BSR/ASHRAE Addendum *h*
to ANSI/ASHRAE Standard 135-2004

Public Review Draft

ASHRAE® Standard

Proposed Addendum *h* to Standard 135-2004, *BACnet®—A Data Communication Protocol for Building Automation and Control Networks*

First Public Review (March 2007)
(Draft Shows Proposed Changes to Current Standard)

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[This foreword 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.

SSPC 135 wishes to recognize the efforts of the following people in developing this addendum: tbd.

135-2004*h*-1. Change Device_Busy to Busy and apply to the Command Object type, p. 1.
135-2004*h*-2. Prevent overflow and underflow in Pulse_Converter object's Count property, p. 2.
135-2004*h*-3. Add context tags to Clause 21 production BACnetPropertyStates, p. 3.
135-2004*h*-4. Add new BACnetEngineering Units, p. 4.
135-2004*h*-5. Define COV notification service Error returns, p. 5.
135-2004*h*-6. Remove non-support for automatic cancellation of COV subscriptions, p. 7.
135-2004*h*-7. Add support for the UTF-8 character set, p. 8.
135-2004*h*-8. Add even and odd day support in Dates, p. 9.

In the following document, language to be added to existing clauses of ANSI/ASHRAE 135-2004 and Addenda is indicated through the use of *italics*, while deletions are indicated by ~~strikethrough~~. Where entirely new subclauses are proposed to be added, plain type is used throughout. Only this new and deleted text is open to comment as this time. All other material in this addendum is provided for context only and is not open for public review comment except as it relates to the proposed changes.

135-2004*h*-1. Change Device_Busy to Busy and apply to the Command Object type.

Rationale
The Command object is required to reject a write request to its Present_Value property when its In_Process property has the value BUSY, but none of the currently available error codes are exactly appropriate to the situation. A similar code, DEVICE_BUSY, is renamed to a more general name, BUSY, for this purpose.

Addendum 135-2004*h*-1

[Change **12.10**, Command Object type, paragraph 3, p.174]

12.10 Command Object type

…

The Command object defines the relationship between a given state and those values that shall be written to a collection of different objects' properties to realize that state. Normally, a Command object is passive. Its In_Process property is FALSE, indicating that the Command object is waiting for its Present_Value property to be written with a value. When Present_Value is written, the Command object shall begin a sequence of actions. The In_Process property shall be set to TRUE, indicating that the Command object has begun processing one of a set of action sequences that is selected based on the particular value written to the Present_Value property. If an attempt is made to write to the Present_Value property through WriteProperty services while In_Process is TRUE, then a Result(-) ~~shall be issued~~ *shall be returned with 'error class' = OBJECT and 'error code' = BUSY,* rejecting the write.

[Change **18.1.1**, p.354]

18.1.1 ~~DEVICE_BUSY~~ *BUSY* - A service request has been temporarily declined because the addressed BACnet device expects to be involved in higher priority processing for a time in excess of the usual request/confirm timeout period.

[Add new **18.2.X**, p.354]

18.2.X BUSY - A service request has been temporarily declined because the addressed object is involved in a process that precludes execution of the service.

[Change **19.1.2.2**, p.359]

19.1.2.2 Preparation for Backup

…

After device B responds to the ReinitializeDevice request with a 'Result(+)', the configuration File objects must exist in the device. It is a local matter as to whether device B will respond to other requests while it is in backup mode. The exception to this is that device B must accept and fulfill read requests by device A that consist of accesses to device B's Device object and/or its configuration File objects. Any services that are rejected due to an in-progress backup procedure will be rejected with an error class of DEVICE and error code of ~~DEVICE_BUSY.~~ *BUSY.*

[Change **21**, production Error, p.406]

```
Error     ::= SEQUENCE {
    …
    error-code     ENUMERATED {
                other                           (0),
                authentication-failed           (1),
                busy                            (3),
                character-set-not-supported     (41),
                configuration-in-progress       (2),
                datatype-not-supported          (47),
                device-busy                     (3),
                -- see busy                     (3),
                duplicate-object-id             (48),
                ...
```

135-2004*h*-2. Prevent overflow and underflow in Pulse_Converter object's Count property.

Rationale
Currently Adjust_Value (datatype REAL) can be successfully written with values that can cause either overflow or underflow of the Pulse Converter object's Count property (datatype Unsigned), resulting in erroneous values in the Count property.

Addendum 135-2004*h*-2

[Change **12.23.13**, p. 237]

12.23.13 Adjust_Value

This property, of type REAL, is written to adjust the Present_Value property (and thus the Count property also) by the amount written to Adjust_Value.

~~If this property is writable the~~*The* following series of operations shall be performed atomically when this property is written:

(1) The value written to Adjust_Value shall be stored in the Adjust_Value property.
(2) The value of Count shall be copied to the Count_Before_Change property.
(3) The value of Count shall be decremented by the value calculated by performing the integer division (Adjust_Value/Scale_Factor) and discarding the remainder.
(4) The current date and time shall be stored in the Count_Change_Time property.

A write to this property results in a change in the value of Present_Value. Whether the new value is computed as part of the atomic series of operations or when Present_Value is read is a local matter.

An attempt to write Adjust_Value with a value that would cause an overflow or underflow condition in Count shall result in a Result(-) to be returned with an error class of PROPERTY and an error code of VALUE_OUT_OF_RANGE.

If Adjust_Value has never been written, it shall have a value of zero.

135-2004*h*-3. Add context tags to Clause 21 production BACnetPropertyStates.

Rationale
The standard defines context tag declarations for each BACnet defined enumeration explicitly in production BACnetPropertyStates, Clause 21. Several of the BACnet defined enumeration datatypes lack these context tag declarations, so they are added here.

Addendum 135-2004*h*-3

[Change **Clause 21**, production **BACnetPropertyStates**, p. 428]
[Note: A change to this production, adding context tag [14], appears in Addendum 135-2004*b* -5.]
[Note: A change to this production, adding context tag [15], appears in Addendum 135-2004*f* -1.]

BACnetPropertyStates ::= CHOICE {
-- This production represents the possible datatypes for properties that
-- have discrete or enumerated values. The choice must be consistent with the
-- datatype of the property referenced in the Event Enrollment Object.

boolean-value	[0] BOOLEAN,
...	
action	*[16] BACnetAction,*
door-secured-status	*[17] BACnetDoorSecuredStatus,*
door-status	*[18] BACnetDoorStatus,*
door-value	*[19] BACnetDoorValue,*
file-access-method	*[20] BACnetFileAccessMethod,*
lock-status	*[21] BACnetLockStatus,*
life-safety-operation	*[22] BACnetLifeSafetyOperation,*
maintenance	*[23] BACnetMaintenance,*
node-type	*[24] BACnetNodeType,*
notify-type	*[25] BACnetNotifyType,*
security-level	*[26] BACnetSecurityLevel,*
shed-state	*[27] BACnetShedState,*
silenced-state	*[28] BACnetSilencedState,*
...	
}	

135-2004*h*-4. Add new BACnetEngineering Units.

Rationale
Requests were made from several sources for support for three additional engineering units, which are added here.

Addendum 135-2004*h*-4

[Change **21**, BACnetEngineeringUnits production, pp. 411-415]

BACnetEngineeringUnits ::= {

…

--Electrical

...

megohms	(123),
micro-siemens	*(190),*
siemens	(173), -- 1 mho equals 1 siemens

…

--Volumetric Flow

cubic-feet-per-second	(142),
cubic-feet-per-minute	(84),
cubic-feet-per-hour	*(191),*
cubic-meters-per-second	(85),
...	
liters-per-hour	(136),
us-gallons-per-hour	*(192),*
us-gallons-per-minute	(89),

135-2004*h*-5 Define COV notification service Error returns.

Rationale
Standard 135.1 defines Error returns for the ConfirmedCOVNotification service that are not required by the current edition of Standard 135; those Error returns are specified here for Standard 135.

Addendum 135-2004*h*-5

[Change **13.6.2**, p. 272, ConfirmedCOVNotification service procedure]

13.6.2 Service Procedure

After verifying the validity of the request, the responding BACnet-user shall take whatever local actions have been assigned to the indicated COV and issue a 'Result(+)' service primitive. If the service request cannot be executed, a 'Result(-)' service primitive shall be issued indicating the error encountered.

The 'Error Class' and 'Error Code' to be returned for specific situations are as follows:

Situation:	*Error Class:*	*Error Code:*
No subscription exists for the specified object, property, and process identifier. Devices may ignore this condition and return a BACnet-SimpleACK-PDU.	*SERVICES*	*UNKNOWN_SUBSCRIPTION*

[Change **13.14.2**, p. 289, SubscribeCOV service procedure]

13.14.2 Service Procedure

…

If a new context is created, or a re-subscription is received, then the COV context shall be initialized and given a lifetime as specified by the 'Lifetime' parameter, if present, or zero if the 'Lifetime' parameter is not present. The subscription shall be automatically cancelled after that many seconds have elapsed unless a re-subscription is received. A lifetime of zero shall indicate that the subscription is indefinite and no automatic cancellation shall occur. In either case, a 'Result(+)' shall be returned. A ConfirmedCOVNotification or UnconfirmedCOVNotification shall be issued as soon as possible after the successful completion of a subscription or re-subscription request, as specified by the 'Issue Confirmed Notifications' parameter.

The 'Error Class' and 'Error Code' to be returned for specific situations are as follows:

Situation:	*Error Class:*	*Error Code:*
Specified object does not exist	*OBJECT*	*UNKNOWN_OBJECT*
Specified object does not support COV notifications	*OBJECT*	*OPTIONAL_FUNCTIONALITY_NOT_SUPPORTED*
No context can be created due to resource limitations	*RESOURCES*	*NO_SPACE_TO_ADD_LIST_ELEMENT*
The Lifetime parameter is out of the range supported by the device	*SERVICES*	*VALUE_OUT_OF_RANGE*

[Add new **18.2.X**, p. 354]

18.2.X OPTIONAL_FUNCTIONALITY_NOT_SUPPORTED – The requested action cannot be executed because the specified object does not support the optional functionality required.

[Add new **18.6.X** and **18.6.Y**, p. 357]

18.6.X UNKNOWN_SUBSCRIPTION – No subscription can be found that matches the specified object, property, and process identifier for the received notification.

18.6.Y VALUE_OUT_OF_RANGE – The requested action cannot be executed because one of the parameters provided is outside of the range supported by the device.

[Change **Clause 21**, **Error** production, pp. 406-407]
[Note: A change to this production, adding enumerations 51-72, appears in proposed Addendum 135-2004*b*-11.]
[Note: A change to this production, adding enumerations 73-74, appears in Addendum 135-2004*d*-11.]

Error ::= SEQUENCE {

```
    …
    error-code      ENUMERATED {
                        other                           (0),
                        …
                        unknown-property                (32),
                        unknown-subscription            (75),
                        -- this enumeration was removed  (33),
                        unknown-vt-class                (34),
                        …
                        -- see unknown-subscription      (75),
                        …
```

135-2004*h*-6. Remove non-support for automatic cancellation of COV subscriptions.

Rationale
The service procedure for the SubscribeCOV service states that a device is allowed to have no support for automatic cancellation of COV subscriptions. This lack of capability was deprecated, so the statement is being removed.

Addendum 135-2004*h*-6

[Change **13.14.2**, SubscribeCOV service, p. 289]

13.14.2 Service Procedure

If neither 'Lifetime' nor 'Issue Confirmed Notifications' are present, then the request shall be considered to be a cancellation. Any COV context that already exists for the same BACnet address contained in the PDU that carries the SubscribeCOV request and has the same 'Subscriber Process Identifier' and 'Monitored Object Identifier' shall be disabled and a 'Result(+)' returned. Cancellations that are issued for which no matching COV context can be found shall succeed as if a context had existed, returning 'Result(+)'.

~~If the 'Lifetime' parameter is present and has a non-zero value but the device does not support automatic cancellation of subscriptions, then a 'Result(-)' shall be returned.~~ If the 'Lifetime' parameter is not present but the 'Issue Confirmed Notifications' parameter is present, then a value of zero (indefinite lifetime) shall be assumed for the lifetime. If the 'Issue Confirmed Notifications' parameter is present but the object to be monitored does not support COV reporting, then a 'Result(-)' shall be returned. If the object to be monitored does support COV reporting, then a check shall be made to locate an existing COV context for the same BACnet address contained in the PDU that carries the SubscribeCOV request and has the same 'Subscriber Process Identifier' and 'Monitored Object Identifier'. If an existing COV context is found, then the request shall be considered a re-subscription and shall succeed as if the subscription had been newly created.

135-2004*h*-7. Add support for the UTF-8 character set.

Rationale
BACnet has not supported UTF-8 (Unicode Transfer Format 8), a specific form of encoding Unicode characters, which has become the base for data format and communication standards used in several markets and computing platforms. Efforts to add UTF-8 support within the context of discussions of the definition of "support" have stalled; support is added here independently and in the same context as already-supported character sets.

Addendum 135-2004*h*-7

[Change **20.2.9**, "Encoding of a Character String Value," pp. 381-382.]

20.2.9 Encoding of a Character String Value

The encoding of a character string value shall be primitive.

The encoding shall contain an initial contents octet, and zero, one, or more additional contents octets equal in value to the octets in the data value, in the order in which they appear in the data value, i.e., most significant octet first, and with the most significant bit of an octet of the data value aligned with the most significant bit of an octet of the contents octets.

The initial octet shall specify the character set with the following encoding:

X'00' ANSI X3.4
X'01' IBM™/Microsoft™ DBCS
X'02' JIS C 6226
X'03' ISO 10646 (UCS-4)
X'04' ISO 10646 (UCS-2)
X'05' ISO 8859-1
X'06' ISO/IEC 10646 AM1 (UTF-8)

...

Example: Application-tagged character string (UCS-2)

ASN.1 = CharacterString
Value = "This is a BACnet String!" (ISO 10646 UCS-2)
Application Tag = Character String (Tag Number = 7)
Encoded Tag = X'75'
Length Extension = X'31'
Encoded Data = X'040054006800690073002000690073002000610020004200410043006E006500740020007300740072006900 6E00670021'

Example: Application-tagged character string (UTF-8)

ASN.1 = CharacterString
Value = "This is a BACnet String!" (UTF-8)
Application Tag = Character String (Tag Number = 7)
Encoded Tag = X'75'
Length Extension = X'19'
Character Set = X'06' (UTF-8)
Encoded Data = X'546869732069732061204241436E657420737472696E6721'

[Change **ANNEX A**, p. 450.]

...

Character Sets Supported:

☐ ANSI X3.4 ☐ IBM™/Microsoft™ DBCS ☐ ISO 8859-1
☐ ISO 10646 (UCS-2) ☐ ISO 10646 (UCS-4) ☐ JIS C 6226
☐ *ISO 10646 (UTF-8)*

...

135-2004*h*-8. Add even and odd day support in Dates.

Rationale
Resource conservation sometimes requires schedules to be able to turn on automated watering systems on either even- or odd-numbered days of the month. Adding enumerations to support this would facilitate automated scheduling of such operations.

Addendum 135-2004*h*-8

[Change clause **20.2.12**, p. 383]

20.2.12 Encoding of a Date Value

The encoding of a date value shall be primitive, with four contents octets.

Date values shall be encoded in the contents octets as four binary integers. The first ~~contents~~ octet shall represent the year minus 1900; the second octet shall represent the month, with January = 1; the third octet shall represent the day of the month; and the fourth octet shall represent the day of the week, with Monday = 1. *A value of 13 in the second octet shall indicate odd months. A value of 14 in the second octet shall indicate even months. A value of 32 in the third octet shall indicate the last day of the month. A value of 33 in the third octet shall indicate odd days of the month. A value of 34 in the third octet shall indicate even days of the month*. A value of X'FF' = D'255' in any of the four octets shall indicate that the corresponding value is unspecified. If all four octets = X'FF', the corresponding date may be interpreted as "any" or "don't care."

[Change **Clause 21**, **Date**, p. 408]

Date ::= [APPLICATION 10] OCTET STRING (SIZE(4)) -- see 20.2.12

--	first octet	year minus 1900	X'FF' = unspecified
--	second octet	month (1..14)	1 = January
--			13 = odd months
--			14 = even months
--			X'FF' = unspecified
--	third octet	day of month (1..~~32~~*34*),	
--			32 = last day of month
--			*33 = odd days of month*
--			*34 = even days of month*
--			X'FF' = unspecified
--	fourth octet	day of week (1..7)	1 = Monday
--			7 = Sunday
--			X'FF' = unspecified