UOB CONTENT GUIDE

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UOB Content Guide

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PURPOSES OF THIS DOCUMENT

This document is written in English, due to the international mindset of Techniek Nederland; the Dutch owner of the document. This document's main purpose is providing a uniform and clear definition on how UOB (Uniforme Objecten Bibliotheek, as Uniform Object Library) families should be built for proper use within Revit. This document is an in-depth guidance. The methodology of modelling and parametrization is built on the know-how and experiences of the CIC team. Both member of the joint-venture CIC (Cadac Group and Itannex) are partners of the RSF and has great willingness to implement the Revit standard DRS 2.5.2. Anyone creating Revit content for UOB should use this Content Model-Guide.

1 INTRODUCTION

Techniek Nederland is the largest branch organization for installers in The Netherlands. Many of its members have been applying BIM-workflows with Revit for multiple years. They have been using several Revit Add-Ins to speed up the modeling process for design and engineering. The biggest concerns they faced is the incompatibility between 3D components at interchange. In order to overcome that problem, many of those Dutch installers, associating the same BIM-communities, initiated the plan UOB. The main goals are:

- Maximum interchange while preserving specifications
- Supporting generic to specific
- Native Revit usage

Fundamentals of UOB should be based on existing methodologies in their business processes and a common ground in workflows. Being able to respond to the above mentioned BIM-demand, the following definitions have been defined:

I. ETIM-classification method being used as a basis
II. Covering 80% of the most common elements being part of an installation and therefore used in 2D and 3D communication
III. Create Model-Classes (MC) for each of the ETIM-classes
IV. Create a Techniek Nederland toolbox being able to support the BIM-workflow of designers and installers for the selection

The 3D objects for Revit, generated by the toolbox (also named as UOB Platform Add-In), should meet the specifications from the RSF.

Revit Standards Foundation

Collaborative BIM-workflows in the Dutch building industry started during the period 2008-2009. Initiated by open minded architects, structural- & building engineers and building contractors together with the support of their software suppliers, started to share ideas, and digital information for common-interest. This lead to Best Practices for using Autodesk Revit.

These Best Practices evolved into the Dutch Revit Standards, which became the Revit Standards Foundation. The RSF is mainly a technical oriented guidance to achieve optimum results in collaborative workflows. It covers in-depth how library-components should be built, including MEP connections, as well as naming conventions. All of this resulting in a set of valuable digital assets.

Although the RSF prescribes many details, it also has topics which are not absolute. This Model-Guide is intended to be as detailed as possible on both technical Revit-issues as well as conventions. All parameters and conventions of RSF which are applicable will be applied. This would secure a maximum uniformity. There might however be some deviation. Anyone creating content for UOB should use this Model-Guide. The RSF is aware of possible deviations, and will afterwards decide if to adopt (or partially)

these new insights, which might lead to an update of the RSF.

2 GENERAL NOTES

The basics of the RSF, in-fact: DRS 2.5.2 dd 26/02/2016, are being taken as the starting point. New insights for existing guidelines, as well as additional guidance.

2.1 Generic to Specific

A design, even for MEP, is generally drafted in a generic fashion. From preliminary, generic design the process then proceeds towards a more specific, execution ready design. In other words: a Revit Family can be generic or Manufacturer and Model specific.
The UOB (or Uniform Object Library) content will seamlessly connect with the rest of the design process. This enables Revit users to swap generic families with Manufacturer specific families (named as Template Objects) , thus enabling a progressive design process. The UOB content is a library of product-models, named as Modeling Classes (MC); an MC belongs to an ETIM-classified product-type. Since the world of products for the MEP-industry is massive, 80% of those elements which are created in both 2D and 3D documents for communication of designs, have been selected for the creation of a Modeling Class. All UOB components are based on ETIM MC product-models and the geometry will be driven by ETIM MC-data. The data is being extracted from the webservice "2ba-unifeed" which will be supplied to the user by an Add-In (named as UOB-toolbox). The data-itself is being supplied by the manufacturers of MEP-industry products. The only way to properly implement this is to agree on common standards for both generic and specific Revit content libraries. The UOB-toolbox is a name in general, there is a free Development-kit available for anyone eager to create a Add-In for “CAD-applications” that do support BIM-workflows such as Revit. The developer of both the Template Objects as well as the Development-kit, CIC (a joint-venture of Cadac Group and Itannex), have already developed a UOB Platform Add-In for the Revit platform,.

2.2 Broad horizons

The main principle of BIM is accommodating information exchange between different members of the design, build and maintenance lifecycle of a building. A Revit component library should support this information exchange. The concept of the Uniform Object Library is well suitable for international implementation due to multilingual ETIM data-model as well as the technical concept of the RSF (which support automatic language switching based on “shared parameters”).
There are different UOB Template Objects suitable for different project stages. The stages progress from Conceptual to Generic, and finally to Specific. To achieve this, Template Objects should be constructed in a way that information contained by that Template Object can be passed on throughout the BIM process, and also to make it easy to interchange families when the project progresses through the three stages.

2.3 Template Objects

The BIM modeller retrieves a digital version of a product in his/her CAD-application using an Add-In built on the UOB Platform Developer Kit. The Add-In will fetch and a Template Object and manufacturer data for the chosen product resulting in a *BIM object*. Choosing products as-if-generic is also supported by the platform. In fact the generic and specific BIM objects are technically identical. A Template Object is a Combination of an ETIM ModelClass (geometrical description, known as MC) and a basic ETIM Class product (known as EC).
On one hand there are many EC’s that do relate to the same geometrical product-shape (MC) such as MC000255, on the other hand there are EC’s that do relate to multiple geometrical product-shapes such as EC003024.

2.4 Native Revit

A Revit library needs to be built from native Revit components (solids and lines). There are several urging reasons for this:

1. Using other file formats, such as IFC or (3D) dwg means losing critical Revit functionality.
2. 3D dwgs are often imported in a Revit Family after which the Family is saved as “native” Revit. This method however puts a disproportionate strain on hardware and software resources, which severely affects Model performance. Besides this, the project is contaminated with all sorts of Linestyles, layers and such from the dwg. And finally, this can make exporting to IFC nearly impossible.
3. IFC’s cannot currently be converted into Revit Families in a proficiently reliable manner, let alone retain all viable information and constraints during this process. Having said this, we do realize this is more of an implementation issue then and not a fundamental weakness of IFC or Revit. Therefore we are open to being proved otherwise. Any manufacturer that can provide with a tested and validated workflow that converts IFC Families into Revit Families, while maintaining compliance with these Standards, is more than welcome to simply share IFC-based libraries.
4. It is very well possible to automatically create Revit families based on a generic template file in combination with Manufacturer created databases containing product information. Most manufacturers already have these kinds of databases for marketing, documentation or production purposes. In other words, manufacturers can reuse datasets they already have, negating the need to build these from scratch;
5. A Revit library doesn’t necessarily require a great amount of geometrical detail. Even more so, most of the time it’s better to use a simplified form to prevent project files from becoming too large and unmanageable. Geometry created in manufacturing software (such as Inventor and Solidworks) is usually too complicated for immediate use in Revit.

Due to *best-in-class* functionality of exporting and importing Ifc models, the Revit platform itself will be suitable for communicating with Ifc. All UOB-generated objects are Ifc-classified.

2.5 Engineering basics

Because design, engineering and construction detailing are more tight together in BIM workflows, it is a must to specific a common ground for technical referencing. In CAD workflows, mechanical engineers calculate with nominal sizes for ducting and piping. For ductwork, the nominal dimensions are reflected in the industry as default. For piping however, this is a big difference. MEP contractors or installers most often translate nominal into trading sizes of their preferred products.

With the use of Revit, which has size-configuration with nominal-, inside- and outside dimension, this is an important consideration. While working in Revit with pipes, the selected diameter is the nominal diameter. So when replacing pipes or even complete pipe-networks, Revit will use the nominal size as the interchange-key.

If Revit cannot find the specified diameter of the new designated pipes & fittings, it will place the larger diameter. In practice, with native Revit, when working with OD as nominal, replacing plastic pipes for copper, Revit will place much larger copper pipes than needed and might error on connections with equipment.

So in order to achieve seamless workflows and therefore maximum interchange throughout the complete project lifecycle, piping connections must be in **nominal diameters**. The ETIM MC model is already prepared for the use of DN (nominal diameters).

3 GENERAL FAMILY SPECIFICATIONS

3.1 Level Of Information

Before getting into Revit details, it is important to have an overview of the functionality being applied.

		Generic (LOD350)	Specific (LOD400)
1	MEP specification	v	v
2	Connection size (mechanical) Connection type (electrical)	v	v
3	Revit connector-specification	v	v
4	Applicable ETIM-Class features	v	v
5	Applicable ETIM-MC drawing codes	v	v
6	Article details of manufacturer		v

1. System type, flow-specification, power, pressure(loss)
   - Main specifications by NLRS parameters
   - Applicable NLRS parameter linked with connector in Generic + Specific
2. Nominal connection size for mechanical connections
   Type of physical connection for electrical connectivity
3. MEP-details such as mechanical connection type
4. In general terms the ETIM-class information will be pushed by the UOB Platform Add-In into individual family-parameters in the parameter-group Model Properties. Although engineering specifications are not part of the MC-class, it is of high importance that both electrical and mechanical features such as power, voltage, pressure loss and flow specifications are part of the process. These specifications are already available as EC-feature. Therefore all relevant EC-features must be added to the Template Object on forehand so the values can be relayed to the connectors thru the use of NLRS-parameters.
   Those MC's that have logical ETIM-class features with geometry impact must be included as Family-parameter in the Template Object and drive the visibility of the designated solids.
5. Every MC should have all MC- features (drawing codes) as family-parameter included. The naming convention will be described in 7.3.1
6. Product and/or article details such as
   - Article/product number from manufacturer as well as GTIN
   - Product min-max range
   - Engineering specifications electrical and/or mechanical
   - Product trading name
   - Product assortment
   - Manufacturer GLN

3.2 Revit Template Object fundamentals

The following should be taken into consideration for Revit Template Objects:

1. Revit 2018 is the base platform for all Template Objects to be created to assure compatibility to all Revit platforms
   - If Revit versions higher than Revit 2018 do facilitate significant improvements, those Template Objects which will be affected should be updated or recreated
   - Therefore the parameter NLRS_C_revit_versie will contain the Revit version of creation

- Because the scale of improvements cannot be foreseen, it cannot be expected to have updates for the Template Objects automatically. CIC, or other content developers, should be commissioned for such.

2. In general all families should be Level-based; known as Unhosted. This supports faster modelling methods as well as scripting.
3. Families must be designated to the appropriate Revit Category.
    - Always have the core-function of the element as appropriate category
    - Possible Categories for all MEP-related Content are listed in Appendix: "160222_NLRSv2.5.2_MEP FamilyGuide_Bijlagen" of the RSF Fundamentals
4. The material parameter of all Solids (except for Zoning) must be parametrized; the primary solid by NLRS_C_materiaal, additional solids to the *increased number.*
5. The OmniClass Number must be applied.
6. Revit users should update their OmniClassTaxonomy.txt file since Autodesk ships an old version of the OmniClass 23 classification file please download & save from https://www.csiresources.org/standards/omniclass ; embrace such standardization!

3.3 Subcategories

1. All solids should be designated to the proper Subcategory (can be found in Appendix 1 of the NLRS MEP Family Guide.)
2. Fittings-families must contain a model-line on subcategory Center Line
    - Which should fit exactly between the connector-positions
    - Visibility further detailed in Chapter 6.3
3. Detail-lines as well as annotation-lines in annotations should be designated to their respective subcategories as described in NLRS v 2.5.2.

3.4 Zoning or Clashvolumes

The NLRS requires the use of subcategories for clash zones to be present in every Revit family if applicable. Although zoning is not standardized in ETIM MC, each Template Object which has any form of manual operation must contain an Operation Zone. It must have the visibility parameter (Instance) NLRS_C_clashvolume. The first content deliverables (May/June 2020) have no clashvolumes applied. This will be postponed:

1. ETIM MC does not contain zoning
2. UOB Expert Team will initiate list of equipment elements which would need a zoning including pragmatic geometrical descriptions

Function	Subcategory	Visibility (Y/N)	Comments
Free space for daily operation or space due to product requirements	Operation Zones	Y	Under construction
Service space	Maintenance Zones	Y	Under construction

4 NAMING CONVENTIONS

Content is downloaded by a platform application, such as the UOB Addin for Revit. The family-name which is designated is defined during an upload process. So in-fact there are 2 naming conventions:

1. Name of the loadable family for Revit, from the user-perspective
2. Name of the source template object, being uploaded to the platform

4.1 Names of loadable families

As stated above, during platform upload a family-name must be given to the Template Objects. It should meet the specifications of the NLRS, meaning 7 attributes according:

	Description
<pos1>	'NLRS', as a fixed prefix
<pos2>	Classification code, NL-SfB
<pos3>	Abbreviation for the Family Category
<pos4>	Abbreviation for hosting: UN, LB or WPB
<pos5>	Description; see details below
<pos6>	'gen' as aggregated value; see details below
<pos7>	'uob' as being the distributor

<pos5>

The description is based on MC and EC replication: if an MC only relates to 1 EC and this EC only relates to the same MC, the NL-description of the MC is to be used (this is a single MC-EC). There are however many "one-to-many" MC-EC's as well as "many-to-one" MC's. For these two situations the MC-name is leading and will have the EC-name between brackets as '(*EC-name*)'; e.g. built-in or surface-built versions of a product with the same ETIM Class. Worth mentioning also are additions for Pipe Fittings due to differentiation in Revit-behaviour. These Revit-specific additions should be enclosed within '( )' brackets.

Pipe Fittings in general			
Part Type	**Default**	**Addition**	**reason**
Elbow (also a bend)	equal	unequal	bends with different nominal connections must be setup differently
Tee (all angles)	unequal	equal	equal tee forces reducer if connections are unequal
Pipe Fittings : Coupling pieces : MC000010, MC000012, MC000020			
Transition		transition	
Union		union	
Multiport		multiport	For couplers with different system connectors (i.e. press – male threaded)
Air Terminals, Duct Accessory or Mechanical Equipment			
Normal	**connector-type**	**Code**	
	Supply Air	Dsp	
	Exhaust Air	Dex	
	Return Air	Drt	
	Other Air	Dot	

Examples:

Reducing coupler: NLRS_5-_PIF_UN_leiding koppeling met sleutelvlak (transition)_gen_uob
Adapter (threaded / press): NLRS_5-_PIF_UN_leiding koppeling met sleutelvlak (multiport)_gen_uob
Regular coupler: NLRS_5-_PIF_UN_leiding koppeling met sleutelvlak (union)_gen_uob
Air Terminal (ventilation extract from rooms): NLRS_57_AIR_LB_ventilatieventiel (Drt)_gen_uob
Air Terminal (ventilation towards rooms): NLRS_57_AIR_LB_ventilatieventiel (Dsp)_gen_uob
Air Terminal (polluted air): NLRS_57_AIR_LB_ventilatieventiel (Dex)_gen_uob

<pos6>

Because the UOB generated families contain a generic and specific version (by family-types) within the same family, the original NLRS attribute for manufacturer or generic ('gen') is intended as 'gen'.

4.2 Name of the source template object

To streamline the upload process there are 6 mandatory attributes needed as examples below, the 7th attribute is optional, the 7th attribute has a '_'prefix:

MC000008_EC010163_UN_PIA_ValveBreaksInto_Pgl02.rfa
MC000011_EC003024_UN_PIF_Elbow_Pft02_unequal.rfa
MC000012_EC003024_UN_PIF_Multiport_Pft02.rfa
MC000098_EC011600_UN_DUA_BreaksInto_Phs01Phr01Dgl02.rfa
MC000210_EC001952_LB_LF_Normal_Epb01.rfa
MC000363_EC010788_UN_DUA_Damper_Dgl02.rfa

MC	EC	Host	Category	Part Type	Connectors included	Option
MC000008	EC010163	UN	PIA	ValveBreaksInto	Pgl02	
MC000011	EC003024	UN	PIF	Elbow	Pft02	unequal
MC000012	EC003024	UN	PIF	Multiport	Pft02	
MC000098	EC011600	UN	DUA	BreaksInto	Phs01Phr01Dgl02	
MC000210	EC001952	LB	LF	Normal	Epb01	
MC000363	EC010788	UN	DUA	Damper	Dgl02	

D = duct, E = Electrical, P = Piping, see also APPENDIX A: SYSTEM CONNECTORS

- Use UN (Unhosted) only for elements that are adaptive to the location of a system family such as conduits, cable trays, pipes and ducts; it concerns mostly fittings and accessories.

4.3 Type-names of loadable families

The naming-syntax will be handled by UOB Platform Add-In. The user can configure the intended type-name as prescribed in NLRS:

attribute	Description
<pos1>	Product description
<pos2>	Manufacturer (optional; value of *uob_prod_Brand*)
<pos3>	Model identification (optional; value of *uob_prod_Model*)
<pos4>	Dimensions (optional)
<pos5>	Limitations (optional)

<pos1>

If generic, it must be *'gen'* in lowercase. If not the value from uob_prod_BrandName is being applied.

<pos2>

The value as being used in the uob_prod_Model parameter will be applied

<pos3>

The typical dimensions for the product. L x W x H or a range (pipe-fittings)

<pos4>

Limitations such as Nominal Pressure

5 MODELLING GUIDELINES

5.1 Insertion Point

The ETIM Model Class drawings should be referenced at all times to determine the orientation. The basics of the ETIM MC are in-fact compatible with Revit except for system families (but these must not be modeled).

5.2 Room Calculation Point

In order to prevent false room/space identification, the Room Calculation Point must be used in a pragmatic way. Be sure to drag the Room Calculation Point of built-in devices/fixtures to a feasible position.

5.3 Reference planes and reference lines

Reference Planes **nor** Reference Lines must be set to any subcategories.

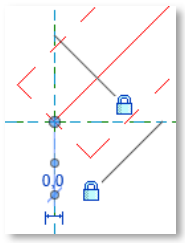
5.3.1 Using reference planes

1. To determine the insertion point of the family (default reference planes present in each family).
2. To determine the bounding box of the main geometry, if it has properties describing the total Length, Width and/or Height. Reference Planes must be set to its functional position (Left / Right / Front / Back / Bottom / Top) to enable intuitive temporary dimensioning within projects.
3. As a Workplane for a nested family within the family. In such case, the reference plane must be set to 'Not a Reference', and its name must reflect the purpose of the element that's hosted on it.
4. To constrain a variable position of an element. When the plane does not determine the bounding box (total Length, Width or Height) then it should be set to 'Not a Reference'.
5. When an instance parameter is attached to a reference plane set to other than 'Not a Reference', it produces a grip arrow when selected in a project's plan- or section view.
    a. Since the value of the parameter is determined by UOB Platform Add-In, this should always be avoided.
    b. If a grip arrow can't be avoided otherwise, it should be attached to a reference plane that's set to 'Not a Reference' which is then constrained to the appropriate insertion point/bounding box reference.

5.3.2 Using reference lines

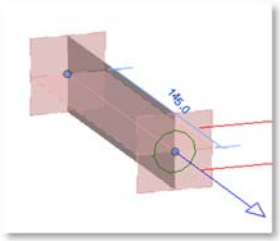
Reference lines are useful to control the position and/or orientation of elements on a fixed plane.

1. By default, connectors should be hosted on the end of a reference line.
2. When a reference line is reasonably expected to rotate, its axis of rotation should be set by making a relation (padlocks) between an end point and two reference planes.
3. When a reference line is always perpendicular to a reference plane that determines an insertion point, a relation should be made between the two references lines (either by a simple dimension or a parameter).
4. If a Reference Line is hosting a connector, then its length should be determined by the appropriate *Z_calculated** value.
   * Z-normally sets the distance from component-origin to connection-type, dependent on the connection-type the connector-position, and thus the length of the hosting Reference Line must be calculated.
5. In addition to reference planes, a reference line can carry out a shape handle in 3D; reference planes only shape handles in 2D views. The parametrization must be Instance-based.



5.4 Connectors

Any Family that has some sort of connection to any MEP system needs to have proper Connectors. These Connectors need to be placed geometrically at that exact position where connecting starts.
For those objects that have a connection which might “rotate” from either a plan or elevation view, the connector must be hosted by end-planes of a Reference Line to be able to support such properly.

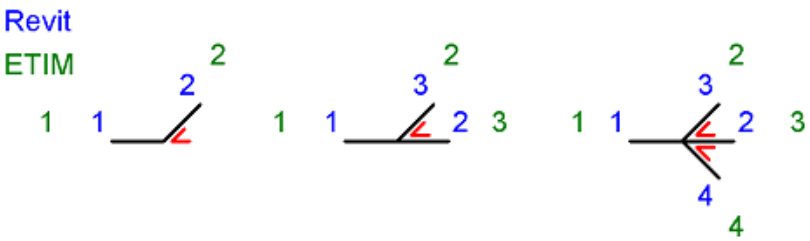


5.4.1 Conventions & parameters

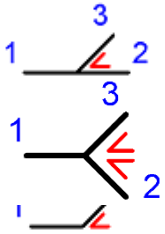
1. Connector naming: c<number>_<description>
2. Connector numbering will be done clockwise, starting with the primary connector
3. The primary connector must be *connector 1*
4. The parametrization of connectors must match with the connector running number, but within a plausible interpretation. If the connectors 1 - 4 are used for piping, connector 5 for duct and connector 6 as electrical it should be:

Piping	Ventilation	Electrical
Ø_NLRS_P_c01_xxxx	Ø_NLRS_M_c01_xxxx	Ø NLRS_E_c01_xxxx
Ø_NLRS_P_c02_xxxx		
Ø_NLRS_P_c03_xxxx		
Ø_NLRS_P_c04_xxxx		

5. Connector description must be in English and contain the local/national abbreviation including a flow-direction (if applicable). Flow direction can be:
    i. **inlet**, **outlet** or **inlet/outlet** (for bidirectional ports)
    ii. if multiple instances of the same system-type exist, they must be indexed such as *heating outlet 01*
    iii. the values may not be restricted by a formula
6. Missing abbreviations can be requested through the website www.revitstandards.org
7. The way to identify the appropriate system connector is being displayed in Attachment A
8. For Fittings (and so the Fitting connectors) to make sure that they can be interchanged, not only the orientation is important but also the order in which connectors are placed. Please refer to the following diagram. Connector number 2 in Revit (blue) can be defined as number 3 in ETIM (green), and the other way around.



9. The parametrization of Dimension and Angle however must be according to ETIM with the following interpretation:
    1. The angle-parameter must be parametrized with NLRS_x_c01_hoek
        - For both connector 1 and 2 in case of a bend
        - For connector 3 in case of a tee*
        - For connector 2 and 3 in case of a symmetrical Y-piece (duct-fitting round / oval and cast-in rectangular)
    2. For rectangular Y-piece large sizes, NLRS_M_c02_hoek and NLRS_M_c03_hoek must be used instead of using c01



10. Connectors in fitting families which must adapt to pipes, ducts, conduits or cable-trays must be *Instance* (size and angles)
    1. For bends and tees or crosses with equal running sizes connector 2 must be equally parametrized as connector 1 for the diameter

2. The “receiving data” of the primary connector makes that the equally configured connectors will force the size of their connection to be equal as to the first connection
3. For other fitting families with multiple ports which should not adapt to pipes, ducts, conduits or cable-trays, but have a parameter-driven size, the diameter-parameter itself must be a *Type*

11. Global connectors for all non-passive components that are part of a mechanical system and are located between source/feed and target/consumer:
    1. All dimensional parameters of connectors must be parametrized to their respective following order as written in 5.4.1 pt.4
    2. The connection-size of a Global parameter must be set as *Type* to make sure that connecting elements adapt to that size; if set to *Instance*, the family will read the size of the connected element
12. In case of a duct- or pipe-connector with system-type other than Fitting, the Flow parameter (Mechanical) of related connectors must to be parametrized by the appropriate parameter NLRS_M_cxx_debiet or NLRS_P_cxx_volumestroom,. If project-standard values are applicable (e.g. Plumbing Fixtures) the NLRS_P_cxx_normdebiet must be applied.
    1. For global connectors it must be Instance-driven
        - for those components that have 2 connectors linked, only 1 connector must be used, which is likely to be the inlet (lowest nr)
    2. Air Terminals in rooms/spaces have only 1 connector, the configuration is:

System	Supply Air	Return Air	Exhaust Air
Flow Direction	In	Out	Out

    3. Equipment that services fixtures or terminals have often multiple connectors in which the direction is opposite to that from the fixture or terminal. They also might have additional connectors (such as an AHU)
13. The Pressure Loss parameter must be Instance-based and should be applied for:
    1. Valves, strainers and filters:
        - the Loss Method must be Specific Loss
        - Pressure Drop must be parametrized by a *pressure loss static* parameter such as NLRS_P_c01_drukverlies_statisch
    2. Duct-silencers, -heaters or VAV-boxes:
        - the Loss Method must be Specific Loss
        - Pressure Drop must be parametrized by a *pressure loss static* parameter such as NLRS_M_c01_drukverlies_statisch
    3. Pumps and AHU’s the Pressure Drop must not be parametrized (leave as 0/ zero)
    4. AHU’s or other service-equipment, must have a *Calculated* Configuration, with a direction OUT for the connector towards *consumers* (Supply Air for the side *towards spaces*, and Hydronic Supply fixture/equipment)
    5. The (*consumer*) receiving side of AHU’s or other service-equipment also needs to be set to Calculated with Direction IN
14. Each mechanical port should also have NLRS parameters for connector type, which contain the local description of the connector type; the value will be fed by UOB Platform Add-In
15. The Description parameter for CableTray – Conduit connectors must not be used in Fitting families; they may only be used in families other than CableTrayFitting or ConduitFitting.

5.4.2 Additional connector guidelines

The pipes, counduits, cabletrays and ducts that are connected to the fitting can drive the behaviour of the conceptual and generic fitting families. Instance parameters of connector will always read the size of the connected system-component, regardless whether or not the value is a calculation. Please keep the following guidelines in mind:

1. All connectors that always have an identical size, should be connected to the same parameter. For instance, in the case of an equal branch or tee, all three connectors refer to the same parameter for their size.

2. Both connectors of a bend should have their Angle property linked to the same parameter. In the case of a branch or cross, only the branching ports should have their angle linked to a parameter (the same if the branch angles are always equal).
3. In the case of a 45 degree branch, 135 degrees should also be read as 45 degrees. Same for 60 degrees and 120 degrees etc. (Common rule: if angle > 90, then it should be read as 180 – angle)
4. In the case of waste water systems, the evaluation of an angle should have a tolerance according to factory specifications (default ≤ 3 degrees).
5. In the case of fittings, all parameters that are attached to a connector should be instance parameters. Since UOB Platform Add-In creates types for each different configuration in a system that's already dimensioned, in the case of Generic and Specific fittings these will be type parameters.
6. If a pipe has a diameter different from that of a connector driven by either a type parameter or being set to the properties of the primary-connector, Revit will attempt to place a transition fitting (which is the preferred behaviour in the case of Pipe Accessories, and terminal connectors such as devices and plumbing fixtures).
7. Connectors can have very specific properties that are important for the behaviour of a system.
    - The connectors in a Fitting should be of type Fitting.
    - The connectors in an Accessory should be of type Global.
    - The connectors in a terminal device drive the system name and behaviour, and should be set according to best practices.

In the UOB content all parameters that are linked to the connectors deliberately are NLRS parameters. Non-Fitting families must relay the value of the MC-port parameter to the respective NLRS parameter. This should facilitate a process where users can read these properties as the minimum desired configuration of the product, to better select an applicable product in the UOB Platform Add-In database.

5.5 Detail Level & Visibility/Graphics

In Revit, there are 3 levels of detail, for MEP the detail levels and visibility should be implemented as well as symbolic representation. Exceptions to be made for those components, like sprinklers, which should always be visualized with a 2D symbol in floorplan views due to national standards.

5.5.1 Mechanical

	Equipment	Accessories	Plumbing Fixtures
Coarse	Only the symbol*[1]	Only the symbol*[2]	**Ceramic**: only 2D Detail in floorplan, full 3D geometry **Other** : Only the symbol *[5]
Medium	Main object geometry	**Pipework**: Only the symbol **Ductwork**: main object geometry, no connection details	**Ceramic**: only 2D Detail in floorplan, full 3D geometry **Other** : Main object geometry, not showing details that have no influence on the space, no symbol
Fine	Full object geometry, including functional details.	Full object geometry, no symbol	**Ceramic**: only 2D Detail in floorplan, full 3D geometry **Other**: Full object geometry, including functional details.

5.5.2 Electrical

	Equipment	Devices	Fixtures
Coarse	Only the symbol*1 (as Detail Component)	Only the symbol*3	Only the symbol*4
Medium	The symbol and main object geometry without details	The symbol and main object geometry without details	The symbol and main object geometry without details
Fine	Full object geometry, no symbol	Full object geometry, no symbol	Full object geometry, no symbol

5.5.3 Fittings

	Pipe Fittings	Duct Fittings	Cabletray- & Conduit Fittings
Coarse	Only the Center Line	Only the Center Line	Only the Center Line
Medium	Center Line, only a symbol *5 for reducers and flanges	Center Line and Main object geometry, no connection details	**Cabletray**: Center Line and main object geometry, no connection details **Conduit**: Center Line only
Fine	Full object geometry and Center Line	Full object geometry and Center Line, no Center Line for rectangular Fittings	Full object geometry and Center Line

*1 Symbols are:
- symbolic lines meant for FloorPlan projection
- have the same subcategory as the solids of the main geometry
- should meet the bounding box geometry

➢ if fill-patterns are required for equipment, model-lines should not be applied. Therefore it is needed to include a Detail Item which should be parametrized by FamilyType parameter *NLRS_DI_symbool*. The Detail Item family itself should be parametrized by Instance parameters on length and visibility with NLRS parameters

*2 For piping: the symbol will be visualized by a (nested) 3D version of the NEN-EN symbol : Symbol mechanical

*3 Created as Annotation Symbol

*4 Symbols for EC001957 and EC002892, resp. MC000161-MC000162 and MC000206//MC000210, should be a Detail Item, all others should have a Annotation Symbol (see explanation in the next chapter).

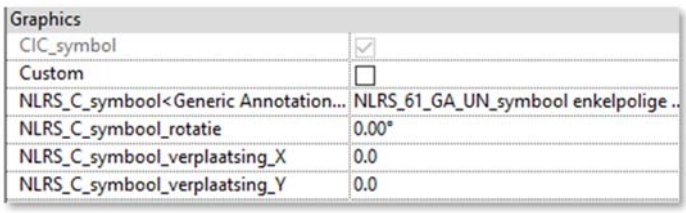
*5 Symbol by model lines

5.6 Symbols for electrical components

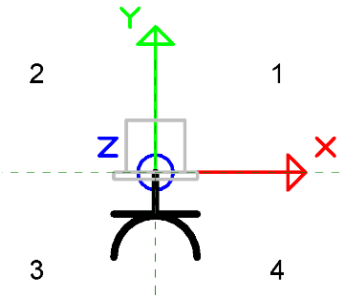
For electrical components, symbols should be made as Generic Annotation. Since E-symbols are a national matter, the size and symbol should meet the national guidelines.

In order to support dynamic symbolization, the Generic Annotation family should be nested and parametrized by the (new) Family-Type parameter **NLRS_60_symbool** within the Template Object. In cases when 2 symbols are relevant, the additional parameter **NLRS_60_symbool_01** should also be used.

In order to complete the dynamic symbolization functionality, the Template Objects need to have a visibility parameter 'Custom' (family parameter, Instance-based, Group Graphics) to be added which will activate the parametrized annotation



family. When ‘Custom’ is not active, a default annotation family (likely the same as the initial parametrized family) should be visible (driven by the calculated ‘CIC_symbol’ parameter).
In addition, the nested Generic Annotation (both the *Custom* as well as the *CIC_symbol* family must be equipped with parameters to move the symbol over X- and Y-axis. These are the new NLRS-parameters ‘NLRS_C_symbool_rotatie’, ‘NLRS_C_symbool_verplaatsing_X’ and ‘NLRS_C_symbool_verplaatsing_Y’. Although the positive Y-direction is as indicated in the image, a positive value for the parameter ‘NLRS_C_symbool_verplaatsing_Y’ is into the other direction (away from the wall).

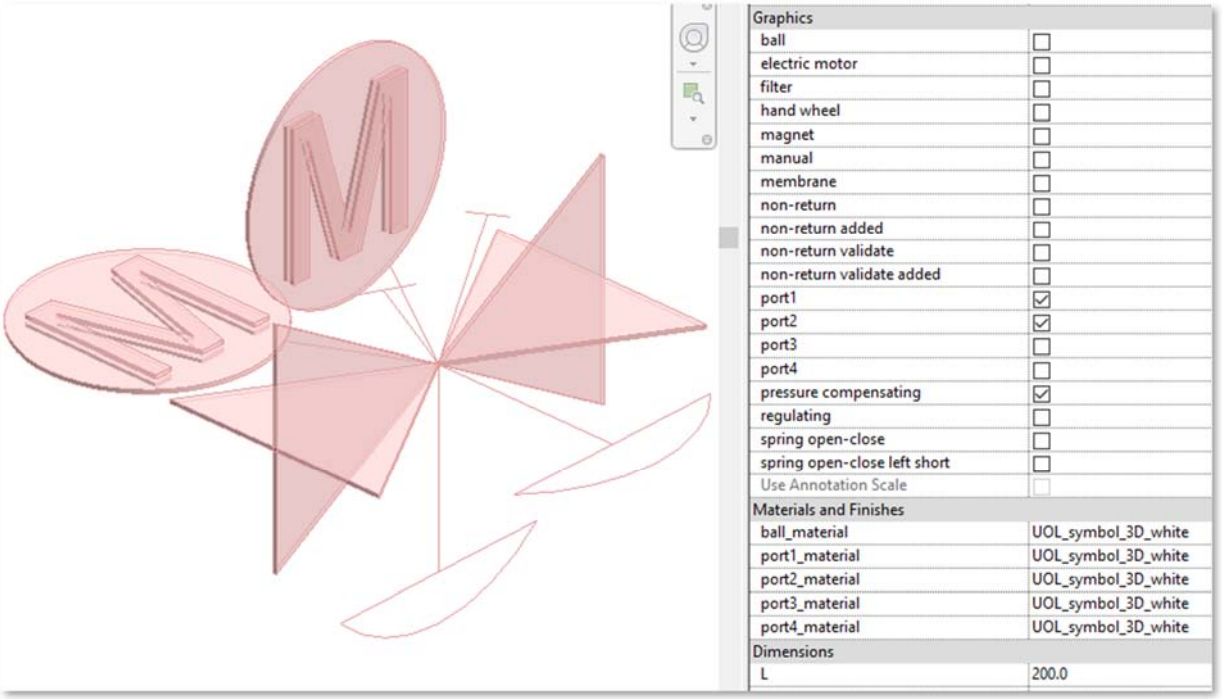


The orientation of the symbol must match the orientation of the component. For a receptacle, in ETIM MC the model is upright, and so is the family, the symbol should therefore be created in quadrants 3 and 4. Components which are to be built in floors and or ceilings, the symbol is of course centralized and created in all applicable quadrants.

Components must be fitted with 2D symbolic representations in compliance with applicable building codes, rules and regulations. For the Dutch MEP sector these are, amongst others, NEN 5152, NEN 2322, NEN-EN 3048 and NEN 3157.

5.7 Symbols for mechanical modeling

1. Symbols for Building Services Components
    - Symbolic-Lines for Floorplan/RCP and Front/Back projection



    - For pipe accessories a standardized 3D symbol is to be used which has most used symbolization for building services
    - The individual solids are set to the designated 2D representations; using Annotation Scale is not available with this UOB approach
    - For UOB fittings: symbols as Model Lines (main family category) are restricted to Reducers and Caps or Plugs
2. Symbols for active Ductwork components
    - Must either be built with Model Lines or
    - A Detail Item family
    - It must reflect the size from the corresponding component

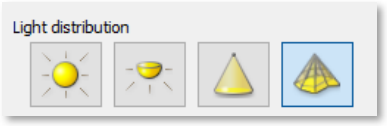
5.8 Nested families

- Each nested family must use the same origin, direction and Reference Plane functions (IsReference parameter) as those which need to be exchanged with each-other; use NLRS parameters at instance level to interchange values.
- Do not implement “mechanical” connectors in shared families, only electrical connectors are allowed.
- Integrated parts of a family (which cannot be used separately) that are modelled as nested components for more efficient family modelling (often happens with repetitive components). These components may not be shared versions. For these components, modelling rules are the same as for the main family. For connection-types implementation of the nested component *NLRS_00_XX_WPB_connector_generiek.rfa* must be used due to repetition over multiple families. It should best be modified per category; concerning the subcategories in which XX is either ME when used in a Mechanical Equipment, or PIA when used in a pipe accessory.

➢ Components which are parts of a family, such as mounting racks or signage, are likely to be nested in the family they belong to. This can only take place when so called *Super Classes* are available in ETIM; which is likely to happen in near future.

5.9 Additional Family Matters

5.9.1 Lighting Fixtures



Lighting Fixtures must be configured as Light Source. The Light Source Definition must be set as Photometric Web. The manufacturer specific .ies files (lighting characteristics) cannot be driven by UOB Platform Add-In, and thus must be configured manually by the Revit user. In The defaut value for Photometric Web File must be set to generic.ies. Revit will seek for .ies files in the IES-specified folder from Revit.ini as **IESFileLocation**, normally is set to [ProgramData]\Autodesk\RVT 20xx\IES\.

6 IFC

Since the building industry is committing to the IFC format for model exchange, the UOB Template Objects need to be equipped with Ifc standards and relevant data. Long term ideology is to be able to feed 3D digital twins with relevant properties and data from the standardized ETIM Classes. In the meantime the Template Objects need to be equipped with properties and, ideally, be fed with existing manufacturer data.

6.1 IfcClassification

The parameters IfcExportAs (IfcType) and IfcExportType (IfcTypeEnum) form the Ifc Classification, must be filled with the most appropriate data from the BuildingSmart website.

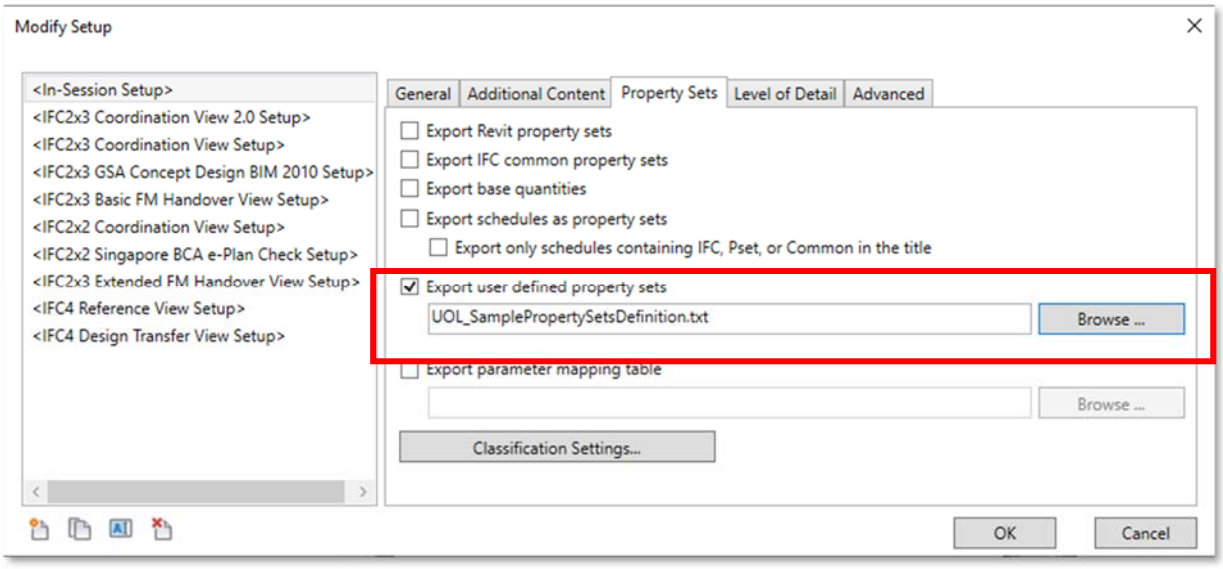
6.2 IfcPropertySets

To make the content generated by UOB available for other parties who are not working with Revit, it will be exported to an IFC standard. There are 2 approaches to observe:

1. Geometry + project model-data with all relevant *IfcClassEnumerated* PropertySets.
2. Geometry + project model-data with basic trading information of the product/article; by implementing Pset_ManufacturerTypeInformation in the Template Object.

6.2.1 UOL_SamplePropertySetsDefinition.txt

The first option would be the optimal level of Ifc-implementation. Whenever it is possible in ETIM to store an Ifc designation, either at product- or at feature level, this would be the ideal method. Unfortunately this is not the case at the moment. → The closest step to the optimal level of Ifc-implementation PropertySet implementation is therefore to use 'Export user defined property sets'.



It is not an easy accessible way of setting up your Ifc export at project level since the user-defined-property-set is a more complex text file with properties and mappings and might be extensive.

If however the requirement is limited to 'Geometry + project model-data with basic trading information of the product/article' then the implementation of Pset_ManufacturerTypeInformation will satisfy.

6.2.2 Pset_ManufacturerTypeInformation

Each UOB Template Object must also contain: Pset_ManufacturerTypeInformation

Parameter	Value	Formula
GlobalTradeItemNumber		uob_prod_GTIN
ArticleNumber		uob_prod_ProdCode
ModelReference		Model
ModelLabel		uob_prod_ShortDescription
ProductionYear		*empty*
AssemblyPlace		"SITE" or "FACTORY" dependent of product
Additional properties at ElementTypeCommon level:		
Reference		*empty*
Status	New	*empty*

.

7 PARAMETERS

The UOB Platform Add-In adds parameter sets depending on applicable standards, to be chosen from the settings defined in UOB Platform Add-In. For this reason, NLRS parameters that are not essential to define either the functionality and/or the geometry are not included. A full overview of NLRS parameters required by the NLRS in each family is listed under 7.2 Generic parameters. There are 5 parameter-sets to keep in mind; all with their individual purposes and the link between many of them:

1. UOB platform
2. ETIM parameters
3. NLRS
4. IFC
5. Native Revit-system

7.1 Basic grouping of parameters

Group name	Description
Constraints	User configurable options
Graphics	Everything concerning symbols; annotation
Materials and Finishes	Revit material
Electrical	Engineering specifications for electrical MEP systems
Mechanical	Engineering specifications for mechanical MEP systems
Dimensions	Dimensional NLRS parameters
IFC Parameters	IFC-classification and the relevant IfcPropertySets
Model Properties	For ETIM parameters only
General	For NLRS parameters only
Data	For UOB platform parameters
Other	All parameters that are used for family calculated purposes

7.2 UOB platform

In general the UOB Template Objects are fed by 2BA as data provider through the UOB Platform Add-In. In order to manage and validate object-data, UOB platform parameters are needed.

Revit Parameter group: Data

Parameters name	Type	Purpose
uob_MC	Text	Fixed value of the Model Class of the Template Object
uob_MC_description	Text	The local[*1] description of the Template Object
uob_MC_csv		Applicable only for Template Objects which are driven by instance values (i.e. pipe- and duct fittings)
uob_prod_Brand	Text	Brandname (often the same as the manufacturer name)
uob_prod_Deeplink	Url	URL to product data in 2BA
uob_prod_ETIM_CultureCode	Text	Code for multilingualism
uob_prod_ETIM_EC	Text	The basic ETIM class for the object
uob_prod_ETIM_Synonyms	Text	The synonyms for the MC
uob_prod_GTIN	Text	GTIN of the product as selected
uob_prod_Manufacturer_GLN	Text	The identification of the production facility

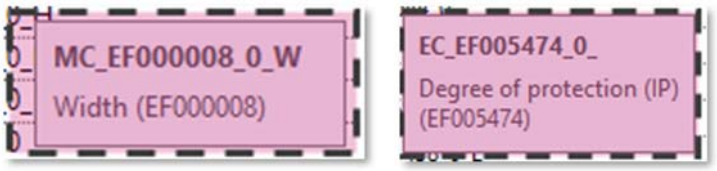
uob_prod_Model	Text	Trading identification
uob_prod_ProductCode	Text	Article number of the product as selected
uob_prod_ProductID	Text	Validation
uob_prod_ShortDescription	Text	Short description of the product as selected

NB: Italic written parameters are relevant only for Instance-driven products (fittings for cable runways, pipes and ducts).

*1: driven by uob_prod_ETIM_CultureCode (Dutch: nl-NL , English international: en-EI). ETIM has a multilingual setup and it contains data available to support synonyms (in multiple languages).

7.3 ETIM parameters

The data from the data provider is pushed into MC- and EC-parameters (in ETIM terminology these are features). Parameters that either drive the geometry (MC) are mandated in the Template Object. Parameters that do not drive the geometry (EC), but do influence the MEP-system in applications, such as Revit, are also mandated in the Template Object; such as electrical- and mechanical specifications. Both MC- and EC parameters must have a tooltip, written in English including the Featurecode.

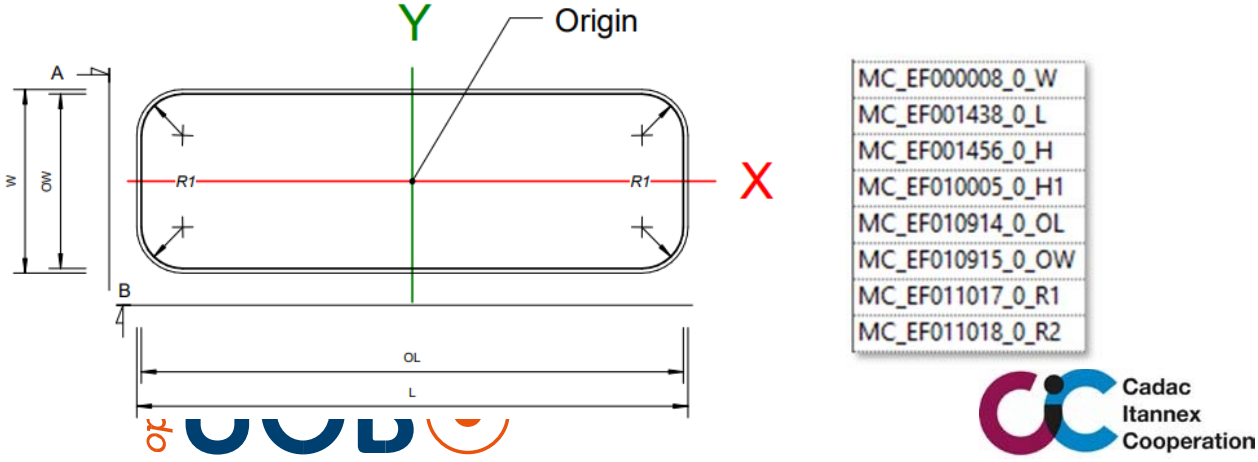


ETIM Feature Type	Code	Revit
Numerical	N	Length, Angle, Apparent Power, Flow
Text	A	Text
Logical	L	Yes/No
Range	R	Dependent of units (Angle, Voltage, Flow, Length, etc)
Coordinate	C	Length
Directional vector	C	Numeric

7.3.1 MC parameters

Revit Parameter group: Model Properties

- All ETIM-MC parameters must be (non-shared) family parameters
- It concerns the codes of product-model on the ETIM-drawingsheets
- The MC parameter has a feature-code EFxxxxxx which is expanded with the port-code and the Drawing Code on the drawing sheet according the naming format:
  MC '_' **Featurecode** '_' **Port Nr** '_' **Drawingcode** as in e.g. **MC_EF001438_0_L**



- Features that do NOT relate to a port, such as the example image, should contain '0' (zero) as port indication
- MC features of type C (coordinates and directional vector) must be implemented by X, Y and Z parameters, example below (MC000266).

	Feature	Port	Drawing code	Description	Type
1	EF011006	1	CA1	Position connection	C
2	EF011006	2	CA2	Position connection	C
82	EF011005	1	RV1	Directional vector connection	C
83	EF011005	2	RV2	Directional vector connection	C

MC_EF011006_1_CA1_X	MC_EF011005_1_RV1_X
MC_EF011006_1_CA1_Y	MC_EF011005_1_RV1_Y
MC_EF011006_1_CA1_Z	MC_EF011005_1_RV1_Z
MC_EF011006_2_CA2_X	MC_EF011005_2_RV2_X
MC_EF011006_2_CA2_Y	MC_EF011005_2_RV2_Y
MC_EF011006_2_CA2_Z	MC_EF011005_2_RV2_Z

7.3.2 EC parameters

Revit Parameter group: Model Properties

95% of the EC-parameters are used as product-information and do not have an active role in the Revit MEP systems.

- EC features, that do influence the use of the family (Yes / No), and those parameters that are mandated by the NLRS (connector specific), must be defined as individual parameters as well.
- The format of the EC-parameter naming is EC '_' Featurecode '_0_'
  EC '_' Featurecode '_0_' as in e..g. **EC_EF005474_0_**
- If the Degree of Protection (IP) is present in the EC-feature-list of the Template Object, this must be incorporated (such as EF005474, EC026395 etcetera) and the value must be relayed to the corresponding NLRS_E_IPklasse parameter.

Parameter	Value	Formula
NLRS_E_IPklasse	IP40	= EC_EF005474_0_

7.4 NLRS

Because of the BIM landscape of the initiators, written in Chapter 2.2, the NLRS is implemented and all specifications should be applied, such as mentioned in Modelling Guidelines.In addition to these modelling conventions, a list of parameters is also a strong part of the NLRS Standard.
NLRS parameters can be divided into:

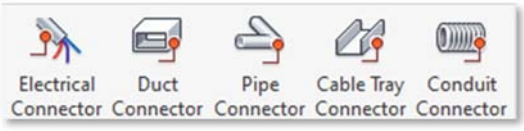
1. Common mandatory for every Template Object
2. MEP-systems dependent per MC

7.4.1 Common mandatory for every Template Object

Parametername	Manual entry	Entry by UOB	Description / purpose *(italic = by formula)*
IfcExportAs	x		Ifc Type mapping for the modelling object
IfcExportType	x		Ifc Enumeration for the Ifc Type
NLRS_C_code_CBNL	x		CBNL identification, e.g. CB01233
NLRS_C_code_CBNL_URL	x		CBNL concept-page, e.g. http://ont.cbnl.org/cb/def/CB01233
NLRS_C_code_ETIM	x	x	*uob_prod_ETIM_EC*
NLRS_C_code_ETIM_MC	x	x	*uob_MC*
NLRS_C_code_ETIM_url	x		MC datasheet URL, example: https://prod.etim-international.com/Class/Details?classId=MC000103
NLRS_C_code_fabrikant_GLN		x	*uob_prod_Manufacturer_GLN*
NLRS_C_code_fabrikant_product		x	*uob_prod_ProductCode*
NLRS_C_code_gtin		x	*uob_prod_GTIN*
NLRS_C_code_SfB_tabel1	x		SfB-code of the modelling object, when applicable, according to the latest version of table 1 from the NL-SfB,
NLRS_C_content_creator	x		*CIC*, or others creating content for UOB
NLRS_C_content_datum_gewijzigd	x		*2020.05.28* (or real modification date of the Template Object)
NLRS_C_content_provider	x		*2ba*
NLRS_C_breedte			Width; inherits from MC parameter if applicable
NLRS_C_diameter			Diameter; inherits from MC parameter if applicable
NLRS_C_diepte			Depth; inherits from MC parameter if applicable
NLRS_C_dikte			Thickness, inherits from MC parameter if applicable
NLRS_C_hoogte			Height; inherits from MC parameter if applicable
NLRS_C_lengte			Length; inherits from MC parameter if applicable
NLRS_C_materiaal	x		Main specific material for the modelling object
NLRS_C_omschrijving		x	*uob_prod_ShortDescription*
NLRS_C_toepassingsdoel	x		General description of the product application
NLRS_C_product_assortiment	x		*uob_prod_Model*
NLRS_C_Revit_versie	x		*2018* (The Revit version which was used to create)

➢ NB. Dimensional parameters should be driven by formulas in such a way that the values cannot drive the MC parameter that drives them.

7.4.2 MEP-systems dependent per MC



Approximately 98% of all UOB Template Objects contain MEP connectors to gain Revit functions for mechanical, electrical or plumbing use. Dependent per MC the UOB Template Objects have 1 or more connectors. There are 5 types of connector. Each connector type has its own specific parameters. These parameters should be linked in accordance with the NLRS parameters for connectors as specified in chapter 5.3.

7.4.3 Connector remarks

The Utility parameter is NOT being used.

Electrical	Specification	Comments
Power	Apparent Power	Instance for all families
Power-Balanced for all families	Load Classification	Instance for all families
	Description	Intended for physical type of connection if applicable
	Load Sub-Class Motor	Only for high power pumps / motors
	Voltage	To be parametrized
	Number of Poles	To be parametrized
Data	Description	Purpose of the data connection
Fire Alarm	Description	Type of Fire Alarm function
Telephone	Description	Type of Telephone function (integrated or other)
Security	Description	Type of Security function
Nurse Call	Description	Type of Medical emergency function
Controls	Description	Function type (sensor or other)
Communication	Description	Type of Human interaction function

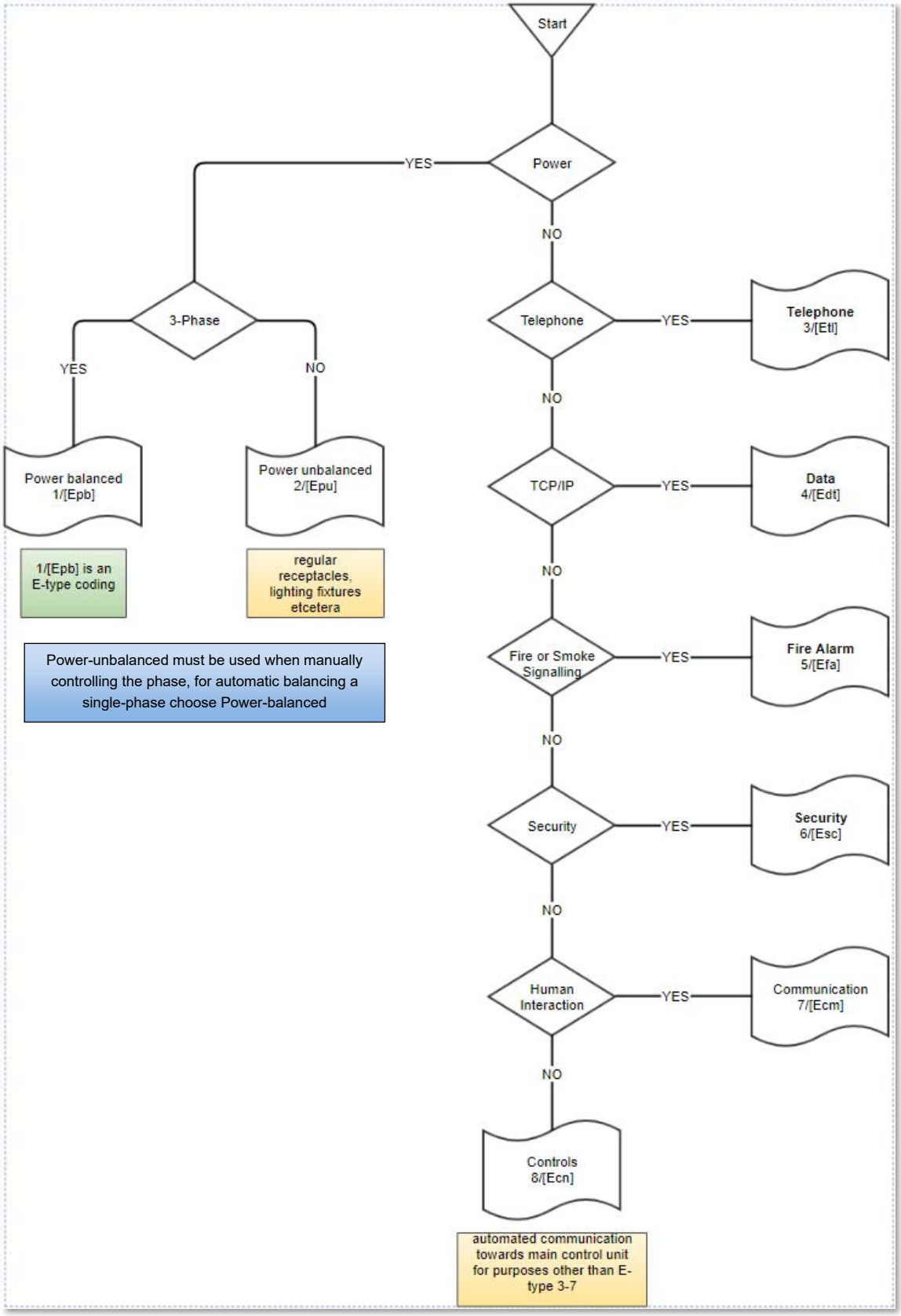
7.5 Native Revit System

In accordance with NLRS, each family should contain at the minimum the list of parameters below. Due to the nature of UOB content, not all parameters are applicable. It has also been elected that NLRS parameters should be omitted when they are duplicates of Built-in parameters.

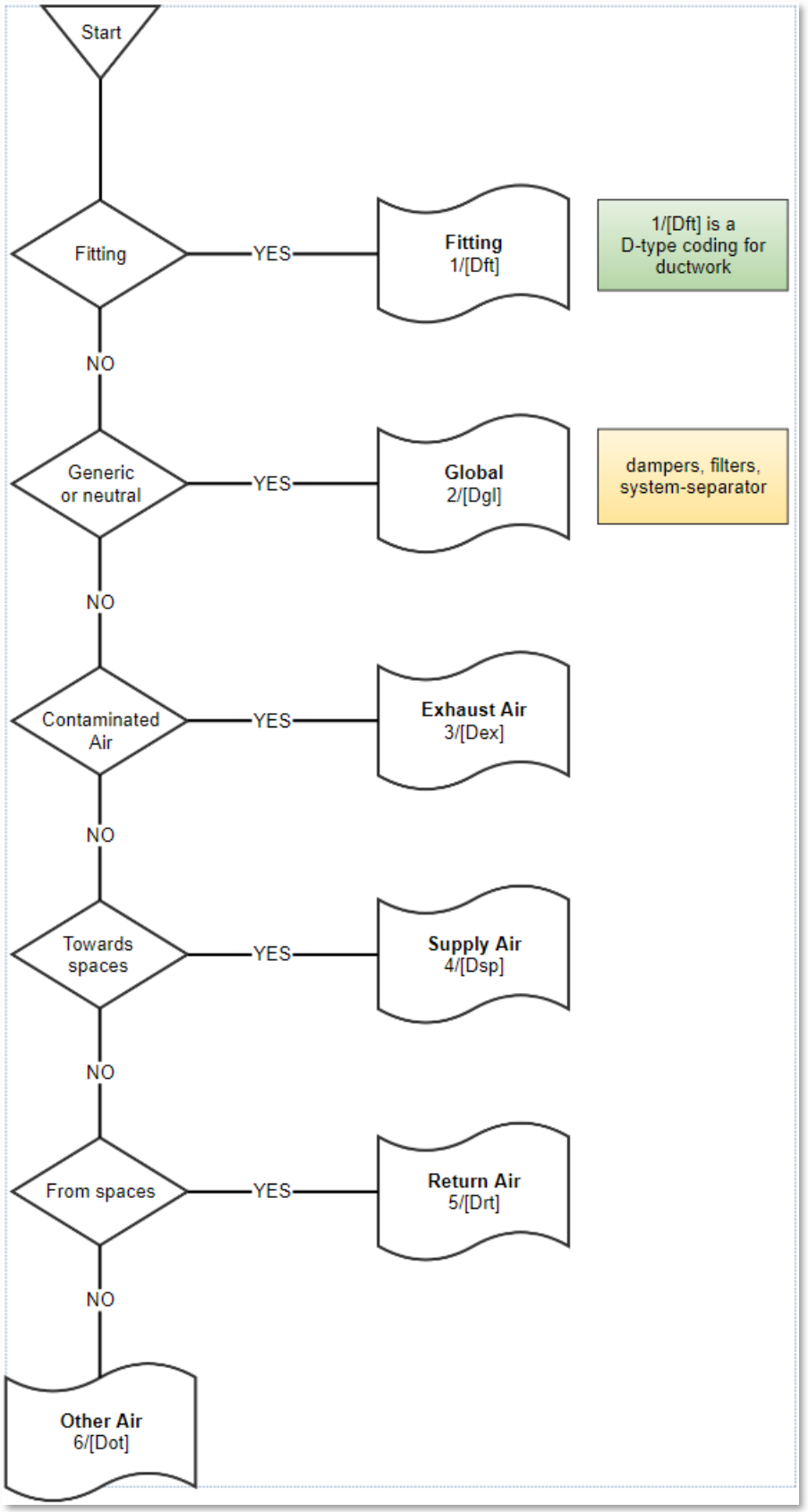
Parametername		Description / purpose
Assembly Code		Intentionally left blank
Cost		Intentionally left blank
Description	x	*uob_MC_description*
Keynote		Intentionally left blank
Manufacturer	x	*uob_prod_Brandname*
Model		'-' (minus) as initial value
Type Comments		Intentionally left blank
Type Image		Intentionally left blank
URL	x	Intentionally left blank

8 APPENDIX A: SYSTEM CONNECTORS

8.1 Electrical System connectors



8.2 Ductwork System connectors



8.3 Pipework System connectors