

Proposed UTMC Model Extensions for Tunnels

Extract from W.P. 2.6 for Issue to UDG

June 2015

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Contents

Chapter	Title	Page
1	Proposed modifications to existing UTMC data definitions	1
1.1	Introduction	1
1.2	Revised UTMC data objects	1
1.2.1	Incident UTMC data object	1
1.2.2	Access Control Types	3
1.2.3	Network Link UTMC data object	3
2	Proposed additional UTMC data object definitions	5
2.1	Introduction	5
2.2	Proposed Direction Type Object Class	5
2.2.1	Direction Type Object XSD	5
2.3	Proposed Lighting Object Classes	6
2.3.1	Proposed Lighting Object Class Definitions	7
2.3.2	Lighting Objects XSD	7
2.4	Proposed Ventilation Object Classes	11
2.4.1	Proposed Ventilation Object Class Definitions	11
2.4.2	Proposed Ventilation Objects XSD	12
2.5	UTMC Object Definitions	16
2.5.1	Direction Type Object Definition	16
2.5.2	Ventilation Object Definitions	16
2.5.3	Lighting Object Definitions	21

1 Proposed modifications to existing UTMC data definitions

1.1 Introduction

Highways England has commissioned Mott MacDonald to deliver a UTMC compliant system in the South East England and part of this commission is to present traffic conditions in and around Roundhill tunnel. This has led to enhancements to the UTMC model. These amendments have approval from Highways England.

The UTMC Tunnels and Bridges Working Group have issued a publication that includes a series of changes to the UTMC framework to support tunnels. Through a detailed analysis of that document, analysis of tunnel control and tunnel subsystems and consultation with tunnel specialists, Mott MacDonald has identified enhancements to the UTMC specification to support tunnel data integration.

This document presents the enhancements as:

- An updated UML data model including class diagrams and element descriptions
- A reference XML schema
- Notes summarising the design decisions where existing objects have been modified

1.2 Revised UTMC data objects

1.2.1 Incident UTMC data object

In terms of the existing Incident data object, Mott MacDonald is not proposing any changes to the structure of the object. Proposed changes are focused on additions to the existing type identifiers which are applicable to tunnel control/subsystems incidents.

1.2.1.1 Additional Incident type identifiers

Mott MacDonald identified that there are no specific tunnel incident type identifiers in the UTMC standard (current or draft). It has been proposed by the UTMC Tunnels and Bridges Working Group that bridge specific incidents were abstracted into tunnel and bridge incidents as shown in Table 1.1.

Table 1.1: Draft Bridge/Tunnel Incident type identifiers

Existing UTMC Incident Data Types	Proposed UTMC Incident Data Types
BRIDGE BLOCKED	BRIDGE/TUNNEL BLOCKED

Existing UTMC Incident Data Types	Proposed UTMC Incident Data Types
BRIDGE CLOSED	BRIDGE/TUNNEL CLOSED
BRIDGE DEMOLITION WORK	BRIDGE/TUNNEL DEMOLITION WORK
BRIDGE MAINTENANCE WORK	BRIDGE/TUNNEL MAINTENANCE WORK
BRIDGE OPENING	BRIDGE/TUNNEL OPENING

Source: UDG Tunnels and Bridges Working Group

Mott MacDonald’s view is that these modifications do not fully represent incidents which could occur within a tunnel. Therefore, Mott MacDonald recommends that the existing Bridge Incident type identifiers remain as originally specified and that tunnel specific type identifiers are added.

To this end, Mott MacDonald has reviewed the document: “Design (Substructures and special structures) materials. Section 2 Special Structures, Part 9, BD 78/99, Design of road tunnels” to identify incidents which are specific for tunnels. A gap analysis identified a shortfall in UTMC for recording the type of incidents in tunnels which are listed in BD 78/99, only a small selection aligns with BD 78/99.

Therefore, Mott MacDonald proposes incorporation of tunnel specific incident data types into the UTMC standard as listed in Table 1.2.

Table 1.2: New ‘Tunnel specific’ UTMC Incident Data Types

ID	Data Type Description
80	Debris on road
81	Lighting failure
82	Ventilation failure
83	Pumping failure
84	Vandalism
85	Hazardous loads
86	Slow moving loads
87	Wide loads
88	Rapid, air vapour condensation on windscreen and mirrors
89	Sun glare
90	Carriageway closures
91	Tunnel bore closures
92	Total closure
93	Tunnel Blocked
94	Tunnel Closed
95	Tunnel Demolition Work

ID	Data Type Description
96	Tunnel Maintenance Work
97	Stationary Vehicles
98	Abnormally Slow Vehicles
99	Vehicles in Wrong Direction
100	Smoke within Tunnel

1.2.2 Access Control Types

In terms of the existing Access Control Types, Mott MacDonald is not proposing any changes to the structure of the object. Proposed changes are focused on additions to the existing type identifiers which are applicable to tunnel control/subsystems incidents.

1.2.2.1 Additional Access Control Types

Mott MacDonald propose the below addition to Access Control Types as emergency access was not previously specified in the existing Type definitions. Such access types are key components of tunnel infrastructure.

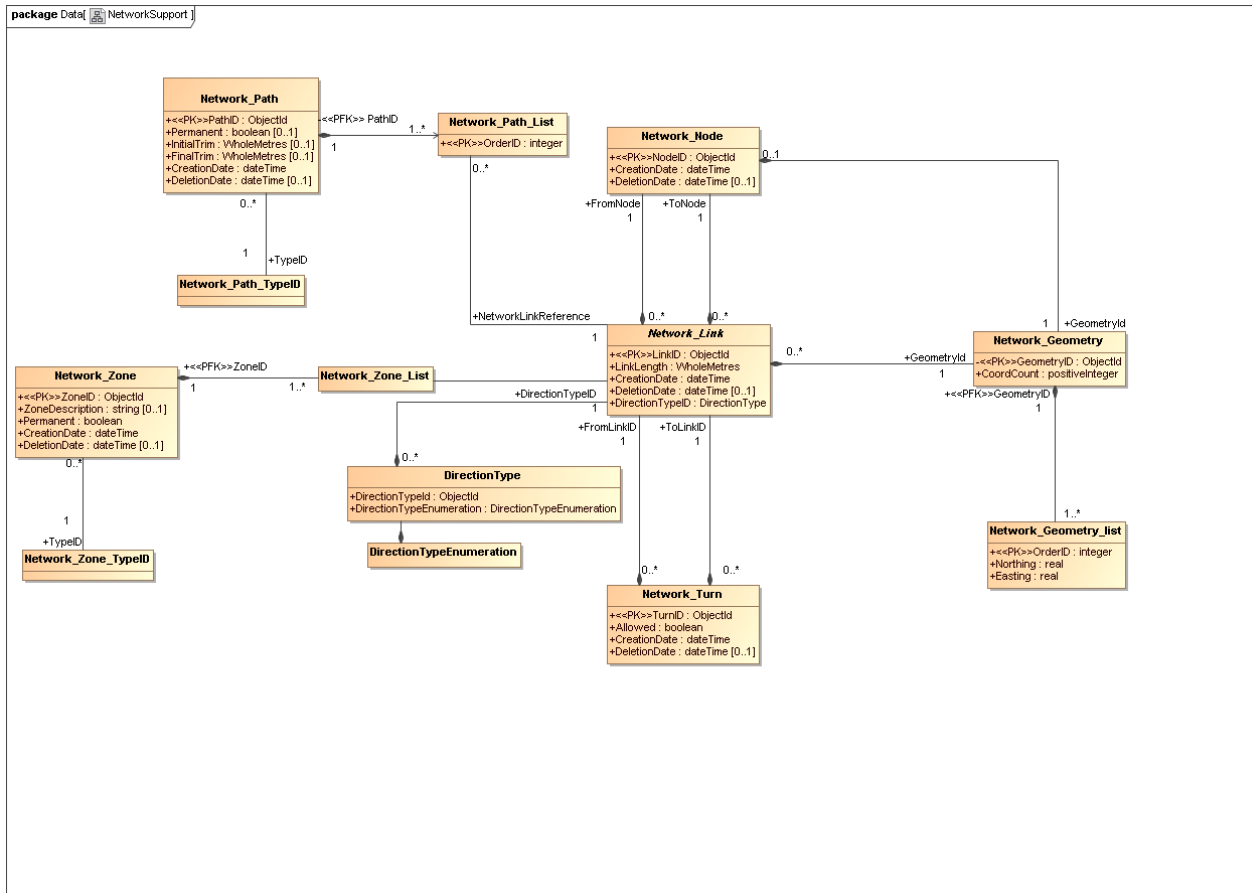
Table 1.3: Additional Access Control Type Identifiers

ID	Description
5	Emergency Access

1.2.3 Network Link UTMC data object

In terms of the existing Network Link data object, Mott MacDonald proposes adding a new attribute called 'DirectionTypeID'. This would represent the direction type of the Network Link. The NetworkPathReference attribute is referenced in existing UTMC objects to represent a Network Link object and will also be present in the new lighting and ventilation UTMC data objects detailed in section 2.

Figure 1.1: Network Support Class Diagram



There is a new object proposed in section 2.2 which details the Direction Type object and enumerations proposed however Figure 1.1 illustrates the relationship between the Direction Type object and the existing Network Support objects.

2 Proposed additional UTMC data object definitions

2.1 Introduction

To be able to support the attribute DirectionTypeID introduced in section 1.2.3, it is proposed a Direction Type object which will be utilised to record the road direction at the asset location.

Mott MacDonald has also identified that there is no support in the current UTMC schema for tunnel lighting and ventilation data objects. Therefore Mott MacDonald proposes the introduction of specific classes to model lighting and ventilation equipment as separate devices in a manner similar to that already utilised for equipment such as Variable Message Signs (VMS) and Closed Circuit Television (CCTV). This approach deconstructs the object into dynamic, fault, command and configuration data, maintaining consistency with existing data object definitions.

The following Object classes have been developed.

2.2 Proposed Direction Type Object Class

2.2.1 Direction Type Object XSD

An object is proposed to represent the possible directions types. Mott MacDonald proposes utilising the DATEX II enumerations for direction type detailed in TPEGLoc02DirectionTypeEnum.

Table 2.1: Direction Enumerations

Direction Enumerations
All Directions
Both Ways
Clockwise
Anticlockwise
Inner Ring
Outer Ring
Northbound
North Eastbound
Eastbound
Southbound
South Eastbound
South Westbound
Westbound
North Westbound

Direction Enumerations

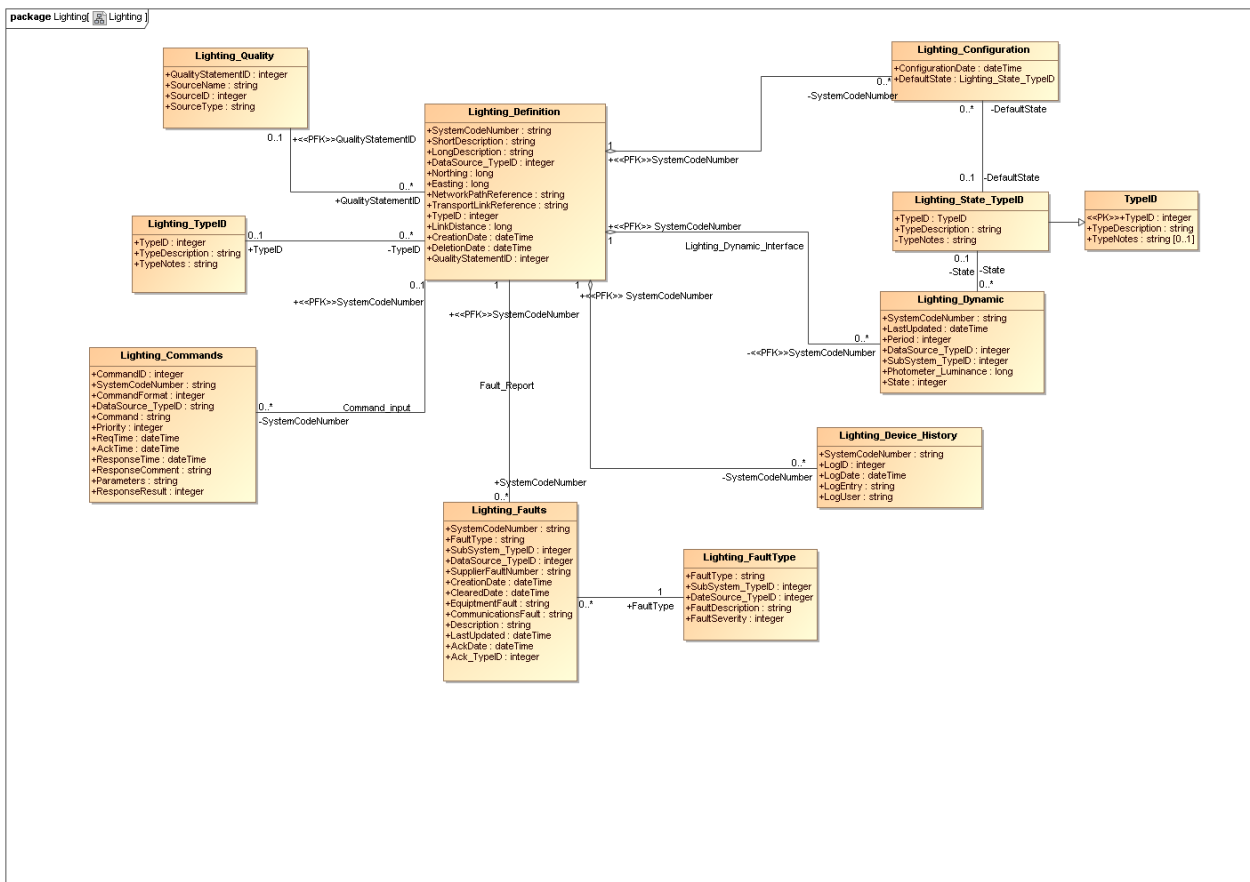
- Inbound Towards Town
- Outbound From Town
- Unknown
- Opposite
- Other

Source: DATEX II : D2LogicalModel : General : Payload Enumerations : Location Enumerations : Direction Enumerations

2.3 Proposed Lighting Object Classes

Detailed below is the UML model for the proposed lighting object classes.

Figure 2.1: Lighting Object Class Diagram



2.3.1 Proposed Lighting Object Class Definitions

Table 2.2: Proposed Lighting Class Definitions

Class Name	Description
Lighting Quality	Defines the quality of lighting
Lighting Type ID	Classification of the lighting equipment. Relates the Type ID field of the object to a particular description.
Lighting Commands	Represents a command to control the lighting equipment.
Lighting Definition	Defines lighting equipment
Lighting Faults	Represents a specific fault with a piece of lighting equipment
Lighting Fault Type	Identifies and describes a type of fault that may occur with a piece of lighting equipment
Lighting Configuration	Details of the lighting equipment
Lighting State Type ID	Classification of the various state values supported by the lighting equipment.
Lighting Dynamic	Details of the lighting equipment status
Lighting Device History	Log entry describing an event relating to Lighting equipment

2.3.2 Lighting Objects XSD

Table 2.3: Proposed Lighting Objects XSD

Lighting Objects XSD
<pre> <?xml version='1.0' encoding='windows-1252'?> <xs:schema targetNamespace="Lighting" xmlns="Lighting" xmlns:xs="http://www.w3.org/2001/XMLSchema"> <xs:complexType name="Lighting_Commands"> <xs:all> <xs:element name="CommandID" type="xs:integer"/> <xs:element name="SystemCodeNumber" type="xs:string"/> <xs:element name="CommandFormat" type="xs:integer"/> <xs:element name="DataSource_TypeID" type="xs:string"/> <xs:element name="Command" type="xs:string"/> <xs:element name="Parameters" type="xs:string"/> <xs:element name="Priority" type="xs:integer"/> <xs:element name="ReqTime" type="xs:dateTime"/> <xs:element name="AckTime" type="xs:dateTime"/> <xs:element name="ResponseTime" type="xs:dateTime"/> <xs:element name="ResponseResult" type="xs:integer"/> <xs:element name="ResponseComment" type="xs:string"/> </xs:all> </xs:complexType> </pre>

Lighting Objects XSD

```
<xs:complexType name="Lighting_Definition">
  <xs:all>
    <xs:element name="SystemCodeNumber" type="xs:string"/>
    <xs:element name="ShortDescription" type="xs:string"/>
    <xs:element name="LongDescription" type="xs:string"/>
    <xs:element name="DataSource_TypeID" type="xs:integer"/>
    <xs:element name="Northing" type="xs:long"/>
    <xs:element name="Easting" type="xs:long"/>
    <xs:element name="NetworkPathReference" type="xs:string"/>
    <xs:element name="TransportLinkReference" type="xs:string"/>
    <xs:element name="TypeID" type="xs:integer"/>
    <xs:element name="LinkDistance" type="xs:long"/>
    <xs:element name="CreationDate" type="xs:dateTime"/>
    <xs:element name="DeletionDate" type="xs:dateTime"/>
    <xs:element name="QualityStatementID" type="xs:integer"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Lighting_Configuration">
  <xs:all>
    <xs:element name="ConfigurationDate" type="xs:dateTime"/>
    <xs:element name="DefaultState" type="Lighting_State_TypeID"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Lighting_Dynamic">
  <xs:all>
    <xs:element name="SystemCodeNumber" type="xs:string"/>
    <xs:element name="LastUpdated" type="xs:dateTime"/>
    <xs:element name="Period" type="xs:integer"/>
    <xs:element name="DataSource_TypeID" type="xs:integer"/>
    <xs:element name="SubSystem_TypeID" type="xs:integer"/>
    <xs:element name="Photometer_Luminance" type="xs:long"/>
    <xs:element name="State" type="xs:integer"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Lighting_FaultType">
  <xs:all>
    <xs:element name="FaultType" type="xs:string"/>
    <xs:element name="SubSystem_TypeID" type="xs:integer"/>
    <xs:element name="DataSource_TypeID" type="xs:integer"/>
    <xs:element name="FaultDescription" type="xs:string"/>
    <xs:element name="FaultSeverity" type="xs:integer"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Lighting_Faults">
```

Lighting Objects XSD

```
<xs:all>
  <xs:element name="SystemCodeNumber" type="xs:string"/>
  <xs:element name="FaultType" type="xs:string"/>
  <xs:element name="SubSystem_TypeID" type="xs:integer"/>
  <xs:element name="DataSource_TypeID" type="xs:integer"/>
  <xs:element name="SupplierFaultNumber" type="xs:string"/>
  <xs:element name="CreationDate" type="xs:dateTime"/>
  <xs:element name="ClearedDate" type="xs:dateTime"/>
  <xs:element name="EquipmentFault" type="xs:string"/>
  <xs:element name="CommunicationsFault" type="xs:string"/>
  <xs:element name="Description" type="xs:string"/>
  <xs:element name="LastUpdated" type="xs:dateTime"/>
  <xs:element name="AckDate" type="xs:dateTime"/>
  <xs:element name="Ack_TypeID" type="xs:integer"/>
</xs:all>
</xs:complexType>
<xs:complexType name="Lighting_Quality">
  <xs:all>
    <xs:element name="QualityStatementID" type="xs:integer"/>
    <xs:element name="SourceName" type="xs:string"/>
    <xs:element name="SourceID" type="xs:integer"/>
    <xs:element name="SourceType" type="xs:string"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Lighting_TypeID">
  <xs:all>
    <xs:element name="TypeID" type="xs:integer"/>
    <xs:element name="TypeDescription" type="xs:string"/>
    <xs:element name="TypeNotes" type="xs:string"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Lighting_Device_History">
  <xs:all>
    <xs:element name="SystemCodeNumber" type="xs:string"/>
    <xs:element name="LogID" type="xs:integer"/>
    <xs:element name="LogDate" type="xs:dateTime"/>
    <xs:element name="LogEntry" type="xs:string"/>
    <xs:element name="LogUser" type="xs:string"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Lighting_State_TypeID">
  <xs:complexContent>
    <xs:extension base="TypeID">
  </xs:all>
```

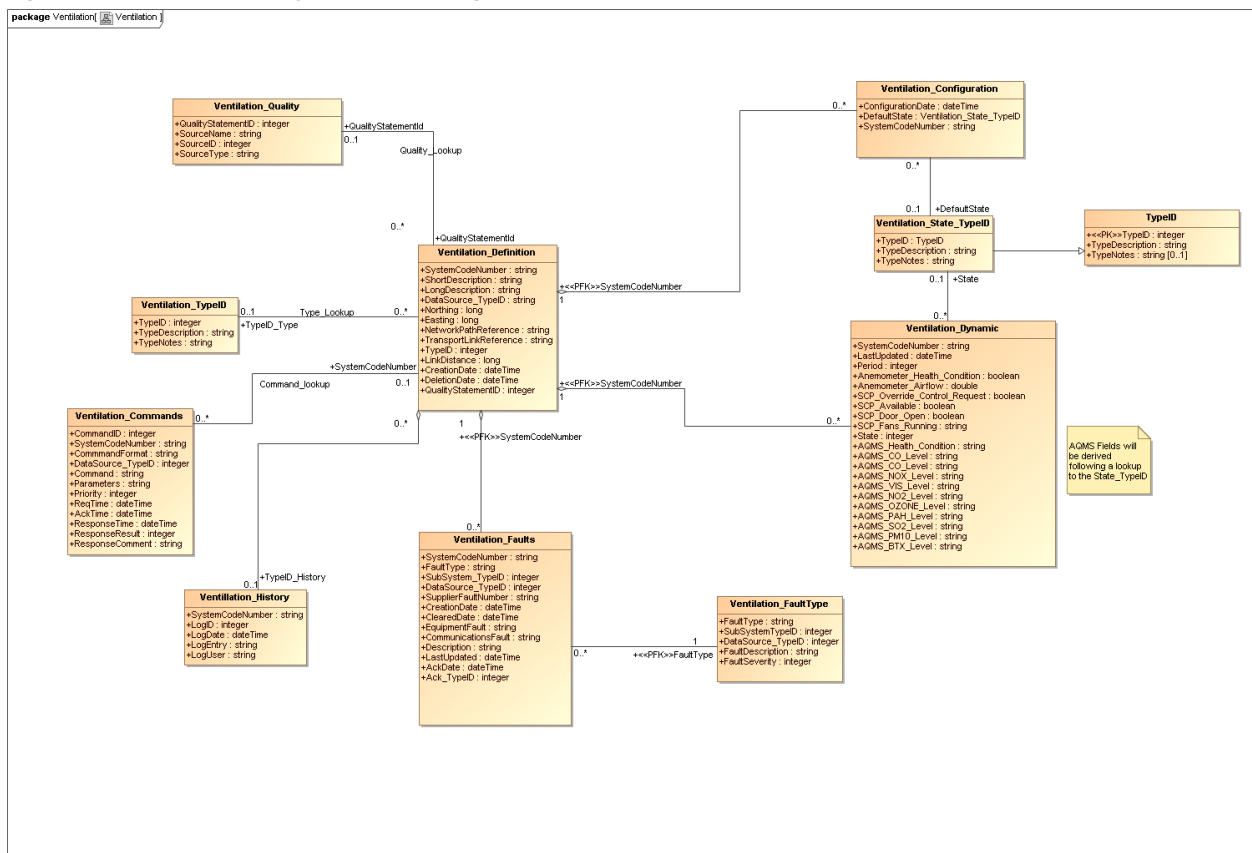

Lighting Objects XSD

```
<xs:element name="TypeID" type="TypeID"/>
<xs:element name="TypeDescription" type="xs:string"/>
<xs:element name="TypeNotes" type="xs:string"/>
</xs:all>
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="TypeID">
<xs:all>
<xs:element name="TypeID" type="xs:integer"/>
<xs:element name="TypeDescription" type="xs:string"/>
<xs:element name="TypeNotes" type="xs:string"/>
</xs:all>
</xs:complexType>
</xs:schema>
```

2.4 Proposed Ventilation Object Classes

Detailed below is the UML model for the proposed ventilation object classes.

Figure 2.2: Ventilation Object Classes Diagram



2.4.1 Proposed Ventilation Object Class Definitions

Table 2.4: Proposed Ventilation Class Definitions

Class Name	Description
Ventilation Quality	Holds a statement about the quality of the ventilation
Ventilation Type ID	Classification of the ventilation equipment. Relates the Type ID field in the object to a particular description.
Ventilation Commands	Represents a command to control the ventilation equipment
Ventilation History	Log entry describing an event relating to ventilation

Class Name	Description
	equipment
Ventilation Faults	Represents a fault with the ventilation equipment
Ventilation Fault Type	Identifies and describes a type of fault that may occur with ventilation equipment
Ventilation Dynamic	Details of the ventilation status
Ventilation Definition	Defines the ventilation equipment
Ventilation State Type ID	Classification of the various state values supported by the system. Relates the "State Type ID field" in the ventilation object to a particular description.
Ventilation Configuration	Details of the ventilation equipment

2.4.2 Proposed Ventilation Objects XSD

Table 2.5: Proposed Ventilation Objects XSD

Ventilation Objects XSD
<pre> <?xml version='1.0' encoding='windows-1252'?> <xs:schema targetNamespace="Ventilation" xmlns="Ventilation" xmlns:xs="http://www.w3.org/2001/XMLSchema"> <xs:complexType name="TypeID"/> <xs:complexType name="Ventilation_Configuration"> <xs:all> <xs:element name="ConfigurationDate" type="xs:dateTime"/> <xs:element name="DefaultState" type="(Ventilation_State)TypeID"/> <xs:element name="SystemCodeNumber" type="xs:string"/> <xs:element name="AQMS_CO_Threshold" type="xs:string"/></xs:element> <xs:element name="AQMS_NO_Threshold" type="xs:string"/></xs:element> <xs:element name="AQMS_NOX_Threshold" type="xs:string"/> <xs:element name="AQMS_VIS_Threshold" type="xs:string"/></xs:element> <xs:element name="AQMS_NO2_Threshold" type="xs:string"/> <xs:element name="AQMS_OZONE_Threshold" type="xs:string"/> <xs:element name="AQMS_PAH_Threshold" type="xs:string"/> <xs:element name="AQMS_SO2_Threshold" type="xs:string"/> <xs:element name="AQMS_PM10_Threshold" type="xs:string"/> <xs:element name="AQMS_BTX_Threshold" type="xs:string"/> <xs:element name="AQMS_Health_Condition" type="xs:string"/> </xs:all> </xs:complexType> <xs:complexType name="Ventilation_Commands"> <xs:all> <xs:element name="CommandID" type="xs:integer"/> <xs:element name="SystemCodeNumber" type="xs:string"/> </pre>

Ventilation Objects XSD

```
<xs:element name="CommmandFormat" type="xs:string"/>
<xs:element name="DataSource_TypeID" type="xs:integer"/>
<xs:element name="Command" type="xs:string"/>
<xs:element name="Parameters" type="xs:string"/>
<xs:element name="Priority" type="xs:integer"/>
<xs:element name="ReqTime" type="xs:dateTime"/>
<xs:element name="AckTime" type="xs:dateTime"/>
<xs:element name="ResponseTime" type="xs:dateTime"/>
<xs:element name="ResponseResult" type="xs:integer"/>
<xs:element name="ResponseComment" type="xs:string"/>
</xs:all>
</xs:complexType>
<xs:complexType name="Ventilation_Definition">
<xs:all>
<xs:element name="SystemCodeNumber" type="xs:string"/>
<xs:element name="ShortDescription" type="xs:string"/>
<xs:element name="LongDescription" type="xs:string"/>
<xs:element name="DataSource_TypeID" type="xs:string"/>
<xs:element name="Northing" type="xs:long"/>
<xs:element name="Easting" type="xs:long"/>
<xs:element name="NetworkPathReference" type="xs:string"/>
<xs:element name="TransportLinkReference" type="xs:string"/>
<xs:element name="TypeID" type="xs:integer"/>
<xs:element name="LinkDistance" type="xs:long"/>
<xs:element name="CreationDate" type="xs:dateTime"/>
<xs:element name="DeletionDate" type="xs:dateTime"/>
<xs:element name="QualityStatementID" type="xs:integer"/>
</xs:all>
</xs:complexType>
<xs:complexType name="Ventilation_Dynamic">
<xs:all>
<xs:element name="SystemCodeNumber" type="xs:string"/>
<xs:element name="LastUpdated" type="xs:dateTime"/>
<xs:element name="Period" type="xs:integer"/>
<xs:element name="DataSource_TypeID" type="xs:integer"/>
<xs:element name="SubSystemTypeID" type="xs:integer"/>
<xs:element name="Anemometer_Health_Condition" type="xs:boolean"/>
<xs:element name="Anemometer_Airflow" type="xs:double"/>
<xs:element name="SCP_Override_Control_Request" type="xs:boolean"/>
<xs:element name="SCP_Available" type="xs:boolean"/>
<xs:element name="SCP_Door_Open" type="xs:boolean"/>
<xs:element name="SCP_Fans_Running" type="xs:string"/>
<xs:element name="State" type="xs:integer"/>
</xs:all>
```

Ventilation Objects XSD

```
</xs:complexType>
<xs:complexType name="Ventilation_FaultType">
  <xs:all>
    <xs:element name="Fault_TypeID" type="xs:integer"/>
    <xs:element name="SubSystemTypeID" type="xs:integer"/>
    <xs:element name="DataSource_TypeID" type="xs:integer"/>
    <xs:element name="FaultDescription" type="xs:string"/>
    <xs:element name="FaultSeverity" type="xs:integer"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Ventilation_Faults">
  <xs:all>
    <xs:element name="FaultID" type="xs:string"/>
    <xs:element name="SystemCodeNumber" type="xs:string"/>
    <xs:element name="FaultType" type="xs:integer"/>
    <xs:element name="SubSystem_TypeID" type="xs:integer"/>
    <xs:element name="DataSource_TypeID" type="xs:integer"/>
    <xs:element name="SupplierFaultNumber" type="xs:string"/>
    <xs:element name="CreationDate" type="xs:dateTime"/>
    <xs:element name="ClearedDate" type="xs:dateTime"/>
    <xs:element name="EquipmentFault" type="xs:string"/>
    <xs:element name="CommunicationsFault" type="xs:string"/>
    <xs:element name="Description" type="xs:string"/>
    <xs:element name="LastUpdated" type="xs:dateTime"/>
    <xs:element name="AckDate" type="xs:dateTime"/>
    <xs:element name="Ack_TypeID" type="xs:integer"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Ventilation_Quality">
  <xs:all>
    <xs:element name="QualityStatementID" type="xs:integer"/>
    <xs:element name="SourceName" type="xs:string"/>
    <xs:element name="SourceID" type="xs:integer"/>
    <xs:element name="SourceType" type="xs:string"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Ventilation_State_TypeID">
  <xs:complexContent>
    <xs:extension base="TypeID">
      <xs:all>
        <xs:element name="TypeID" type="TypeID"/>
        <xs:element name="TypeDescription" type="xs:string"/>
        <xs:element name="TypeNotes" type="xs:string"/>
      </xs:all>
    </xs:extension>
  </xs:complexContent>
</xs:complexType>
```

Ventilation Objects XSD

```
</xs:extension>
</xs:complexContent>
</xs:complexType>
<xs:complexType name="Ventilation_TypeID">
  <xs:all>
    <xs:element name="TypeID" type="xs:integer"/>
    <xs:element name="TypeDescription" type="xs:string"/>
    <xs:element name="TypeNotes" type="xs:string"/>
  </xs:all>
</xs:complexType>
<xs:complexType name="Ventillation_History">
  <xs:all>
    <xs:element name="SystemCodeNumber" type="xs:string"/>
    <xs:element name="LogID" type="xs:integer"/>
    <xs:element name="LogDate" type="xs:dateTime"/>
    <xs:element name="LogEntry" type="xs:string"/>
    <xs:element name="LogUser" type="xs:string"/>
  </xs:all>
</xs:complexType>
</xs:schema>
```

2.5 UTMC Object Definitions

2.5.1 Direction Type Object Definition

The following are the proposed attributes for the Direction Type object definition.

Figure 2.3: Direction Type Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
DirectionTypeID	STATIC	Unique identifier for the directiontypeid	Integer			Y			Direction_Type
DirectionDescription	STATIC	Description of direction on the roadside	Character	1	32	Y			

2.5.2 Ventilation Object Definitions

The following are the proposed attributes for each ventilation object definition.

Figure 2.4: Ventilation_Definition Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
SystemCodeNumber	STATIC	Unique identifier for the ventilation fan	Character	1	32	Y		GENERIC DATA Generic information including ventilation fan type and location	Ventilation_Definition
ShortDescription	STATIC	Short description of the ventilation fan	Character		32				
LongDescription	STATIC	Long description of the ventilation fan	Character		2,000				
DataSource_TypeID	STATIC	Source of information, e.g. UTC - taken from the DataSource Look-up Table	Integer				Y		
Northing	STATIC	Location of the ventilation fan in OS grid coordinates	Real						
Easting	STATIC		Real						
NetworkPathReference	STATIC	Reference to Network Link	Character		32				
TransportLinkReference	STATIC	Reference to Transport Link	Character		32				
TypeID	STATIC	Type of equipment from generic list	Integer				Y		
LinkDistance	STATIC	Distance of the ventilation fan from the start of the link	Real						
CreationDate	STATIC	Date/time at which the ventilation fan was entered into the database	DateTime			Y			
DeletionDate	STATIC	Date of deletion	DateTime						
QualityStatementID	STATIC	Reference to quality model	Integer						

Figure 2.5: Ventilation_Typeid Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
TypeID	STATIC	Identifier for equipment type	Integer		9999	Y		List of all types of ventilation fan types supported by the tunnel system	Ventilation_typeID
TypeDescription	STATIC	Description of equipment type	Character		64	Y			
TypeNotes	STATIC	Additional Notes	Character		255				

Figure 2.6: Ventilation_Faults

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
SystemCodeNumber	DYNAMIC	Identifier for the device associated with the fault	Character		32	Y		This view is provided as a generic mechanism for reporting/storing faults associated with a ventilation fan	Ventilation_Faults
FaultType	DYNAMIC	A reference to one of a set of fault types defined for the object in question - will be 999 if the sub-system does not supply a FaultType	Integer	1		Y	Y		
SubSystem_TypeID	DYNAMIC		Integer	1			Y		
DataSource_TypeID	DYNAMIC		Integer	1			Y		
SupplierFaultNumber	DYNAMIC	Allocated by the supplier/configuration manager for maintenance purposes if required	Character	1	32				
CreationDate	DYNAMIC		Date	1		Y			
ClearedDate	DYNAMIC		Date	1					
EquipmentFault	DYNAMIC	Faulty Y/N?	Character	1	1				
CommunicationsFault	DYNAMIC	Faulty Y/N?	Character	1	1				
Description	DYNAMIC	Text describing the fault	Character	1					
LastUpdated	DYNAMIC	Time/date of last fault information	Date						
AckDate	DYNAMIC	Date on which the fault was acknowledged	Date						
Ack_TypeID	DYNAMIC	Status of the acknowledgement	Number	1			Y		

Figure 2.7: Ventilation_Fault_Type

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
FaultType	STATIC	Identifier for the fault type	Integer			Y		This view is provided as a generic mechanism for describing faults associated with a ventilation fan	Ventilation_fault_type
SubSystem_TypeID	STATIC		Integer				Y		
DataSource_TypeID	STATIC		Integer				Y		
FaultDescription	STATIC	Description of the fault	Character						
FaultSeverity	STATIC	Severity of the fault	Integer						

Figure 2.8: Ventilation_Dynamic

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
SystemCodeNumber	DYNAMIC	Unique identifier for the ventilation fan	Character	1	32	Y		DYNAMIC DATA taken from the ventilation system	Ventilation_dynamic
LastUpdated	DYNAMIC	Time/date of last change of this data	DateTime			Y			
Period	DYNAMIC	Period of time for updating - eg: 60seconds	Integer						
DataSource_TypeID	DYNAMIC	Source of information, e.g. UTC - taken from the DataSource Look-up Table	Character	1					
SubSystem_TypeID	DYNAMIC	1 = Eastbound, 2 = Westbound [Generated from system]	Character	1					
State_TypeID	DYNAMIC	Refers to a value in Ventilation_StateTypeID object (eg NO, VIS, NO2 etc)	Character	1	32				
State_Threshold	DYNAMIC	A value of either: 'Normal','Medium','High', 'Alarm'	Character	1	32				
Anemometer Health Condition	DYNAMIC	TRUE,FALSE	Boolean						
Anemometer Airflow Value	DYNAMIC	0.43	Real						
SCP Override Control Request	DYNAMIC	TRUE,FALSE	Boolean						
SCP Available	DYNAMIC	TRUE,FALSE	Boolean						
SCP Door Open	DYNAMIC	TRUE,FALSE	Boolean						
SCP Fans Running	DYNAMIC	A value of either: 'Forward','Reverse','Tripped'	Character	1	32				
State	DYNAMIC	The current state of the ventilation unit	Integer						
AQMS_CO_Level	DYNAMIC		Character						
AQMS_NO_Level	DYNAMIC		Character						
AQMS_NOX_Level	DYNAMIC		Character						
AQMS_VIS_Level	DYNAMIC		Character						
AQMS_NO2_Level	DYNAMIC		Character						
AQMS_OZONE_Level	DYNAMIC		Character						
AQMS_PAH_Level	DYNAMIC		Character						
AQMS_SO2_Level	DYNAMIC		Character						
AQMS_PM10_Level	DYNAMIC		Character						
AQMS_BTX_Level	DYNAMIC		Character						
AQMS_Health_Condition	DYNAMIC		Character						

Figure 2.9: Ventilation_Quality

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
QualityStatementID	STATIC	Unique identifier for the quality statement	Integer			Y		This view is provided for potential inclusion of the UTMCD7/17 quality statements.	Ventilation_quality
SourceName	STATIC	Source of the data	Character		200				
SourceID	STATIC	Identifier for the data	Integer						
SourceType	STATIC	Type of the source	Character		200				

Figure 2.10: Ventilation_StateTypeID

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
TypeID	STATIC	Identifier for AQMS type	Character		5	Y		List of all types of AQMS types supported by the tunnel system	Ventilation_typeID
TypeDescription	STATIC	Description of AQMS type	Character		64	Y			
TypeNotes	STATIC	Additional Notes	Character		255				

Proposed UTMC Model Extensions for Tunnels

Extract from W.P. 2.6 for Issue to UDG



Figure 2.11: Ventilation_Commands

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
CommandID	DYNAMIC	Unique identifier for the command object. (See Note 2)	Integer			Y		Command block to allow requests to be sent to the CDB with field to allow acknowledgement and response. (Note all major objects which require a level of command input should have this block)	ventilation_command
SystemCodeNumber	DYNAMIC	Unique identifier for the device to which the command object relates when command is for a specific device When used in a subsystem command table this field is not mandatory	Character		32	see note1			
CommandFormat	DYNAMIC	Indicates the format of the following command information	Integer	1	2		Y		
DataSource_TypeID	DYNAMIC	Reference to the data source of the object (SystemCodeNumer) that the command refers to.	Integer				Y		
Command	DYNAMIC	Actual command sent to the equipment	Character		255	Y			
Parameters	DYNAMIC	Delimited list of parameters to be sent with the command	Character		1024				
Priority	DYNAMIC	Level of priority associated with the request	Integer						
ReqTime	DYNAMIC	Date/time at which request was made	DateTime				Y		
AckTime	DYNAMIC	Time at which the request was acknowledged	DateTime						
ResponseTime	DYNAMIC	Time at which equipment responded	DateTime						
ResponseResult	DYNAMIC	Indicates if the request was executed or denied	Integer						
ResponseComment	DYNAMIC	Textual Description of Reason For Failure	Character						

The following figure outlines the proposed ventilation fault types.

Figure 2.12: Note 1: Ventilation Fault Types

Note 1:	
Ventilation Fault Types	
1	Motor Thermal Overload Trip Alarm
2	Soft Start Common Alarm
3	Motor Thermistor Alarm
4	Fan Vibration Alarm
5	Bearing Over-temperature Alarm
6	Emergency Stop Operated
7	Fan Available/Not Available
8	Fan Running Forward
9	Fan Running Reverse
10	Fan Failed
11	Fan Isolator Operated
12	Fan Local Control
13	Fan Forward Request
14	Fan Reverse Request
15	Fan Stop Request
16	Fan Failed to Start
17	Fan Failed to Stop
18	Fan Running Hour run
19	Cross Passage Damper Open
20	Cross Passage Damper Closed
21	Cross Passage Fail to Open
22	Cross Passage Fail to Close

The following figure outlines the proposed ventilation and smoke control panel commands.

Figure 2.13: Note 2: Ventilation and Smoke Control Panel Commands

Note 2:	
Ventilation Fan and Smoke Control Panel Commands	
Smoke Control Panels	SCP Flashing Beacon 2 SCP Fans Start Forward Request SCP Fans Start Reverse Request SCP Fans Start Stop Request SCP Tunnel Lighting Fully On Request SCP Tunnel Lighting Normal On Request
Ventilation Fan Commands	Fan Forward Request Fan Reverse Request Fan Stop Request

2.5.3 Lighting Object Definitions

The following are the proposed attributes for each lighting object definition.

Figure 2.14: Lighting_Definition Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
SystemCodeNumber	STATIC	Unique identifier for the lighting	Character	1	32	Y		GENERIC DATA Generic information including Lighting type and location	Lighting_Definition
ShortDescription	STATIC	Short description of the lighting	Character		32				
LongDescription	STATIC	Long description of the lighting	Character		2,000				
DataSource_TypeID	STATIC	Source of information, e.g. UTC - taken from the DataSource Look-up Table	Integer				Y		
Northing	STATIC	Location of the lighting in OS grid coordinates	Real						
Easting	STATIC		Real						
NetworkPathReference	STATIC	Reference to Network Link	Character		32				
TransportLinkReference	STATIC	Reference to Transport Link	Character		32				
TypeID	STATIC	Type of equipment from generic list	Integer				Y		
LinkDistance	STATIC	Distance of the lighting from the start of the link	Real						
CreationDate	STATIC	Date/time at which the lighting was entered into the	DateTime			Y			
DeletionDate	STATIC	Date of deletion	DateTime						
QualityStatementID	STATIC	Reference to quality model	Integer						

Figure 2.15: Lighting_TypeID Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
TypeID	STATIC	Identifier for equipment type	Integer		9999	Y		List of all types of lighting system types supported by the tunnel system	lighting_typeID
TypeDescription	STATIC	Description of equipment type	Character		64	Y			
TypeNotes	STATIC	Additional Notes	Character		255				

Proposed UTMC Model Extensions for Tunnels

Extract from W.P. 2.6 for Issue to UDG



Figure 2.16: Lighting_Faults Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
SystemCodeNumber	DYNAMIC	Identifier for the device associated with the fault	Character		32	Y		This view is provided as a generic mechanism for reporting/storing faults associated with a lighting component	lighting_Faults
FaultType	DYNAMIC	A reference to one of a set of fault types defined for the object in question - will be 999 if the sub-system does not supply a FaultType	Integer	1		Y	Y		
SubSystem_TypeID	DYNAMIC		Integer	1			Y		
DataSource_TypeID	DYNAMIC		Integer	1			Y		
SupplierFaultNumber	DYNAMIC	Allocated by the supplier/configuration manager for maintenance purposes if required	Character	1	32				
CreationDate	DYNAMIC		Date	1		Y			
ClearedDate	DYNAMIC		Date	1					
EquipmentFault	DYNAMIC	Faulty Y/N?	Character	1	1				
CommunicationsFault	DYNAMIC	Faulty Y/N?	Character	1	1				
Description	DYNAMIC	Text describing the fault	Character	1					
LastUpdated	DYNAMIC	Time/date of last fault information	Date						
AckDate	DYNAMIC	Date on which the fault was acknowledged	Date						
Ack_TypeID	DYNAMIC	Status of the acknowledgement	Number	1			Y		

Figure 2.17: Lighting_FaultType Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
FaultType	STATIC	Identifier for the fault type	Integer			Y		This view is provided as a generic mechanism for describing faults associated with a lighting component	lighting_fault_type
SubSystem_TypeID	STATIC		Integer				Y		
DataSource_TypeID	STATIC		Integer				Y		
FaultDescription	STATIC	Description of the fault	Character						
FaultSeverity	STATIC	Severity of the fault	Integer						

Figure 2.18: Lighting_Dynamic Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
SystemCodeNumber	DYNAMIC	Unique identifier for the lighting system	Character	1	32	Y		DYNAMIC DATA taken from the lighting system	lighting_dynamic
LastUpdated	DYNAMIC	Time/date of last change of this data	DateTime			Y			
Period	DYNAMIC	Period of time for updating - eg: 60seconds	Integer						
DataSource_TypeID	DYNAMIC	Source of information, e.g. UTC - taken from the DataSource Look-up Table	Character	1					
SubSystem_TypeID	DYNAMIC	1 = Eastbound, 2 = Westbound [Generated from system]	Character	1					
Photometer Luminance	DYNAMIC		Real						
State	DYNAMIC	Current state of the lighting unit	Integer						

Figure 2.19: Lighting_Quality Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
QualityStatementID	STATIC	Unique identifier for the quality statement	Integer			Y		This view is provided for potential inclusion of the UTMC07/17 quality statements.	lighting_quality
SourceName	STATIC	Source of the data	Character		200				
SourceID	STATIC	Identifier for the data	Integer						
SourceType	STATIC	Type of the source	Character		200				

Figure 2.20: Lighting_Commands Object

Attribute Name	Attribute Type	Description	Data Type	Min size	Max size	Man	ET	Comments	Component Reference
CommandID	DYNAMIC	Unique identifier for the command object. (See Note 2)	Integer			Y		Command block to allow requests to be sent to the CDB with field to allow acknowledgement and response. (Note all major objects which require a level of command input should have this block)	lighting_command
SystemCodeNumber	DYNAMIC	Unique identifier for the device to which the command object relates when command is for a specific device When used in a subsystem command table this field is not mandatory	Character		32	see note1			
CommandFormat	DYNAMIC	Indicates the format of the following command information	Integer	1	2		Y		
DataSource_TypeID	DYNAMIC	Reference to the data source of the object (SystemCodeNumber) that the command refers to.	Integer				Y		
Command	DYNAMIC	Actual command sent to the equipment	Character		255	Y			
Parameters	DYNAMIC	Delimited list of parameters to be sent with the command	Character		1024				
Priority	DYNAMIC	Level of priority associated with the request	Integer						
ReqTime	DYNAMIC	Date/time at which request was made	DateTime			Y			
AckTime	DYNAMIC	Time at which the request was acknowledged	DateTime						
ResponseTime	DYNAMIC	Time at which equipment responded	DateTime						
ResponseResult	DYNAMIC	Indicates if the request was executed or denied	Integer						
ResponseComment	DYNAMIC	Textual Description of Reason For Failure	Character						

The following figure outlines the proposed lighting fault types.

Figure 2.21: Note 1: Lighting Fault Types

Note 1:	
Lighting Fault Types	
1	Power supply load 'current in each phase
2	Alarm thresholds for undercurrent on each stage
3	Alarms for any faulty lamp
4	Alarms for any mains failure in VPs
5	Lighting controller failure
6	Lighting auto/manual mode
7	Luminance Level Up Demand
8	Luminance Level Down Demand
9	Photometer Health Condition
10	Photometer Wash Level Low
11	Photometer Fail

The following figure outlines the proposed lighting and photometer commands.

Figure 2.22: Note 2: Lighting and Photometer Commands

Note 2:	
Lighting and Photometer commands	
Lighting Systems	Luminance Level Up Demand
	Luminance Level Down Demand
Photometer Systems	Photometer Wash/Wipe Request