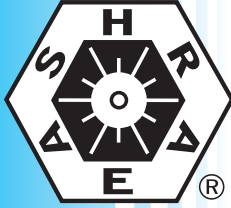


ANSI/ASHRAE Addendum e to  
ANSI/ASHRAE Standard 135-2004



# ASHRAE STANDARD



## BACnet<sup>®</sup>

# A Data Communication Protocol for Building Automation and Control Networks

Approved by the ASHRAE Standards Committee on January 27, 2007; by the ASHRAE Board of Directors on March 25, 2007; and by the American National Standards Institute on March 26, 2007.

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**[The foreword and the "rationale" on the following page 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 revise ANSI/ASHRAE Standard 135-2004. The modifications in this addendum are the result of change proposals made pursuant to the ASHRAE continuous maintenance procedures and of deliberations within Standing Standard Project Committee 135.

SSPC 135 wishes to recognize the efforts of the following people in developing this addendum: Howard Coleman, Sharon Dinges, Stuart Donaldson, David Fisher, John Hartman, Bernhard Isler, Roland Laird, Hans-Joachim Mundt, H. Michael Newman, and David Ritter. The committee is also grateful to Andrey Golovin, René Quirighetti, and Takeji Toyoda.

The changes in Addendum 135*e* are summarized below.

135-2004*e*-1. Add a new Load Control object type, p. 1.

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 ~~strike through~~. Where entirely new subclauses are to be added, plain type is used throughout.

## 135-2004e-1. Add a new Load Control object type.

### Rationale

There is need for a standard object type to allow a standard means for providing external control over load shedding.

### Addendum 135-2004e-1

[Add new **Clause 12.17**, p. 206, and renumber existing **Clause 12.17** and subsequent clauses, including tables and figures]

#### 12.17 Load Control Object Type

The Load Control object type defines a standardized object whose properties represent the externally visible characteristics of a mechanism for controlling load requirements. A BACnet device can use a Load Control object to allow external control over the shedding of a load that it controls. The mechanisms by which the loads are shed are not visible to the BACnet client. One or more objects may be used in the device to allow independent control over different sub-loads. The Load Control object may also be used in a hierarchical fashion to control other Load Control objects in other BACnet devices.

A BACnet client (controller) can request that the Load Control object shed a portion of its load for a specified time by writing to the four properties: Requested\_Shed\_Level, Start\_Time, Shed\_Duration, and Duty\_Window. For any given shed request, which may arrive while a previous request is pending or active, each of these parameters is optional except for Start\_Time, which must be written if no shed request is pending or active. If no shed request is pending or active, only the writing of Start\_Time will cause the Load Control object to become active. Modification of these shed request parameters serves to configure the load shed command. Initial values of these properties, and the values taken at the completion of a shed command execution, are as specified in the individual property descriptions.

The Load Control object shed mechanism follows a state machine whose operation is displayed in Figure 12-2. This state machine only describes the behavior of the Load Control object when the Enable property has the value TRUE. See Clause 12.19.14 for a description of the effect of this property. The state machine captures the transitions that occur within the Load Control object.

If the device is unable to comply fully with the shed request by shedding the entire amount of load requested, it is a local matter whether the device sheds as much load as it can or whether it does not shed any of its loads. Determination of compliance with a client's load shed request may also be affected by other factors, such as the definition of the baseline usage, synchronization of time between the client and the device containing the Load Control object, and any intrinsic limits on shed amounts that the device may have. If these factors are not in agreement, the client's determination of compliance may not match the object's determination.

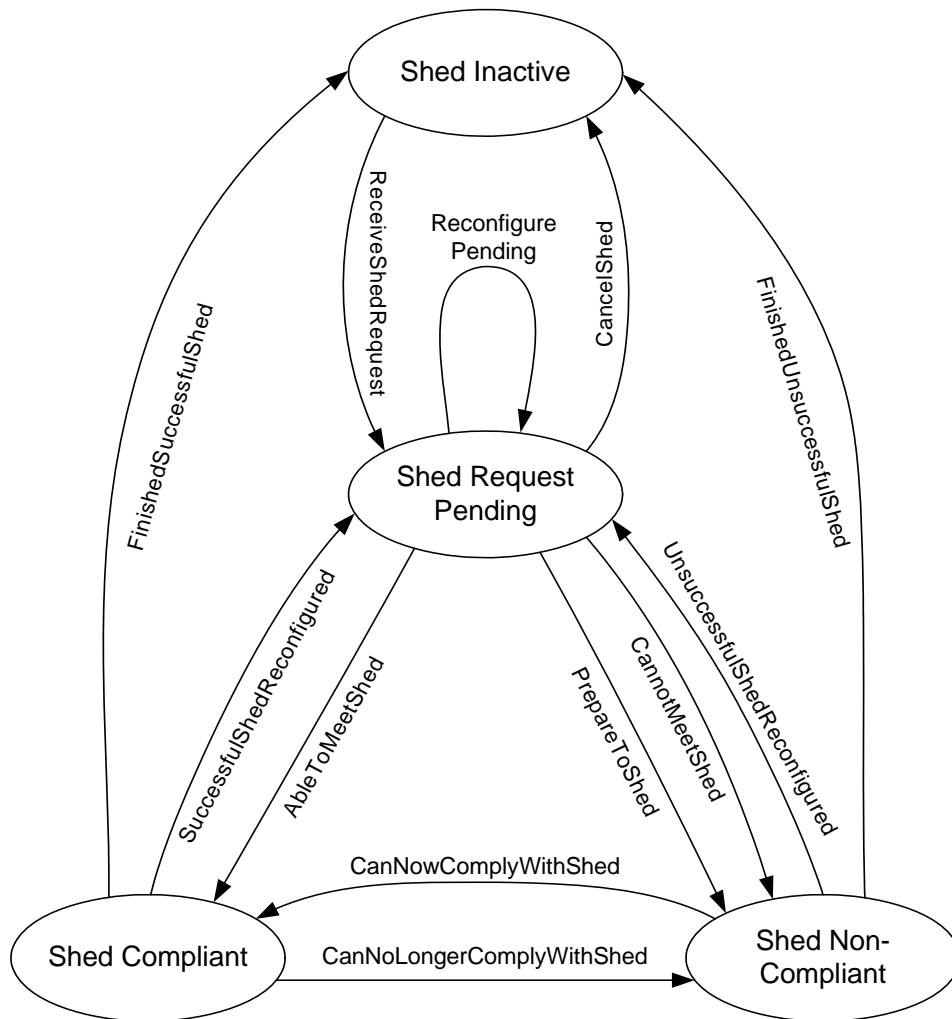
The activity of a Load Control object in the SHED\_REQUEST\_PENDING state will vary. For a Load Control object controlling only one or more direct loads that it can shed instantly, the activity will be simply waiting for the first duty window to arrive, at which point it will monitor the clock and cycle on/off or begin modulation of loads or reduce loads by some other means. The object may need to begin shedding some of the loads before Start\_Time in order to meet the shed target by Start\_Time, in which case it will enter the SHED\_NON\_COMPLIANT state. For a Load Control object controlling other Load Control objects subordinate to it, the shedding activity will begin prior to Start\_Time by communicating the shed request (possibly modified) to these other Load Control objects. There may be some Load Control objects that indicate an inability to comply with the request, which may lead to requests for increased load reduction from these or other Load Control objects.

While the Load Control object is designed to allow independent operation, it is possible that there will exist within a building (or even within a device) a hierarchy of Load Control objects, where one Load Control object receives a load shed command, possibly from a non-BACnet client (e.g., a utility), and the controller which hosts that object (the master) in turn will be responsible for managing and issuing requests to other Load Control objects. There may be a negotiation between the master and its subordinate Load Control objects. The master uses WriteProperty or WritePropertyMultiple to set shed request parameters in the subordinate Load Control objects. A subordinate Load Control object would then set its Expected\_Shed\_Level property to the value that it expects to be able to achieve after Start\_Time. Before

Start\_Time, the master object can read the Expected\_Shed\_Level properties of its subordinates to determine expected compliance with the request. After Start\_Time plus Duty\_Window, the Actual\_Shed\_Level properties of the subordinate objects will reflect the actual amount shed in the past Duty\_Window. If by reading these properties the master Load Control object determines that one or more subordinate objects cannot completely comply with the request, the master may choose to modify the shed requests to subordinates, such that the overall shed target is achieved. For instance, it may request that another object shed a greater amount of its load or it may choose to request that the noncompliant device shed a greater amount. This negotiation could be repeated at each successive level in the hierarchy. If the subordinate Load Control objects also support intrinsic reporting, expected or actual instances of non-compliance can be reported to the master object using event notifications.

Where large loads are concerned, it is expected that the master Load Control object will employ sequencing to distribute the startup and shutdown of managed loads. When the load control master is used in a gateway to a non-BACnet load control client, such as a utility company, the gateway shall accept and process any start randomization commands and accordingly distribute the initiation of load control requests to its subordinate Load Control objects.

The Load Control object shall exhibit restorative behavior across a restart or time change of the BACnet device in which it resides. The shed request property values shall be maintained across a device restart. Upon device restart or a time change, the object shall behave as if Start\_Time were written and shall re-evaluate the state machine's state.



**Figure 12-2.** State Diagram for Load Control Object.

## SHED\_INACTIVE

In the SHED\_INACTIVE state, the Load Control object waits for a shed request.

### ReceiveShedRequest

If Start\_Time is written, the object shall calculate Expected\_Shed\_Level and Actual\_Shed\_Level and enter the SHED\_REQUEST\_PENDING state.

## SHED\_REQUEST\_PENDING

In the SHED\_REQUEST\_PENDING state, the object makes a determination from the newly written shed parameters whether the shed request needs to be executed immediately or at some time in the future.

### CancelShed

If the current time is after Start\_Time plus Shed\_Duration, this request is for an invalid time and is ignored. The object shall stop shedding and enter the SHED\_INACTIVE state.

If Requested\_Shed\_Level is equal to the default value for the choice, or Start\_Time contains wildcards, then this is a cancellation of shedding. The object shall stop shedding and enter the SHED\_INACTIVE state.

### ReconfigurePending

If the current time is prior to Start\_Time, and a new write is received for Requested\_Shed\_Level, Shed\_Duration, Duty\_Window, or Start\_Time, this is a reconfiguration of the shed request. The object shall calculate Expected\_Shed\_Level and Actual\_Shed\_Level and enter the SHED\_REQUEST\_PENDING state.

### PrepareToShed

If the current time is prior to Start\_Time, but the loads to be shed require time to decrease usage to the requested shed level, the object may choose to initiate shedding of its subordinates prior to Start\_Time in order to be in compliance by Start\_Time. If this approach is followed, the object shall calculate Expected\_Shed\_Level and Actual\_Shed\_Level and enter the SHED\_NON\_COMPLIANT state.

### CannotMeetShed

If the current time is after Start\_Time, and the object is unable to meet the shed request immediately, it shall begin shedding its loads, calculate Expected\_Shed\_Level and Actual\_Shed\_Level, and enter the SHED\_NON\_COMPLIANT state.

### AbleToMeetShed

If the current time is after Start\_Time and the object is able to achieve the shed request immediately, it shall shed its loads, calculate Expected\_Shed\_Level and Actual\_Shed\_Level, and enter the SHED\_COMPLIANT state.

If the current time is before Start\_Time, and the object has initiated shedding prior to Start\_Time in order to be in compliance by Start\_Time, and the object has achieved the requested shed level, it shall calculate Expected\_Shed\_Level and Actual\_Shed\_Level and enter the SHED\_COMPLIANT state.

## SHED\_NON\_COMPLIANT

In the SHED\_NON\_COMPLIANT state, the object attempts to meet the shed request until the shed is achieved, the object is reconfigured, or the request has completed unsuccessfully.

### FinishedUnsuccessfulShed

If the current time is after Start\_Time plus Shed\_Duration, the shed request has completed unsuccessfully. The object shall stop shedding and enter the SHED\_INACTIVE state.

### UnsuccessfulShedReconfigured

If the object receives a write to any of the properties Requested\_Shed\_Level, Shed\_Duration, Duty\_Window, or Start\_Time, the object shall enter the SHED\_REQUEST\_PENDING state.

CanNowComplyWithShed

If the object has achieved the Requested\_Shed\_Level, it shall calculate Expected\_Shed\_Level and Actual\_Shed\_Level and enter the SHED\_COMPLIANT state.

SHED\_COMPLIANT

In the SHED\_COMPLIANT state, the object continues meeting the shed request until the shed is either reconfigured or completes, or conditions change and the object is no longer able to maintain the requested shed level.

FinishedSuccessfulShed

If the current time is after Start\_Time plus Shed\_Duration, the shed request has completed successfully. The object shall stop shedding, set Start\_Time to all wildcards, and enter the SHED\_INACTIVE state.

SuccessfulShedReconfigured

If the object receives a write to any of the properties Requested\_Shed\_Level, Shed\_Duration, Duty\_Window, or Start\_Time, the object shall enter the SHED\_REQUEST\_PENDING state.

CanNoLongerComplyWithShed

If the object is no longer able to maintain the Requested\_Shed\_Level, it shall calculate Expected\_Shed\_Level and Actual\_Shed\_Level and enter the SHED\_NON\_COMPLIANT state.

**Table 12-20. Properties of the Load Control Object Type**

Property Identifier	Property Datatype	Conformance Code
Object_Identifier	BACnetObjectIdentifier	R
Object_Name	CharacterString	R
Object_Type	BACnetObjectType	R
Description	CharacterString	O
Present_Value	BACnetShedState	R
State_Description	CharacterString	O
Status_Flags	BACnetStatusFlags	R
Event_State	BACnetEventState	R
Reliability	BACnetReliability	O
Requested_Shed_Level	BACnetShedLevel	W
Start_Time	BACnetDateTime	W
Shed_Duration	Unsigned	W
Duty_Window	Unsigned	W
Enable	BOOLEAN	W
Full_Duty_Baseline	REAL	O
Expected_Shed_Level	BACnetShedLevel	R
Actual_Shed_Level	BACnetShedLevel	R
Shed_Levels	BACnetARRAY[N] of Unsigned	W <sup>1</sup>
Shed_Level_Descriptions	BACnetARRAY[N] of CharacterString	R
Notification_Class	Unsigned	O <sup>2</sup>
Time_Delay	Unsigned	O <sup>2</sup>
Event_Enable	BACnetEventTransitionBits	O <sup>2</sup>
Acked_Transitions	BACnetEventTransitionBits	O <sup>2</sup>
Notify_Type	BACnetNotifyType	O <sup>2</sup>
Event_Time_Stamps	BACnetARRAY[3] of BACnetTimeStamp	O <sup>2</sup>
Profile_Name	CharacterString	O

<sup>1</sup> The elements of this array are required to be writable, although the array is not required to be resizable.

<sup>2</sup> These properties are required if the object supports intrinsic reporting.

### 12.17.1 Object\_Identifier

This property, of type BACnetObjectIdentifier, is a numeric code that is used to identify the object. It shall be unique within the BACnet Device that maintains it.

### 12.17.2 Object\_Name

This property, of type CharacterString, shall represent a name for the object that is unique within the BACnet Device that maintains it. The minimum length of the string shall be one character. The set of characters used in the Object\_Name shall be restricted to printable characters.

### 12.17.3 Object\_Type

This property, of type BACnetObjectType, indicates membership in a particular object type class. The value of this property shall be LOAD\_CONTROL.

### 12.17.4 Description

This property, of type CharacterString, is a string of printable characters whose content is not restricted.

### 12.17.5 Present\_Value

This property, of type BACnetShedState, indicates the current load shedding state of the object. See Figure 12-2 for a diagram of the state machine governing the value of Present\_Value.

### 12.17.6 State\_Description

This property, of type CharacterString, is a string of printable characters whose content is not restricted. The State\_Description provides additional information for human operators about the shed state of the Load Control object.

### 12.17.7 Status\_Flags

This property, of type BACnetStatusFlags, represents four Boolean flags that indicate the general "health" of a Load Control object. Three of the flags are associated with the values of other properties of this object. A more detailed status could be determined by reading the properties that are linked to these flags. The relationship between individual flags is not defined by the protocol. The four flags are

{IN\_ALARM, FAULT, OVERRIDDEN, OUT\_OF\_SERVICE}

where:

- |                |  |
|----------------|--|
| IN_ALARM       | Logical FALSE (0) if the Event_State property has a value of NORMAL, otherwise logical TRUE (1).                                     |
| FAULT          | Logical TRUE (1) if the Reliability property is present and does not have a value of NO_FAULT_DETECTED, otherwise logical FALSE (0). |
| OVERRIDDEN     | Logical TRUE (1) if the point has been overridden by some mechanism local to the BACnet Device, otherwise logical FALSE (0).         |
| OUT_OF_SERVICE | This bit shall always be Logical FALSE (0).  |



### 12.17.8 Event\_State

The Event\_State property, of type BACnetEventState, is included in order to provide a way to determine if this object has an active event state associated with it. If the object supports intrinsic reporting, then the Event\_State property shall indicate the event state of the object. If the object does not support intrinsic reporting and if the Reliability property is not present, then the value of this property shall be NORMAL. If the Reliability property is present and does not have a value of NO\_FAULT\_DETECTED, then the value of the Event\_State property shall be FAULT. Changes in the Event\_State property to the value FAULT are considered to be “fault” events.

### 12.17.9 Reliability

The Reliability property, of type BACnetReliability, provides an indication of whether the Load Control object is reliably reporting its compliance with any load shed requests. The Reliability property for this object type may have any of the following values:

{NO\_FAULT\_DETECTED, UNRELIABLE\_OTHER}

### 12.17.10 Requested\_Shed\_Level

This property, of type BACnetShedLevel, indicates the desired load shedding. Table 12-21 describes the default values and power targets for the different choices of Requested\_Shed\_Level.

If the choice for Requested\_Shed\_Level is PERCENT, the value of Requested\_Shed\_Level is interpreted as a requested percentage of Full Duty to which the device is to attempt to reduce its load. The determination of the Full Duty rating (or some alternative baseline power usage) is a local matter. It may be determined from the Full\_Duty\_Baseline property, if present.

If the choice for Requested\_Shed\_Level is LEVEL, the value of Requested\_Shed\_Level is used to set a preconfigured level of load shedding.

The Load Control object’s available shed actions are described by the Shed\_Level\_Descriptions array and are mapped to the BACnet visible values of Requested\_Shed\_Level by the Shed\_Levels array. The SHED\_INACTIVE state shall always be represented by the value 0, which is not represented in the Shed\_Levels or Shed\_Level\_Descriptions arrays. If Requested\_Shed\_Level choice is AMOUNT, the value of Requested\_Shed\_Level shall be interpreted as an amount, in kilowatts, by which to reduce power usage. Load Control objects are required to support the LEVEL choice. Support for the PERCENT and AMOUNT choices is optional. This allows a master to be guaranteed the ability to write to the Load Control object by using the LEVEL choice.

If a load control command has been issued, and execution of the command has completed, Requested\_Shed\_Level shall be reset to the default value appropriate to the choice of Requested\_Shed\_Level used for the last command.

**Table 12-21.** Requested\_Shed\_Level Default Values and Power Targets

Choice	Default Requested_Shed_Level value	Power load target in kW
PERCENT	100	(current baseline) * Requested_Shed_Level / 100
LEVEL	0	locally pre-specified shed target for the given level
AMOUNT	0.0	(current baseline) - Requested_Shed_Level

### 12.17.11 Start\_Time

This property, of type BACnetDateTime, indicates the start of the duty window in which the load controlled by the Load Control object must be compliant with the requested shed. Load shedding (or determination of loads to shed) may need to begin before Start\_Time in order to be compliant with the shed request by Start\_Time. If no shed request is pending or active, Start\_Time shall contain all wildcard values. If a load control command has been issued, and execution of the command has completed, Start\_Time shall be reset by the device to contain all wildcard values. If a client wishes to initiate an immediate shed, it can set Start\_Time to a value prior to the device’s current time.

### **12.17.12 Shed\_Duration**

This property, of type Unsigned, indicates the duration of the load shed action, starting at Start\_Time. The units for Shed\_Duration are minutes. If no shed request is pending or active, Shed\_Duration shall be zero. If a load control command has been issued, and execution of the command has completed, Shed\_Duration shall be reset by the device to zero.

### **12.17.13 Duty\_Window**

This property, of type Unsigned, indicates the time window used for load shed accounting. The units for Duty\_Window are minutes. Duty\_Window is used for performance measurement or compliance purposes. The average power consumption across a duty window must be less than or equal to the requested reduced consumption. It is a local matter whether this window is fixed or sliding. The first Duty\_Window begins at Start\_Time. If a shed request is received with no value written to this property, Duty\_Window shall be set to some pre-agreed upon value. If a load control command has been issued, and execution of the command has completed, Duty\_Window shall be reset by the device to this pre-agreed value.

### **12.17.14 Enable**

This property, of type BOOLEAN, indicates and controls whether the Load Control object is currently enabled to respond to load shed requests. If Enable is TRUE, the object will respond to load shed requests normally and follow the state machine described in Figure 12-2. If Enable is FALSE, the object will transition to the SHED\_INACTIVE state if necessary and remain in that state. It shall not respond to any load shed request while Enable is FALSE.

### **12.17.15 Full\_Duty\_Baseline**

This property, of type REAL, indicates the baseline power consumption value for the sheddable load controlled by this object, if a fixed baseline is used. Shed requests may be made with respect to this baseline, that is, to “percent of baseline” and “amount off baseline”. The units of Full\_Duty\_Baseline are kilowatts.

### **12.17.16 Expected\_Shed\_Level**

This property, of type BACnetShedLevel, indicates the amount of power that the object expects to be able to shed in response to a load shed request. When the object is in the SHED\_INACTIVE state, this value shall be equal to the default value of Requested\_Shed\_Level. When a shed request is pending or active, Expected\_Shed\_Level shall be equal to the shed level the object expects to be able to achieve at Start\_Time. Expected\_Shed\_Level allows a client (e.g., a master-level Load Control object) to determine if a pending shed request needs to be modified in order to achieve the requested shed level, in the event that Expected\_Shed\_Level is less than the Requested\_Shed\_Level. The units for Expected\_Shed\_Level are the same as the units for Requested\_Shed\_Level.

### **12.17.17 Actual\_Shed\_Level**

This property, of type BACnetShedLevel, indicates the actual amount of power being shed in response to a load shed request. When the object is in the SHED\_INACTIVE state, this value shall be equal to the default value of Requested\_Shed\_Level. After Start\_Time plus Duty\_Window has elapsed, this value shall be the actual shed amount as calculated based on the average value over the previous duty window. The units for Actual\_Shed\_Level are the same as the units for Requested\_Shed\_Level.

### **12.17.18 Shed\_Levels**

This property is a BACnetARRAY of unsigned integers representing the shed levels for the LEVEL choice of BACnetShedLevel that have meaning for this particular Load Control object. The array shall be ordered by increasing shed amount. When commanded with the LEVEL choice, the Load Control object shall take a shedding action described by the corresponding element in the Shed\_Level\_Descriptions array. If the Load Control object is commanded to go to a level that is not in the Shed\_Levels array, it shall go to the Shed\_Level whose entry in the Shed\_Levels array has the nearest numerically lower value. The elements of the array are required to be writable, allowing local configuration of

how this Load Control object will participate in load shedding for the facility. This array is not required to be resizable through BACnet write services. The size of this array shall be equal to the size of the Shed\_Level\_Descriptions array. The behavior of this object when the Shed\_Levels array contains duplicate entries is a local matter.

#### **12.17.19 Shed\_Level\_Descriptions**

This property is a BACnetARRAY of character strings representing a description of the shed levels that the Load Control object can take on. This allows a local configuration tool to provide to a user an understanding of what each shed level in this Load Control object's load shedding algorithm will do. The level at which each shed action will occur can then be configured by writing to the Shed\_Levels property.

#### **12.17.20 Notification\_Class**

This property, of type Unsigned, shall specify the notification class to be used when handling and generating event notifications for this object. The Notification\_Class property implicitly refers to a Notification Class object that has a Notification\_Class property with the same value. This property is required if intrinsic reporting is supported by this object.

#### **12.17.21 Time\_Delay**

This property, of type Unsigned, shall specify the minimum period of time in seconds that the Present\_Value property shall remain equal to SHED\_NON\_COMPLIANT when the current time is after Start\_Time and before a TO-OFFNORMAL event is generated, or not equal to SHED\_NON\_COMPLIANT before a TO-NORMAL event is generated. This property is required if intrinsic reporting is supported by this object.

#### **12.17.22 Event\_Enable**

This property, of type BACnetEventTransitionBits, shall convey three flags that separately enable and disable reporting of TO-OFFNORMAL, TO-FAULT, and TO-NORMAL events. This property is required if intrinsic reporting is supported by this object.

##### **12.17.22.1 Conditions for Generating a TO-OFFNORMAL Event**

A TO-OFFNORMAL event is generated under these conditions:

- (a) the Present\_Value must remain in the SHED\_NON\_COMPLIANT state for a minimum period of time, specified in the Time\_Delay property,
- (b) the TO-OFFNORMAL flag must be set in the Event\_Enable property, and
- (c) the current time is after Start\_Time.

##### **12.17.22.2 Conditions for Generating a TO-NORMAL Event**

Once the Present\_Value transitions to the SHED\_NON\_COMPLIANT state, a TO-NORMAL event is generated under these conditions:

- (a) the Present\_Value leaves the SHED\_NON\_COMPLIANT state and remains out of this state for a minimum period of time, specified in the Time\_Delay property, and
- (b) the TO-NORMAL flag must be set in the Event\_Enable property.

#### **12.17.23 Acked\_Transitions**

This property, of type BACnetEventTransitionBits, shall convey three flags that separately indicate the receipt of acknowledgements for TO-OFFNORMAL, TO-FAULT, and TO-NORMAL events. These flags shall be cleared upon the occurrence of the corresponding event and set under any of these conditions:

- (a) upon receipt of the corresponding acknowledgement;

- (b) upon the occurrence of the event if the corresponding flag is not set in the Event\_Enable property (meaning event notifications will not be generated for this condition and thus no acknowledgement is expected); or
- (c) upon the occurrence of the event if the corresponding flag is set in the Event\_Enable property and the corresponding flag in the Ack\_Required property of the Notification Class object implicitly referenced by the Notification\_Class property of this object is not set (meaning no acknowledgement is expected).

This property is required if intrinsic reporting is supported by this object.

**12.17.24 Notify\_Type**

This property, of type BACnetNotifyType, shall convey whether the notifications generated by the object should be Events or Alarms. This property is required if intrinsic reporting is supported by this object.

**12.17.25 Event\_Time\_Stamps**

This optional property, of type BACnetARRAY[3] of BACnetTimeStamp, shall convey the times of the last event notifications for TO-OFFNORMAL, TO-FAULT, and TO-NORMAL events, respectively. Time stamps of type Time or Date shall have X'FF' in each octet and Sequence number time stamps shall have the value 0 if no event notification of that type has been generated since the object was created. This property is required if intrinsic reporting is supported by this object.

**12.17.26 Profile\_Name**

This property, of type CharacterString, is the name of an object profile to which this object conforms. To ensure uniqueness, a profile name must begin with a vendor identifier code (see Clause 23) in base-10 integer format, followed by a dash. All subsequent characters are administered by the organization registered with that vendor identifier code. The vendor identifier code that prefixes the profile name shall indicate the organization that publishes and maintains the profile document named by the remainder of the profile name. This vendor identifier need not have any relationship to the vendor identifier of the device within which the object resides.

A profile defines a set of additional properties, behavior, and/or requirements for this object beyond those specified here. This standard defines only the format of the names of profiles. The definition of the profiles themselves is outside the scope of this standard.

[Change Table 13-1, p.254]

**Table 13-1. Standardized Objects That May Support COV Reporting**

Object Type	Criteria	Properties Reported
...		
<i>Load Control</i>	<i>If Present_Value, Requested_Shed_Level, Start_Time, Shed_Duration, or Duty_Window changes at all</i>	<i>Present_Value, Status_Flags, Requested_Shed_Level, Start_Time, Shed_Duration, Duty_Window</i>
Loop	If Present_Value changes by COV_Increment or Status_Flags changes at all	Present_Value, Status_Flags, Setpoint, Controlled_Variable_Value
...		

[Change Table 13-2, p.256]

**Table 13-2. Standard Objects That May Support Intrinsic Reporting**

Object Type	Criteria	Event Type
...		
Binary Output, Multi-state Output	If Present_Value differs from Feedback_Value for longer than Time_Delay AND the new transition is enabled in Event_Enable	COMMAND_FAILURE
<i>Load Control</i>	<i>If Present_Value equals SHED_NON_COMPLIANT for longer than Time_Delay AND the new transition is enabled in Event_Enable</i>	<i>COMMAND_FAILURE</i>
Loop	If the absolute difference between Setpoint and Controlled_Variable_Value exceeds Error_Limit for longer than Time_Delay AND the new transition is enabled in Event_Enable	FLOATING_LIMIT
...		

[Change Table 13-3, p.257]

**Table 13-3. Standard Object Property Values Returned in Notifications**

Object	Event Type	Notification Parameters	Referenced Object's Properties
...			
Binary Output, Multi-state Output	COMMAND_FAILURE	Command_Value Status_Flags Feedback_Value	Present_Value Status_Flags Feedback_Value
<i>Load Control</i>	<i>COMMAND_FAILURE</i>	<i>Command_Value Status_Flags Feedback_Value</i>	<i>Requested_Shed_Level Status_Flags Actual_Shed_Level</i>
Loop	FLOATING_LIMIT	Referenced_Value Status_Flags Setpoint_Value Error_Limit	Controlled_Variable_Value Status_Flags Setpoint Error_Limit
...			

[Add to Clause 21, BACnetObjectType production, p. 421]

**BACnetObjectType ::= ENUMERATED {**

```

...
life-safety-zone           (22),
load-control                (28),
...
-- enumerations 25-27 are used in Addendum b to ANSI/ASHRAE 135-2004(135b-1, -2 and -3)
-- see load-control        (28),
-- enumeration 29 is used in Addendum d to ANSI/ASHRAE 135-2004(135d-1)
...
}

```

[Add to **Clause 21, BACnetObjectTypesSupported** production, p. 422]

```
BACnetObjectTypesSupported ::= ENUMERATED {  
  ...  
  -- life-safety-zone          (22),  
  -- load-control              (28),  
  ...  
  -- Objects added after 2004  
  -- enumerations 25-27 are used in Addendum b to ANSI/ASHRAE 135-2004(135b-1, -2 and -3)  
  load-control                (28),  
  -- enumeration 29 is used in Addendum d to ANSI/ASHRAE 135-2004(135d-1)  
}
```

[Add to **21, BACnetPropertyIdentifier** production (distributed alphabetically), pp. 423-428]

```
BACnetPropertyIdentifier ::= ENUMERATED {  
  ...  
  active-cov-subscriptions    (152),  
  actual-shed-level          (212),  
  ...  
  direct-reading              (156),  
  duty-window                 (213),  
  ...  
  enable                      (133),  
  -- The enable property is renamed from log-enable in Addendum b to ANSI/ASHRAE 135-2004(135b-2)  
  ...  
  exception-schedule          (38),  
  expected-shed-level         (214),  
  ...  
  firmware-revision           (44),  
  full-duty-baseline          (215),  
  ...  
  relinquish-default          (104),  
  requested-shed-level        (218),  
  ...  
  setting                     (162),  
  shed-duration               (219),  
  shed-level-descriptions     (220),  
  shed-levels                 (221),  
  ...  
  start-time                  (142),  
  ...  
  -- enumerations 193-206 are used in Addendum b to ANSI/ASHRAE 135-2004(135b-2)  
  -- enumerations 207-211 are used in Addendum d to ANSI/ASHRAE 135-2004(135d-1)  
  -- see actual-shed-level     (212),  
  -- see duty-window           (213),  
  -- see expected-shed-level   (214),  
  -- see full-duty-baseline     (215),  
  -- see requested-shed-level   (218),  
  -- see shed-duration         (219),  
  -- see shed-level-descriptions (220),  
  -- see shed-levels           (221),  
  -- see state-description      (222),  
  ...  
}
```

-- The special property identifiers all, optional, and required are reserved for use in the ReadPropertyConditional and ReadPropertyMultiple services or services not defined in this standard.

--

-- Enumerated values 0-511 are reserved for definition by ASHRAE. Enumerated values 512-4194303 may be used by others subject to the procedures and constraints described in Clause 23. ~~The highest enumeration used in this version is 492.~~

[Add to **21**, new **BACnetShedLevel** production, p. 431]

```
BACnetShedLevel ::= CHOICE {
    percent      [0] Unsigned,
    level        [1] Unsigned,
    amount       [2] REAL
}
```

[Add to **21**, new **BACnetShedState** enumeration, p. 431]

```
BACnetShedState ::= ENUMERATED {
    shed-inactive      (0),
    shed-request-pending (1),
    shed-compliant     (2),
    shed-non-compliant (3)
}
```

[Add to **Annex C**, p. 460]

```
LOAD-CONTROL ::= SEQUENCE {
    object-identifier [75] BACnetObjectIdentifier,
    object-name       [77] CharacterString,
    object-type       [79] BACnetObjectType,
    description       [28] CharacterString OPTIONAL,
    present-value     [85] BACnetShedState,
    state-description [28] CharacterString OPTIONAL,
    status-flags      [111] BACnetStatusFlags,
    event-state       [36] BACnetEventState,
    reliability        [103] BACnetReliability OPTIONAL,
    requested-shed-level [218] BACnetShedLevel,
    start-time        [142] BACnetDateTime,
    shed-duration     [219] Unsigned,
    duty-window       [213] Unsigned,
    enable            [133] BOOLEAN,
    -- The enable property appears in Addendum b to ANSI/ASHRAE 135-2004(135b-2)
    full-duty-baseline [215] REAL OPTIONAL,
    expected-shed-level [214] BACnetShedLevel,
    actual-shed-level  [212] BACnetShedLevel,
    shed-levels       [221] SEQUENCE OF Unsigned, -- accessed as a BACnetARRAY
    shed-level-descriptions [220] SEQUENCE OF CharacterString, -- accessed as a BACnetARRAY
    notification-class [17] Unsigned OPTIONAL,
    time-delay        [113] Unsigned OPTIONAL,
    event-enable      [35] BACnetEventTransitionBits OPTIONAL,
    acked-transitions [0] BACnetEventTransitionBits OPTIONAL,
    notify-type       [72] BACnetNotifyType OPTIONAL,
    event-time-stamps [130] SEQUENCE OF BACnetTimeStamp OPTIONAL, -- accessed as a
BACnetARRAY
    profile-name      [167] CharacterString OPTIONAL
}
```

[Add new **Annex D.17**, p. 477, and renumber existing **Annex D.17** and subsequent examples.]

### **D.17 Example of a Load Control object**

Property: Object\_Identifier = (Load\_Control, Instance 1)  
Property: Object\_Name = "Load Control 1"  
Property: Object\_Type = LOAD CONTROL  
Property: Description = "Chiller Load Control"  
Property: Present\_Value = SHED\_COMPLIANT  
Property: State\_Description = "shedding compliant with request"  
Property: Status\_Flags = {FALSE, FALSE, FALSE, FALSE}  
Property: Event\_State = NORMAL  
Property: Reliability = NO\_FAULT\_DETECTED  
Property: Requested\_Shed\_Level = (Percent, 80)  
Property: Start\_Time = (1-JUL-2002,10:00:00.0)  
Property: Shed\_Duration = 120  
Property: Duty\_Window = 30  
Property: Enable = TRUE  
Property: Full\_Duty\_Baseline = 250.0  
Property: Expected\_Shed\_Level = 80  
Property: Actual\_Shed\_Level = 80  
Property: Shed\_Levels = (1, 3, 6, 9)  
Property: Shed\_Level\_Descriptions = ("switch to alternate energy",  
"setback 2 degrees",  
"dim lights 20%",  
"setback 4 degrees")  
  
Property: Notification\_Class = 3  
Property: Time\_Delay = 60  
Property: Event\_Enable = {TRUE, FALSE, TRUE}  
Property: Acked\_Transitions = {TRUE, TRUE, TRUE}  
Property: Notify\_Type = ALARM  
Property: Event\_Time\_Stamps = ((17-APR-2001,18:50:21.2),  
(\*-\*.\*,\*:\*:\*.\*),  
(17-APR-2001,19:01:34.0))



[Add a new entry to **History of Revisions**, p.598]

**(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

<i>Protocol</i>		<i>Summary of Changes to the Standard</i>
<i>Version</i>	<i>Revision</i>	
...	...	...
1	6	<b>Addendum e to ANSI/ASHRAE 135-2004</b> Approved by the ASHRAE Standards Committee January 27, 2007; by the ASHRAE Board of Directors March 25, 2007; and by the American National Standards Institute March 26, 2007.  1. Add a new Load Control object type.

**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.