day</i>	(47835),
pounds-mass-per-second	(119),
pounds-mass-per-minute	(45),
pounds-mass-per-hour	(46),
pounds-mass-per-day	(47812),
tons-per-hour	(156), -- <i>ambiguous ton unit</i>
<i>short-tons-per-second</i>	(47836),
<i>short-tons-per-minute</i>	(47837),
<i>short-tons-per-hour</i>	(47838),
<i>short-tons-per-day</i>	(47839),
<i>metric-tonnes-per-second</i>	(47840),
<i>metric-tonnes-per-minute</i>	(47841),
<i>metric-tonnes-per-hour</i>	(47842),
<i>metric-tonnes-per-day</i>	(47843),
<i>long-tons-per-second</i>	(47844),
<i>long-tons-per-minute</i>	(47845),
<i>long-tons-per-hour</i>	(47846),
<i>long-tons-per-day</i>	(47847),

--Power

milliwatts	(132),
watts	(47),
kilowatts	(48),
megawatts	(49),
<i>gigawatts</i>	(47924),
<i>btus-per-second</i>	(47848),
<i>btus-per-minute</i>	(47849),
btus-per-hour	(50),
<i>btus-per-day</i>	(47850),
<i>kilo-btus-per-second</i>	(47851),
<i>kilo-btus-per-minute</i>	(47852),
kilo-btus-per-hour	(157),
<i>kilo-btus-per-day</i>	(47853),
<i>mega-btus-per-second</i>	(47854),
<i>mega-btus-per-minute</i>	(47855),
<i>mega-btus-per-hour</i>	(47856),
<i>mega-btus-per-day</i>	(47857),
<i>joules-per-second</i>	(47858),

<i>joules-per-minute</i>	(47859),	
<i>joules-per-hour</i>	(247),	
<i>joules-per-day</i>	(47860),	
<i>kilojoules-per-second</i>	(47861),	
<i>kilojoules-per-minute</i>	(47862),	
<i>kilojoules-per-hour</i>	(47863),	
<i>kilojoules-per-day</i>	(47864),	
<i>megajoules-per-second</i>	(47865),	
<i>megajoules-per-minute</i>	(47866),	
<i>megajoules-per-hour</i>	(47867),	
<i>megajoules-per-day</i>	(47868),	
horsepower	(51),	
tons-refrigeration	(52),	-- Heat transfer to melt one short ton of ice

--Pressure

pascals	(53),
hectopascals	(133),
kilopascals	(54),
millibars	(134),
bars	(55),
pounds-force-per-square-inch	(56),
<i>pounds-force-per-square-inch-absolute</i>	(47907),
<i>pounds force-per-square-inch-gauge</i>	(47908),
millimeters-of-water	(206),
centimeters-of-water	(57),
inches-of-water	(58),
millimeters-of-mercury	(59),
centimeters-of-mercury	(60),
inches-of-mercury	(61),

--Temperature

degrees-celsius	(62),
<i>degrees-celsius-per-day</i>	(47869),
<i>degrees-celsius-per-hour</i>	(91),
<i>degrees-celsius-per-minute</i>	(92),
degrees-kelvin	(63),
<i>kelvin-per-day</i>	(47870),
degrees-kelvin-per-hour	(181),
degrees-kelvin-per-minute	(182),
degrees-fahrenheit	(64),
<i>degrees-fahrenheit-per-day</i>	(47871),
<i>degrees-fahrenheit-per-hour</i>	(93),
<i>degrees-fahrenheit-per-minute</i>	(94),
degree-days-celsius	(65),
degree-days-fahrenheit	(66),
<i>delta-degrees-celsius</i>	(47872),
delta-degrees-fahrenheit	(120),
delta-degrees-kelvin	(121),

--Time

years	(67),
months	(68),
weeks	(69),
days	(70),
hours	(71),
minutes	(72),

seconds	(73),
hundredths-seconds	(158),
milliseconds	(159),
--Torque	
newton-meters	(160),
<i>pound-force-feet</i>	(47904),
<i>pound-force-inches</i>	(47905),
<i>ounce-force-inches</i>	(47906),
--Velocity	
millimeters-per-second	(161),
millimeters-per-minute	(162),
meters-per-second	(74),
meters-per-minute	(163),
meters-per-hour	(164),
kilometers-per-hour	(75),
feet-per-second	(76),
feet-per-minute	(77),
miles-per-hour	(78),
--Volume	
cubic-feet	(79),
cubic-meters	(80),
imperial-gallons	(81),
milliliters	(197),
liters	(82),
us-gallons	(83),
<i>millions-of-us-gallons</i>	(47912),
<i>millions-of-imperial-gallons</i>	(47913),
<i>volume1</i>	(47937),
<i>volume2</i>	(47938),
<i>volume3</i>	(47939),
<i>volume4</i>	(47940),
<i>volume5</i>	(47941),
<i>volume6</i>	(47942),
<i>volume7</i>	(47943),
<i>volume8</i>	(47944),
<i>volume9</i>	(47945),
<i>volume10</i>	(47946),
--Volumetric Flow	
cubic-feet-per-second	(142),
cubic-feet-per-minute	(84),
million-standard-cubic-feet-per-minute	(254),
cubic-feet-per-hour	(191),
cubic-feet-per-day	(248),
standard-cubic-feet-per-day	(47808),
million-standard-cubic-feet-per-day	(47809),
thousand-cubic-feet-per-day	(47810),
thousand-standard-cubic-feet-per-day	(47811),
<i>million-cubic-feet-per-minute</i>	(47873),
<i>million-cubic-feet-per-day</i>	(47874),
cubic-meters-per-second	(85),
cubic-meters-per-minute	(165),
cubic-meters-per-hour	(135),

cubic-meters-per-day	(249),	
<i>imperial-gallons-per-second</i>	(47875),	
imperial-gallons-per-minute	(86),	
<i>imperial-gallons-per-hour</i>	(47876),	
<i>imperial-gallons-per-day</i>	(47877),	
milliliters-per-second	(198),	
<i>milliliters-per-minute</i>	(47914),	
liters-per-second	(87),	
liters-per-minute	(88),	
liters-per-hour	(136),	
<i>liters-per-day</i>	(47878),	
<i>us-gallons-per-second</i>	(47879),	
us-gallons-per-minute	(89),	
us-gallons-per-hour	(192),	
<i>us-gallons-per-day</i>	(47880),	
<i>cubic-meter-pulse-value</i>	(47923),	-- i.e., 1/m ³
<i>volumetric-flow1</i>	(47947),	
<i>volumetric-flow2</i>	(47948),	
<i>volumetric-flow3</i>	(47949),	
<i>volumetric-flow4</i>	(47950),	
<i>volumetric-flow5</i>	(47951),	
<i>volumetric-flow6</i>	(47952),	
<i>volumetric-flow7</i>	(47953),	
<i>volumetric-flow8</i>	(47954),	
<i>volumetric-flow9</i>	(47955),	
<i>volumetric-flow10</i>	(47956),	

--Other

degrees-angular	(90),
degrees-celsius-per-hour	(91),
degrees-celsius-per-minute	(92),
degrees-fahrenheit-per-hour	(93),
degrees-fahrenheit-per-minute	(94),
joule-seconds	(183),
kilograms-per-cubic-meter	(186),
kilowatt-hours-per-square-meter	(137),
kilowatt-hours-per-square-foot	(138),
watt-hours-per-cubic-meter	(250),
joules-per-cubic-meter	(251),
megajoules-per-square-meter	(139),
megajoules-per-square-foot	(140),
mole-percent	(252),
no-units	(95),
newton-seconds	(187),
newtons-per-meter	(188),
parts-per-million	(96),
parts-per-billion	(97),
pascal-seconds	(253),
percent	(98),
percent-obscurtion-per-foot	(143),
percent-obscurtion-per-meter	(144),
percent-per-second	(99),
<i>percent-per-minute</i>	(47881),
<i>percent-per-hour</i>	(47882),
<i>percent-per-day</i>	(47883),

per minute	(100),		
per second	(101),		
psi-per-degree-fahrenheit	(102),		
radians	(103),		
radians-per-second	(184),		
revolutions-per-minute	(104),		
square-meters-per-newton	(185),		
watts-per-meter-per-degree-kelvin	(189),		
watts-per-square-meter-degree-kelvin	(141),		
per-mille	(207),		
<i>per-million</i>	(47884),	-- 1:1000000	-- 1:1000000
<i>per-billion</i>	(47885),	-- 1:1000000000	-- 1:1000000000
grams-per-gram	(208),		
<i>milligrams-per-gram</i>	(211),		
<i>micrograms-per-gram</i>	(47886),		
<i>nanograms-per-gram</i>	(47887),		
kilograms-per-kilogram	(209),		
grams-per-kilogram	(210),		
milligrams per gram	(211),		
milligrams-per-kilogram	(212),		
<i>micrograms-per-kilogram</i>	(47888),		
<i>nanograms-per-kilogram</i>	(47889),		
grams-per-milliliter	(213),		
<i>milligrams-per-milliliter</i>	(47890),		
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...
}
-- Enumerated values 0-255 and 47808-49999 are reserved for definition by ASHRAE. Enumerated values
-- 256-47807 and 50000-65535 may be used by others subject to the procedures and constraints described
-- in Clause 23.

[Add a new entry to History of Revisions, p. 1364]

(This History of Revisions is not part of this standard. It is merely informative and does not contain requirements necessary for conformance to the standard.)

HISTORY OF REVISIONS

...
1	26	Addendum <i>cn</i> to ANSI/ASHRAE Standard 135-2020 Approved by ASHRAE on June 28, 2024; and by the American National Standards Institute on June 28, 2024. 1. Clarify Engineering Units

POLICY STATEMENT DEFINING ASHRAE'S CONCERN FOR THE ENVIRONMENTAL IMPACT OF ITS ACTIVITIES

ASHRAE is concerned with the impact of its members' activities on both the indoor and outdoor environment. ASHRAE's members will strive to minimize any possible deleterious effect on the indoor and outdoor environment of the systems and components in their responsibility while maximizing the beneficial effects these systems provide, consistent with accepted Standards and the practical state of the art.

ASHRAE's short-range goal is to ensure that the systems and components within its scope do not impact the indoor and outdoor environment to a greater extent than specified by the Standards and Guidelines as established by itself and other responsible bodies.

As an ongoing goal, ASHRAE will, through its Standards Committee and extensive Technical Committee structure, continue to generate up-to-date Standards and Guidelines where appropriate and adopt, recommend, and promote those new and revised Standards developed by other responsible organizations.

Through its *Handbook*, appropriate chapters will contain up-to-date Standards and design considerations as the material is systematically revised.

ASHRAE will take the lead with respect to dissemination of environmental information of its primary interest and will seek out and disseminate information from other responsible organizations that is pertinent, as guides to updating Standards and Guidelines.

The effects of the design and selection of equipment and systems will be considered within the scope of the system's intended use and expected misuse. The disposal of hazardous materials, if any, will also be considered.

ASHRAE's primary concern for environmental impact will be at the site where equipment within ASHRAE's scope operates. However, energy source selection and the possible environmental impact due to the energy source and energy transportation will be considered where possible. Recommendations concerning energy source selection should be made by its members.

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Founded in 1894, ASHRAE is a global professional society committed to serve humanity by advancing the arts and sciences of heating, ventilation, air conditioning, refrigeration, and their allied fields.

As an industry leader in research, standards writing, publishing, certification, and continuing education, ASHRAE and its members are dedicated to promoting a healthy and sustainable built environment for all, through strategic partnerships with organizations in the HVAC&R community and across related industries.

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