Technical specification code: MAT-E&C-NC-2021-0057-GIN

Version no. 2 dated [17/02/2022]

Subject: Global Infrastructure and Networks GSCG003 - Employer's Information Requirements for supplier power components / devices

Application Areas
Perimeter: *Global*
Staff Function: -
Service Function: -
Business Line: *Infrastructure & Networks*

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THE HEAD OF COMPONENTS AND DEVICES DESIGN
Enrico Valigi

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1. DOCUMENT AIMS AND APPLICATION AREA

The purpose of this Technical specification is to provide the BIM Employer's Information Requirements (EIR Supplier), with the aim of supporting Enel Global Infrastructure and Networks vision for the implementation of an OpenBIM methodology based on the IFC extension, and to unify equipment and project information.

This approach has been defined has the main tool to support development, definition, and communication of technical standards at a global level.

The EIR Supplier has been written by ENEL in order to define the basis of development and homologation of standardized BIM models by all its suppliers.

The development of standardized and homologated BIM models and their utilization during: design, build, operation and management of assets; allows ENEL to ensure which the information, provided and used by the person involved in the different project's development, is comparable and work as a support to standardized processes at a global level.

Within the ENEL`s global activity and his BIM implementation process a set of standards, defined in the present document, have been developed. All the ENEL suppliers which develop any BIM model must be compliant with the criteria defined.

This document shall be implemented and applied to the extent possible within the Global Infrastructure and Networks Business Line and in compliance with any applicable laws, regulations and governance rules, including any stock exchange and unbundling-relevant provisions, which in any case prevail over the provisions contained in this document

1.1 RELATED DOCUMENTS TO BE IMPLEMENTED AT COUNTRY LEVEL

This document applies to both Enel Global Infrastructure and Networks Srl Company, as it is, and within Infrastructure and Networks Business Line, when each Company must issue, under the supervision of Global I&N - Engineering and Construction, a detailed document in accordance with the provisions of this document.

2. DOCUMENT VERSION MANAGEMENT

Version	Date	Main changes description
1	25/10/2021	Issuing of "GSCG003 - Employer's Information Requirements for supplier components" technical specification.
2	17/02/2022	General review, some unnecessary parts removed

3. UNITS IN CHARGE OF THE DOCUMENT

- Responsible for drawing up the document: Global Infrastructure and Networks: Engineering and Construction / Components and Devices Design / Network Components unit.

Responsible for authorizing the document:

- Global Infrastructure and Networks: Head of Network Components unit;
- Global Infrastructure and Networks: Head of Quality unit.

4. REFERENCES

- Code of Ethics of Enel Group;
- Enel Human Right Policy;
- The Enel Group Zero Tolerance of Corruption (ZTC) Plan;
- Organization and management model as per Legislative Decree No. 231/2001;
- Enel Global Compliance Program (EGCP);
- Integrated Policy of Quality, Health and Safety, Environment and anti-Bribery;
- ISO 9001:2015 - Quality Management System - Requirements;
- ISO 14001:2015 - Environmental Management System - Requirements and user guide;
- ISO 45001:2018 - Occupational Health and Safety Management System - Requirements and user guide;
- ISO 50001:2018 - Energy management systems - Requirements with guidance for use;
- ISO 37001:2016 - Anti-bribery Management System - Requirements with guidance for use.

5. ORGANIZATIONAL PROCESS POSITION IN THE PROCESS TAXONOMY

Value Chain/Process Area: Engineering and Construction

Macro Process: Network Engineering

Process: Network Design

6. DEFINITIONS AND ACRONYMS

Acronym and Key words	Description
Building Information Modelling (BIM)	Use of a shared digital representation of a built asset to facilitate design, construction, and operation processes to form a reliable basis for decisions.
2D drawing (2D)	Originating from a BIM model through export.
3D model (3D)	Model with the Geometry of the project. If it contains information.
ASSET	They are virtual elements that represent the real ones and that contain graphic and non-graphic information.
AS BUILT	BIM model with graphic and non-graphic information of the real state of the finished work.
Information Container (CONTAINER)	refer to the BIM model (ISO 19650).
Employers Information Requirement (EIR)	Set out the information required by the employer aligned to key decision points or project stages, enabling suppliers to produce an initial BIM execution plan from which their proposed approach, capability and capacity can be evaluated.
Globally Unique Identifier (GUID)	Unique identifier for the interoperability of files.
Industry Foundation Classes (IFC)	Industry Foundation Classes, format for the exchange of OpenBIM models A neutral, non-proprietary data format used to describe exchange of OpenBIM models.
Level of Definition (LOD)	Level of Definition of an asset or project. Sum of LoG, LoI.
Level of Geometry (LoG)	Asset geometry level
Level of information (LoI)	Level of information contained in the asset.

7. DESCRIPTION

This Technical Specification (EIR Supplier) has been written by ENEL in order to define the basis of development and homologation of standardized BIM models by all its suppliers.
All ENEL suppliers which develop any BIM model must be compliant with the criteria defined in this document.

The defined standard criteria are the following:

- Definition of standardization process, including modelling best practices, codification standards, level of geometric detail and level of information.
- BIM elements homologation process.
- Definition of the BIM procedures, including IFC export, property sets definition and native model configuration for BIM exports.

Annexes of this document for the specific element requested to be homologated:

- ANNEX A: Equipment specific requirements.
- ANNEX B: Level of Geometry (LoG).
- ANNEX C: Level of Information (LoI).
- ANNEX D: Element codification table.

Suppliers can develop BIM models using any authoring tools; it is important to adapt the procedures and criteria of their specific authoring tool following the logic and essence of the requirements established in this document.

7.1 DELIVERABLES & HOMOLOGATION PROCEDURE

All BIM models submitted by the suppliers must be homologated in order to guarantee the technical quality of the model and to ensure that it complies with the BIM standards defined in his document.

To achieve the normalization objectives, ENEL will require that all its suppliers develop standardized BIM models for all the equipment homologated to be installed and used in the network at a global level. These models will be used by different actors in the asset lifecycle and in different design, build, operations and management processes.

7.1.1. DELIVERABLES

The homologation process (TCA) will require the supplier, among other things, to model and deliver a BIM model, developed accordingly to the requirements and standards established in this document.

Deriverables

7.1.1.1. **IFC BIM model**

- Schema architecture - IFC 4.
- Export View – IFC 4 Reference View.
- The model must contain all Property sets defined in the LoI Annex provided by ENEL.
- The IFC Model should not exceed the size of 15 Mb.

7.1.1.2. **Native BIM Model**

- Model developed in the original BIM authoring tool.
- Supplier can use any BIM authoring tool to develop the BIM model, considering it possesses all the BIM capabilities essential to achieve the requirements established by ENEL.
- The model must contain all Property sets defined in the LoI Annex provided by ENEL.
- The Native Model should not exceed the size of 15 Mb. Possible exceptions in Annex A.

Likewise, the supplier will be required to deliver the LoI table with all the data required at LoI400 for ENEL´s use with the final delivery and installation of the equipment.

7.1.2. HOMOLOGATION PROCEDURE

During the homologation procedure (TCA), the supplier will be requested do develop and deliver a BIM Model that represents the homologated equipment accordingly to the requirements define in this document.

7.2 ANNEX A: Equipment specific requirements

This Annex gives components specific additional information for BIM modelling. It defines if the specific component has to be modelled as:

- Simple Component: is represented by a single geometric and data structure entity.
  - From IFC point of view the component is a single building element.
  - Annex C (LoI) has only one spreadsheet because the data structure shall be connected to a single building element.
- Complex Component: is represented by one geometric and data structure entity for each subcomponent defined in Annex A.
  - From IFC point of view the component must have a number of building elements equal to the number of subcomponents.
  - Annex C (LoI) has one spreadsheet for each subcomponent.

In Annex A possible exceptions regarding the common rules defined in this document are given, for example:

- File limit dimensions
- Definition of geometric structure by more than one element for a simple component (*)
- Other if necessary.

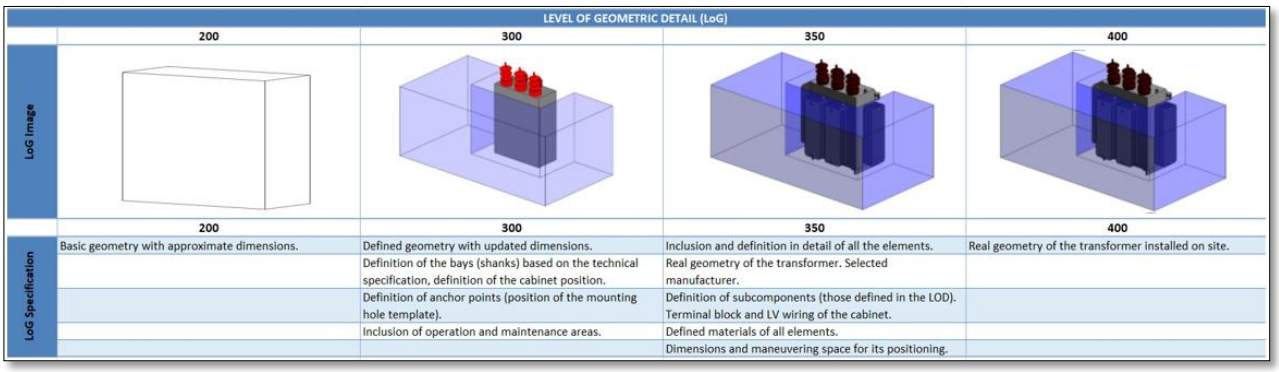
(*) As a general rule simple components must correspond to a single building element in IFC format. However in some cases it can be requested to divide a single component in more than one element. This request will be included in Annex A for each specific component. In any case the information structure shall be linked to the element that represent the main body of the component (see 7.4).

7.3 ANNEX B: Level of Geometry (LoG)

Annex B (LoG) criterion identifies and describes the quality of the graphic representation and the degree of detail of an element, defining its overall dimension and shape and its internal components or subcomponents.

It will include the definition of graphic representations of non-physical spatial criteria, such as areas of action due to the movement of subcomponents, or other types of physical considerations for construction, operation and maintenance uses. These may include equipment maintenance areas or areas of special action during the installation or maintenance of the equipment.

These criteria will be defined by ENEL in a standardized way through the **LoG Table** included in this document as Annex B. The supplier shall follow the indication for level of detail LOG 350, which shall include also all the details of lower levels (LoG 200 and LoG 300).



LEVEL OF GEOMETRIC DETAIL (LoG)				
	200	300	350	400
LoG Image				
	200	300	350	400
LoG Specification	Basic geometry with approximate dimensions.	Defined geometry with updated dimensions.	Inclusion and definition in detail of all the elements.	Real geometry of the transformer installed on site.
		Definition of the bays (shanks) based on the technical specification, definition of the cabinet position.	Real geometry of the transformer. Selected manufacturer.	
		Definition of anchor points (position of the mounting hole template).	Definition of subcomponents (those defined in the LOD). Terminal block and LV wiring of the cabinet.	
		Inclusion of operation and maintenance areas.	Defined materials of all elements.	
			Dimensions and maneuvering space for its positioning.	

Figure 1 – Annex B (Level of Geometry: LoG) – Example

All geometric elements not defined as subcomponents in the **LoG Table** must be associated with the subcomponent to which it is logically connected.

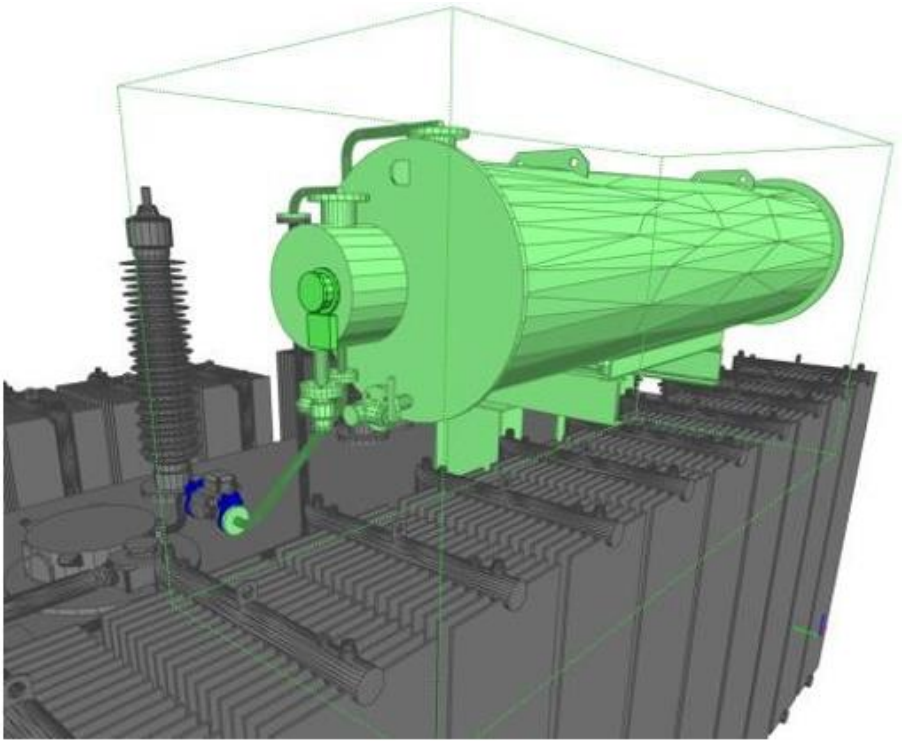


Figure 2 – Subcomponent geometry – Example

The color of the materials used in the models shall have the same appearance as the real component.

7.4 ANNEX C: Level of Information (LoI)

Annex C (LoI) identifies and describes the type of information, the format and content of the data to be included in each type of element.
According to IFC standard, attributes are organized in Property Sets (groups of attributes), as detailed in Annex C for each component.

The LoI that shall be used for the equipment to be homologated, delivered by ENEL during the homologation, will denote which data need to be indicated by supplier.
In case the supplier identifies any data required in the LoI structure that is not applicable to the equipment developed, that parameter will be left empty or blanked.

In Figure 3 an example of LoI is provided, to better understand the information structure required for the BIM model.

	A	B	C	D	E	F	G	H	I
3	X:Mandatory O:Optional								
4				Attribute Description					
5		Group	Attribute	Data Type	Units	Description			Information
6		GLOB_CAT_MASTERDATA							
7			GLOB_CAT_MASTERDATA__GLOB_CAT_CODE	TEXT		Code Global Category			TR
8			GLOB_CAT_MASTERDATA__GLOB_CAT_DESC	TEXT		Description Global Category			POWER TRANSFORMERS
9			GLOB_CAT_MASTERDATA__IS_MULTIBAY	Boolean		Multibay			1
10			GLOB_CAT_MASTERDATA__SCHEME	TEXT		Scheme			[N] Network
11			GLOB_CAT_MASTERDATA__TYPE	TEXT		Typology			[C] Component
12		GLOB_TYPE_MATGROUP							
13			GLOB_TYPE_MATGROUP__MATGROUP_GLOB	TEXT		Gruppo Merci Globale			FETR0509
14		GLOB_TYPE_MASTERDATA							
15			GLOB_TYPE_MASTERDATA__DATE	TEXT		Data			15-01-2014
16			GLOB_TYPE_MASTERDATA__GLOB_TYPE_CODE	TEXT		Codice Global Type			GST002/241
17			GLOB_TYPE_MASTERDATA__GLOB_TYPE_DESC	TEXT		Descrizione Global Type			POWER TRANSFORMERS
18			GLOB_TYPE_MASTERDATA__OPER_VERSION	TEXT		Versione Operativa			[S] Yes
19			GLOB_TYPE_MASTERDATA__PARENT_MODEL_ID	TEXT		Riferimento Livello Superiore			_TR
20			GLOB_TYPE_MASTERDATA__REVISION_CODE	TEXT		Revisione			01
21			GLOB_TYPE_MASTERDATA__TECH_SPEC_CODE	TEXT		Codice Specifica Tecnica			GST002
22			GLOB_TYPE_MASTERDATA__TECH_SPEC_DESC	TEXT		Descrizione Specifica Tecnica			POWER TRANSFORMERS
23		GLOB_TYPE_TR_CT							
24			GLOB_TYPE_TR_CT__TR_COOLING_SYSTEM	TEXT		Cooling System (ONAN-AF, ... , Powers (MVA))			ONAN - ONAF (20-25/20-25)
25			GLOB_TYPE_TR_CT__TR_EFFICIENCY_INDEX	INTEGER	%	Minimum Efficiency Index required @kEI (%)			99,7
26			GLOB_TYPE_TR_CT__TR_FALL_ARREST_SYS_FOR_OPER	TEXT		Fall arrest system for operator			[1] Yes
27			GLOB_TYPE_TR_CT__TR_FREQUENCY	INTEGER	Hz	Rated frequency: fr (Hz)			50
28			GLOB_TYPE_TR_CT__TR_HV_DOUBLE_LEV_CHANGE	TEXT		HV Double Level change (YES/NO)			[2] No
29			GLOB_TYPE_TR_CT__TR_HV_INSULATION_LEVEL	TEXT		HV Insulation Levels - (Um/SI/LI/LIC/AC) (kV)			72.5/325/140/-/-
30			GLOB_TYPE_TR_CT__TR_HV_NEUTRAL	TEXT		HV Neutral (accessible/not accessible)			[1] Accessible
31			GLOB_TYPE_TR_CT__TR_HV_NEUTRAL_INS_LEV	TEXT		HV Neutral insulation levels (Um/LI/AC) (kV)			72.5/325/140/-/-
32			GLOB_TYPE_TR_CT__TR_HV_VOLT_REG	TEXT		HV Volt. Reg. (n. of steps, value %)			±11x1.50%
33			GLOB_TYPE_TR_CT__TR_HV_VOLT_REG_TYPE	TEXT		HV Volt. Reg. Type (OLTC, DETC, NO)			[1] OLTC
34			GLOB_TYPE_TR_CT__TR_INSTALLATION	TEXT		Installation (Indoor, Outdoor)			[2] Outdoor
35			GLOB_TYPE_TR_CT__TR_MV_CHANGER_TYPE	TEXT		MV Changer Type (DETC, Intanked Bars, N/A)			[3] N/A

Figure 3 – Level of Information (LoI) - Annex C. Example

The type of parameter is defined in the **Data Type** column, this information is important to guarantee the correct export of the data types that the BIM model houses and their future interconnection with the database that can correctly read all defined attributes.
For simple components that only have one LOI, but are divided, only from the geometry point of view, in different subcomponents, all the information must be included in the main subcomponent of the model.

7.5 ANNEX D: Element codification table

The majority of codes, naming and classes defined can be found in the **Annex D (Elements Codification Table).**

- In case of complex components defined by ENEL and detailed in the Annex A (Equipment specific requirements), each sub-component needs to be followed by a dedicated LoI.
- The information defined in the LoI will be categorized accordingly to the IFC class defined in Annex D for each subcomponent.
- In case of complex component, the general information regarding the whole component will be associated to the IfcProject level. This information is included in one specific spreadsheet of LoI table.
- The information regarding subcomponents (in case of complex components) or all the information (in case of simple components) will be associated to the IfcBuildingElement level.

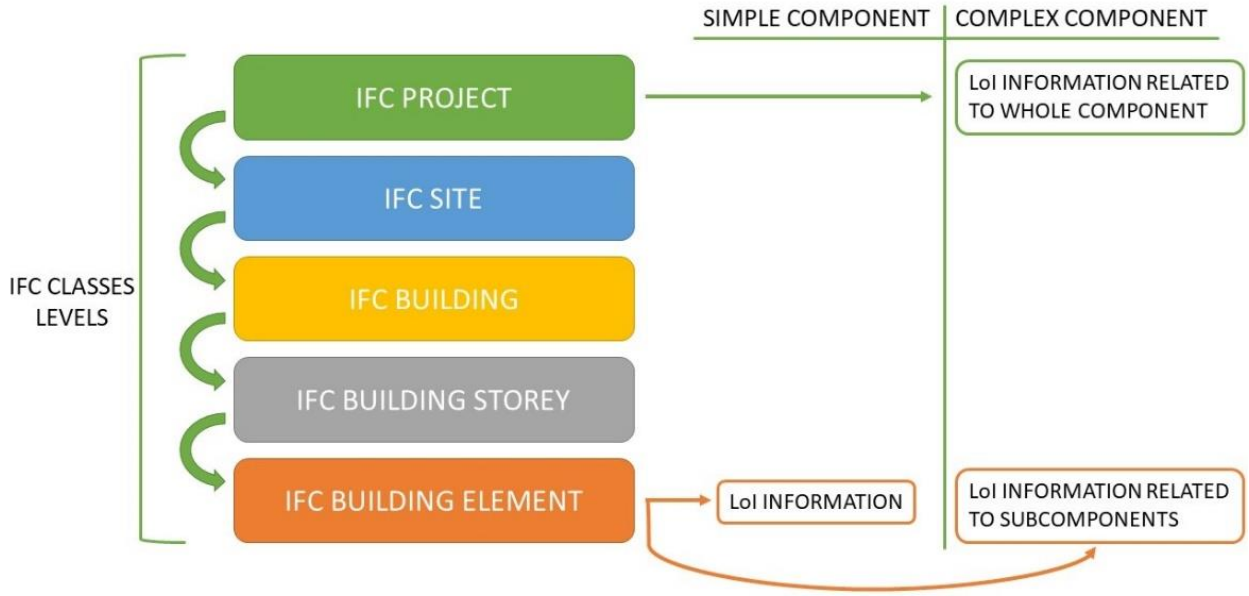


Figure 4 – IFC classes level and location of information for simple and complex components

ELEMENT CODE	ELEMENT DESCRIPTION	IFC CLASS
Tank & Tank Cover	Tank and Tank Cover	**IfcTransformer**
BushingsPrimaryU	Primary BUSHINGS - PHASE U	**IfcDistributionFlowElement**
BushingsPrimaryV	Primary BUSHINGS - PHASE V	**IfcDistributionFlowElement**
BushingsPrimaryW	Primary BUSHINGS - PHASE W	**IfcDistributionFlowElement**
BushingsPrimaryN	Primary BUSHING - NEUTRAL	**IfcDistributionFlowElement**
BushingsSecundaryU	Secondary (1) BUSHINGS - PHASE U	**IfcDistributionFlowElement**
BushingsSecundaryV	Secondary (1) BUSHINGS - PHASE V	**IfcDistributionFlowElement**
BushingsSecundaryW	Secondary (1) BUSHINGS - PHASE W	**IfcDistributionFlowElement**
BushingsSecundaryN	Secondary (1) BUSHINGS - NEUTRAL	**IfcDistributionFlowElement**
BushingsSecundaryU	Secondary (2) BUSHINGS - PHASE U	**IfcDistributionFlowElement**
BushingsSecundaryV	Secondary (2) BUSHINGS - PHASE V	**IfcDistributionFlowElement**
BushingsSecundaryW	Secondary (2) BUSHINGS - PHASE W	**IfcDistributionFlowElement**
BushingsSecundaryN	Secondary (2) BUSHINGS - NEUTRAL	**IfcDistributionFlowElement**
BushingsTertiaryU	STABILIZING WINDING/TERTIARY BUSHINGS U	**IfcDistributionFlowElement**
BushingsTertiaryV	STABILIZING WINDING/TERTIARY BUSHINGS V	**IfcDistributionFlowElement**
BushingsTertiaryW	STABILIZING WINDING/TERTIARY BUSHINGS W	**IfcDistributionFlowElement**
LoadTopChanger	ON LOAD TAP CHANGER	**IfcController**
EnergizedTapChanger	DE - ENERGIZED TAP CHANGER (1)	**IfcController**
EnergizedTapChanger	DE - ENERGIZED TAP CHANGER (2)	**IfcController**
Radiator	RADIATORS	**IfcHeatExchanger**
RadiatorValve	Valves for radiator	**IfcValve**
Fan	FANS	**IfcFan**
OilTempIndicator	Oil Temperature Indicator (OTI)	**IfcSensor**
WindingTempIndicator	Winding Temperature Indicator (WTI - THERMAL IMAGE)	**IfcSensor**
BuchholzRelay	BUCHHOLZ RELAY	**IfcFlowInstrument**
BuchholzValve	Buchholz interception valves	**IfcValve**
BuchholzRelay	BUCHHOLZ RELAY between conservator and relief junctions of bottom flange of Oil/SF6 or Oil/Oil bushings	**IfcSensor**
BuchholzRelay	BUCHHOLZ RELAY between cable boxes and compensator - for OIL/OIL primary bushings	**IfcSensor**
OilCableBox	OIL CABLE BOXES	**IfcCovering**
GasSampling	Gas Sampling Device	**IfcTank**
FluxRelay	OLTC PROTECTIVE FLUX RELAY	**IfcFlowInstrument**
RelayValves	OLTC relay interception valves	**IfcValve**
OilLevelIndicator	Oil Level Indicator (OLI)	**IfcFlowMeter**
LiquidTempIndicator	Liquid temperature indicator	**IfcSensor**
BreatherTR	Dehydrating Breather for TR	**IfcFilter**
BreatherOLTC	Dehydrating Breather for OLTC	**IfcFilter**
PT-100	PT-100	**IfcSensor**
ThermalPocket	THERMAL POCKET	**IfcCovering**
OverpressureValve	Overpressure Valves (Pressure Relief Devices)	**IfcValve**
LiquidSamplesValve	Valves for extracting liquid samples	**IfcValve**
LiquidTreatmentValve	Valves for liquid treatment	**IfcValve**
VacuumPumpValve	Valve for vacuum pump	**IfcValve**
Conservator	Conservator	**IfcTank**
SiteArea	Areas and spaces	**IfcSpace**
FoundationArea	Areas and spaces	**IfcSpace**
OperationArea	Areas and spaces	**IfcSpace**

Figure 5 – Element codification table - Annex D. Example

7.5.1. ELEMENTS CODIFICATION

The name of all the files for the models to be delivered, both .IFC and native, must have the following codification:

$$ENEL - I\&N - GLOBAL - TYPE - [MANUFACTURER] - [Element] - [Model]$$

[MANUFACTURER] To be defined by the supplier, it will be a CODE with 4 characters that identifies the name of the supplier. Examples are identified in the Annex D.

[Element] This code is defined in the column *Element code* of the Annex D for each component and subcomponent to be delivered (using 'CamelCase' mode).

[Model] To be defined by the supplier (using 'CamelCase' mode). It is Compulsory at As Built level for Asset Management uses.

7.5.2. IFC NAME

The **IfcName** parameter must be created in the native model. The data in this parameter will be indicated by Enel on the Annex C. according with the description of the attribute **TECH_DETAIL__IFCNAME.** This indication applies to all the components and sub-components.

7.5.3. IFC CLASSES

In the native file, categories of elements must be specified in order to be exported to IFC extension. These categories are called IFC Classes. This configuration can be done using the **IfcExportAs** parameter. This parameter is associated with a specific physical element. It allows 2 elements with the same classification within the same group of the native program to be exported to different IFC classes.

All IFC classes and native categories of the different elements are defined in **Annex D** (Element codification table). An example is given in Figure 5.

7.6 AREAS AND SPACES

In the LoG table of each element, spaces or physical zones with certain functions are defined: it is possible to define areas for coordination during the project phases, forecast areas for the work or commissioning phase or even areas for operation actions or maintenance.

They will be used mainly to define the areas where coordination actions with other elements must be considered. An example are the areas for operation and maintenance, such as the action zone of a door movement or minimum distances between equipment.

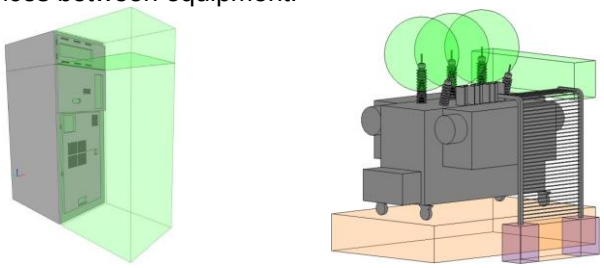


Figure 6 – Areas and spaces example

Each zone will be identified with a unique material for each type of action within an element, this material must be coded according to the use of the zone it defines and, considering that it is not a physical element, it must have transparency properties.

Identify the type of zones available:

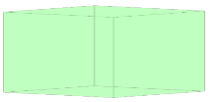
Zone Name:	Site Area	Foundation Area	Operation Area
Image Zone			
IFC Class	IfcSpace	IfcSpace	IfcSpace
Visibility Parameter	VIS_SITE	VIS_FOUNDATION	VIS_OPERATION
Data Type	BOOLEAN (YES/NO)		

Table 1 – Zone types

8. ANNEXES

8.1 ANNEX A. Equipment specific requirements

8.2 ANNEX B. Level of Geometry (LoG)

8.3 ANNEX C. Level of Information (LoI)

8.4 ANNEX D. Elements codification table

8.5 ANNEX E. GUIDELINES FOR MODELIZATION

8.5.1. ENEL BIM CONCEPTS / STANDARDS

In this paragraph basic concepts for the development of suppliers BIM models are given.

8.5.1.1. LEVEL OF DETAIL (LOD)

The Level of Definition (LOD) is a classification system that allows establishing the type and quality of information according to a progressive structure based on a numerical scale. This numerical classification allows defining the minimum quantity and quality of the information that the BIM model must contain, associating each level to a specific BIM phase or use.

The objective of defining a Level of Definition (LoD) concept is to provide a set of standards that ensure that all BIM models and their content are developed according to minimum and consistent standards, with a uniform geometric definition and data structure.

For this, it is considered important to define a specific LOD concept for ENEL, based on existing international standards, combining the different types of information to be defined for each type of element or equipment in each project phase.

8.5.1.2. LOD CONCEPT

The reference to LOD is commonly used in the industry to define the Level Of Detail (or Development) as a single criterion. ENEL defines the concept of LOD as the duality between the level of development of the geometry and the amount of information and data.

In this way, the concept of Level of Development (LOD) will be based on two criteria of consideration, **Level of Geometry** (LoG) and **Level of Information** (LoI).

LOD = LoG + LoI

8.5.1.3. OPENBIM

The openBIM concept, established by buildingSmart, is a concept that has the objective of expanding the benefits of BIM by improving the accessibility, usability, management and sustainability of digital data in the built asset industry.

ENEL has established openBIM as the main collaborative process for project collaboration and management of sharable project information, through vendor neutral processes and file formats.

The openBIM methodology is based on the use of open standards such as IFC, that serves as a data exchange format between agents, processes and applications.

8.5.1.4. IFC

The open format **IFC** (*Industry Foundation Classes*), international standard by **ISO 16739 "Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries"**, is the main standard that defines ENEL BIM methodology implementation.

For this reason a main ICF structure has been defined and it shall be applied to all BIM models developed by suppliers.

- IFC 4 is established as the main Schema to be used by ENEL.
- While the current schema does not include specific classes for High and Medium Voltage equipment, general electric classes have been defined for each type of equipment.
- A specific export process has been defined using custom Property Sets.
- The export view, IFC 4 Reference View, is defined as mandatory for the basis of the custom export profile.

8.5.2. MODELLING BEST PRACTICES

A set of minimum modelling best practices and coding standards have been defined by ENEL.

The examples hereinafter shown have been made using Autodesk BIM authoring software (Revit) and are given as examples. If different authoring tools are used, Supplier shall adjust the procedures and criteria to their specific authoring tool following the logic and essence defined in this document in order to obtain the same result in the IFC export.
The main standard to be followed by all suppliers when modelling the different elements is the LoG table (Annex B) and the defined characteristics of the specific element type.

In addition, a set of modelling best practices have been defined to standardize the overall geometric features of the models developed by multiple authors.

8.5.2.1. ELEMENT INSERTION POINT

The insertion point of the element in the project BIM model must be located at the point of contact or physical connection between that element and the rest of the components, that point must be located at the origin of the family as shown in the following plan and elevation illustrations of a string of insulators. In this example, the insertion point is located at the connection point of the insulation with the support structure.

- The coupling center of the element will be located at the origin (0,0,0).
- The coupling point will correspond to the point where it will be anchored with another element, for example, a chain of insulators, its center corresponds to the coupling with the post.

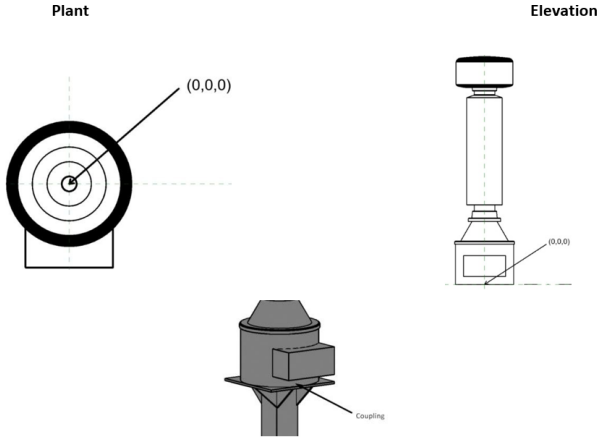


Figure 7 – Insertion point

8.5.2.2. ELEMENTS MODELLING

When modelling the elements, avoid designing several elements continuously: each element must be a single entity modelled separately, getting as close to the reality of the element as possible and avoiding interferences between the modelled elements. Below are some examples of rules to follow:

- Model subcomponents of the same element separately.
- Structural elements will form their own elements.
- Over-modelling must be avoided as much as possible.
- Internal non-visible components will not be modelled.
- Excess of information, that is not present on the LoI Tables, will be rejected.

GEOMETRY SIMPLIFICATION

An effort in limiting the excess of geometric information must be made in order to avoid oversized models. In order to achieve this in an effective and standardized manner, a set of overall recommendations for geometry simplification are included in this section.

- **Avoid Intersecting or superposed elements**

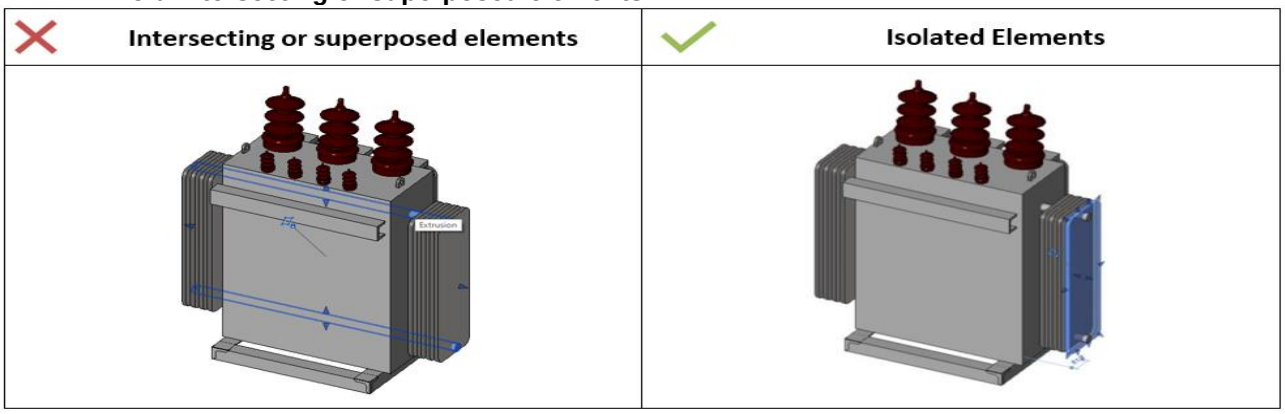


Figure 8 – Element modelling-1

- **Pipes & Reservoirs**

Hollow elements will be modelled as solid in each case for which the representation of internal geometry does not affect the general comprehension of element's geometry or function.

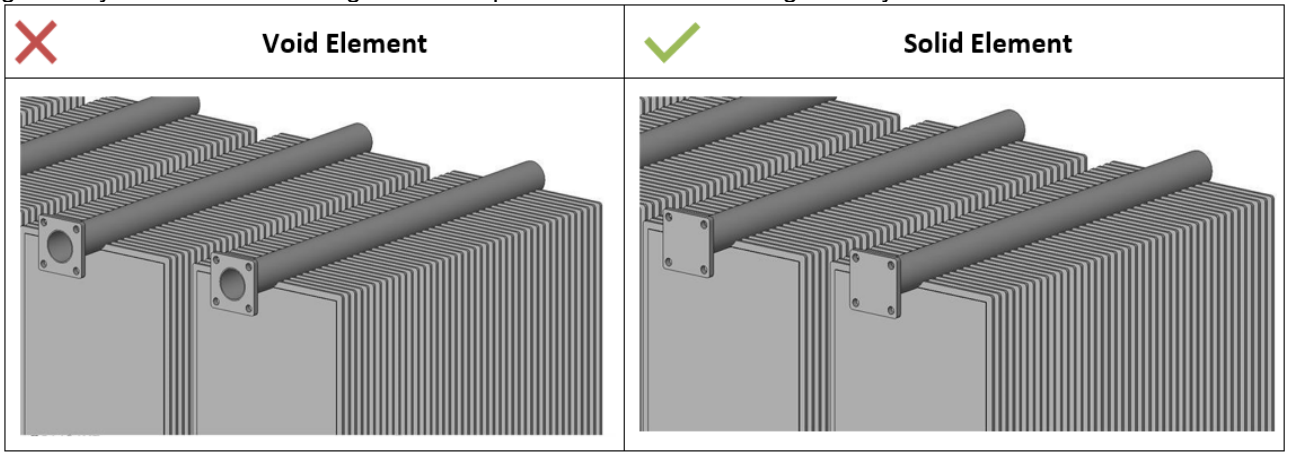


Figure 9 – Element modelling-3

- **Tubes and metallic profiles**

Hollow elements will be modelled as solid in each case for which the representation of internal geometry does not affect the general comprehension of element's geometry or function.

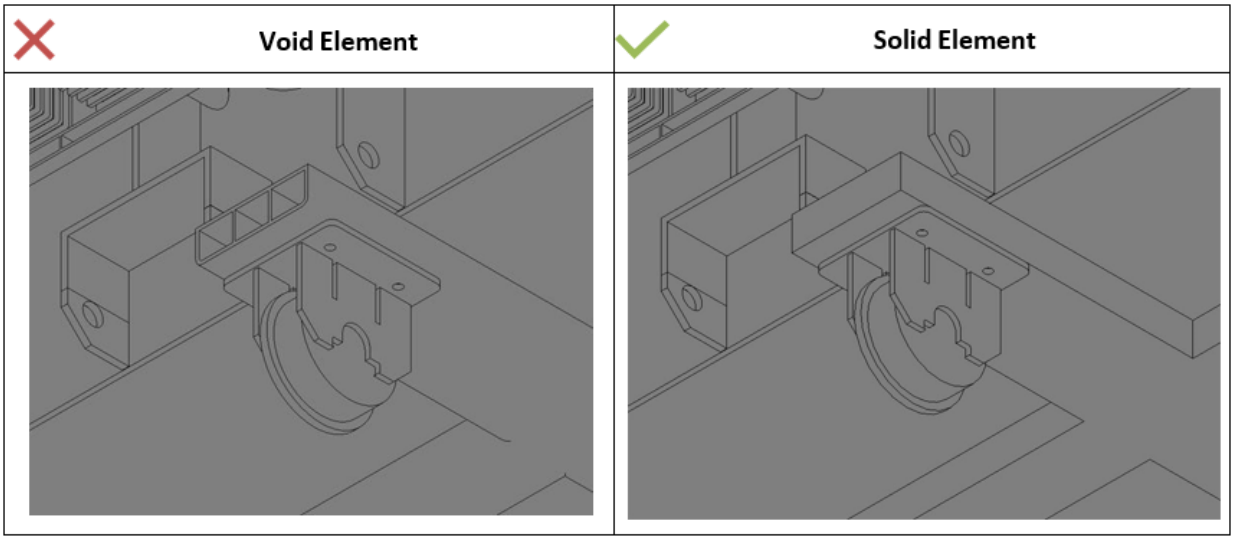


Figure 10 – Element modelling-4

- **Complex DDK elements**

Complex elements like grids, grills or continuous grid-like elements should be simplified by surfaces that simulate the result with simulated transparency.

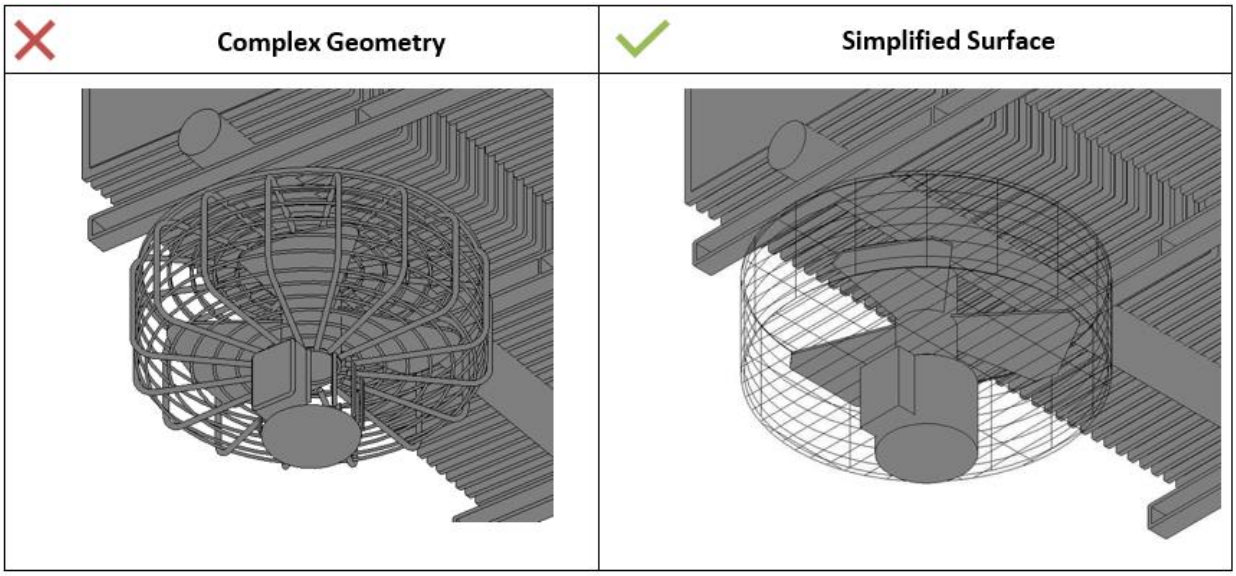


Figure 11 – Element modelling-5

- **Screws and other fasteners**

Small elements like screws and fasteners will be only represented by their external geometry, internal voids for fastener insertion, not visible geometry and internal geometry will not be represented.
This type of operations should be done to all relevant geometry as an overall optimization effort.

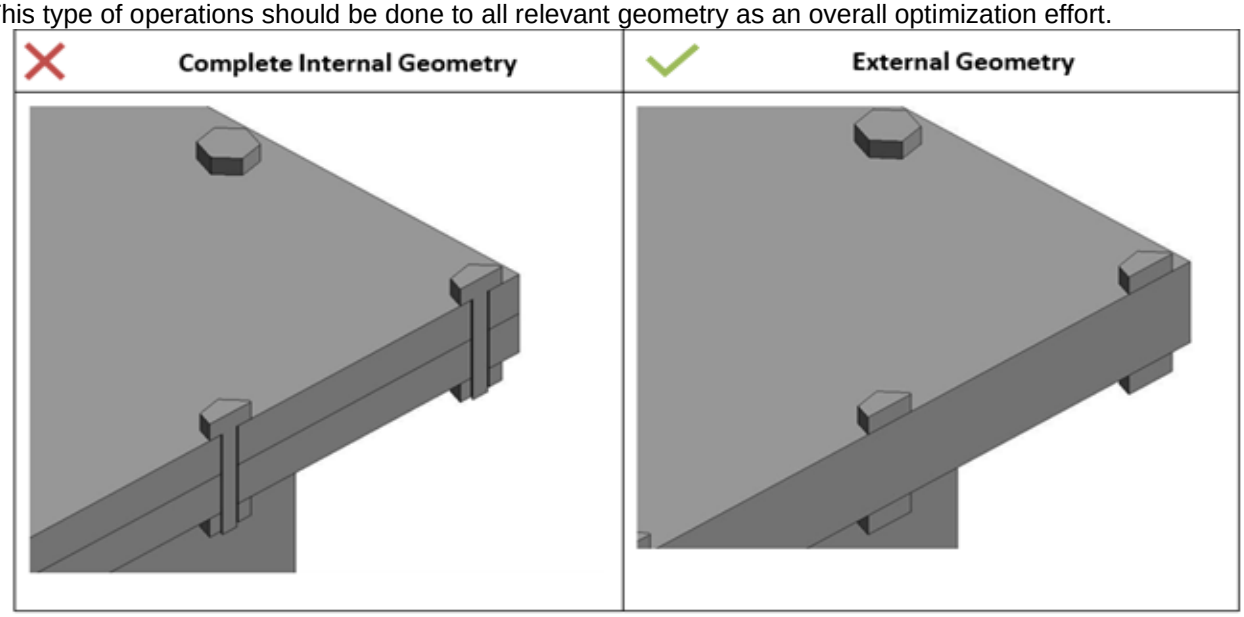


Figure 12 – Element modelling-6

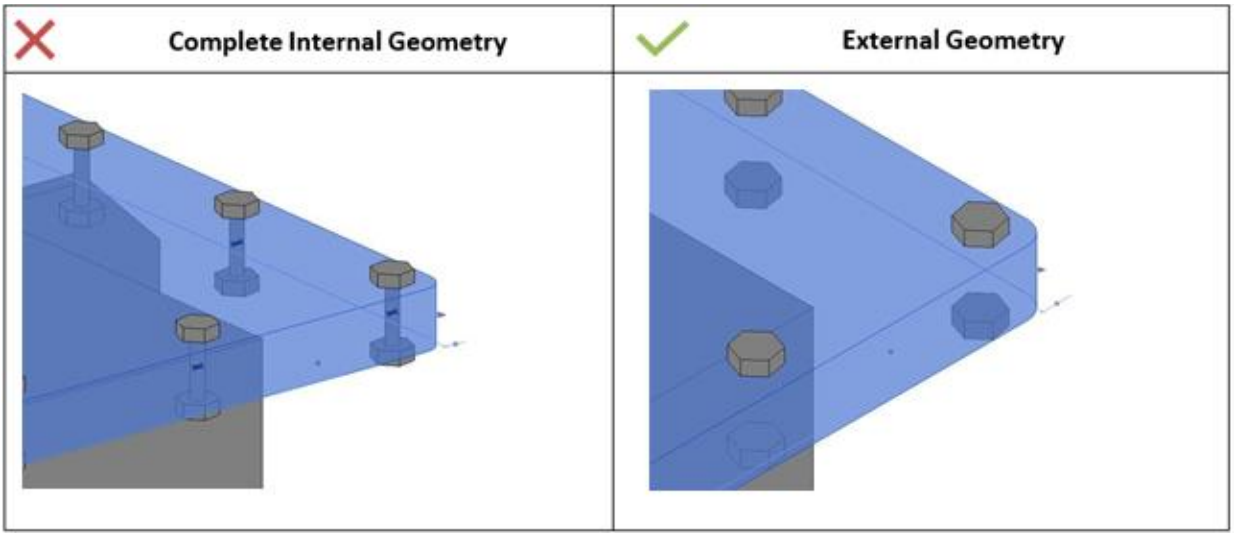


Figure 13 – Element modelling-7

8.5.2.3. LOCATION TO EXPORT TO IFC

Once the element has been developed both at a geometric and information level natively, the element must be inserted into a project in order to be exported. To facilitate future connections and couplings of elements after exporting, the coupling points, connection, etc., of the elements, will be located at the origin of the project (point 0,0,0).

- The Building Storeys will be located at the base level (Z=0.0) considered for the installation of the equipment on site. Example, 0.0 will be the ground level or top of foundation.

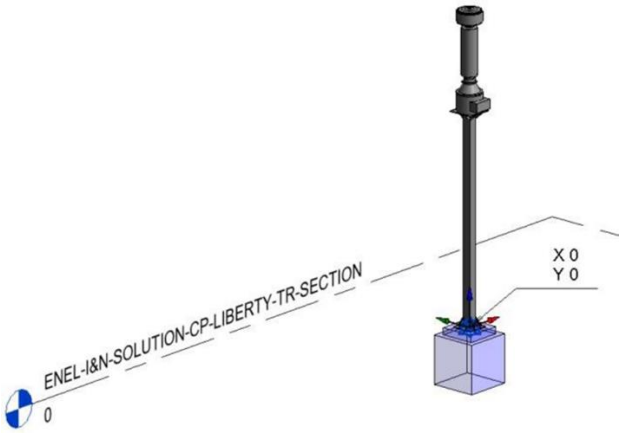


Figure 14 – Element location to export to IFC

8.5.2.4. EXAMPLE TO CREATE .TXT FILE OF THE P.SETS PROPERTY FILE

The supplier must create a list of parameters (using Autodesk Revit as an example) that must be associated with all projects and items search element. All information requirements are defined in the **Annex C. LoI.**

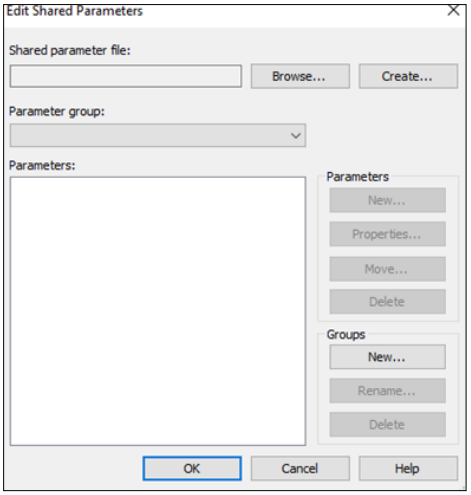


Figure 15 – Edit shared parameters

The list of parameters is grouped into Groups of parameters that will include all the parameters necessary to export the information required in each phase.

Figure 16 – Parameter group

Parameters in Annex C are grouped into Groups of parameters, and the type of information that each parameter will hold is also defined. The images below are just examples, each parameter must be defined with the discipline and type required accordingly to the data units.

For example, if we require the data to be set in Kg we will need to set the parameter as Type MASS and to the STRUCTURAL discipline, as showed in the image bellow.

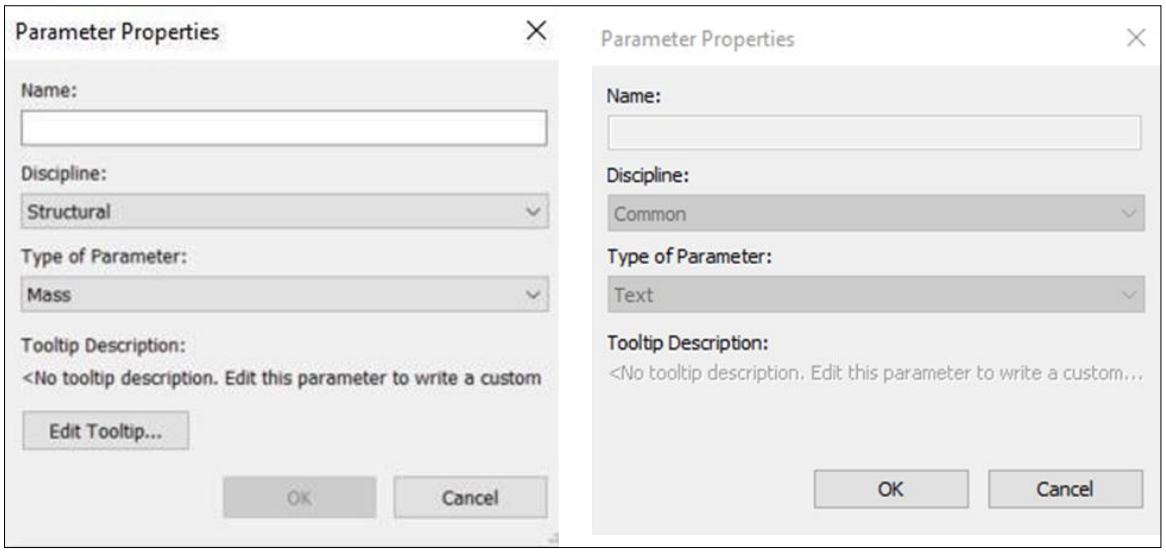


Figure 17 – Parameter properties example

Each supplier / engineering company must fill in the fields that are appropriate for each element and leave those that do not apply blank

8.5.3. BIM PROCESS TO EXPORT /SUBMIT

To export the native elements to IFC extension, the criteria established in this technical specification must be followed to guarantee compliance with ENEL standards.

The level of detail of the elements must include all the information required by ENEL in addition to what the manufacturer, from the point of view of the Geometry (LoG) deems appropriate, as mentioned in previous chapters.

The elements must not contain wiring systems or civil works elements, such as foundations, slabs, reinforcements. They will only include the established spaces that indicate civil works elements corresponding to Foundations Areas.

8.5.3.1. EXPORT CONFIGURATION

As previously defined, the file format to be used will be the IFC (Industry Foundation Classes) format in its 4 Reference View version.
The parameter export files, the Property Sets (Psets) must be defined by the BIM designer, considering the information defined in the LoI table and the native categories of the native modelling software.
For the process defined in this document, the Autodesk Revit settings and categories will be used, as indicated in Annex D.

At this point the criteria for the definition of lol Psets will be defined.

PROPERTYSET

The export files are defined using a file in .txt format, in which all the Property Sets and the parameters associated with their corresponding types are defined as shown in the following illustration.

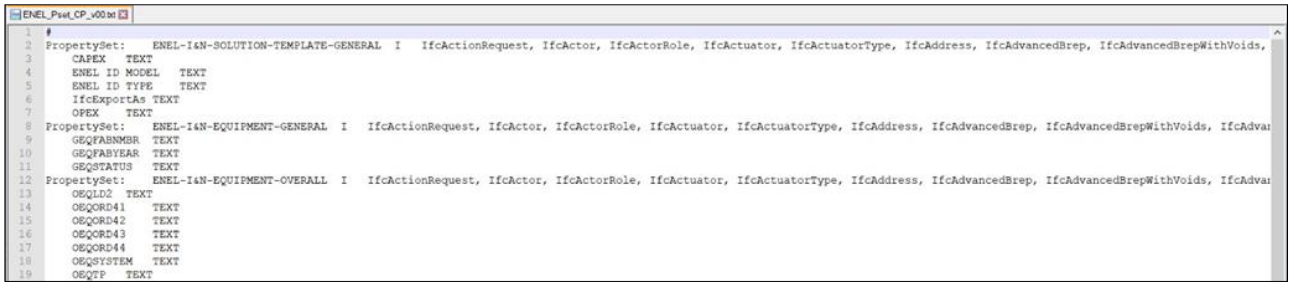


Figure 18 – Property set example

The configuration style of the export file that contains the Property Sets will be written:

- Using the **CamelCase** writing style for PropertySet code and IFC entities, that is, without spaces or accents and with the first letter of each word capitalized.
- Separating columns with tab.
- Always started by a pound sign (#).
- The names of the parameters and those of the Property Set group if it can contain spaces.
- As many Property Sets will have to be defined as groups of parameters are defined in the LoI information table.

The following zones are defined in the file.

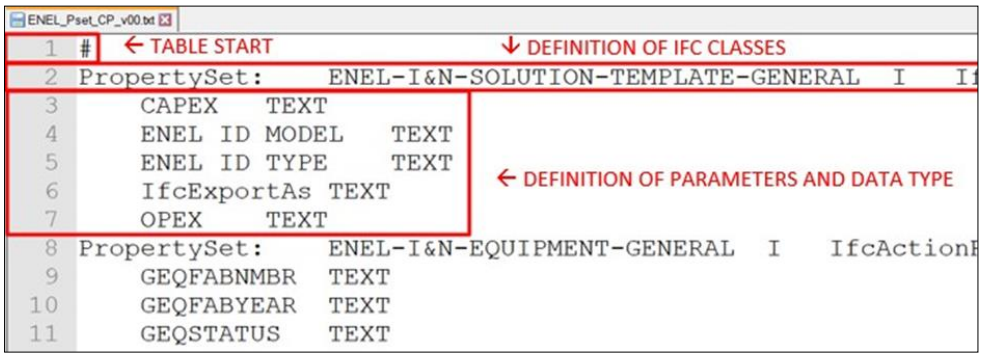


Figure 19 – Property set zones

Figure 20 – Property set example-2

- At the beginning the table is started (#),
- PropertySet group name will be defined
- The typology of the parameters associated with that PropertySet,
- The IFC categories to which it applies

The **PropertySet** typology can be an instance or a type, this refers to how the value of each parameter affects, if it is applied to a whole set of common elements (Type) or each instance may have an independent value (Instance). This definition is done in Revit, and as a rule they will all be defined as an instance.

IFC categories will be stated separated by commas, spaces and written in CamelCase style. All the categories that must be used are defined in the elements by means of the **IfcExportAs** parameter, according to the IFC classes defined.

PARAMETERS

Once the name, type and IFC categories that affect the PropertySet have been defined, the name of the parameters that you want to export from the model must be included:

- It should be started with tab and
- The exact name of the parameter to be exported will be written
- Separated with a tab, the type of parameter is indicated.

The names and types of parameters will be defined in a LoI table.

DIM_HEIGHT	LENGTH
DIM_LENGTH	LENGTH
DIM_SECTION	AREA
DIM_SURFACE	AREA
DIM_VOLUME	VOLUME
DIM_WEIGHT	MASS
DIM_WIDTH	LENGTH

Figure 21 – Parameter types example.

Generally, the following types of parameters will be used:

- TEXT - Data containing general information with text.
- AREA – Area data.
- LENGTH – Length data.
- REAL - Data type general numerical values such as voltage.
- VOLUME – Volume data.
- MASS – Weight data.
- INTEGER – Integer numeric data, such as the number of quantity of items.
- BOOLEAN – Logical value data of true or false

8.5.3.2. IFC PROFILE EXPORT FROM REVIT

Exporting an IFC from the authoring software is handled by the software's native export tool. An IFC export profile must be configured based on the native export in IFC4 Reference View version, and the export definitions indicated in the following images must be followed.

General Tab.

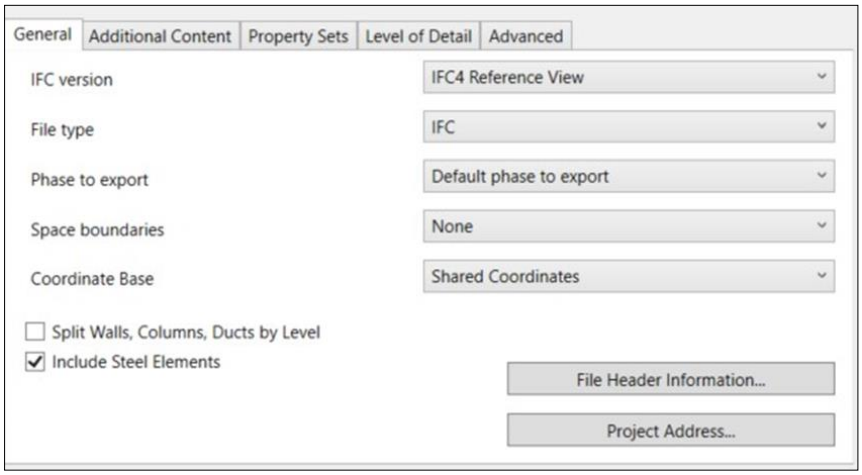


Figure 22 – IFC Export - General Tab.

- It will be done in IFC format
- The project phase specified by default will be defined (it can be changed to a different phase in order to fulfil the use considered for the model to be generated)
- The project origin will be defined by shared coordinates

Additional Content Tab.

Figure 23 – IFC Export - Additional Content Tab.

- Links will not have to be exported as separate IFC elements
- 2D views will not be exported
- It is recommended not to limit the export to barely visible elements. (This definition will depend on the modelling procedures and the complexity of the model to be exported)

Property Sets Tab

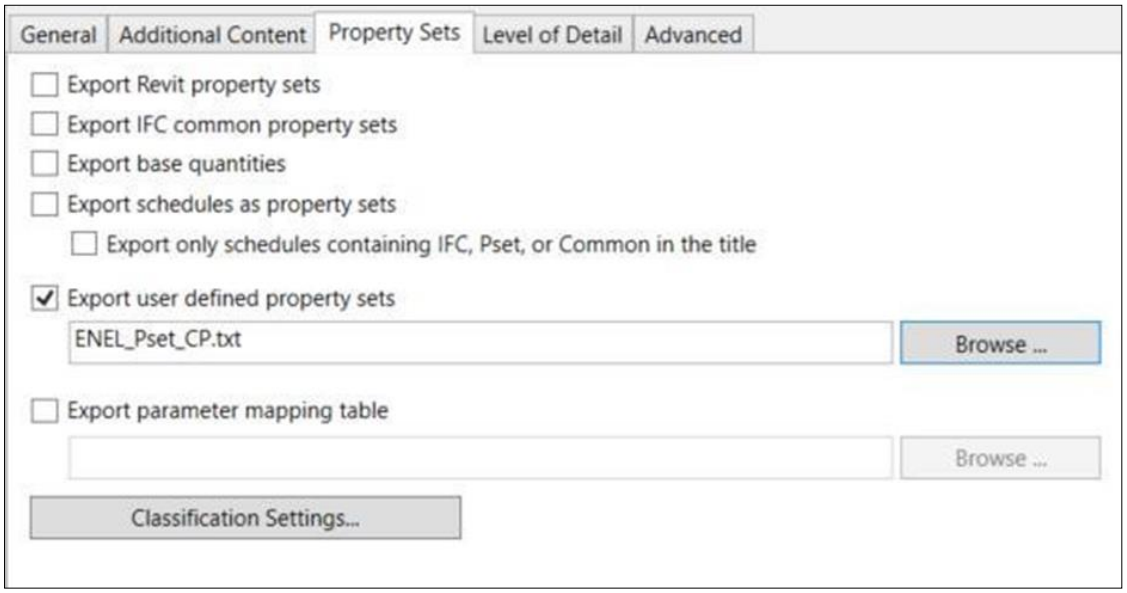


Figure 24 – IFC Export - Property Sets Tab.

- Export with user defined Property Sets will be selected
- You will have to locate the .txt file that has been generated previously where all the defined Property sets are located.
- It is not recommended to select the export of Revit Property Sets
- It is not recommended to select the export of native IFC Property Sets

Level of Detail Tab

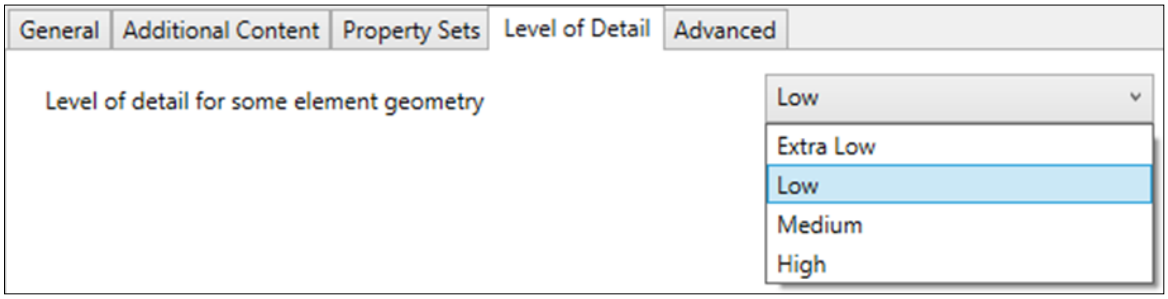


Figure 25 – IFC Export - Level of Detail Tab.

The level of detail in the export will be specified according to design requirements in the LoG Matrix, in general cases, the level of geometric detail will be defined as low.

Advanced Tab

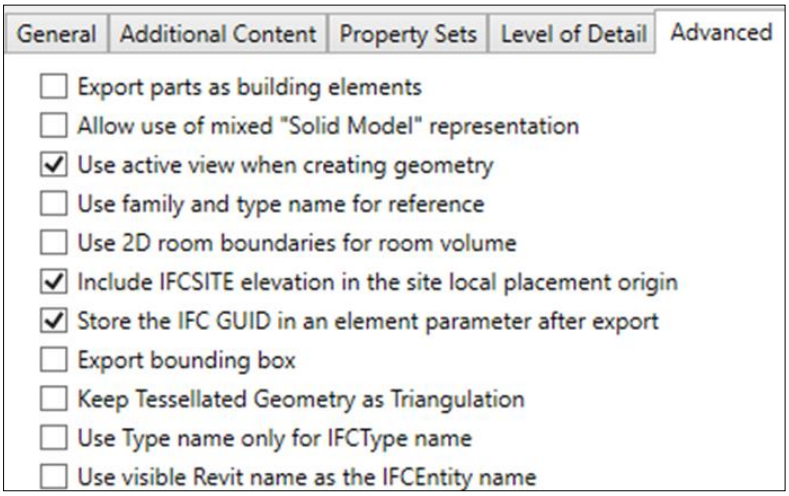


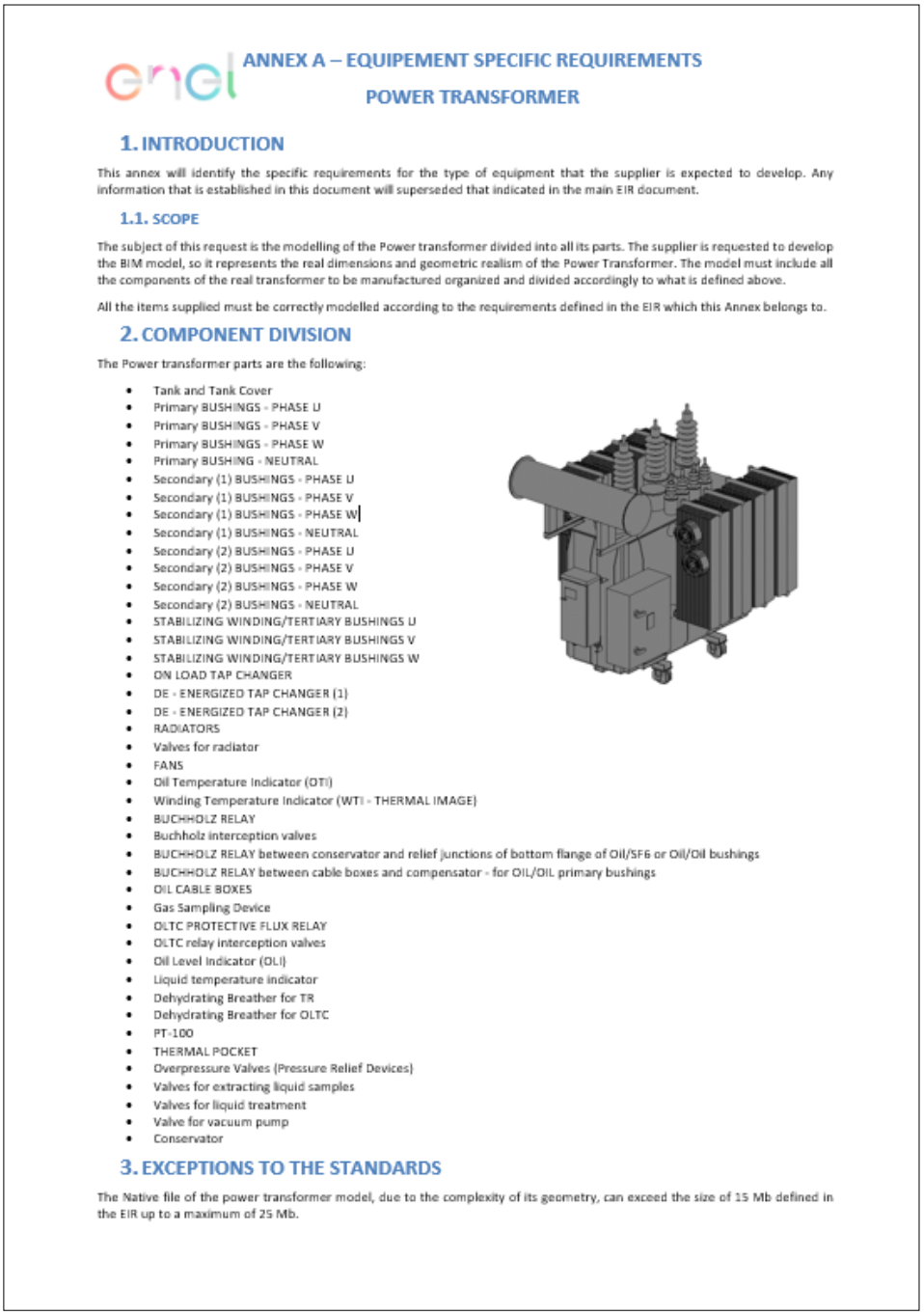
Figure 26 – IFC Export - Advanced Tab.

- You will have to specify that the active view is used to create the geometry.
- The IfcSite parameter will be included in the site and the code of the exported element IFC GUID will be stored in the element after export.
- Family and Type codes will not be included as a reference.

After having the configuration of the export profile ready, the elements can be exported to IFC extension.

8.6 ANNEX F. EIR SUPPLIER EXAMPLE DOCUMENTATION

The following figures show an example of the EIR Supplier documentation for a Power Transformer.:



ANNEX A – EQUIPEMENT SPECIFIC REQUIREMENTS

POWER TRANSFORMER

1. INTRODUCTION

This annex will identify the specific requirements for the type of equipment that the supplier is expected to develop. Any information that is established in this document will superseded that indicated in the main EIR document.

1.1. SCOPE

The subject of this request is the modelling of the Power transformer divided into all its parts. The supplier is requested to develop the BIM model, so it represents the real dimensions and geometric realism of the Power Transformer. The model must include all the components of the real transformer to be manufactured organized and divided accordingly to what is defined above.

All the items supplied must be correctly modelled according to the requirements defined in the EIR which this Annex belongs to.

2. COMPONENT DIVISION

The Power transformer parts are the following:

- Tank and Tank Cover
- Primary BUSHINGS - PHASE U
- Primary BUSHINGS - PHASE V
- Primary BUSHINGS - PHASE W
- Primary BUSHING - NEUTRAL
- Secondary (1) BUSHINGS - PHASE U
- Secondary (1) BUSHINGS - PHASE V
- Secondary (1) BUSHINGS - PHASE W
- Secondary (1) BUSHINGS - NEUTRAL
- Secondary (2) BUSHINGS - PHASE U
- Secondary (2) BUSHINGS - PHASE V
- Secondary (2) BUSHINGS - PHASE W
- Secondary (2) BUSHINGS - NEUTRAL
- STABILIZING WINDING/TERTIARY BUSHINGS U
- STABILIZING WINDING/TERTIARY BUSHINGS V
- STABILIZING WINDING/TERTIARY BUSHINGS W
- ON LOAD TAP CHANGER
- DE - ENERGIZED TAP CHANGER (1)
- DE - ENERGIZED TAP CHANGER (2)
- RADIATORS
- Valves for radiator
- FANS
- Oil Temperature Indicator (OTI)
- Winding Temperature Indicator (WTI - THERMAL IMAGE)
- BUCHHOLZ RELAY
- Buchholz interception valves
- BUCHHOLZ RELAY between conservator and relief junctions of bottom flange of Oil/SF6 or Oil/Oil bushings
- BUCHHOLZ RELAY between cable boxes and compensator - for OIL/OIL primary bushings
- OIL CABLE BOXES
- Gas Sampling Device
- OLTC PROTECTIVE FLUX RELAY
- OLTC relay interception valves
- Oil Level Indicator (OLI)
- Liquid temperature indicator
- Dehydrating Breather for TR
- Dehydrating Breather for OLTC
- PT-100
- THERMAL POCKET
- Overpressure Valves (Pressure Relief Devices)
- Valves for extracting liquid samples
- Valves for liquid treatment
- Valve for vacuum pump
- Conservator

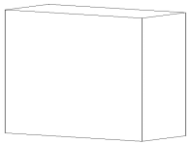
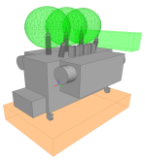
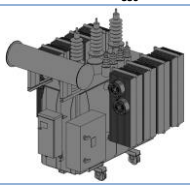
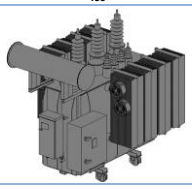
3. EXCEPTIONS TO THE STANDARDS

The Native file of the power transformer model, due to the complexity of its geometry, can exceed the size of 15 Mb defined in the EIR up to a maximum of 25 Mb.

Annex F.1 - Power Transformer - ANNEX A. Equipment specific requirements

Subject: Global Infrastructure and Networks GSCG003 - Employer's Information Requirements for supplier power components / devices

Application Areas
Perimeter: *Global*
Staff Function: -
Service Function: -
Business Line: *Infrastructure & Networks*

LEVEL OF GEOMETRIC DETAIL (LoG)				
	200	300	350	400
LoG Image				
	200	300	350	400
LoG Specification	Basic geometry with approximate dimensions.	Defined geometry with updated dimensions.	Real geometry of the transformer. Inclusion and definition (geometry and position), in detail, of the following elements:	As LoG 350.
		Appearance of the different elements that make up the transformer.	all hydraulic connections, all hydraulic valves	
		Geometry of terminals and bushings for high input and medium voltage outputs (cable coupling and support for the triad of medium voltage cables).	All subcomponents and their particular detailes, as follow:	
		The dimensions of the oil conservator.	Conservator - taps for filling and draining	
		Position and dimensions of the VSC control cabinet (Variator Under Load).	Conservator - removable side wall or window for inspection	
		Position and dimensions of the general cabinet.	Conservator - eyebolts for lifting	
		Position and dimensions of the cooling unit heaters.	Radiators	
		Inclusion of operation and maintenance areas.	Radiators - eyebolts for lifting	
			Radiators - thermometer pocket	
			Radiators - drain plugs	
			Radiators - air purging devices	
			Plates and relevant supports for GIS or cable boxes	
			Compensators for GIS or Oil Cable boxes	
			Cable boxes	
			Geometrical details of following elements represented in the IFC item "TANK AND TANK COVER"(see Annex D):	
			Supporting plates - dimensions and location are important	
			Shelf plates for hoisting - dimensions and location are important	
			Lifting points/hooks	
			Pulling eyes/hooks	
			Grounding terminals	
			Fall arrest system for operator	
			wheels/sliding rolls	
			Marshalling box	
			Primary BUSHINGS - PHASE U	
			Primary BUSHINGS - PHASE V	
			Primary BUSHINGS - PHASE W	
			Primary BUSHING - NEUTRAL	
			Secondary (1) BUSHINGS - PHASE U	
			Secondary (1) BUSHINGS - PHASE V	
			Secondary (1) BUSHINGS - PHASE W	
			Secondary (1) BUSHINGS - NEUTRAL	
			Secondary (2) BUSHINGS - PHASE U	
			Secondary (2) BUSHINGS - PHASE V	
			Secondary (2) BUSHINGS - PHASE W	
			Secondary (2) BUSHINGS - NEUTRAL	
			STABILIZING WINDING/TERTIARY BUSHINGS U	
			STABILIZING WINDING/TERTIARY BUSHINGS V	
			STABILIZING WINDING/TERTIARY BUSHINGS W	
			ON LOAD TAP CHANGER	
			DE - ENERGIZED TAP CHANGER (1)	
			DE - ENERGIZED TAP CHANGER (2)	
			RADIATORS	
			Valves for radiator	
			FANS	
			Oil Temperature Indicator (OTI)	
			Winding Temperature Indicator (WTI - THERMAL IMAGE)	
			BUCHHOLZ RELAY	
			Buchholz interception valves	
			BUCHHOLZ RELAY between conservator and relief junctions of bottom flange of Oil/SF6 or Oil/Oil bushings	
			BUCHHOLZ RELAY between cable boxes and compensator - for OIL/OIL primary bushings	
			OIL CABLE BOXES	
			Gas Sampling Device	
			OLTC PROTECTIVE FLUX RELAY	
			OLTC relay interception valves	
			Oil Level Indicator (OLI)	
			Liquid temperature indicator	
			Dehydrating Breather for TR	
			Dehydrating Breather for OLTC	
			PT-100	
			THERMAL POCKET	
			Overpressure Valves (Pressure Relief Devices)	
			Valves for extracting liquid samples	
			Valves for liquid treatment	
			Valve for vacuum pump	
			Conservator	

Annex F.2 - Power Transformer - ANNEX B. Level of Geometry (LoG)

Subject: Global Infrastructure and Networks GSCG003 - Employer's Information Requirements for supplier power components / devices

Application Areas
Perimeter: *Global*
Staff Function: -
Service Function: -
Business Line: *Infrastructure & Networks*

	A	B	C	D	E	F	G	H	I
1	A			D			G	H	
2	Group			Element Type			IFC category	Element Description	
3	X:Mandatory O:Optional								
4				Attribute Description					
5		Group	Attribute	Data Type	Units	Description			Information
6		GLOB_CAT_MASTERDATA							
7			GLOB_CAT_MASTERDATA__GLOB_CAT_CODE	TEXT		Code Global Category			TR
8			GLOB_CAT_MASTERDATA__GLOB_CAT_DESC	TEXT		Description Global Category			POWER TRANSFORMERS
9			GLOB_CAT_MASTERDATA__IS_MULTIBAY	Boolean		Multibay			1
10			GLOB_CAT_MASTERDATA__SCHEME	TEXT		Scheme			[N] Network
11			GLOB_CAT_MASTERDATA__TYPE	TEXT		Typology			[C] Component
12		GLOB_TYPE_MATGROUP							
13			GLOB_TYPE_MATGROUP__MATGROUP_GLOB	TEXT		Gruppo Merci Globale			FETR0509
14		GLOB_TYPE_MASTERDATA							
15			GLOB_TYPE_MASTERDATA__DATE	TEXT		Data			15-01-2014
16			GLOB_TYPE_MASTERDATA__GLOB_TYPE_CODE	TEXT		Codice Global Type			GST002/241
17			GLOB_TYPE_MASTERDATA__GLOB_TYPE_DESC	TEXT		Descrizione Global Type			POWER TRANSFORMERS
18			GLOB_TYPE_MASTERDATA__OPER_VERSION	TEXT		Versione Operativa			[S] Yes
19			GLOB_TYPE_MASTERDATA__PARENT_MODEL_ID	TEXT		Riferimento Livello Superiore			_TR
20			GLOB_TYPE_MASTERDATA__REVISION_CODE	TEXT		Revisione			01
21			GLOB_TYPE_MASTERDATA__TECH_SPEC_CODE	TEXT		Codice Specifica Tecnica			GST002
22			GLOB_TYPE_MASTERDATA__TECH_SPEC_DESC	TEXT		Descrizione Specifica Tecnica			POWER TRANSFORMERS
23		GLOB_TYPE_TR_CT							
24			GLOB_TYPE_TR_CT__TR_COOLING_SYSTEM	TEXT		Cooling System (ONAN-AF, ... , Powers (MVA))			ONAN - ONAF (20-25/20-25)
25			GLOB_TYPE_TR_CT__TR_EFFICIENCY_INDEX	INTEGER	%	Minimum Efficiency Index required @kEI (%)			99,7
26			GLOB_TYPE_TR_CT__TR_FALL_ARREST_SYS_FOR_OPER	TEXT		Fall arrest system for operator			[1] Yes
27			GLOB_TYPE_TR_CT__TR_FREQUENCY	INTEGER	Hz	Rated frequency: fr (Hz)			50
28			GLOB_TYPE_TR_CT__TR_HV_DOUBLE_LEV_CHANGE	TEXT		HV Double Level change (YES/NO)			[2] No
29			GLOB_TYPE_TR_CT__TR_HV_INSULATION_LEVEL	TEXT		HV Insulation Levels - (Um/SI/LI/LIC/AC) (kV)			72.5/325/140/-/-
30			GLOB_TYPE_TR_CT__TR_HV_NEUTRAL	TEXT		HV Neutral (accessible/not accessible)			[1] Accessible
31			GLOB_TYPE_TR_CT__TR_HV_NEUTRAL_INS_LEV	TEXT		HV Neutral insulation levels (Um/LI/AC) (kV)			72.5/325/140/-/-
32			GLOB_TYPE_TR_CT__TR_HV_VOLT_REG	TEXT		HV Volt. Reg. (n. of steps, value %)			±11x1.50%
33			GLOB_TYPE_TR_CT__TR_HV_VOLT_REG_TYPE	TEXT		HV Volt. Reg. Type (OLTC, DETC, NO)			[1] OLTC
34			GLOB_TYPE_TR_CT__TR_INSTALLATION	TEXT		Installation (Indoor, Outdoor)			[2] Outdoor
35			GLOB_TYPE_TR_CT__TR_MV_CHANGER_TYPE	TEXT		MV Changer Type (DETC, Intanked Bars, N/A)			[3] N/A
36			GLOB_TYPE_TR_CT__TR_MV_INSULATION_LEVEL	TEXT		MV Insulation levels (Um/LI/AC) (kV)			24/125/50
37			GLOB_TYPE_TR_CT__TR_MV_LEV_CHANGE	TEXT		MV Level change (YES/NO)			[2] No
38			GLOB_TYPE_TR_CT__TR_MV_NEUTRAL	TEXT		MV Neutral (accessible/not accessible)			[2] Not accessible
39			GLOB_TYPE_TR_CT__TR_MV_NEUTRAL_INSULATION_LE	TEXT		MV Neutral insulation levels (Um/LI/AC) (kV)			24/125/50
40			GLOB_TYPE_TR_CT__TR_MV_RATED_VOLTAGE_UR	INTEGER	kV	MV Rated Voltage Ur (kV)			15,6
41			GLOB_TYPE_TR_CT__TR_MV_VOLT_REG_TYPE	TEXT		MV Volt. Reg. Type (OLTC, DETC, Intanked Bars, N/A			[3] No
42			GLOB_TYPE_TR_CT__TR_MV_Y_LEV_CHANGE	TEXT		MV Y - Delta change (YES/NO)			[2] No
43			GLOB_TYPE_TR_CT__TR_NUMBER_OF_WINDINGS	TEXT		Number of windings			1/1
44			GLOB_TYPE_TR_CT__TR_PHASES	INTEGER		N. of Phases			3
45			GLOB_TYPE_TR_CT__TR_POLLUTION_LEVEL	TEXT		Pollution Level/Corrosivity			[2] Heavy/C4
46			GLOB_TYPE_TR_CT__TR_RATED_HV	INTEGER	kV	Rated HV Ur (kV)			66
47			GLOB_TYPE_TR_CT__TR_RATED_HV_CURRENT	INTEGER	A	Rated HV Current (A)			218693
48			GLOB_TYPE_TR_CT__TR_RATED_MV_CURRENT	INTEGER	A	Rated MV Current (A)			925241
49			GLOB_TYPE_TR_CT__TR_RATED_POWER	TEXT		Rated Power Sr (MVA) - (1stW/2ndW/3thW +SW)			25/25
50			GLOB_TYPE_TR_CT__TR_REF_D_TEMP	TEXT		Ref. Delta Temp. (TopOil/AvrgWindg/HotSpot) (K)			50/55/68
51			GLOB_TYPE_TR_CT__TR_SAME_TYPE_INS_LIQ	TEXT		Insulating liquid: Same Type of liquid used for OLTC			[1] Yes
52			GLOB_TYPE_TR_CT__TR_SEISMIC_REQ	TEXT		Seismic Requirements			[2] No
53			GLOB_TYPE_TR_CT__TR_SERVICE_CONDITIONS	TEXT		Service Conditions (acc. to IEC 60076-1)			[2] Special
54			GLOB_TYPE_TR_CT__TR_SOUND_PRESS_LEV	INTEGER	dB	Sound level			73,00
55			GLOB_TYPE_TR_CT__TR_STD_TO_REFERENCE_INS_LIQ	TEXT		Insulating liquid: Standard of reference			IEC 60296
56			GLOB_TYPE_TR_CT__TR_TR_ATR	TEXT		Transformer (TR) or Autotransformer (ATR)			[1] TR
57			GLOB_TYPE_TR_CT__TR_TYPE_INS_LIQ	TEXT		Insulating liquid: Type			TVBU
58			GLOB_TYPE_TR_CT__TR_TYPE_OF_HV_LEV_CHANGE	TEXT		Type of HV Level change (DETC, Intanked Bars, N/A)			[3] N/A
59			GLOB_TYPE_TR_CT__TR_VECTOR_GROUP	TEXT		Vector group (Connecting symbol)			YNd11
60			GLOB_TYPE_TR_CT__TR_ZSC_RATED_TAP_HV_MV	INTEGER	%	Zsc RATED TAP HV-MV (%, ref. Sr)			10
61		SUBTYPE_MASTERDATA							
62			SUBTYPE_MASTERDATA__COUNTRY	TEXT		Nazione			[ES] Spain
63			SUBTYPE_MASTERDATA__DISTRIBUTION_COMPANY	TEXT		Società di distribuzione			[EE] E-Distribucion
64			SUBTYPE_MASTERDATA__GLOB_CAT_CODE	TEXT		Codice categoria globale			_TR
65			SUBTYPE_MASTERDATA__GLOB_TYPE_CODE	TEXT		Codice Global Type			GST002-241
66			SUBTYPE_MASTERDATA__MATERIAL_CODE	TEXT		Matricola Enel			110340
67			SUBTYPE_MASTERDATA__PARENT_MODEL_ID	TEXT		Riferimento Livello Superiore			GST002_241_01
68			SUBTYPE_MASTERDATA__REVISION_CODE	TEXT		Revisione			01
69			SUBTYPE_MASTERDATA__SHORT_TEXT	TEXT		Testo breve			TR 20-25 MVA ONAN-AF; 66/15,6 kV; YNd11; 10% (25 MVA); (HAT) (ABS)
70			SUBTYPE_MASTERDATA__TECH_SPEC_CODE	TEXT		Codice Specifica Tecnica			GST002
71			SUBTYPE_MASTERDATA__TECH_SPEC_DESC	TEXT		Descrizione Specifica Tecnica			POWER TRANSFORMERS
72		OEM_MASTERDATA							
73			OEM_MASTERDATA__GLOB_CAT_CODE	TEXT		Code Global Category			TR
74			OEM_MASTERDATA__MODEL	TEXT		Model			Competenza Fornitore
75			OEM_MASTERDATA__SUPPLIER_CODE	TEXT		Supplier code			Competenza Fornitore
76			OEM_MASTERDATA__SUPPLIER_DESCRIPTION	TEXT		Supplier description			Competenza Fornitore
77			OEM_MASTERDATA__MATERIAL_CODE	TEXT		Code Enel			110340
78			OEM_MASTERDATA__COUNTRY	TEXT		Country			[ES] Spain
79			OEM_MASTERDATA__DISTRIBUTION_COMPANY	TEXT		Distribution Company			[EE] E-Distribucion
80			OEM_MASTERDATA__REVISION_CODE	TEXT		Revision			01
81			OEM_MASTERDATA__PARENT_MODEL_ID	TEXT		Upper level reference			EE_ES_110340_01
82		OEM_TR_CT_IT							
83			OEM_TR_CT_IT__TR_OEM_TRILETTERALE	TEXT		Triletterale			Competenza Fornitore
84		TECH_DETAIL							
85			TECH_DETAIL__IFCNAME	TEXT		IfcName			POWER TRANSFORMERS-EE_ES_110340_01
86			TECH_DETAIL__LOI_PHASE	TEXT		Fase Loi			350/400
87			TECH_DETAIL__LANGUAGE	TEXT		Lingua			IT_EN
88			TECH_DETAIL__PARENT_ID_1	TEXT		Riferimento livello superiore			EE_ES_110340_01
89			TECH_DETAIL__TEMPLATE_1	TEXT		Template generale model			TEMP_OEM
90			TECH_DETAIL__TEMPLATE_2	TEXT		Template caratteristiche tecniche			TEMP_OEM_TR
91			TECH_DETAIL__MODEL_TYPE_1	TEXT		Model type 1			EQU_MOD
92			TECH_DETAIL__IMAGE_1	TEXT		Immagine			OEM MODEL.png
93			TECH_DETAIL__MODEL_TYPE_2	TEXT		Model type 2			EQU_MOD
94			TECH_DETAIL__IMAGE_2	TEXT		Immagine			EQUIPMENT.png

Annex F.3 – Power Transformer - ANNEX C. Level of Information (LoI)

ELEMENT CODE	ELEMENT DESCRIPTION	IFC CLASS
Tank & Tank Cover	Tank and Tank Cover	**IfcTransformer**
BushingsPrimaryU	Primary BUSHINGS - PHASE U	**IfcDistributionFlowElement**
BushingsPrimaryV	Primary BUSHINGS - PHASE V	**IfcDistributionFlowElement**
BushingsPrimaryW	Primary BUSHINGS - PHASE W	**IfcDistributionFlowElement**
BushingsPrimaryN	Primary BUSHING - NEUTRAL	**IfcDistributionFlowElement**
BushingsSecundaryU	Secondary (1) BUSHINGS - PHASE U	**IfcDistributionFlowElement**
BushingsSecundaryV	Secondary (1) BUSHINGS - PHASE V	**IfcDistributionFlowElement**
BushingsSecundaryW	Secondary (1) BUSHINGS - PHASE W	**IfcDistributionFlowElement**
BushingsSecundaryN	Secondary (1) BUSHINGS - NEUTRAL	**IfcDistributionFlowElement**
BushingsSecundaryU	Secondary (2) BUSHINGS - PHASE U	**IfcDistributionFlowElement**
BushingsSecundaryV	Secondary (2) BUSHINGS - PHASE V	**IfcDistributionFlowElement**
BushingsSecundaryW	Secondary (2) BUSHINGS - PHASE W	**IfcDistributionFlowElement**
BushingsSecundaryN	Secondary (2) BUSHINGS - NEUTRAL	**IfcDistributionFlowElement**
BushingsTertiaryU	STABILIZING WINDING/TERTIARY BUSHINGS U	**IfcDistributionFlowElement**
BushingsTertiaryV	STABILIZING WINDING/TERTIARY BUSHINGS V	**IfcDistributionFlowElement**
BushingsTertiaryW	STABILIZING WINDING/TERTIARY BUSHINGS W	**IfcDistributionFlowElement**
LoadTopChanger	ON LOAD TAP CHANGER	**IfcController**
EnergizedTapChanger	DE - ENERGIZED TAP CHANGER (1)	**IfcController**
EnergizedTapChanger	DE - ENERGIZED TAP CHANGER (2)	**IfcController**
Radiator	RADIATORS	**IfcHeatExchanger**
RadiatorValve	Valves for radiator	**IfcValve**
Fan	FANS	**IfcFan**
OilTempIndicator	Oil Temperature Indicator (OTI)	**IfcSensor**
WindingTempIndicator	Winding Temperature Indicator (WTI - THERMAL IMAGE)	**IfcSensor**
BuchholzRelay	BUCHHOLZ RELAY	**IfcFlowInstrument**
BuchholzValve	Buchholz interception valves	**IfcValve**
BuchholzRelay	BUCHHOLZ RELAY between conservator and relief junctions of bottom flange of Oil/SF6 or Oil/Oil bushings	**IfcSensor**
BuchholzRelay	BUCHHOLZ RELAY between cable boxes and compensator - for OIL/OIL primary bushings	**IfcSensor**
OilCableBox	OIL CABLE BOXES	**IfcCovering**
GasSampling	Gas Sampling Device	**IfcTank**
FluxRelay	OLTC PROTECTIVE FLUX RELAY	**IfcFlowInstrument**
RelayValves	OLTC relay interception valves	**IfcValve**
OilLevelIndicator	Oil Level Indicator (OLI)	**IfcFlowMeter**
LiquidTempIndicator	Liquid temperature indicator	**IfcSensor**
BreatherTR	Dehydrating Breather for TR	**IfcFilter**
BreatherOLTC	Dehydrating Breather for OLTC	**IfcFilter**
PT-100	PT-100	**IfcSensor**
ThermalPocket	THERMAL POCKET	**IfcCovering**
OverpressureValve	Overpressure Valves (Pressure Relief Devices)	**IfcValve**
LiquidSamplesValve	Valves for extracting liquid samples	**IfcValve**
LiquidTreatmentValve	Valves for liquid treatment	**IfcValve**
VacuumPumpValve	Valve for vacuum pump	**IfcValve**
Conservator	Conservator	**IfcTank**

SiteArea	Areas and spaces	**IfcSpace**
FoundationArea	Areas and spaces	**IfcSpace**
OperationArea	Areas and spaces	**IfcSpace**

Annex F.4 - Power Transformer - ANNEX D. Elements codification table: Element codes