ADDENDA

ANSI/ASHRAE Addendum i to
ANSI/ASHRAE Standard 135-2010

BACnet®—A Data Communication Protocol for Building Automation and Control Networks

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[This foreword and the "rationale" 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

Addendum 135*i* to ANSI/ASHRAE Standard 135-2010 contains a number of changes to the current standard. 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.

135-2010*i*-1. Define new Lighting Output Object type, p. 1.

In the following document, language to be added to existing clauses of ANSI/ASHRAE 135-2010 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.

135-2010*i*-1. Define new Lighting Output Object type.

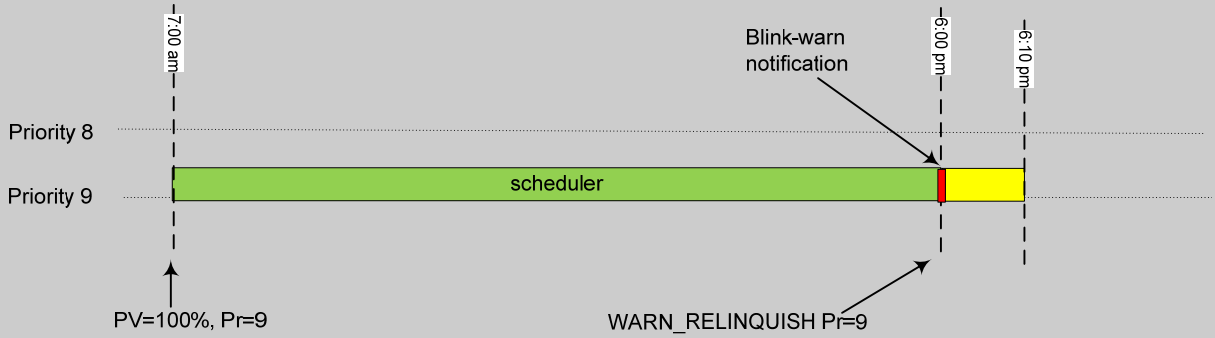
Rationale
A new object is needed to present the externally visible characteristics of a lighting output. Specifically, this addendum on Lighting Outputs incorporates various features used in lighting applications, such as:
- Blink-warning,
- Continuous analog control of lighting level,
- Ramping to a level at a fixed rate of change,
- Fading to a level over a fixed period of time,
- Incremental stepping values up and down.

These functions have clear equivalencies to similar functions in DALI-based lighting systems.

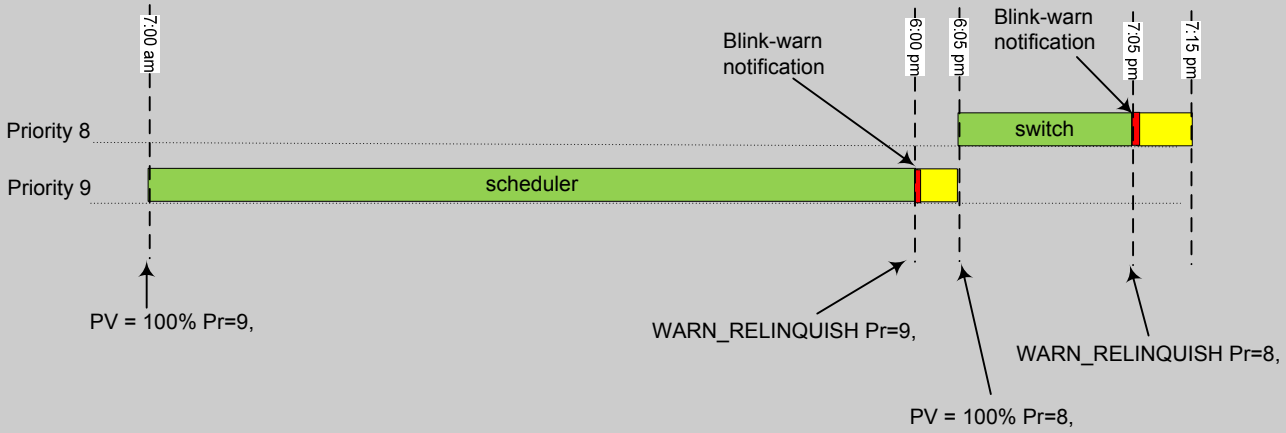
Examples:

Note: - The BACnet schedule cannot directly write a lighting command.
- Assume Relinquish_Default = 0.0% (physical lights off).

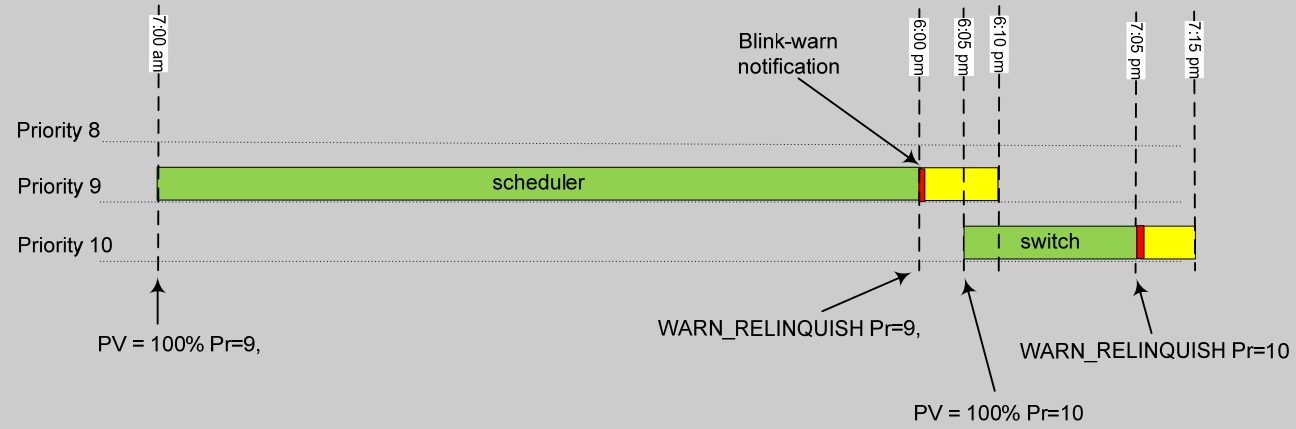
1. A scheduler turns on the lights at 7:00 am at priority 9. At 6:00 am, the scheduler relinquishes control by (indirectly) writing a WARN_RELINQUISH command at priority 9. The blink-warn time is set to 10 minutes. A blink-warn notification (shown in red) is executed at 6:00 pm. At 6:10 pm, priority 9 is relinquished and the lights turn off.



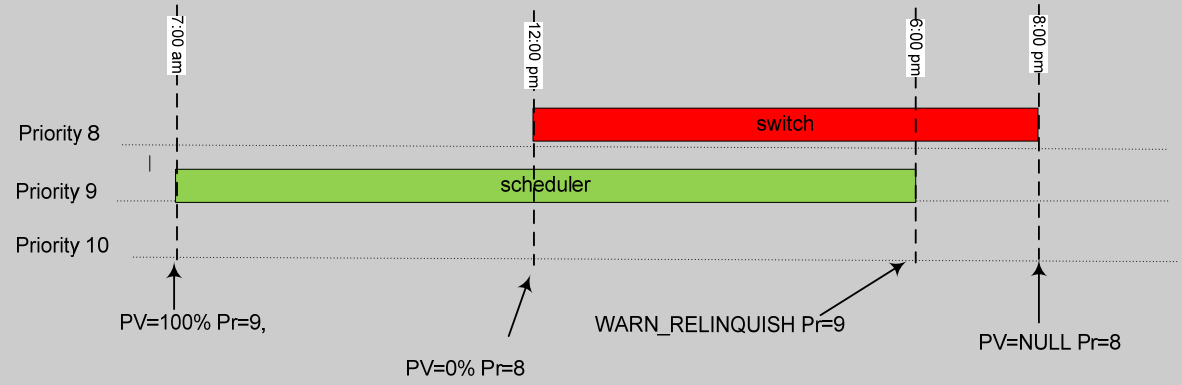
2. Same as example 1 except that an override switch is turned on during the egress period, which extends the light for a period of time. In this case, the override switch writes to the lighting output at priority 8 with a value of 100% at 6:05 pm. The override switch has written at a higher priority than the scheduler, so the egress timer is terminated, and the value at priority 9 relinquishes immediately. A WARN_RELINQUISH command is written at priority 8 at 7:05 pm, and it eventually relinquishes 10 minutes later.



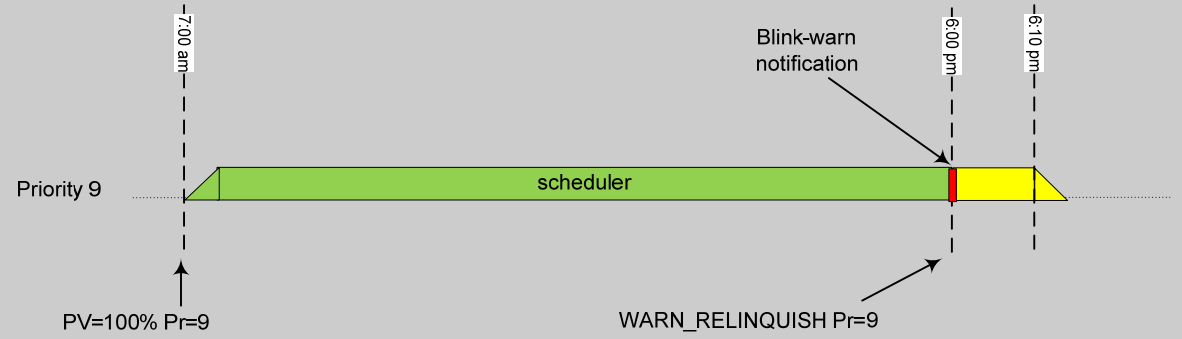
3. Same as example 2 except that the override switch is written at a lower priority (10) than the scheduler. In this case, writing the override switch value does not cancel the egress timer, which is active at priority 9. The value at priority 9 is finally relinquished at 6:10 pm when the 10 minute egress timer expires. The lights do not go off when priority 9 is relinquished at 6:10 pm, as it is still being commanded on at priority 10.



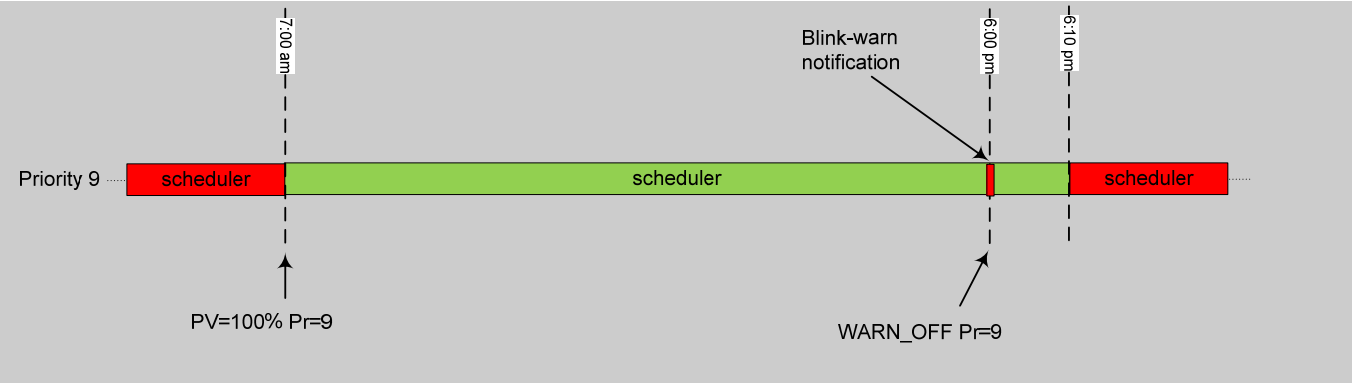
4. Same scheduler as in example 1. At noon (12:00 pm), the occupant leaves his office for the day and turns the lights off (Present_Value = 0%) at the switch for 8 hours. When the scheduler writes WARN_RELINQUISH at priority 9 at 6:00 pm, it is not the highest priority; therefore, no blink-warn will occur and the value relinquishes immediately. The switch relinquishes control at 8:00 pm. There is no change in the physical lights, which remain off.



5. Same situation as example 1, but in this case, the transition property is set to FADE and the default fade-time is 5 seconds.



In some circumstances, the scheduler never relinquishes control and is always controlling, either ON or OFF, at a specified priority. In this case a WARN_OFF command is used to turn the lights off rather than a relinquish.



Addendum 135-2010*i*-1

[Insert new definitions in **Clause 3.2**, p. 2]

…
blink-warn: *in lighting control, typically a method of notifying room occupants of an impending automated command to turn off the lights whereby the lights may be blinked, once or multiple times, or an audible signal is generated. After the warning occurs, the room lights are held on for a grace period to allow occupants to either safely leave the room or to initiate a request to keep the room lights on. Also known as "flick warn" or "flash warn."*
…
fading: *the gradual increase or decrease of the actual output from one setting to another over a fixed period of time.*
…
ramping: *the gradual increase or decrease of the actual output from one setting to another at a fixed rate of change.*
...
stepping: *the increase or decrease of an output value in discrete steps.*
...

[Change **Clause 12**, p. 146]

12. MODELING CONTROL DEVICES AS A COLLECTION OF OBJECTS
...
Several object types defined in this clause have a property called "Reliability." This property is an enumerated datatype that may have different possible enumerations for different object types. The values defined below are a superset of all possible values of the Reliability property for all object types. The range of possible values returned for each specific object is defined in the appropriate object type definition.

…

MEMBER_FAULT	Indicates that the group includes one or more Status_Flags properties whose FAULT flag value is equal to TRUE.
TRIPPED	*The end device, such as an actuator, is not responding to commands, prevented by a tripped condition or by being mechanically held open.*

[Add new **Clause 12.X**, p. 410]

12.X Lighting Output Object Type

The Lighting Output object type defines a standardized object whose properties represent the externally visible characteristics of a lighting output and includes dedicated functionality specific to lighting control that would otherwise require explicit programming. The lighting output is analog in nature.

The physical output level, or non-normalized range, is specified as the linearized percentage (0..100%) of the possible light output range with 0.0% being off, 1.0% being dimmest, and 100.0% being brightest. The actual range represents the subset of physical output levels defined by Min_Actual_Value and Max_Actual_Value (or 1.0 to 100.0% if these properties are not present). The normalized range is always 0.0 to 100.0% where 1.0% = bottom of the actual range and 100.0% = top of the actual range. All 0.0% to 100.0% properties of the Lighting Output object shall use the normalized range except for Min_Actual_Value and Max_Actual_Value. If Min_Actual_Value and Max_Actual_Value are not present, then the normalized and non-normalized ranges shall be the same.

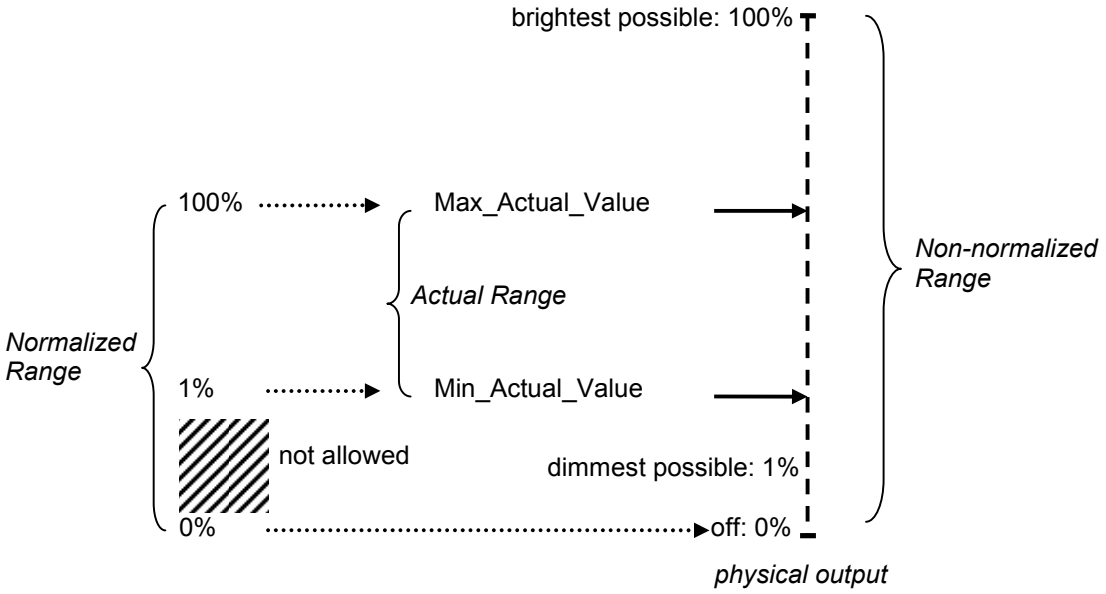


Figure 12-X1. Normalized Range of the Lighting Output

The level of the lights can be changed directly to an absolute level by writing to the Present_Value. This property is commandable and uses a priority array to arbitrate between multiple writers to the lighting output.

The level of the lights may also be changed by writing to the Lighting_Command property. The lighting command provides additional lighting functionality with special lighting-specific functions such as ramping, stepping, and fading.

The Lighting_Command also provides a blink-warn mechanism to notify room occupants that the lights are about to turn off. The blink-warning mechanism is internal to the lighting output and may cause the physical lights to blink on and off or issue a notification in some other manner. The blink-warn commands come in three different variants. The WARN command causes a blink-warn notification but then leaves the level of the lights unaffected. The WARN_RELINQUISH command executes the blink-warn notification and then keeps the light at the current level for a predetermined amount of time (egress time) and then relinquishes the value at the given priority. The WARN_OFF command executes the blink-warn notification and then keeps the light at the current level and then writes 0.0% (off) at the given priority.

The following example illustrates how a Lighting Output object may be used in a typical office scenario. Prior to 7:00 am the lights are off as the Lighting Output object is being controlled at the relinquish default value (0.0%). At 7:00 am a scheduler (e.g., a BACnet Schedule object or other automated process) turns the physical lights on by writing 100.0% to the Present_Value property at priority 9. At 6:00 pm a WARN_RELINQUISH lighting command is executed at priority 9, which causes an immediate blink-warn notification to occur but leaves the lights on until the egress timer has expired. Assuming a

10 minute (600 seconds) egress time is specified, the value at priority 9 is relinquished at 6:10 pm. This scenario is shown in figure 12-X2.

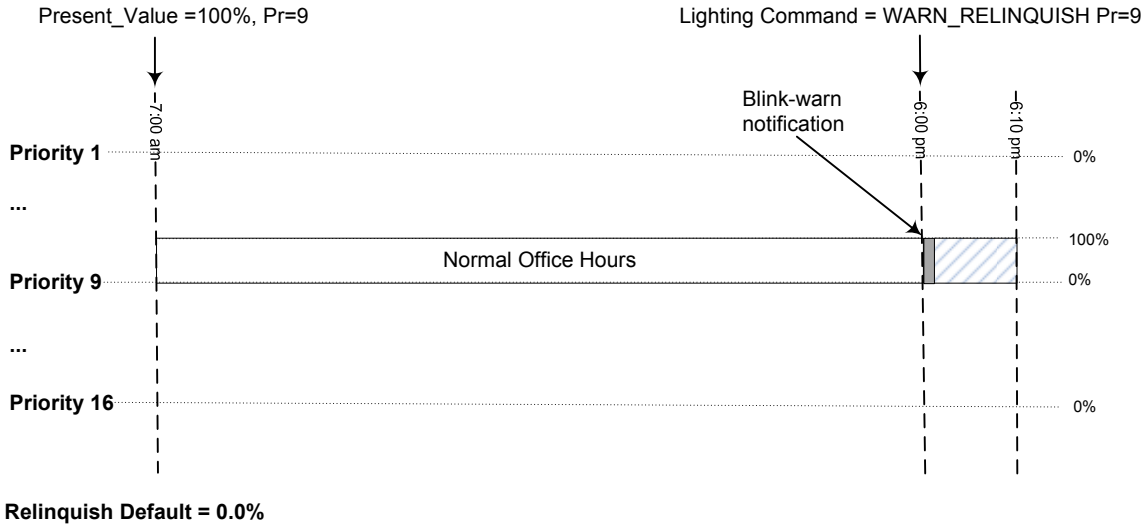


Figure 12-X2. Daily Schedule with Blink-Warn Example

The object and its properties are summarized in Table 12-X1 and described in detail in this subclause.

Table 12-X1. Properties of the Lighting Output Object

Property Identifier	Property Datatype	Conformance Code
Object_Identifier	BACnetObjectIdentifier	R
Object_Name	CharacterString	R
Object_Type	BACnetObjectType	R
Present_Value	REAL	W
Tracking_Value	REAL	R
Lighting_Command	BACnetLightingCommand	W
In_Progress	BACnetLightingInProgress	R
Description	CharacterString	O
Status_Flags	BACnetStatusFlags	R
Reliability	BACnetReliability	O
Out_Of_Service	BOOLEAN	R
Blink_Warn_Enable	BOOLEAN	R
Egress_Time	Unsigned	R
Egress_Active	BOOLEAN	R
Default_Fade_Time	Unsigned	R
Default_Ramp_Rate	REAL	R
Default_Step_Increment	REAL	R
Transition	BACnetLightingTransition	O
Feedback_Value	REAL	O
Priority_Array	BACnetPriorityArray	R
Relinquish_Default	REAL	R
Power	REAL	O
Instantaneous_Power	REAL	O
Min_Actual_Value	REAL	O[1]
Max_Actual_Value	REAL	O[1]
Lighting_Command_Default_Priority	Unsigned	R
COV_Increment	REAL	O[2]
Profile_Name	CharacterString	O

[1] If either of these properties is present, they shall both be present, and they shall be writable.
[2] This property is required if, and shall be present only if, the object supports COV reporting.

12.X.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.X.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.X.3 Object_Type

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

12.X.4 Present_Value (Commandable)

This property, of type REAL, specifies the target value, in percent, for the lighting output within the normalized range. The valid range of values for the Present_Value is 0.0% to 100.0%. Writes to Present_Value at a value greater than 0.0% but less than 1.0% shall be clamped to 1.0%.

Present_Value may also be affected by writes to the Lighting_Command property that initiate lighting commands. These commands may asynchronously affect the lighting output by establishing a new target for Present_Value and carrying out the requested operation. When a ramp or fade lighting command is in progress, the Present_Value shall indicate the target level of the operation and not the current value. The current value is always indicated in the Tracking_Value property. If a lighting command is currently in progress and the Present_Value is written at a higher or equal priority, the lighting command shall be halted (see clause 12.X.6.1 Halting a Lighting Command in Progress).

The Present_Value supports special values outside of the normal range of values to provide blink-warn functionality from objects and devices that are unable to write the complex datatypes used in the Lighting Command property (i.e., the BACnet Schedule object type). The special values of the Present_Value are summarized in table 12-X2.

Table 12-X2. Special Values of the Present_Value Property

Value	Description
-1.0	Provides the same functionality as the WARN lighting command.
-2.0	Provides the same functionality as the WARN_RELINQUISH lighting command.
-3.0	Provides the same functionality as the WARN_OFF lighting command.

Writing a special value has the same effect as writing the corresponding lighting command (see table 12.X4 Lighting Commands) and is subject to the same restrictions. The special value itself is not written to the priority array.

The physical lighting output shall be updated whenever the Present_Value is commanded or changed as a result of executing a lighting command. However, when the device starts up or is reset, it is a local matter as to whether the physical lighting output is updated with the current value of Present_Value or whether the value of the physical output before startup or reset is retained. When the physical output is not updated at startup or reset, the property In_Progress shall be set to NOT_CONTROLLED until the physical output is updated with the current value of Present_Value. Writes to Present_Value of values outside of the valid range of values shall cause a Result(-) to be returned with an Error Class of PROPERTY and an Error Code of VALUE_OUT_OF_RANGE

12.X.5 Tracking_Value

This property, of type REAL, indicates the value at which the physical lighting output is being controlled within the normalized range at all times.

When the value of In_Progress is IDLE, Tracking_Value shall be equal to Present_Value.

When the value of In_Progress is RAMP_ACTIVE or FADE_ACTIVE, Tracking_Value shall indicate the current calculated value of the ramp or fade algorithm. The manner by which the Tracking_Value is calculated in this situation shall be a local matter.

When the value of In_Progress is NOT_CONTROLLED or OTHER, the value of Tracking_Value shall be a local matter.

12.X.6 Lighting_Command

This property, of type BACnetLightingCommand, is used to request special lighting commands with specific behaviors. Lighting_Command is written with compound values that specify particular lighting operations. Devices containing Lighting Output objects shall support all BACnetLightingOperations shown in Table 12-X4.

When a lighting operation is written to the Lighting_Command property, the effect of that operation is written to the Present_Value at the priority level specified by the priority field. If the priority field is not included with the command, the priority specified in Lighting_Command_Default_Priority shall be used.

Some lighting operations require additional parameters. These are provided by optional fields of the BACnetLightingCommand value.

The fields of the BACnetLightingCommand are summarized in Table 12-X3.

Table 12-X3. BACnetLightingCommand Fields

Field	Description
operation	This field is an enumeration of type BACnetLightingOperation that defines the lighting operation desired.
target-level	This field, of type REAL, represents the target lighting output level in the normalized range (0.0%…100.0%).
ramp-rate	This field, of type REAL, represents the rate of change in percent-per-second for ramp operations. The range of allowable ramp-rate values is 0.1 to 100.0 inclusive. If this field is not specified, then the value of Default_Ramp_Rate specifies the ramp rate to be used
fade-time	This field, of type Unsigned, represents the time in milliseconds over which fade operations take place. The range of allowable fade-time values is 100 ms to 86400000 ms (1 day) inclusive. If this field is not specified, then the value of Default_Fade_Time specifies the fade time to be used.
step-increment	This field, of type REAL, represents the percent amount to be added to Present_Value when stepping. The range of allowable values is 0.1% to 100.0% inclusive. If this field is not specified, then the value of Default_Step_Increment specifies the step increment to be used.
priority	This field, of type Unsigned, (1..16) represents the priority values 1 (highest priority) through 16 (lowest priority). If this field is not specified, then the value of Lighting_Command_Default_Priority specifies the priority to be used.

The lighting commands are described in Table 12-X4. The notation to specify the syntax of the lighting commands is as follows:

<field in angle brackets> - required field of the BACnetLightingCommand
<field in angle brackets = value> - required field of the BACnetLightingCommand with a specified value
[fields in square brackets] – optional fields of the BACnetLightingCommand.

Table 12-X4. Lighting Commands

Operation	Description
NONE	This operation is used to indicate that no lighting command has been written to the Lighting_Command property. This operation shall not be written to the Lighting_Command property. Attempts to write this operation to the Lighting_Command property shall cause a Result(-) to be returned with an Error Class of PROPERTY and an Error Code of VALUE_OUT_OF_RANGE
FADE_TO	Commands Present_Value to fade from the current Tracking_Value to the target-level specified in the command at the specified priority. The fade operation is implemented by first writing target-level to the specified slot in the priority array. If the fade command is the highest priority when written, then the fade operation continues by changing the physical lighting output proportionally from its current value to target-level, over a period of time defined by fade-time. While the fade operation is executing, In_Progress shall be set to FADE_ACTIVE, and Tracking_Value shall be updated to reflect the current progress of the fade. If the fade command is not the highest priority when written, then this fade operation is not executed. syntax: <operation = FADE_TO> <target-level> [priority] [fade-time]
RAMP_TO	Commands Present_Value to ramp from the current Tracking_Value to target-level specified in the command at the specified priority. The ramp operation is implemented by first writing target-level to the specified slot in the priority array. If the ramp command is the highest priority when written, then the ramp operation continues by changing the physical lighting output proportionally from its current value to target-level, with a fixed rate of change defined by ramp-rate. While the ramp operation is executing, In_Progress shall be set to RAMP_ACTIVE, and Tracking_Value shall be updated to reflect the current progress of the fade. If the ramp command is not the highest priority when written, then this ramp operation is not executed. syntax: <operation = RAMP_TO> <target-level> [priority] [ramp-rate]

STEP_UP	Commands Present_Value to a value equal to the Tracking_Value plus the step-increment at the specified priority. The step-up operation is implemented by writing the Tracking_Value plus step-increment to the specified slot in the priority array. If the result of the addition is greater than 100.0%, the value shall be set to 100.0%. If the starting level of Tracking_Value is 0.0%, then this operation is ignored. syntax: <operation = STEP_UP> [priority] [step-increment]
STEP_DOWN	Commands Present_Value to a value equal to the Tracking_Value minus the step-increment at the specified priority. The step-down operation is implemented by writing the Tracking_Value minus step-increment to the specified slot in the priority array. If the result of the subtraction is less than 1.0%, the value shall be set to 1.0%. If the starting level of Tracking_Value is 0.0%, then this operation is ignored. syntax: <operation = STEP_DOWN> [priority] [step-increment]
STEP_ON	Same as STEP_UP except when Tracking_Value is 0.0%, in which case, 1.0% is written to the specified slot in the priority array. syntax: <operation = STEP_ON> [priority] [step-increment]
STEP_OFF	Same as STEP_DOWN except when Tracking_Value is 1.0%, in which case, 0.0% is written to the specified slot in the priority array. syntax: <operation = STEP_OFF> [priority] [step-increment]
WARN	Executes a blink-warn notification at the specified priority. After the blink-warn notification has been executed, the value at the specified priority is unchanged. The blink-warn notification shall not occur if any of the following conditions occur: (a) The specified priority is not the highest active priority, or (b) The value at the specified priority is 0.0%, or (c) Blink_Warn_Enable is FALSE. (see clause 12.X.6.2 Blink-Warn Behavior) syntax: <operation = WARN> [priority]

WARN_RELINQUISH	Executes a blink-warn notification at the specified priority and then relinquishes the value at the specified priority slot after a delay of Egress_Time seconds. The blink-warn notification shall not occur, and the value at the specified priority shall be relinquished immediately if any of the following conditions occur: (a) The specified priority is not the highest active priority, or (b) The value at the specified priority is 0.0% or NULL, or (c) The value of the next highest non-NULL priority, including Relinquish_Default, is greater than 0.0%, or (d) Blink_Warn_Enable is FALSE. (See clause 12.X.6.2 Blink-Warn Behavior). syntax: <operation = WARN_RELINQUISH> [priority]
WARN_OFF	Executes a blink-warn notification at the specified priority and then writes the value 0.0% to the specified slot in the priority array after a delay of Egress_Time seconds. The blink-warn notification shall not occur and the value 0.0% written at the specified priority immediately if any of the following conditions occur: (a) The specified priority is not the highest active priority, or (b) The Present_Value is 0.0%, or (c) Blink_Warn_Enable is FALSE. (see clause 12.X.6.2 Blink-Warn Behavior). syntax: <operation = WARN_OFF> [priority]
STOP	Stops any FADE_TO or RAMP_TO command in progress at the specified priority and writes the current value of Tracking_Value to that slot in the priority array and sets In_Progress to IDLE. Cancels any WARN_RELINQUISH or WARN_OFF command in progress at the specified priority and cancels the blink-warn egress timer. The value in the priority array at the specified priority remains unchanged. If there is no fade, ramp, or warn command currently executing at the specified priority, then this operation is ignored. syntax: <operation = STOP> [priority]

Some lighting devices may incorporate remote subnetworks or other technology that may introduce latency or non-linearity in the behavior of the physical light being controlled. Consequently, the absolute timing resolution of lighting operations should not be assumed. Some lighting devices may not be capable of achieving the performance implied by a given operation, in which case, the device shall use its best effort to carry out the intended operation.

The Lighting_Command property shall indicate the last written value or NONE if it has not yet been written.

[**Reviewer note**: the following sentence was moved from Clause 12.X.6 and is therefore not marked as a substantive change] If a BACnetLightingCommand is sent that includes an optional field that is not explicitly described for that operation in Table 12-X4, then the field value shall be ignored. Lighting commands written with a required or optional field, explicitly

specified for this command, which are outside of the allowable range of values, shall cause a Result(-) to be returned with an Error Class of PROPERTY and an Error Code of VALUE_OUT_OF_RANGE.

12.X.6.1 Halting a Lighting Command in Progress

Some lighting commands (i.e., RAMP_TO, FADE_TO, WARN_RELINQUISH, and WARN_OFF) are executed over a period of time. While a lighting command, at a specific priority, is in progress, it shall be halted under the following conditions:

(a) A valid command, other than STOP, is written to the Lighting_Command property at a higher priority than the command in progress, or

(b) The Present_Value is written at a higher priority than the command in progress.

When a RAMP_TO or FADE_TO command that is currently in progress is halted, the internal ramp or fade algorithm is halted, and the corresponding slot in the priority array remains unchanged.

When a WARN_RELINQUISH command that is currently in progress is halted, the blink-warn egress timer is immediately expired, and the corresponding value of the priority array is relinquished.

When a WARN_OFF command that is currently in progress is halted, the egress timer is immediately expired, and the value 0.0% is written to the priority array at the specified priority.

A lighting command that is in progress is implicitly halted when it is overwritten by another lighting command at the same priority or by a write to the Present_Value at the same priority.

There may only be one lighting command currently in progress at any time.

12.X.6.2 Blink-Warn Behavior

The WARN, WARN_RELINQUISH, and WARN_OFF lighting commands, as well as writing one of the special values to the Present_Value property, cause a blink-warn notification to occur at the specified priority. A blink-warn notification is used to warn the occupants that the lights are about to turn off, giving the occupants the opportunity to exit the space or to override the lights for a period of time.

The actual blink-warn notification mechanism shall be a local matter. The physical lights may blink once, multiple times, or repeatedly. They may also go bright, go dim, or signal a notification through some other means. In some circumstances, no blink-warn notification will occur at all. The blink-warn notification shall not be reflected in the priority array or the tracking value.

The WARN_RELINQUISH and WARN_OFF lighting commands include an egress time in which the lights are held at the current level until the egress time expires or the command is halted. The number of seconds for egress is specified in the Egress_Time property. The egress timer shall start when the WARN_RELINQUISH or WARN_OFF command is written. While the egress timer is active, the property Egress_Active shall be set to TRUE. When the egress timer expires or the command is halted, then Egress_Active shall be set to FALSE. There may only be one priority slot with an active egress timer at any time.

If the Blink_Warn_Enable property has the value FALSE, then the blink-warn notification shall not occur, and the effect of the operation shall occur immediately without an egress delay.

The relationship between Egress_Time and the Egress_Active property is shown in Figure 12-X3.

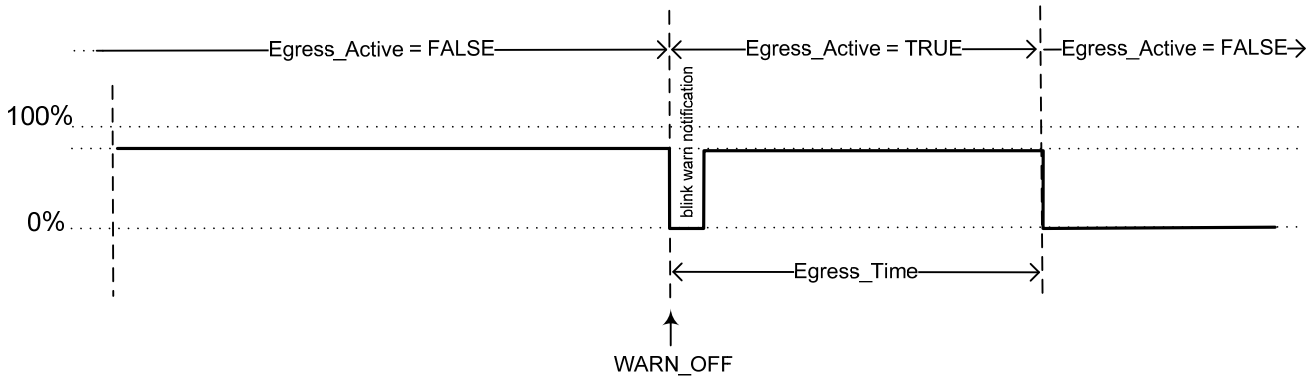


Figure 12-X3. Blink-warn and Egress Time

12.X.7 In_Progress

This property, of type BACnetLightingInProgress, shall indicate processes in the lighting output object that may cause the Tracking_Value and Present_Value to differ temporarily. The processes indicated in the property are summarized in table 12-X5.

Table 12-X5. BACnetLightingInProgress Values

Value	Description
IDLE	The default value that indicates that no processes are executing which would cause the Present_Value and Tracking _Value to differ.
RAMP_ACTIVE	Indicates that a ramp lighting command is currently being executed.
FADE_ACTIVE	Indicates that a fade lighting command is currently being executed.
NOT_CONTROLLED	Indicates that on startup or reset the physical output has not been updated with the current value of Present_Value.
OTHER	Indicates that the Tracking_Value and Present_Value may differ but none of the other conditions describe the nature of the process.

12.X.8 Description

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

12.X.9 Status_Flags

This property, of type BACnetStatusFlags, represents four Boolean flags that indicate the general "health" of a Lighting Output object. Two 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 Always Logical FALSE (0).

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 output has been overridden by some mechanism local to the BACnet Device, otherwise logical FALSE (0). In this context "overridden" is taken to mean that the physical output is no longer tracking changes to the Present_Value property, and the Reliability property is no longer a reflection of the physical output.

OUT_OF_SERVICE Logical TRUE (1) if the Out_Of_Service property has a value of TRUE, otherwise logical FALSE (0).

12.X.10 Reliability

This property, of type BACnetReliability, provides an indication of whether the Present_Value or the operation of the physical output in question is "reliable" as far as the BACnet Device or operator can determine and, if not, why.

12.X.11 Out_Of_Service

This property, of type BOOLEAN, indicates whether (TRUE) or not (FALSE) the physical point that the object represents is not in service. This means that changes to the Present_Value property are decoupled from the physical lighting output when the value of Out_Of_Service is TRUE. In addition, the Reliability property and the corresponding state of the FAULT flag of the Status_Flags property shall be decoupled from the physical lighting output when Out_Of_Service is TRUE. While the Out_Of_Service property is TRUE, the Present_Value and Reliability properties may still be changed to any value as a means of simulating specific fixed conditions or for testing purposes. Other functions that depend on the state of the Present_Value or Reliability properties shall respond to changes made to these properties while Out_Of_Service is TRUE, as if those changes had occurred to the physical lighting output. The Present_Value property shall still be controlled by the BACnet command prioritization mechanism and lighting command if Out_Of_Service is TRUE. See Clause 19.

12.X.12 Blink_Warn_Enable

This property, of type BOOLEAN, specifies whether a blink-warn is executed (TRUE) or not (FALSE) when a WARN, WARN_RELINQUISH, or WARN_OFF command is written to the Lighting_Command property or one of the special values is written to the Present_Value. When this property is FALSE and a warn operation is written, a blink-warn notification shall not occur, and the effect of the operation shall occur immediately without an egress delay.

12.X.13 Egress_Time

This property, of type Unsigned, specifies the egress time in seconds when a WARN_RELINQUISH or WARN_OFF is written to the Lighting_Command property or when the special values -2.0 or -3.0 are written to the Present_Value property. The egress time is the time in which the light level is held at its current level before turning off.

12.X.14 Egress_Active

This property, of type BOOLEAN, shall be TRUE whenever the Egress_Time for a WARN_RELINQUISH or WARN_OFF lighting operation is in effect and FALSE otherwise.

12.X.15 Default_Fade_Time

This property, of type Unsigned, indicates the amount of time in milliseconds over which changes to the normalized value reflected in the Tracking_Value property of the lighting output shall occur when the Lighting_Command property is written with a fade request that does not include a fade-time value. The range of allowable fade-time values is 100 ms to 86400000 ms (1 day) inclusive.

Values written outside of the allowable range shall cause a Result(-) to be returned with an Error Class of PROPERTY and an Error Code of VALUE_OUT_OF_RANGE.

12.X.16 Default_Ramp_Rate

This property, of type REAL, indicates the rate in percent-per-second at which changes to the normalized value reflected in the Tracking_Value property of the lighting output shall occur when the Lighting_Command property is written with a ramp request that does not include a ramp-rate value. The range of allowable ramp-rate values is 0.1 %/s to 100.0 %/s inclusive.

Values written outside of the allowable range shall cause a Result(-) to be returned with an Error Class of PROPERTY and an Error Code of VALUE_OUT_OF_RANGE.

12.X.17 Default_Step_Increment

This property, of type REAL, indicates the amount to be added to the Tracking_Value when the Lighting_Command property is written with a step request that does not include a step-increment value. The range of allowable values is 0.1% to 100.0% inclusive.

Values written outside of the allowable range shall cause a Result(-) to be returned with an Error Class of PROPERTY and an Error Code of VALUE_OUT_OF_RANGE.

12.X.18 Transition

This property, of type BACnetLightingTransition, specifies how a change in the Present_Value transitions from the current level to the target level. A transition comes into effect when the Present_Value is directly commanded or when the current

highest priority value has been relinquished. Writing the Lighting commands FADE_TO, RAMP_TO, STEP_ON, STEP_OFF, STEP_UP, or STEP_DOWN shall ignore the Transition property.

The transition may be one of NONE, FADE, or RAMP. The transition NONE causes the Present_Value to immediately be set to the target level when the highest priority value has been relinquished. If this property does not exist, then the transition type shall be assumed to be NONE.

FADE or RAMP transitions allow a smooth transition of the lighting level when the Present_Value changes. A FADE transition executes a fade operation from the Tracking_Value to the target level using the fade time specified in Default_Fade_Time. A RAMP transition executes a ramp operation from the Tracking_Value to the target level using the ramp rate specified in Default_Ramp_Rate.

When a transition results in an operation that may cause the Tracking_Value to differ from the Present_Value, then the In_Progress property shall be set to the value that reflects the operation in progress.

12.X.19 Feedback_Value

This property, of type REAL, shall indicate the actual value of the physical lighting output within the normalized range.

If the actual value of the physical lighting output in the non-normalized range is not off but is less than the Min_Actual_Value, then Feedback_Value shall be set to 1.0%. If the actual value in the non-normalized range is greater than Max_Actual_Value, then Feedback_Value shall be set to 100.0%.

The manner by which the Feedback_Value is determined shall be a local matter.

12.X.20 Priority_Array

This property is a read-only array of prioritized values. See Clause 19 for a description of the prioritization mechanism.

12.X.21 Relinquish_Default

This property, of type REAL, is the default value to be used for the Present_Value property when all command priority values in the Priority_Array property have a NULL value. See Clause 19.

12.X.22 Power

This property, of type REAL, is the nominal power consumption of the load(s) controlled by this object when the light level is 100.0% of the non-normalized range. The units shall be kilowatts.

12.X.23 Instantaneous_Power

This property, of type REAL, is the nominal power consumption of the load(s) controlled by this object at this moment. The units shall be kilowatts.

12.X.24 Min_Actual_Value

This property, of type REAL, shall specify the physical output level that corresponds to a Present_Value of 1.0%. Changing Min_Actual_Value to a value greater than Max_Actual_Value shall force Max_Actual_Value to become equal to Min_Actual_Value. Min_Actual_Value shall always be a positive number in the range 1.0% to 100.0%.

12.X.25 Max_Actual_Value

This optional property, of type REAL, shall specify the physical output level that corresponds to a Present_Value of 100.0%. Changing Max_Actual_Value to a value less than Min_Actual_Value shall force Min_Actual_Value to become equal to Max_Actual_Value. Max_Actual_Value shall always be a positive number in the range 1.0% to 100.0%.

12.X.26 Lighting_Command_Default_Priority

This property, of type Unsigned, shall specify a write priority of 1 to 16 that indicates the element of the Priority_Array controlled by the Lighting_Command property when the BACnetLightingCommand priority field is absent.

The priority value 6 shall not be used for this property. If a value of 6 is written to this property, then a Result(-) shall be returned with an Error Class of PROPERTY and an Error Code of VALUE_OUT_OF_RANGE.

12.X.27 COV_Increment

This property, of type REAL, shall specify the minimum change in Present_Value that will cause a COVNotification to be issued to subscriber COV-clients.

12.X.28 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. 413]

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

Object Type	Criteria	Properties Reported
....	...	..
Analog Input, Analog Output, Analog Value, *Lighting Output*	If Present_Value changes by COV_Increment or Status_Flags changes at all	Present_Value, Status_Flags
...		

[Change **Clause 19.2.1.1**, p. 534]

19.2.1.1 Commandable Properties

The prioritization scheme is applied to certain properties of objects. The standard commandable properties and objects are as follows:

OBJECT	COMMANDABLE PROPERTY
Analog Output	Present_Value
Binary Output	Present_Value
Multi-state Output	Present_Value
Multi-state Value	Present_Value
Analog Value	Present_Value
Binary Value	Present_Value
Access Door	Present_Value
BitString Value	Present_Value
CharacterString Value	Present_Value
Date Value	Present_Value
Date Pattern Value	Present_Value
DateTime Value	Present_Value
DateTime Pattern Value	Present_Value
Large Analog Value	Present_Value
OctetString Value	Present_Value
Integer Value	Present_Value
Time Value	Present_Value
Time Pattern Value	Present_Value
Positive Integer Value	Present_Value
Lighting Output	*Present_Value*

The designated properties of the Analog Output, Binary Output, Multi-state Output*,* ~~and~~ Access Door, *and Lighting Output* objects are commandable (prioritized) by definition. The designated properties of the Analog Value, Binary Value, Multi-state Value, BitString Value, CharacterString Value, Date Value, Date Pattern Value, DateTime Value, DateTime Pattern Value, Large Analog Value, OctetString Value, Integer Value, Time Value, Time Patterm Value, and Positive Integer Value objects may optionally be commandable. Individual vendors, however, may decide to apply prioritization to any of the vendor-specified properties. These additional commandable properties shall have associated Priority_Array and Relinquish_Default properties with appropriate names. See 23.3.

[Add new productions to **Clause 21**, p. 604]

```
BACnetLightingCommand ::= SEQUENCE {
    operation                   [0] BACnetLightingOperation,
    target-level                [1] REAL (0.0..100.0) OPTIONAL,
    ramp-rate                   [2] REAL (0.1..100.0)  OPTIONAL,
    step-increment              [3] REAL (0.1..100.0)  OPTIONAL,
    fade-time                   [4] Unsigned (100.. 86400000)  OPTIONAL,
    priority                    [5] Unsigned (1..16) OPTIONAL
    }
```

-- Note that the combination of level, ramp-rate, step-increment, and fade-time fields is
-- dependent on the specific lighting operation. See Table 12-X4.

BACnetLightingInProgress ::= ENUMERATED {
idle (0),
fade-active (1),
ramp-active (2),
not-controlled (3),
other (4)
}

BACnetLightingOperation ::= ENUMERATED {
none (0),
fade-to (1),
ramp-to (2),
step-up (3),
step-down (4),
step-on (5),
step-off (6),
warn (7),
warn-off (8),
warn-relinquish (9),
stop (10)
}
-- Enumerated values 0-255 are reserved for definition by ASHRAE. Enumerated values 256-65535 may be used by
-- others subject to the procedures and constraints described in Clause 23.

BACnetLightingTransition ::= ENUMERATED {
none (0),
fade (1),
ramp (2)
}
-- Enumerated values 0-63 are reserved for definition by ASHRAE. Enumerated values 64-255 may be used by
-- others subject to the procedures and constraints described in Clause 23.

[Change **Clause 21**, existing **BACnetObjectType** and **BACnetObjectTypesSupported** enumerations, p. 609]

BACnetObjectType ::= ENUMERATED { -- see below for numerical order
…
life-safety-zone (22),
lighting-output (54),
...
-- see time-value (50),
...
-- see lighting-output (54),
}

BACnetObjectTypesSupported ::= BIT STRING {
...
time-value (50),
...
lighting-output (54)
}

[Change Clause **21**, existing **BACnetPropertyIdentifier** production , p. 613]

BACnetPropertyIdentifier ::= ENUMERATED { -- see below for numerical order
…

bit-text (343),
blink-warn-enable *(373),*
…
deadband (25),
default-fade-time *(374),*
default-ramp-rate *(375),*
default-step-increment *(376),*
...
effective-period (32),
egress-timer *(377),*
…
in-process (47),
in-progress *(378),*
...
instance-of (48),
instantaneous-power *(379),*
...
life-safety-alarm-values (166),
lighting-command *(380),*
lighting-command-default-priority *(381),*
...
maximum-value-timestamp (149),
max-actual-value *(382),*
…
minimum-value-timestamp (150),
min-actual-value *(383),*
...
positive-access-rules (302),
power *(384),*
…
transaction-notification-class (309),
transition *(385),*
…
-- see event-message-texts (351),
...
-- see blink-warn-enable *(373),*
-- see default-fade-time *(374),*
-- see default-ramp-rate *(375),*
-- see default-step-increment *(376),*
-- see egress-timer *(377),*
-- see in-progress *(378),*
-- see instantaneous-power *(379),*
-- see lighting-command *(380),*
-- see lighting-command-default-priority *(381),*
-- see max-actual-value *(382),*
-- see min-actual-value *(383),*
-- see power *(384),*
-- see transition *(385)*
}

[Change **Clause 21**, **BACnetPropertyStates** choice, p. 625]

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,
...

backup-state [36] BACnetBackupState,
...
lighting-in-progress [38] BACnetLightingInProgress,
lighting-operation [39] BACnetLightingOperation,
lighting-transition [40] BACnetLightingTransition
...
}

[Change **Clause 21**, **BACnetReliability** enumeration, p. 626]

BACnetReliability ::= ENUMERATED {
...
member-fault (13),
...
tripped (15),
...
}

[Change **Table 23-1**, p. 636]

Table 23-1. Extensible Enumerations

Enumeration Name	Reserved Range	Maximum Value
…	…	…
BACnetLifeSafetyOperation	0-63	65535
BACnetLightingOperation	*0-255*	*65535*
BACnetLightingTransition	*0-63*	*255*
…	…	…

[Add a new entry to **History of Revisions**, p. 1006]

(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	14	**Addendum *i* to ANSI/ASHRAE 135-2010** Approved by the ASHRAE Standards Committee June XX, 2012; by the ASHRAE Board of Directors June XX, 2012; and by the American National Standards Institute June XX, 2012. 1. Add Lighting Output 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.