

**BIM-MEP**<sup>AUS</sup>



# Guideline

Shared parameters

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## About

BIM-MEP<sup>AUS</sup> is an industry initiative lead by the AMCA to support best practice building services building information modelling for digital project delivery and life cycle asset management.

## Contact

Contact us via [www.bimmepaus.com.au](http://www.bimmepaus.com.au)

## Document formatting convention

The following text formats are used in BIM-MEP<sup>AUS</sup> documents:

Text type		Used for
Italicised text	BIM Execution Plan	The generic title for a type of document
Bold italicized text	<b>BIM-MEP<sup>AUS</sup> specification</b>	The name of a referenced document
Red bold text	<b>LOD</b>	First reference to a term or abbreviation that is defined in the BIM-MEP <sup>AUS</sup> website glossary
Blue text	<a href="http://www.bimmepaus.com.au">www.bimmepaus.com.au</a>	Hyperlink / web link
Blue italicized text	<i>Explanatory notes</i>	Explanatory or reference notes

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# 1 INTRODUCTION

## 1.1. Scope

BIM-MEP<sup>AUS</sup> aims to provide a Revit MEP Template Add-in with supporting generic design, manufacturers and fabrication content, shared parameters and workflows that facilitate productivity enhancements and improved outcomes for all stakeholders throughout the asset life cycle.

Shared parameters are used to manage and display data within a BIM model and allow the data to be exchanged with external databases via Open Database Interfaces (ODIs).

This guideline provides an overview of the rules BIM-MEP<sup>AUS</sup> applies to name and manage shared parameters.

## 1.2. Master list

The BIM-MEP<sup>AUS</sup> website provides the reference list of system and shared parameters used within the design families and extends to include parameters for use throughout the asset lifecycle.

The master list is used to create the BIM-MEP<sup>AUS</sup> Shared Parameter txt file which is updated with each release of the Template Add-in.

The aim of the reference list is to assure consistent shared parameters across all families and avoidance of multiple shared parameters serving the same purpose.

The master reference list provides the following information for each shared parameter:

- Name
- GUID
- DataType / Unit of Measure
- Group (BIM-MEP<sup>AUS</sup>)
- Parameter Type (System, Instance or Type)
- Specification schedule
- Nominal Value Range / Value Set
- Description.

Filters are provided to allow users to generate tailored subsets of the parameters.

Parameters are being progressively added by BIM-MEP<sup>AUS</sup> as needed through the development of new family specifications and user proposals.

The Shared Parameter txt file is updated from the website with each version release of the BIM-MEP<sup>AUS</sup> Revit MEP Template Add-in.

## 1.3. Product Data Templates

Family Product Data Template (PDT) parameters published with the Product Family Specifications are based on the Revit system and BIM-MEP<sup>AUS</sup> shared parameters.

BIM-MEP<sup>AUS</sup> generic design models include the shared parameters listed in the LOD 300 Schedule whilst BIM-MEP<sup>AUS</sup> Manufacturer's Models include the shared parameters listed in the LOD 500 Schedule.

## 2 Autodesk Revit families and parameters

Parameters define the properties and attributes of the elements that form the model, including not only model components and annotation objects, but also views and sheets.

It is important to understand the difference between the types of Revit parameters as it is central to their proper use and for the efficient management of information within the model.

### 2.1. Family categories

Autodesk Revit uses family categories to classify families and drive their behaviour:

**Family category** - Family categories are built into Revit and cannot be modified. To create a new family, a family template is selected through the Family Editor and this sets the family properties and family parameters.

For further information refer to Autodesk Knowledge Network: About Categories for Revit MEP Families.

### 2.2. Parameter Types

Autodesk Revit provides five types of parameters that are intended to be used for specific purposes.

**System parameters** - are built into Revit and cannot be modified. System parameters can be displayed in tags and schedules. Whilst there are relatively few system parameters, they are widely utilized in projects and families.

**Global parameters** - are specific to a single project file and are used for driving a global value, scheduling, sorting, and filtering, but unlike project parameters are not assigned to specific categories.

**Project parameters** - are specific to a single project file and can appear in schedules but not tags. They are added to elements by assigning them to one or more categories of elements, sheets, or views.

**Family parameters** - are specific to a family type and are typically used to control geometry and parametric behaviour and are not available for tags or schedules. They are created within the family editor and are then typically editable by the user within the project environment or controlled using a specific formula.

**Shared parameters** - Shared parameters can be used by multiple families and projects after a shared parameter definition is added to the shared parameter txt file. As the shared parameter property set is stored in a separate file external to the project or family, it is protected from change once created.

Shared parameters can be tagged and scheduled, and importantly, shared parameter data can be imported or exported through an Open Data Base Interface. Shared Parameters are either

- Type parameters - these parameters have the same value across common across all instances of the family.
- Instance parameters - these parameters can have independent values for each instance of the component in the model.

### 2.3. Shared parameter .Txt file

The shared parameter .txt file holds the values and properties of the shared parameters and must be loaded into the project and define the information required for organizing, displaying and exchanging data.

The format of the txt file is as follows;

- Meta Data
- GROUP
- PARAM

For each PARAM Value the following parameter properties are reported:

- GUID
- Name
- Data Type
- Data Category
- Group
- Visible
- Description
- User modifiable.

### 2.4. Parameter Visibility

The shared parameter text file includes the visibility setting for each Type and Instance based shared parameter which can be set as either "1" or "0".

1 = visible in the project and able to be modified by the user.

0 = hidden in the project and unable to be modified by the user.

If the parameter is set to be visible in the project, a Type parameter appears in the Type properties dialogue whilst Instance based parameters appear in the properties palette.

## 3 Shared parameters

### 3.1. Shared Parameter Types

Shared parameters can be of two types

Type parameters - are common across all instances of that family type and are generally not visible within the properties palette.

Instance parameters - are used to modify a parameter value within a specific instance of the family type.

An instance parameter can be set to be a reporting parameter. A reporting parameter will hold a value that can be used in formulas for other parameters - or it can be used to drive the behaviour of another parameter.

Most BIM-MEP<sup>AUS</sup> family shared parameters are instance based, however Type parameters are used where the shared parameter is intrinsically linked to the family and common across all instances. Within the Txt File BIM-MEP<sup>AUS</sup> typically sets Type Parameters to Visible.

As an example, within the pump families, PumpType is Type based as it is specific to the pump family but made visible to the user for clarity and to align with the PDT.

### 3.2. Shared parameter properties

The BIM-MEP<sup>AUS</sup> shared parameter properties are listed in the BIM-MEP<sup>AUS</sup> website shared parameter reference schedule providing a single point of truth for BIM-MEP<sup>AUS</sup> shared parameters.

Autodesk Revit shared parameter properties are contained in the Shared Parameter Txt file with each shared parameter having the following property fields:

GUID	Global Unique Identifier generated by Revit
NAME	Shared Parameter Name
DATATYPE	Revit Data Type ie: TEXT, NUMBER, ELECTRICAL_POWER
DATA CATEGORY	Only used for nested families - the value is generally left blank within BIM-MEP <sup>AUS</sup> .
GROUP	is the user defined group that allows similar parameters to be grouped together.
VISIBLE	determines whether the parameter is visible within the properties palette or the type properties dialogue box.
DESCRIPTION	parameter description
USER MODIFIABLE	sets the ability for the shared parameter to be modified.

In the most instances, the BIM-MEP<sup>AUS</sup> Shared Parameters should provide the shared parameters needed for design, construction and life cycle asset management. Naming a new shared parameter where this already exists will result in the Type of Parameter and Discipline being unavailable for selection.

Where a new shared parameter is required and has not been defined, the decision tree in terms of creating the shared parameter via the dialog box is as follows:

- Select **Revit Discipline**
- Select Revit Discipline specific **Type of Parameter**
- Group Parameter Under.

Where the Revit Discipline structure and Revit Type of Parameter delivers an appropriate outcome, then the use of a specific Revit Discipline is preferred, however where this cannot be achieved then the Common Discipline should be used.

The 'Group Parameter Under' shown in the Parameter properties dialog box is used to define where parameters are listed in the family and properties pallet.

The 'Groups' are used to organise Shared Parameters into logical groupings and provide an intuitive location for users to search when adding to a project or family.

The applicable measurement unit associated with each Type of Parameter is set by the BIM-MEP<sup>AUS</sup> Revit Template Add-in and is attached automatically to the shared parameter selected.

### 3.3. Revit Disciplines

In order to reduce confusion, BIM-MEP<sup>AUS</sup> defines Discipline and Revit Disciplines to have specific meanings

**Discipline** - is the industry established convention of disciplines related to design, construction and maintenance skill sets and work packages.

**Revit Disciplines**- are built into Revit and cannot be modified. They appear to define groups of shared parameters related to systems.

Revit Disciplines related to MEP are as follows:

- HVAC – Heating/Loading Calculations, Air Distribution Systems, Ductwork
- Piping – Fluid Distribution Systems, Piping Systems
- Electrical – Power and Lighting
- Energy – Energy Modelling

In addition, to the above Revit MEP Disciplines is the Revit 'Common' Discipline that has the majority of engineering units of measures and other parameter types.

The full schedule of Revit Types of Parameters is provided in Annexure 2.

### 3.4. Shared parameter properties palette grouping

Parameter grouping options within the Revit shared parameter properties pallet are hard coded, however can be arranged within the parameter properties palette.

The list of available <Group Parameter Under> options related to MEP and General classifications are as follows:

Analysis Results	Fire Protection	Other
Constraints	General	Phasing
Construction	Graphics	Photometrics
Data	Green Building Properties	Plumbing
Dimensions	Identity Data	Segments and Fittings
Electrical	IFC Parameters	
Electrical – Circuiting	Layers	
Electrical – Lighting	Materials and Finishes	
Electrical – Loads	Mechanical	
Electrical Engineering	Mechanical – Flow	
Energy Analysis	Mechanical – Loads	

The Group Parameters Under are done on an available best fit basis with the BIM-MEP<sup>AUS</sup> Shared Parameter Groups.



### **3.5. Shared Parameter Groups**

BIM-MEP<sup>AUS</sup> uses its own shared parameter groups to organise and enable users to search for similar types of shared parameters. These groupings are generally discipline based and aligned with the specification schedules and product data templates.

Each Group is assigned an ID number and appears at the top of the shared parameter text file.

Spare placeholders are provided within the numbering structure to provide flexibility to logically add Groups as needed.

Refer to the Annexure 2 for the Shared Parameter Groups

## 4 Shared Parameter Naming Conventions

The BIM-MEP<sup>AUS</sup> parameter naming convention generally aligns with established database guidelines for parameter naming as well as industry established naming practices.

The aim of the naming conventions is to allow for a consistent approach to naming shared parameters that once understood will allow shared parameters to be easily generated and located.

This section should be read in conjunction with the **BIM-MEP<sup>AUS</sup> Definitions, Nomenclature and Units of Measure Guideline**,

### 4.1. Syntax

The following conventions are incorporated in the shared parameter naming convention

- CamelCase
- Maximum string length 35 characters
- Spaces are not permitted in the name string, where necessary for readability an underscore can be used to separate parts of the name
- Units of measure are not to be included in the parameter name
- Country prefixes/suffixes are not to be included in the names
- Mathematical operators in the naming string are not permitted:
  - Plus '+'
  - Minus '-'
  - Divide '/'
  - Multiply '\*'
  - Hash '#'
  - Carat '^'.

### 4.2. Parameter Naming Conventions

The naming of an individual shared parameter must often balance several competing considerations including:

- Readability
- Naming hierarchy priority
- Type of selection action required
- Differentiation of family parameters
- How the parameter will schedule out in the properties palette
- Established industry naming conventions
- String Length
- Commissioning Data
- Product specificity.

To illustrate the application of the above principles the following examples are provided:

#### Readability

Camel case generally creates a readable shared parameter name avoiding risks related to an incorrect number of space characters and data delimiters. However, in some cases such as where abbreviations are used, this can lead to poor readability and an underscore is used.

- IPRating is replaced with IP\_Rating

## Selection

Where the parameter requires a selection from a defined range of parameter values then a Type suffix may be included unless the requirement to select a value is generally well understood or implied.

Examples of the approach used are:

Use of Type suffix to indicate selection from a defined value range:	PumpType, ElectricMotorType
Understood requirement for selection:	ElectricMotorPoles
Requirement is indicated by Parameter Type i.e. [Yes/No]:	ElectricMotorThermistor.

## Family Requirements

The preferred shared parameter for air flow in the first instance is AirFlow and is used for fans, VAV terminals, air terminals, etc. where there is a single air flow.

For Air Handling Units, Fan Coil Units there is a need to schedule three or four potential airflows

- Supply Air
- Return Air
- Outside Air.

AirFlow is used for Supply Air Flow as this is the unit capacity value and the other air flow parameters are identified as follows:

- AirFlowOutside
- AirFlowReturn.

## Naming Hierarchy

The naming hierarchy convention is driven by the following logic

- Primary Variable- Classification nomination.

Use of the naming hierarchy is illustrated as follows

- AirFlow - primary variable for air flow quantity
- AirFlowOutside - differentiates between primary airflow and outside airflow
- TempAirFlowOutside - temperature variable related to the Outside Air Flow.

## Commissioning data parameters

A measured value of a specific property parameter value is indicated by the suffix Actual.

Design Parameter:           TempAirFlowOutside

Measured Value:           TempAirFlowOutsideActual.

## Abbreviations

The following general abbreviations are used where required to minimize the overall length of the variable name character string:

- Press - Pressure
- Temp - Temperature
- Min - Minimum
- Max - Maximum
- Amb - Ambient.

## Flow Directions

The use of abbreviations is generally minimized as far as practical -

For components:

- In : Entering the component
- Out : Leaving the component.

For flow direction

- Flow: To the field from the pump/fan
- Return: From the field to the pump/fan.

The above definition is used as it is the pump/fan that creates the flow direction, not any other component in the system.

## Product Specificity

Where parameters are specific to a product group then there can be benefits to including the product name as a prefix to the property. This helps in the grouping of the shared parameters within the Revit Properties Palette.

## A1 System Parameters

Revit System parameters under the Identity Data group (common to system families and component families):

- Assembly Code
- Cost
- Description
- Keynote
- Manufacturer
- Model
- Type Comments
- Type Image
- URL

Additional system parameters that appear in the 'Properties palette' when the family is loaded into a project but are not available in the Family Editor Dialog Box are as follows:

- Type Mark
- Offset
- Level
- Host
- Mark
- Phase Created
- Phase Demolished

## A2 Parameter Groups

The following parameter groupings are used within BIM-MEP<sup>AUS</sup>. The grouping table provides capacity and flexibility to grow the groupings as the initiative progresses

### Identity, Classification & Life Cycle Asset Management

- 1 Identity
- 2 IFC
- 3 BIM Classification
- 4 Sustainability Properties
- 5 Completion
- 6 Asset Management
- 7 Maintenance
- 8 **Commissioning**
- 9 Spare9

### Physical Properties, Dimensions and Measures

- 10 Length
- 11 Area
- 12 Volume
- 13 Mass & Density
- 14 Power & Energy
- 15 Sound
- 16 Air Flow
- 17 Air Temperature
- 18 Air Pressure
- 19 Fluid Flow
- 20 Fluid Temperature
- 21 Fluid Pressure
- 22 Electrical
- 23 Spare23
- 24 Spare24
- 25 Spare25
- 26 Spare26
- 27 Spare27
- 28 Spare28
- 29 Spare29

### General - All Disciplines

- 30 Materials and Finishes
- 31 Mounting and Accessories
- 32 Safety and Access
- 33 Spare33
- 34 Spare34
- 35 Spare35
- 36 Spare36
- 37 Spare 37
- 38 Spare 38
- 39 Spare 39

### Mechanical Services

- 40 Mechanical Design
- 41 Air Conditioning Loads
- 42 Mechanical Equipment
- 43 Ducting and Air Distribution
- 44 Piping and Water Distribution
- 45 Mech-Elec Systems
- 46 Spare46
- 47 Spare47
- 48 Spare48
- 49 Spare49

### Electrical Services

- 50 Electrical Design
- 51 Electrical Loads
- 52 Electrical Equipment
- 53 Power Distribution
- 54 Earthing
- 55 Lighting
- 56 CIT (Communications Information Technology)
- 57 Security
- 58 Electric Motors
- 59 Spare59

### Fire Services

- 60 Fire Design
- 61 Wet Fire Equipment
- 62 Wet Pipe Systems
- 63 Dry Fire Equipment
- 64 Dry Systems
- 65 EWIS
- 66 Spare66
- 67 Spare67
- 68 Spare68
- 69 Spare69

#### Hydraulics

- 70 Hydraulic Design
- 71 Hydraulic Equipment
- 72 Hydraulic Fittings
- 73 Domestic Water
- 74 Reclaimed Water
- 75 Sanitary
- 76 Drainage
- 77 Spare77
- 78 Spare78
- 79 Spare79

#### Vertical Transportation

- 80 VT Design
- 81 Lifts
- 82 Escalators
- 83 Spare83
- 84 Spare84

#### Medical Services

- 85 Medical Services Design
- 86 Medical Gases
- 87 Spare87
- 88 Spare88
- 89 Spare89

#### Building Automation

- 90 BMS System

## A3 Revit DataTypes

The available DataTypes are determined by the Revit Discipline selected. The following tables define both the DataTypes by Revit Discipline and the associated metric unit of measure used by BIM-MEP<sup>AUS</sup>.

### Revit Discipline - HVAC

The HVAC Discipline principally relates to cooling and heating load calculations and air side system design

DataType	Units
• HVAC Temperature	°C
• HVAC Pressure	Pa
• HVAC Energy	J
• HVAC Energy	kWh
• HVAC Velocity	m/s
• HVAC Density	kg/m <sup>3</sup>
• HVAC Power	kW
• HVAC Power Density	W/m <sup>2</sup>
• HVAC Roughness	mm
• HVAC Viscosity	Pa/s
• HVAC Friction	Pa/m
• Specific Heat	J/kg.K
• Thermal Conductivity	W/m.K
• Air Flow	L/s
• Air Flow Density	L/s/m <sup>2</sup>
• Air Flow divided by Volume	L/s/m <sup>3</sup>
• Coefficient of Heat Transfer	W/m <sup>2</sup> /K
• Cross Section	mm <sup>2</sup>
• Heat Gain	kW
• Cooling Load	kW
• Cooling Load divided by Area	W/m <sup>2</sup>
• Heating Load	kW
• Heating Load divided by Area	W/m <sup>2</sup>
• Slope	%
• Factor	%
• Duct Size	mm
• Duct Insulation Thickness	mm
• Area divided by Cooling Load	w/m2
• Duct Lining Thickness	mm



## Revit Discipline – Piping

The Piping Discipline principally relates to piping system design including HVAC piping systems and hydraulics.

DataTypes	Units
• Flow	L/s
• Pipe Dimension	mm
• Pipe Insulation Thickness	mm
• Pipe Mass	kg
• Pipe Mass per Unit Length	kg/m
• Pipe Size	Kg/m <sup>3</sup>
• Piping Pressure	kPa
• Piping Roughness	mm
• Piping Slope	%
• Piping Slope	Slope Degrees
• Piping Velocity	Pa/s
• Piping Viscosity	Pa/m
• Piping Volume	L

## Revit Discipline – Electrical

The Electrical Discipline relates to power distribution and lighting.

DataTypes	Units
• Apparent Power	kVA
• Current	A
• Current	kA
• Current	mA
• Demand Factor	%
• Efficacy	Lm/w
• Piping Roughness	kW
• Electrical Frequency (Hertz)	1/s
• Electrical Potential	V
• Electrical Potential	mV
• Electrical Power	W
• Electrical Power	kW
• Electrical Power Density	W/m <sup>2</sup>
• Electrical Resistivity	Ω.m
• Electrical Temperature	°C
• Illuminance	lm/m <sup>2</sup>

• Luminance	Cd/m <sup>2</sup>
• Luminous Flux	Lu
• Luminous Intensity	Cd

### Revit Discipline – Energy Modelling

DataTypes	Units
• Energy	J
• Energy	kJ

### Revit Discipline – Common

The Common Discipline includes all parameter types that are not classified under the preceding Revit MEP disciplines.

DataTypes	Units
• Acceleration	m/s <sup>2</sup>
• Angle	°
• Area	m <sup>2</sup>
• Area	mm <sup>2</sup>
• Area Force	N/m <sup>2</sup>
• Area Force	kN/m <sup>2</sup>
• Cable Tray Size	mm
• Colour Temperature	K
• Conduit Size	mm
• Currency	(other) Currency
• Factor	%
• Fixture Units	Integer
• Force	kN
• Linear Force	kN/m
• Length	mm
• Length	m
• Load Classification	Other (Text)
• Mass	kg
• Mass Density	kg/m <sup>2</sup>
• Mass per unit length	kg/m
• Material	Other (Text)
• Moment	kN.m
• Number	Other (Number)
• Number of Poles	Other (Integer)
• Period	s

• Rotation	°
• Section Area	mm <sup>2</sup>
• Section Area	m <sup>2</sup>
• Slope	%
• Stress	kPa
• Surface Area per Unit Length	m <sup>2</sup> /m
• Text	Other (Text)
• Thermal Expansion Coefficient	°C <sup>-1</sup>
• Volume	m <sup>3</sup>
• Wattage	W
• Weight	N
• Weight	kN
• Weight per Unit Length	kN/m
• Yes_No	Other (Yes_No)